

Appendix A.5.1.4

Phase 3 Contract 1

N6 Galway City Transport Project Phase 3 Ground Investigation Contract 1,

January to April 2016

A.5.1.4

IGSL Ltd

**N6 Galway City Transport
Project – Phase 3
Ground Investigation
Contract 1**

Factual Report

Project No. 18963

July 2017



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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 (**N6 Galway City Transport Project – Phase 3 Ground Investigation Contract 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 +A2:2010 and BS 1377 (Parts 1 to 9) and the following European Norms:

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

Reporting

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 Galway County Council / ARUP and the information should not be used without prior written permission of either party. 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 variation 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.

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.

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

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

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

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.

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

At the instruction of ARUP on behalf of their Client Galway County Council, IGSL has undertaken a programme of geotechnical site investigation works in the environs around Galway City from Bearna in the west to Coolagh, Briarhill in the east (Figure 1). It is understood that the Client (Galway County Council) intends to construct a new by-pass road extending east-west across the northern fringe of Galway City incorporating a new River Corrib bridge crossing. Tunnelling and the construction of a viaduct will also form part of the scheme. This will allow the road infrastructure to cross the Lough Corrib cSAC without direct impact on Annex I habitat (N6 Galway City, 2015).

Figure 1 – Site Location Plan – Proposed N6



Reproduced from N6galwaycity.ie website (N6 Galway City, 2015)

The investigations comprised both machine-excavated and hand-dug trial pits, window samples, cable percussive boreholes and rotary coreholes. In situ testing comprised falling head permeability testing and soakaway testing to BRE Digest 365. The intrusive works were supplemented by numerous geophysical 2D resistivity and seismic survey lines throughout the scheme. Geotechnical instrumentation (50mm diameter standpipes) was installed in nominated cable percussive boreholes and rotary coreholes. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (1999+A2:2010) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing.

Geotechnical laboratory testing was carried out on a range of disturbed bulk samples. The testing included particle size distributions, moisture contents, Atterberg Limits, CBR, compactions and 5-point MCV testing. Chemical soil analyses were also completed comprising pH, sulphate and organic testing. Specialist environmental testing (ARUP Disposal Suite and asbestos screening) were also undertaken on nominated soil samples.

Rock strength testing comprising Point Load Strength Index (PLSI) and Unconfined Compressive Strength (UCS) tests were performed on the rock core samples acquired from the rotary coring. The strength testing was carried out in accordance with ISRM. Los Angeles abrasion, slake durability and 10% fines analysis were also conducted on rock core samples. The 'as-built' exploratory locations were surveyed by IGSL and the co-ordinates and elevations are presented on the field logs. An exploratory hole location plan is presented in Appendix 17.

2. FIELDWORK

2.1 General

The fieldworks were carried out from January 2016 to April 2016 and comprised the following:

- Cable percussion boreholes (29 No.)
- Hand-excavated pits at cable percussive borehole locations (18 No.)
- Rotary Coreholes (40 No.)
- Machine-excavated inspection pit at rotary corehole (1 No.)
- Trial pits (38 No.) ⁽ⁱ⁾
- Hand-excavated pits at trial pit locations (5 No.)
- Soakaway Testing (2 No.)
- Falling head Permeability Testing (5 No.)
- Plate Bearing Tests (4 No.)
- Window Sampling (4 No.)
- Geophysical Survey
- Groundwater Monitoring
- Surveying of *as-built* exploratory locations

⁽ⁱ⁾ Including hand-excavated pit record from TP3/43 (formerly BH3/05)

2.2 Cable Percussion Boreholes

Cable percussive boring (200mm diameter) was undertaken at twenty nine locations using a Dando 3000 rig. At eighteen other proposed borehole locations, because of the obvious presence of outcropping bedrock in the vicinity and occasionally due to prohibitive access issues posed by boggy or undulating terrain, hand digging was carried out through the very shallow overburden soils. The borehole numbers are prefixed BH3/_ and extended to depths of between 0.10m and 10.50m bgl. Boring commenced after scanning (CAT & Jenny) to verify the presence or absence of service ducts. Disturbed bulk samples were recovered at 1m intervals or change of strata during boring and these are denoted 'B' on the engineering logs.

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. BH3/17 at 1.0m where N=21). 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. BH3/06 at 0.50m where N=50/75mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (Er) value is incorporated on the engineering logs. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio.

Descriptions of the soils encountered, in-situ tests undertaken and samples recovered are presented on the borehole records in Appendix 1. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records. A standpipe was installed in one of the boreholes (BH3/21) to establish an equilibrium groundwater level. The standpipe (50mm diameter uPVC with proprietary 1mm slots and filter sock) incorporated a pea gravel filter pack and cement/bentonite grout seal. A protective stand-up headwork cover was concreted in place. Measured groundwater levels are detailed in Appendix 12.

2.3 Hand-excavated pits at Cable Percussive Borehole locations

Hand-digging was deployed at cable percussive borehole locations where shallow bedrock was anticipated and occasionally where access issues were faced in trying to achieve rig access. In all eighteen hand-dug pits were carried out at borehole locations. At three of these locations (BH3/15, BH3/31 and BH3/35), cable percussive boring (200mm diameter) was ultimately undertaken using a Dando 3000 rig. Here rig set-up was undertaken only after shallow rockhead was not thought intercepted to a depth of 1.20m / 1.30m in the pit. The hand-dug pits extended to depths of between 0.30m and 1.30m bgl. Disturbed bulk samples recovered during pit excavation are denoted 'B' on the engineering logs. Photographs were taken as the pits progressed and these are presented in Appendix 2.

2.4 Rotary Core Drillholes

Rotary core drilling (coreholes denoted BH3/_R) was carried out across the site using three different drill rigs. The terrain largely dictated which rig was used where. A track-mounted Casagrande C6 rig, a rubber-wheeled Unimog-mounted Knebel rig and a smaller rubber-tracked Comacchio GEO 205 were all used at various times throughout the contract period. Across all rigs symmetrex drilling was utilized within the superficial deposits with conventional coring techniques used in the bedrock. The rotary drilling in bedrock produced 79mm (T6-H core bit) and 71.7mm (T2-86) diameter cores using air mist flush. The smaller diameter drill bit was utilized in the very strong granite bedrock to effect penetration.

The cores were placed in 3m capacity timber boxes and logged by an IGSL engineering geologist. This included photography of the cores with a digital camera. Where rock core was recovered, a graphic fracture log is also presented alongside the mechanical indices. This illustrates the fracture state of the rock cores and allows easy identification of highly fractured / non-intact zones and discontinuity spacings. It should be noted that no correction for dip of the joints has been made and that the spacings shown are successive joint / core intersections within the core.

The core log records are presented in Appendix 3 and this includes engineering geological descriptions, details of the bedding / discontinuities and mechanical indices (TCR, SCR and RQD's) for each core run. Core photographs are also presented in Appendix 3 and these illustrate the structure and fracture state of the bedrock.

Groundwater monitoring standpipes were installed in numerous coreholes as specified by the client's representative on site. The installed well standpipes consist of 50mm diameter HDPE pipework with proprietary 1mm slots and incorporated a pea gravel filter pack and cement/bentonite grout seal. Stand-up headwork covers were concreted in place with protective post-and-rail timber fencing erected about the well heads. The groundwater reading measurements are presented in Appendix 12. Monthly dip readings are to be taken for a period of 12 months from the end of the contract period.

In the case of BH3/30R, a small trial excavation was initially excavated to ensure that symmetrex open-hole drilling did not push through possible asbestos-containing soils from ground level to 1.60m. Possible asbestos fragments were thought intercepted during the construction of cable percussive borehole BH3/30*. The rotary casing was lowered into the excavation prior to machine-backfilling of the inspection pit. Photographs of the excavation are presented in Appendix 4.

*Environmental testing with asbestos screening later failed to identify asbestos material in the sampled soils at BH3/30

2.5 Trial Pits & Hand-excavated pits at Trial Pit locations

The majority of trial pits were excavated on site using an 8ton tracked excavator. Pitting was also undertaken using a 13ton tracked excavator (TP3/30). In addition to machine-excavation, hand-digging was deployed in the case of five trial pits. Where hand-digging was used, poor access to trial pits was generally a deciding factor coupled with the knowledge that shallow (<1.20m) overburden existed in the area. The trial pits were logged and sampled by an IGSL geotechnical engineer in accordance with BS 5930 (1999+A2:2010). Bulk disturbed samples (typically 30 to 40 kg) were taken as the pits progressed. The bulk samples were placed in heavy-duty polyethylene bags and sealed before being transported to Naas for laboratory testing. The trial 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 5 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls. Appendix 6 presents the hand-dug pit log for TP3/43. This trial pit was scheduled in place of BH3/05 after it was agreed that access to the location would not be possible with a cable percussive boring rig.

2.6 Soakaway Tests

Two infiltration tests were performed to assess the suitability of the sub-soils for dispersion of storm water through a soakaway system. The infiltration tests were performed in accordance with BRE Digest 365 'Soakaway Design'. To obtain a measure of the infiltration rate of the sub-soils, water is poured into each test pit, and records taken of the fall in water level against time. This procedure is repeated twice more to ensure saturation of the sub-soils. The infiltration rate is the volume of water dispersed per unit of exposed area per unit of time, and is generally expressed as metres / minute or metres / second. Designs are based on the slowest infiltration rate, which is generally calculated from the final cycle. The soakaway design logs are presented in Appendix 7.

2.7 Falling Head Permeability Testing

Four falling head permeability tests were performed in 50mm diameter groundwater wells installed over the course of the contract. The wells identified by the client's representative were BH3/35R, BH3/46R, BH3/47R and BH3/48R. In addition to performing variable head permeability tests in the aforementioned corehole installations, one further permeability test was conducted. This was an existing 4" diameter well (MW3) located in Lackagh Quarry. It was drilled several years ago by the operators of the quarry. The records for the permeability tests are presented in Appendix 8.

2.8 Plate Bearing Tests

Four number plate bearing tests were conducted along the proposed road corridor. The depth of the four tests varied from beneath shallow peats at c.0.50m bgl to 1.20m bgl (TP3/23). All tests were undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used with kentledge provided by a tracked excavator. Two load cycle tests were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 9.

2.9 Window Sampling (Driven Sampling)

Window sampling was carried out at four locations using a Dando Terrier rig mounted upon a Kubota tracked dumper. Ground conditions varied from shallow blanket peat bog to soft organic clays. The rig was positioned atop the dumper in order to facilitate access to each of the four locations. The Terrier rig uses a 63.5kg weight to drive the window sampler and the material was retrieved in a semi-rigid plastic core liner. Depths were dictated by the level of very stiff to hard stratum or medium dense to dense stratum in the area. Termination depths were also influenced by coarse cobble and boulder material obstructing the sample drive.

The maximum depth achieved with window sampling was 4.0m bgl (WS3/04). Overall recovery of the subsurface soils was high and provides a good understanding of the composition, structure and

strength of the near surface materials. The window sample records are presented in Appendix 10 and include descriptions of the soils encountered and the total recovery per run.

2.10 Geophysical Surveying

Minerex Geoservices carried out the geophysical survey across the site. The key aim of the survey was to determine the depth to rockhead and to identify any anomalous ground conditions. A combination of techniques was utilized consisting of 2D Electrical Resistivity Tomography (ERT) and Seismic Refraction Profiling. The findings of the geophysical survey are incorporated in Appendix 11.

2.11 Groundwater Monitoring

Groundwater monitoring was undertaken during the fieldworks period and at designated intervals following completion (monthly for a period of 12 months beyond the end of the contract term). Groundwater levels were measured using an electric dipmeter with measurements taken from the wells installed in boreholes and coreholes throughout the project. The levels recorded are shown in Appendix 12.

2.12 Surveying of Exploratory Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plan in Appendix 17.

3. LABORATORY TESTING

Geotechnical laboratory testing was carried out on selected borehole and trial pit samples. The soils testing was undertaken in accordance with BS 1377 (1990) and included particle size gradings, Atterberg limit, 5-point MCV, optimum moisture content plots, shear box, CBR, water soluble sulphate and pH testing. The geotechnical laboratory test results are contained in Appendix 13 with the chemical results presented separately in Appendix 14. Environmental testing performed on soil samples acquired from site are presented in Appendix 15.

Geotechnical laboratory testing was also carried out on selected rock cores. Point load strength index (PLSI), unconfined compressive strength (UCS), Los Angeles abrasion, slake durability and 10% fines analysis were conducted with the results presented in Appendix 16.

REFERENCES

- 1.0 BS 5930 (1999 + A2:2010) Code of Practice for Site Investigation, British Standards Institution (BSI).
- 2.0 BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.
- 3.0 Eurocode 7, Part 2: Ground Investigation & Testing (EN 1997-2:2007)
- 4.0 N6 Galway City (2015). *Emerging Preferred Route Options – Brochure*. Retrieved March 30, 2016 from the N6 Galway City website http://www.n6galwaycity.ie/wp-content/uploads/2015/05/GCOB-4.03-17.3.3-004_PC-No.-3_Brochure.pdf
- 5.0 Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

Appendix 1

Cable Percussive Borehole Logs

(including shallow hand-excavated pits at borehole locations)

Exploratory Hole Number	Method of Construction [Cable Percussive / Hand Dug]
BH3/03	HD
BH3/04	CP
BH3/06	CP
BH3/07	HD
BH3/08	CP
BH3/09	CP
BH3/10	HD
BH3/11	CP
BH3/12	CP
BH3/14	HD
BH3/15	HD
BH3/15 CP	CP
BH3/16	CP
BH3/17	CP
BH3/18	HD
BH3/19	HD
BH3/20	HD
BH3/21	CP
BH3/22	HD
BH3/23	CP
BH3/25	CP
BH3/26	CP
BH3/27	CP
BH3/28	HD
BH3/29	CP
BH3/30	HD
BH3/31	HD
BH3/31 CP	CP

BH3/32	CP
BH3/33	CP
BH3/33A	CP
BH3/34	CP
BH3/35	HD
BH3/35 CP	CP
BH3/36	HD
BH3/38	CP
BH3/39	CP
BH3/40	HD
BH3/41	CP
BH3/42	CP
BH3/43	HD
BH3/46	HD
BH3/47	CP
BH3/48	HD
BH3/52	CP
BH3/53	CP
BH3/54	CP

Note: Boreholes BH3/15, BH3/31 and BH3/35 were each hand dug initially and then drilled using cable percussive methods



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/03	
CO-ORDINATES 523,119.09 E 724,228.86 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 39.99		BOREHOLE DIAMETER (mm)		DATE COMMENCED 12/02/2016	
		BOREHOLE DEPTH (m) 0.70		DATE COMPLETED 12/02/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY AC	
ENGINEER ARUP		ENERGY RATIO (%)		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		39.89	0.10						
	Soft black and brown fibrous PEAT		39.29	0.70	AA49473 AA49474 AA49475	D D B	0.50 0.50 0.50			
1	Obstruction - Possible Weathered Granite Rockhead End of Borehole at 0.70 m									
2										
3										
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
				0.00					Seepage

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

REMARKS Hand dug pit at location of BH3/03	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 18963.GPJ IGSL_GDT 16/08/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/04	
CO-ORDINATES 523,645.55 E 724,286.79 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 36.82		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 26/01/2016	
		BOREHOLE DEPTH (m) 0.10		DATE COMPLETED 26/01/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 Obstruction - Possible Rockhead End of Borehole at 0.10 m		36.72	0.10						
1										
2										
3										
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
0.1	0.1	1							No water strike

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

REMARKS Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.	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 18963.GPJ IGSL_GDT 16/08/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/06	
CO-ORDINATES 524,240.55 E 724,825.14 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 23.68		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 27/01/2016	
		BOREHOLE DEPTH (m) 0.70		DATE COMPLETED 27/01/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Gravelly TOPSOIL		23.28	0.40	AA43886	B	0.50-0.70		N = 50/75 mm (16, 9, 37, 13)	
	Loose to medium dense light brown silty very sandy GRAVEL		22.98	0.70						
1	Obstruction End of Borehole at 0.70 m									
2										
3										
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
0.5	0.7	1		0.70	0.70	No	0.50	20	Seepage

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

REMARKS Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring. Waiting on following position from 10:30 to 16:30.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/07
CO-ORDINATES 524,504.62 E 725,005.37 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 36.22	RIG TYPE Hand Dug	DATE COMMENCED 12/02/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 12/02/2016
	BOREHOLE DEPTH (m) 0.60	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY AC
ENGINEER ARUP	ENERGY RATIO (%)	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		36.12	0.10	AA49476	D	0.10-0.30			
	Soft black to dark brown fibrous PEAT		35.92	0.30	AA49477	D	0.10-0.30			
	Brown angular COBBLES and BOULDERS of granite		35.62	0.60	AA49478	B	0.10-0.30			
1	Obstruction - Possible Weathered Granite Rockhead End of Borehole at 0.60 m									
2										
3										
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
				0.30					Slow

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

REMARKS Hand dug pit at location of BH3/07	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/08	
CO-ORDINATES 524,620.87 E 725,068.66 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 41.74		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 26/01/2016	
		BOREHOLE DEPTH (m) 0.70		DATE COMPLETED 26/01/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Gravelly TOPSOIL		41.24	0.50						
0.50 - 0.70	Dark brown clayey/silty very sandy angular fine to coarse GRAVEL-sized fragments of Granite with some cobbles Obstruction - Possible Rockhead End of Borehole at 0.70 m		41.04	0.70	AA43885	B	0.50-0.70		N = 50/75 mm (10, 15, 28, 22)	
1										
2										
3										
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	
0.5	0.7	1							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 1.5hr getting rig and tools to BH location. Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.					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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/09	
CO-ORDINATES 524,952.19 E 725,305.97 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 47.38		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 28/01/2016	
		BOREHOLE DEPTH (m) 0.40		DATE COMPLETED 28/01/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	PEAT		46.98	0.40						
	Soft light grey brown very sandy gravelly slightly peaty SILT				AA43887	D	0.50			
1	Loose to medium dense mottled grey brown clayey/silty very sandy GRAVEL		46.38	1.00	AA43888	B	1.00-1.30			
	Obstruction End of Borehole at 0.40 m		46.08	1.30	AA43889	D	1.30			N = 50/85 mm (2, 4, 15, 35)
2										
3										
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
1.2	1.3	1							No water strike

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

REMARKS Borehole backfilled upon completion	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/10	
CO-ORDINATES 525,320.57 E 725,603.65 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 66.51		BOREHOLE DIAMETER (mm)		DATE COMMENCED 11/02/2016	
		BOREHOLE DEPTH (m) 0.30		DATE COMPLETED 11/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO.		BORED BY AC
			ENERGY RATIO (%)		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		66.21	0.30						
	Obstruction - Possible granite rockhead End of Borehole at 0.30 m									
1										
2										
3										
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
				0.30					Seepage

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

REMARKS Hand dug pit at location of BH3/10	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/11	
CO-ORDINATES 525,784.11 E 725,831.24 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 54.37		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 21/01/2016	
		BOREHOLE DEPTH (m) 2.60		DATE COMPLETED 22/01/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Gravelly TOPSOIL		53.97	0.40						
	Very soft dark brown sandy gravelly CLAY		53.57	0.80						
1	Soft dark brown black slightly gravelly pseudofibrous PEAT with occasional wood fragment				AA43876 AA43877	B D	1.00-1.45 1.00		N = 6 (0, 0, 1, 1, 0, 4)	
	Medium dense to dense dark brown slightly clayey/silty sandy fine to coarse GRAVEL with a medium cobble content		52.57	1.80						
2					AA43878 AA43879	D B	2.00 2.00-2.45		N = 39 (3, 4, 7, 7, 9, 16)	
	Obstruction		51.77	2.60						
	End of Borehole at 2.60 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
2.4	2.6	1.5		1.20 1.90	1.20 1.90	No	0.95	20	Seepage Moderate

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

REMARKS Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/12	
				SHEET Sheet 1 of 1	
CO-ORDINATES 525,909.63 E 725,923.39 N		RIG TYPE Dando 3000		DATE COMMENCED 22/01/2016	
GROUND LEVEL (m AOD) 53.99		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 22/01/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Very soft black slightly gravelly organic SILT	x o x o	53.49	0.50						
	Loose dark brown slightly silty sandy GRAVEL with many cobbles	x o x o x o x o			AA43880 AA43881	D B	0.50 0.50-0.95		N = 2 (2, 2, 1, 0, 1, 0)	
1	Loose light brown grey silty sandy GRAVEL	x o x o x o x o	52.69	1.30	AA43882 AA43883	D B	1.50 1.50-1.95		N = 5 (0, 0, 0, 0, 1, 4)	
2	Obstruction	x o x o x o x o	51.89	2.10						
	End of Borehole at 2.20 m	x o x o x o x o	51.79	2.20						

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
2.1	2.2	1		1.30 1.90	1.30 1.90	No	1.10	20	Seepage Moderate

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

REMARKS Borehole backfilled upon completion	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/14	
CO-ORDINATES 526,467.41 E 726,392.59 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 55.52		BOREHOLE DIAMETER (mm)		DATE COMMENCED 18/02/2016	
		BOREHOLE DEPTH (m) 0.70		DATE COMPLETED 18/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY JD
ENGINEER ARUP			ENERGY RATIO (%)		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		55.42	0.10	AA39959	B	0.10-0.70			
	Light brown clayey/silty very sandy GRAVEL with a medium cobble content. Sand is fine to medium. Gravel is angular to subangular coarse.		54.82	0.70						
1	Obstruction End of Borehole at 0.70 m									
2										
3										
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
									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 Hand dug pit at location of BH3/14	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/15	
CO-ORDINATES 526,580.27 E 726,493.82 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 59.00		BOREHOLE DIAMETER (mm)		DATE COMMENCED 19/02/2016	
		BOREHOLE DEPTH (m) 1.30		DATE COMPLETED 19/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY JD
ENGINEER ARUP			ENERGY RATIO (%)		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 with rootlets		58.80	0.20						
	(Loose) Dark brown clayey/silty sandy GRAVEL with a high cobble content. Sand is coarse. Cobbles are weathered of granite.		58.60	0.40	AA39960	B	0.20-0.40			
					AA39961	B	0.40-0.80			
					AA39962	B	0.80-1.20			
1	(Loose) Light brown slightly silty/clayey slightly sandy GRAVEL with a high cobble content. Sand is coarse. Gravel is angular to subangular fine of granite. Cobbles are weathered of granite.		58.20	0.80						
2	(Loose) Brown slightly silty/clayey very sandy GRAVEL. Sand is fine. Gravel is angular to subangular coarse.		57.70	1.30						
	Obstruction - Possible Rockhead / Boulder End of Borehole at 1.30 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
					1.20					Slow
INSTALLATION DETAILS					GROUNDWATER PROGRESS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments	

REMARKS Hand dug pit at location of BH3/15	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/15 CP	
				SHEET Sheet 1 of 1	
CO-ORDINATES 526,595.30 E 726,495.59 N		RIG TYPE Dando 3000		DATE COMMENCED 15/03/2016	
GROUND LEVEL (m AOD) 58.49		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 15/03/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Gravelly TOPSOIL		58.29	0.20	AA48883	B	0.50-0.60			
	Soft to firm dark brown sandy gravelly CLAY		58.09	0.40						
	Obstruction - Driller reports LIMESTONE fragments		57.89	0.60						
	End of Borehole at 0.60 m									
1										
2										
3										
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
0.5	0.6	0.5							No water strike

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

REMARKS 2hrs getting plant and equipment to borehole location. 1.5hrs getting off position.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/16	
CO-ORDINATES 526,754.60 E 726,635.82 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 58.47		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 29/01/2016	
		BOREHOLE DEPTH (m) 0.50		DATE COMPLETED 29/01/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	PEAT		58.17	0.30						
	Angular GRAVEL- and COBBLE-sized fragments of Granite		57.97	0.50						
1	Obstruction End of Borehole at 0.50 m									
2										
3										
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
0.4	0.5	0.5		0.30	0.30	No	0.20	20	Seepage

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

REMARKS 1.5hr getting rig and tools off BH location. Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.

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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/17	
CO-ORDINATES 527,023.54 E 726,804.98 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 65.54		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 14/03/2016	
		BOREHOLE DEPTH (m) 2.80		DATE COMPLETED 14/03/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 dark brown sandy gravelly CLAY with a medium cobble content		65.04	0.50						
	Medium dense dark brown silty sandy GRAVEL with some cobbles		64.54	1.00	AA48880	B	0.50			
1	Medium dense light brown silty sandy GRAVEL with a medium cobble and boulder content				AA48881	B	1.00-1.45		N = 21 (3, 4, 4, 5, 7, 5)	
2					AA48882	B	2.00-2.45		N = 15 (2, 8, 4, 3, 3, 5)	
2.80	End of Borehole at 2.80 m		62.74	2.80						

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	2.8	0.5		2.70	2.70	No	2.40	20	Seepage

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

REMARKS 1.75hrs getting plant and equipment to borehole location. 1hr getting off position.

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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/18
CO-ORDINATES 527,254.91 E 726,892.24 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 70.75	RIG TYPE Hand Dug	DATE COMMENCED 22/02/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 22/02/2016
	BOREHOLE DEPTH (m) 0.70	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY JD
ENGINEER ARUP	ENERGY RATIO (%)	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		70.55	0.20	AA39965	B	0.50			
	Dark brown clayey/silty sandy fine to coarse angular GRAVEL with a high cobble content. Cobbles are angular of granite.		70.05	0.70						
1	Obstruction End of Borehole at 0.70 m									
2										
3										
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
									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 Hand dug pit at location of BH3/18	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 18963.GPJ IGSL_GDT 16/8/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/19	
CO-ORDINATES 527,396.47 E 727,015.87 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 61.67		BOREHOLE DIAMETER (mm)		DATE COMMENCED 23/03/2016	
		BOREHOLE DEPTH (m) 1.20		DATE COMPLETED 23/03/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY JD
ENGINEER ARUP			ENERGY RATIO (%)		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		61.37	0.30						
	Loose dark brown clayey/silty sandy GRAVEL with a high cobble and boulder content. Cobbles and boulders are angular to subangular of granite.		61.17	0.50	AA39978	B	0.30-0.50			
					AA39979	B	0.50-1.20			
1	Firm light brown and dark brown silty sandy GRAVEL with a high cobble and boulder content. Cobbles and boulders are angular to subangular of granite.		60.47	1.20						
	Obstruction - Possible weathered rock / boulder End of Borehole at 1.20 m									
2										
3										
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
				0.80					Slow
INSTALLATION DETAILS				GROUNDWATER PROGRESS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug pit at location of BH3/19	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 18963.GPJ IGSL_GDT 16/08/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/20
CO-ORDINATES 527,212.43 E 727,670.35 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 51.46	RIG TYPE Hand Dug	DATE COMMENCED 23/03/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 23/03/2016
	BOREHOLE DEPTH (m) 1.00	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY AC
ENGINEER ARUP	ENERGY RATIO (%)	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		51.36	0.10	AA49485	B	0.10-0.45			
	Dark grey black clayey/silty very sandy organic GRAVEL with rootlets		51.01	0.45						
	Orange brown slightly clayey/silty fine to coarse sandy GRAVEL with a high cobble content. Cobbles are angular to subangular of granite.		50.66	0.80	AA49486	B	0.50-0.80			
1	Brown slightly clayey/silty very sandy fine to coarse GRAVEL with a high cobble content. Cobbles are angular of granite.		50.46	1.00	AA49487	B	0.80-1.00			
2	Obstruction - Slow progress due to many cobbles in pit End of Borehole at 1.00 m									
3										
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
									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 Hand dug pit at location of BH3/20	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/21	
				SHEET Sheet 1 of 1	
CO-ORDINATES 527,143.84 E 726,344.76 N		RIG TYPE Dando 3000		DATE COMMENCED 16/02/2016	
GROUND LEVEL (m AOD) 37.76		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 16/02/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		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 dark brown sandy very gravelly PEAT		37.26	0.50						
	Light brown sandy GRAVEL		36.96	0.80		B	0.50			
1	Light brown silty sandy GRAVEL with many cobbles		36.46	1.30		B	1.00-1.45			
	Firm cream very sandy gravelly CLAY		36.06	1.70						
2	Reddish brown slightly silty very sandy fine to medium GRAVEL		35.96	1.80		B	1.70-1.80			
	End of Borehole at 1.80 m									
3										
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
1.7	1.8	0.75		1.70	1.70	No	1.30	20	Slow

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
16-02-16	1.80	1.10	1.80	50mm SP					

REMARKS 2.5hr getting rig on to position from BH3/38. Driller reports wet ground from 1.50m. 4.5hr getting rig and tracked dumper out of field, reinstating field and cleaning down road. Tracked excavator used to assist rig access / egress from field. Move to next borehole, BH3/27.

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 18963.GPJ IGSL_GDT 16/08/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/22	
CO-ORDINATES 527,548.26 E 727,126.52 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 49.40		BOREHOLE DIAMETER (mm)		DATE COMMENCED 12/02/2016	
		BOREHOLE DEPTH (m) 0.50		DATE COMPLETED 12/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY AC
ENGINEER ARUP			ENERGY RATIO (%)		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		49.10	0.30	AA49472	B	0.30-0.50			
	Brown slightly clayey/silty sandy fine to coarse GRAVEL with a high cobble content. Cobbles are angular of granite.		48.90	0.50						
1	Obstruction - Possible Weathered Granite Rockhead End of Borehole at 0.50 m									
2										
3										
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
				0.45					Slow

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

REMARKS Hand dug pit at location of BH3/22	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 18963.GPJ IGSL_GDT 16/08/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/23	
CO-ORDINATES 527,770.91 E 727,345.14 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 26.78		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 05/02/2016	
		BOREHOLE DEPTH (m) 3.70		DATE COMPLETED 05/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 sandy gravelly CLAY with a low to medium cobble and boulder content		25.78	1.00						
1	Medium dense brown silty very sandy GRAVEL with some cobbles				AA32640	B	1.00-1.45		N = 15 (2, 3, 3, 3, 4, 5)	
2			24.48	2.30	AA32641	B	2.00-2.45		N = 15 (3, 3, 2, 3, 4, 6)	
3	Medium dense light brown clayey/silty very sandy GRAVEL with a low to medium cobble and boulder content				AA32643	B	3.00-3.45		N = 16 (3, 4, 3, 4, 4, 5)	
4	End of Borehole at 3.70 m		23.08	3.70						

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
3.6	3.7	0.75		3.70	3.70	No	3.20	20	Slow

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

REMARKS 0.5hr moving boulders obstructing access to plot. 0.5hr moving rig and tracked dumper from borehole including replacement of boulders to block entrance.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/25	
CO-ORDINATES 528,732.55 E 727,834.69 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 12.60		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 01/02/2016	
		BOREHOLE DEPTH (m) 3.80		DATE COMPLETED 01/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Gravelly TOPSOIL		12.30	0.30						
1	Firm light grey mottled brown silty very sandy GRAVEL with some cobbles				AA43893	B	0.50-1.00		N = 16 (3, 3, 4, 3, 4, 5)	
					AA43894	B	1.00-1.45			
2	Firm becoming firm to stiff light brown slightly sandy gravelly SILT. Gravel is angular.		11.00	1.60					N = 18 (4, 4, 3, 4, 5, 6)	
					AA43895	B	2.00-2.45			
3	Firm becoming firm to stiff light brown slightly sandy gravelly SILT with many cobbles. Gravel is angular.		9.60	3.00					N = 20 (3, 3, 4, 4, 4, 8)	
					AA43896	B	3.00-3.45			
4	Obstruction End of Borehole at 3.80 m		8.80	3.80						

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	3.8	0.75							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 Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/26	
CO-ORDINATES 528,815.44 E 727,922.07 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 14.67		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 01/02/2016	
		BOREHOLE DEPTH (m) 0.40		DATE COMPLETED 01/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 sandy gravelly CLAY with a low to medium boulder content Obstruction End of Borehole at 0.40 m	D	14.27	0.40						
1										
2										
3										
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
0.4	0.4	0.5							No water strike

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

REMARKS 0.75hr gaining access to field and moving to BH location. Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/27	
CO-ORDINATES 528,960.51 E 728,130.68 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 8.94		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 17/02/2016	
		BOREHOLE DEPTH (m) 1.40		DATE COMPLETED 18/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 sandy gravelly CLAY		8.54	0.40						
1	Firm brown slightly sandy slightly gravelly CLAY with a medium cobble and boulder content				AA48872	B	0.50		N = 50/180 mm (2, 2, 4, 8, 38)	
					AA48873	B	1.00-1.45			
1.40	Obstruction End of Borehole at 1.40 m		7.54	1.40						

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
1.4	1.4	0.5							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 2.5hr getting rig on to position from BH3/21. Tracked excavator used to assist rig access / egress from field. 3hr removing rig and track machine from field.

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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/28	
CO-ORDINATES 529,132.46 E 728,217.63 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 18.82		BOREHOLE DIAMETER (mm)		DATE COMMENCED 18/02/2016	
		BOREHOLE DEPTH (m) 0.70		DATE COMPLETED 18/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY JD
ENGINEER ARUP			ENERGY RATIO (%)		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		18.62	0.20	AA39957	B	0.20-0.30			
	Firm brown slightly sandy gravelly SILT		18.52	0.30						
	Firm brownish grey slightly silty sandy gravelly CLAY with a medium cobble and boulder content		18.12	0.70						
1	Obstruction - Large BOULDER / Possible Limestone Rockhead End of Borehole at 0.70 m									
2										
3										
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	
										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 Hand dug pit at location of BH3/28					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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/29	
CO-ORDINATES 529,489.29 E 728,334.05 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 13.73		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 01/02/2016	
		BOREHOLE DEPTH (m) 2.70		DATE COMPLETED 01/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY WC
ENGINEER ARUP			ENERGY RATIO (%)		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 with a low to medium cobble and boulder content		12.93	0.80						
1	Firm to stiff light brown silty sandy GRAVEL with a medium cobble and low to medium boulder content		AA43890	B	1.00				N = 32 (4, 7, 7, 8, 8, 9)	
2					AA43891	B	1.50-1.95			
2	Stiff light brown slightly sandy slightly gravelly CLAY with many cobbles		11.33	2.40					N = 50/105 mm (8, 11, 16, 34)	
3	Obstruction End of Borehole at 2.70 m		11.03	2.70	AA43892	B	2.50-2.70			
3	Obstruction End of Borehole at 2.70 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
2.6	2.7	0.5							No water strike

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

REMARKS Hand dug inspection pit excavated to commence hole (1.5hr). Reinstating field upon completion (0.5hr). Move gear to BH3/26 (0.75hr). Borehole backfilled upon completion. Borehole scheduled for rotary follow-on coring.

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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/30
CO-ORDINATES 531,041.18 E 728,509.06 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 23.76	RIG TYPE Hand Dug	DATE COMMENCED 23/02/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 23/02/2016
	BOREHOLE DEPTH (m) 0.50	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY JD
ENGINEER ARUP	ENERGY RATIO (%)	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 (MADE GROUND)		23.61	0.15						
	Brown clayey/silty very sandy GRAVEL with occasional fragments of concrete, red brick, ceramic pipe, timber, roof slate, plastic and possible tarmac/bitumen (MADE GROUND) End of Borehole at 0.50 m		23.26	0.50	AA39968 AA39969 AA39970	B ENV ENV	0.15-0.50 0.15-0.50 0.15-0.50			
1										
2										
3										
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
									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 Hand dug pit at location of BH3/30. Pit terminated at 0.50m due to presence of possible asbestos roofing fragments.

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

IGSL BH LOG 18963.GPJ IGSL_GDT 16/8/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/31	
CO-ORDINATES 531,272.27 E 728,425.74 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 11.44		BOREHOLE DIAMETER (mm)		DATE COMMENCED 23/02/2016	
		BOREHOLE DEPTH (m) 1.20		DATE COMPLETED 23/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY JD
ENGINEER ARUP			ENERGY RATIO (%)		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		11.14	0.30						
	Firm light brown and dark brown slightly sandy slightly gravelly SILT with a low to medium cobble content. Sand is fine to medium. Gravel is angular to subangular coarse. Firm grey mottled brown slightly sandy gravelly SILT with a medium to high cobble content. Sand is coarse. Gravel is angular to subangular coarse. Cobbles are of limestone. End of Borehole at 1.20 m		10.84	0.60	AA39971	B	0.30-0.60			
					AA39972	B	0.60-1.20			
1				10.24	1.20					
2										
3										
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
				1.20					Seepage

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

REMARKS Hand dug pit at location of BH3/31	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/31 CP	
				SHEET Sheet 1 of 1	
CO-ORDINATES 531,272.27 E 728,425.74 N		RIG TYPE Dando 3000		DATE COMMENCED 02/03/2016	
GROUND LEVEL (m AOD) 11.44		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 02/03/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		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 sandy slightly gravelly SILT with a low to medium cobble and boulder content		10.74	0.70	AA48875	B	0.50			
1	Firm and firm to stiff light brown and grey slightly sandy slightly gravelly SILT with a medium cobble content				AA48876	B	1.00-1.45		N = 16 (2, 4, 5, 6, 2, 3)	
2					AA48877	B	2.00-2.45		N = 13 (3, 4, 4, 3, 3, 3)	
3	Driller notes wet ground from 3.0m				AA48878	B	3.00-3.45		N = 28 (3, 4, 7, 8, 7, 6)	
4	End of Borehole at 4.20 m		7.24	4.20	AA48879	B	4.00-4.45		N = 50/75 mm (16, 9, 37, 13)	
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
4.1	4.2	0.5		3.00					Seepage

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

REMARKS 3.0hrs getting rig and tracked dumper on and off field. Tracked excavator deployed to assist in moving equipment.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/32	
				SHEET Sheet 1 of 2	
CO-ORDINATES 531,971.12 E 728,317.72 N		RIG TYPE Dando 3000		DATE COMMENCED 02/02/2016	
GROUND LEVEL (m AOD) 24.43		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 03/02/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		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		24.23	0.20						
0	Firm light brown slightly sandy gravelly SILT with a low to medium cobble and boulder content				AA48851	B	0.50		N = 16 (3, 4, 3, 4, 4, 5)	
1					AA48852	B	1.00-1.45			
2					AA48853	B	2.00-2.45			
3					AA48854	B	3.00-3.45			
4	Firm orange brown sandy gravelly silty CLAY		20.23	4.20	AA48855	B	4.00-4.45		N = 23 (3, 3, 3, 4, 8, 8)	
4	Stiff light grey and grey brown slightly sandy slightly gravelly laminated SILT/CLAY		19.93	4.50	AA48856	D	4.50		N = 28 (3, 4, 6, 7, 7, 8)	
5					AA48857	B	5.00-5.45			
6	Stiff dark brown slightly sandy slightly gravelly SILT		18.43	6.00	AA48858	B	6.00-6.45		N = 29 (4, 6, 6, 7, 8, 8)	
7					AA48859	B	7.00-7.45		N = 28 (5, 6, 6, 7, 7, 8)	
8					AA48860	B	8.00-8.45		N = 28 (4, 5, 6, 6, 7, 9)	
9	Stiff mottled light brown grey slightly sandy slightly gravelly CLAY		15.43	9.00	AA48861	B	9.00-9.45		N = 32 (6, 6, 7, 8, 8, 9)	
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
3.7	3.85	0.75							No water strike
10.3	10.5	0.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					03-02-16	9.00	9.00	4.10	Start of Shift

REMARKS 2hrs removing rig from BH3/26 field and accessing BH3/32. Borehole BH3/32 scheduled for rotary follow-on coring taking it beyond scheduled depth of 10m. 3hr delivering / installing protective pipework in CP hole for RC follow-on.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/33	
CO-ORDINATES 532,101.71 E 728,307.46 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 35.60		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 04/02/2016	
		BOREHOLE DEPTH (m) 2.70		DATE COMPLETED 04/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Gravelly TOPSOIL		35.45	0.15						
	Firm light brown /grey slightly sandy gravelly SILT with a medium cobble and boulder content				AA48863	B	0.50			
1	Medium dense light brown silty very sandy GRAVEL		34.60	1.00	AA48864	B	1.00-1.45		N = 16 (2, 3, 4, 4, 5, 3)	
2					AA48865	B	2.00-2.45		N = 36 (3, 3, 7, 8, 10, 11)	
3	End of Borehole at 2.70 m		32.90	2.70						
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
2.5	2.7	1							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 Pit terminated at 2.70m on obstruction. Borehole BH3/33A re-setup adjacent to hole.

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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/33A	
CO-ORDINATES 532,100.62 E 728,308.29 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 35.57		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 04/02/2016	
		BOREHOLE DEPTH (m) 2.50		DATE COMPLETED 04/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Gravelly TOPSOIL		35.37	0.20						
	Firm light brown /grey slightly sandy gravelly SILT with a medium cobble and boulder content									
1	Medium dense light brown silty very sandy GRAVEL		34.57	1.00						
2										
3	End of Borehole at 2.50 m		33.07	2.50						
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
2.4	2.5	0.5							No water strike

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

<p>REMARKS Borehole BH3/33A setup adjacent to BH3/33 following shallow obstruction. 2.0hr moving rig out of field with tracked dumper.</p>	<p>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</p>
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/34	
CO-ORDINATES 532,404.52 E 728,276.63 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 32.53		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 08/02/2016	
		BOREHOLE DEPTH (m) 2.60		DATE COMPLETED 09/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 sandy gravelly CLAY		32.13	0.40						
1	Firm light brown slightly sandy gravelly SILT				AA48866	B	0.50		N = 12 (2, 2, 3, 2, 4, 3)	
					AA48867	B	1.00-1.45			
2	Firm very light brown slightly sandy gravelly SILT with a low to medium cobble and boulder content.		30.63	1.90	AA48868	B	2.00-2.45		N = 28 (1, 2, 4, 5, 7, 12)	
	End of Borehole at 2.60 m		29.93	2.60						

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
2.6	2.6	0.5							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 3hr getting rig on to borehole. 0.50hr reinstating top field.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/35	
CO-ORDINATES 532,850.77 E 728,225.98 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 17.52		BOREHOLE DIAMETER (mm)		DATE COMMENCED 19/02/2016	
		BOREHOLE DEPTH (m) 1.20		DATE COMPLETED 19/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY JD
ENGINEER ARUP			ENERGY RATIO (%)		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		17.32	0.20						
	Firm light brown mottled brown slightly sandy slightly gravelly SILT with a low to medium cobble content and low boulder content. Sand is coarse. Gravel is angular to subangular coarse.		16.52	1.00	AA39963	B	0.50			
1	Firm mottled brown slightly sandy gravelly CLAY		16.32	1.20	AA39964	B	1.00			
	Obstruction - Possible Weathered Limestone Rockhead End of Borehole at 1.20 m									
2										
3										
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
									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 Hand dug pit at location of BH3/35	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/35 CP	
CO-ORDINATES 532,852.21 E 728,223.09 N				SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 17.70		RIG TYPE Dando 3000		DATE COMMENCED 29/03/2016	
		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 30/03/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		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		17.40	0.30						
	Firm becoming stiff light brown slightly sandy gravelly CLAY with a medium cobble and boulder content				AA1	B	0.50			
1	Stiff light brown/grey slightly sandy gravelly SILT with a low to medium cobble content		16.70	1.00	AA2	B	1.00-1.45		N = 10 (1, 2, 2, 2, 3, 3)	
2					AA3	B	2.00-2.45		N = 19 (2, 2, 3, 4, 6, 6)	
3					AA4	B	3.00-3.45		N = 37 (5, 7, 4, 8, 11, 14)	
4					AA5	B	4.00-4.45		N = 26 (3, 3, 5, 7, 6, 8)	
5					AA6	B	5.00-5.45		N = 39 (6, 7, 7, 9, 11, 12)	
6	Stiff to very stiff dark brown mottled grey brown slightly sandy slightly gravelly SILT with a medium cobble and boulder content		11.80	5.90	AA7	B	6.50-6.95		N = 45 (8, 5, 9, 11, 12, 13)	
7										
8					AA8	B	8.00-8.45		N = 31 (4, 6, 7, 11, 7, 6)	
	Stiff orange brown sandy gravelly CLAY		9.40	8.30						
	Stiff dark grey brown sandy gravelly silty CLAY with a medium cobble and boulder content		9.20	8.50						
9	End of Borehole at 8.90 m		8.80	8.90						

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
6.3	6.5	0.5							No water strike
8.8	8.9	0.75							

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

REMARKS 1.5hrs getting plant and equipment to borehole location. 0.5hr cleaning down road after exiting field.

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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/36	
CO-ORDINATES 533,124.66 E 728,204.71 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 51.78		BOREHOLE DIAMETER (mm)		DATE COMMENCED 12/02/2016	
		BOREHOLE DEPTH (m) 0.50		DATE COMPLETED 12/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO.		BORED BY AC
			ENERGY RATIO (%)		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		51.68	0.10	AA49479	B	0.10-0.50			
	Firm brown sandy slightly gravelly SILT with a low to medium cobble content. Cobbles are of limestone.		51.28	0.50						
1	Obstruction - Large BOULDERS of limestone End of Borehole at 0.50 m									
2										
3										
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
									No water strike

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

REMARKS Hand dug pit at location of BH3/36	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/38	
CO-ORDINATES 534,249.34 E 727,540.83 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 45.27		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 09/02/2016	
		BOREHOLE DEPTH (m) 0.40		DATE COMPLETED 09/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 light brown sandy gravelly CLAY		44.87	0.40						
0	Obstruction - Possible Rockhead End of Borehole at 0.40 m									
1										
2										
3										
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
0.4	0.4	0.5							No water strike

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

REMARKS 1hr moving to location with tracked dumper. 0.5hr reinstating field after works.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/39	
CO-ORDINATES 534,360.45 E 727,402.19 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 41.88		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 10/02/2016	
		BOREHOLE DEPTH (m) 0.40		DATE COMPLETED 10/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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	Driller reports GRAVEL hardstanding (MADE GROUND) Obstruction - Possible Rockhead End of Borehole at 0.40 m		41.48	0.40						
1										
2										
3										
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
0.4	0.4	0.5							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 0.50hr moving rig and tracked dumper to BH3/39	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/40
CO-ORDINATES 534,439.24 E 727,295.41 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 42.35	RIG TYPE Hand Dug	DATE COMMENCED 11/02/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 11/02/2016
	BOREHOLE DEPTH (m) 0.80	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY AC
ENGINEER ARUP	ENERGY RATIO (%)	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 (MADE GROUND)		42.30	0.05						
	Brown grey sandy fine to medium GRAVEL (MADE GROUND)		42.20	0.15	AA49469	B	0.15-0.50			
			41.85	0.50	AA49470	B	0.50-0.80			
	Firm dark grey slightly sandy gravelly CLAY with a low to medium cobble content. Cobbles are of limestone.		41.55	0.80						
1	Firm brown slightly sandy slightly gravelly SILT with a high cobble and boulder content. Cobbles and boulders are angular of limestone.									
2	Obstruction - Large BOULDERS / Possible weathered rockhead									
	End of Borehole at 0.80 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
									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 Hand dug pit at location of BH3/40	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/41	
CO-ORDINATES 534,580.56 E 727,065.87 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 41.38		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 10/02/2016	
		BOREHOLE DEPTH (m) 0.50		DATE COMPLETED 10/02/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 sandy gravelly CLAY	0.30	41.08	0.30						
1	Obstruction - Possible Rockhead End of Borehole at 0.50 m									
2										
3										
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
0.3	0.3	0.5							No water strike

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

<p>REMARKS 1hr getting rig and tracked dumper to location. 0.75hr reinstating field post works. Awaiting next borehole 10:30 - 16:30 - delay to BH3/39 due to access constraints posed by landowner.</p>	<p>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</p>
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IGSL BH LOG 18963.GPJ IGSL_GDT 16/08/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/42	
CO-ORDINATES 534,727.54 E 726,825.97 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 31.36		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 22/03/2016	
		BOREHOLE DEPTH (m) 0.30		DATE COMPLETED 22/03/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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		31.06	0.30						
0	Obstruction - Driller reports Possible Rockhead End of Borehole at 0.30 m									
1										
2										
3										
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
0.3	0.3	0.75							No water strike

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

REMARKS 1.5hrs getting plant and equipment to borehole location	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 18963.GPJ IGSL_GDT 16/8/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/43
CO-ORDINATES 534,627.31 E 726,780.71 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 32.77	RIG TYPE Hand Dug	DATE COMMENCED 22/02/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 22/02/2016
	BOREHOLE DEPTH (m) 0.60	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY JD
ENGINEER ARUP	ENERGY RATIO (%)	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 (Possible MADE GROUND)		32.57	0.20						
	Soft to firm dark grey and brown slightly sandy gravelly SILT with a low to medium cobble content (Possible MADE GROUND)		32.47	0.30	AA39966	B	0.20-0.30			
			32.17	0.60	AA39967	B	0.30-0.60			
1	Firm brown and dark brown slightly sandy gravelly SILT with a medium cobble content									
	Obstruction End of Borehole at 0.60 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
				0.50					Seepage
INSTALLATION DETAILS				GROUNDWATER PROGRESS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug pit at location of BH3/43	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 18963.GPJ IGSL_GDT 16/8/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		BOREHOLE NO. BH3/46
CO-ORDINATES 531,751.37 E 728,390.26 N		SHEET Sheet 1 of 1
GROUND LEVEL (m AOD) 29.88	RIG TYPE Hand Dug	DATE COMMENCED 23/03/2016
	BOREHOLE DIAMETER (mm)	DATE COMPLETED 23/03/2016
	BOREHOLE DEPTH (m) 0.60	
CLIENT Galway County Council	SPT HAMMER REF. NO.	BORED BY JD
ENGINEER ARUP	ENERGY RATIO (%)	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 with rootlets and a high cobble and boulder content from 0.20m bgl. Cobbles and boulders are of limestone.		29.28	0.60	AA39980	B	0.00-0.60			
1	Obstruction - Possible Limestone rockhead End of Borehole at 0.60 m									
2										
3										
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
									No water strike

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

REMARKS Hand dug pit at location of BH3/46	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 18963.GPJ IGSL_GDT 16/8/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/47	
				SHEET Sheet 1 of 1	
CO-ORDINATES 533,058.02 E 728,289.22 N		RIG TYPE Dando 3000		DATE COMMENCED 22/03/2016	
GROUND LEVEL (m AOD) 37.02		BOREHOLE DIAMETER (mm) 200		DATE COMPLETED 22/03/2016	
CLIENT Galway County Council		SPT HAMMER REF. NO.		BORED BY WC	
ENGINEER ARUP		ENERGY RATIO (%)		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		36.72	0.30						
1	Firm light brown slightly sandy slightly gravelly SILT with a medium cobble and boulder content				AA48890	B	0.50			
					AA48891	B	1.00-1.45		N = 8 (2, 2, 2, 2, 2, 2)	
2	Firm to stiff mottled brown slightly sandy slightly gravelly CLAY		35.02	2.00	AA48892	B	2.00-2.45		N = 12 (2, 3, 3, 2, 3, 4)	
3					AA48893	B	3.00-3.45		N = 20 (3, 3, 4, 5, 5, 6)	
4	Obstruction End of Borehole at 4.00 m		33.02	4.00					N = 50/20 mm (25, 50)	

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
3.9	4	0.75							No water strike

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

REMARKS 1.5hrs getting plant and equipment to borehole location	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/48	
CO-ORDINATES 534,396.60 E 727,197.18 N		RIG TYPE Hand Dug		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 40.72		BOREHOLE DIAMETER (mm)		DATE COMMENCED 11/02/2016	
		BOREHOLE DEPTH (m) 0.60		DATE COMPLETED 11/02/2016	
CLIENT Galway County Council			SPT HAMMER REF. NO.		BORED BY AC
ENGINEER ARUP			ENERGY RATIO (%)		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	x x x x x x x x x x	40.62	0.10	AA49471	B	0.10-0.50			
	Firm dark grey occasionally light brown slightly sandy slightly gravelly SILT with a low to medium cobble content. Cobbles are of limestone.	x x x x x x x x x x	40.22	0.50						
	Brown grey clayey angular COBBLES of limestone	x x x x x x x x x x	40.12	0.60						
1	Obstruction - BOULDERS / Possible weathered limestone rockhead End of Borehole at 0.60 m									
2										
3										
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	
										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 Hand dug pit at location of BH3/48					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			

IGSL BH LOG 18963.GPJ IGSL_GDT 16/8/16



GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/52	
CO-ORDINATES 528,276.23 E 727,648.14 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 15.45		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 16/03/2016	
		BOREHOLE DEPTH (m) 3.80		DATE COMPLETED 16/03/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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		15.15	0.30						
1	Soft to firm becoming firm light brown slightly sandy gravelly CLAY with a medium cobble and boulder content				AA48884	B	0.50		N = 10 (1, 2, 2, 2, 3, 3) N = 15 (2, 2, 3, 3, 4, 5) N = 23 (2, 2, 3, 5, 6, 9)	
2	Firm light grey brown slightly sandy slightly gravelly SILT		13.45	2.00	AA48885	B	1.00-1.45			
3	Stiff light grey and brown silty sandy GRAVEL		12.45	3.00	AA48886	B	2.00-2.45			
4	Obstruction End of Borehole at 3.80 m		11.65	3.80	AA48887	B	3.00-3.45			

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	3.8	0.75							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 2hrs getting plant and equipment to borehole location. 1.0hr getting off position.	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/53	
CO-ORDINATES 528,433.41 E 727,696.60 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 10.31		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 21/03/2016	
		BOREHOLE DEPTH (m) 2.20		DATE COMPLETED 21/03/2016	
CLIENT ENGINEER Galway County Council ARUP			SPT HAMMER REF. NO.		BORED BY WC
			ENERGY RATIO (%)		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 with a low boulder content		9.81	0.50						
	Medium dense light grey brown silty sandy GRAVEL		9.51	0.80	AA48888	B	0.50			
1	Medium dense to dense light grey brown silty sandy GRAVEL with some cobbles				AA48889	B	1.00-1.45		N = 44 (4, 6, 8, 11, 11, 14)	
2	End of Borehole at 2.20 m		8.11	2.20					N = 50/75 mm (19, 6, 43, 7)	
3										
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	2.2	0.75							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 1.5hrs getting plant and equipment to borehole location	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3				BOREHOLE NO. BH3/54	
CO-ORDINATES 528,601.86 E 727,756.28 N		RIG TYPE Dando 3000		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 8.05		BOREHOLE DIAMETER (mm) 200		DATE COMMENCED 30/03/2016	
		BOREHOLE DEPTH (m) 3.70		DATE COMPLETED 31/03/2016	
CLIENT Galway County Council ENGINEER ARUP			SPT HAMMER REF. NO. ENERGY RATIO (%)		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 with COBBLES and BOULDERS and some dark grey brown slightly silty slightly sandy GRAVEL (Possible MADE GROUND)		7.35	0.70	AA9	B	0.50			
1	Dense grey brown silty sandy GRAVEL with a medium cobble content				AA10	B	1.00-1.45		N = 40 (6, 9, 12, 14, 8, 6)	
2					AA11	B	2.00-2.45		N = 49 (5, 7, 8, 11, 14, 16)	
3					AA12	B	3.00-3.45		N = 50/200 mm (3, 4, 6, 17, 27)	
4	End of Borehole at 3.70 m		4.35	3.70						

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	3.7	0.75							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 1.0hr getting plant and equipment to borehole location	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 18963.GPJ IGSL_GDT 16/8/16

Appendix 2

Hand-excavated Pit Records at Cable Percussive Borehole Locations

BH3/03

BH3/07

BH3/10

BH3/14

BH3/15

BH3/18

BH3/19

BH3/20

BH3/22

BH3/28

BH3/30

BH3/31

BH3/35

BH3/36

BH3/40

BH3/43

BH3/46

BH3/48



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/03
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	12/02/2016

PHOTOS

Hand Dug Pit at BH3/03



Spoil Heap at BH3/03



LOG

0.00	0.10	TOPSOIL
0.10	0.70	Soft black fibrous PEAT
0.70		OBSTRUCTION - Possible Weathered Rockhead (Granite)

SAMPLES	D	0.50	AA49473
	D	0.50	AA49474
	B	0.50	AA49475

GROUNDWATER Seepages from ground level



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/07
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	12/02/2016

PHOTOS

Hand Dug Pit at BH3/07



Spoil Heap at BH3/07



LOG

0.00	0.10	TOPSOIL
0.10	0.30	Soft black to dark brown fibrous PEAT
0.30	0.60	Brown angular COBBLES and BOULDERS of granite
0.60		OBSTRUCTION - Possible Weathered Rockhead (Granite)

SAMPLES

D	0.10	to	0.30	AA49476
D	0.10	to	0.30	AA49477
B	0.10	to	0.30	AA49478

GROUNDWATER

Slow water strike at 0.30m



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/10
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	11/02/2016

PHOTOS

Hand Dug Pit at BH3/10



Spoil Heap at BH3/10



LOG

0.00	0.30	TOPSOIL
0.30		OBSTRUCTION - Large boulders, Possible Weathered Rockhead (Granite)

SAMPLES

None Taken

GROUNDWATER

Seepage at 0.30m



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/14
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	18/02/2016

PHOTOS

Hand Dug Pit at BH3/14



Spoil Heap at BH3/14



LOG

0.00	0.10	TOPSOIL
0.10	0.70	Light brown clayey/silty very sandy GRAVEL with a medium cobble content. Sand is fine to medium. Gravel is angular to subangular coarse.
0.70		OBSTRUCTION - Possible Weathered Rockhead / Boulder

SAMPLES B 0.10 to 0.70 AA39959

GROUNDWATER Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/15
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	19/02/2016

PHOTOS

Hand Dug Pit at BH3/15



Spoil Heap at BH3/15



LOG

0.00	0.20	TOPSOIL with rootlets
0.20	0.40	(Loose) Dark brown clayey/silty sandy GRAVEL with a medium to high cobble content. Sand is coarse. Cobbles are weathered of granite.
0.40	0.80	(Loose) Light brown silty/clayey slightly sandy GRAVEL with a high cobble content. Sand is coarse. Gravel is angular to subangular fine. Cobbles are weathered of granite.
0.80	1.30	(Loose) Brown slightly silty/clayey very sandy GRAVEL. Sand is fine. Gravel is angular to subangular coarse.
1.30		OBSTRUCTION - Possible Weathered Rockhead / Boulder

SAMPLES

B	0.20	to	0.40	AA39960
B	0.40	to	0.80	AA39961
B	0.80	to	1.20	AA39962

GROUNDWATER

Water strike at 1.20m



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/18
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	22/02/2016

PHOTOS

Hand Dug Pit at BH3/18



Spoil Heap at BH3/18



LOG

0.00	0.20	TOPSOIL
0.20	0.70	Dark brown clayey/silty sandy fine to coarse angular GRAVEL with a high cobble content. Cobbles are of granite.
0.70		OBSTRUCTION - Possible Weathered Rockhead / Boulder

SAMPLES B 0.50 AA39965

GROUNDWATER Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/19
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	23/03/2016

PHOTOS

Hand Dug Pit at BH3/19



Spoil Heap at BH3/19



LOG

0.00	0.30	TOPSOIL
0.30	0.50	Loose dark brown clayey/silty sandy GRAVEL with cobbles and boulders of granite
0.50	1.20	Firm light brown very gravelly very sandy CLAY with cobbles and boulders of granite
1.20		Obstruction - Possible weathered rock / boulder

SAMPLES

B	0.30	to	0.50	AA39978
B	0.50	to	1.20	AA39979

GROUNDWATER

Ground water entering pit at 0.80m



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/20
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	23/03/2016

PHOTOS

Hand Dug Pit at BH3/20



Spoil Heap at BH3/20



LOG

0.00	0.10	TOPSOIL
0.10	0.45	Dark grey black clayey gravelly organic fine to coarse SAND with rootlets
0.45	0.80	Orange brown clayey very gravelly fine to coarse SAND with many cobbles of granite
0.80	1.00	Brown very sandy fine to coarse GRAVEL with many cobbles of granite

SAMPLES

B	0.10	to	0.45	AA49485
B	0.50	to	0.80	AA49486
B	0.80	to	1.00	AA49487

GROUNDWATER

Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/28
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	18/02/2016

PHOTOS

Hand Dug Pit at BH3/28



Spoil Heap at BH3/28



LOG

0.00	0.20	TOPSOIL
0.20	0.30	Firm brown slightly sandy SILT
0.30	0.70	Firm brownish grey slightly silty sandy gravelly CLAY with a medium cobble and boulder content
0.70		OBSTRUCTION - Possible Weathered Rockhead / Boulder (Limestone)

SAMPLES B 0.20 to 0.30 AA39957

GROUNDWATER Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/30
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	23/02/2016

PHOTOS

Hand Dug Pit at BH3/30



Spoil Heap at BH3/30



Possible tarmac / bitumen fragment?



LOG

0.00	0.15	TOPSOIL
0.15	0.50	Brown clayey/silty very sandy GRAVEL with fragments of concrete, red brick, ceramic pipe, timber, roof slate, plastic and possible asbestos / felt / tarmac / bitumen (MADE GROUND)
Pit terminated on encountering possible asbestos (possible tarmac / bitumen)		

SAMPLES	B	0.15	to	0.50	AA39968
	ENV	0.15	to	0.50	AA39969
	ENV	0.15	to	0.50	AA39970

GROUNDWATER Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/31
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	23/02/2016

PHOTOS

Hand Dug Pit at BH3/31



Spoil Heap at BH3/31



LOG

0.00	0.30	TOPSOIL
0.30	0.60	Firm light brown slightly sandy slightly gravelly SILT with a low cobble content. Sand is fine to medium. Gravel is angular to subangular coarse.
0.60	1.20	Firm grey mottled brown slightly sandy gravelly SILT with a medium to high cobble content. Sand is coarse. Gravel is angular to subangular coarse.

SAMPLES

B	0.30	to	0.60	AA39971
	0.60	to	1.20	AA39972

GROUNDWATER Water strike at 0.90m



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/35
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	19/02/2016

PHOTOS

Hand Dug Pit at BH3/35



Spoil Heap at BH3/35



LOG

0.00	0.20	TOPSOIL
0.20	1.00	Firm light brown mottled brown slightly sandy slightly gravelly SILT with a low to medium cobble and boulder content. Sand is coarse. Gravel is angular to subangular coarse. Cobbles and boulders are of limestone.
1.00	1.20	Firm mottled brown slightly sandy gravelly CLAY
1.20		OBSTRUCTION - Possible Weathered Rockhead

SAMPLES	B	0.50	AA39963
	B	1.00	AA39964

GROUNDWATER Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/40
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	11/02/2016

PHOTOS

Hand Dug Pit at BH3/40



Spoil Heap at BH3/40



LOG

0.00	0.05	TOPSOIL
0.05	0.15	Brown grey sandy fine to medium GRAVEL
0.15	0.50	Firm dark grey slightly sandy gravelly CLAY with occasional cobbles of limestone
0.50	0.80	Firm brown slightly sandy slightly gravelly SILT with many angular cobbles and boulders of limestone
0.80		OBSTRUCTION - Large boulders, Possible Weathered Rockhead

SAMPLES

B	0.15	to	0.50	AA49469
B	0.50	to	0.80	AA49470

GROUNDWATER

Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/43
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	22/02/2016

PHOTOS

Hand Dug Pit at BH3/43



Spoil Heap at BH3/43



LOG

0.00	0.20	TOPSOIL (Possible MADE GROUND)
0.20	0.30	Soft to firm dark grey and brown slightly sandy gravelly SILT with a low to medium cobble content (Possible MADE GROUND)
0.30	0.60	Firm brown and dark brown slightly sandy slightly gravelly SILT with a medium cobble content
0.60		OBSTRUCTION - Possible Weathered Rockhead / Boulder

SAMPLES	B	0.20	to	0.30	AA39966
	B	0.30	to	0.60	AA39967

GROUNDWATER Water strike at 0.50m



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/46
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	23/03/2016

PHOTOS

Hand Dug Pit at BH3/46



Spoil Heap at BH3/46



LOG

0.00	0.60	TOPSOIL with rootlets and many limestone cobbles and boulders from 0.20m
0.60		Obstruction - Possible weathered rock

SAMPLES B 0.00 to 0.60 AA39980

GROUNDWATER Dry



Hand Dug Pit Log (Cable Percussive BH Location)

See BH Log also

LOCATION	BH3/48
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	11/02/2016

PHOTOS

Hand Dug Pit at BH3/48



Spoil Heap at BH3/48



LOG

0.00	0.10	TOPSOIL
0.10	0.50	Firm dark grey occasionally light brown slightly sandy slightly gravelly SILT with occasional cobbles of limestone
0.50	0.60	Brown grey clayey angular COBBLES of limestone
0.60		OBSTRUCTION - Large boulders, Possible Weathered Rockhead

SAMPLES B 0.10 to 0.50 AA49471

GROUNDWATER Dry

Appendix 3**Rotary Core Drillhole Records and Photographs**

BH3/03R	BH3/29R
BH3/04R	BH3/30R
BH3/06R	BH3/31R
BH3/07R	BH3/32R
BH3/08R	BH3/33R
BH3/10R	BH3/34R
BH3/11R	BH3/35R
BH3/13R	BH3/36R
BH3/16R	BH3/38R
BH3/17R	BH3/39R
BH3/18R	BH3/40R
BH3/19R	BH3/41R
BH3/20R	BH3/42R
BH3/22R	BH3/43R
BH3/23R	BH3/46R
BH3/24R	BH3/47R
BH3/25R	BH3/48R
BH3/26R	BH3/52R
BH3/27R	BH3/53R
BH3/28R	BH3/54R



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/03R
CO-ORDINATES 523,119.29 E 724,217.70 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 40.59	RIG TYPE Casagrande	DATE DRILLED 06/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 06/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as peat	0.50	40.09		
0.90								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	0.90	39.69		
1		100	87	61				Very strong, thickly to thinly banded, brown pink green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered. Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
2												
2.40												
3		100	98	85								
3.70												
4		100	83	83								
5	5.20							End of Borehole at 5.20 m	5.20	35.39		
6												
7												
8												
9												

REMARKS Hole cased 0.00-0.90m.					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 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/04R
CO-ORDINATES 523,645.55 E 724,286.79 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 36.82	RIG TYPE Knebel	DATE DRILLED 15/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 16/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as peaty TOPSOIL.	0.30	36.52		
0.80								SYMMETRIX DRILLING: Driller reports greenish pink rock	0.80	36.02		
1		100	96	84				Very strong, thickly to thinly banded, light pink/red/brown/grey/white/orange mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
1.90								Dips are 35° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing, slightly iron-oxide stained.				
2		100	100	100								
2.90												
3		100	100	100								
3.70												
4		100	100	93								
4.30												
4.70		100	100	100								
5		100	100	100								
5.60								End of Borehole at 5.60 m	5.60	31.22		
6												
7												
8												
9												

REMARKS Hole cased 0.00-0.80m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					0.30	0.30	N/S	0.30	5	Seepage
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
16-02-16	5.00	1.00	5.60	50mm SP						

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/06R
CO-ORDINATES 524,242.31 E 724,826.60 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 23.09	RIG TYPE Casagrande	DATE DRILLED 26/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel	0.80	22.29		
1	1.20							SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.20	21.89		
		100	77	61				Very strong, thickly to thinly banded, dark brownish purple mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
2	2.20							Dips are 20° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
		100	32	25								
3	3.20											
		100	77	42								
4	4.20											
		100	95	55								
5	5.20											
		100	81	61								
6	6.20											
		100	96	96								
7	7.20											
	7.50	333	100	100					7.50	15.59		
End of Borehole at 7.50 m												

REMARKS Hole cased 0.00-1.20m.					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					
	2.60	0.80	2.80	50mm SP					

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/07R
CO-ORDINATES 524,502.21 E 725,015.04 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 36.41	RIG TYPE Casagrande	DATE DRILLED 07/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 08/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as peat				
1							+	SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.30	35.11		
2.60							+	Very strong, thickly to thinly banded, brown pink green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered. Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. 2.60-3.15m - Moderately weathered, slight weakening. 3.71-5.02m - Moderately weathered, slight weakening.	2.60	33.81		
3.60	100	46	32			+						
4	100	96	90				+	6.60-6.74m - Moderately weathered, slight weakening.				
4.60						+						
5	100	76	76				+					
5.60							+					
6	100	100	100				+					
6.60							+					
7	100	85	79				+					
7.60							+	End of Borehole at 7.60 m	7.60	28.81		

REMARKS Hole cased 0.00-2.60m.					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					

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3

DRILLHOLE NO BH3/08R

SHEET Sheet 1 of 1

CO-ORDINATES 524,622.58 E
725,067.54 N
GROUND LEVEL (mOD) 42.05

RIG TYPE Knebel
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 80

DATE DRILLED 16/02/2016
DATE LOGGED 17/02/2016

CLIENT Galway County Council
ENGINEER ARUP

DRILLED BY S. Petersen
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								SYMMETRIX DRILLING: No recovery, observed by driller as peaty TOPSOIL.	0.30	41.75		
0.90								SYMMETRIX DRILLING: No recovery, observed by driller as brownish pink weathered rock	0.70	41.35		
1		100	96	91				SYMMETRIX DRILLING: No recovery, observed by driller as brownish pink rock	0.90	41.15		
2								Very strong, thickly to thinly banded, light pink/red/brown/grey/white/orange mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
2.60		100	97	87				Dips are 35° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing, slightly iron-oxide stained.				
3												
3.90		100	92	81								
4												
4.75		100	100	80								
5												
5.75		100	100	100								
6												
7		100	100	92								
7.30												
8												
8.50		100	100	88								
9												
9.80		100	100	100								
End of Borehole at 9.80 m									9.80	32.25		

REMARKS

Hole cased 0.00-0.90m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
17-02-16	9.00	4.00	9.80	50mm SP	17-02-16	9.80	0.90	0.90	Water level measured 10 mins after end of drilling

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/02/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/10R
CO-ORDINATES 525,320.57 E 725,603.65 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 66.51	RIG TYPE Casagrande	DATE DRILLED 04/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 06/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 peat SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	0.10	66.41		
1	1.20							<p>Very strong, thickly to thinly banded, brown pink green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.</p> <p>Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.</p>	1.20	65.31		
2		100	99	95			510					
3		100	99	94			680					
4		100	99	94			710					
5		100	94	94								
6		100	100	100			720					
7		100	99	96								
8		100	99	96			750					
9		100	97	97			820					

REMARKS Hole cased 0.00-1.20m.					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					
06-04-16	10.00	5.50	11.00	50mm SP					

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3

DRILLHOLE NO BH3/10R

SHEET Sheet 2 of 2

CO-ORDINATES 525,320.57 E
725,603.65 N

GROUND LEVEL (mOD) 66.51

RIG TYPE Casagrande
FLUSH Air/Mist

DATE DRILLED 04/04/2016

DATE LOGGED 06/04/2016

CLIENT Galway County Council
ENGINEER ARUP

INCLINATION (deg) -90
CORE DIAMETER (mm) 80

DRILLED BY IGSL

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	10.20						++	<p>Very strong, thickly to thinly banded, brown pink green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.</p> <p>Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i></p>				
11		100	99	98			++					
	11.70						++					
12		100	100	100			++					
	13.20						++					
14		100	100	100			++					
	14.70						++					
15		100	100	100			++					
	16.20						++					
	16.70	100	98	86			++	16.70	49.81			
17								End of Borehole at 16.70 m				

REMARKS

Hole cased 0.00-1.20m.

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
06-04-16	10.00	5.50	11.00	50mm SP

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/11R
CO-ORDINATES 525,784.67 E 725,830.02 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 54.24	RIG TYPE Comacchio	DATE DRILLED 02/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 10/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as grey brown clayey sandy gravel	0.70	53.54		
1								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock				
1.80								Possible weathered rock - recovered as angular gravel of basalt.	1.80	52.44		
2.00	100	0	0									
2.30	100	0	0					Strong to very strong, thickly banded, fine to coarse grained, very dark greenish purple (with angular cream phenocrysts), Possible BASALTIC ANDESITE, fresh to locally slightly weathered. Dips are 10°. Discontinuities are widely to medium spaced, smooth, planar. Apertures are tight, very thin brown clay smearing, slightly iron-oxide stained.	2.60	51.64		
2.60	33	0	0									
3.00	100	93	46									
3.30	100	33	0									
3.60	100	45	45									
4.00	100	0	0									
4.30	100	100	100									
4.60	100	60	0									
5.00	100	100	70									
5.80	100	100	100									
6.50	100	93	93									
7.10	100	100	100									
7.50	100	100	100									
7.80	100	100	100						7.80	46.44		
8								End of Borehole at 7.80 m				

REMARKS Hole cased 0.00-4.60m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					1.00					Slow
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	10-02-16	7.80	4.60	0.40	Water level measured 10 mins after end of drilling	
10-02-16	2.50	1.80	2.70	50mm SP						

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/13R
CO-ORDINATES 526,078.57 E 726,036.12 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 58.65	RIG TYPE Casagrande	DATE DRILLED 21/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 22/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel	0.70	57.95		
1	1.10							SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.10	57.55		
2	2.10	100	96	96		600		Very strong, thickly to thinly banded, dark brownish purple mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered. Dips are 20° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
3	3.10	100	97	97		1070						
4	4.10	100	100	100		830						
5	5.10	100	100	100								
6	6.10	100	100	100		899.999999999999						
7	7.10	100	100	100								
8	8.10	100	100	100		570						
9	9.10	100	100	100		530.000000000000						

REMARKS Hole cased 0.00-1.10m.					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					
22-03-16	9.00	6.00	10.10	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/13R
CO-ORDINATES 526,078.57 E 726,036.12 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 58.65	RIG TYPE Casagrande	DATE DRILLED 21/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 22/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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)
10.10	10.10				0 250 500		+	End of Borehole at 10.10 m	10.10	48.55	°	°
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-1.10m.					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	
22-03-16	9.00	6.00	10.10	50mm SP						

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18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/16R
CO-ORDINATES 526,764.74 E 726,611.40 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 61.66	RIG TYPE Casagrande	DATE DRILLED 23/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 24/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel				
1									1.50	60.16		
2								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock				
2.50									2.50	59.16		
3		100	86	64				Very strong, thickly to thinly banded, dark brownish purple mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
3.50								Dips are 20° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
4		100	35	35				2.50-5.80m - Slightly to locally moderately weathered, clay-smearing, penetrative iron-oxide staining, slight weakening.				
4.50												
5		62	16	0								
5.80												
6		100	93	73								
7												
7.00												
8		100	97	97								
8.50												
9		100	99	99								
10.00									10.00	51.66		

REMARKS End of Borehole at 10.00 m					WATER STRIKE DETAILS					
Hole cased 0.00-1.10m.					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						
24-03-16	10.00	6.00	10.00	50mm SP						

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/17R
CO-ORDINATES 527,021.46 E 726,804.57 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 65.33	RIG TYPE Casagrande	DATE DRILLED 10/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 11/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel				
1												
2												
2.70								SYMMETRIX DRILLING: No recovery, observed by driller as gravelly clay	2.70	62.63		
3												
4												
5								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	5.00	60.33		
5.70								Very strong, thickly to thinly banded, dark green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.	5.70	59.63		
6	100	26	0					Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
6.70												
7	100	88	68									
8												
8.20												
9	100	100	91									
9.70												

REMARKS Hole cased 0.00-5.20m.					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					
11-03-16	10.20	3.00	10.20	50mm SP					

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/17R
CO-ORDINATES 527,021.46 E 726,804.57 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 65.33	RIG TYPE Casagrande	DATE DRILLED 10/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 11/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.20	100	92	92	0 250 500		+	End of Borehole at 10.20 m	10.20	55.13	□	
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-5.20m.					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	
11-03-16	10.20	3.00	10.20	50mm SP						

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/18R
CO-ORDINATES 527,254.48 E 726,893.52 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 70.64	RIG TYPE Knebel	DATE DRILLED 24/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 peaty TOPSOIL.	0.40	70.24		
0.40								SYMMETRIX DRILLING: No recovery, observed by driller as brown sandy peaty gravel				
3.60								SYMMETRIX DRILLING: No recovery, observed by driller as pink weathered rock	3.90	67.04		N = 35 (2, 4, 6, 6, 9, 14)
4.00								SYMMETRIX DRILLING: No recovery, observed by driller as pink rock	4.00	66.64		N = 50/85 mm (8, 14, 41, 9)
4.00		100	94	84				Very strong, thickly to thinly banded, light pink/red/brown/grey/white/orange mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
5.00		100	100	100				Dips are 35° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing, slightly iron-oxide stained.				
5.60												
6.00		100	99	68								
6.80												
7.20		100	100	80								
7.70		100	96	48								
8.00		100	98	73								
9.00		100	91	84								

REMARKS Hole cased 0.00-4.00m.					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
26-02-16	4.00	0.50	4.00	50mm SP					

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18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/18R
CO-ORDINATES 527,254.48 E 726,893.52 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 70.64	RIG TYPE Knebel	DATE DRILLED 24/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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	10.30						++	<p>Very strong, thickly to thinly banded, light pink/red/brown/grey/white/orange mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.</p> <p>Dips are 35° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing, slightly iron-oxide stained. <i>(continued)</i></p>				
		100	100	100			++					
11	11.45						++					
		100	100	100			++					
12	12.70						++					
		100	96	88			++					
13	13.70						++					
		100	100	95			++					
14	15.20						++					
		100	99	99			++					
15	16.60						++					
		100	98	82			++					
16	17.50						++					
		100	97	91			++					
17	18.90						++					
		100	97	93			++					

REMARKS Hole cased 0.00-4.00m.					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	26-02-16	16.60	4.00	2.50	Water level measured start last day drilling
26-02-16	4.00	0.50	4.00	50mm SP					

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/18R
CO-ORDINATES 527,254.48 E 726,893.52 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 70.64	RIG TYPE Knebel	DATE DRILLED 24/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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	20.40						+	Very strong, thickly to thinly banded, light pink/red/brown/grey/white/orange mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered. Dips are 35° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing, slightly iron-oxide stained. <i>(continued)</i>			○	
	20.90	100	100	100			+				○	
21	21.50	100	100	100			+				○	
22	23.00	100	100	100			+				○	
23	24.50	100	100	100			+	End of Borehole at 24.50 m	24.50	46.14	○	
24							+				○	
25							+				○	
26							+				○	
27							+				○	
28							+				○	
29							+				○	

REMARKS Hole cased 0.00-4.00m.					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
26-02-16	4.00	0.50	4.00	50mm SP					

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REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/19R
		SHEET Sheet 1 of 2
CO-ORDINATES 527,395.72 E 727,015.07 N	RIG TYPE Knebel	DATE DRILLED 03/03/2016
GROUND LEVEL (mOD) 61.46	FLUSH Air/Mist	DATE LOGGED 07/03/2016
CLIENT Galway County Council	INCLINATION (deg) -90	DRILLED BY S. Petersen
ENGINEER ARUP	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as TOPSOIL.	0.40	61.06		
								SYMMETRIX DRILLING: No recovery, observed by driller as brown sandy gravel	1.20	60.26		
1								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.70	59.76		
2	2.20							SYMMETRIX DRILLING: No recovery, observed by driller as rock	2.20	59.26		
3		100	100	96				Very strong, thickly to thinly banded, brown pink green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered. Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
4		100	100	94								
5	5.00											
6		100	100	85								
7		100	100	93								
8		100	100	92								
9		100	100	94								
9.95												

REMARKS Hole cased 0.00-2.20m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					0.50	0.50	N/S	0.30	5	Moderate
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	07-03-16	9.20	2.20	0.20	Water level measured start last day drilling	

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18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/19R
CO-ORDINATES 527,395.72 E 727,015.07 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 61.46	RIG TYPE Knebel	DATE DRILLED 03/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 07/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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		100	100	100	0 250 500	1140	+	Very strong, thickly to thinly banded, brown pink green mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
11	11.10	100	100	100			+	Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>				
12	12.20						+					
13	13.50	100	93	88			+					
14		100	95	91			+					
15	15.10						+	End of Borehole at 15.10 m	15.10	46.36		
16							+					
17							+					
18							+					
19							+					

REMARKS Hole cased 0.00-2.20m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					0.50	0.50	N/S	0.30	5	Moderate
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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18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/20R
CO-ORDINATES 527,214.10 E 727,669.10 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 51.63	RIG TYPE Casagrande	DATE DRILLED 29/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 31/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly clay with occasional cobbles				
1								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.20	50.43		
2												
3								SYMMETRIX DRILLING: No recovery, observed by driller as rock	3.20	48.43		
4	4.10							Strong to very strong, thickly banded, fine to coarse grained, very dark green (with angular cream phenocrysts), Possible BASALTIC ANDESITE, fresh to locally slightly weathered.	4.10	47.53		
5	5.10	100	45	34				Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
6	6.10	100	66	31								
7	7.10	100	77	66								
8	8.10	100	86	71		700						
9	9.10	100	91	86		520						
		100	92	88								

REMARKS Hole cased 0.00-4.10m.					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						
31-03-16	14.00	6.00	15.00	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/20R
CO-ORDINATES 527,214.10 E 727,669.10 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 51.63	RIG TYPE Casagrande	DATE DRILLED 29/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 31/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.10	100	91	81				Strong to very strong, thickly banded, fine to coarse grained, very dark green (with angular cream phenocrysts), Possible BASALTIC ANDESITE, fresh to locally slightly weathered.				
11	11.10	100	90	90				Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>				
12	12.10	100	89	81								
13	13.10	100	86	81								
14	14.10	100	97	84								
15	15.00							End of Borehole at 15.00 m	15.00	36.63		

REMARKS Hole cased 0.00-4.10m.					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						
31-03-16	14.00	6.00	15.00	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/22R
CO-ORDINATES 527,606.92 E 727,191.08 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 43.46	RIG TYPE Casagrande	DATE DRILLED 05/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 10/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 clayey gravel				
1							○ ○ ○ ○ ○					
2							+ + + + +	SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.70	41.76		
2.70							+ + + + +					
3		100	99	81			+ + + + +	Very strong to strong, thickly to thinly banded, light green/grey/white mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
4							+ + + + +	Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
4.20							+ + + + +					
5		100	97	81			+ + + + +					
5.70							+ + + + +	Very strong to strong, thickly to thinly banded, dark green, porphyritic, fine-grained, GRANITE, fresh to locally moderately weathered.	5.60	37.86		
6		100	97	77			+ + + + +	Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
7							+ + + + +					
7.20							+ + + + +					
8		100	97	90			+ + + + +					
8.70							+ + + + +					
9		100	77	61			+ + + + +	8.73-8.79m - Moderately weathered, slight weakening. 8.88-8.99m - Moderately weathered, slight weakening.				

REMARKS Hole cased 0.00-2.70m.					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 PC FI 10M 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/22R
CO-ORDINATES 527,606.92 E 727,191.08 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 43.46	RIG TYPE Casagrande	DATE DRILLED 05/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 10/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.20				0 250 500		+	Very strong to strong, thickly to thinly banded, dark green, porphyritic, fine-grained, GRANITE, fresh to locally moderately weathered.				
11		100	95	81	560		+	Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>	11.60	31.86		
12	11.70				340		+	Very strong to strong, thickly to thinly banded, light green/grey/white mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally slightly weathered.				
13		100	100	93	570		+	Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
14	13.20						+					
15		100	97	97			+					
15	14.70						+					
15	15.30	100	100	87			+		15.30	28.16		
End of Borehole at 15.30 m												
16							+					
17							+					
18							+					
19							+					

REMARKS Hole cased 0.00-2.70m.					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 18963.GPJ IGSL.GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/23R
CO-ORDINATES 527,773.63 E 727,346.05 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 26.93	RIG TYPE Casagrande	DATE DRILLED 24/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 24/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravelly cobbles				
1												
2												
3								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly clay with occasional cobbles	2.80	24.13		
4	4.20							SYMMETRIX DRILLING: No recovery, observed by driller as greenish grey weathered rock	3.70	23.23		
5		100	31	14				Very strong to strong, thickly to thinly banded, light green/grey/white mottled, porphyritic, medium to coarse-grained, GRANITE, fresh to locally moderately weathered. Dips are 20° to locally 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. 4.20-5.30m - Moderately weathered, slight weakening.	4.20	22.73		
6	5.70											
7		100	95	91								
8	7.20											
9	8.70	100	100	93								
		100	100	100								

REMARKS Hole cased 0.00-4.20m.					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
24-02-16	5.50	3.50	5.70	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/23R
CO-ORDINATES 527,773.63 E 727,346.05 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 26.93	RIG TYPE Casagrande	DATE DRILLED 24/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 24/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.20				0 250 500		+	End of Borehole at 10.20 m	10.20	16.73	///	
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-4.20m.					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	
24-02-16	5.50	3.50	5.70	50mm SP						

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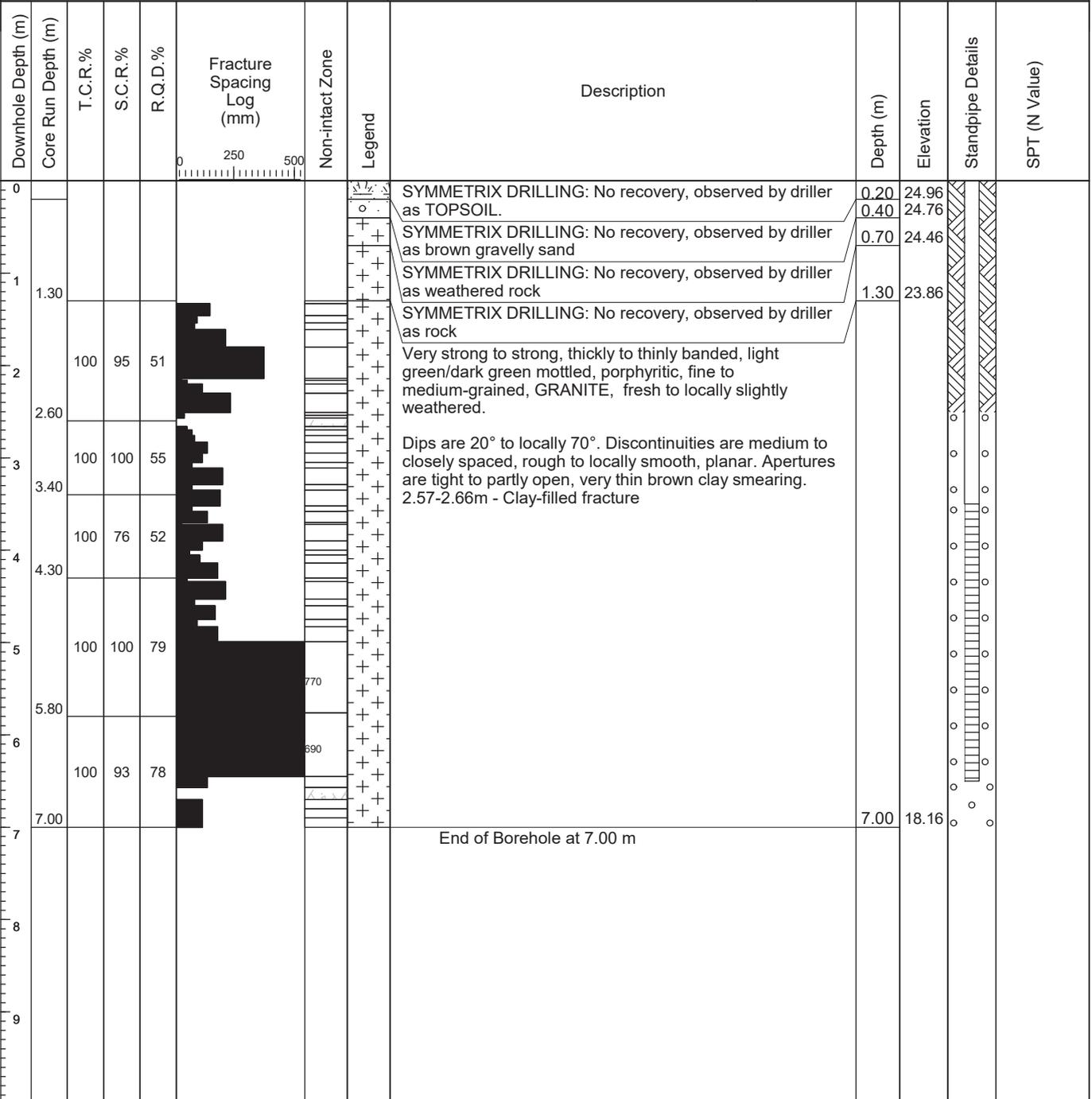


GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/24R
CO-ORDINATES 528,036.05 E 727,520.61 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 25.16	RIG TYPE Knebel	DATE DRILLED 03/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 03/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	LOGGED BY D. O'Shea



REMARKS Hole cased 0.00-1.30m.					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	
03-03-16	6.50	2.50	7.00	50mm SP						

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REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/25R
CO-ORDINATES 528,734.81 E 727,833.14 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 12.85	RIG TYPE Comacchio	DATE DRILLED 26/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 29/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 made ground consisting of Shell & Auger material				
1												
2												
3												
4	4.10							SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	3.80	9.05		
5	5.10	100	100	100				Very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.	4.10	8.75		
6	6.70	100	93	73				Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
7		100	100	100								
8	8.30											
9	9.90	100	100	100								

REMARKS Hole cased 0.00-4.10m.					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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/25R
CO-ORDINATES 528,734.81 E 727,833.14 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 12.85	RIG TYPE Comacchio	DATE DRILLED 26/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 29/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.30	100	100	100	██████████			End of Borehole at 10.30 m	10.30	2.55		
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-4.10m.					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	29-02-16	10.30	4.10	9.60	Water level measured 10 mins after end of drilling	

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REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/26R
CO-ORDINATES 528,816.97 E 727,920.32 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 14.42	RIG TYPE Comacchio	DATE DRILLED 15/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 25/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as made ground consisting of shell & auger material	0.40	14.02		
1								SYMMETRIX DRILLING: No recovery, observed by driller as rock				
1.90		100	82	26				Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally moderately weathered.	1.40	13.02		
2								Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay/gravel filled, locally calcite veined (10mm).				
3		100	100	84								
3.50												
3.70		100	100	100								
4												
5		100	94	81								
5.10												
6		100	100	78								
6.20												
6.60		100	100	100								
7												
8		100	98	84								
8.20												
8.90		100	97	77								
9		100	100	100								
9.10												
9.30		67	47	47				9.30-9.83m - Clay/gravel-filled fracture - some gravel is rounded.				
10.00												

REMARKS Hole cased 0.00-1.40m.					WATER STRIKE DETAILS			
					Water Strike	Casing Depth	Sealed At	Rise To
					No water strike recorded			
INSTALLATION DETAILS					GROUNDWATER DETAILS			
					Date	Hole Depth	Casing Depth	Depth to Water
Date	Tip Depth	RZ Top	RZ Base	Type				

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/26R
CO-ORDINATES 528,816.97 E 727,920.32 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 14.42	RIG TYPE Comacchio	DATE DRILLED 15/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 25/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								10.40-10.60m - Clay/gravel-filled fracture	10.70	3.72		
11								End of Borehole at 10.70 m				
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-1.40m.					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	25-02-16	10.70	1.40	6.80	Water level measured 10 mins after end of drilling	

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/27R
CO-ORDINATES 528,960.43 E 728,133.26 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 9.10	RIG TYPE Casagrande	DATE DRILLED 12/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 13/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clay	0.80	8.30		
1.00								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.00	8.10		
2		93	93	93		1350		Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly weathered.				
2.50								Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
3		100	87	87		930		2.90-3.00m - Clay-filled fracture				
4		100	84	64				4.31-4.53m - Clay-filled fracture				
5		100	85	76		720		5.72-5.86m - Clay-filled fracture				
6		100	91	82				6.36-6.51m - Clay-filled fracture				
7		90	75	70				6.97-7.32m - Clay-filled fracture				
8		100	80	30		1080		8.59-8.71m - Clay-filled fracture				
9		20	20	20				9.24-11.05m - Clay-filled fracture				

REMARKS Hole cased 0.00-1.00m.					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					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/27R
CO-ORDINATES 528,960.43 E 728,133.26 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 9.10	RIG TYPE Casagrande	DATE DRILLED 12/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 13/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.50				0 250 500		750					
11		92	58	58					11.80	-2.70		
12								End of Borehole at 11.80 m				
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-1.00m.					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					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/28R
CO-ORDINATES 529,130.20 E 728,221.35 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 18.86	RIG TYPE Casagrande	DATE DRILLED 11/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 12/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 gravelly clay				
1								SYMMETRIX DRILLING: No recovery, observed by driller as gravelly cobbly clay	1.20	17.66		
2												
3								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	3.00	15.86		
4	4.10							Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly weathered.	4.10	14.76		
5		97	97	94		540		Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
6	5.60					1610		4.64-4.78m - Clay-filled fracture				
7		100	100	89		550.00000000000000						
8	7.20											
9	8.70	100	100	100		1330						
	8.98	100	84	57				8.98-9.01m - Clay-filled fracture				
	9.60							End of Borehole at 9.60 m	9.60	9.26		

REMARKS Hole cased 0.00-4.10m.					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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18963

CONTRACT N6 Galway City Transport Project - Phase 3

DRILLHOLE NO BH3/29R

SHEET Sheet 1 of 1

CO-ORDINATES 529,489.29 E
728,334.05 N

GROUND LEVEL (mOD) 13.73

RIG TYPE Comacchio
FLUSH Air/Mist

DATE DRILLED 11/02/2016

DATE LOGGED 12/02/2016

CLIENT Galway County Council
ENGINEER ARUP

INCLINATION (deg) -90
CORE DIAMETER (mm) 80

DRILLED BY IGSL

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 made ground consisting of shell & auger material				
1												
2												
2.80								SYMMETRIX DRILLING: No recovery, observed by driller as rock	2.70	11.03		
3		100	97	90				Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to locally slightly weathered.	2.80	10.93		
4												
4.10												
4.40		100	93	67				Dips are horizontal to locally vertical. Discontinuities are wide to closely spaced, rough to occasionally smooth, undulose to locally planar. Apertures are tight to moderately open, with very thin brown clay smearing, slight iron-oxide staining.				
4.80		100	73	33								
5												
6		100	85	83								
6.30												
6.90		100	63	48					6.90	6.83		
7								End of Borehole at 6.90 m				
8												
9												

REMARKS

Hole cased 0.00-2.80m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					12-02-16	6.90	2.80	3.70	Water level measured 10 mins after end of drilling

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/30R
CO-ORDINATES 531,041.18 E 728,509.06 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 23.76	RIG TYPE Casagrande	DATE DRILLED 29/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 29/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as made ground consisting of concrete clay and wire				
1									1.60	22.16		
2								SYMMETRIX DRILLING: No recovery, observed by driller as gravelly cobbly clay	2.40	21.36		
2.70								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	2.70	21.06		
3		83	32	0				Possible weathered rock - recovered as angular gravel and cobbles of limestone	3.30	20.46		
3.30		0	0	0				No recovery - driller notes clay band	3.80	19.96		
3.80												
4		100	85	52				Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
5		67	54	51				Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. 4.16-4.40m - Clay-filled fracture 4.57-5.01m - Clay-filled fracture				
5.70												
6		100	93	89								
7												
7.00		100	56	56				7.22-7.75m - Clay-filled fracture				
8								End of Borehole at 8.00 m	8.00	15.76		
9												

REMARKS Hole cased 0.00-4.20m.					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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/31R
CO-ORDINATES 531,274.12 E 728,424.27 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 11.08	RIG TYPE Casagrande	DATE DRILLED 25/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 25/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 gravelly clay				
1												
2												
3								SYMMETRIX DRILLING: No recovery, observed by driller as grey silty gravelly clay	2.70	8.38		
4												
5												
5.70								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock with clay bands	5.20	5.88		
6								Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally moderately weathered.	5.70	5.38		
7		100	84	63				Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay/gravel filled.	7.20			
8		100	63	45				6.17-6.40m - Clay/gravel-filled fracture 7.34-7.74m - Clay/gravel-filled fracture 7.93-8.20m - Clay/gravel-filled fracture				
9		100	48	29				8.54-8.58m - Clay-filled fracture 9.00-9.46m - Clay/gravel-filled fracture	8.70			
10.00								9.70-10.00m - Clay/gravel-filled fracture	10.00	1.08		

REMARKS End of Borehole at 10.00 m

Hole cased 0.00-5.70m.						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
											No water strike recorded

INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
	9.00	5.00	10.00	50mm SP					

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CONTRACT N6 Galway City Transport Project - Phase 3

DRILLHOLE NO BH3/32R

SHEET Sheet 1 of 3

CO-ORDINATES 531,971.12 E
728,317.72 N

GROUND LEVEL (mOD) 24.43

RIG TYPE Knebel
FLUSH Air/Mist

DATE DRILLED 18/02/2016

DATE LOGGED 19/02/2016

CLIENT Galway County Council
ENGINEER ARUP

INCLINATION (deg) -90
CORE DIAMETER (mm) 80

DRILLED BY S. Petersen

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			Hole commenced by Shell & Auger drilling.				
1												
2												
3												
4												
5												
5.40								SYMMETRIX DRILLING: No recovery, observed by driller as made ground consisting of Shell & Auger material	5.40	19.03		
6												
7												
8												
9												

REMARKS

Hole cased 0.00-24.60m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
16.50	16.50	21.00	15.80	5	Slow Moderate
24.00	24.00	N/S	19.80	5	

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
19-02-16	14.00	7.00	15.00	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/32R
CO-ORDINATES 531,971.12 E 728,317.72 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 24.43	RIG TYPE Knebel	DATE DRILLED 18/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 19/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 made ground consisting of Shell & Auger material (continued)	10.50	13.93		
11								SYMMETRIX DRILLING: No recovery, observed by driller as brown grey sandy gravelly clay	11.20	13.23		
12								SYMMETRIX DRILLING: No recovery, observed by driller as orange brown silty clay				N = 50/240 mm (5, 8, 11, 16, 15, 8)
13												N = 50/220 mm (7, 11, 15, 19, 16)
14												N = 50/200 mm (9, 14, 17, 21, 12)
15									15.60	8.83		N = 35 (4, 6, 7, 7, 9, 12)
16								SYMMETRIX DRILLING: No recovery, observed by driller as brown sandy silt				N = 50/210 mm (6, 7, 9, 13, 28)
17												N = 50/230 mm (7, 10, 10, 14, 14)
18												
19												

REMARKS Hole cased 0.00-24.60m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					16.50	16.50	21.00	15.80	5	Slow
					24.00	24.00	N/S	19.80	5	Moderate
					GROUNDWATER DETAILS					
INSTALLATION DETAILS					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
19-02-16	14.00	7.00	15.00	50mm SP						

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18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/33R
CO-ORDINATES 532,102.93 E 728,306.15 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 35.63	RIG TYPE Knebel	DATE DRILLED 17/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 18/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 TOPSOIL.	0.30	35.33		
1								SYMMETRIX DRILLING: No recovery, observed by driller as brown grey silty sandy gravel				
2									2.70	32.93		
3								SYMMETRIX DRILLING: No recovery, observed by driller as possible weathered rock recovered as brown grey silty sandy gravel with cobbles				
4									4.40	31.23		
5	5.10							SYMMETRIX DRILLING: No recovery, observed by driller as rock	5.10	30.53		
6		100	97	88				Medium strong to very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally moderately weathered.				
7	6.60							Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled.				
8		100	94	72								
9	8.10											
		100	100	95								
	9.60											

N = 50/235 mm
(11, 14, 26, 19, 5, 0)

REMARKS Hole cased 0.00-5.10m.					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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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/33R
CO-ORDINATES 532,102.93 E 728,306.15 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 35.63	RIG TYPE Knebel	DATE DRILLED 17/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 18/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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	10.60	100	100	92	0-500			Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally moderately weathered.				
11	11.90	100	98	94				Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled. <i>(continued)</i>				
12	13.10	100	100	88								
13	13.80	100	73	63				13.80-14.08m - Moderately weathered, slight weakening.				
14	14.70							14.88-15.04m - Clay-filled fracture				
15	16.00	100	88	77								
16	17.00	100	99	90					17.00	18.63		
17								End of Borehole at 17.00 m				

REMARKS Hole cased 0.00-5.10m.					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	18-02-16	11.90	10.60	5.10	Water level measured start last day drilling	

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/34R
CO-ORDINATES 532,404.98 E 728,275.25 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 32.57	RIG TYPE Casagrande	DATE DRILLED 18/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 23/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 clayey gravelly cobbles				
1												
2									2.30	30.27		
2.80								SYMMETRIX DRILLING: No recovery, observed by driller as rock	2.80	29.77		
3		100	100	95				Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally moderately weathered.				
4								Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled.				
4.30												
5		100	100	87								
5.80												
6		100	100	94								
7												
7.30												
8		100	100	95								
8.80												
9		100	100	94								

REMARKS Hole cased 0.00-2.80m.					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
23-02-16	16.00	8.50	17.40	50mm SP					

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/34R
CO-ORDINATES 532,404.98 E 728,275.25 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 32.57	RIG TYPE Casagrande	DATE DRILLED 18/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 23/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.30							Medium strong to very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally moderately weathered.				
11		100	100	97				Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled. <i>(continued)</i>				
12	11.80							12.45-12.57m - Moderately weathered, slight weakening.				
13		100	87	83								
14	13.30											
15		100	100	97								
16	14.80											
17		100	100	100								
18	16.30											
19		100	100	100								
	17.40							End of Borehole at 17.40 m	17.40	15.17		

REMARKS Hole cased 0.00-2.80m.					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
23-02-16	16.00	8.50	17.40	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3	DRILLHOLE NO BH3/35R
CO-ORDINATES 532,850.77 E 728,225.98 N	SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 17.52	DATE DRILLED 23/02/2016 DATE LOGGED 24/02/2016
CLIENT Galway County Council ENGINEER ARUP	RIG TYPE Knebel FLUSH Air/Mist INCLINATION (deg) -90 CORE DIAMETER (mm) 80
	DRILLED BY S. Petersen 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 TOPSOIL.	0.50	17.02		
1								SYMMETRIX DRILLING: No recovery, observed by driller as silty sandy gravelly cobbly clay				
2								SYMMETRIX DRILLING: No recovery, observed by driller as silty clayey sand	2.40	15.12		N = 50/135 mm (11, 14, 17, 33)
3								SYMMETRIX DRILLING: No recovery, observed by driller as silty clayey sand with cobbles and boulders	5.30	12.22		N = 50/10 mm (25, 50)
4								SYMMETRIX DRILLING: No recovery, observed by driller as silty clayey sand with cobbles and boulders	6.80	10.72		N = 50/195 mm (5, 11, 20, 13, 17)
5								SYMMETRIX DRILLING: No recovery, observed by driller as silty clayey sand with many boulders				N = 50/0 mm (25, 50)
6												N = 50/10 mm (25, 50)
7												N = 50/40 mm (15, 10, 50)
8												
9												

REMARKS Hole cased 0.00-21.60m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					4.30	4.30	4.40	15.50	5	Seepage Moderate
					18.50	18.50	N/S			
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
24-02-16	18.00	10.50	19.50	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

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CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/35R
CO-ORDINATES 532,850.77 E 728,225.98 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 17.52	RIG TYPE Knebel	DATE DRILLED 23/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 24/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 silty clayey sand with many boulders (<i>continued</i>)			○	
11							○				○	N = 50/85 mm (16, 9, 36, 14)
12							○				○	N = 50/15 mm (9, 16, 50)
13							○				○	N = 50/10 mm (25, 50)
14							○		14.50	3.02	○	N = 50/15 mm (25, 50)
15							□	SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock			○	N = 50/15 mm (25, 50)
16							□				○	N = 50/50 mm (21, 4, 50)
17							□				○	N = 50/95 mm (16, 9, 42, 8)
18							□				○	
19							□				○	

REMARKS Hole cased 0.00-21.60m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					4.30	4.30	4.40	15.50	5	Seepage Moderate
					18.50	18.50	N/S			
					GROUNDWATER DETAILS					
INSTALLATION DETAILS					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
24-02-16	18.00	10.50	19.50	50mm SP						

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18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/35R
CO-ORDINATES 532,850.77 E 728,225.98 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 17.52	RIG TYPE Knebel	DATE DRILLED 23/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 24/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 weathered rock (<i>continued</i>)				
21								SYMMETRIX DRILLING: No recovery, observed by driller as rock	20.90	-3.38		
21.60								Very strong (where competent), medium to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly to locally highly weathered contributing to coreloss. Dips are horizontal to locally 45°. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are wide, locally clay-filled. 22.00-23.00m - No recovery, possible clay-filled fracture 23.10-24.50m - No recovery, possible clay-filled fracture	21.60	-4.08		
22		33	23	15								
23									23.10			
24		7	7	7								
24.60								End of Borehole at 24.60 m	24.60	-7.08		
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00-21.60m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					4.30	4.30	4.40	15.50	5	Seepage Moderate
					18.50	18.50	N/S			
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
24-02-16	18.00	10.50	19.50	50mm SP						

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/36R
CO-ORDINATES 533,124.66 E 728,204.71 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 51.78	RIG TYPE Knebel	DATE DRILLED 19/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 22/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as TOPSOIL.	0.50	51.28		
1								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.90	49.88		
2	2.20							SYMMETRIX DRILLING: No recovery, observed by driller as rock	2.20	49.58		
3		100	88	57				Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
4								Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled.				
5		100	95	39				3.50m - Evidence of honeycomb solution weathering				
6								5.00-6.20m - Subvertical fracture				
7		100	99	87								
8												
9		100	95	87								
	9.50											

REMARKS Hole cased 0.00-2.20m.					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						
23-02-16	19.00	11.50	19.75	50mm SP						

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/36R
CO-ORDINATES 533,124.66 E 728,204.71 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 51.78	RIG TYPE Knebel	DATE DRILLED 19/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 22/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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		100	91	91				<p>Very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.</p> <p>Dips are horizontal to locally vertical. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled. <i>(continued)</i></p>				
11	11.00											
12		100	100	100								
13		100	84	84								
14	14.00											
15		100	93	93								
16	15.50											
17		100	94	94								
18	17.10											
19		100	100	100								
	18.50											
	19.75								19.75	32.03		

End of Borehole at 19.75 m

REMARKS Hole cased 0.00-2.20m.					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
23-02-16	19.00	11.50	19.75	50mm SP					

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/38R
CO-ORDINATES 534,249.34 E 727,540.83 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 45.27	RIG TYPE Casagrande	DATE DRILLED 17/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 18/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel	1.00	44.27		
1	1.20							SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.20	44.07		
2		87	64	42				Very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
3								Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
4								1.20-1.66m - Moderately weathered, slight weakening.				
5		100	93	88				3.23-3.41m - Moderately weathered, slight weakening.				
6												
7												
8		100	100	100								
9												

REMARKS Hole cased 0.00-2.70m.					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						
18-02-16	8.30	2.80	10.30	50mm SP						

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/38R
CO-ORDINATES 534,249.34 E 727,540.83 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 45.27	RIG TYPE Casagrande	DATE DRILLED 17/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 18/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.30							End of Borehole at 10.30 m	10.30	34.97	o	
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-2.70m.					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	
18-02-16	8.30	2.80	10.30	50mm SP						

IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/39R
CO-ORDINATES 534,360.45 E 727,402.19 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 41.88	RIG TYPE Casagrande	DATE DRILLED 16/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 17/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 made ground consisting of clayey gravel	0.40	41.48		
1.10								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.10	40.78		
2	100	96	76					Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
2.60								Dips are horizontal. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled.				
3	100	91	88									
4.10												
5	100	100	97									
5.30												
6	100	100	100									
6.80												
7	100	100	100									
8.20												
9	100	100	100									
9.70												
	100	100	80									

REMARKS Hole cased 0.00-1.20m.					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					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/39R
CO-ORDINATES 534,360.45 E 727,402.19 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 41.88	RIG TYPE Casagrande	DATE DRILLED 16/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 17/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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)
10.10	10.10				0 250 500			End of Borehole at 10.10 m	10.10	31.78		
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-1.20m.					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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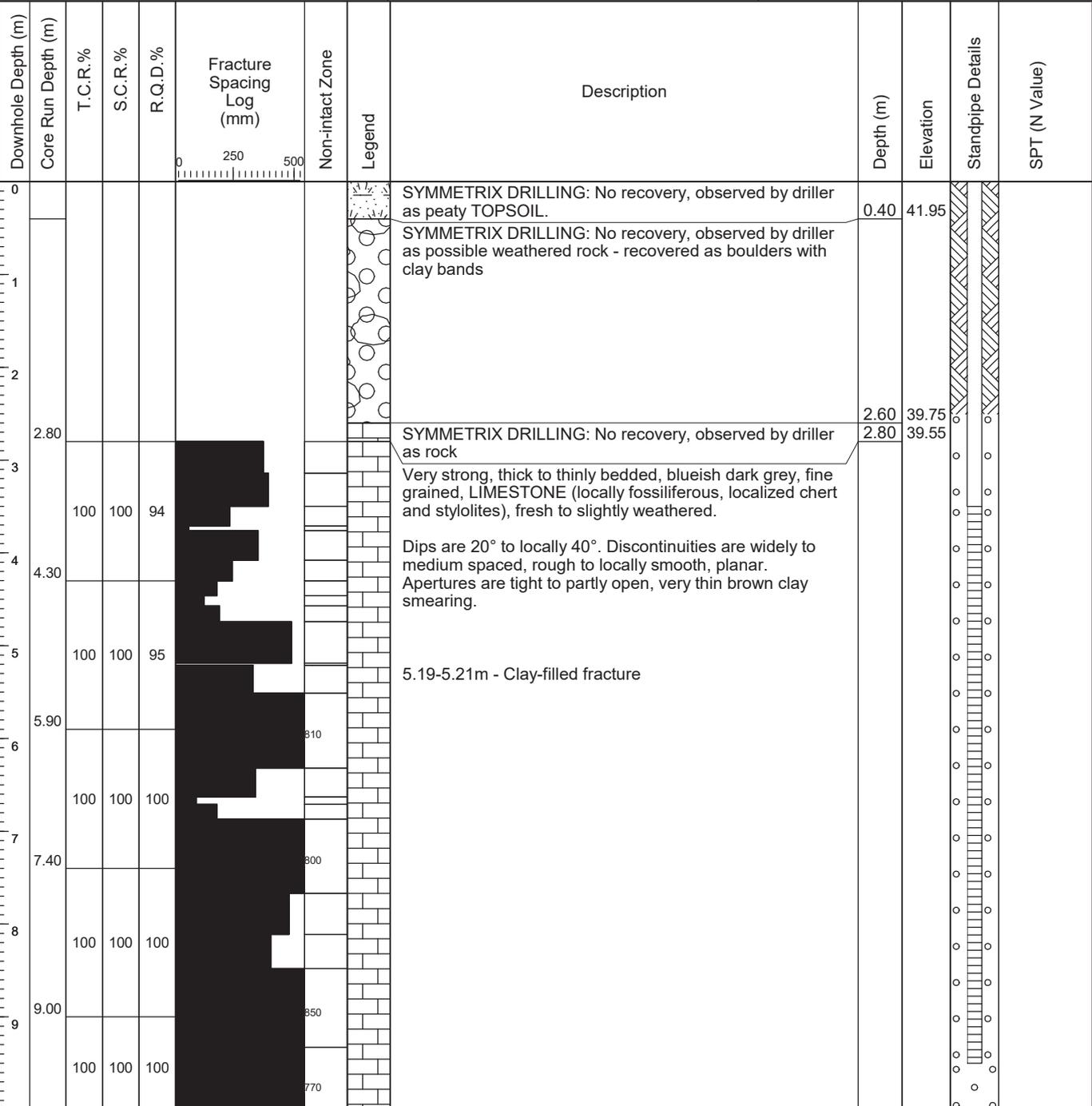


GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/40R
CO-ORDINATES 534,439.24 E 727,295.41 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 42.35	RIG TYPE Knebel	DATE DRILLED 29/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 29/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	LOGGED BY D. O'Shea



REMARKS Hole cased 0.00-2.80m.					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					
29-02-16	9.50	2.50	10.10	50mm SP					

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/40R
CO-ORDINATES 534,439.24 E 727,295.41 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 42.35	RIG TYPE Knebel	DATE DRILLED 29/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 29/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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	10.10				0 250 500			End of Borehole at 10.10 m	10.10	32.25	°	°
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-2.80m.					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						
29-02-16	9.50	2.50	10.10	50mm SP						

IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/41R
CO-ORDINATES 534,579.87 E 727,065.42 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 41.52	RIG TYPE Casagrande	DATE DRILLED 15/02/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 16/02/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel	0.40	41.12		
								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock				
1	1.20							Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.	1.20	40.32		
2		100	61	14				Dips are horizontal to locally 45°. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are wide, locally clay-smearing.				
3								1.20-3.60m - Medium to thin bedded				
4		100	81	38				3.20-3.34m - Moderately weathered, slight weakening.				
5												
6		100	95	95								
7		100	100	100								
7.20												
7.50		100	100	100				End of Borehole at 7.50 m	7.50	34.02		

REMARKS Hole cased 0.00-1.20m.					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					
16-02-16	6.30	2.50	7.50	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/42R
CO-ORDINATES 534,756.39 E 726,839.91 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 32.65	RIG TYPE Knebel	DATE DRILLED 11/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 11/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as TOPSOIL.	0.20	32.45		
1								SYMMETRIX DRILLING: No recovery, observed by driller as brown clay with cobbles and boulders	1.00	31.65		
2								SYMMETRIX DRILLING: No recovery, observed by driller as possible weathered rock	1.80	30.85		
2.30								SYMMETRIX DRILLING: No recovery, observed by driller as rock with clay bands	2.00	30.65		
3		100	89	38				SYMMETRIX DRILLING: No recovery, observed by driller as rock	2.30	30.35		
3.90								Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
4								Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
5		100	100	100								
5.45												
6		100	100	100								
6.90												
7		100	100	100								
8												
8.45												
9		100	100	100								
9.85									9.85	22.80		

REMARKS End of Borehole at 9.85 m

Hole cased 0.00-2.30m.						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						2.30	2.30	N/S	2.20	20	Seepage

INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
11-03-16	9.85	5.35	9.85	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/43R
CO-ORDINATES 534,627.31 E 726,780.71 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 32.77	RIG TYPE Knebel	DATE DRILLED 10/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 10/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 TOPSOIL.	0.20	32.57		
1								SYMMETRIX DRILLING: No recovery, observed by driller as brown clay with cobbles and boulders				
2												N = 25 (3, 4, 4, 6, 8, 7)
3								SYMMETRIX DRILLING: No recovery, observed by driller as brown clay with cobbles and boulders	3.00	29.77		
4								SYMMETRIX DRILLING: No recovery, observed by driller as rock	4.30	28.47		N = 50/195 mm (6, 11, 15, 19, 16)
5	5.00							Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.	5.00	27.77		
6		100	100	100				Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
7	6.45											
8		100	100	100								
9	7.85											
	9.40	100	94	90								
		100	92	92								

REMARKS Hole cased 0.00-5.00m.					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					4.50	4.50	N/S	4.00	20	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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/43R
CO-ORDINATES 534,627.31 E 726,780.71 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 32.77	RIG TYPE Knebel	DATE DRILLED 10/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 10/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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	10.05				0 250 500			End of Borehole at 10.05 m	10.05	22.72		
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
					4.50	4.50	N/S	4.00	20	Slow
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/46R
CO-ORDINATES 531,749.54 E 728,391.61 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 29.81	RIG TYPE Casagrande	DATE DRILLED 14/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 15/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as clayey gravel	0.50	29.31		
1	1.20							SYMMETRIX DRILLING: No recovery, observed by driller as rock				
2		100	91	61				Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered. Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.	1.20	28.61		
3												
4	2.70	100	92	56								
5												
6		100	97	93								
7												
8	4.20	100	99	93								
9												
	5.70	100	99	93								
	7.20	100	100	92								
	8.70	100	100	100								

REMARKS Hole cased 0.00-1.20m.					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						
15-03-16	16.00	11.50	16.40	50mm SP						

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/46R
CO-ORDINATES 531,749.54 E 728,391.61 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 29.81	RIG TYPE Casagrande	DATE DRILLED 14/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 15/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.20							Very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
11		100	89	89				Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>				
	11.70							11.60-11.82m - Clay/gravel-filled fracture				
12		100	95	95								
13	13.20											
14		100	65	41								
	14.70											
15		100	100	100								
16	16.20											
	16.40	100	100	100				End of Borehole at 16.40 m	16.40	13.41		
17												
18												
19												

REMARKS Hole cased 0.00-1.20m.					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					
15-03-16	16.00	11.50	16.40	50mm SP					

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/47R
CO-ORDINATES 533,062.37 E 728,286.02 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 37.74	RIG TYPE Casagrande	DATE DRILLED 16/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 21/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 gravelly clay				
1												
2												
3												
4									4.20	33.54		
4.50								SYMMETRIX DRILLING: No recovery, observed by driller as clayey cobbles	4.50	33.24		
5								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock				
5.60									5.60	32.14		
6		100	87	87				Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
6.60								Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
7		100	75	75								
7.60												
8		100	95	75								
8.60												
9		100	93	83								
9.60												

REMARKS Hole cased 0.00-4.50m.					WATER STRIKE DETAILS			
					Water Strike	Casing Depth	Sealed At	Rise To
					No water strike recorded			
INSTALLATION DETAILS					GROUNDWATER DETAILS			
					Date	Hole Depth	Casing Depth	Depth to Water
21-03-16	12.00	7.00	13.50	50mm SP				

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/8/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/47R
CO-ORDINATES 533,062.37 E 728,286.02 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 37.74	RIG TYPE Casagrande	DATE DRILLED 16/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 21/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.60	100	100	100		590		Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.			0 250 500	
11	11.60	100	100	100		770.0000000000001		Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>			0 250 500	
12	12.60	100	100	100		860					0 250 500	
13	13.50	100	100	100				End of Borehole at 13.50 m	13.50	24.24	0 250 500	
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-4.50m.					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					
21-03-16	12.00	7.00	13.50	50mm SP					

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/03/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/48R
CO-ORDINATES 534,396.60 E 727,197.18 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 40.72	RIG TYPE Casagrande	DATE DRILLED 04/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 05/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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								SYMMETRIX DRILLING: No recovery, observed by driller as gravelly clay	0.70	40.02		
1	1.30							SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	1.30	39.42		
2		100	85	54				Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly weathered.				
3								Dips are horizontal to locally 45°. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are wide, locally clay-filled.				
4		100	89	83				2.22-2.26m - Clay-filled fracture				
5								3.91-4.11m - Clay-filled fracture				
6		100	97	92				5.40-5.58m - Clay-filled fracture				
7												
8		100	91	55								
9												
		100	95	93								
		100	100	100								

REMARKS Hole cased 0.00-1.30m.					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						
05-04-16	20.00	10.00	20.30	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/48R
CO-ORDINATES 534,396.60 E 727,197.18 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 40.72	RIG TYPE Casagrande	DATE DRILLED 04/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 05/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.30							Medium strong to very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly weathered.				
11		100	100	100				Dips are horizontal to locally 45°. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are wide, locally clay-filled. <i>(continued)</i>				
12	11.80											
13		100	100	100								
14	13.30											
15		100	100	100								
16	14.80											
17		100	100	100								
18	17.30											
19		100	100	100								
	18.80											
		100	100	93								

REMARKS Hole cased 0.00-1.30m.					WATER STRIKE DETAILS		
					Water Strike	Casing Depth	Sealed At
					No water strike recorded		
INSTALLATION DETAILS					GROUNDWATER DETAILS		
					Date	Hole Depth	Casing Depth
05-04-16	20.00	10.00	20.30	50mm SP			

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/48R
CO-ORDINATES 534,396.60 E 727,197.18 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 40.72	RIG TYPE Casagrande	DATE DRILLED 04/04/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 05/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	20.30							End of Borehole at 20.30 m	20.30	20.42	o	
21												
22												
23												
24												
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00-1.30m.					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	
05-04-16	20.00	10.00	20.30	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/52R
CO-ORDINATES 528,277.05 E 727,648.55 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 15.42	RIG TYPE Knebel	DATE DRILLED 09/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 09/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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 TOPSOIL.	0.30	15.12		
1								SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty sandy clay				
2									2.50	12.92		N = 32 (4, 5, 9, 10, 6, 7)
3								SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay				N = 50/90 mm (9, 16, 39, 11)
4												N = 50/40 mm (25, 50)
5												N = 50/185 mm (8, 13, 16, 19, 15)
6												N = 50/170 mm (7, 8, 21, 18, 11)
7									8.40	7.02		
8								SYMMETRIX DRILLING: No recovery, observed by driller as rock	8.60	6.82		
9	100	89	74									
9.90												

REMARKS Hole cased 0.00-8.60m.						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						8.50	8.50	N/S	8.00	20	Moderate
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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/52R
CO-ORDINATES 528,277.05 E 727,648.55 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 15.42	RIG TYPE Knebel	DATE DRILLED 09/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 09/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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		100	100	100	0 250 500	1050	[Brick Pattern]	Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), fresh to slightly weathered.				
11	11.20				500.00000000000000	600.00000000000000	[Brick Pattern]	Dips are horizontal to locally 45°. Discontinuities are medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are wide, locally clay-filled. <i>(continued)</i>				
12		100	100	100	500	600	[Brick Pattern]					
13	12.70				500	600	[Brick Pattern]					
14		100	100	100	500	600	[Brick Pattern]					
15	14.00				500	600	[Brick Pattern]					
15	15.30	100	100	100	500	600	[Brick Pattern]		15.30	0.12		
End of Borehole at 15.30 m												
16												
17												
18												
19												

REMARKS Hole cased 0.00-8.60m.						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						8.50	8.50	N/S	8.00	20	Moderate
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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/53R
CO-ORDINATES 528,431.27 E 727,697.66 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 10.06	RIG TYPE Knebel	DATE DRILLED 08/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 08/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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			<p>SYMMETRIX DRILLING: No recovery, observed by driller as TOPSOIL.</p> <p>SYMMETRIX DRILLING: No recovery, observed by driller as made ground consisting of clause 804 material and boulders</p>	0.10	9.96		
1												
2												N = 24 (5, 6, 9, 4, 7, 4)
3												
4												N = 31 (4, 5, 3, 9, 12, 7)
5								SYMMETRIX DRILLING: No recovery, observed by driller as possible weathered rock	5.20	4.86		N = 50/115 mm (8, 13, 27, 23)
6								SYMMETRIX DRILLING: No recovery, observed by driller as rock with clay bands	6.10	3.96		
6.40								SYMMETRIX DRILLING: No recovery, observed by driller as rock with clay bands	6.40	3.66		
7		100	100	100				Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites, common quartz veining), fresh to slightly weathered.				
7.85								Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
8		100	100	95								
9												
9.35												

REMARKS Hole cased 0.00-6.40m.					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

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/53R
CO-ORDINATES 528,431.27 E 727,697.66 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 10.06	RIG TYPE Knebel	DATE DRILLED 08/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 08/03/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY S. Petersen
	CORE DIAMETER (mm) 80	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		100	100	100				Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites, common quartz veining), fresh to slightly weathered.				
10.90								Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>				
11		100	100	98								
12												
12.35												
13		100	79	79								
13.55												
14		100	100	100								
15	15.10							End of Borehole at 15.10 m	15.10	-5.04		
16												
17												
18												
19												

REMARKS Hole cased 0.00-6.40m.					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					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/54R
CO-ORDINATES 528,601.20 E 727,757.95 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 8.29	RIG TYPE Casagrande	DATE DRILLED 31/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 01/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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 gravelly clay				
1								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly clay with occasional cobbles	1.20	7.09		
2												
3								SYMMETRIX DRILLING: No recovery, observed by driller as weathered rock	3.20	5.09		
4	4.20							Medium strong to very strong, thick to thin bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly weathered.	4.20	4.09		
5		100	94	94				Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.				
6	5.70							6.11-6.35m - Clay-filled fracture				
7		100	97	97								
8	7.20											
9	8.70											
		100	99	99								
		100	99	99								

REMARKS Hole cased 0.00-4.20m.					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					

IGSL RC Fl 10M 18963.GPJ IGSL_GDT 17/08/16



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		DRILLHOLE NO BH3/54R
CO-ORDINATES 528,601.20 E 727,757.95 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 8.29	RIG TYPE Casagrande	DATE DRILLED 31/03/2016
CLIENT Galway County Council	FLUSH Air/Mist	DATE LOGGED 01/04/2016
ENGINEER ARUP	INCLINATION (deg) -90	DRILLED BY IGSL
	CORE DIAMETER (mm) 80	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	10.20				0 250 500			Medium strong to very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert and stylolites), slightly weathered.				
11	11.00	100	92	92	600			Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. <i>(continued)</i>				
12	11.70				639.9999999999999			11.25-11.40m - Clay-filled fracture				
13	13.20	100	94	94	699.9999999999999							
14	14.20	100	100	100	2430							
15	15.20	100	100	100				End of Borehole at 15.20 m	15.20	-6.91		
16												
17												
18												
19												

REMARKS Hole cased 0.00-4.20m.					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						

IGSL RC Fl 10M 18963.GPJ IGSL.GDT 17/8/16

BH3/03R Box 1 of 2



BH3/03R Box 2 of 2



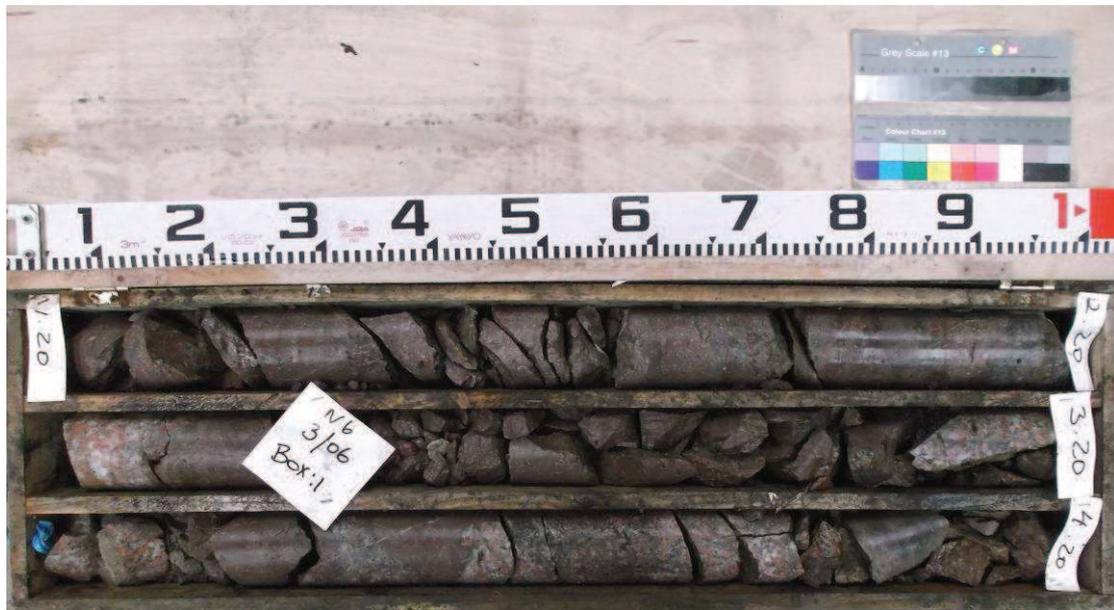
BH3/04R Box 1 of 2



BH3/04R Box 2 of 2



BH3/06R Box 1 of 3



BH3/06R Box 2 of 3



BH3/06R Box 3 of 3



BH3/07R Box 1 of 2



BH3/07R Box 2 of 2



BH3/08R Box 1 of 3



BH3/08R Box 2 of 3



BH3/08R Box 3 of 3



BH3/10R Box 1 of 6



BH3/10R Box 2 of 6



BH3/10R Box 3 of 6



BH3/10R Box 4 of 6



BH3/10R Box 5 of 6



BH3/10R Box 6 of 6



BH3/11R Box 1 of 3



BH3/11R Box 2 of 3



BH3/11R Box 3 of 3



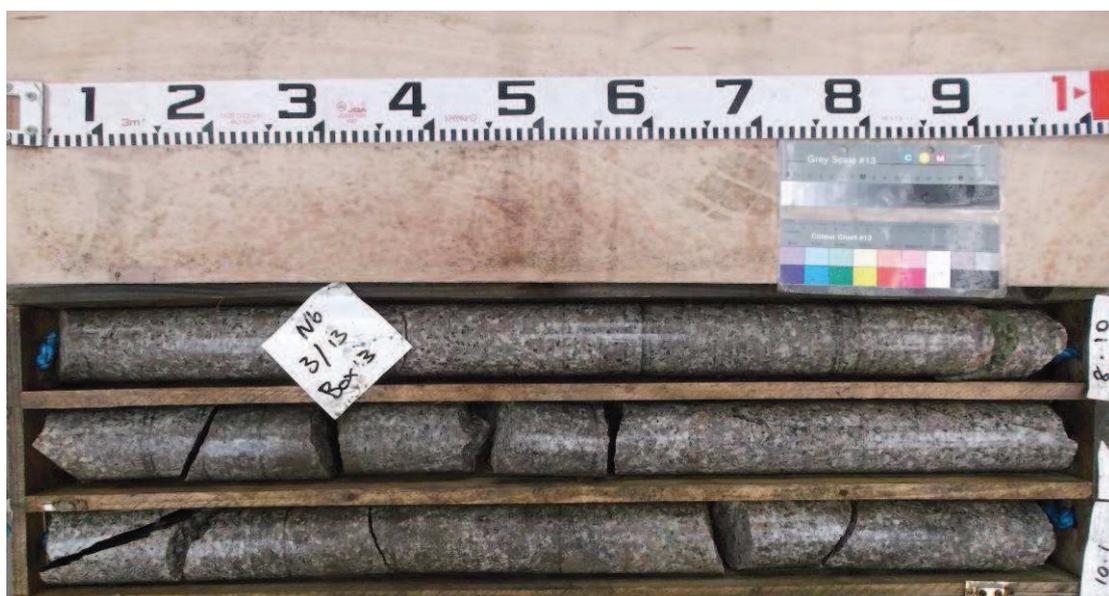
BH3/13R Box 1 of 3



BH3/13R Box 2 of 3



BH3/13R Box 3 of 3



BH3/16R Box 1 of 3



BH3/16R Box 2 of 3



BH3/16R Box 3 of 3



BH3/17R Box 1 of 2



BH3/17R Box 2 of 2



BH3/18R Box 1 of 8



BH3/18R Box 2 of 8



BH3/18R Box 3 of 8

BH3/18R Box 4 of 8



BH3/18R Box 5 of 8



BH3/18R Box 6 of 8



BH3/18R Box 7 of 8



BH3/18R Box 8 of 8



BH3/19R Box 1 of 5



BH3/19R Box 2 of 5



BH3/19R Box 3 of 5



BH3/19R Box 4 of 5



BH3/19R Box 5 of 5



BH3/20R Box 1 of 4



BH3/20R Box 2 of 4



BH3/20R Box 3 of 4



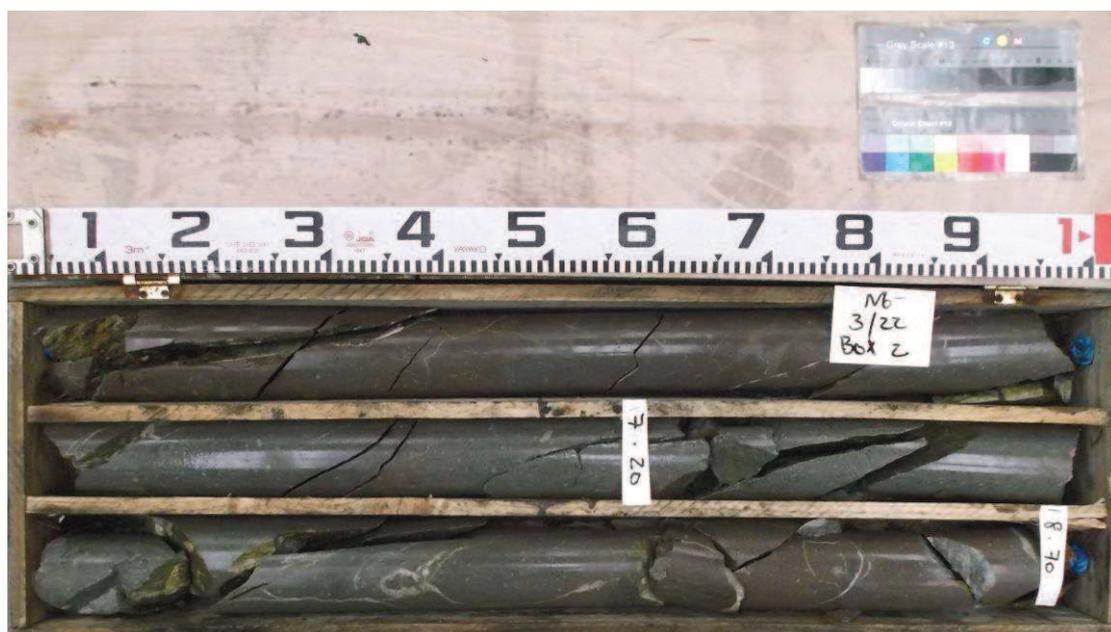
BH3/20R Box 4 of 4



BH3/22R Box 1 of 5



BH3/22R Box 2 of 5



BH3/22R Box 3 of 5



BH3/22R Box 4 of 5



BH3/22R Box 5 of 5



BH3/23R Box 1 of 2



BH3/23R Box 2 of 2



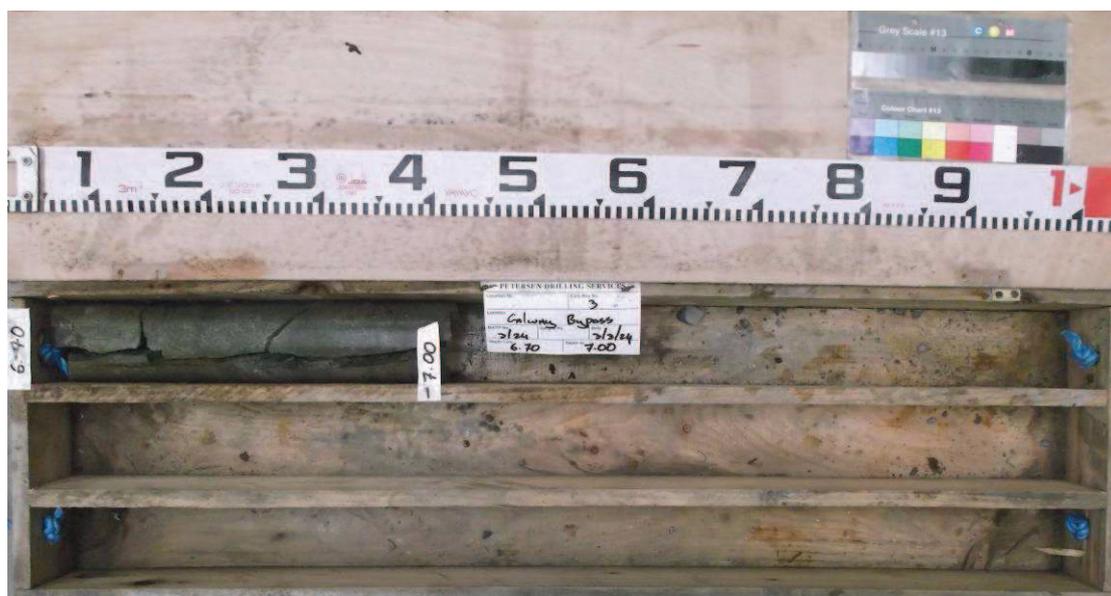
BH3/24R Box 1 of 3



BH3/24R Box 2 of 3



BH3/24R Box 3 of 3



BH3/25R Box 1 of 3



BH3/25R Box 2 of 3



BH3/25R Box 3 of 3



BH3/26R Box 1 of 4



BH3/26R Box 2 of 4



BH3/26R Box 3 of 4



BH3/26R Box 4 of 4



BH3/27R Box 1 of 4



BH3/27R Box 2 of 4



BH3/27R Box 3 of 4



BH3/27R Box 4 of 4



BH3/28R Box 1 of 2



BH3/28R Box 2 of 2



BH3/29R Box 1 of 2



BH3/29R Box 2 of 2



BH3/30R Box 1 of 2



BH3/30R Box 2 of 2



BH3/31R Box 1 of 2



BH3/31R Box 2 of 2



BH3/32R Box 1 of 1



BH3/33R Box 1 of 5



BH3/33R Box 2 of 5



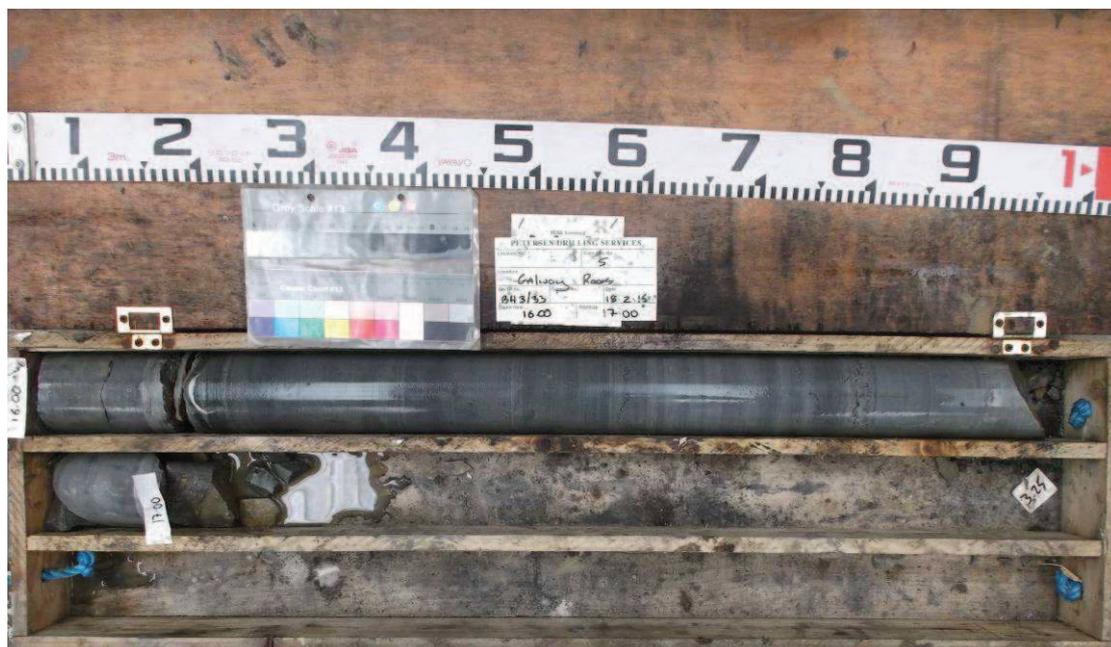
BH3/33R Box 3 of 5



BH3/33R Box 4 of 5



BH3/33R Box 5 of 5



BH3/34R Box 1 of 5



BH3/34R Box 2 of 5



BH3/34R Box 3 of 5



BH3/34R Box 4 of 5



BH3/34R Box 5 of 5



BH3/35R Box 1 of 1



BH3/36R Box 1 of 7



BH3/36R Box 2 of 7



BH3/36R Box 3 of 7



BH3/36R Box 4 of 7



BH3/36R Box 5 of 7



BH3/36R Box 6 of 7



BH3/36R Box 7 of 7



BH3/38R Box 1 of 4



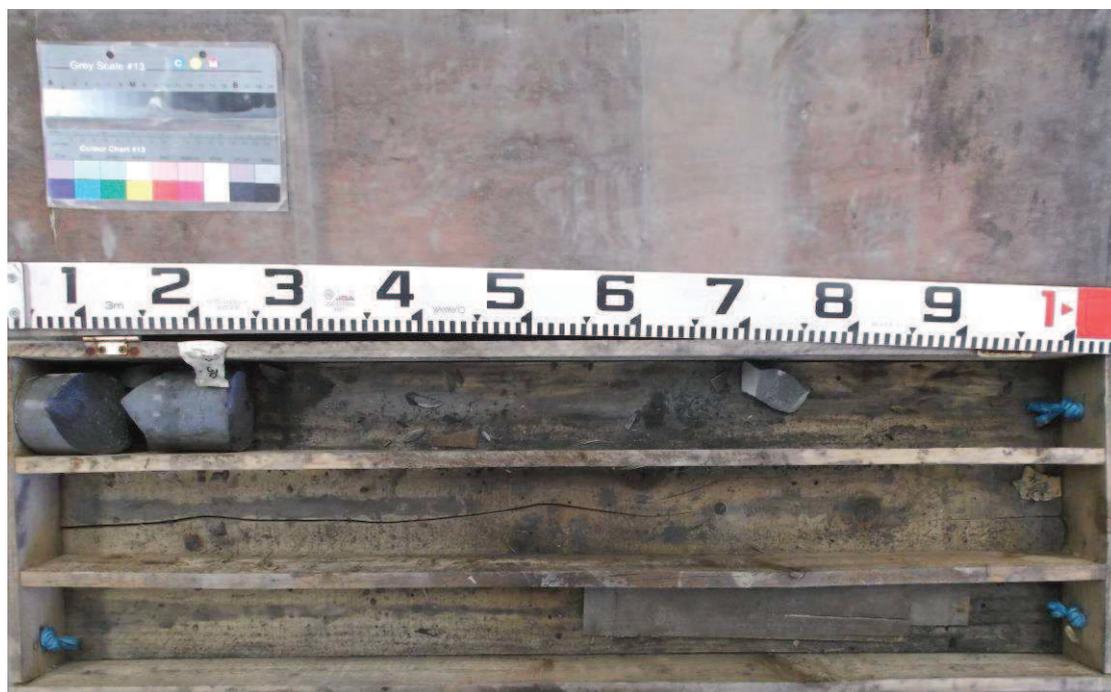
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BH3/38R Box 3 of 4



BH3/38R Box 4 of 4



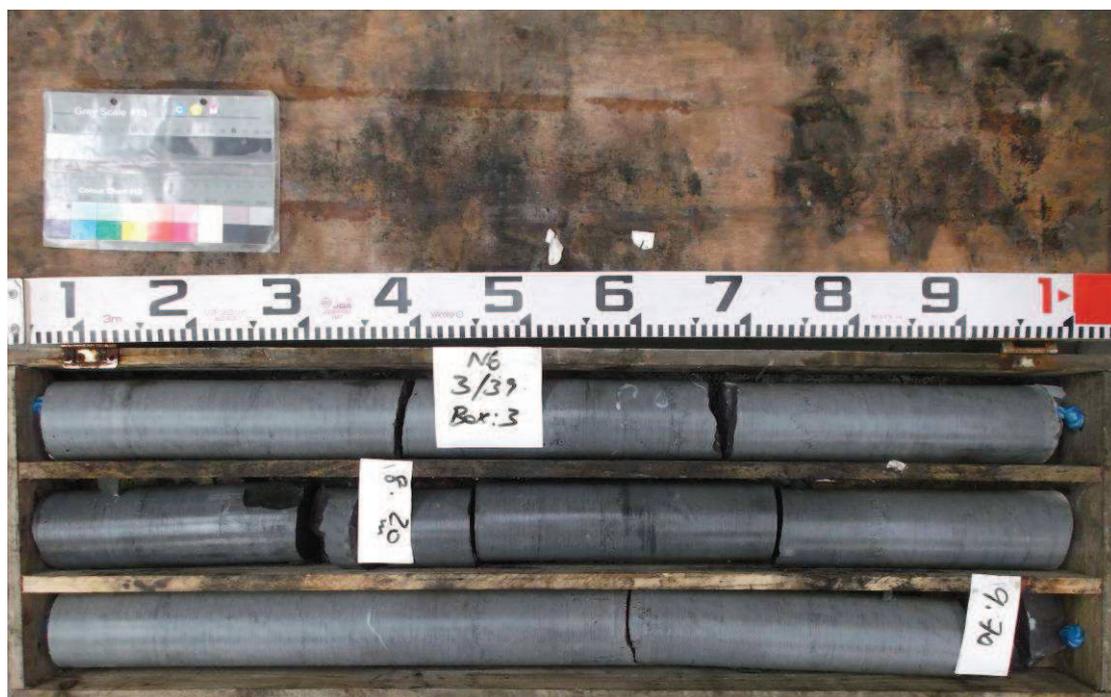
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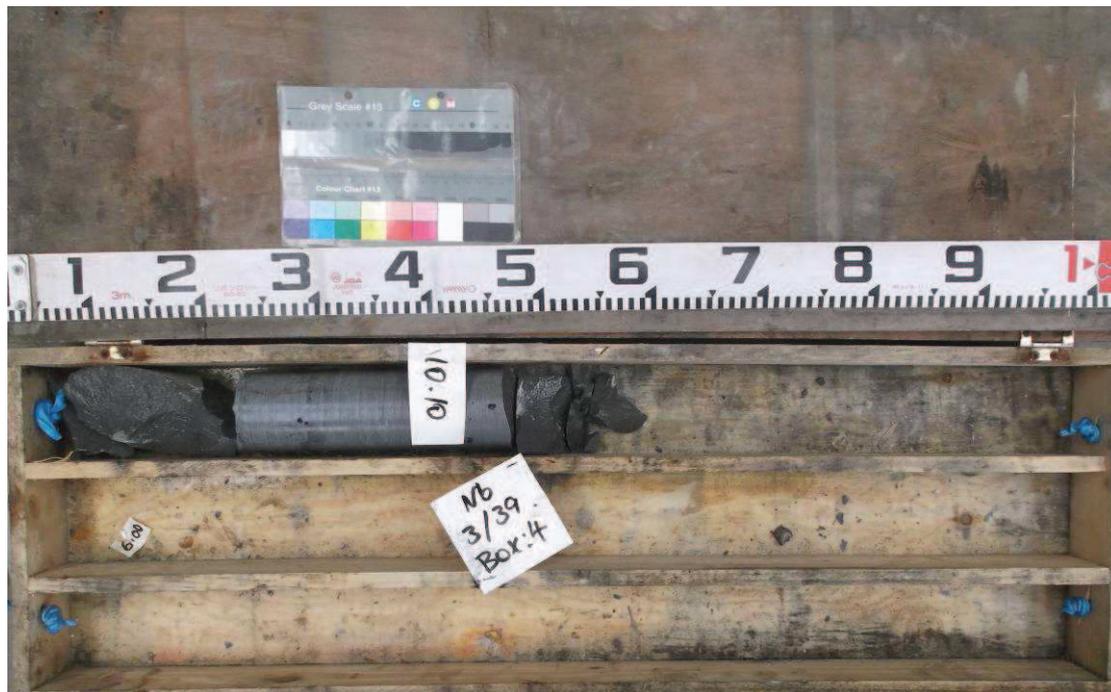
BH3/39R Box 2 of 4



BH3/39R Box 3 of 4



BH3/39R Box 4 of 4



BH3/40R Box 1 of 3



BH3/40R Box 2 of 3



BH3/40R Box 3 of 3



BH3/41R Box 1 of 3



BH3/41R Box 2 of 3



BH3/41R Box 3 of 3



BH3/42R Box 1 of 3



BH3/42R Box 2 of 3



BH3/42R Box 3 of 3



BH3/43R Box 1 of 2



BH3/43R Box 2 of 2



BH3/46R Box 1 of 6



BH3/46R Box 2 of 6



BH3/46R Box 3 of 6



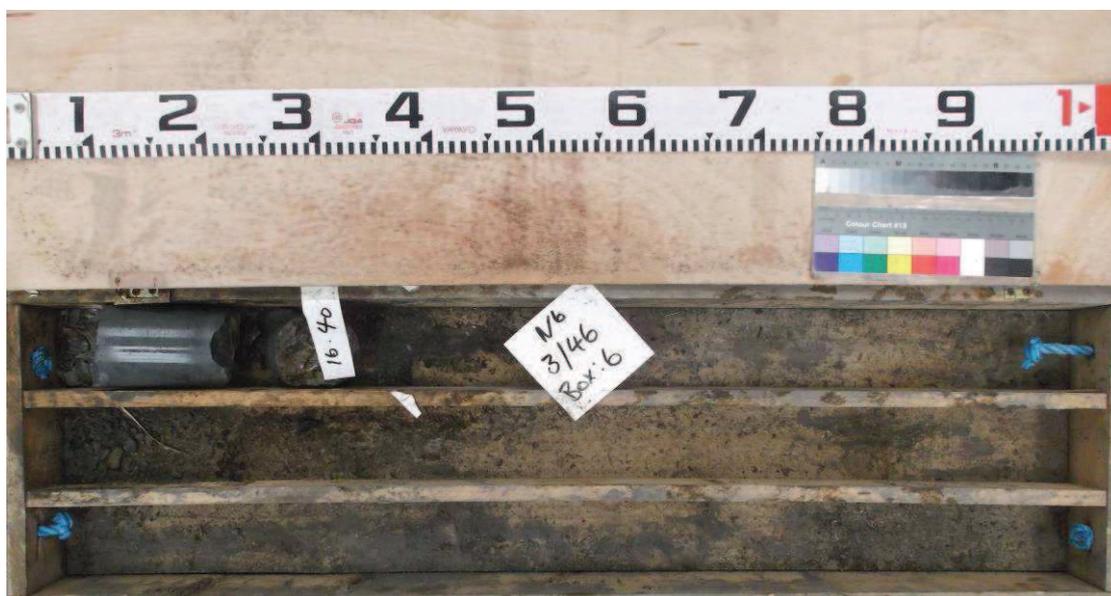
BH3/46R Box 4 of 6



BH3/46R Box 5 of 6



BH3/46R Box 6 of 6



BH3/47R Box 1 of 3



BH3/47R Box 2 of 3



BH3/47R Box 3 of 3



BH3/48R Box 1 of 7



BH3/48R Box 2 of 7



BH3/48R Box 3 of 7



BH3/48R Box 4 of 7



BH3/48R Box 5 of 7



BH3/48R Box 6 of 7



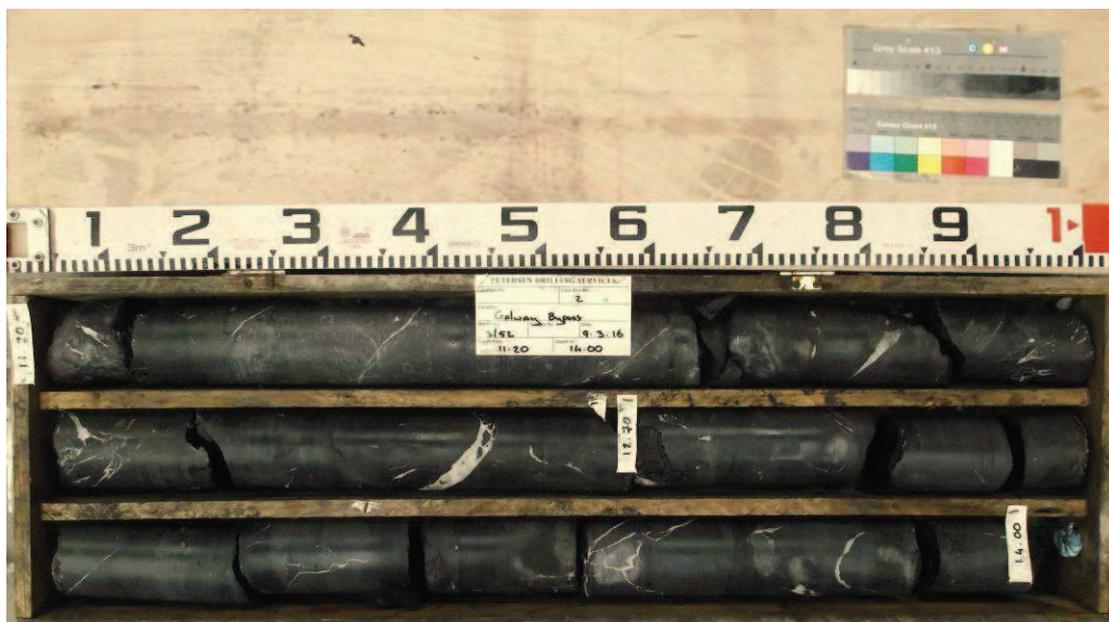
BH3/48R Box 7 of 7



BH3/52R Box 1 of 3



BH3/52R Box 2 of 3



BH3/52R Box 3 of 3



BH3/53R Box 1 of 3



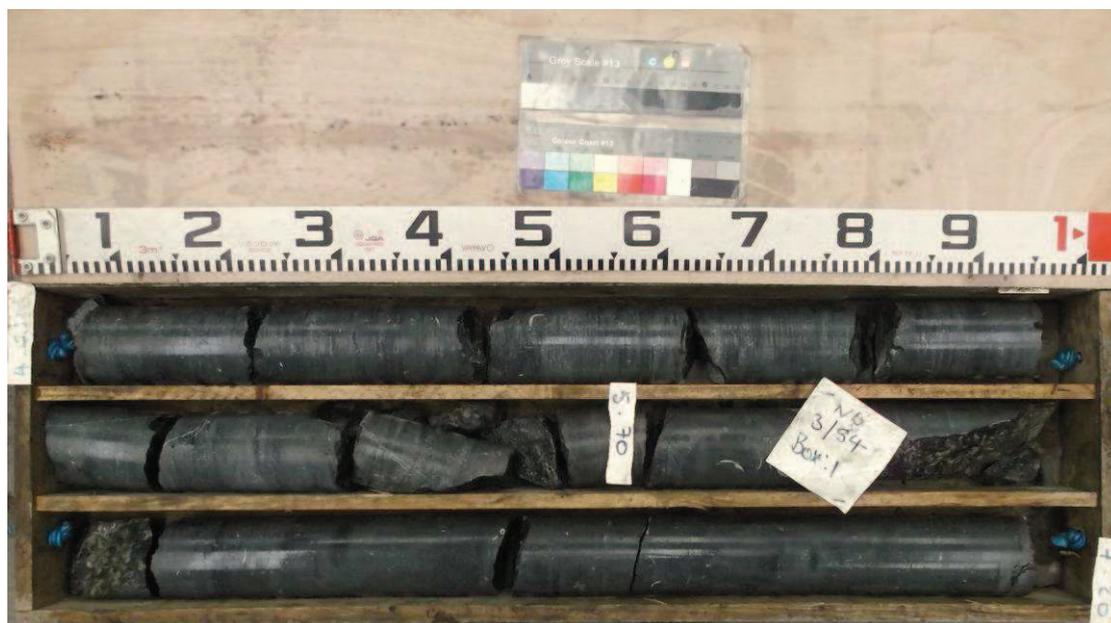
BH3/53R Box 2 of 3



BH3/53R Box 3 of 3



BH3/54R Box 1 of 4



BH3/54R Box 2 of 4



BH3/54R Box 3 of 4



BH3/54R Box 4 of 4



Appendix 4

Photographs of machine-excavated inspection pit at BH3/30R

BH3/30R - 1 of 4



BH3/30R - 2 of 4



BH3/30R - 3 of 4



BH3/30R - 4 of 4



Appendix 5**Trial Pit Logs and Photographs**

Exploratory Hole Number	Method of Construction [Machine Excavated / Hand Dug]
TP3/01	ME
TP3/02	HD
TP3/03	ME
TP3/04	ME
TP3/05	ME
TP3/06	ME
TP3/07	ME
TP3/08	ME
TP3/09	ME
TP3/10	HD
TP3/11	HD
TP3/12	ME
TP3/13	ME
TP3/14	HD
TP3/15	ME
TP3/16	ME
TP3/17	ME
TP3/18	ME
TP3/19	ME
TP3/20	ME
TP3/21	ME
TP3/22	ME
TP3/23	ME
TP3/24	ME
TP3/25	ME
TP3/27	ME
TP3/28	ME
TP3/29	ME
TP3/30	ME

TP3/31	ME
TP3/32	ME
TP3/33	ME
TP3/34	ME
TP3/35	ME
TP3/36	ME
TP3/37	ME
TP3/39	ME
TP3/40	ME
TP3/41	ME
TP3/42	ME
TP3/43 (formerly BH3/05)	HD
TP3/44	ME
TP3/45	ME



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/01
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,346.87 E 722,589.22 N		DATE STARTED 14/01/2016
GROUND LEVEL (m) 10.10		DATE COMPLETED 14/01/2016
CLIENT Galway County Council	EXCAVATION METHOD Hitachi Zaxis 80	
ENGINEER ARUP		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Dark brown/black sandy gravelly very fibrous PEAT					AA37828	B	0.00-0.40		
0.40	Light grey clayey/silty very sandy fine to coarse angular GRAVEL with many cobbles and occasional boulders		0.40	9.70						
1.0						AA37829	B	1.00		
1.40	Obstruction - Possible Rockhead End of Trial Pit at 1.40m		1.40	8.70						

Groundwater Conditions
Dry

Stability
Good

General Remarks
0.50hr Clearance required to gain access to pit location



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/02
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,334.47 E 722,752.56 N		DATE STARTED 25/01/2016
GROUND LEVEL (m) 17.84		DATE COMPLETED 25/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hand dug	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Grey clayey/silty very sandy fine to coarse GRAVEL with many cobbles and boulders		0.30	17.54						
			0.70	17.14		AA44496 AA44497	D B	0.50 0.50		
	Obstruction - Possible Rockhead End of Trial Pit at 0.70m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
1.50hr Taking down stone wall. TP location inaccessible with machine due to steep granite outcrop which emerged during clearing works. Reinstating wall.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/03
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,335.24 E 722,996.25 N		DATE STARTED 21/01/2016
GROUND LEVEL (m) 30.56		DATE COMPLETED 21/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.20	30.36						
	COBBLES and BOULDERS with some brown black silty very sandy GRAVEL with many rootlets (Possible MADE GROUND)						AA44478 AA44479 AA44480	D D B	0.50 0.50 0.50	
1.0	Dark brown/black sandy gravelly SILT/CLAY (Possible MADE GROUND)		1.00	29.56		AA44481	D	1.00		
	Grey brown silty very sandy fine to coarse angular GRAVEL with many cobbles and occasional boulders			1.60		28.96	AA44482 AA44483 AA44484	D D B	1.60 1.60 1.60	
2.0			2.40	28.16	1 (Slow)					
	Obstruction - Possible Rockhead End of Trial Pit at 2.40m									

Groundwater Conditions
Slow water inflow at 1.70m

Stability

General Remarks

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/04
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 523,645.55 E 724,286.79 N		DATE STARTED 25/01/2016
GROUND LEVEL (m) 36.82		DATE COMPLETED 25/01/2016
CLIENT Galway County Council	EXCAVATION METHOD Hitachi Zaxis 80	
ENGINEER ARUP		

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 dark brown black PEAT		0.15	36.67						
	Grey brown clayey/silty very gravelly SAND with many cobbles and boulders. Gravel is angular fine to coarse.		0.70	36.12	↓ (Seepage)	AA44498	D	0.50		
						AA44499	D	0.50		
						AA44500	B	0.50		
						AA49501	D	0.80		
						AA49502	B	0.80		
1.0	Obstruction - Possible Rockhead End of Trial Pit at 1.00m		1.00	35.82						

Groundwater Conditions
Seepage at 0.70m

Stability
Good

General Remarks
0.25hr Clearance required to access trial pit location



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/05
LOGGED BY A.Chryst	CO-ORDINATES 521,603.76 E 723,516.84 N	SHEET Sheet 1 of 1
CLIENT ENGINEER Galway County Council ARUP	GROUND LEVEL (m) 40.97	DATE STARTED 21/01/2016 DATE COMPLETED 21/01/2016
		EXCAVATION METHOD Hitachi Zaxis 80

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Slow)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Soft dark brown fibrous PEAT		0.20	40.77						
						AA44473	D	0.50		
						AA44474	D	0.50		
						AA44475	B	0.50		
1.0	Grey slightly clayey/silty very sandy fine to coarse GRAVEL with many cobbles of granite		0.90	40.07						
	Obstruction - Possible Rockhead		1.10	39.87		AA44476	D	1.00		
	End of Trial Pit at 1.10m					AA44477	B	1.00		

Groundwater Conditions
Ingress from surface

Stability

General Remarks
1.25hr Clearing route to trial pit. Difficult access (large granite boulders, steep granite outcrops, soft ground in places). 0.75hr Difficult track back to main road.

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/06
LOGGED BY A. Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,854.39 E 723,856.76 N		DATE STARTED 12/01/2016
GROUND LEVEL (m) 48.76		DATE COMPLETED 12/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

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 dark brown black fibrous PEAT		0.20	48.56						
						AA35350	D	0.50-0.50		
						AA37803	B	0.50-1.10		
1.0	Brown grey slightly clayey/silty sandy fine to coarse angular GRAVEL with many angular cobbles of granite.		1.10	47.66	↓ (Seepage)	AA37804	D	1.10-1.10		
						AA37805	B	1.10-1.50		
	Obstruction - Possible Granite bedrock End of Trial Pit at 1.50m		1.50	47.26						

Groundwater Conditions
Seepage at 1.30m

Stability
Good

General Remarks



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/07
LOGGED BY A. Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,718.09 E 723,627.37 N		DATE STARTED 12/01/2016
GROUND LEVEL (m) 46.47		DATE COMPLETED 12/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Grey brown silty very gravelly fine to coarse SAND with cobbles of granite.		0.20	46.27		AA37806	D	0.20-0.50		
			0.50	45.97		AA37807	B	0.20-0.50		
	Obstruction- Possible Granite bedrock End of Trial Pit at 0.50m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
0.50hr Clearance required in tracking machine to trial pit location. 0.25hr Reinstatement during track out of field



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/08
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 527,097.40 E 726,120.24 N		DATE STARTED 14/01/2016
GROUND LEVEL (m) 35.55		DATE COMPLETED 14/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.08	35.47	 (Rapid)					
	Dark grey clayey/silty very sandy fine to coarse GRAVEL with occasional cobbles (MADE GROUND)									
	Dark grey/brown COBBLES and BOULDERS with some dark grey clayey sand (MADE GROUND)		0.60	34.95		AA37818	D	0.50		
							AA37819	B	0.50	
1.0	Light grey clayey/silty very sandy fine to coarse angular GRAVEL with many cobbles		1.20	34.35						
						AA37820	D	1.20-1.70		
					AA37821	B	1.20-1.70			
2.0	Obstruction End of Trial Pit at 1.70m		1.70	33.85						

Groundwater Conditions
Rapid water ingress at 1.60m

Stability
Good

General Remarks



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/09
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 527,025.70 E 727,259.02 N		DATE STARTED 26/01/2016
GROUND LEVEL (m) 65.80		DATE COMPLETED 26/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.15	65.65	↓ Water Strike (Rapid)					
	Soft black to dark brown slightly gravelly PEAT		0.50	65.30						
	COBBLES and BOULDERS of granite		0.70	65.10		AA49503	D	0.50		
	Obstruction - Possible Rockhead End of Trial Pit at 0.70m					AA49504	D	0.50		
						AA49505	B	0.50		

Groundwater Conditions
Rapid ingress of surface water

Stability
Good

General Remarks
0.50hr Clearance required in order to allow tracking to trial pit location. 0.75hr Reinstatement during track from field



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/10
LOGGED BY JL		SHEET Sheet 1 of 1
CO-ORDINATES 522,163.10 E 723,947.78 N		DATE STARTED 12/01/2016
GROUND LEVEL (m) 56.56		DATE COMPLETED 12/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hand dug	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Soft brown to dark brown sandy peaty organic CLAY with frequent rootlets									
0.40	Loose brown clayey sandy GRAVEL with a medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of granite. Cobbles are subangular to subrounded of granite.		0.40	56.16	↓ (Seepage)					
0.50			56.06							
1.0	Obstruction - Possible Granite bedrock / boulders End of Trial Pit at 0.50m									

Groundwater Conditions
Water seepage at 0.50m

Stability
Moderate

General Remarks
Hand dug pit carried out due to lack of available access for track machine and abundant granite outcrops in area. 0.50hr accessing and leaving site.

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/11
LOGGED BY A. Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 522,413.85 E 724,062.10 N		DATE STARTED 13/01/2016
GROUND LEVEL (m) 51.74		DATE COMPLETED 13/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hand dug	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Brown grey clayey/silty very sandy fine to coarse angular GRAVEL with cobbles of granite.		0.25	51.49	↓ (Slow)	AA37814	B	0.25-0.40		
	Obstruction - Possible Granite bedrock End of Trial Pit at 0.40m		0.40	51.34						
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Slow ingress at 0.20m

Stability
Good

General Remarks
TP location inaccessible for excavator. 1hr accessing and leaving site by foot.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/12
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 522,742.48 E 724,210.61 N		DATE STARTED 20/01/2006
GROUND LEVEL (m) 50.27		DATE COMPLETED 20/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL - Dark brown/black sandy gravelly organic SILT/CLAY		0.30	49.97		AA44457	B	0.10-0.30		
	Obstruction - Possible Rockhead End of Trial Pit at 0.30m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability

General Remarks
0.20hr Minor clearance work required to gain access to trial pit.

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/13
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 522,883.59 E 724,266.07 N		DATE STARTED 20/01/2016
GROUND LEVEL (m) 46.73		DATE COMPLETED 20/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike ↓ (Rapid)	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL - Dark brown black slightly sandy gravelly SILT/CLAY with many cobbles		0.30	46.43		AA44458 AA44459	D B	0.10-0.30 0.10-0.30		
	Soft to firm brown grey sandy slightly gravelly SILT with many cobbles and occasional boulders		0.90	45.83		AA44460 AA44461	D B	0.50 0.50		
1.0	Obstruction - Possible Rockhead End of Trial Pit at 0.90m									

Groundwater Conditions
Rapid inflow of water from surface

Stability

General Remarks
0.40hr Taking down stone wall. 0.50hr Reinstating stone wall.

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/14
LOGGED BY A. Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 523,204.92 E 724,220.77 N		DATE STARTED 13/01/2016
GROUND LEVEL (m) 39.73		DATE COMPLETED 13/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hand dug	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Dark brown black slightly clayey/silty sandy fine to coarse GRAVEL with cobbles of granite.		0.20	39.53	↓ (Slow)	AA37815	B	0.20-0.40		
	Obstruction - Possible Granite bedrock End of Trial Pit at 0.40m		0.40	39.33						
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Slow ingress at 0.20m

Stability
Good

General Remarks
Hand dug pit carried out due to lack of available access for track machine and abundant granite outcrops in area. 0.50hr accessing and leaving site by foot without assistance of track machine for clearance.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/15
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 523,703.17 E 724,344.09 N		DATE STARTED 21/01/2016
GROUND LEVEL (m) 36.49		DATE COMPLETED 21/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL - Dark brown black slightly gravelly PEAT		0.40	36.09		AA44485	D	0.10-0.40		
						AA44486	B	0.10-0.40		
	Obstruction - Possible Rockhead End of Trial Pit at 0.40m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability

General Remarks



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/16
LOGGED BY A. Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 524,043.03 E 724,679.85 N		DATE STARTED 13/01/2016
GROUND LEVEL (m) 29.81		DATE COMPLETED 13/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Brown slightly clayey/silty very sandy fine to coarse GRAVEL with cobbles of granite.		0.20	29.61		AA37816	D	0.20-0.50		
			0.50	29.31		AA37817	B	0.20-0.50		
	Obstruction - Possible Granite bedrock End of Trial Pit at 0.50m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions

Stability
Good

General Remarks
1hr Clearing. Difficult access (narrow laneway, granite outcrops, steep, long distance). 0.75hr Reinstatement.

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/17
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 524,724.12 E 725,124.75 N		DATE STARTED 21/01/2016
GROUND LEVEL (m) 44.04		DATE COMPLETED 21/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Orange brown COBBLES and BOULDERS with some clayey/silty sandy gravel		0.30	43.74		AA44487 AA44488 AA44489	D B B	0.50 0.50 0.50		
1.0	Obstruction - Possible Rockhead End of Trial Pit at 0.90m		0.90	43.14						
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability

General Remarks
0.50hr Clearance required to gain access to pit location. 0.50hr Reinstatement of access route following machine excavation at pit

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/18
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 525,081.67 E 725,407.94 N		DATE STARTED 14/01/2016
GROUND LEVEL (m) 49.67		DATE COMPLETED 14/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL - Dark brown black sandy gravelly SILT/CLAY		0.15	49.52	 (Moderate)	AA37825	B	0.15		
	Soft black gravelly PEAT		0.50	49.17						
	Light grey/brown clayey/silty sandy fine to coarse GRAVEL with many cobbles and occasional boulders		1.0			AA37826	B	1.00		
			2.0			AA37827	B	2.00		
	Obstruction - Possible Rockhead End of Trial Pit at 2.20m		2.20	47.47						

Groundwater Conditions
Moderate water ingress at 1.10m

Stability

General Remarks
1hr tracking in total to and from trial pit location

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/19
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 525,459.79 E 725,719.43 N		DATE STARTED 22/01/2016
GROUND LEVEL (m) 59.04		DATE COMPLETED 22/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.15	58.89						
	(Medium dense to dense) COBBLES and BOULDERS with some dark brown clayey/silty very sandy gravel		0.70	58.34		AA44490 AA44491 AA44492	D B B	0.50 0.50 0.50		
1.0	Obstruction - Possible Rockhead End of Trial Pit at 0.70m									

Groundwater Conditions
Dry

Stability

General Remarks



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/20
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 525,602.13 E 725,756.44 N		DATE STARTED 14/01/2016
GROUND LEVEL (m) 57.06		DATE COMPLETED 14/01/2016
CLIENT Galway County Council	EXCAVATION METHOD Hitachi Zaxis 80	
ENGINEER ARUP		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL (MADE GROUND)		0.15	56.91	↓ (Rapid)	AA37822	B	0.15-0.40		
	Dark brown black very fibrous PEAT (MADE GROUND)		0.40	56.66						
	Dark brown black very fibrous PEAT with concrete, timber, metal, glass, copper pipe, lead pipe and ceramic pipe (MADE GROUND)		1.00	56.06						
1.0	Dark brown grey very sandy GRAVEL with concrete, timber, metal, glass, copper pipe, lead pipe and ceramic pipe (MADE GROUND)		1.30	55.76						
	Obstruction - Possible Rockhead End of Trial Pit at 1.30m									

Groundwater Conditions
Rapid water ingress at 0.40m

Stability

General Remarks
0.50hr Tracking to and from site including reinstatement of routeway following excavation

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/21
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 526,361.74 E 726,284.13 N		DATE STARTED 22/01/2016
GROUND LEVEL (m) 60.01		DATE COMPLETED 22/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	(Medium dense to dense) COBBLES with some dark brown black clayey/silty sandy GRAVEL		0.15	59.86		AA44493	D	0.15-0.40		
						AA44494	B	0.15-0.40		
			0.40	59.61		AA44495	B	0.15-0.40		
	Obstruction - Possible Rockhead End of Trial Pit at 0.40m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions

Stability

General Remarks
1hr tracking in total to and from trial pit location



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/22
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 533,297.22 E 728,311.06 N		DATE STARTED 19/01/2016
GROUND LEVEL (m) 56.03		DATE COMPLETED 19/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

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 slightly gravelly SILT		0.15	55.88		AA33946	D	0.15-0.45		
						AA33947	B	0.15-0.45		
	Obstruction - Possible Bedrock End of Trial Pit at 0.45m		0.45	55.58						
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions

Stability

General Remarks
1hr tracking in total to and from trial pit location inclusive of reinstatement

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/23
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 533,040.76 E 728,019.86 N		DATE STARTED 19/01/2016
GROUND LEVEL (m) 46.26		DATE COMPLETED 19/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.15	46.11						
	Soft to firm light brown slightly sandy slightly gravelly SILT					AA33940 AA33941	D B	0.50 0.50		
1.0	Soft to firm light brown/grey slightly sandy gravelly SILT with some cobbles		1.10	45.16		AA33942 AA33943	D B	1.10 1.10		
2.0	Very stiff light brown/grey slightly sandy gravelly SILT with some cobbles and occasional boulders		1.80	44.46		AA33944 AA33945	D B	2.00 2.00		
	Obstruction - Possible Rockhead End of Trial Pit at 2.30m		2.30	43.96						
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Slightly unstable

General Remarks
Plate bearing test carried out in pit at 1.20m bgl. 1hr tracking in total to and from trial pit location.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/24
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 529,752.24 E 728,388.27 N		DATE STARTED 26/01/2016
GROUND LEVEL (m) 13.69		DATE COMPLETED 26/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.10	13.59						
	Angular COBBLES and BOULDERS of limestone with some light brown clayey/silty sandy GRAVEL		0.70	12.99		AA49456 AA49457	D B	0.50 0.50		
	Obstruction - Possible Rockhead End of Trial Pit at 0.70m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
0.75hr Tracking to stone wall en route to trial pit location. 0.15hr Taking down stone wall. 0.50hr Reinstating wall upon trial pit completion.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/25
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 530,843.30 E 728,535.88 N		DATE STARTED 18/01/2016
GROUND LEVEL (m) 34.75		DATE COMPLETED 18/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	(Loose to medium dense) Dark brown silty very sandy GRAVEL with rootlets		0.15	34.60		AA33934	D	0.15-0.40		
	Light brown grey clayey/silty very sandy fine to coarse GRAVEL with many cobbles and occasional boulders		0.40	34.35		AA33935	B	0.15-0.40		
1.0						AA33936	D	1.00		
						AA33937	B	1.00		
2.0	Light brown grey slightly sandy gravelly SILT/CLAY with some cobbles		1.80	32.95						
	Obstruction - Possible Rockhead End of Trial Pit at 2.10m		2.10	32.65		AA33938	D	2.00		
						AA33939	B	2.00		

Groundwater Conditions
Dry

Stability
Slightly unstable

General Remarks
1.5hr tracking to and from location inclusive of reinstatement. Some soft ground.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/27
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 531,637.55 E 728,342.72 N		DATE STARTED 19/01/2016
GROUND LEVEL (m) 30.68		DATE COMPLETED 19/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm dark brown slightly sandy gravelly SILT/CLAY with rootlets		0.15	30.53						
	Firm grey brown slightly sandy slightly gravelly SILT with occasional cobbles		0.60	30.08		AA44451 AA44452	D B	0.50 0.50		
1.0						AA44453 AA44454	D B	1.00 1.00		
2.0	Very stiff grey and light brown slightly sandy slightly gravelly SILT with occasional cobbles and boulders		1.80	28.88		AA44455 AA44456	D B	2.00 2.00		
2.40	Obstruction - Possible Rockhead End of Trial Pit at 2.40m		2.40	28.28						

Groundwater Conditions
Dry

Stability
Good

General Remarks
1.15hr tracking to and from location together with padlock removal and reinstatement upon completion



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/28
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 532,797.33 E 727,833.55 N		DATE STARTED 15/01/2016
GROUND LEVEL (m) 28.41		DATE COMPLETED 15/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm light brown slightly sandy gravelly SILT with some cobbles and occasional boulders		0.20	28.21		AA37830 AA37831	D B	0.50-0.50 0.50-0.50		
1.0						AA37832 AA37833	D B	1.00-1.00 1.00-1.00		
2.0	Stiff to very stiff light brown slightly sandy slightly gravelly SILT/CLAY with many cobbles and occasional boulders		1.80	26.61		AA37834 AA37835	D B	2.00-2.00 2.00-2.00		
3.0						AA37836 AA37837	D B	3.00-3.00 3.00-3.00		
	End of Trial Pit at 3.30m		3.30	25.11						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated at 3.30m due to very slow progress

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/29
LOGGED BY JL		SHEET Sheet 1 of 1
CO-ORDINATES 521,662.74 E 723,484.36 N		DATE STARTED 12/01/2016
GROUND LEVEL (m) 41.84		DATE COMPLETED 12/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	Firm to spongy dark brown to black fibrous PEAT									
0.60	0.50m Rare glass bottle 0.60m Many subangular to subrounded BOULDERS of granite (up to 600mm)		0.60	41.24	↓ (Seepage)	AA37808 AA37809	D B	0.50 0.50		
1.0	Soft light brown mottled grey brown sandy gravelly slightly organic SILT/CLAY with some cobbles, frequent decaying organic rootlets and occasional lense of clayey/silty sandy gravel. Sand is fine to coarse.					AA37810 AA37811	D B	1.00 1.00		
1.30	Soft brown grey brown and dark grey brown clayey/silty very sandy GRAVEL with some cobbles. Sand is fine to coarse. Gravel is subangular to subrounded of granite.		1.30	40.54						
1.80	Possible Highly Weathered Rockhead recovered as light grey COBBLES and GRAVEL of weathered granite		1.80	40.04		AA37812 AA37813	D B	1.60-1.80 1.60-1.80		
2.0	End of Trial Pit at 2.10m		2.10	39.74						

Groundwater Conditions
Seepage at 0.60m

Stability
Good

General Remarks
1hr tracking to and from location inclusive of selection of specific machine trackway and reinstatement upon completion



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/30
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 534,741.61 E 726,867.42 N		DATE STARTED 22/03/2016
GROUND LEVEL (m) 31.74		DATE COMPLETED 22/03/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi 13T	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL Firm brown slightly sandy gravelly SILT with many angular cobbles and boulders of limestone		0.10	31.64		AA49484	B	0.10-0.50		
	Obstruction - Possible Rockhead End of Trial Pit at 0.50m		0.50	31.24						
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/31
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 532,602.82 E 728,253.70 N		DATE STARTED 27/01/2016
GROUND LEVEL (m) 22.27		DATE COMPLETED 27/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

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 slightly sandy gravelly SILT with many cobbles and occasional boulders		0.20	22.07						
						AA49458	D	0.50		
						AA49459	B	0.50		
1.0										
						AA49460	D	1.50		
						AA49461	B	1.50		
2.0										
						AA49462	D	2.50		
						AA49463	B	2.50		
3.0										
	Soft to firm light brown grey slightly sandy gravelly SILT with many cobbles and boulders		3.10	19.17						
						AA49464	D	3.50		
						AA49465	B	3.50		
4.0										
	End of Trial Pit at 4.50m		4.50	17.77						

Groundwater Conditions
Dry

Stability
Slightly unstable

General Remarks
TM required to gain access to field gate (N17). 0.50hr Set up TM. 0.50hr Clearing access at entrance gate.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/32
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 534,462.87 E 727,096.99 N		DATE STARTED 27/01/2016
GROUND LEVEL (m) 41.71		DATE COMPLETED 27/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

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 dark brown sandy slightly gravelly SILT with rootlets		0.15	41.56						
	Obstruction - Possible Limestone Rockhead End of Trial Pit at 0.60m		0.60	41.11		AA49466 AA49467 AA49468	D D B	0.40 0.40 0.40		

Groundwater Conditions
Dry

Stability
Good

General Remarks
TM required to gain access to field gate (Briarhill Junction). 0.50hr setting up TM.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/33
LOGGED BY A. Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 522,045.06 E 723,748.24 N		DATE STARTED 12/01/2016
GROUND LEVEL (m) 48.44		DATE COMPLETED 12/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL - Black gravelly sandy organic SILT/CLAY		0.20	48.24		AA35349	B	0.00-0.20		
	Obstruction - Possible Granite bedrock End of Trial Pit at 0.20m									
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
0.75hr Tracking to and from pit location



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/34
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,962.32 E 723,827.95 N		DATE STARTED 20/01/2016
GROUND LEVEL (m) 48.89		DATE COMPLETED 20/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

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 dark brown black PEAT		0.15	48.74						
						AA44464	D	0.50		
						AA44465	D	0.50		
						AA44466	B	0.50		
1.0	Soft to firm grey brown slightly sandy slightly gravelly SILT/CLAY with frequent cobbles		0.90	47.99	↓ (Seepage)					
						AA44467	D	1.00		
						AA44468	B	1.00		
						AA44471	CBR	1.00		
						AA44472	CBR	1.00		
2.0	Grey clayey/silty sandy fine to coarse angular GRAVEL with many cobbles and occasional boulders		1.70	47.19						
2.10	Obstruction - Possible Rockhead End of Trial Pit at 2.10m		2.10	46.79		AA44469	D	2.00		
						AA44470	B	2.00		

Groundwater Conditions
Water seepage at 0.90m

Stability
Good

General Remarks
Carried out near location BH3/01. Additional samples acquired at 1.0m under instruction from ARUP - samples taken for CBR analysis. 0.75hr tracking to and from location.

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/35
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 522,857.21 E 724,233.35 N		DATE STARTED 20/01/2016
GROUND LEVEL (m) 46.89		DATE COMPLETED 20/01/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL				↓ (Rapid)					
	Soft dark brown black fibrous PEAT with boulders of granite		0.20	46.69		AA44462	D	0.50		
						AA44463	B	0.50		
1.0	Obstruction - Possible Granite bedrock End of Trial Pit at 0.90m		0.90	45.99						

Groundwater Conditions
Rapid inflow of water from surface

Stability

General Remarks
Carried out near location BH3/02. 0.50hr reinstatement following completion of pit.

IGSL TP LOG 18963.GPJ IGSL GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/36
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 529,700.01 E 728,410.10 N		DATE STARTED 20/04/2016
GROUND LEVEL (m) 13.66		DATE COMPLETED 20/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm dark brown slightly sandy slightly gravelly SILT/CLAY with frequent rootlets		0.20	13.46						
	Firm light brown grey slightly sandy gravelly SILT/CLAY with a low to medium cobble and boulder content. Cobbles and boulders are of limestone.		0.50	13.16		AA43065 AA43066	B B	0.40 0.40		
1.0						AA43067 AA43068	B B	0.80 0.80		
1.50	Obstruction - Possible Rockhead End of Trial Pit at 1.50m		1.50	12.16						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/37
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 521,359.17 E 722,614.44 N		DATE STARTED 14/04/2016
GROUND LEVEL (m) 10.98		DATE COMPLETED 14/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
0.30	Brown grey clayey/silty very sandy angular fine to coarse GRAVEL with a high cobble and low to medium boulder content. Cobbles and boulders are angular of granite.		0.30	10.68		AA49488	B	0.50		
0.90	Brown very sandy very gravelly CLAY		0.90	10.08	1 ↓ (Moderate)					
1.10	Obstruction - Possible Rockhead End of Trial Pit at 1.10m		1.10	9.88		AA49489	B	1.00		

Groundwater Conditions
Moderate water strike at 1.0m

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/39
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 525,045.94 E 725,382.41 N		DATE STARTED 18/04/2016
GROUND LEVEL (m) 49.79		DATE COMPLETED 18/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Brown slightly clayey/silty sandy angular fine to coarse GRAVEL of granite with a high cobble and boulder content		0.20	49.59	 (Seepage)	AA49491	B	0.50-1.00		
1.0	Grey and brown very sandy angular fine to coarse GRAVEL of granite with a high cobble and boulder content. Cobbles and boulders are angular.		1.10	48.69		AA49492	B	1.10-1.60		
	Obstruction - Possible Rockhead End of Trial Pit at 1.60m		1.60	48.19						

Groundwater Conditions
Seepage at 0.60m

Stability
Slightly unstable

General Remarks
Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/40
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 525,397.63 E 725,677.10 N		DATE STARTED 18/04/2016
GROUND LEVEL (m) 59.65		DATE COMPLETED 18/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Brown clayey/silty very sandy angular fine to coarse GRAVEL of granite with a low to medium cobble and boulder content		0.25	59.40		AA49490	B	0.30-0.60		
	Brown grey COBBLES and BOULDERS of granite		0.60	59.05						
	Obstruction - Possible Rockhead End of Trial Pit at 0.80m		0.80	58.85						
1.0										
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/41
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 529,897.01 E 728,377.37 N		DATE STARTED 19/04/2016
GROUND LEVEL (m) 22.57		DATE COMPLETED 19/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm orange brown sandy slightly gravelly CLAY with a high cobble and boulder content. Cobbles and boulders are of limestone.		0.40	22.17		AA43057	B	0.50		
	Possible Highly Weathered Rockhead recovered as Grey COBBLES and BOULDERS of limestone		0.80	21.77		AA43058	D	0.50		
1.0	Obstruction - Possible Rockhead End of Trial Pit at 1.40m		1.40	21.17						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/42
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 529,931.08 E 728,410.99 N		DATE STARTED 19/04/2016
GROUND LEVEL (m) 23.89		DATE COMPLETED 19/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm dark brown sandy gravelly CLAY/SILT with frequent rootlets		0.20	23.69						
	Firm light grey slightly sandy slightly gravelly CLAY		0.50	23.39		AA43059	B	0.40		
						AA43060	B	0.80		
						AA43061	D	0.80		
1.0										
	Brown clayey/silty gravelly fine to coarse SAND		1.40	22.49		AA43062	B	1.50		
2.0										
						AA43063	B	2.50		
3.0										
	Grey brown clayey/silty very sandy subangular to rounded fine to coarse GRAVEL		3.20	20.69		AA43064	B	3.50		
4.0										
	End of Trial Pit at 4.40m		4.40	19.49						

Groundwater Conditions
Dry

Stability
Good

General Remarks



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/43
LOGGED BY J.Duggan	CO-ORDINATES 524,111.34 E 724,725.07 N	SHEET Sheet 1 of 1
		DATE STARTED 25/02/2016 DATE COMPLETED 25/02/2016
CLIENT ENGINEER Galway County Council ARUP	GROUND LEVEL (m) 19.85	EXCAVATION METHOD Hand Dug

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.15	19.70	↓ (Slow)	AA39973	D	0.15-0.45		
	Soft dark brown to black sandy gravelly slightly organic SILT/CLAY with occasional rootlets		0.45	19.40		AA39974	D	0.15-0.45		
	Grey brown and dark brown clayey/silty sandy GRAVEL with a medium cobble content. Sand is coarse. Gravel is angular to subangular coarse. Cobbles are of weathered granite.					AA39976	B	0.15-0.45		
							AA39975	B	0.45-0.90	
1.0	Obstruction - Possible granite rockhead End of Trial Pit at 0.90m		0.90	18.95						

Groundwater Conditions
Dry

Stability
Moderate

General Remarks
Carried out at original location of BH3/05. Hand dug pit carried out due to lack of suitable access for track machine. 0.75hr accessing and leaving site by foot.



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/44
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 533,740.76 E 728,060.11 N		DATE STARTED 19/04/2016
GROUND LEVEL (m) 54.81		DATE COMPLETED 19/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	GRAVEL surface dressing - Possible Cl.804 (MADE GROUND) Angular to subangular COBBLES of crushed stone with occasional fragments of concrete and red brick (MADE GROUND)		0.15	54.66						
1.0	Firm light brown slightly sandy slightly gravelly SILT/CLAY with a high cobble content. Cobbles are of limestone.		0.80	54.01		AA49493 AA49494 AA49495	B B D	1.00 1.00 1.00		
2.0	Stiff to very stiff light brown grey slightly sandy slightly gravelly CLAY with a high cobble content. Cobbles are of limestone.		1.80	53.01		AA49496 AA49497 AA49498	B B D	2.00 2.00 2.00		
2.50	End of Trial Pit at 2.50m		2.50	52.31						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated at 2.50m due to very slow progress



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. TP3/45
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 533,837.88 E 728,015.11 N		DATE STARTED 19/04/2016
GROUND LEVEL (m) 53.28		DATE COMPLETED 19/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	GRAVEL surface dressing - Possible Cl.804 (MADE GROUND) Angular to subangular COBBLES of crushed stone with occasional fragments of concrete and boulders of limestone (MADE GROUND)		0.15	53.13						
1.0	Soft to firm light brown slightly sandy slightly gravelly SILT/CLAY with a high cobble and low to medium boulder content. Cobbles and boulders are of limestone.		1.20	52.08						
2.0	Stiff to very stiff light brown grey slightly sandy slightly gravelly SILT/CLAY with a high cobble and low to medium boulder content. Cobbles and boulders are of limestone.		2.20	51.08						
3.0	End of Trial Pit at 3.00m		3.00	50.28						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated at 3.0m due to very slow progress

TP3/01 - 1 of 2



TP3/01- 2 of 2



TP3/02 - 1 of 2



TP3/02 - 2 of 2



TP3/03 - 1 of 2



TP3/03 - 2 of 2



TP3/04 - 1 of 2



TP3/04 - 2 of 2



TP3/05 - 1 of 2



TP3/05 - 2 of 2



TP3/06 - 1 of 2



TP3/06 - 2 of 2



TP3/07 - 1 of 2



TP3/07 - 2 of 2



TP3/08 - 1 of 2



TP3/08 - 2 of 2



TP3/09 - 1 of 2



TP3/09 - 2 of 2



TP3/10 - 1 of 2



TP3/10 - 2 of 2



TP3/11 - 1 of 2



TP3/11- 2 of 2



TP3/12 - 1 of 2



TP3/12 - 2 of 2



TP3/13 - 1 of 2



TP3/13 - 2 of 2



TP3/14 - 1 of 2



TP3/14 - 2 of 2



TP3/15 - 1 of 2



TP3/15 - 2 of 2



TP3/16 - 1 of 2



TP3/16 - 2 of 2



TP3/17 - 1 of 2



TP3/17 - 2 of 2



TP3/18 - 1 of 2



TP3/18 - 2 of 2



TP3/19 - 1 of 2



TP3/19 - 2 of 2



TP3/20 - 1 of 2



TP3/20 - 2 of 2



TP3/21 - 1 of 2



TP3/21- 2 of 2



TP3/22 - 1 of 2



TP3/22 - 2 of 2



TP3/23 - 1 of 2



TP3/23 - 2 of 2



TP3/24 - 1 of 2



TP3/24 - 2 of 2



TP3/25 - 1 of 2



TP3/25 - 2 of 2



TP3/27 - 1 of 2



TP3/27 - 2 of 2



TP3/28 - 1 of 2



TP3/28 - 2 of 2



TP3/29 - 1 of 2



TP3/29 - 2 of 2



TP3/30 - 1 of 2



TP3/30 - 2 of 2



TP3/31 - 1 of 2



TP3/31- 2 of 2



TP3/32 - 1 of 2



TP3/32 - 2 of 2



TP3/33 - 1 of 2



TP3/33 - 2 of 2



TP3/34 - 1 of 2



TP3/34 - 2 of 2



TP3/35 - 1 of 2



TP3/35 - 2 of 2



TP3/36 - 1 of 2



TP3/36 - 2 of 2



TP3/37 - 1 of 2



TP3/37 - 2 of 2



TP3/39 - 1 of 2



TP3/39 - 2 of 2



TP3/40 - 1 of 2



TP3/40 - 2 of 2



TP3/41 - 1 of 2



TP3/41- 2 of 2



TP3/42 - 1 of 2



TP3/42- 2 of 2



TP3/43 - 1 of 2



TP3/43- 2 of 2



TP3/44 - 1 of 2



TP3/44- 2 of 2



TP3/45 - 1 of 2



TP3/45- 2 of 2



Appendix 6

Hand-excavated pit record from Trial Pit TP3/43 (formerly BH3/05)



Hand Dug Trial Pit Log (Formerly Cable Percussive BH3/05)

See TP Log also

LOCATION	TP3/43 (formerly known as BH3/05)
PROJECT	GCTP Phase 3 Contract 1
PROJECT REF.	18963
DATE	25/02/2016

PHOTOS

Hand Dug Pit at TP3/43



Spoil Heap at TP3/43



LOG

0.00	0.15	TOPSOIL
0.15	0.45	Soft dark brown to black sandy gravelly slightly organic SILT/CLAY with occasional rootlets
0.45	0.90	Grey brown and dark brown clayey/silty sandy GRAVEL with a medium cobble content. Sand is coarse. Gravel is angular to subangular coarse. Cobbles are of weathered granite.
0.90		OBSTRUCTION - Possible Weathered Granite Rockhead / Boulder

SAMPLES

D	0.15	to	0.45	AA39973
D	0.15	to	0.45	AA39974
B	0.15	to	0.45	AA39976
B	0.45	to	0.90	AA39975

GROUNDWATER

Water strike at 0.70m

Appendix 7

Soakaway Test Records

SW3/01

SW3/02



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. SW3/01
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 529,698.76 E 728,401.42 N		DATE STARTED 20/04/2016
GROUND LEVEL (m) 13.33		DATE COMPLETED 21/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL									
	Firm dark brown slightly sandy slightly gravelly CLAY with rootlets		0.20	13.13						
	Firm light brown silty slightly sandy gravelly CLAY with occasional cobbles and occasional boulders.		0.50	12.83						
1.0										
	Obstruction - Possible limestone rockhead End of Trial Pit at 1.50m		1.50	11.83						
2.0										
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		TRIAL PIT NO. SW3/02
LOGGED BY A.Chryst		SHEET Sheet 1 of 1
CO-ORDINATES 532,683.26 E 728,117.63 N		DATE STARTED 26/04/2016
GROUND LEVEL (m) 21.03		DATE COMPLETED 27/04/2016
CLIENT ENGINEER Galway County Council ARUP	EXCAVATION METHOD Hitachi Zaxis 80	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL		0.20	20.83						
	Soft to firm brown sandy slightly gravelly SILT/CLAY with rootlets					AA46069	B	0.50		
1.0	Soft light brown slightly sandy gravelly SILT/CLAY with many cobbles and occasional boulders		0.85	20.18						
	End of Trial Pit at 1.44m		1.44	19.59						

Groundwater Conditions
Dry

Stability
Good

General Remarks

Soakaway Design f -value from field tests IGSL

Contract: GCTP Phase 3 Contract No. 18963
 Test No. SW 3/01 test 1
 Client Galway Co Co
 Date: 20.04.16

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	DRY
0.20	0.50	Dark brown sligly sandy slightly gravelly CLAY with rootlets	
0.50	1.50	Light brown silty slightly sandy slightly gravelly CLAY	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.85	0.00
0.85	0.50
0.85	1.00
0.85	1.50
0.86	2.00
0.86	2.50
0.86	3.00
0.86	3.50
0.86	4.00
0.86	4.50
0.86	5.00
0.86	6.00
0.87	7.00
0.87	8.00
0.87	9.00
0.87	10.00
0.88	30.00
0.91	90.00
1.40	1200.00

Field Test

Depth of Pit (D) = 1.50 m
 Width of Pit (B) = 1.15 m
 Length of Pit (L) = 1.50 m

Initial depth to Water = 0.85 m
 Final depth to water = 1.40 m
 Elapsed time (mins) = 1200.00

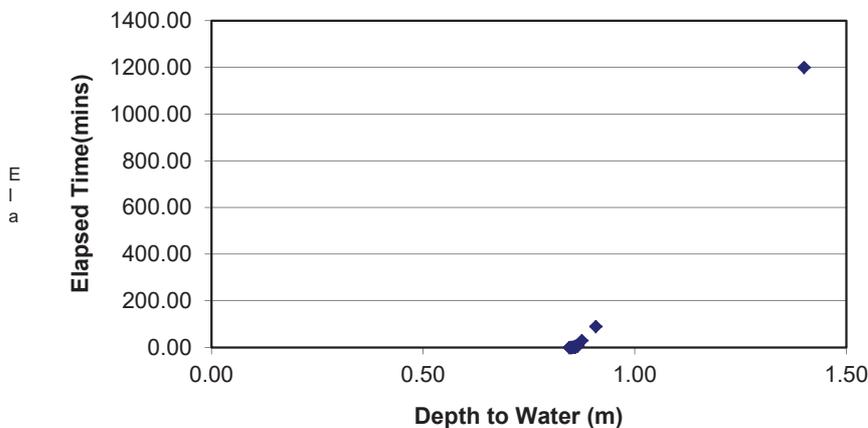
Top of permeable soil = m
 Base of permeable soil = m

Base area = 1.725 m²
 *Av. side area of permeable stratum over test pe = 2.00075 m²
 Total Exposed area = 3.72575 m²

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

f = 0.00021 m/min or 3.569E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: GCTP Phase 3 Contract No. 18963
 Test No. SW 3/01 test 2
 Client Galway Co Co
 Date: 21.04.16

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	DRY
0.20	0.50	Dark brown sligly sandy slightly gravelly CLAY with rootlets	
0.50	1.50	Light brown silty slightly sandy slightly gravelly CLAY	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.82	0.00
0.82	0.50
0.82	1.00
0.82	1.50
0.82	2.00
0.82	2.50
0.82	3.00
0.82	3.50
0.82	4.00
0.82	4.50
0.82	5.00
0.82	6.00
0.82	7.00
0.82	8.00
0.82	9.00
0.82	10.00
0.84	30.00
0.86	90.00
1.28	1365.00

Field Test

Depth of Pit (D) = 1.50 m
 Width of Pit (B) = 1.15 m
 Length of Pit (L) = 1.50 m

Initial depth to Water = 0.82 m
 Final depth to water = 1.28 m
 Elapsed time (mins) = 1365.00

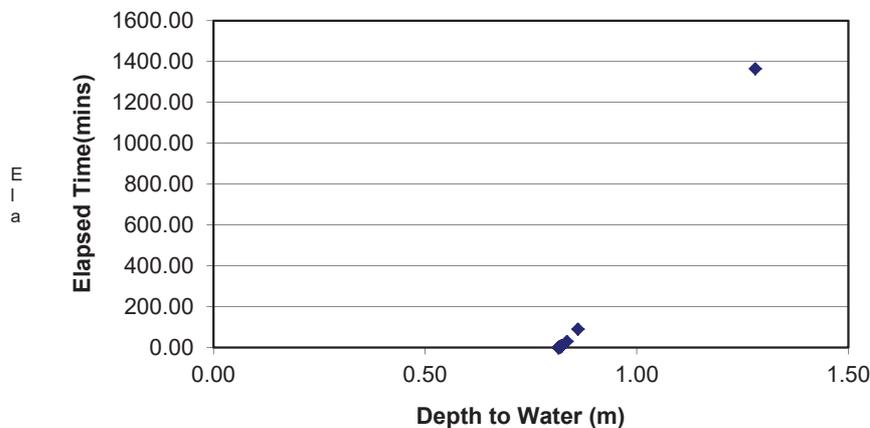
Top of permeable soil = m
 Base of permeable soil = m

Base area = 1.725 m²
 *Av. side area of permeable stratum over test pit = 2.385 m²
 Total Exposed area = 4.11 m²

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

f = 0.00014 m/min or 2.357E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f-value from field tests IGSL

Contract: GCTP Phase 3 Contract No. 18963
 Test No. SW 3/01 test 3
 Client Galway Co Co
 Date: 22.04.16

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	DRY
0.20	0.50	Dark brown sligly sandy slightly gravelly CLAY with rootlets	
0.50	1.50	Light brown silty slightly sandy slightly gravelly CLAY	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.79	0.00
0.79	0.50
0.79	1.00
0.79	1.50
0.79	2.00
0.79	2.50
0.79	3.00
0.79	3.50
0.79	4.00
0.79	4.50
0.79	5.00
0.79	6.00
0.79	7.00
0.79	8.00
0.79	9.00
0.79	10.00
0.81	30.00
0.82	45.00
0.84	90.00

Field Test

Depth of Pit (D) = 1.50 m
 Width of Pit (B) = 1.15 m
 Length of Pit (L) = 1.50 m

Initial depth to Water = 0.79 m
 Final depth to water = 0.84 m
 Elapsed time (mins) = 90.00

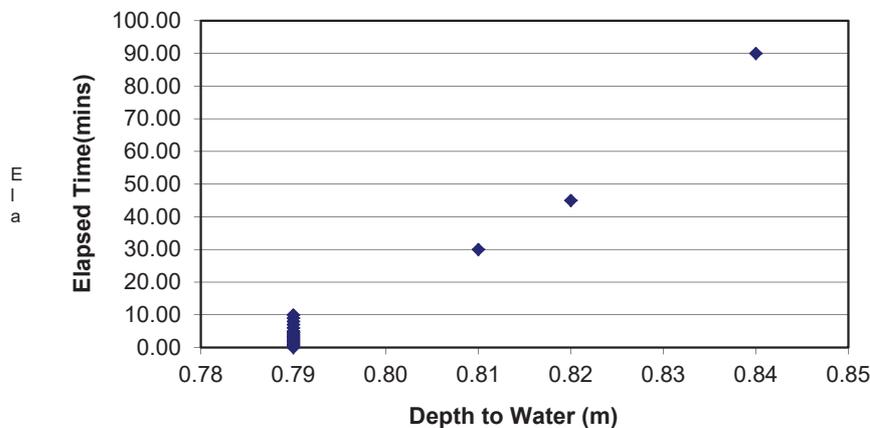
Top of permeable soil = m
 Base of permeable soil = m

Base area = 1.725 m²
 *Av. side area of permeable stratum over test pe = 3.6358 m²
 Total Exposed area = 5.3608 m²

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

f = 0.00017 m/min or 2.86E-06 m/sec

Depth of water vs Elapsed Time (mins)



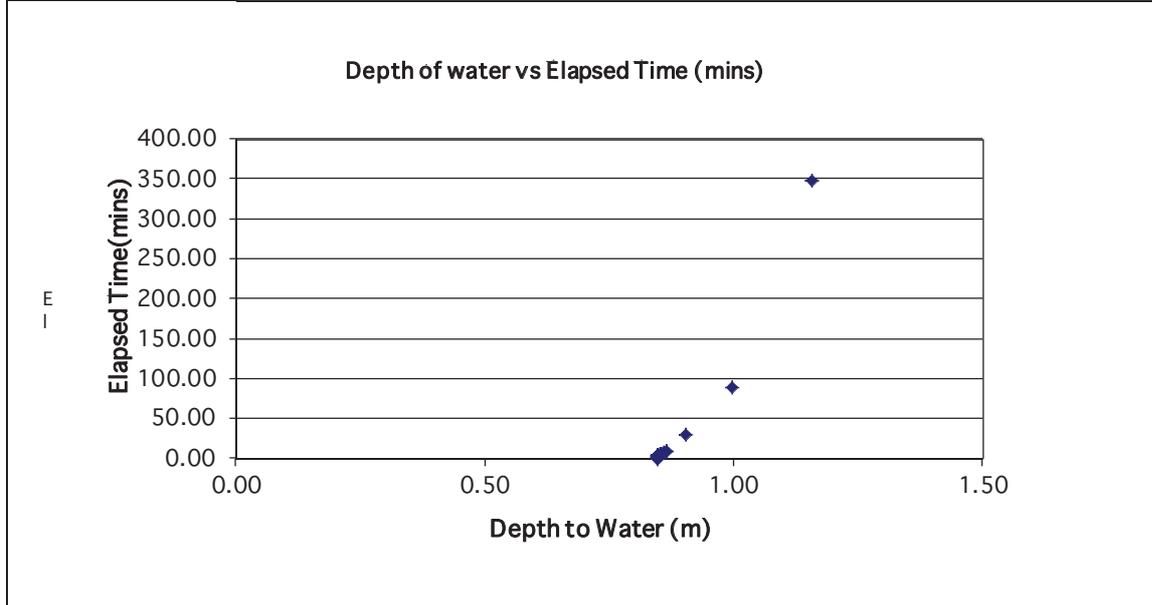
Soakaway Design f -value from field tests IGSL

Contract: GCTP Phase 3 Contract No. 18963
 Test No. SW 3/02 test 1
 Client Galway Co Co
 Date: 26.04.16

Summary of ground conditions			
from	to	Description	Ground water
0.00	0.20	TOPSOIL	DRY
0.20	0.85	Brown sandy slightly gravelly SILT/CLAY with rootlets	
0.85	1.44	Light brown slightly sandy gravelly silty SILT/CLAY with many cobbles and occasional boulders	

Notes:

Field Data	Field Test																																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; color: red;">Depth to Water (m)</th> <th style="width: 50%; color: red;">Elapsed Time (min)</th> </tr> </thead> <tbody> <tr><td>0.85</td><td>0.00</td></tr> <tr><td>0.85</td><td>0.50</td></tr> <tr><td>0.85</td><td>1.00</td></tr> <tr><td>0.85</td><td>1.50</td></tr> <tr><td>0.85</td><td>2.00</td></tr> <tr><td>0.85</td><td>2.50</td></tr> <tr><td>0.85</td><td>3.00</td></tr> <tr><td>0.85</td><td>3.50</td></tr> <tr><td>0.85</td><td>4.00</td></tr> <tr><td>0.85</td><td>4.50</td></tr> <tr><td>0.85</td><td>5.00</td></tr> <tr><td>0.85</td><td>6.00</td></tr> <tr><td>0.86</td><td>7.00</td></tr> <tr><td>0.86</td><td>8.00</td></tr> <tr><td>0.86</td><td>9.00</td></tr> <tr><td>0.87</td><td>10.00</td></tr> <tr><td>0.90</td><td>30.00</td></tr> <tr><td>1.00</td><td>90.00</td></tr> <tr><td>1.16</td><td>348.00</td></tr> </tbody> </table>	Depth to Water (m)	Elapsed Time (min)	0.85	0.00	0.85	0.50	0.85	1.00	0.85	1.50	0.85	2.00	0.85	2.50	0.85	3.00	0.85	3.50	0.85	4.00	0.85	4.50	0.85	5.00	0.85	6.00	0.86	7.00	0.86	8.00	0.86	9.00	0.87	10.00	0.90	30.00	1.00	90.00	1.16	348.00	<p>Depth of Pit (D) = 1.44 m</p> <p>Width of Pit (B) = 1.10 m</p> <p>Length of Pit (L) = 1.30 m</p> <p>Initial depth to Water = 0.85 m</p> <p>Final depth to water = 1.16 m</p> <p>Elapsed time (mins) = 348.00</p> <p>Top of permeable soil = m</p> <p>Base of permeable soil = m</p> <p>Base area = 1.43 m²</p> <p>*Av. side area of permeable stratum over test period = 2.088 m²</p> <p>Total Exposed area = 3.518 m²</p> <p>Infiltration rate (f) = Volume of water used/unit exposed area / unit time</p> <p style="text-align: center;">f = 0.0004 m/min or 6.03E-06 m/sec</p>
Depth to Water (m)	Elapsed Time (min)																																								
0.85	0.00																																								
0.85	0.50																																								
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0.86	8.00																																								
0.86	9.00																																								
0.87	10.00																																								
0.90	30.00																																								
1.00	90.00																																								
1.16	348.00																																								



Soakaway Design f -value from field tests IGSL

Contract: GCTP Phase 3	Contract No. 18963
Test No. SW 3/02 test 2	
Client Galway Co Co	
Date: 27.04.16	

Summary of ground conditions			
from	to	Description	Ground water
0.00	0.20	TOPSOIL	DRY
0.20	0.85	Brown sandy slightly gravelly SILT/CLAY with rootlets	
0.85	1.44	Light brown slightly sandy gravelly silty SILT/CLAY with many cobbles and occasional boulders	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.83	0.00
0.83	0.50
0.83	1.00
0.83	1.50
0.83	2.00
0.83	2.50
0.83	3.00
0.83	3.50
0.83	4.00
0.85	4.50
0.83	5.00
0.83	6.00
0.84	7.00
0.84	8.00
0.84	9.00
0.85	10.00
0.89	30.00
0.98	90.00
1.44	1403.00

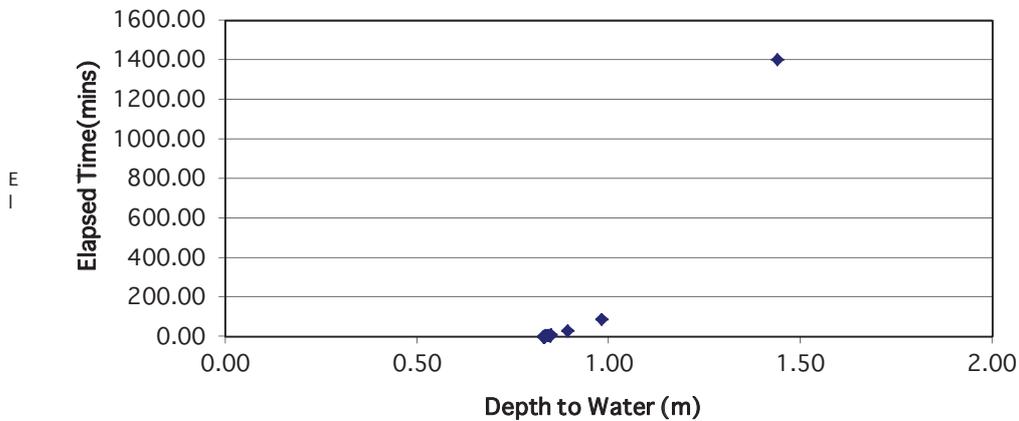
Field Test

Depth of Pit (D)	1.44	m
Width of Pit (B)	1.10	m
Length of Pit (L)	1.30	m
Initial depth to Water =	0.83	m
Final depth to water =	1.44	m
Elapsed time (mins)=	1403.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	1.43	m ²
*Av. side area of permeable stratum over test period	1.464	m ²
Total Exposed area =	2.894	m ²

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

f= 0.00021 m/min or 3.581E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: GCTP Phase 3 Contract No. 18963
 Test No. SW 3/02 test 3
 Client Galway Co Co
 Date: 28.04.16

Summary of ground conditions			Ground water
from	to	Description	
0.00	0.20	TOPSOIL	DRY
0.20	0.85	Brown sandy slightly gravelly SILT/CLAY with rootlets	
0.85	1.44	Light brown slightly sandy gravelly silty SILT/CLAY with many cobbles and occasional boulders	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.81	0.00
0.82	0.50
0.82	1.00
0.82	1.50
0.82	2.00
0.82	2.50
0.82	3.00
0.82	3.50
0.82	4.00
0.82	4.50
0.83	5.00
0.83	6.00
0.83	7.00
0.83	8.00
0.83	9.00
0.84	10.00
0.87	30.00
0.90	45.00
0.97	90.00

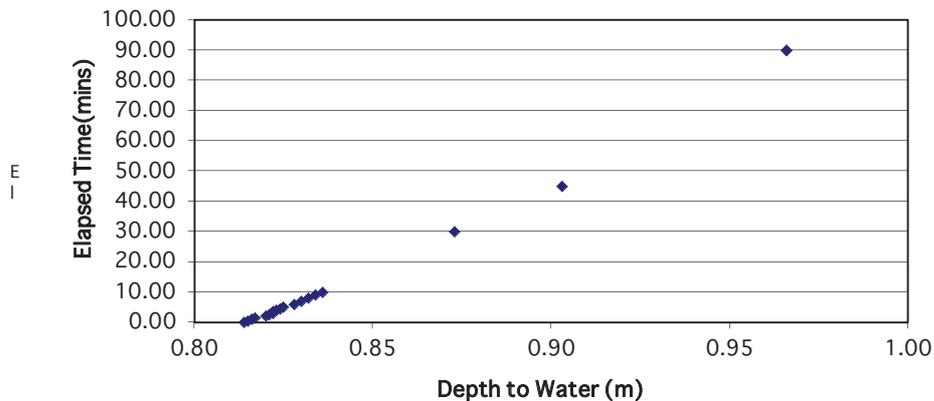
Field Test

Depth of Pit (D)	1.44	m
Width of Pit (B)	1.10	m
Length of Pit (L)	1.30	m
Initial depth to Water =	0.81	m
Final depth to water =	0.97	m
Elapsed time (mins)=	90.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	1.43	m ²
*Av. side area of permeable stratum over test period	2.64	m ²
Total Exposed area =	4.07	m ²

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

f= 0.0006 m/min or 1.041E-05 m/sec

Depth of water vs Elapsed Time (mins)



Appendix 8

Falling Head Permeability Test Records

BH3/35R

BH3/46R

BH3/47R

BH3/48R

MW3

Variable Head Permeability Test Report Sheet

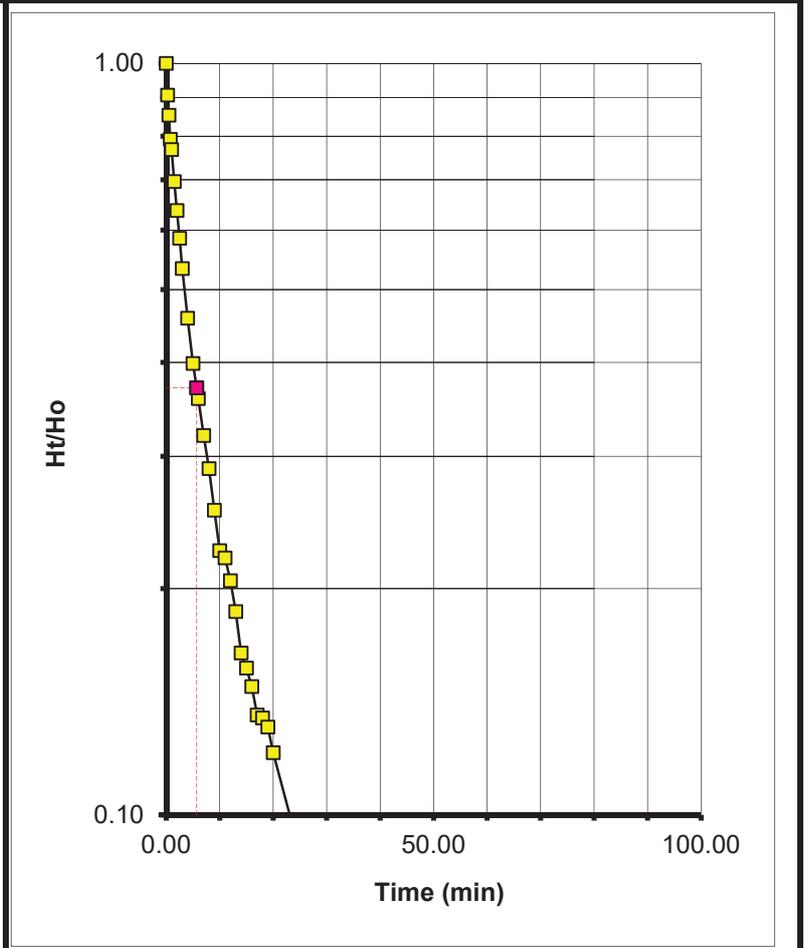
IGSL(F4B)

Contract: GCTP Phase 3
Number: 18963
Client: Galway Co Co
Engineer: ARUP
Location: BH3/35 (Elev.=17.521)
Hole No.: BH3/35
Test No.: 1
Date: 27/04/2016

TEST RESPONSE ZONE DETAILS:

Top (mbgl):	12.00
Bottom (mbgl):	18.00
Length (m):	6.00
*** Diameter (m):	0.1013
Initial Standing Water Level (m below top of casing / standpipe):	9.04
Height of casing or standpipe : above ground level (m)	0.35
Falling or Rising Head Test?	Falling

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
0.00	0.94	1.00
0.25	1.69	0.91
0.50	2.13	0.85
0.75	2.62	0.79
1.00	2.82	0.77
1.50	3.40	0.70
2.00	3.88	0.64
2.50	4.30	0.59
3.00	4.72	0.53
4.00	5.33	0.46
5.00	5.81	0.40
6.00	6.14	0.36
7.00	6.45	0.32
8.00	6.70	0.29
9.00	6.98	0.25
10.00	7.22	0.22
11.00	7.26	0.22
12.00	7.38	0.20
13.00	7.53	0.19
14.00	7.71	0.16
15.00	7.77	0.16
16.00	7.84	0.15
17.00	7.94	0.14
18.00	7.95	0.13
19.00	7.98	0.13
20.00	8.06	0.12
25.00	8.32	0.09
30.00	8.50	0.07
40.00	8.63	0.05
50.00	8.75	0.04
60.00	8.84	0.02
70.00	8.87	0.02
80.00	8.90	0.02
		0.00
		0.00



**Diameter of standpipe/borehole (m)	0.1013
** X-sectional area of BH/Standpipe	A= 0.00806
Shape Factor	F= 9.02338
Time to reach Ht/Ho = 0.37 (sec)	T= 342
Extrapolated Yes/No	No
Coefficient of Permeability (A/FT) (m/s)	K= 2.61E-06

Notes

- * Depth of water below top of casing/standpipe
- ** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.
- *** This is normally the diameter of the borehole since the response zone includes the gravel surround
 Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Variable Head Permeability Test Report Sheet

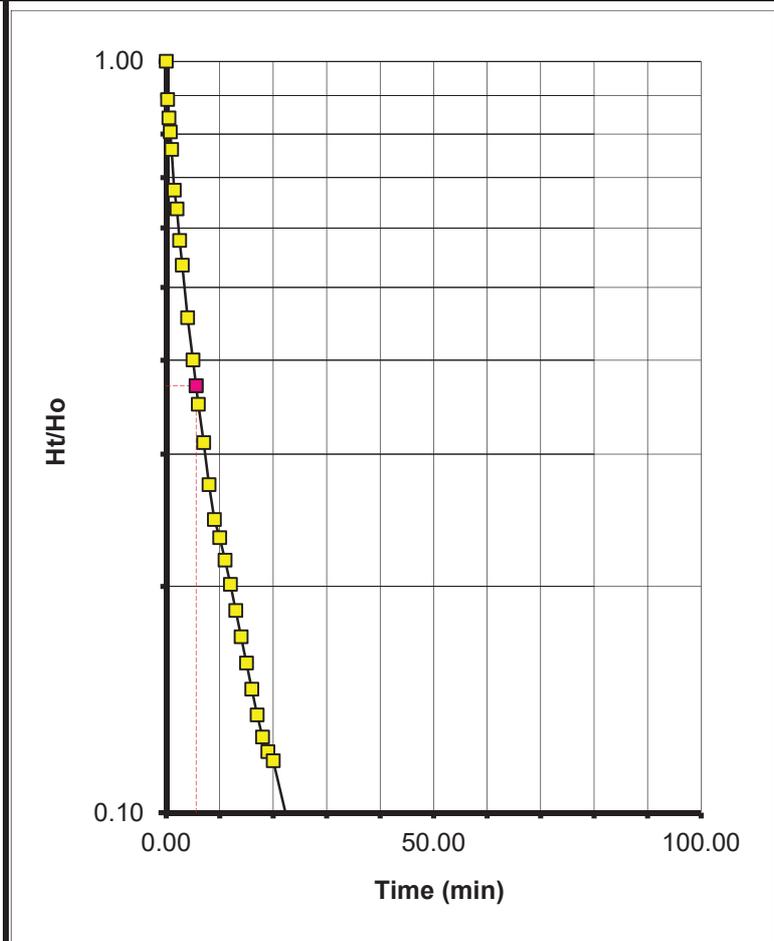
IGSL(F4B)

Contract: GCTP Phase 3
Number: 18963
Client: Galway Co Co
Engineer: ARUP
Location: BH3/35 (Elev.=17.521)
Hole No.: BH3/35
Test No.: 2
Date: 27/04/2016

TEST RESPONSE ZONE DETAILS:

Top (mbgl):	12.00
Bottom (mbgl):	18.00
Length (m):	6.00
*** Diameter (m):	0.1013
Initial Standing Water Level (m below top of casing / standpipe):	9.04
Height of casing or standpipe : above ground level (m)	0.35
Falling or Rising Head Test?	Falling

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
0.00	0.00	1.00
0.25	1.00	0.89
0.50	1.44	0.84
0.75	1.76	0.81
1.00	2.14	0.76
1.50	2.95	0.67
2.00	3.29	0.64
2.50	3.82	0.58
3.00	4.20	0.54
4.00	4.92	0.46
5.00	5.42	0.40
6.00	5.88	0.35
7.00	6.23	0.31
8.00	6.57	0.27
9.00	6.82	0.25
10.00	6.94	0.23
11.00	7.08	0.22
12.00	7.22	0.20
13.00	7.36	0.19
14.00	7.49	0.17
15.00	7.61	0.16
16.00	7.72	0.15
17.00	7.82	0.13
18.00	7.90	0.13
19.00	7.95	0.12
20.00	7.98	0.12
25.00	8.29	0.08
30.00	8.46	0.06
40.00	8.69	0.04
50.00	8.74	0.03
60.00	8.83	0.02
70.00	8.85	0.02
80.00	8.87	0.02



**Diameter of standpipe/borehole (m)	0.1013
** X-sectional area of BH/Standpipe	A= 0.00806
Shape Factor	F= 9.02338
Time to reach Ht/Ho = 0.37 (sec)	T= 335
Extrapolated Yes/No	No
Coefficient of Permeability (A/FT) (m/s)	K= 2.67E-06

Notes

- * Depth of water below top of casing/standpipe
 - ** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.
 - *** This is normally the diameter of the borehole since the response zone includes the gravel surround
- Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Variable Head Permeability Test Report Sheet

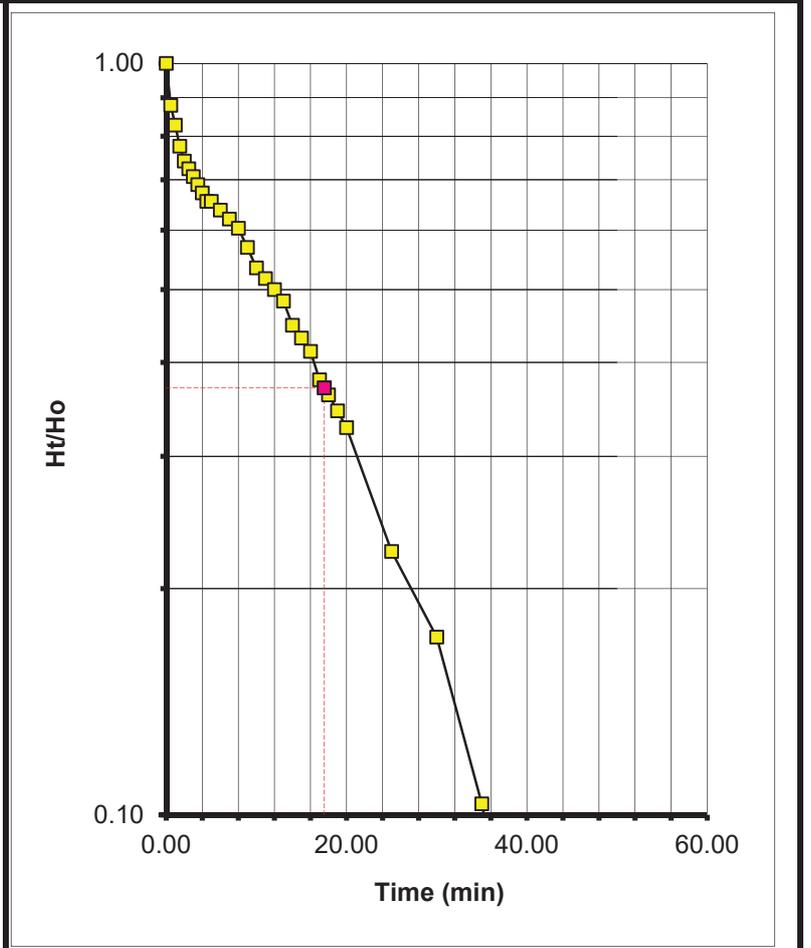
IGSL(F4B)

Contract: GCTP Phase 3
Number: 18963
Client: Galway Co Co
Engineer: ARUP
Location: BH3/46 (Elev.=29.882)
Hole No.: BH3/46
Test No.: 1
Date: 08/04/2016

TEST RESPONSE ZONE DETAILS:

Top (mbgl):	13.00
Bottom (mbgl):	16.00
Length (m):	3.00
*** Diameter (m):	0.1013
Initial Standing Water Level (m below top of casing / standpipe):	12.90
Height of casing or standpipe : above ground level (m)	0.30
Falling or Rising Head Test?	Falling

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
0.00	12.32	1.00
0.50	12.39	0.88
1.00	12.42	0.83
1.50	12.45	0.78
2.00	12.47	0.74
2.50	12.48	0.72
3.00	12.49	0.71
3.50	12.50	0.69
4.00	12.51	0.67
4.50	12.52	0.66
5.00	12.52	0.66
6.00	12.53	0.64
7.00	12.54	0.62
8.00	12.55	0.60
9.00	12.57	0.57
10.00	12.59	0.53
11.00	12.60	0.52
12.00	12.61	0.50
13.00	12.62	0.48
14.00	12.64	0.45
15.00	12.65	0.43
16.00	12.66	0.41
17.00	12.68	0.38
18.00	12.69	0.36
19.00	12.70	0.34
20.00	12.71	0.33
25.00	12.77	0.22
30.00	12.80	0.17
35.00	12.84	0.10
40.00	12.87	0.05
45.00	12.89	0.02
50.00	12.90	0.00



**Diameter of standpipe/borehole (m)	0.1013
** X-sectional area of BH/Standpipe	A= 0.00806
Shape Factor	F= 5.26442
Time to reach Ht/Ho = 0.37 (sec)	T= 1052
Extrapolated Yes/No	No
Coefficient of Permeability (A/FT) (m/s)	K= 1.46E-06

Notes

- * Depth of water below top of casing/standpipe
- ** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.
- *** This is normally the diameter of the borehole since the response zone includes the gravel surround
 Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Variable Head Permeability Test Report Sheet

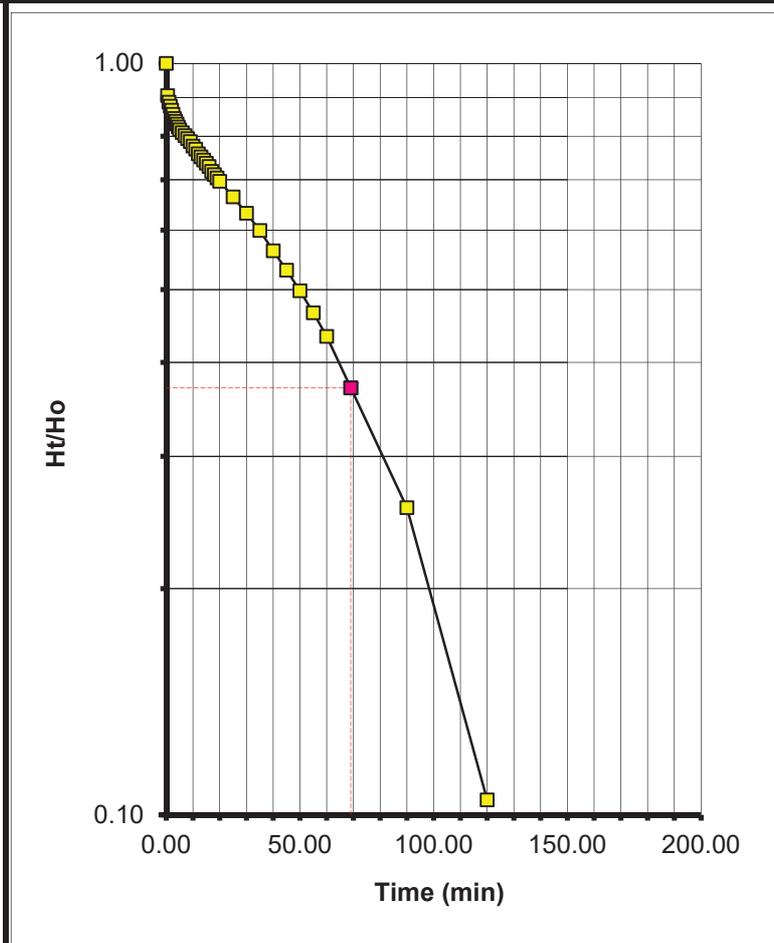
IGSL(F4B)

Contract: GCTP Phase 3
Number: 18963
Client: Galway Co Co
Engineer: ARUP
Location: BH3/47 (Elev.=37.737)
Hole No.: BH3/47
Test No.: 1
Date: 06/04/2016

TEST RESPONSE ZONE DETAILS:

Top (mbgl):	9.00
Bottom (mbgl):	12.00
Length (m):	3.00
*** Diameter (m):	0.1013
Initial Standing Water Level (m below top of casing / standpipe):	10.45
Height of casing or standpipe : above ground level (m)	0.30
Falling or Rising Head Test?	Falling

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
0.00	7.68	1.00
0.50	7.94	0.91
1.00	7.99	0.89
1.50	8.02	0.88
2.00	8.05	0.87
2.50	8.08	0.86
3.00	8.11	0.84
3.50	8.13	0.84
4.00	8.15	0.83
4.50	8.17	0.82
5.00	8.19	0.82
6.00	8.21	0.81
7.00	8.23	0.80
8.00	8.25	0.79
9.00	8.27	0.79
10.00	8.30	0.78
11.00	8.32	0.77
12.00	8.35	0.76
13.00	8.37	0.75
14.00	8.39	0.74
15.00	8.41	0.74
16.00	8.43	0.73
17.00	8.46	0.72
18.00	8.48	0.71
19.00	8.50	0.70
20.00	8.52	0.70
25.00	8.61	0.66
30.00	8.70	0.63
35.00	8.79	0.60
40.00	8.89	0.56
45.00	8.98	0.53
50.00	9.07	0.50
55.00	9.16	0.47
60.00	9.25	0.43
90.00	9.74	0.26
120.00	10.16	0.10
150.00	10.45	0.00



**Diameter of standpipe/borehole (m)	0.1013
** X-sectional area of BH/Standpipe	A= 0.00806
Shape Factor	F= 5.26442
Time to reach Ht/Ho = 0.37 (sec)	T= 4141
Extrapolated Yes/No	No
Coefficient of Permeability (A/FT) (m/s)	K= 3.70E-07

Notes

- * Depth of water below top of casing/standpipe
- ** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.
- *** This is normally the diameter of the borehole since the response zone includes the gravel surround
 Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Variable Head Permeability Test Report Sheet

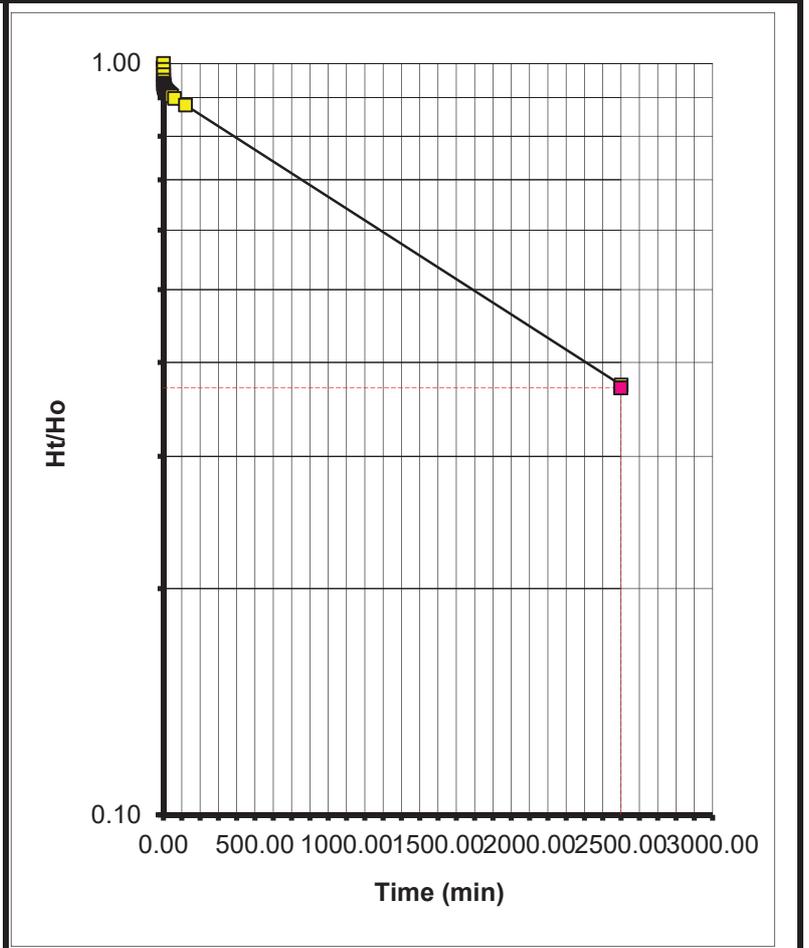
IGSL(F4B)

Contract: GCTP Phase 3
Number: 18963
Client: Galway Co Co
Engineer: ARUP
Location: MW3 (Elev.=15.000)
Hole No.: MW3
Test No.: 1
Date: 28/04/2016

TEST RESPONSE ZONE DETAILS:

Top (mbgl):	0.68
Bottom (mbgl):	7.50
Length (m):	6.82
*** Diameter (m):	0.1500
Initial Standing Water Level (m below top of casing / standpipe):	5.40
Height of casing or standpipe : above ground level (m)	0.30
Falling or Rising Head Test?	Falling

Elapsed Time (mins)	Depth to Water* (m)	Ht/Ho
0.00	0.98	1.00
0.25	1.06	0.98
0.50	1.13	0.97
0.75	1.20	0.95
1.00	1.24	0.94
1.50	1.25	0.94
2.00	1.27	0.93
2.50	1.27	0.93
3.00	1.27	0.93
3.50	1.28	0.93
4.00	1.28	0.93
4.50	1.29	0.93
5.00	1.29	0.93
6.00	1.30	0.93
7.00	1.31	0.93
8.00	1.32	0.92
9.00	1.33	0.92
10.00	1.33	0.92
11.00	1.34	0.92
12.00	1.34	0.92
13.00	1.34	0.92
14.00	1.34	0.92
15.00	1.34	0.92
16.00	1.34	0.92
17.00	1.35	0.92
18.00	1.35	0.92
19.00	1.35	0.92
20.00	1.35	0.92
25.00	1.36	0.91
30.00	1.37	0.91
35.00	1.38	0.91
40.00	1.39	0.91
45.00	1.40	0.90
60.00	1.43	0.90
120.00	1.51	0.88
2500.0	3.75	0.37
		0.00



**Diameter of standpipe/borehole (m)	0.1013
** X-sectional area of BH/Standpipe	A= 0.00806
Shape Factor	F= 10.84844
Time to reach Ht/Ho = 0.37 (sec)	T= 149896
Extrapolated Yes/No	Yes
Coefficient of Permeability (A/FT) (m/s)	K= 4.96E-09

Notes Final elapsed time visually extrapolated from last measured point on graph

* Depth of water below top of casing/standpipe

** 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.

*** This is normally the diameter of the borehole since the response zone includes the gravel surround Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Appendix 9

Plate Bearing Tests

TP3/23

TP3/37

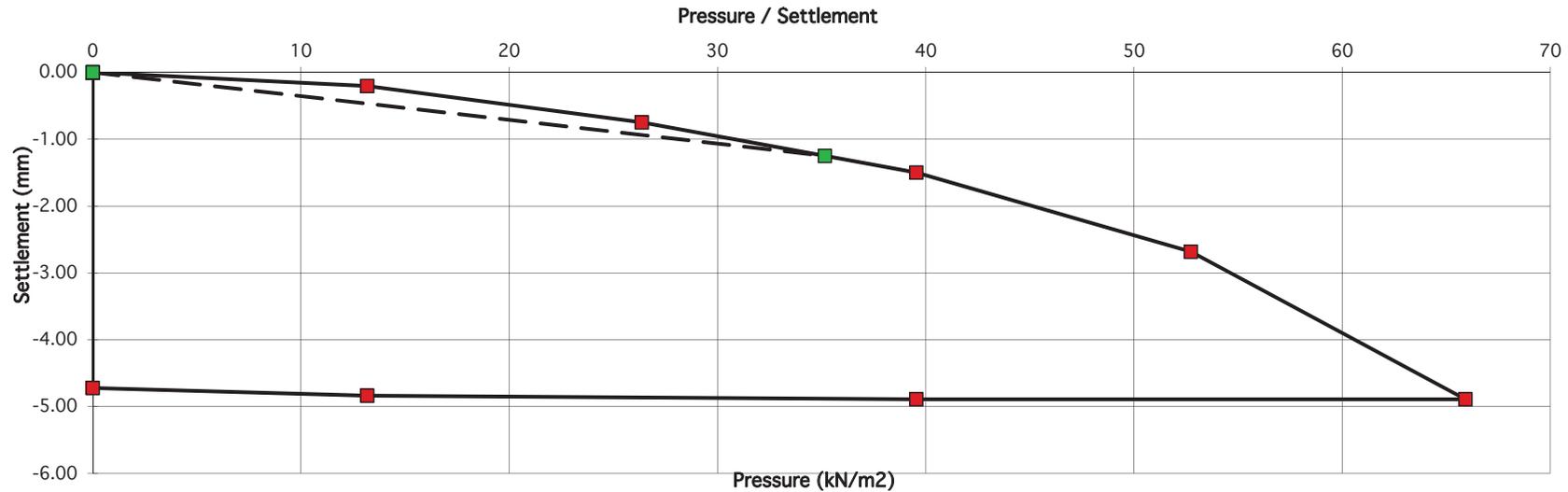
TP3/39

TP3/40

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71365	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/23 Load	Sandy slightly gravelly SILT/CLAY	Sample Ref No. Depth m bgl
Location	E=533040.762, N=728019.859, Elev=46.261		
Depth	1.20m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	19/01/2016		



Gradient at 1.25 mm settlement intersection = 28
 Modulus of subgrade reaction = 18 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

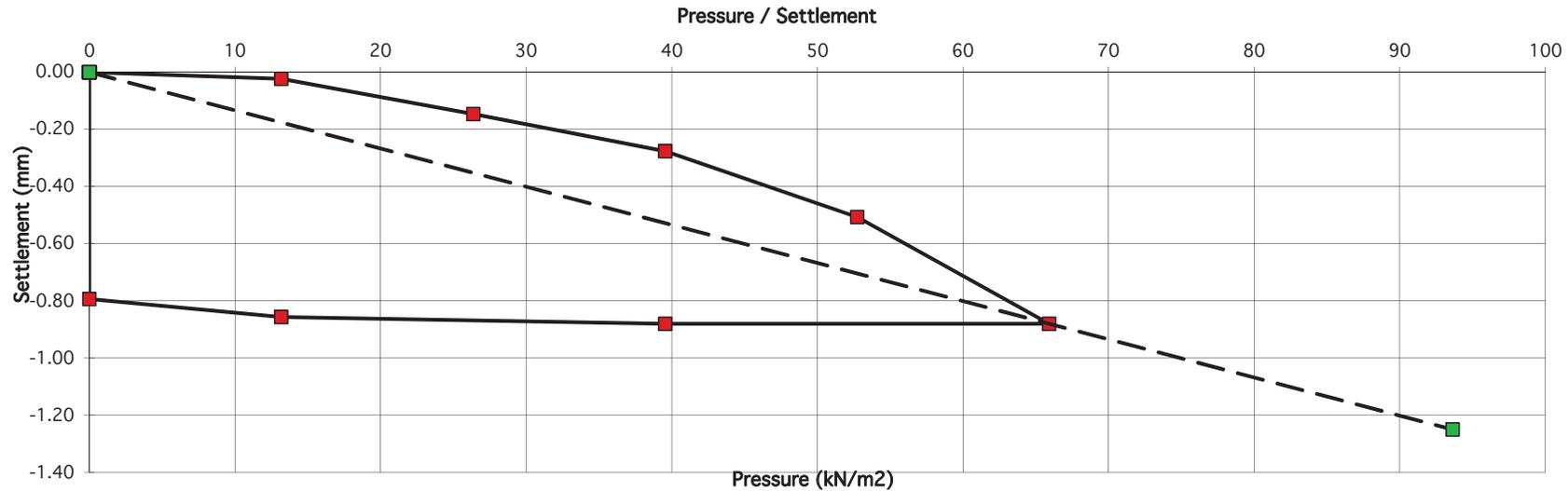
Equivalent CBR value in accordance with NRA HD25-26/10

1.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71365	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/23 Reload	Sandy slightly gravelly SILT/CLAY	Sample Ref No. Depth m bgl
Location	E=533040.762, N=728019.859, Elev=46.261		
Depth	1.20m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	19/01/2016		



Gradient at 1.25 mm settlement intersection = 75
 Modulus of subgrade reaction = 48 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10

7.9 %

PLATE TEST REPORT SHEET (F3.1)

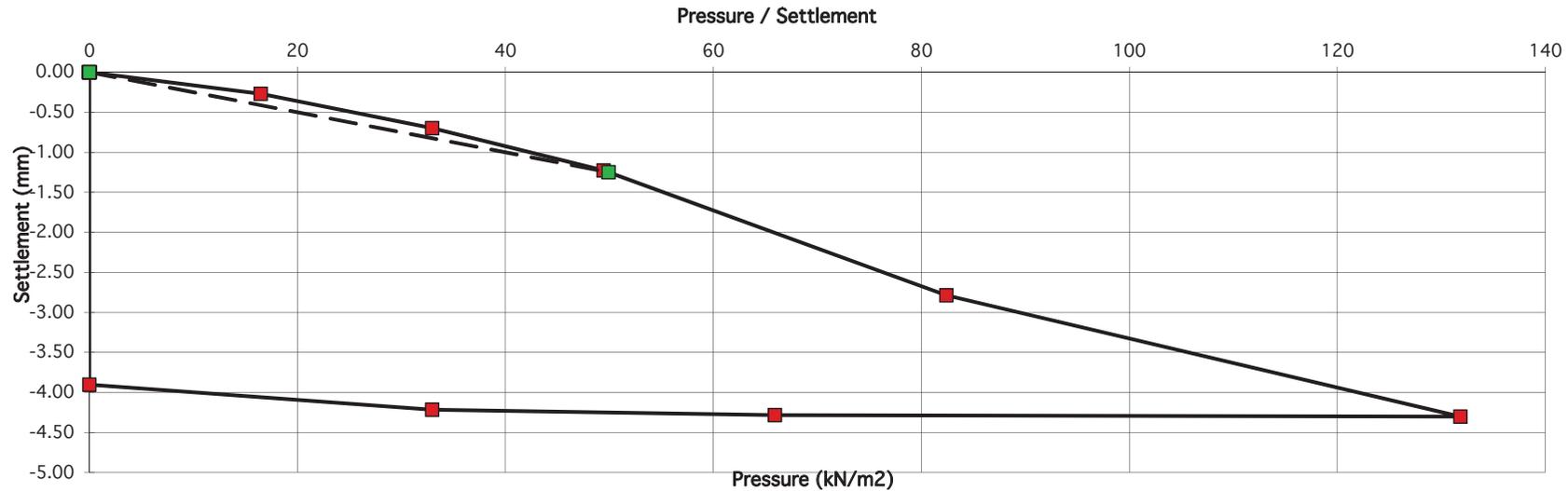
Applied Pressure/Settlement Curve

Reference No. R71980
 Contract GCTP Phase 3
 Test No. PBT TP3/37 Load
 Location E=521359.173, N=722614.435, Elev=10.979
 Depth 0.45m bgl
 Client Galway County Council
 Plate Diameter: 450 mm
 Test Method BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
 Technician AC
 Authorised by H. Byrne
 Date 18/04/2016

Description of soil under test
 (natural soil, placed fill, sub-base)
 Brown grey very sandy fine to coarse angular
 GRAVEL with many angular cobbles and occasional
 boulders of granite



Sample Ref No.
 Depth m bgl



Gradient at 1.25 mm settlement intersection = 40

Modulus of subgrade reaction = 26 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

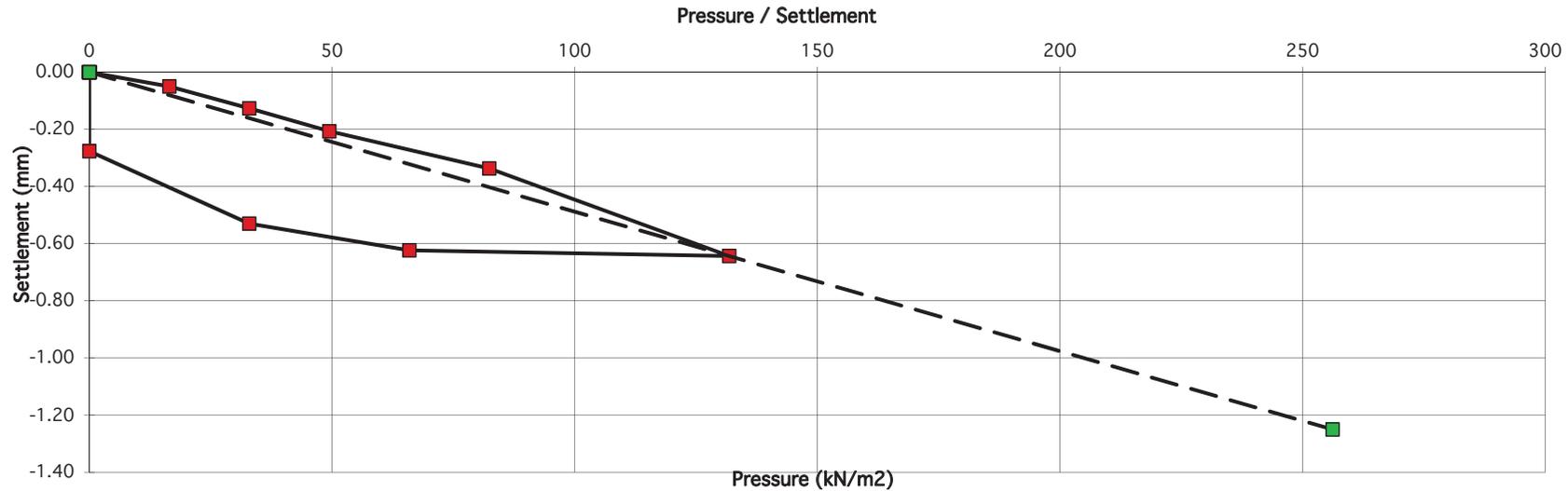
Equivalent CBR value in accordance with NRA HD25-26/10

2.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71980	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/37 Reload	Brown grey very sandy fine to coarse angular GRAVEL with many angular cobbles and occasional boulders of granite	Sample Ref No. Depth m bgl
Location	E=521359.173, N=722614.435, Elev=10.979		
Depth	0.45m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	18/04/2016		



Gradient at 1.25 mm settlement intersection = 205
 Modulus of subgrade reaction = 132 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

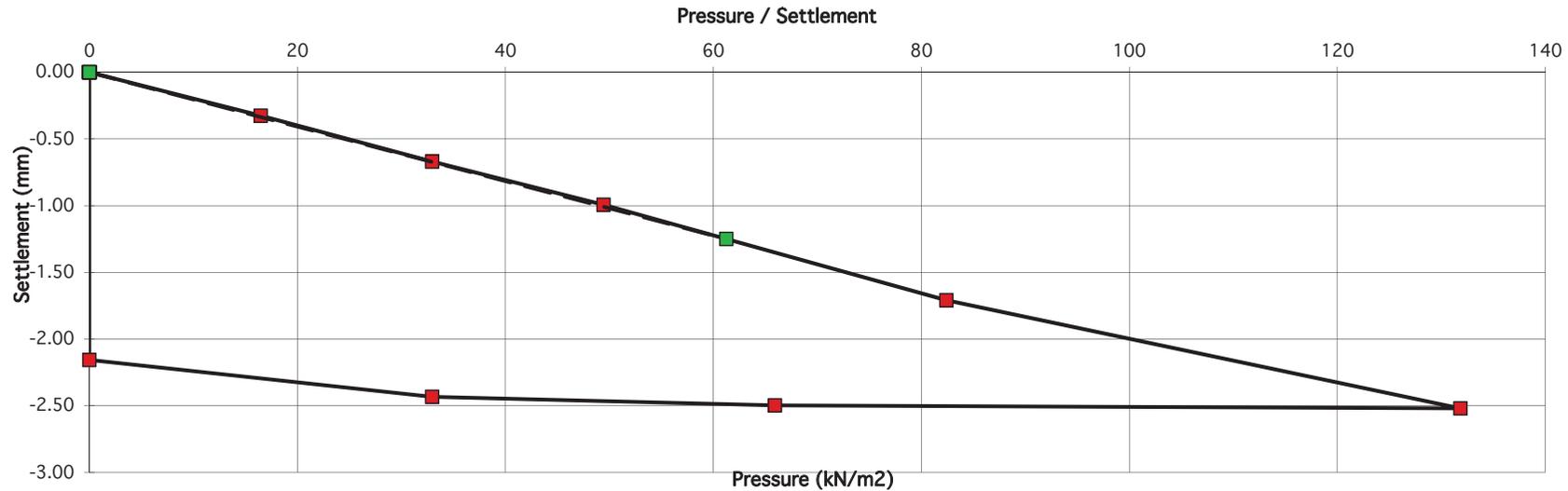
Equivalent CBR value in accordance with NRA HD25-26/10

45.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71981	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/39 Load	Brown sandy angular fine to coarse GRAVEL of granite with many angular cobbles and boulders	Sample Ref No. Depth m bgl
Location	E=525045.941, N=725382.414, Elev=49.788		
Depth	0.40m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	18/04/2016		



Gradient at 1.25 mm settlement intersection = 49
 Modulus of subgrade reaction = 31 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

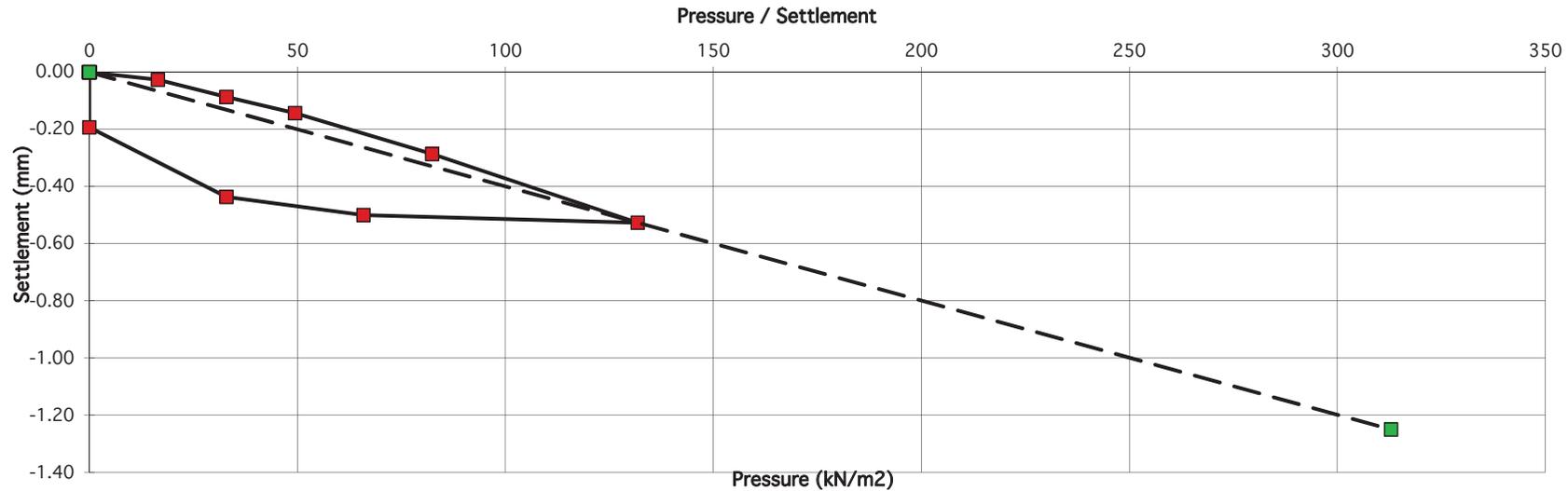
Equivalent CBR value in accordance with NRA HD25-26/10

3.8 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71981	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/39 Reload	Brown sandy angular fine to coarse GRAVEL of granite with many angular cobbles and boulders	Sample Ref No. Depth m bgl
Location	E=525045.941, N=725382.414, Elev=49.788		
Depth	0.40m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	18/04/2016		



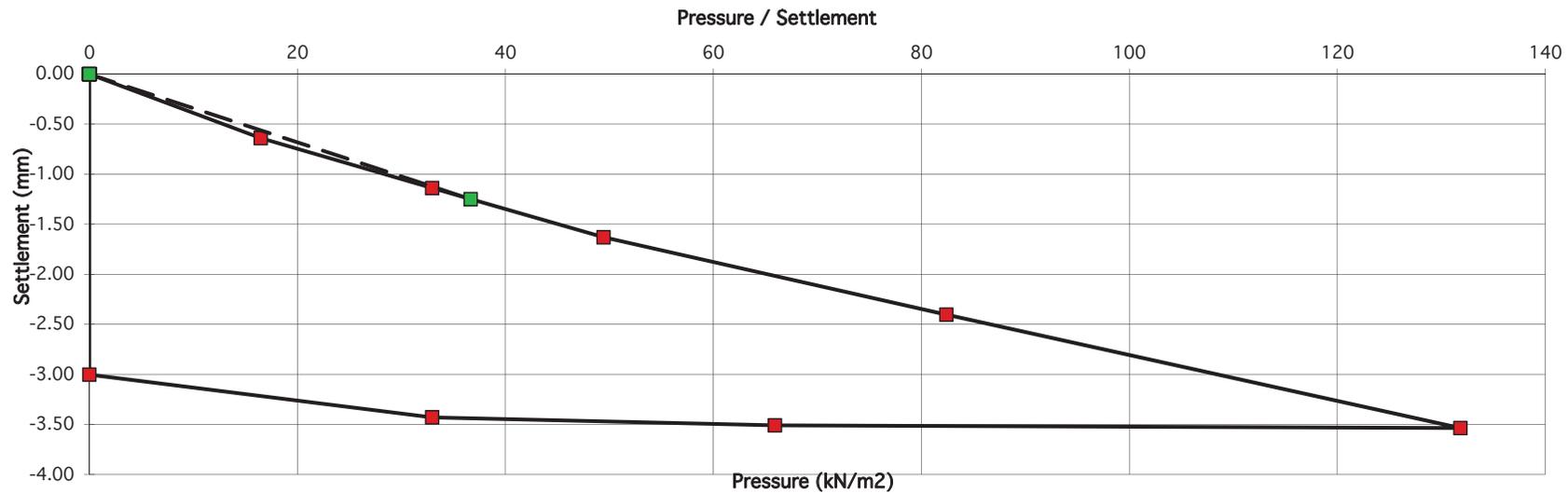
Gradient at 1.25 mm settlement intersection = 250
 Modulus of subgrade reaction = 161 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 **64.3 %**

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71982	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/40 Load	Brown slightly clayey very sandy fine to coarse GRAVEL with occasional cobbles and boulders	Sample Ref No. Depth m bgl
Location	E=525397.630, N=725677.100, Elev=59.649		
Depth	0.35m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	18/04/2016		



Gradient at 1.25 mm settlement intersection = 29
 Modulus of subgrade reaction = 19 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

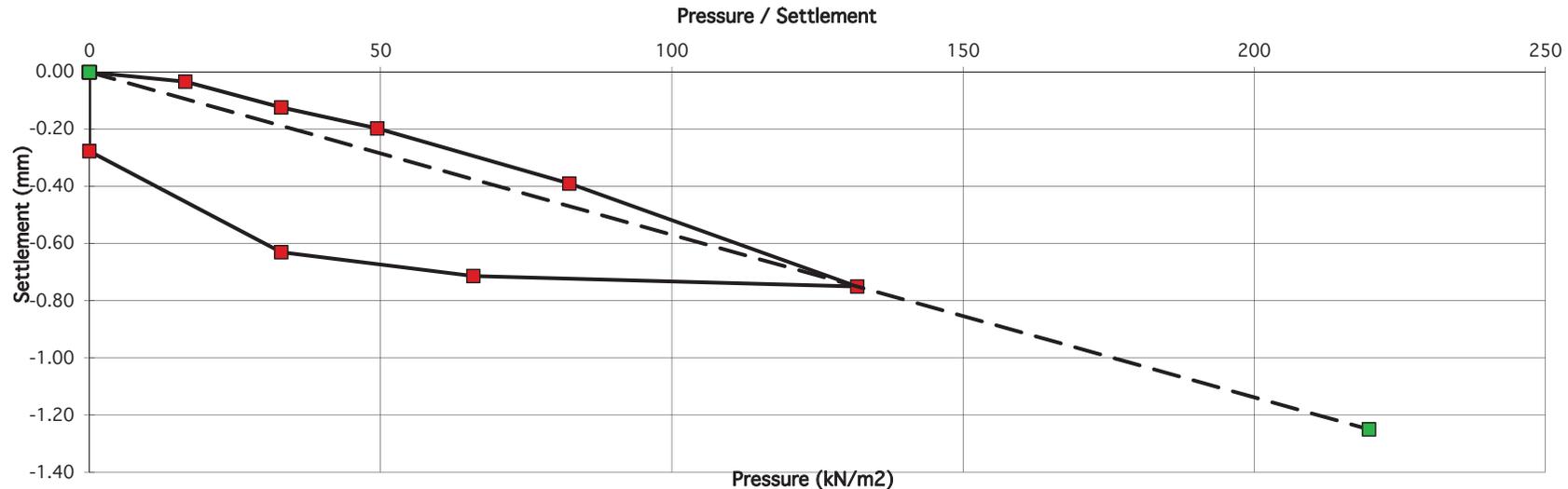
Equivalent CBR value in accordance with NRA HD25-26/10

1.6 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R71982	Description of soil under test (natural soil, placed fill, sub-base)	 
Contract	GCTP Phase 3		
Test No.	PBT TP3/40 Reload	Brown slightly clayey very sandy fine to coarse GRAVEL with occasional cobbles and boulders	Sample Ref No. Depth m bgl
Location	E=525397.630, N=725677.100, Elev=59.649		
Depth	0.35m bgl		
Client	Galway County Council		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	AC		
Authorised by	H. Byrne		
Date	18/04/2016		



Gradient at 1.25 mm settlement intersection = 176
 Modulus of subgrade reaction = 113 MPa/m
 Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 **34.9 %**

Appendix 10

Window Sample Records

WS3/01

WS3/02

WS3/03

WS3/04



WINDOW SAMPLE RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		PROBE NO. WS3/01
CO-ORDINATES 522,765.73 E 724,237.89 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 48.00		DATE DRILLED 08/04/2016
CLIENT Galway County Council ENGINEER ARUP		DATE LOGGED 08/04/2016
		SAMPLED BY CK
		LOGGED BY JL

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Firm dark brown clayey spongy PEAT with frequent decaying organic roots									
	Firm grey brown sandy slightly gravelly organic CLAY with occasional decaying organic remnants. Sand is medium to coarse. Gravel is subangular to subrounded fine to medium of limestone.		0.35	47.65		0.00-0.50	100			
	Final Depth 0.50m		0.50	47.50						
1.0										
2.0										
3.0										
4.0										
5.0										

General Remarks

Installations



WINDOW SAMPLE RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3		PROBE NO. WS3/02
CO-ORDINATES 531,268.78 E 728,473.95 N		SHEET Sheet 1 of 1
GROUND LEVEL (mOD) 9.55		DATE DRILLED 08/04/2016
CLIENT Galway County Council ENGINEER ARUP		DATE LOGGED 08/04/2016
		SAMPLED BY CK
		LOGGED BY JL

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL: Soft brown sandy organic CLAY with frequent rootlets		0.20	9.35						
	Soft to firm light yellow brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.		0.37	9.18						
	Firm dark brown spongy PEAT		0.60	8.95						
	Soft to firm light grey and light grey brown silty CLAY		0.95	8.60		0.00-1.00	95			
1.0	Soft to firm light grey and light yellow grey sandy silty CLAY. Sand is fine to medium.									
	Firm occasional firm to stiff light grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone.		1.90	7.65		1.00-2.00	90			
2.0										
	Final Depth 2.80m		2.80	6.75		2.00-2.80	100			
3.0										
4.0										
5.0										

General Remarks

Installations



WINDOW SAMPLE RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3

PROBE NO. **WS3/03**
SHEET Sheet 1 of 1

CO-ORDINATES 528,959.08 E
728,090.10 N
GROUND LEVEL (mOD) 7.63

DATE DRILLED 08/04/2016
DATE LOGGED 08/04/2016

CLIENT Galway County Council
ENGINEER ARUP

SAMPLED BY CK
LOGGED BY JL

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Soft brown sandy slightly gravelly CLAY with occasional rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Firm yellow brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Angular COBBLE and BOULDER-sized fragments of strong grey fine grained limestone		0.25	7.38						
			0.65	6.98						
1.0			1.00	6.63		0.00-1.00	80			
	Final Depth 1.00m									
2.0										
3.0										
4.0										
5.0										

General Remarks

Installations



WINDOW SAMPLE RECORD

REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3

PROBE NO. **WS3/04**
SHEET Sheet 1 of 1

CO-ORDINATES 531,290.25 E
728,447.79 N

DATE DRILLED 08/04/2016
DATE LOGGED 08/04/2016

GROUND LEVEL (mOD) 9.90

CLIENT Galway County Council
ENGINEER ARUP

SAMPLED BY CK
LOGGED BY JL

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	<p>TOPSOIL: Soft dark brown very sandy organic CLAY with frequent roots and rootlets. Sand is fine to coarse.</p> <p>Soft brown sandy gravelly organic CLAY. Sand is fine to medium. Gravel is subangular fine to coarse of limestone.</p> <p>Firm dark brown spongy to fibrous PEAT</p>		0.15	9.75		0.00-1.00	70			
			0.40	9.50						
1.0			1.10	8.80						
	<p>Soft to firm grey to grey blue sandy gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone.</p> <p>Soft light grey to light grey brown sandy silty CLAY. Sand is fine to medium.</p>		1.30	8.60						
2.0			1.80	8.10						
	<p>(Medium dense) Grey silty fine to medium SAND</p> <p>Soft to firm grey to light grey brown sandy silty CLAY. Sand is fine to medium.</p>		1.90	8.00						
			2.80	7.10						
3.0	<p>Firm light grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of limestone.</p>									
			4.00	5.90						
4.0	Final Depth 4.00m					3.00-4.00	95			
5.0										

General Remarks

Installations

WS3/01



WS3/02



WS3/03



WS3/04



Appendix 11

Geophysical Survey Report

MGX File Ref: 6031f-005.doc

N6 Galway City Transport Plan
County Galway
Geophysical Survey

Report Status: Final

MGX Project Number:6031

MGX File Ref: 6031f-005.doc

3rd July 2016

Confidential Report To:

IGSL

Unit FM7 Business Park
M7 Business Park
Naas
Co. Kildare

**Report submitted by :
Minerex Geophysics Limited**

Unit F4, Maynooth Business Campus
Maynooth, Co. Kildare
Ireland
Tel.: 01-6510030
Fax.: 01-6510033
Email: info@mgx.ie

Issued by:

Ruth Jackson (Senior Geophysicist)

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 Galway N6 GCTP.
2. The main objectives of the survey were to determine ground conditions, estimate the depth to rock and overburden thickness and to check for karst and other possible features that may create a concern during construction.
3. The survey was carried out at certain areas within the scheme that were given by the consulting engineers.
4. The geophysical surveys carried out show that the subsurface bedrock geology consists of Granite and Limestone.
5. The results of direct ground investigations which were on-going at the time of the geophysics survey, are drawn on the plans and show a good fit overall with the geophysics.
6. High resistivities and seismic velocities within the Granite section indicate the presence of bedrock close to the surface.
7. This Granite would require breaking or blasting and trial breaking of rock is recommended in proposed deep cut areas.
8. High resistivities within the Limestone area indicate a clean Limestone, often occurring quite close to the surface. This type of limestone is liable to karstification.
9. Zones of lower resistivity within the clean Limestone point towards a weathered or karstified Limestone. Rotary core holes could be drilled at these locations to test for the degree of weathering/karstification.
10. Recommendations for targeted trial pits with test breaking and coreholes have been made, based on the geophysics models. These locations may be investigated at a later ground investigation phase.

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List of Tables and Plans:

Title	Pages	Document Reference
Table 1: Geophysical Survey Locations and Acquisition Parameters	2 x A4	6031f-Tab1.xls
Table 2: Structure Locations and Geological Background	3 x A4	6031f-Tab2.xls
Table 3: Interpretation Areas	In text	In text
Table 4: Summary of Results and Interpretation in Granite Area	In text	In text
Table 5: Summary of Results and Interpretation in Limestone Area (Resistivity only)	In text	In text
Table 6: Summary of Results and Interpretation in Limestone Area (Resistivity and Seismic Refraction)	In text	In text
Table 7: Locations of recommended Rotary Core holes	In text	In text
Plan 1a: Survey Locations and Models for GP3/01	1 x A1	6031f_Plans.dwg
Plan 1b: Survey Locations and Models for GP3/02 & GP3/04	1 x A1	6031f_Plans.dwg
Plan 1c: Survey Locations and Models for GP3/03	1 x A1	6031f_Plans.dwg
Plan 1d: Survey Locations and Models for GP3/05	1 x A1	6031f_Plans.dwg
Plan 1e: Survey Locations and Models for GP3/06	1 x A1	6031f_Plans.dwg
Plan 1f: Survey Locations and Models for GP3/07	1 x A1	6031f_Plans.dwg
Plan 1g: Survey Locations and Models for GP3/08	1 x A1	6031f_Plans.dwg
Plan 1h: Survey Locations and Models for GP3/09 & GP3/10	1 x A1	6031f_Plans.dwg
Plan 1i: Survey Locations and Models for GP3/12,GP3/18,GP3/13	1 x A1	6031f_Plans.dwg
Plan 1j: Survey Locations and Models for GP3/14	1 x A1	6031f_Plans.dwg
Plan 1k: Survey Locations and Models for GP3/15,GP16,GP3/17	1 x A1	6031f_Plans.dwg
Plan 1l: Survey Locations and Models for GP3/17	1 x A1	6031f_Plans.dwg
Plan 1m: Survey Locations and Models for GP3/23,GP3/24,GP3/25	1 x A1	6031f_Plans.dwg
Plan 1n: Survey Locations and Models for GP3/19	1 x A1	6031f_Plans.dwg
Plan 1o Survey Locations and Models for GP3/20	1 x A1	6031f_Plans.dwg
Plan 1p: Survey Locations and Models for GP3/21	1 x A1	6031f_Plans.dwg
Plan 2a: Survey Locations and Interpretation for GP3/01	1 x A1	6031f_Plans.dwg
Plan 2b: Survey Locations and Interpretation for GP3/02 & GP3/04	1 x A1	6031f_Plans.dwg
Plan 2c: Survey Locations and Interpretation for GP3/03	1 x A1	6031f_Plans.dwg
Plan 2d: Survey Locations and Interpretation for GP3/05	1 x A1	6031f_Plans.dwg
Plan 2e: Survey Locations and Interpretation for GP3/06	1 x A1	6031f_Plans.dwg
Plan 2f: Survey Locations and Interpretation for GP3/07	1 x A1	6031f_Plans.dwg
Plan 2g: Survey Locations and Interpretation for GP3/08	1 x A1	6031f_Plans.dwg

Plan 2h: Survey Locations and Interpretation for GP3/09 & GP3/10	1 x A1	6031f_Plans.dwg
Plan 2i: Survey Locations and Interpretation for GP3/12,GP3/18,GP3/13	1 x A1	6031f_Plans.dwg
Plan 2j: Survey Locations and Interpretation for GP3/14	1 x A1	6031f_Plans.dwg
Plan 2k: Survey Locations and Interpretation for GP3/15,GP16,GP3/17	1 x A1	6031f_Plans.dwg
Plan 2l: Survey Locations and Interpretation for GP3/17	1 x A1	6031f_Plans.dwg
Plan 2m: Survey Locations and Interpretation for GP3/23,GP3/24,GP3/25	1 x A1	6031f_Plans.dwg
Plan 2n: Survey Locations and Interpretation for GP3/19	1 x A1	6031f_Plans.dwg
Plan 2o Survey Locations and Interpretation for GP3/20	1 x A1	6031f_Plans.dwg
Plan 2p: Survey Locations and Interpretation for GP3/21	1 x A1	6031f_Plans.dwg

1. INTRODUCTION

1.1 Background

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey for the N6 Galway City Transport Plan. The survey consisted of 2D-Resistivity and seismic refraction (p-wave) measurements.

The survey employed various geophysical methods that complement each other and improve the interpretation. The role of geophysics as a non-destructive fast method is to allow later targeted direct investigations. Those results can be used to improve the initial results and interpretation.

The survey was done at locations selected by the consulting engineers. This report was reviewed after the results from direct ground investigation results were available. Recommendations for targeted direct ground investigation are made in this report. These may be carried out at a future ground investigation stage.

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 detect possible karstified zones and fracture zones within the rock

1.3 Site Description

The site is located around Galway city, from Bearna in the west to Coolagh, Briarhill in the east.

The geophysical profiles were located at specific chainage locations along the proposed road alignment and the survey was carried out as close as possible to the proposed centre line.

The survey locations are tabulated in Table 1 and shown on maps in the upper frames of the plans. The route crosses mainly over private farmland with one survey area on paved ground.

A weekly programme of works was used to ensure access was arranged in advance of MGX carrying out the geophysical survey. A number of locations within the survey area were overgrown and it was not possible to carry out the geophysics at the time. These locations were returned to at a later date when clearance had been carried out by the client. At some locations the survey lines were meandered through the vegetation after agreeing the path on site with the engineers.

1.4 Geology

The Geological Survey of Ireland bedrock geological map (www.gsi.ie) indicates that the survey area is underlain by both Carboniferous Limestones (Visean Limestone) and Caledonian Granitic rocks (mainly the Errisbeg Townland Granite).

The overburden is predominantly Made Ground and Till derived from either the Limestone or Granite.

Table 2 contains a summary of the geology and survey locations of the individual survey areas.

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 client provided maps of the site and the digital version was used as the background map in this report. Elevations were surveyed on site and are used in the vertical sections.

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 consisted of using 2D-Resistivity and Seismic Refraction as outlined in the tender documents.

The survey locations are indicated in the top frames of Plans 1a – 1p. The profiles, locations, chainage and parameters are tabulated in Tab. 1.

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

The 2D-Resistivity profiles were as continuous as possible along the chainage and 3m or 5m electrode spacing was used. The standard spacing of 5m was used to achieve the maximum depth along the majority of profiles. The exception to this was GP 3/1 and GP3/4 where the maximum cuts were 3.8 and 2.9m respectively and therefore 3m spaced electrodes allowed for more detail in the shallow subsurface.

In concrete and hard standing areas small holes (12mm) were drilled to place the electrodes in them and saline water was added to make a good electrical connection.

The readings were taken with a Tigre Resistivity Meter, Imager Cables, stainless steel electrodes, laptop and ImagerPro acquisition software.

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.

While the achieved depth may be viewed as greater than required for the proposed project it does not result in a loss of detail or accuracy in the shallow subsurface. It may however provide additional useful information such as detecting areas of possible karstification which may have implications for subsidence or other construction issues.

The penetration depth of a resistivity profile increases towards the centre where it reaches an approx. value of 1/6th of the layout length.

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 Plans 1a – 1p.

Each of the profiles consisted of 24 geophones with 3 m spacing, resulting in lengths of 69m per profile. Profiles were acquired continuously along chainage to allow for concatenation during the processing stage. 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. At least 7 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 (e.g. below solid ground surface) or where layers dip with more than 20 degrees angle the accuracy becomes much less.

The seismic refraction profiles with 69 m individual length have a reasonable penetration depth of around 10m. An internationally accepted maximum depth estimate for a seismic refraction layout is 1/6 of the layout length. The depth penetration varies according to the velocity structure of the subsurface.

2.4 Site Work

The data acquisition was carried out between the 26th of January and 15th of April 2016, which included a period of time away from the site, to allow for overgrown areas to be cleared and access possible for geophysical surveying. The weather conditions were variable throughout the acquisition period. Health and safety standards were adhered to at all times. While working on roadways the area was clearly highlighted by the use of warning signs and cones and a traffic management system was in place.

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.

The interpretation is based on the methods available and the type of bedrock in each area. In some areas only 2D-Resistivity was carried out, so the interpretation is made solely by resistivity. In other areas seismic refraction was done at the same location as the 2D-Resistivity and the interpretation is based on both methods. Table 3 shows the areas along the survey area and the method of interpretation used.

The bedrock geological map of Ireland (www.gsi.ie) shows the granite/limestone boundary occurring at approx. CH8890. This chainage agrees with the survey (Plan 2d) where a sudden change in elevation is present in Area GP 3/5. The interpretation at the start of this area is made for the granite area and the interpretation for the rest of the area follows the limestone area.

Table 3: Interpretation Areas

	Interpretation Areas	Chainage (CH)
1	Granite Bedrock with 2D-Resistivity and Seismic Refraction Survey	5315 – 8325 Side Road 0 - 600
2	Limestone bedrock with 2D- Resistivity Survey only	8750 – 10060 10550 – 11110 12220 - 12575
3	Limestone Bedrock with 2D-Resistivity and Seismic Refraction Survey	All other areas

Ground investigation results were available after the survey and the abbreviated borehole logs are indicated on the sections. The rock was generally divided into Limestone/Granite and Weathered Limestone/Granite based on the driller description. Where no description was made in the logs, it was based on the RQD value of more or less than 50%. This can be done only to a certain extent as the rock is very variable and RQD values and fracture index often changes rapidly with depth.

In general, there is a good fit between the boreholes and the geophysical data. In some boreholes a difference in rock level with the geophysical interpretation is evident, those are discussed further below.

3.1 2D-Resistivity Models

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 < 3.0%. The resulting models were colour contoured with the same resistivity scale for all profiles and they are displayed as cross sections (Plans 1a – 1p).

Resistivities are characteristic for certain overburden material types. If there is a high content of clay minerals (which are electrically conductive) then the overburden resistivity will be lower than as if there is a high content of clastic grains like sand or gravel. The purer the clay and the lower the sand/gravel content the lower the resistivity. The water content in the overburden also influences the resistivities but generally the clay content has a larger effect.

The resistivities cover a range typical for materials from clay rich overburden (low resistivities) to fresh strong unweathered bedrock (high resistivities). The ranges have been taken into the consideration for the interpretation.

Within bedrock types like clean limestone and granite high resistivities indicate a fresh strong unweathered rock. As the weathering in the rock increases the resistivity gets lower because of weathering products, remineralisation of rock and infill of cracks, faults and voids with clay and water. Weathering within rock is typically indicated by lower resistivity values in the cross sections.

In limestone areas karstified rock is defined in this report as a formerly intact clean limestone rock, liable to karstification, that has been partially dissolved by water over long geological time scales and where the cavities and voids have either remained empty (filled by air) or became filled by overburden sediment (clay, silt, sand), weathering product of the broken rock itself or water. This process would lead to a reduction of the resistivity of the overall rock and therefore karstified rock has a lower resistivity than intact clean limestone rock.

3.2 Seismic Refraction Models

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 2 layers were used for the granite area and 3-4 layers were used for the limestone area. 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 1.9 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 (Plans 1a – 1p). The average seismic velocities obtained within the layers are annotated on the sections as bold black numbers.

The p-wave seismic velocity is closely linked to the density of subsurface materials and to parameters like compaction, stiffness, strength and rock quality. The higher the density of the subsurface materials the higher the seismic velocity. Similarly for the other parameters it is generally valid that a more compacted, stiffer and stronger material will have a higher seismic velocity. For rock the seismic velocity is higher when the rock is stronger, less weathered and has a higher quality. If the rock is more weathered broken fractured or fissured then the seismic velocity will be reduced compared to that of intact fresh rock.

Because of the above relation the seismic refraction method and seismic velocities are suitable to investigate ground where the layers get denser, more compacted and stronger with depth. A disadvantage is that some different materials have the same or similar seismic velocity: A very stiff or very dense highly consolidated overburden and a weathered rock can have the same seismic velocity range.

3.3 Interpretation of Granite Area with 2D-Resistivity and Seismic Refraction

Table 4 summarises the interpretation for this area. The stiffness/compaction and the rock strength/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.

Interpreted cross sections are shown in Plans 2a – 2c (lower sections). 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 different types of rock. 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 4: Summary of Results and Interpretation in Granite Area

Layer	General Seismic Velocity Range (m/sec)	General Resistivity Range (Ohmm)	Compaction/ Strength/ Rock Quality	Interpretation	Estimated Excavation Method
G1	200 - 400	All	Soft/Loose	Topsoil/Overburden	Diggable
G2a	4100 - 7500	< 640	Fair to Good Rock	Strong Granite with some Weathered Zones	Breaking & Blasting
G2b	4100 - 7500	> 640	Fair to Good Rock	Strong Granite	Breaking & Blasting

Layer G1 is generally thin (1m) and comprises topsoil, made ground and overburden. The seismic velocity range of 200 - 400 m/s indicates that the geological material in this layer would be mainly soft or loose in terms of stiffness and compaction.

The depth to top of rock (Layer G2a and G2b) with a seismic velocity range of 4100 - 7500 m/s varies between 1 and 3m bgl. under the survey profiles. This layer requires breaking/blasting for removal. Layer G2a with high velocities (4100 – 7500 m/s) but lower resistivities (<640 Ohmm) occurs at a small number of locations. The lower resistivities would indicate that the granite rock is partially weathered.

3.4 Interpretation of Limestone Area with 2D-Resistivity Method only

Table 5 summarises the interpretation for the resistivities in the limestone area. Interpreted cross sections are shown in Plans 2d, 2e, 2g & 2h (lower sections).

Resistivities are used to indicate the bedrock type and how clean the limestone is. Resistivity values < 120 Ohmm, where present near the surface indicate a clay or silt overburden and where they occur at depth a clay filled karstified limestone (Layer A). Layer B with a medium resistivity range (120 – 640 Ohmm) has been interpreted as a more gravel rich overburden or an infilled (silt, sand, weathering products and moisture) or karstified limestone.

Resistivity values greater than 640 Ohmm (Layer C) have been interpreted as either a sand/gravel overburden or a clean limestone that is hardly weathered or broken.

2D-Resistivity data allows for interpretation of different types of overburden and rock types and features within the rock, but it is not possible to distinguish between overburden and rock where they have similar velocities. This distinction is done from the seismic refraction which was not carried out in this area.

Table 5: Summary of Results and Interpretation in Limestone Area (Resistivity only)

Layer	General Resistivity Range (Ohmm)	Interpretation
A	< 120	Clay or Silt Overburden, or Clay Filled Limestone
B	120 - 640	Gravelly Clay Overburden, or Infilled Limestone
C	> 640	Sand or Gravel Overburden, or Fresh Limestone

3.5 Interpretation of Limestone Area with 2D-Resistivity and Seismic Refraction

Table 6 summarises the interpretation for this area. The stiffness/compaction and the rock strength/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.

Interpreted cross sections are shown in Plans 2f, 2j & 2i – 2p (lower sections). 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 different types of overburden and rock. Resistivity data is better suited to show overburden and rock types and features within the rock while seismic refraction velocities are indicating the change of compaction/stiffness/rock quality with depth.

Table 6: Summary of Results and Interpretation in Limestone Area (Resistivity and Seismic Refraction)

Layer	General Seismic Velocity Range (m/sec)	General Resistivity Range (Ohmm)	Stiffness/ Compaction or Rock Strength/ Quality	Interpretation	Estimated Excavation Method
1	200 - 360	Any	Soft or Loose	Topsoil/Fill/Made Ground	Diggable
2a	900 - 1200	< 120	Firm to Stiff or Medium Dense	Clay or Silt Overburden	Diggable
2b	900 - 1200	120 - 640	Firm to Stiff or Medium Dense	Gravelly Clay Overburden	Diggable
2c	900 - 1200	> 640	Firm to Stiff or Medium Dense	Sand or Gravel Overburden	Diggable
3a	2000 - 2400	< 120	Poor to fair rock or Very stiff to hard or Very dense	Clay Filled Weathered Limestone or Clay or Silt Overburden	Diggable/rippable to marginal rippable
3b	2000 - 2400	120 - 640	Poor to fair rock or Very stiff to hard or Very dense	Infilled Weathered Limestone or Gravelly Clay Overburden	Diggable/rippable to marginal rippable
3c	2000 - 2400	> 640	Poor to fair rock or Very stiff to hard or Very dense	Weathered Limestone or Sand or Gravel Overburden	Diggable/rippable to marginal rippable
4a	4000 - 5000	< 120	Good to very good rock	Clay Filled Strong Limestone	Breaking & Blasting
4b	4000 - 5000	120 - 640	Good to very good rock	Infilled Strong Limestone	Breaking & Blasting
4c	4000 - 5000	> 640	Good to very good rock	Fresh Strong Limestone	Breaking & Blasting

Seismic layer 1, a relatively thin layer with seismic velocities of 200 - 340 m/s, has been interpreted as a layer of overburden, mainly comprised of made ground, topsoil and soil with a soft/loose stiffness/compaction.

Seismic layer 2 was modelled with a velocity range of 900 – 1200 m/s, which indicates overburden material with firm to stiff or medium dense strength/compaction. The resistivity ranges indicate varying amounts of clay, sand or gravel within the overburden. This layer may also include some highly weathered limestone at the base of the layer.

Seismic layer 3, with velocities of 2000 – 2400 m/s indicates predominantly Limestone bedrock with varying degrees of weathering or a very stiff to hard/very dense overburden. Within this layer, where the lower resistivity ranges occur at depth, the interpretation points towards that of a weathered/karstified Limestone. Occurring closer to the surface, the layer is more likely overburden with varying degrees of clay, silt, sand and gravel.

Strong Limestone is indicated by seismic velocities between 4000 – 5000 m/s of Layer 4. Again the varying resistivity ranges within this Limestone layer indicate varying degrees of weathering/karstification.

A division of seismic layers 2 – 4 into the subdivisions by resistivity (A – C) is made, and the interpretation by resistivity is the same as for chapter 3.4.

4. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are made:

- The geophysical surveys carried out show that the subsurface geology consists of various overburden material overlying granite and limestone bedrock. Recommendations for targeted ground investigation locations were made during the geophysical survey. These are included in this report for a future phase of ground investigation.
- Direct ground investigation comprising of cable percussive boreholes, rotary boreholes and trial pits was carried out by IGSL Ltd. The locations are shown on the maps, in the upper frames of plans. The abbreviated logs of the cable percussive and rotary core holes have been drawn on the sections (lower frames). There is generally a good fit between the boreholes and the geophysical data.
- It is possible to divide the survey area along the length of the chainage based on this subsurface geology. The Caledonian Granitic rocks are located from CH0 to approx. CH8890. East from here the geology consists of Carboniferous Limestones.

Granite

- Within the Granite section (Plans a-c), high resistivities and high seismic velocities indicate granite bedrock close to the surface. The overburden has an average thickness of 1 m.
- Small zones of lower resistivities in the rock indicate that the Granite is slightly weathered at these locations. On the side road at CH 250 (Plans c), this zone of weathered rock extends to a depth of approx. 18m bgl and might also indicate a fault. A targeted rotary core hole is recommended at this location (CH250).
- High seismic velocities in the granite rock indicate that the rock requires breaking or blasting for removal.
- The direct ground investigation results generally indicate that the granite is shallow and unweathered. Some boreholes near the survey line (BH3/17, BH3/18 and BH3/20) indicate the strong unweathered granite deeper than the seismic data. This could indicate irregular weathering of granite (spheroidal or woolsack weathering), where the overall rock unit is good quality rock though at a small scale weathered granite and unweathered granite occur close together. Other boreholes in the granite area show a good fit of the rock head with the seismic interpretation.
- Trial breaking of granite rock is recommended in the proposed deep cut areas CH7700 – 8200 and sideroad CH50 – 350. Trial breaking of rock in trial pits with a large surface area will give the best indication of the excavatability.

Limestone

- Within the Limestone section high resistivities indicate a clean Limestone, which occurs shallowest under the topographical rises along the scheme. This good to very good Limestone would require breaking and blasting during construction of cuts.
- The bedrock resistivities in the limestone section are generally high which indicates a clean limestone that is liable to karstification (but does not have to be karstified).
- Lower resistivity values within the clean high resistivity limestone point towards a weathered or karstified Limestone. The existence of karstified rock could lead to subsidence and therefore its location is of particular relevance in areas of proposed cut and fill in the construction plan.
- The limestone area starts at approx. CH8890, from here on to the eastern end of the scheme there is a risk of the occurrence of karst.
- The first karst feature appears inside the rock at CH8930 and has a width of approx. 40m and a depth of 20m. This feature could be drilled by a targeted corehole if there is an impact of the future design, e.g. if foundations for a bridge are proposed at this chainage.
- At area GP 3/5 the resistivities indicate overburden or infilled limestone. Borehole BH 3/53R places the depth to rock at approx. 5m bgl. In this area no seismic refraction was done, and the depth to rock cannot be determined from the resistivity data alone.
- The largest zone of weathered and karstified limestone occurs CH13650 – 14150. It is located in a topographical depression likely caused by erosion of the lesser quality rock.
- A zone of thick overburden and deep rock occurs at CH13050 – 13140 where the resistivity profile did not reach good quality limestone to at least 15m depth. A longer 2D-Resistivity profile is recommended at this location.
- The survey at the abandoned Coolagh quarry was done to check for weathered and karstified rock in relation to the hydrogeological conditions between the quarry and the proposed road.
- In some areas there are possible contradictions between the resistivity and seismic data (e.g. CH11900 – 11950 in area GP 3/9). The resistivities are quite high (> 1000 Ohmm) and the seismic velocities medium (2300 m/s). Resistivities can indicate a limestone rock while seismic velocities indicate poor to fair weathered rock or very dense sand and gravel overburden. The models were reviewed and it is not possible to seismically model a strong limestone at shallow depth as might be proposed by the resistivity data. Targeted boreholes can resolve these locations more, especially such locations like at CH11970 where the construction changes from proposed cut to fill or bridge.

- In order to test for weathered and karstified limestone targeted rotary core holes could be drilled and have been recommended at the following locations shown in Table 7.

Table 7: Locations of recommended Rotary Core Holes

Chainage	Plan
8930	Plan 2d
10760	Plan 2g
12020	Plan 2h
12370	Plan 2h
13775	Plan 2i
200m along GP3/19	Plan 2n
480m along GP3/19	Plan 2n
320m along GP3/20	Plan 2o
200m along GP3/21	Plan 2p

5. REFERENCES

1. **GSEG 2002.** Geophysics in Engineering Investigations. Geological Society Engineering Geology Special Publication 19, London, 2002.
2. **GSI, 2004.** Geology of Galway Bay. Geological Survey of Ireland 2004.
3. **Milsom, 1989.** Field Geophysics. John Wiley and Sons.
4. **Reynolds, 1997.** An Introduction to Applied and Environmental Geophysics. John Wiley and Son.

Table 1: Geophysical Survey Locations and Acquisition Parameters

2D-Resistivity Survey					
Site	Profile	Length (m)	Combined Length (m)	Electrode Spacing	Start Chainage
GP3/1	R4	189		3	5309
GP3/1		96		3	
GP3/1		42	327	3	
GP3/2	R1	200	200	5	7565
GP3/2	R3	315		5	7750
GP3/2		75	390	5	
GP3/3	R2	315		5	16
GP3/3		160		5	
GP3/3		120	595	5	
GP3/4	R5	153	153	3	8203
GP3/5	R13	315		5	8759
GP3/5		160		5	
GP3/5		60	535	5	
GP3/6	R6	315		5	9491
GP3/6		55	370	5	
GP3/6	R22	295	295	5	9790
GP3/7	R21	285	285	5	10160
GP3/7					
GP3/8	R7	315		5	10550
GP3/8		160		5	
GP3/8		115	590	5	
GP3/9	R25	265	265	5	11855
GP3/10	R16	315		5	12222
GP3/10		45	360	5	
GP3/12	R8	85	85	5	13052
GP3/13	R10	315		5	13457
GP3/13		150	465	5	
GP3/14	R11	315		5	13957
GP3/14		55	370	5	
GP3/15	R14	205	205	5	15499
GP3/16	R15	105	105	5	15724
GP3/17	R12	315		5	15874
GP3/17		160		5	
GP3/17		160		5	
GP3/17		65	700	5	
GP3/18	R9	120	120	5	13198
GP3/19	R23	315		5	OFF Mainline

Table 1: Geophysical Survey Locations and Acquisition Parameters

GP3/19		160		5	
GP3/19		50	525	5	
GP3/20	R24	315		5	OFF Mainline
GP3/20		95	410	5	
GP3/21	R17	315		5	Across Mainline
GP3/21		80	395	5	
GP3/23	R20	115	115	5	Across Mainline
GP3/24	R19	170	170	5	10958
GP3/25	R18	290	290	5	10897
	SUM	8320			
Seismic Refraction Survey					
Site	Profile Name	Length (m)	Spacing (m)	No. Geophones	Start Chainage
GP3/1	S5	321	3	108	5309
GP3/2	S1	171	3	58	7565
GP3/2	S3	213	3	72	7750
GP3/2	S4	174	3	58	7948
GP3/3	S2	591	3	198	16
GP3/4	S6	141	3	48	8206
GP3/7	S21	285	3	96	10154
GP3/9	S31	258	3	87	11854
GP3/12	S7	84	3	29	13052
GP3/13	S9	285	3	96	13457
GP3/13	S10	177	3	59	13742
GP3/14	S11	357	3	120	13957
GP3/15	S15	213	3	72	15499
GP3/16	S16	105	3	36	15724
GP3/17	S12	285	3	96	15874
GP3/17	S13	216	3	72	16162
GP3/17	S14	195	3	65	16361
GP3/18	S8	120	3	41	13198
GP3/19	S30	501	3	168	OFF Mainline
GP3/20	S32	411	3	138	OFF Mainline
GP3/21	S17	402	3	135	Across Mainline
GP3/23	S33	69	3	24	Across Mainline
GP3/24	S19	162	3	55	10960
GP3/25	S18	285	3	96	10898
	SUM	6021			
Chainage is based on the Alignment received 12/02/2016					

Table 2: Structure Locations and Geological Background

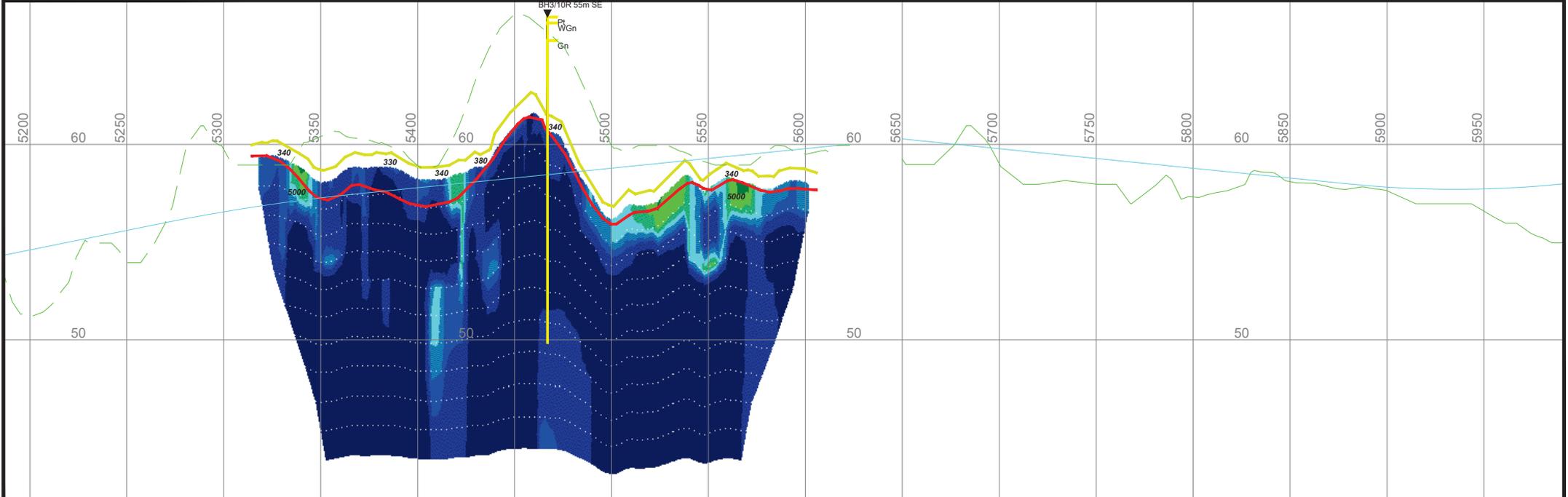
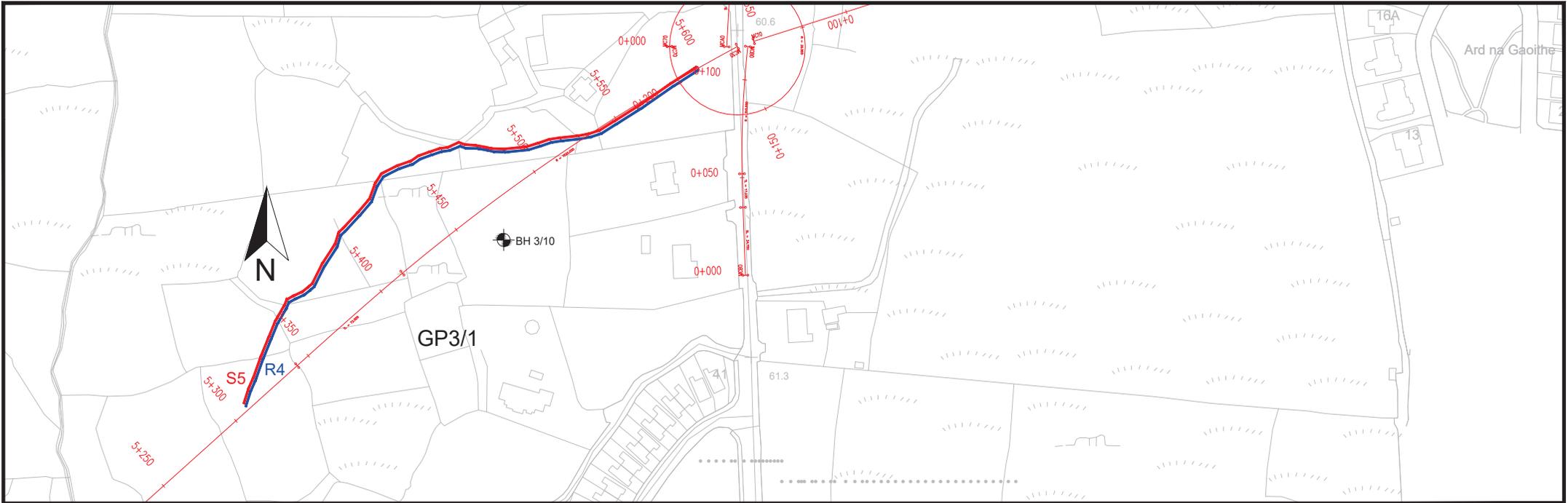
Geophysical Survey Area	Geophysical Method	Proposed Cut Depth/Design Feature	Soil	Subsoils	Soft Ground	Bedrock	Outcrop (Rock < 2m bgl)	Fractures/Faults	Karst Features
G.P 3/1	2D-Resistivity 3m & Seismic Refraction 3m	Maximum cut depth 3.8m	Shallow soils derived from non-calcareous rock or gravels	Bedrock outcrop and subcrop	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite	Yes	No	No
G.P 3/2	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 14.6m at approx. Ch. 7900	Shallow soils derived from mainly non-calcareous parent materials	Bedrock outcrop and subcrop	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite	Yes	No	No
G.P 3/3	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 12m at approx. Ch. 145	Shallow soils derived from mainly non-calcareous parent materials	Till derived chiefly from granite	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite	Yes	No	No
G.P 3/4	2D-Resistivity 3m & Seismic Refraction 3m	Maximum cut depth of 2.9m at approx. Ch. 8+270	Shallow soils derived from mainly non-calcareous parent materials	Till derived chiefly from granite	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite & Murvey Granite - non-porphyrific syenogranite; pink	No	No	No
G.P 3/5	2D-Resistivity 5m	Bridge structure, 30m depth required due to bedrock formation change (granite to limestone)	Made Ground, Soils derived from mainly calcareous and non calcareous parent materials	Made ground, Till derived from granites and karstified bedrock outcrop and subcrop	No	Partially Murvey Granite - non-porphyrific syenogranite; pink and moves into Visean Limestones- Undifferentiated limestome	No	No	No
G.P 3/6	2D-Resistivity 5m	Bridge structure, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	Soft Compressible Ground	Visean Limestones- Undifferentiated limestome	Yes	No	No

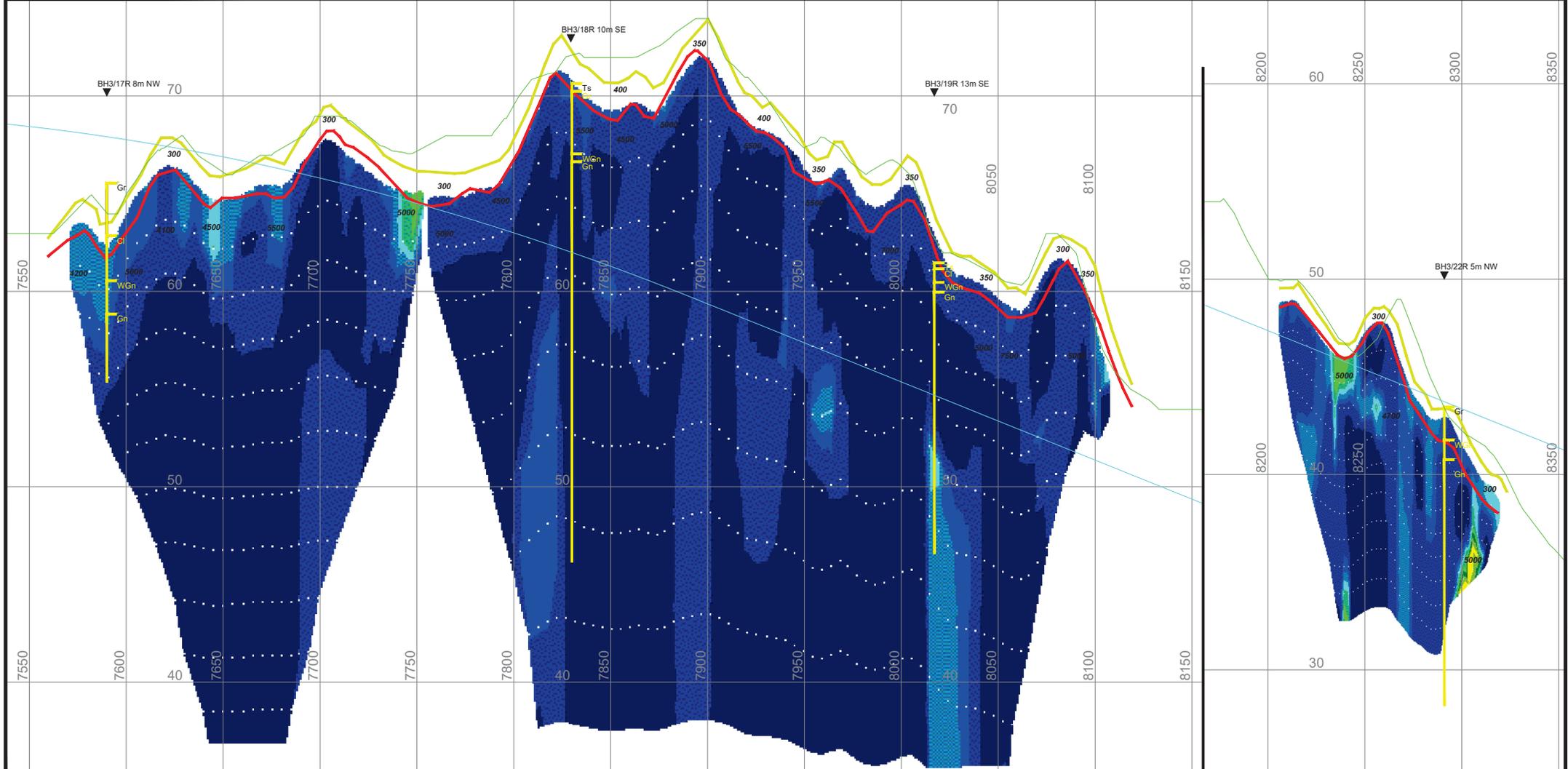
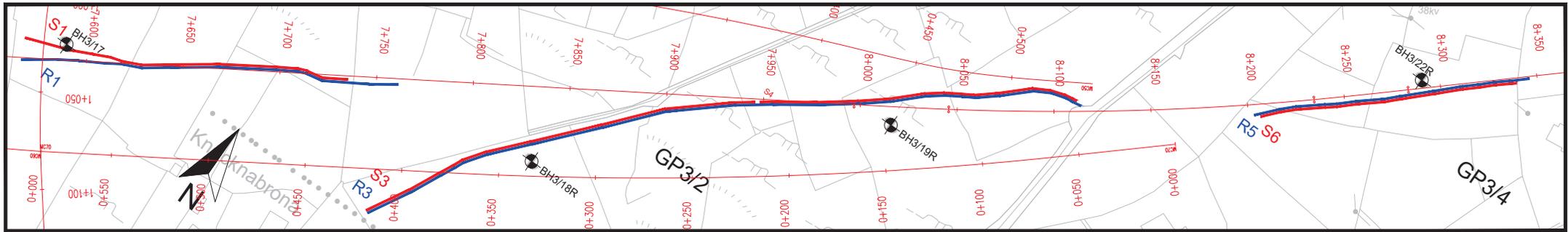
Table 2: Structure Locations and Geological Background

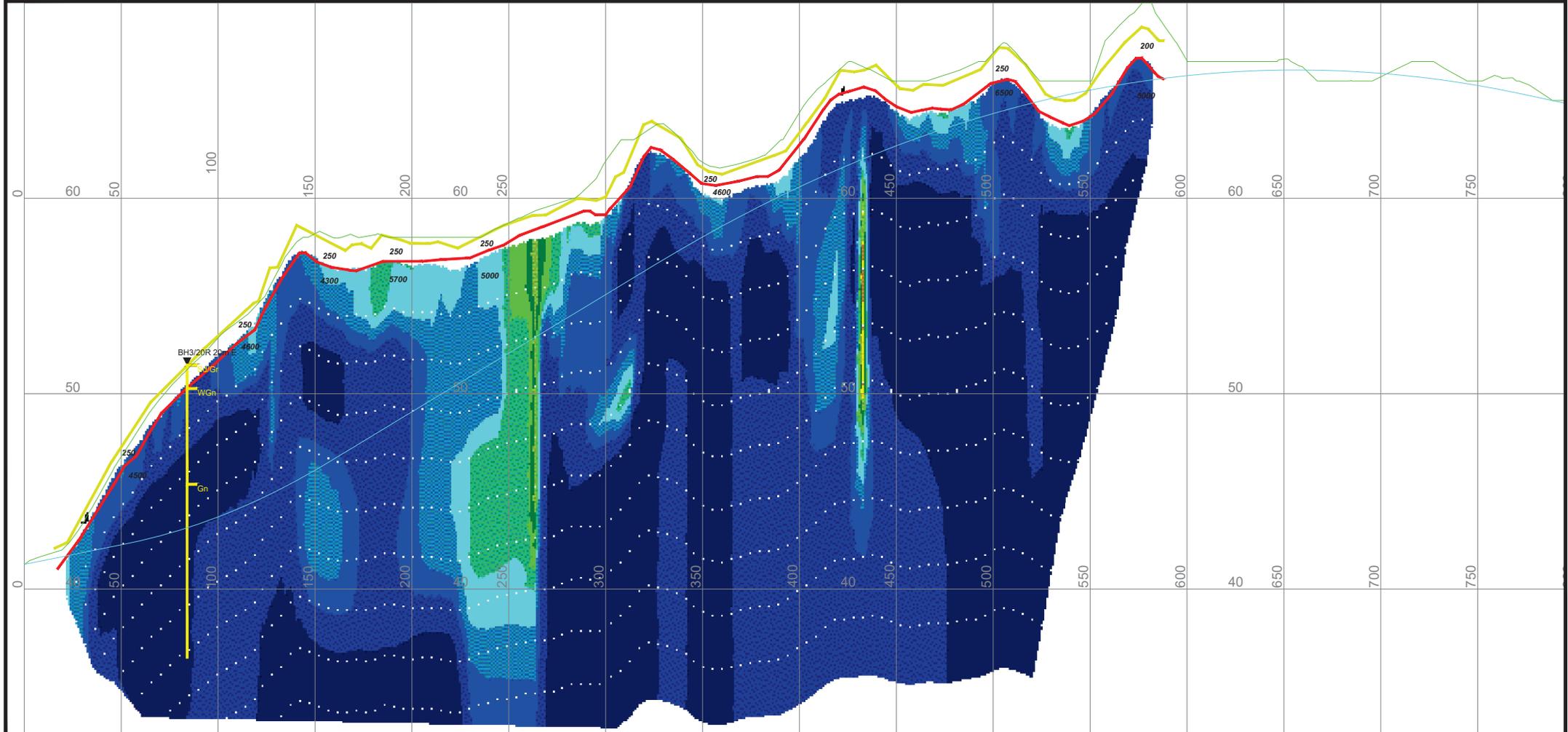
Geophysical Survey Area	Geophysical Method	Proposed Cut Depth/Design Feature	Soil	Subsoils	Soft Ground	Bedrock	Outcrop (Rock < 2m bgl)	Fractures/Faults	Karst Features
G.P 3/7	2D-Resistivity 5m & Seismic Refraction 3m	Viaduct structure, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/8	2D-Resistivity 5m	Lackagh Tunnel (21m below surface) 30m depth required	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/9	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 13.4m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/10	2D-Resistivity 5m	Embankment, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	Cut Peat	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/12	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.7m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	No	No	No
G.P 3/13	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.3m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	Yes	No	No

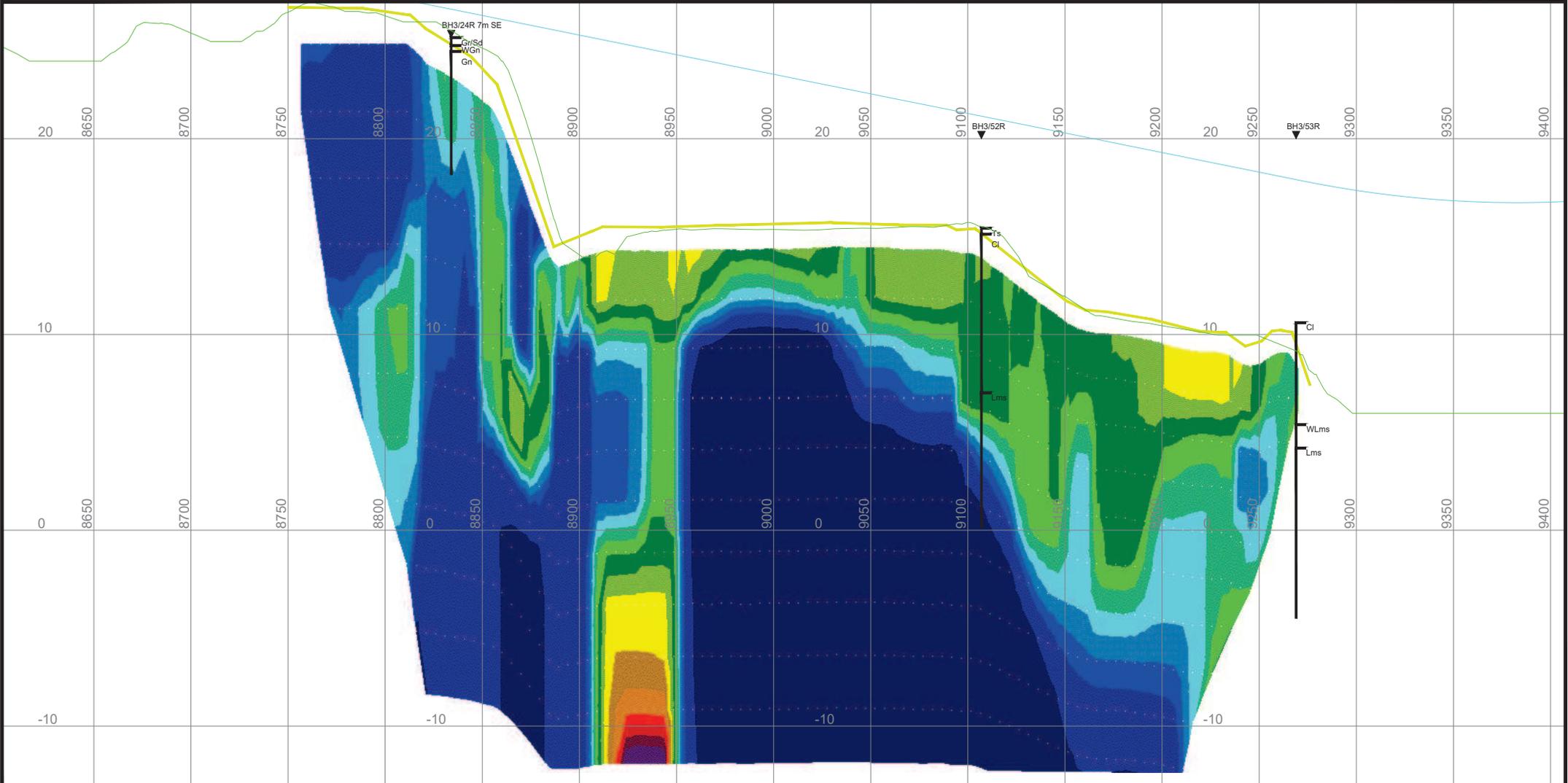
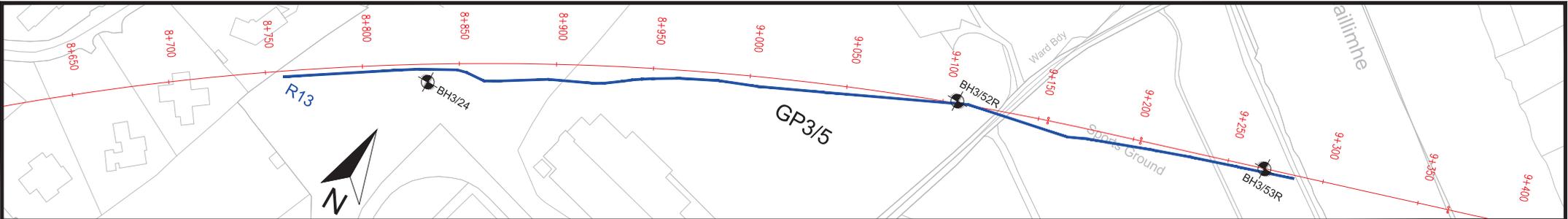
Table 2: Structure Locations and Geological Background

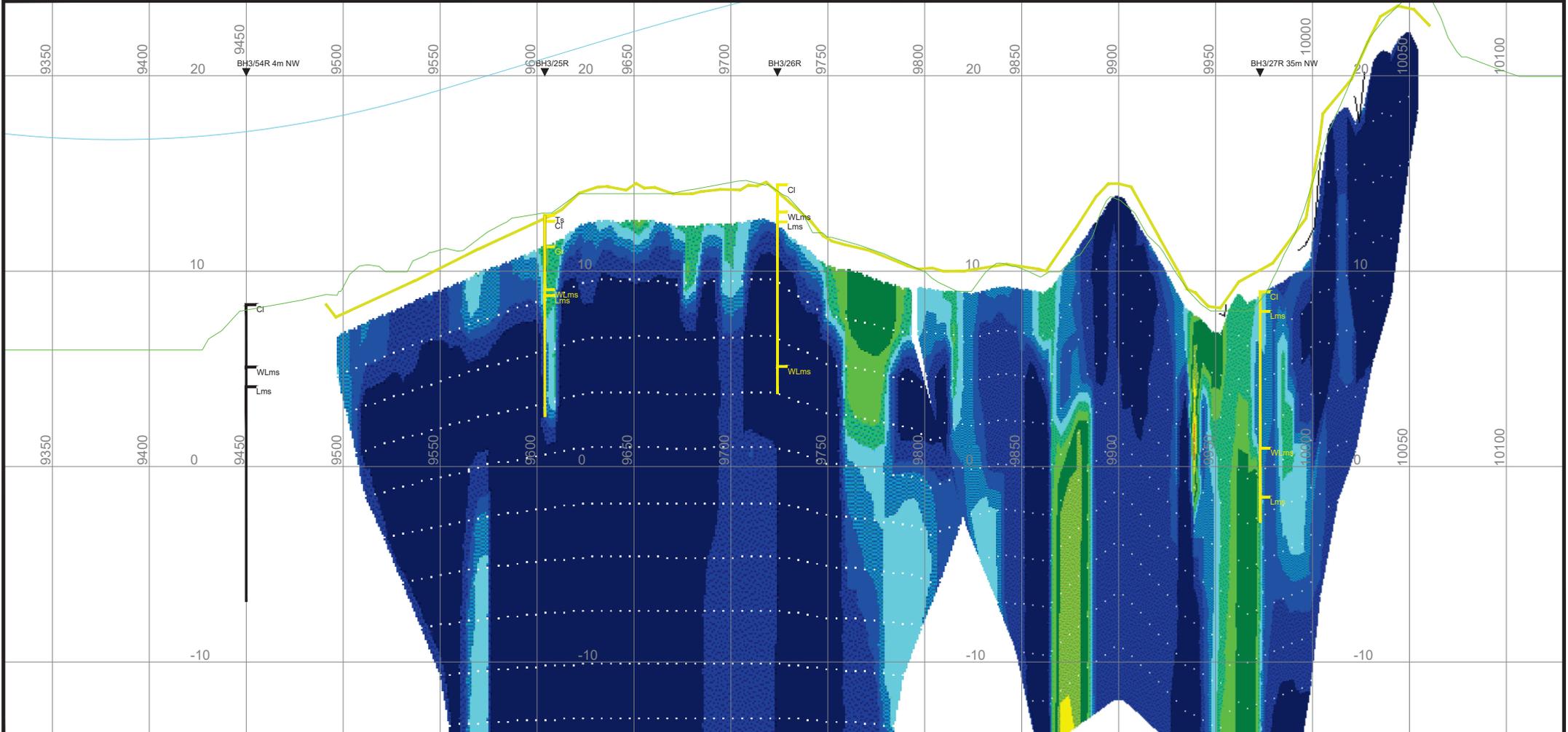
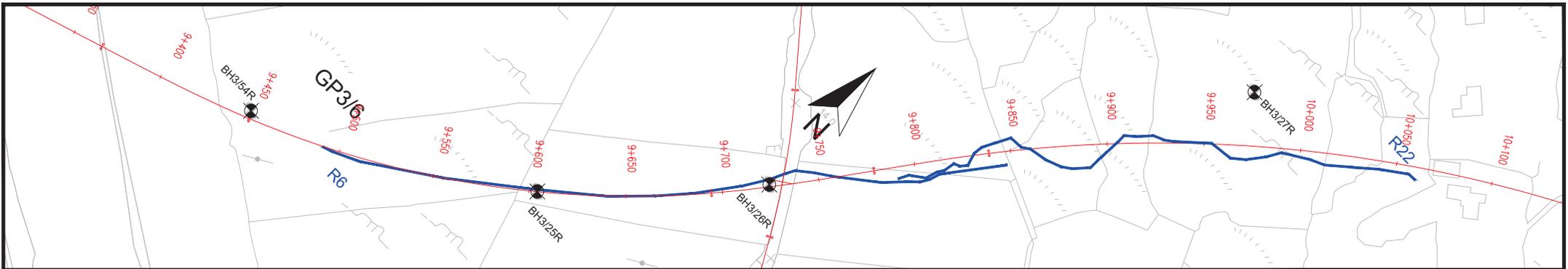
Geophysical Survey Area	Geophysical Method	Proposed Cut Depth/Design Feature	Soil	Subsoils	Soft Ground	Bedrock	Outcrop (Rock < 2m bgl)	Fractures/Faults	Karst Features
G.P 3/14	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 12.3m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/15	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.0m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/16	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.0m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/17	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.0m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones	No	Visean Limestones-Undifferentiated limestone	Yes	No	No
G.P 3/18	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 12.1m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	No	Visean Limestones-Undifferentiated limestone	No	No	No

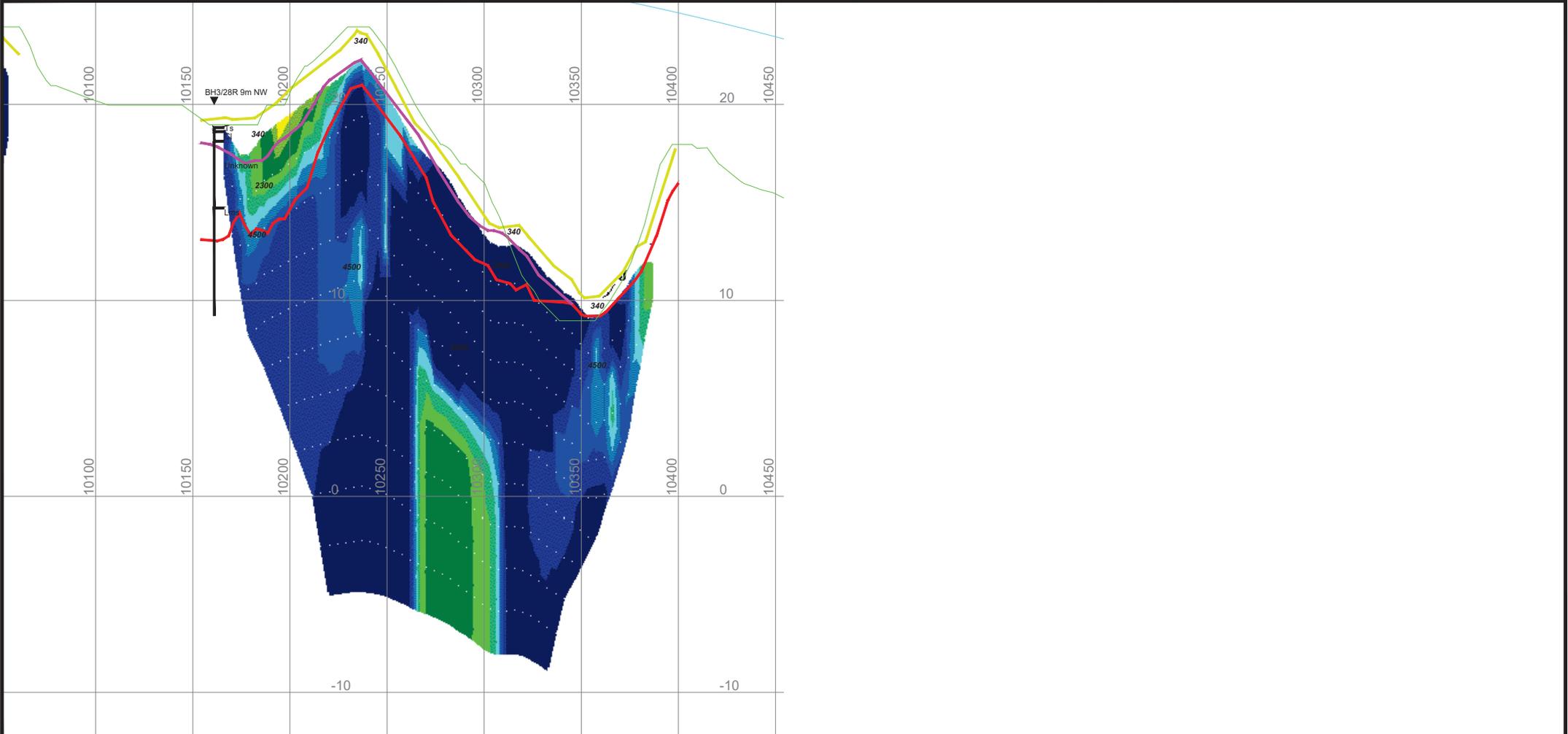












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Web: www.mgx.ie

CLIENT: IGSL
ARUP
PROJECT: N6 GCTP Phase 3
Geophysical Survey
TITLE: Plan I.F. Survey Locations and
Models for GP317

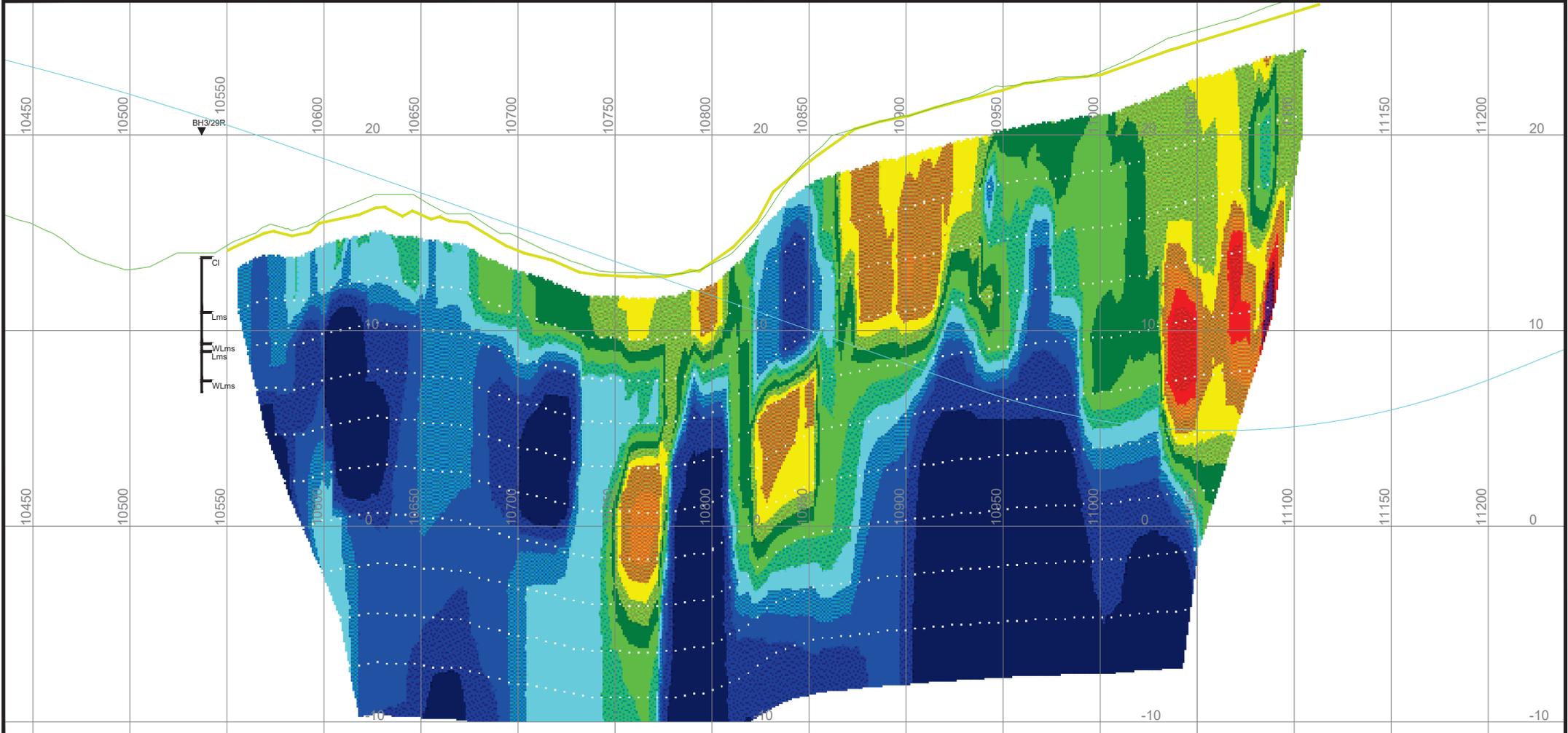
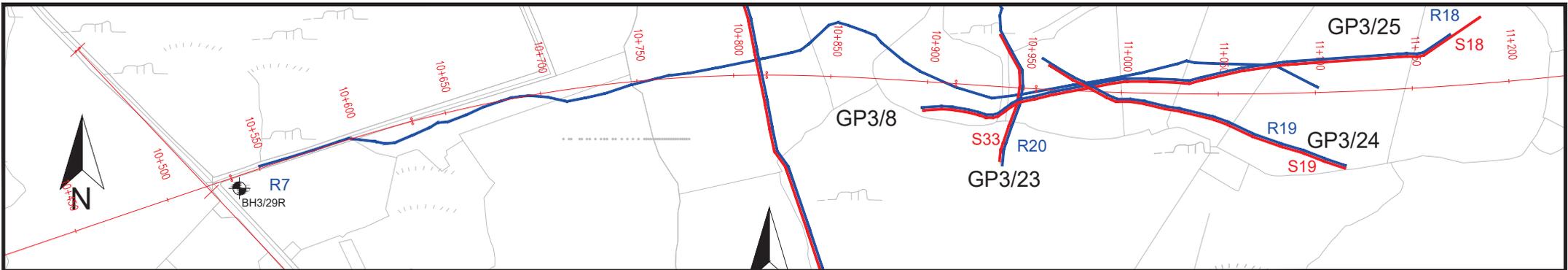
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PROJECT: 6651
DRAWN: RJ
DATE: 18/01/2016
MGX FILE: 6651_GPlan.dwg
STATUS: Final

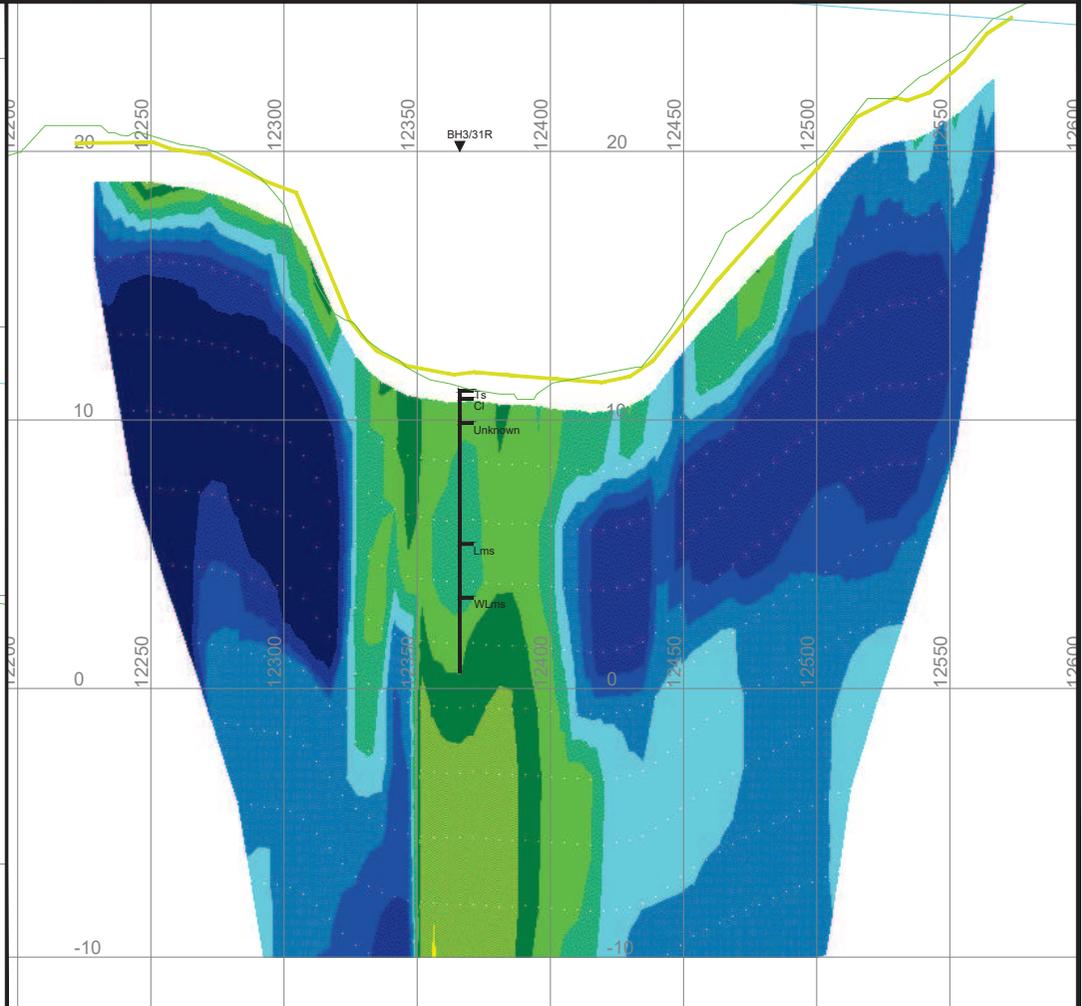
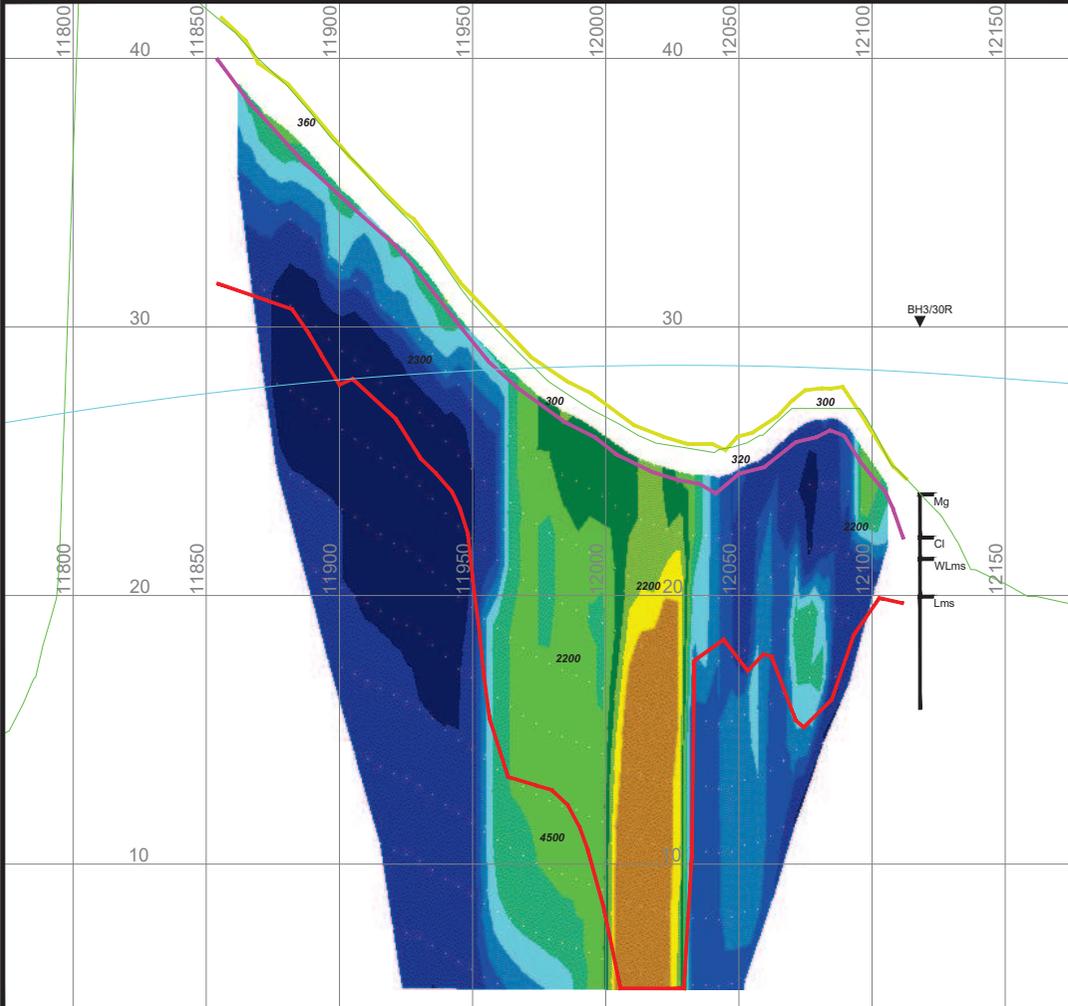
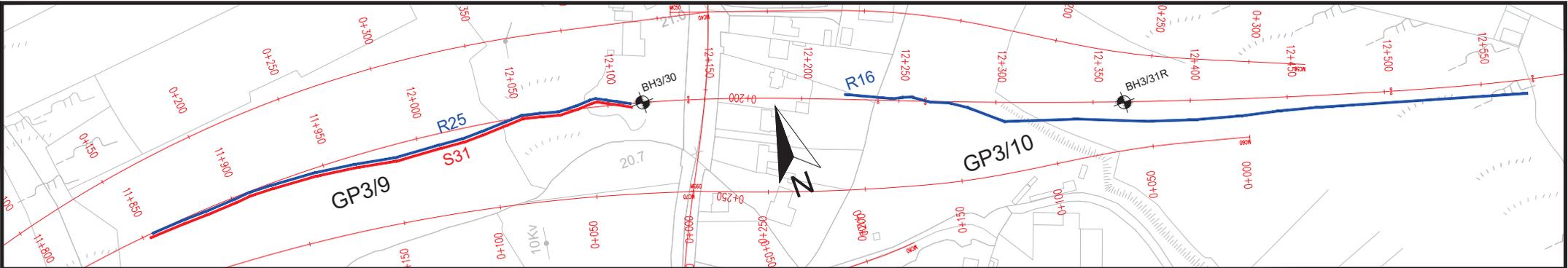
Legend:
Geophysical Survey Locations:
R2 2D-Resistivity Profile
S1 Seismic Refraction Profile
Geophysical Survey Locations:
Ground Surface along Survey Profile
Existing Ground Level along Centre Line
Proposed Vertical Alignment Centre Line
2D Resistivity and Seismic Refraction results are projected onto the Centre Line
Changes based on Alignment received 12.02.2016
Locations are in Irish Transverse Mercator. Elevations are in mOD (Belfast Head)

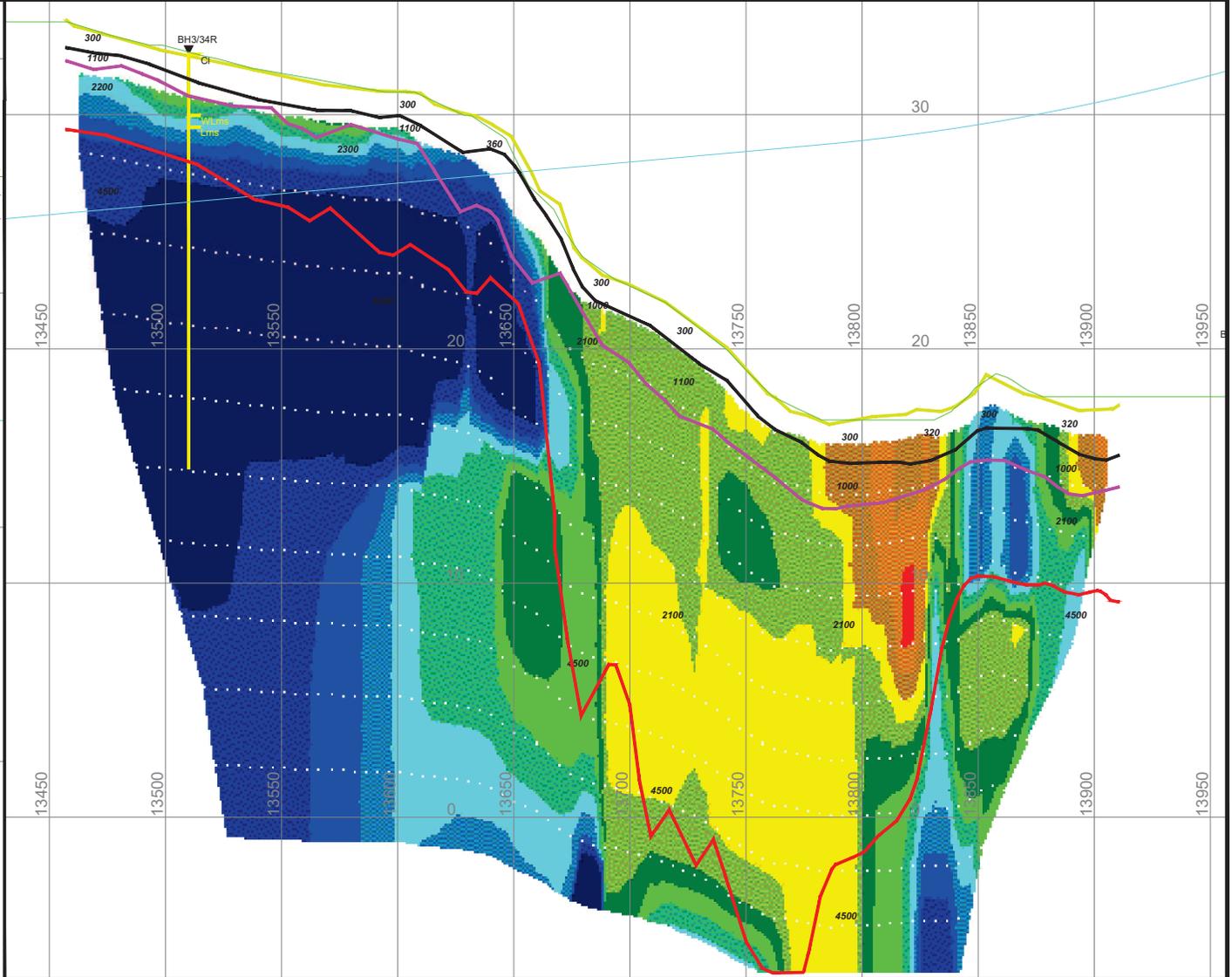
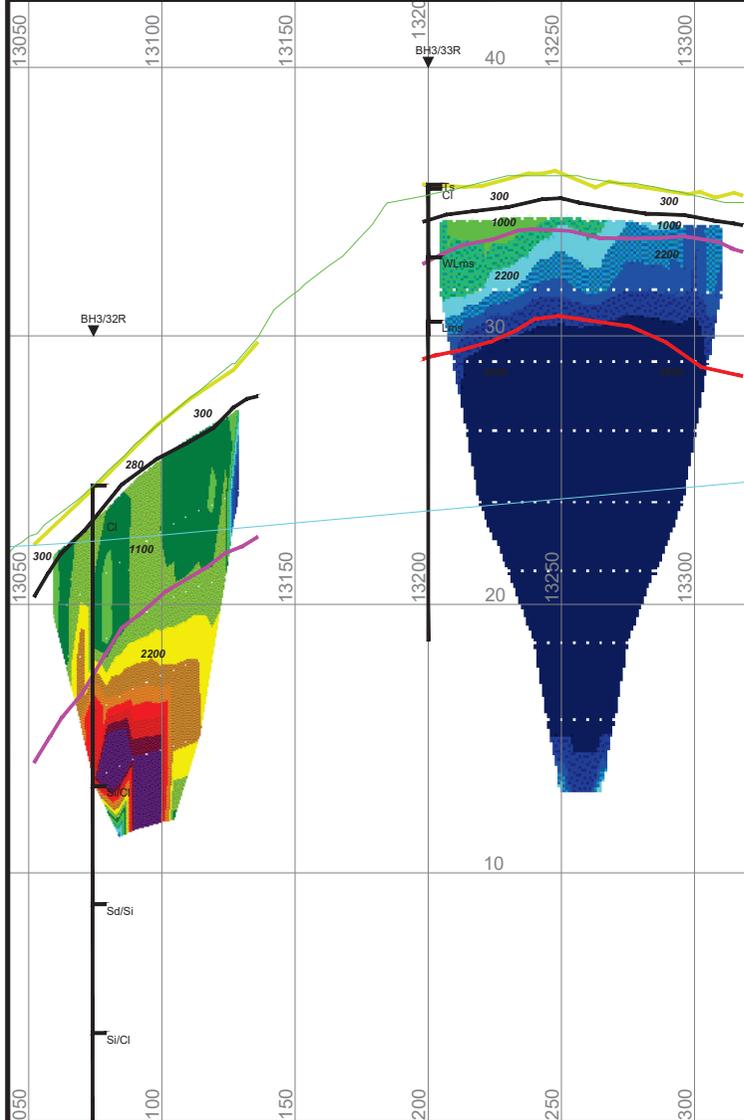
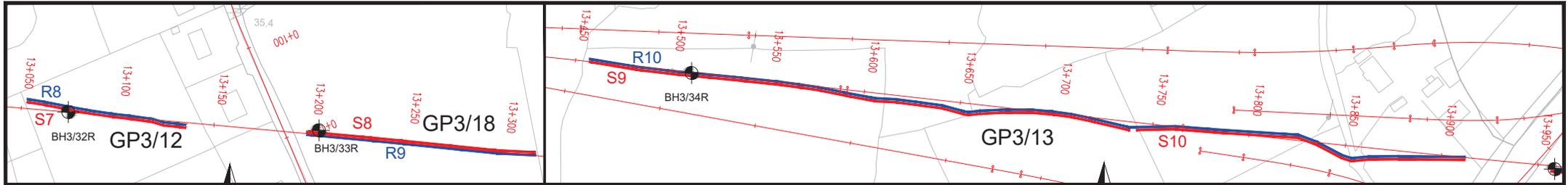
Layers from Seismic Refraction Model:
Ground Surface/Top of Layer 1 (200 - 340 m/s)
Top of Layer 2 (800 - 1200 m/s)
Top of Layer 3 (2000 - 2400 m/s)
Top of Layer 4 (4000 - 5000 m/s)
1800 Seismic Velocity in m/s

2D-Resistivity Model Values:
Resistivities (Ohm) for 2D-Resistivity Model
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000 5100 5200 5300 5400 5500 5600 5700 5800 5900 6000 6100 6200 6300 6400 6500 6600 6700 6800 6900 7000 7100 7200 7300 7400 7500 7600 7700 7800 7900 8000 8100 8200 8300 8400 8500 8600 8700 8800 8900 9000 9100 9200 9300 9400 9500 9600 9700 9800 9900 10000

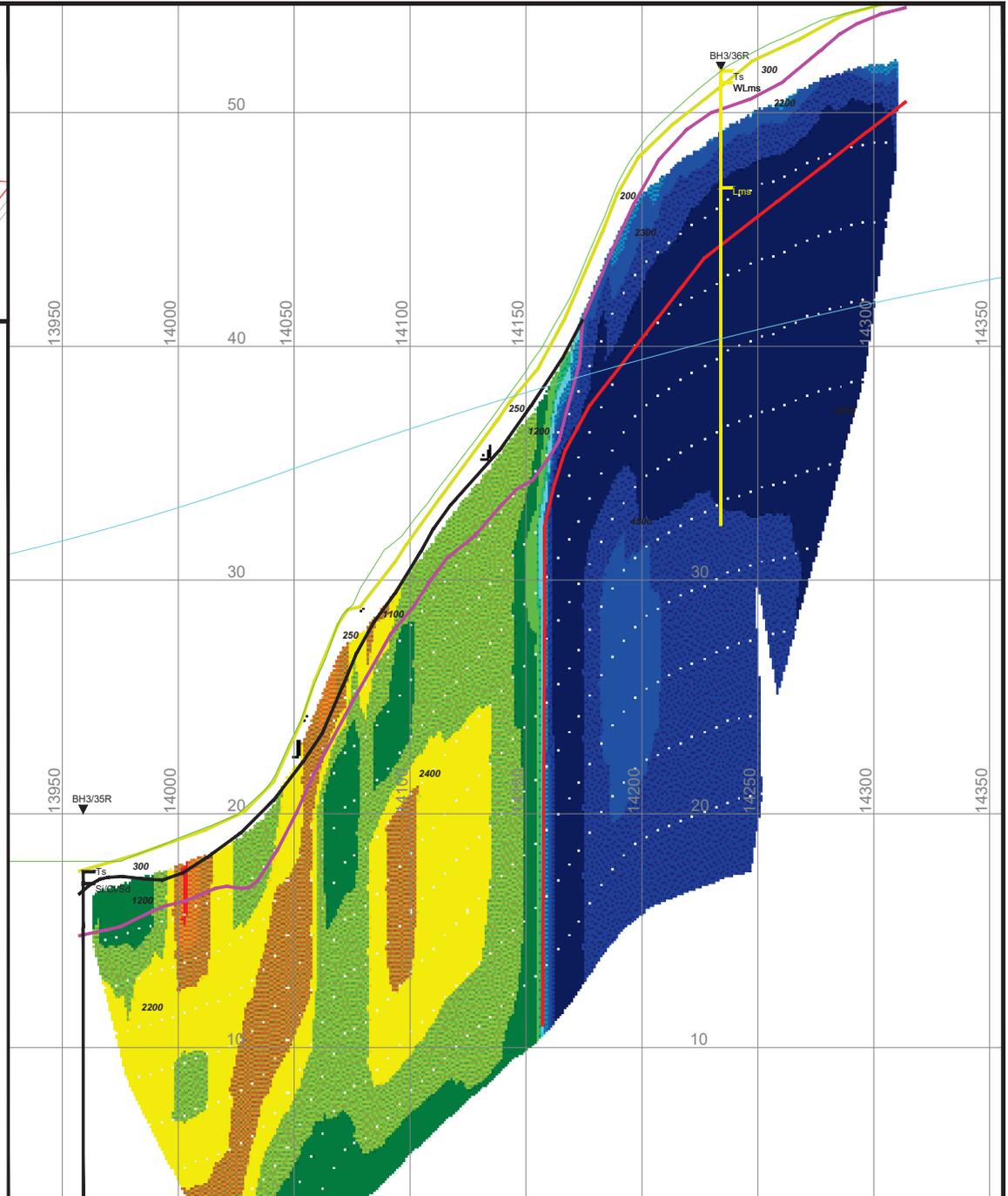
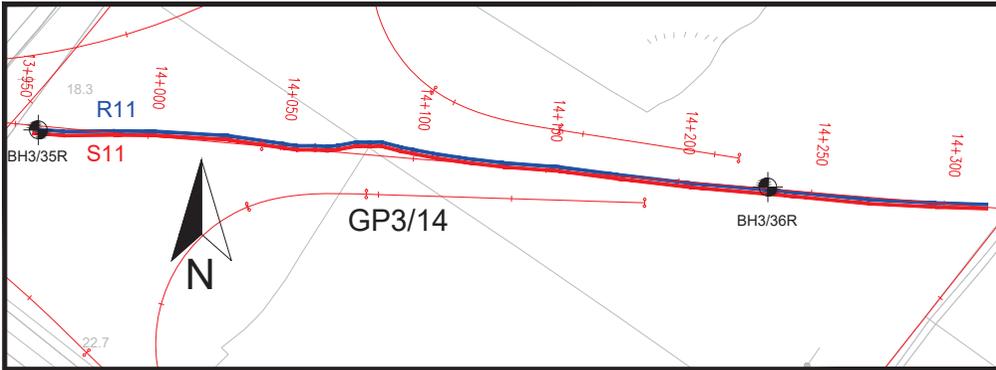
Abbreviated GI Logs:
BH3/18R Borehole Name and Location
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Cl Clay Lms Limestone
Ts Topsoil Wlms Weathered Limestone
Mg Made Ground Gn Granite
Gr Gravel WGr Weathered Granite
Sd Sand

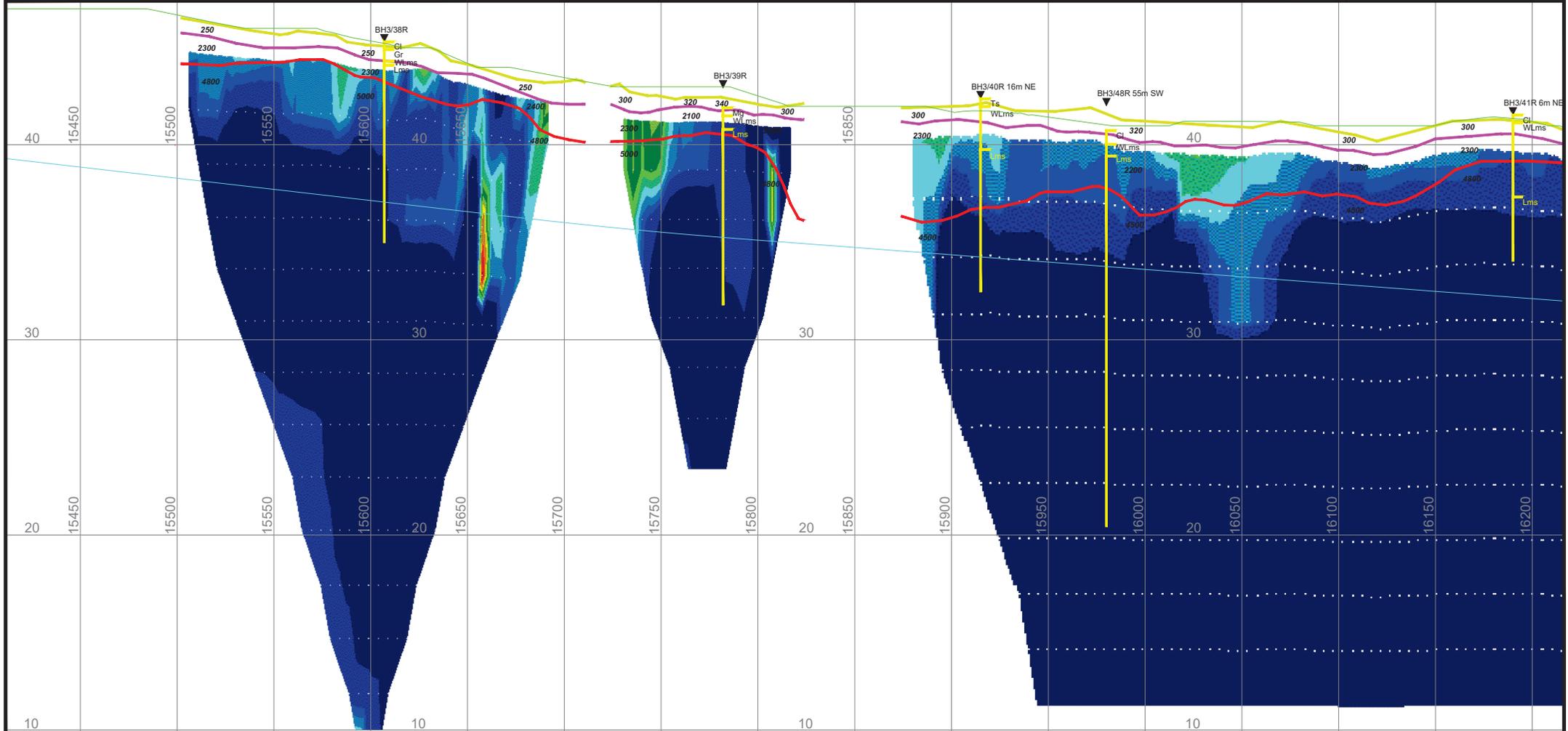
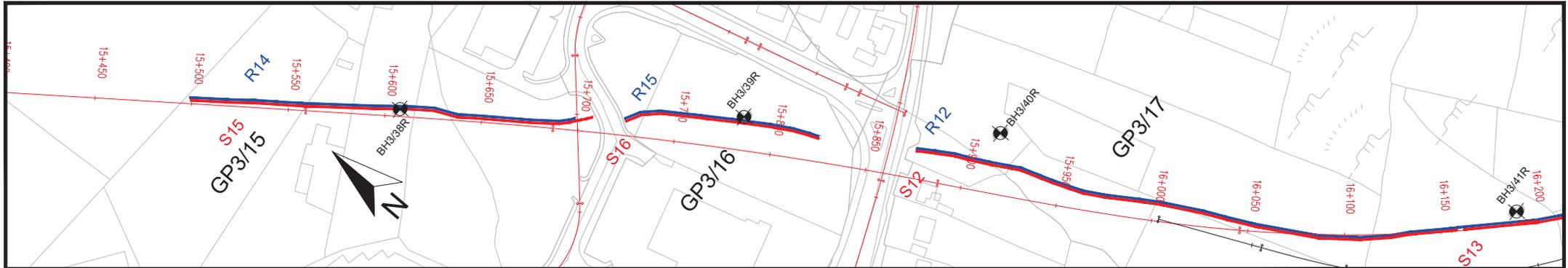


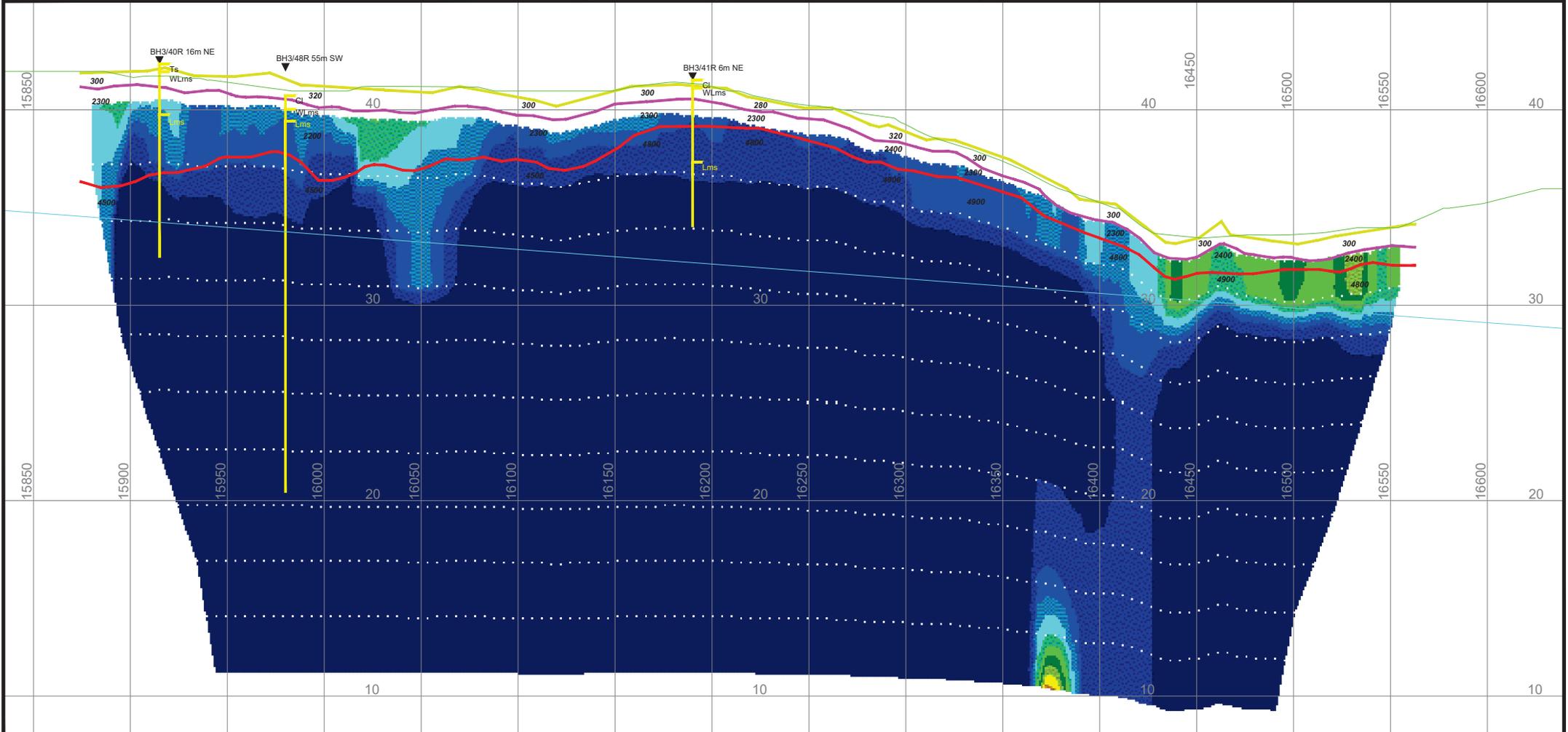
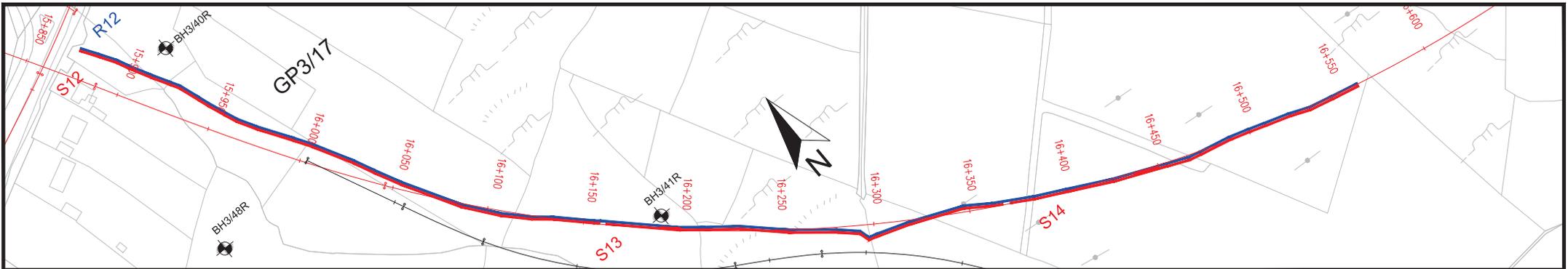


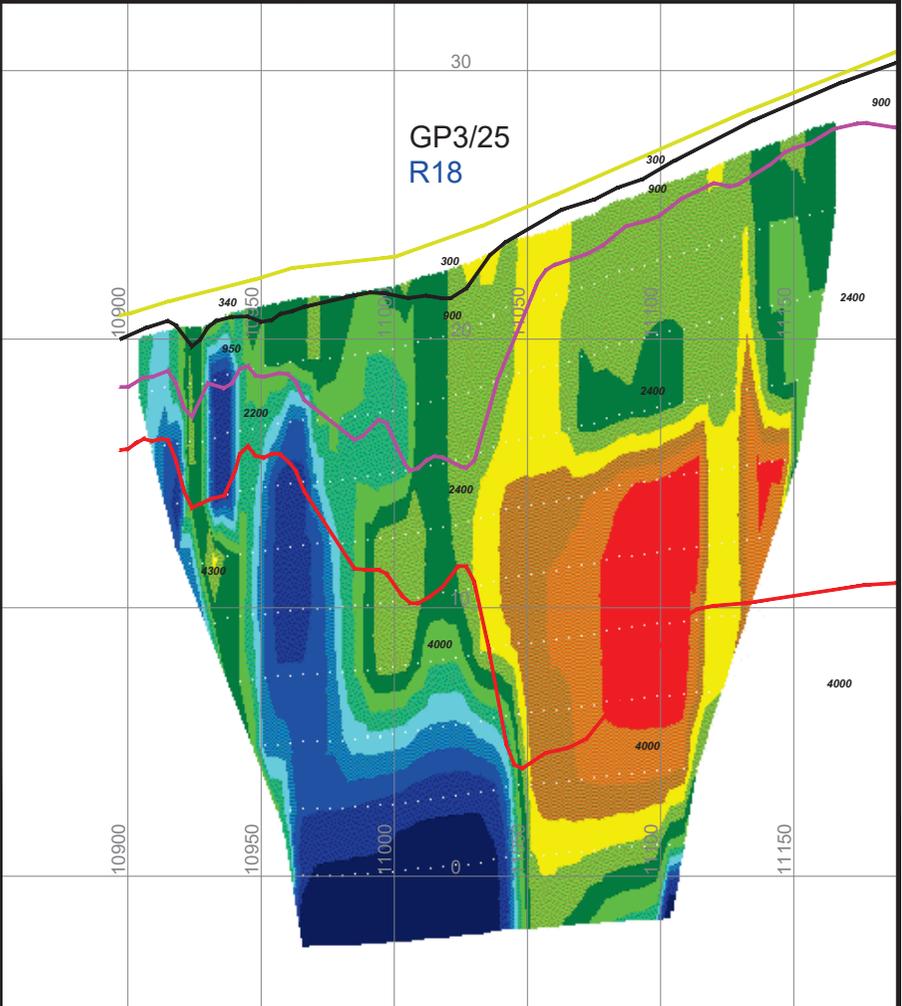
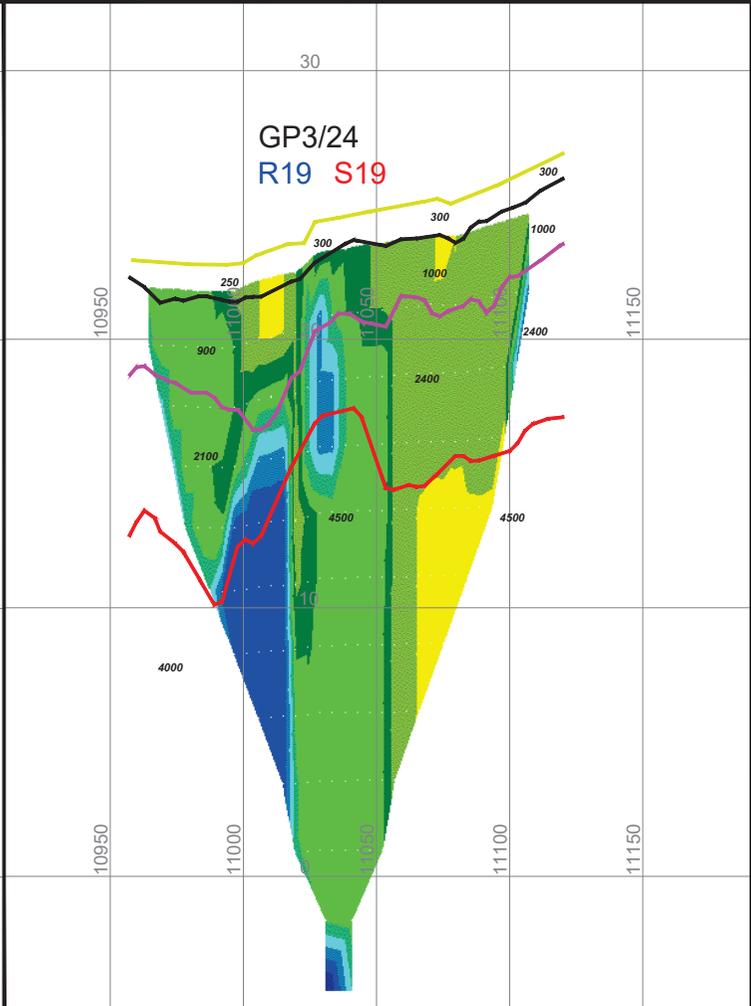
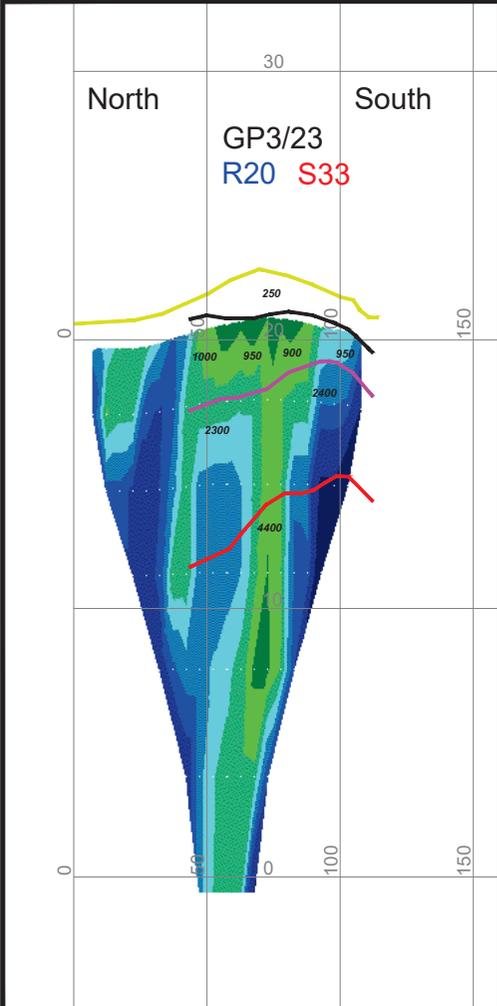
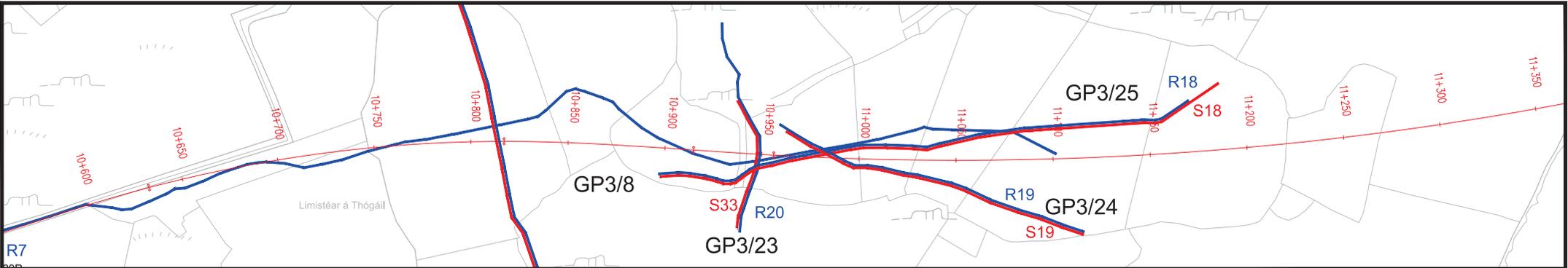


<p>Unit 14, Maynooth Business Campus Maynooth, Co. Kildare Tel: 001 853 0030 Fax: 011 853 0033 Email: info@mgp.ie Web: www.mgp.ie</p>	<p>CLIENT: IGSL ARUP</p>	<p>SCALE: Hor 1:1000 @ A1, Ver 1:100 @ A1, VE x 10</p>	<p>LEGEND:</p> <ul style="list-style-type: none"> R2 2D-Resistivity Profile S1 Seismic Refraction Profile 	<p>Geophysical Survey Locations:</p> <ul style="list-style-type: none"> Ground Surface along Survey Profile Existing Ground Level along Centre Line Proposed Vertical Alignment Centre Line <p>2D Resistivity and Seismic Refraction results are projected onto the Centre Line</p>	<p>Layers from Seismic Refraction Model:</p> <ul style="list-style-type: none"> Ground Surface/Top of Layer 1 (200 - 340 m/s) Top of Layer 2 (800 - 1200 m/s) Top of Layer 3 (2000 - 2400 m/s) Top of Layer 4 (4000 - 5000 m/s) <p>1800 Seismic Velocity in m/s</p>	<p>2D-Resistivity Model Values:</p> <p>Resistivities (Ohm) for 2D-Resistivity Model</p>	<p>Abbreviated GI Logs:</p> <p>BH3/18R Borehole Name and Location</p> <table border="1"> <tr> <td>Pr</td><td>Peat</td><td>Sl</td><td>Silt</td></tr> <tr> <td>Cl</td><td>Clay</td><td>Lms</td><td>Limestone</td></tr> <tr> <td>Ts</td><td>Topsoil</td><td>Wlms</td><td>Weathered Limestone</td></tr> <tr> <td>Mg</td><td>Made Ground</td><td>Gn</td><td>Granite</td></tr> <tr> <td>Gr</td><td>Gravel</td><td>WGr</td><td>Weathered Granite</td></tr> <tr> <td>Sd</td><td>Sand</td><td></td><td></td></tr> </table>	Pr	Peat	Sl	Silt	Cl	Clay	Lms	Limestone	Ts	Topsoil	Wlms	Weathered Limestone	Mg	Made Ground	Gn	Granite	Gr	Gravel	WGr	Weathered Granite	Sd	Sand		
	Pr	Peat	Sl	Silt																											
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Sd	Sand																														
<p>PROJECT: N6 GCTP Phase 3 Geophysical Survey</p>	<p>DATE: 18/01/2016</p>	<p>PROJECT: 6651</p>	<p>DRAWN: RJ</p>	<p>MCX FILE: 6651C_Plan.dwg</p>	<p>STATIST: Final</p>	<p>Change based on Alignment received 12.02.2016</p> <p>Locations are in 10m Transverse Meters. Elevations are in mOD (Banks Head)</p>																									
<p>TITLE: Plan 1: Survey Locations and Models for GP3/12, GP3/18, GP3/13</p>																															

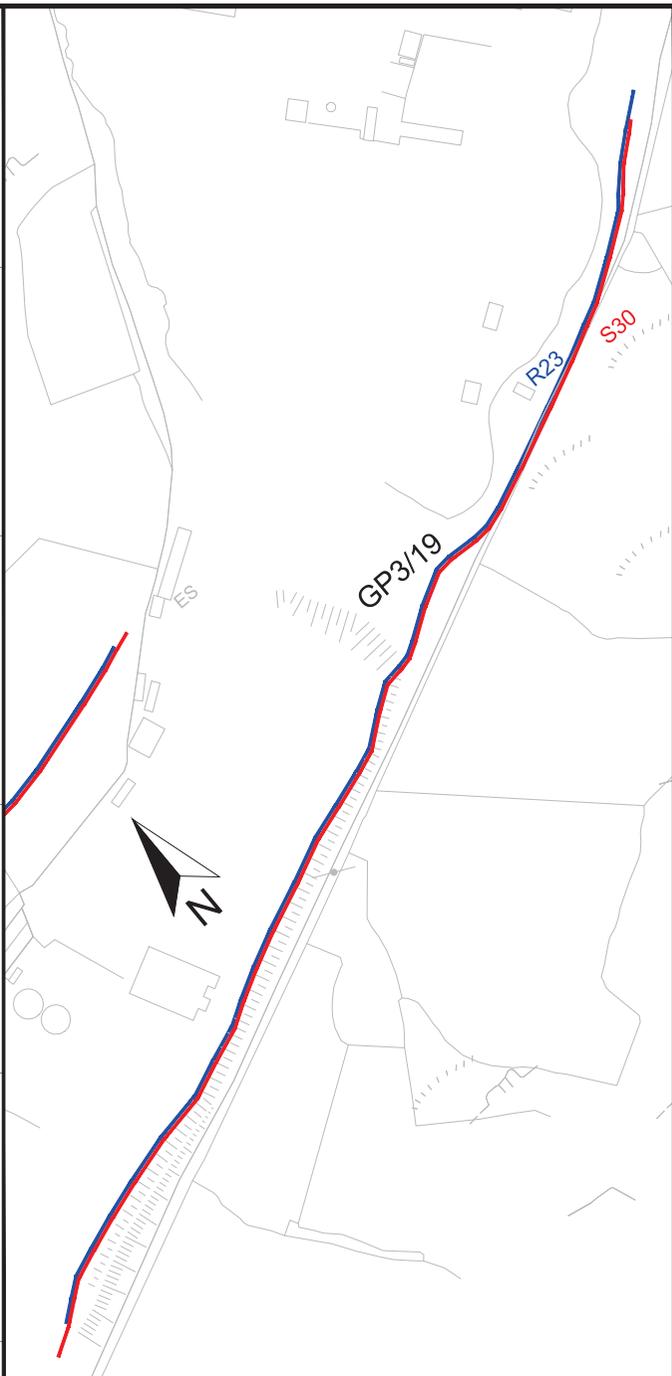
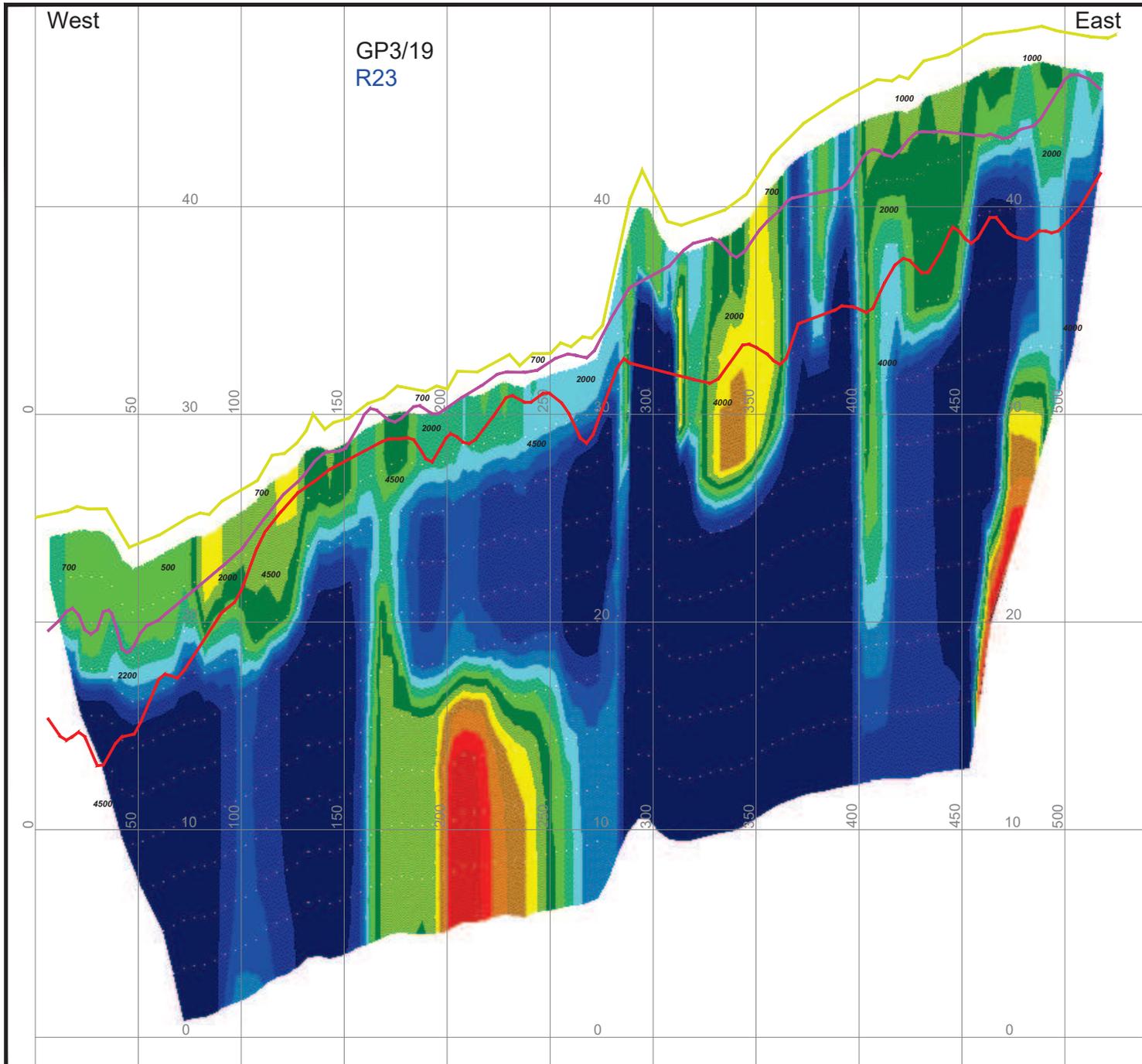








<p>Unit F4, Maynooth Business Campus Maynooth, Co. Kildare Tel: 001 85310030 Fax: 011 85310033 Email: info@mgp.ie Web: www.mgp.ie</p>	CLIENT	IGSL ARUP	SCALE:	Hor 1:1000 @ A1, Ver 1:100 @ A1, VE x 10	LEGEND <p>Geophysical Survey Locations: R2 2D-Resistivity Profile S1 Seismic Refraction Profile</p> <p>Geophysical Survey Locations: Ground Surface along Survey Profile Existing Ground Level along Centre Line Proposed Vertical Alignment Centre Line</p> <p>Layers from Seismic Refraction Model: Ground Surface/Top of Layer 1 (200 - 340 m/s) Top of Layer 2 (800 - 1200 m/s) Top of Layer 3 (2000 - 2400 m/s) Top of Layer 4 (4000 - 5000 m/s)</p> <p>2D-Resistivity Model Values: </p>																							
	PROJECT	N6 GCTP Phase 3 Geophysical Survey	PROBECT:	6651																								
	DRAWN:	RJ	DATE:	18/01/2016																								
	MGX FILE:	6651C_Plan.dwg	STATIS:	Final																								
TITLE	Plan 1m: Survey Locations and Models for GP3/23, GP3/24, GP3/25	<p>Abbreviated GI Logs: BH3/18R Borehole Name and Location</p> <table border="1"> <tr> <td>Pr</td><td>Peat</td><td>Sl</td><td>Silt</td></tr> <tr> <td>C</td><td>Clay</td><td>Li</td><td>Limestone</td></tr> <tr> <td>Ts</td><td>Topsoil</td><td>WLi</td><td>Weathered Limestone</td></tr> <tr> <td>Mg</td><td>Made Ground</td><td>Gn</td><td>Granite</td></tr> <tr> <td>Gr</td><td>Gravel</td><td>WGr</td><td>Weathered Granite</td></tr> <tr> <td>Sd</td><td>Sand</td><td></td><td></td></tr> </table>			Pr	Peat	Sl	Silt	C	Clay	Li	Limestone	Ts	Topsoil	WLi	Weathered Limestone	Mg	Made Ground	Gn	Granite	Gr	Gravel	WGr	Weathered Granite	Sd	Sand		
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CLIENT: IGSL
ARUP
PROJECT: N6 GCTP Phase 3
Geophysical Survey
TITLE: Plan In: Survey Locations and
Models for GP3/19

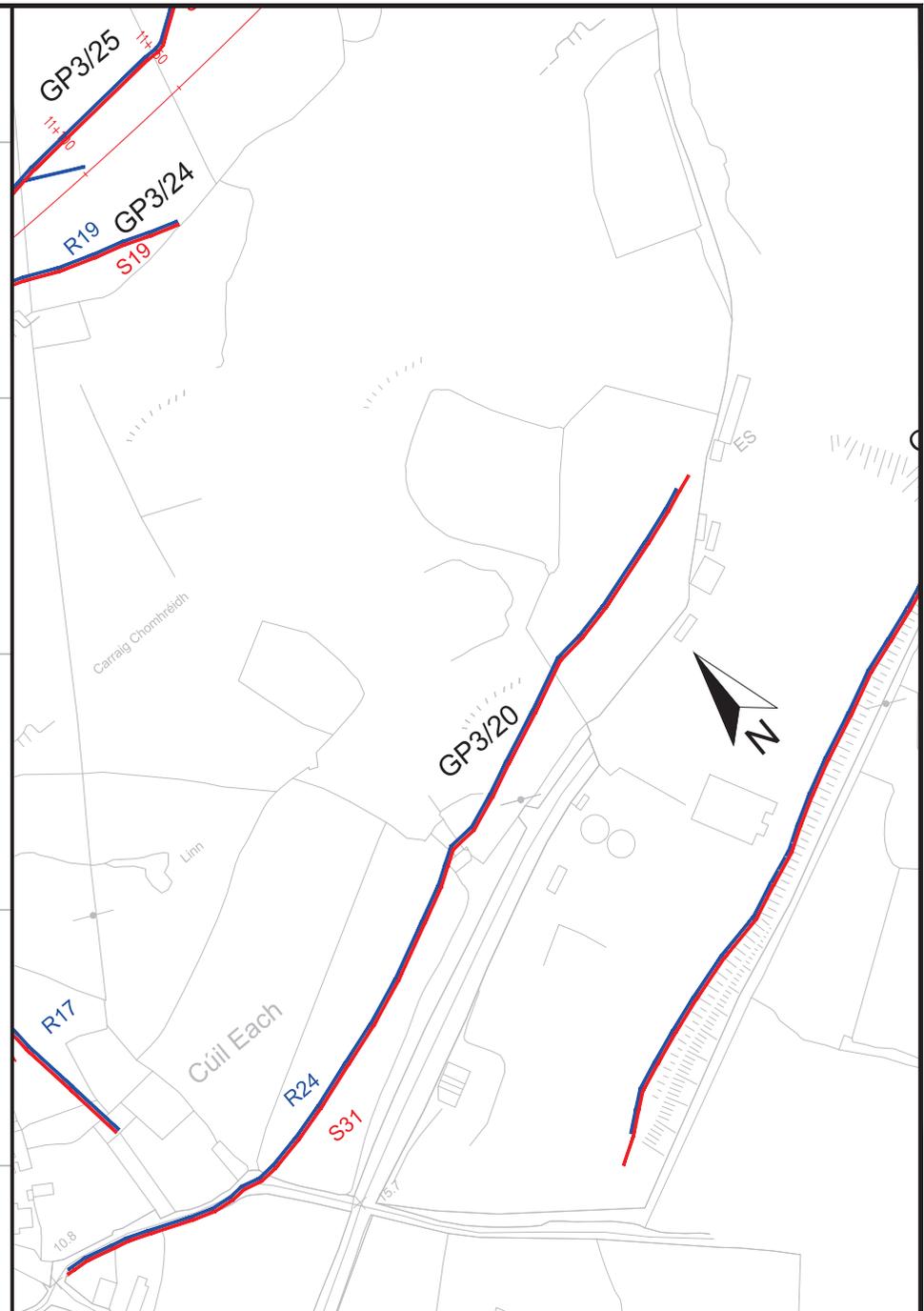
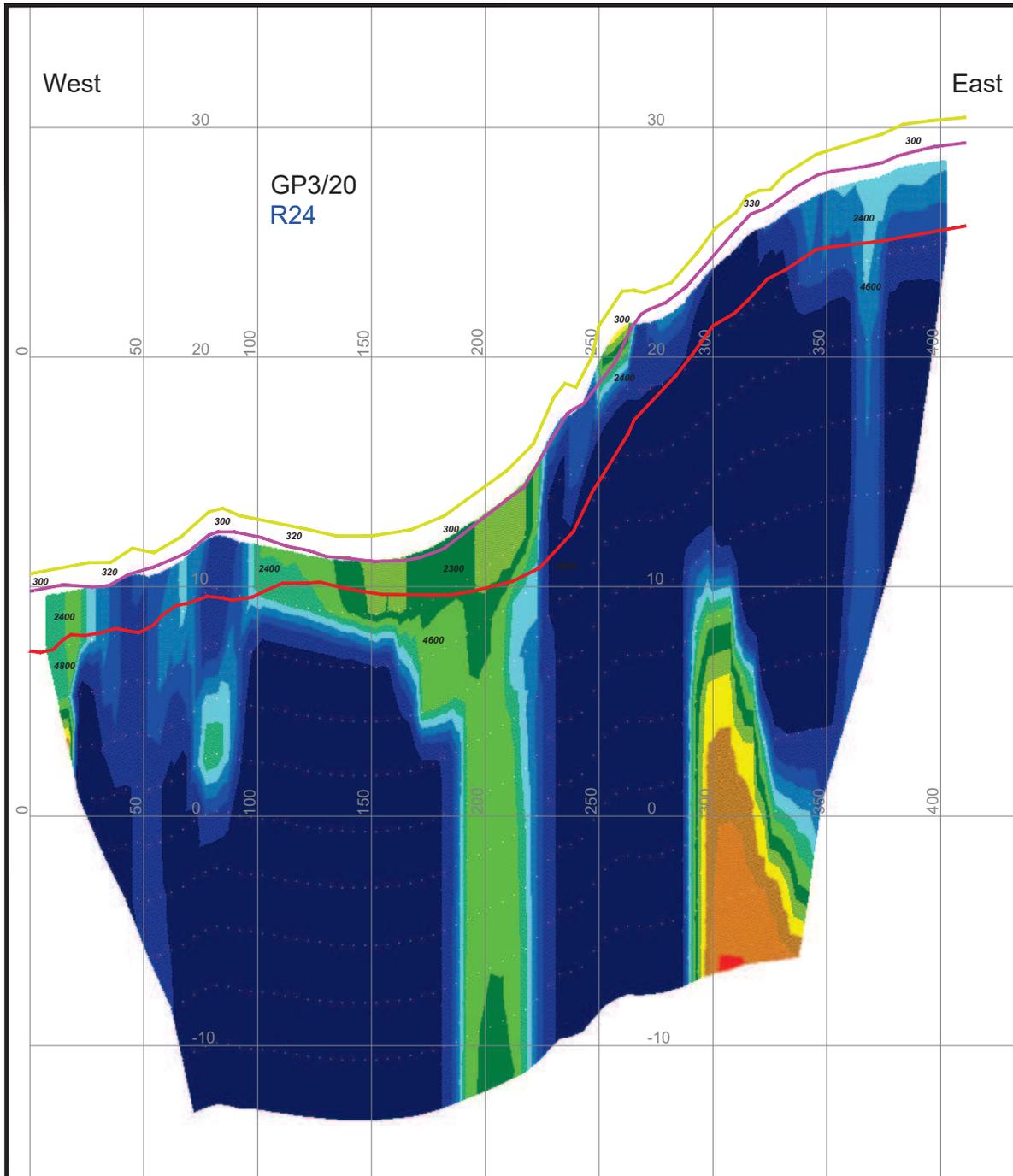
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PROJECT: 6651
DRAWN: RJ
DATE: 18/01/2016
MGS FILE: 6651C_Plan.dwg
STATUS: Final

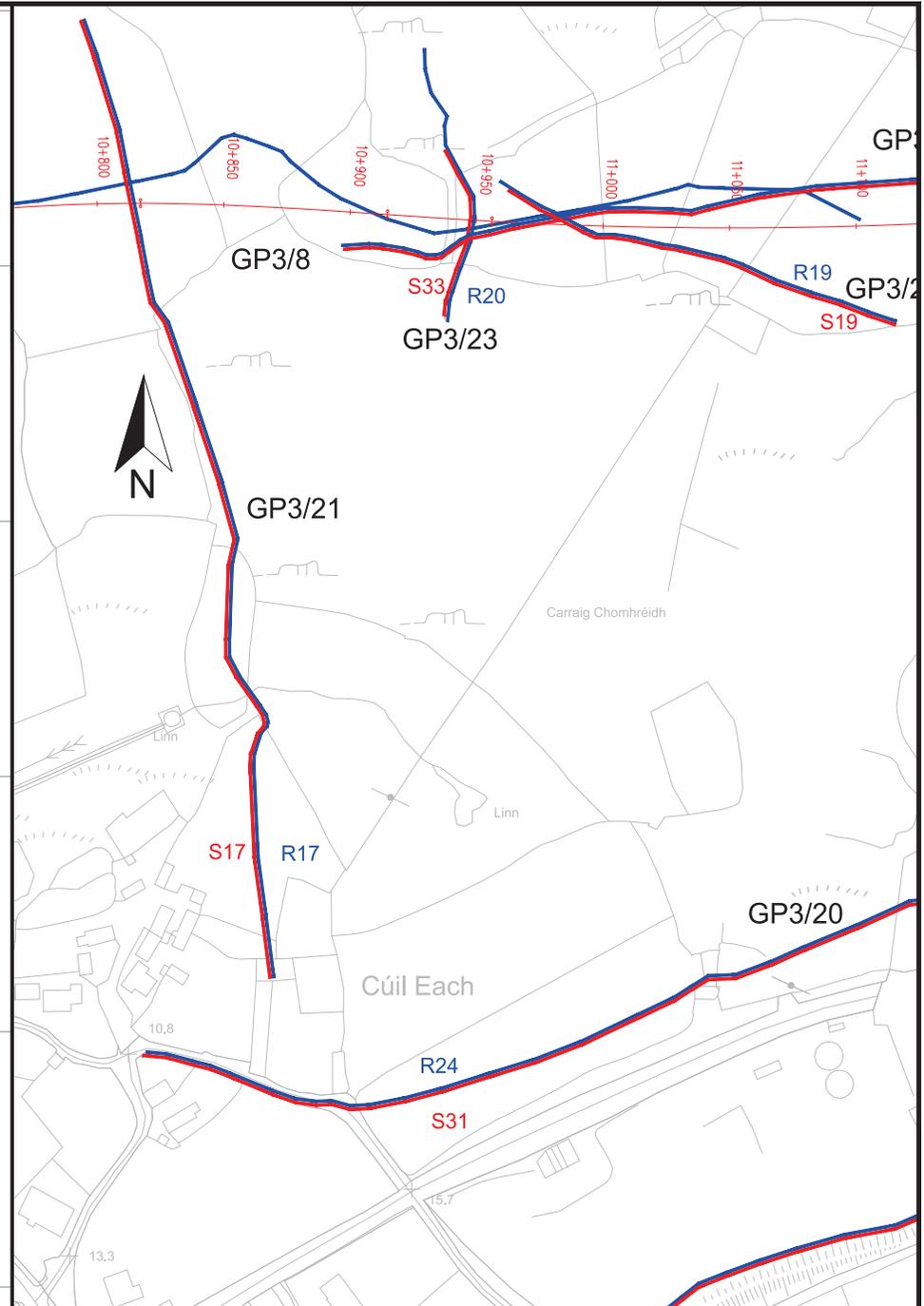
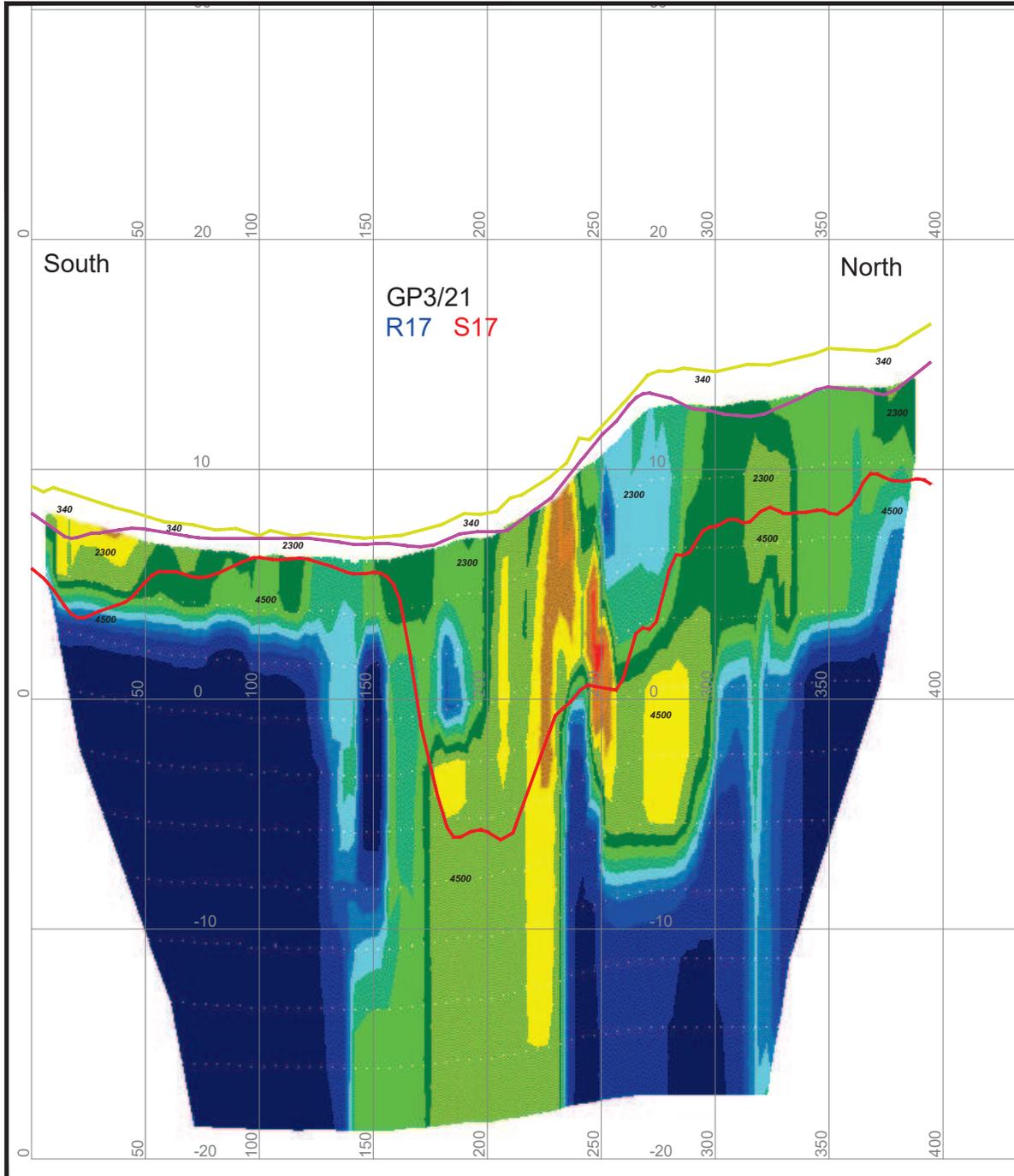
LEGEND
Geophysical Survey Locations:
R2 2D-Resistivity Profile
S1 Seismic Refraction Profile
Geophysical Survey Locations:
Ground Surface along Survey Profile
Existing Ground Level along Centre Line
Proposed Vertical Alignment Centre Line
2D Resistivity and Seismic Refraction results are
projected onto the Centre Line
Changes based on Alignment received 12.02.2016
Locations are to N60 Transverse Meridian. Elevations are to MGD (Bath. Head)

Layers from Seismic Refraction Model:
Ground Surface/Top of Layer 1 (200 - 340 m/s)
Top of Layer 2 (600 - 1200 m/s)
Top of Layer 3 (2000 - 2400 m/s)
Top of Layer 4 (4000 - 5000 m/s)
1800 Seismic Velocity in m/s

2D-Resistivity Model Values:
Resistivities (Ohm-m) for 2D-Resistivity Model
700 2000 4000 4500

Abbreviated GI Logs:
BH3/18R Borehole Name and Location
Pt Peat Si Silt
Cl Clay Lms Limestone
Ts Topsoil Wlms Weathered Limestone
Mg Made Ground Gn Granite
Gr Gravel WGr Weathered Granite
Sd Sand





<p>Unit F4, Mayoosh Business Campus Maynooth, Co. Kildare Tel: 001 853 0030 Fax: 011 653 0033 Email: info@minerex.ie Web: www.minerex.ie</p>	CLIENT	IGSL ARUP	SCALE:	Hor 1:1000 @ A1, Ver 1:100 @ A1, VE x 10
	PROJECT	N6 GCTP Phase 3 Geophysical Survey	PROBECT:	6631
			DRAWN:	RJ
			DATE:	18/06/2016
TITLE	Plan / p: Survey Locations and Models for GP3/21		MCX FILE:	6631C_Plan.dwg
			STATUS:	Final

Legend:	
— R2	2D-Resistivity Profile
— S1	Seismic Refraction Profile

Geophysical Survey Locations:	
—	Ground Surface along Survey Profile
—	Existing Ground Level along Centre Line
—	Proposed Vertical Alignment Centre Line

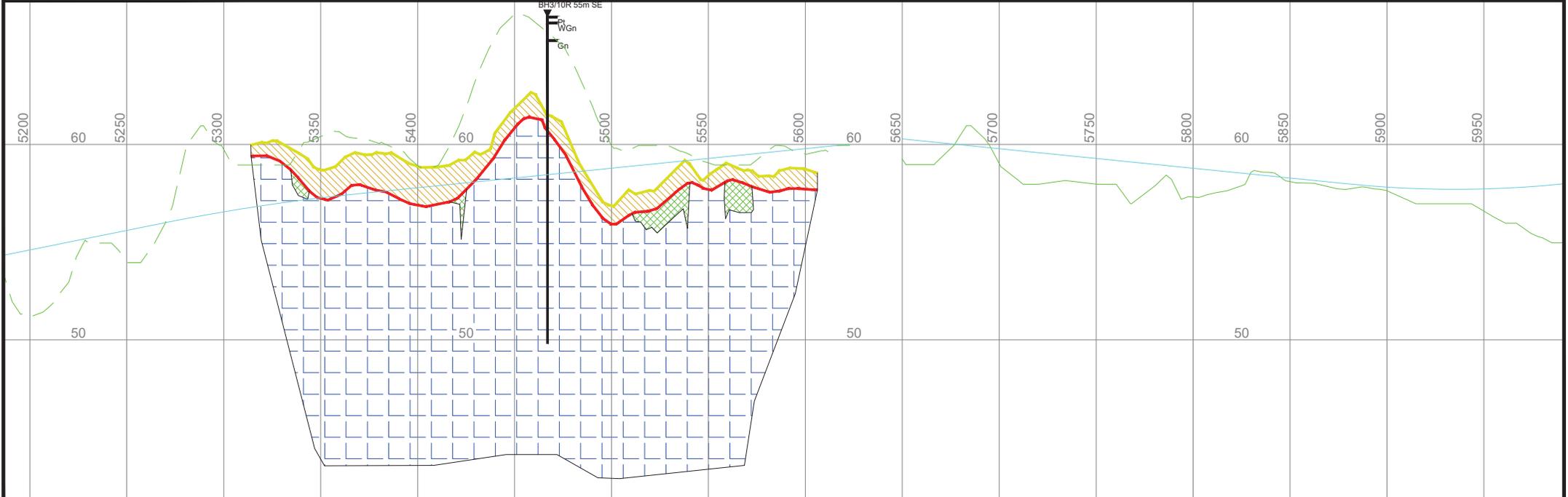
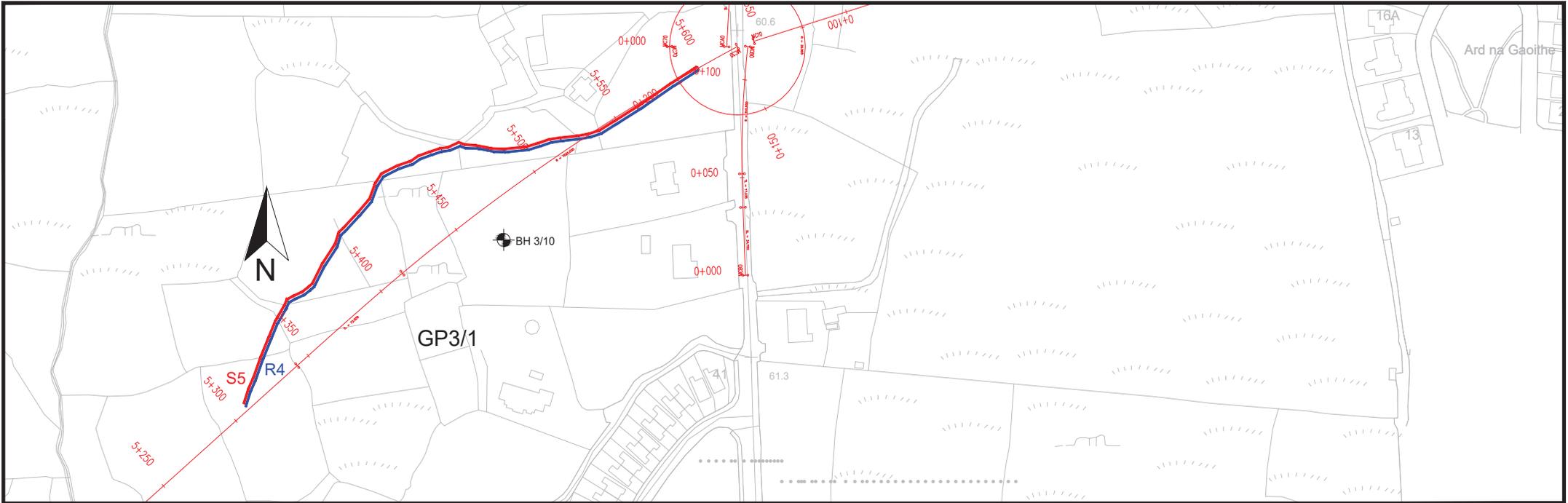
2D Resistivity and Seismic Refraction results are projected onto the Centre Line

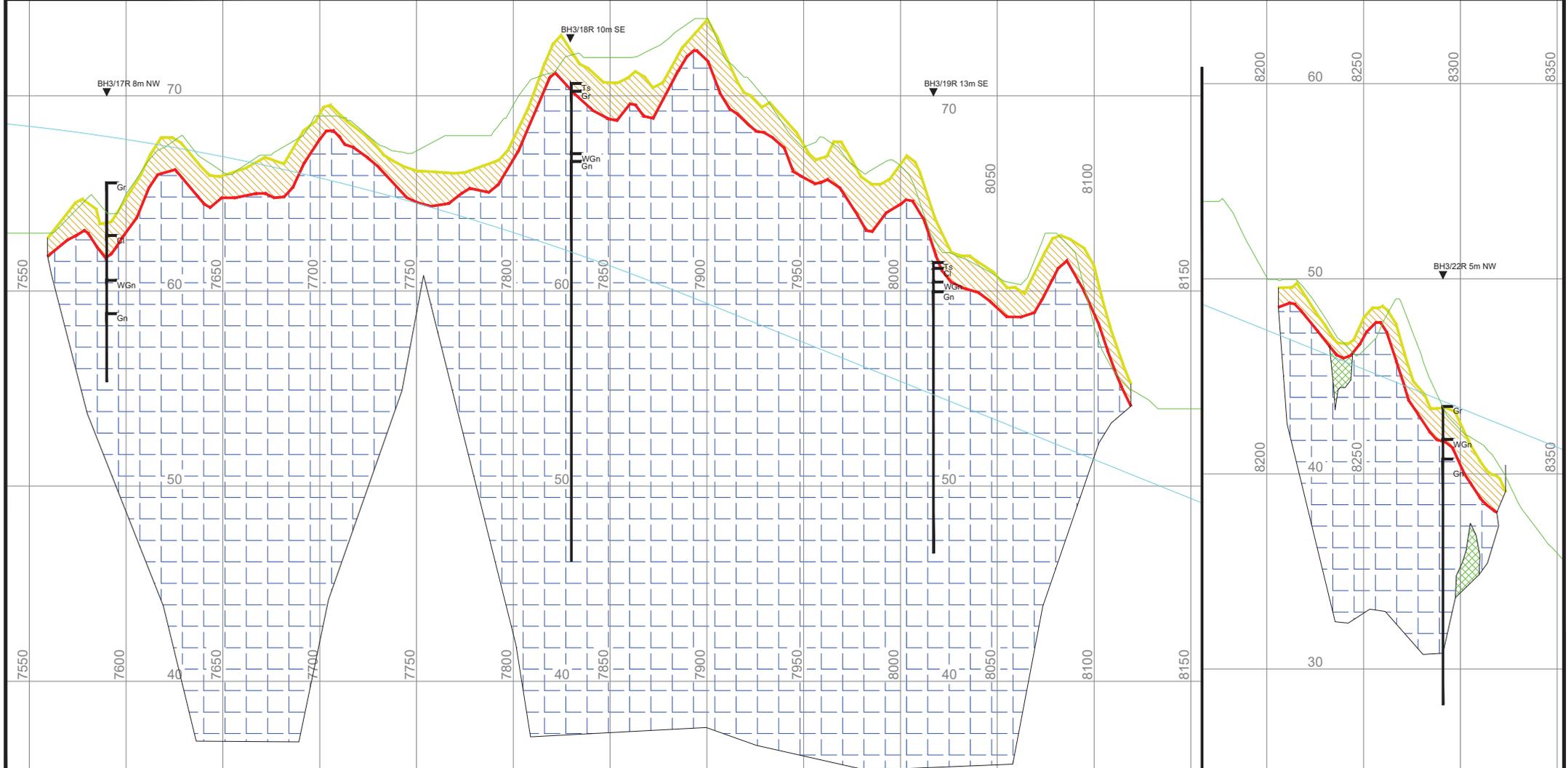
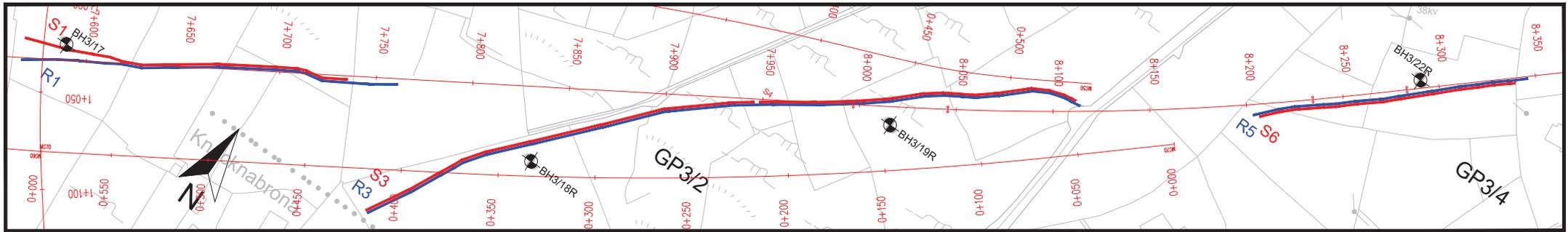
Layers from Seismic Refraction Model:	
—	Ground Surface/Top of Layer 1 (200 - 340 m/s)
—	Top of Layer 2 (600 - 1200 m/s)
—	Top of Layer 3 (2000 - 2400 m/s)
—	Top of Layer 4 (4000 - 5000 m/s)

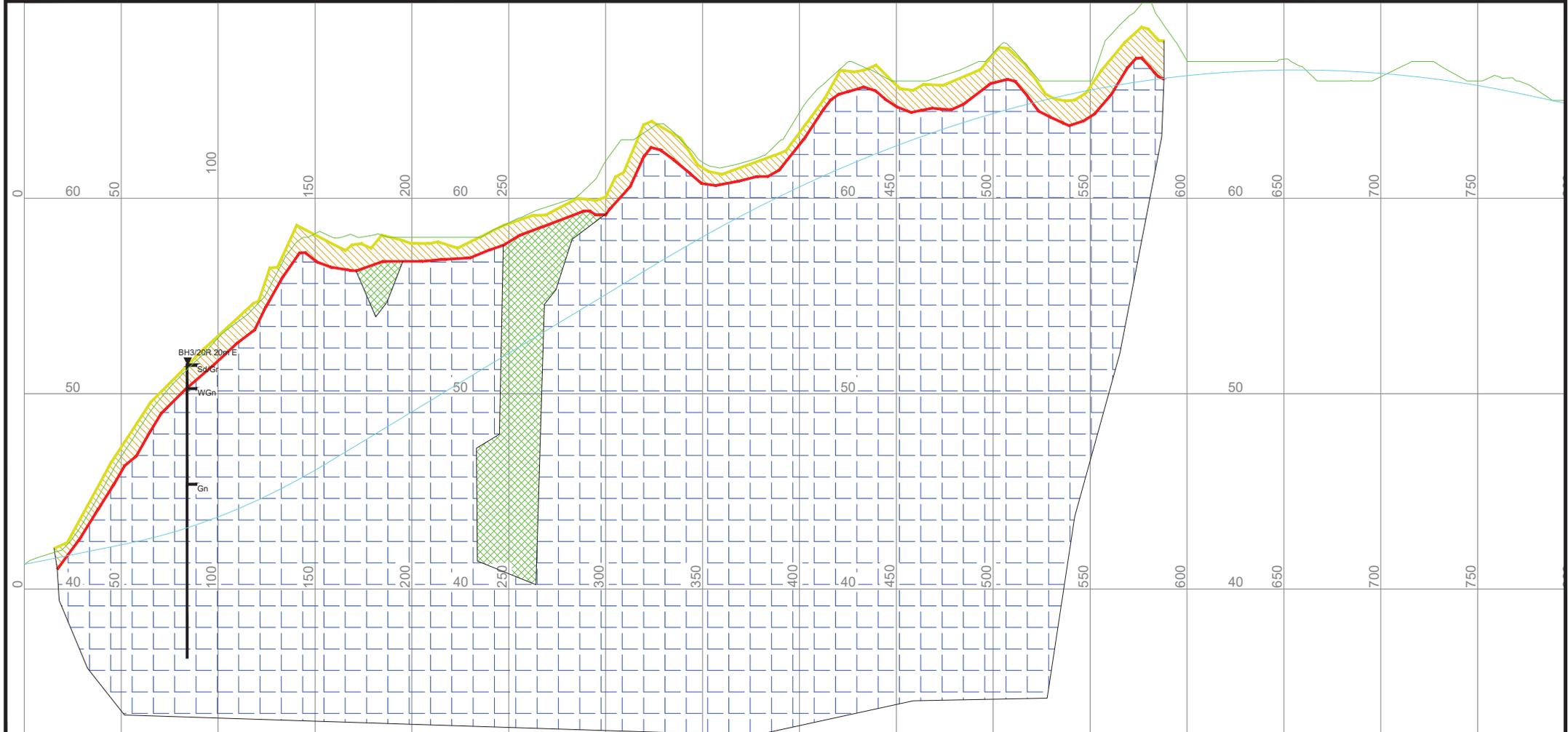
1800 Seismic Velocity in m/s

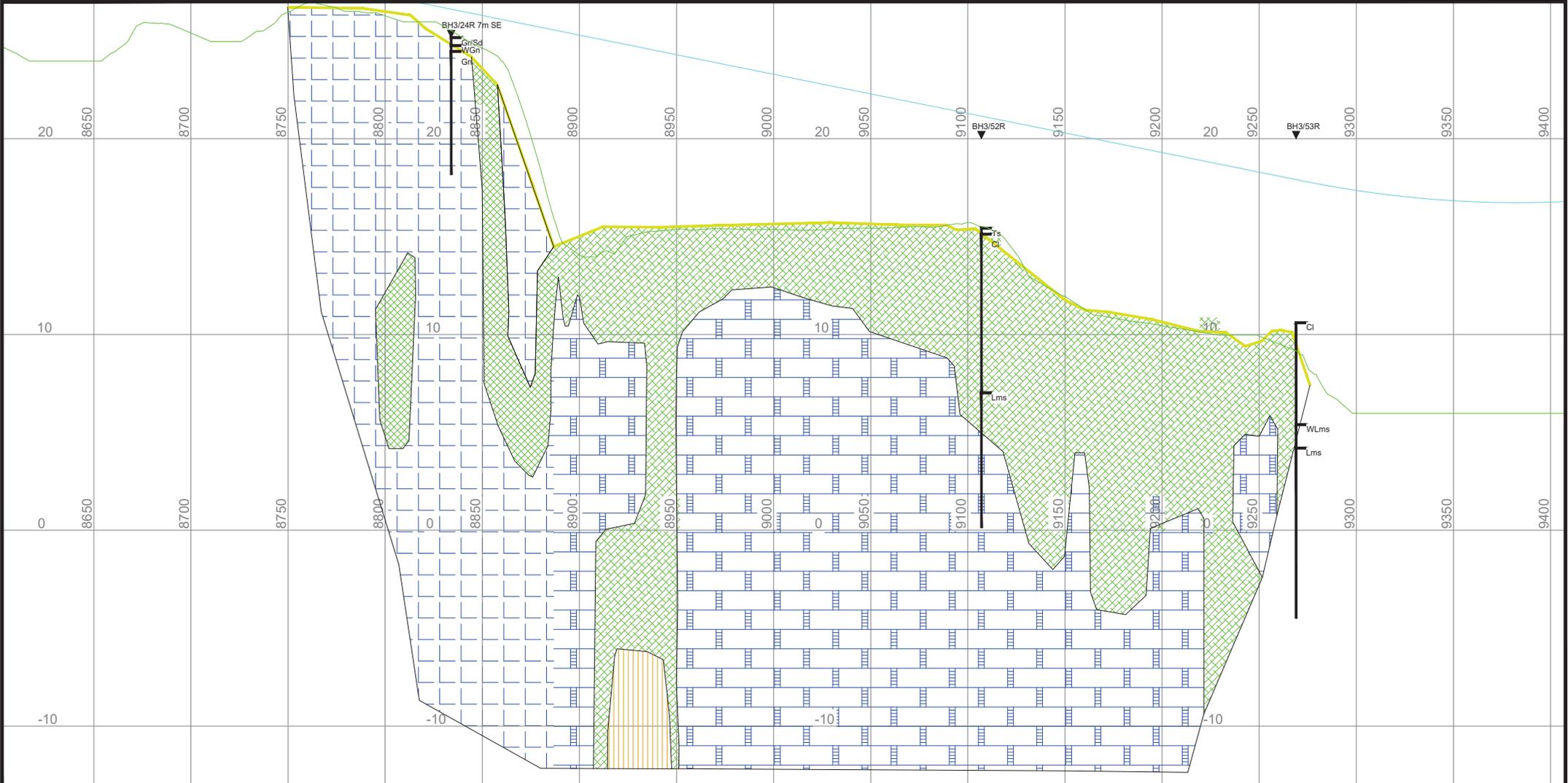
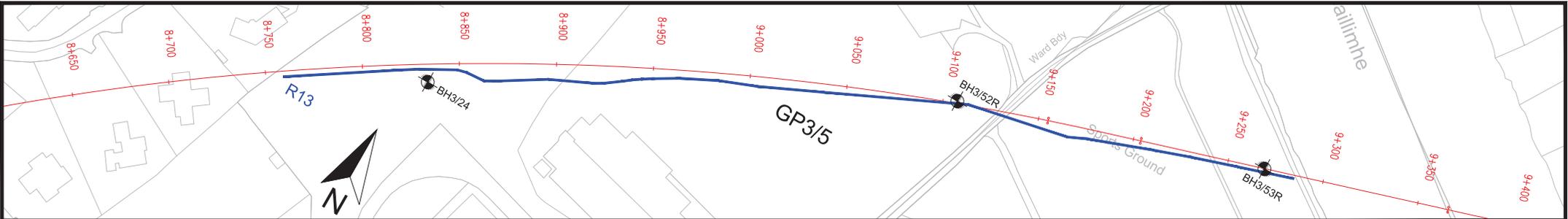
2D-Resistivity Model Values:	
Resistivities (Ohm) for 2D-Resistivity Model	

Abbreviated GI Logs:			
BH3/18R Borehole Name and Location			
Pt	Peat	Sl	Silt
C	Clay	Lm	Limestone
Ts	Topsoil	WLM	Weathered Limestone
Mg	Made Ground	Gn	Granite
Gr	Gravel	WGr	Weathered Granite
Sd	Sand		









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CLIENT	IGSL ARUP	SCALE:	Hor 1:1000 @ A1, Ver 1:100 @ A1, VE x 10
PROJECT	N6 GCTP Phase 3 Geophysical Survey	PROJECT:	6651
TITLE	Plan 2d: Survey Locations and Interp for GP3/05	DRAWN:	RJ
		DATE:	18/01/2016
		MCX FILE:	6651C_Plan.dwg
		STATUS:	Final

LEGEND:

Geophysical Survey Locations:

- R2 2D-Resistivity Profile
- S1 Seismic Refraction Profile

Geophysical Survey Locations:

- Ground Surface along Survey Profile
- Existing Ground Level along Centre Line
- Proposed Vertical Alignment Centre Line

2D Resistivity and Seismic Refraction results are projected onto the Centre Line

Changes based on Alignment received 12.02.2016
Locations are to N60 Transverse Meridian. Elevations are to mOD (Banks Head)

Interpretation:

Granite Area (to approx. CH8890)

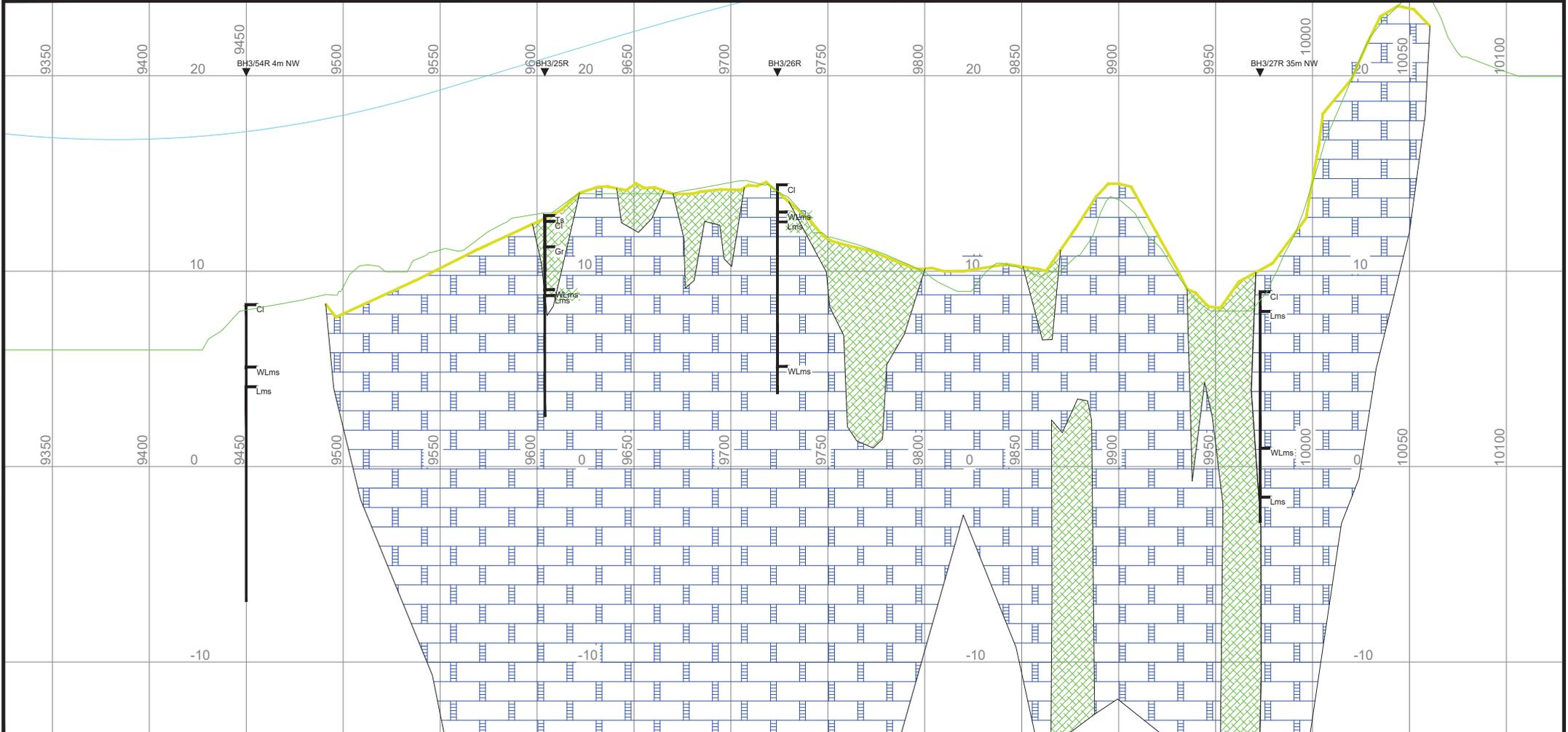
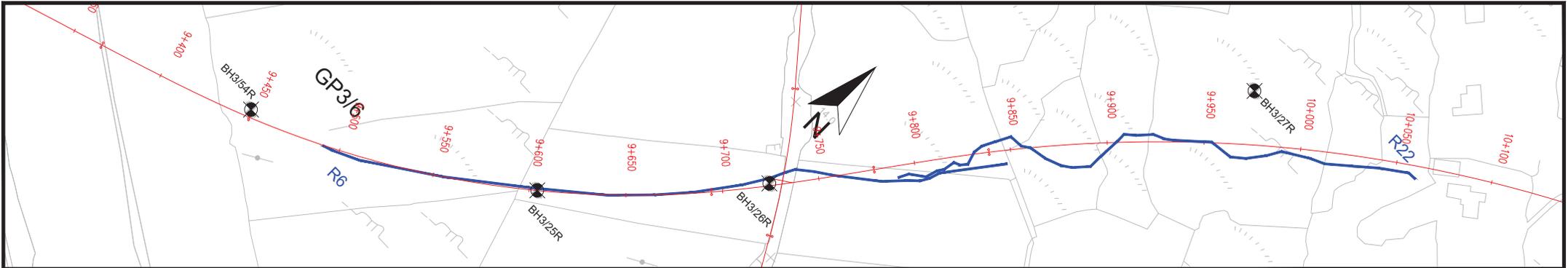
- G1 Soft or loose Topsoil or Overburden
- G2a Fair to Good Rock with some weathered zones
- G2b Fair to Good Rock

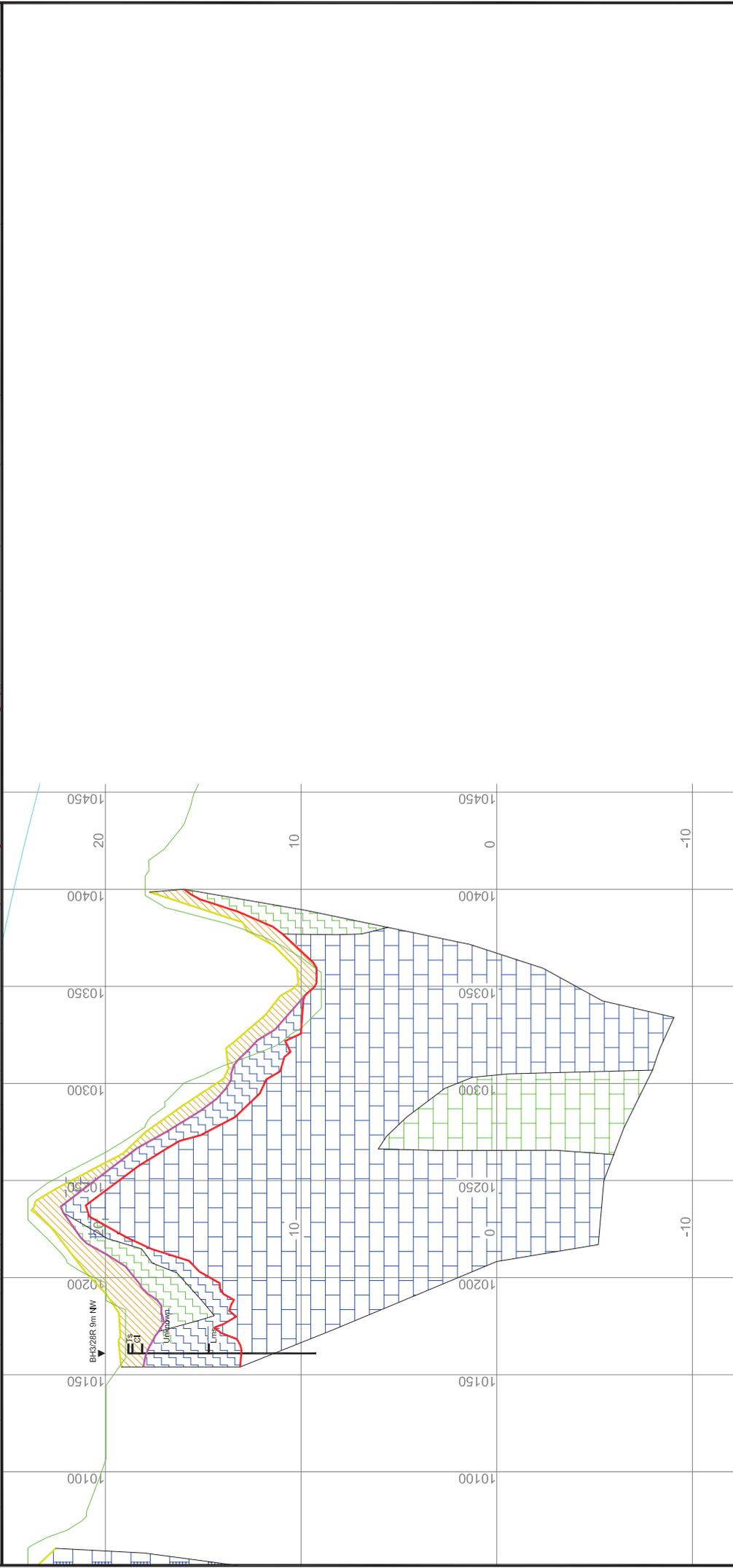
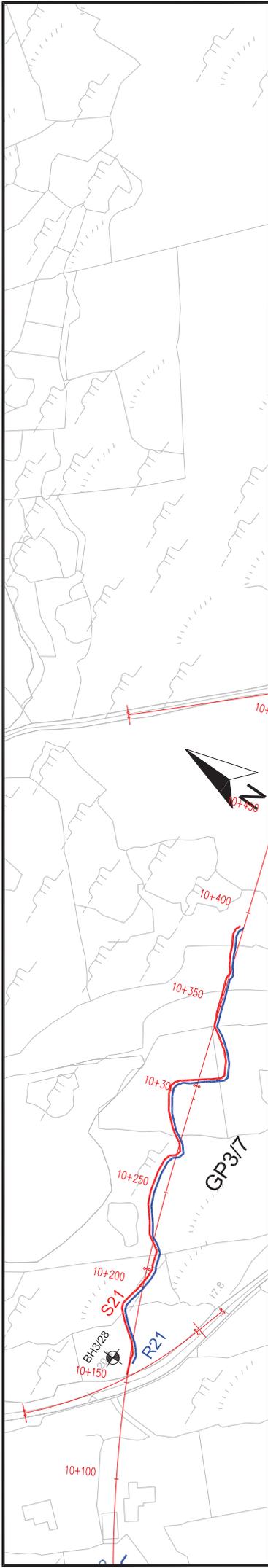
Limestone Area (from approx. CH8890)

- A Overburden (Clay or Silt) or Clay Filled Limestone
- B Overburden (Gravelly Clay) or Filled Limestone
- C Overburden (Sand or Gravel) or Fresh Limestone

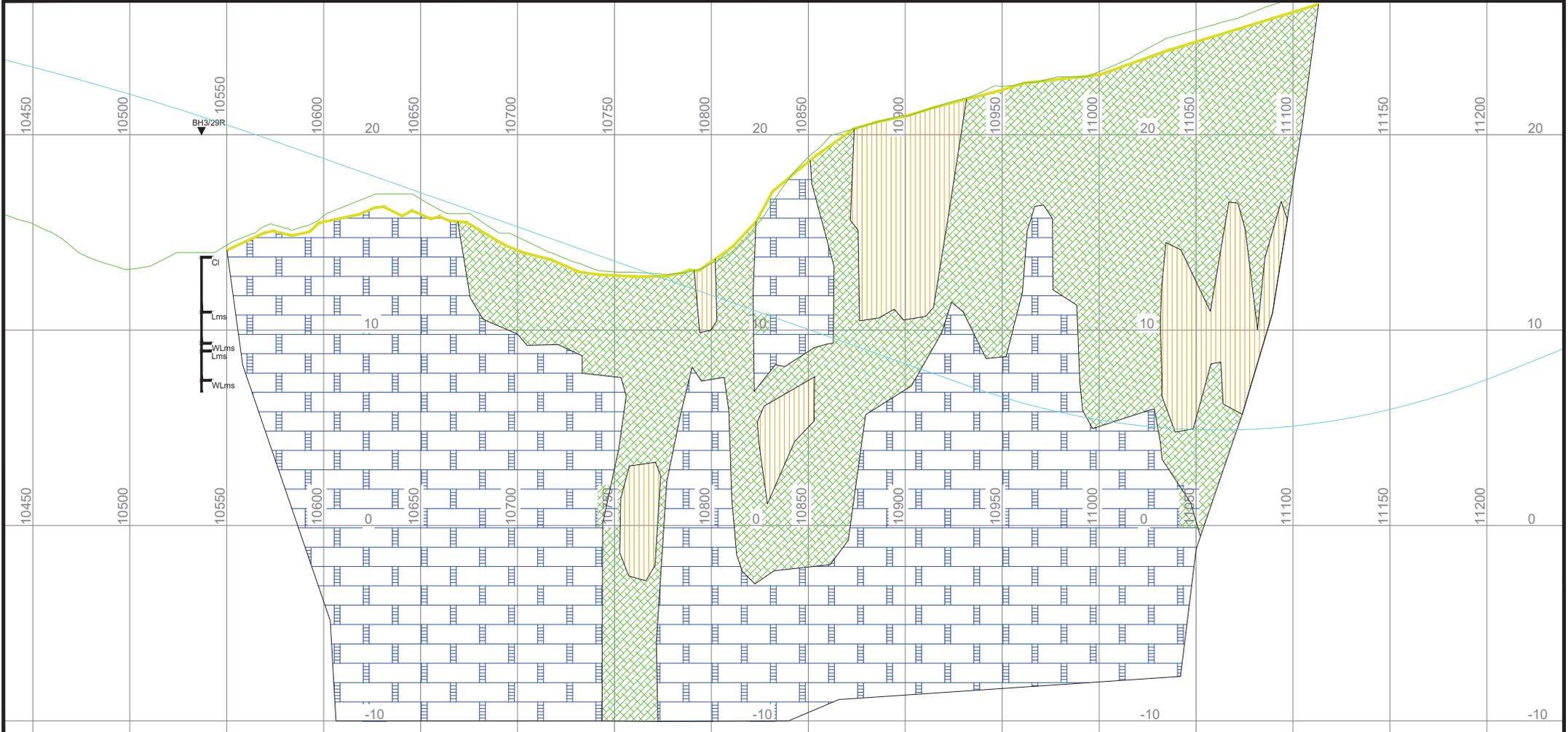
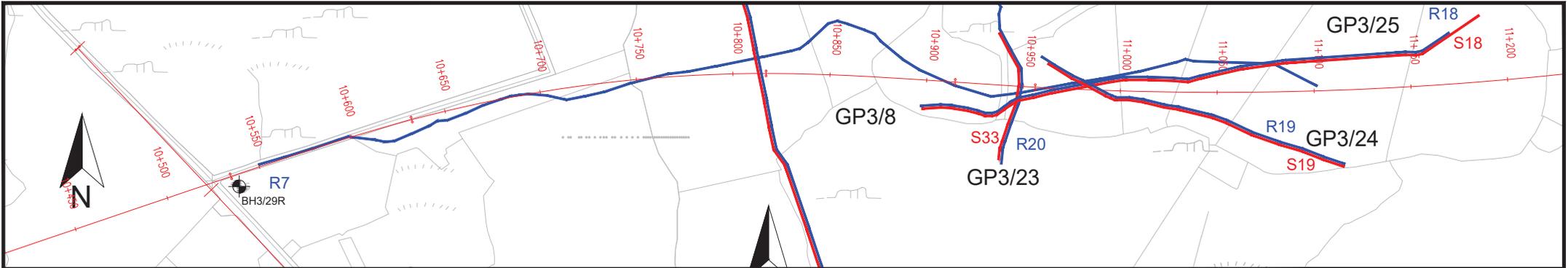
Abbreviated GI Logs:

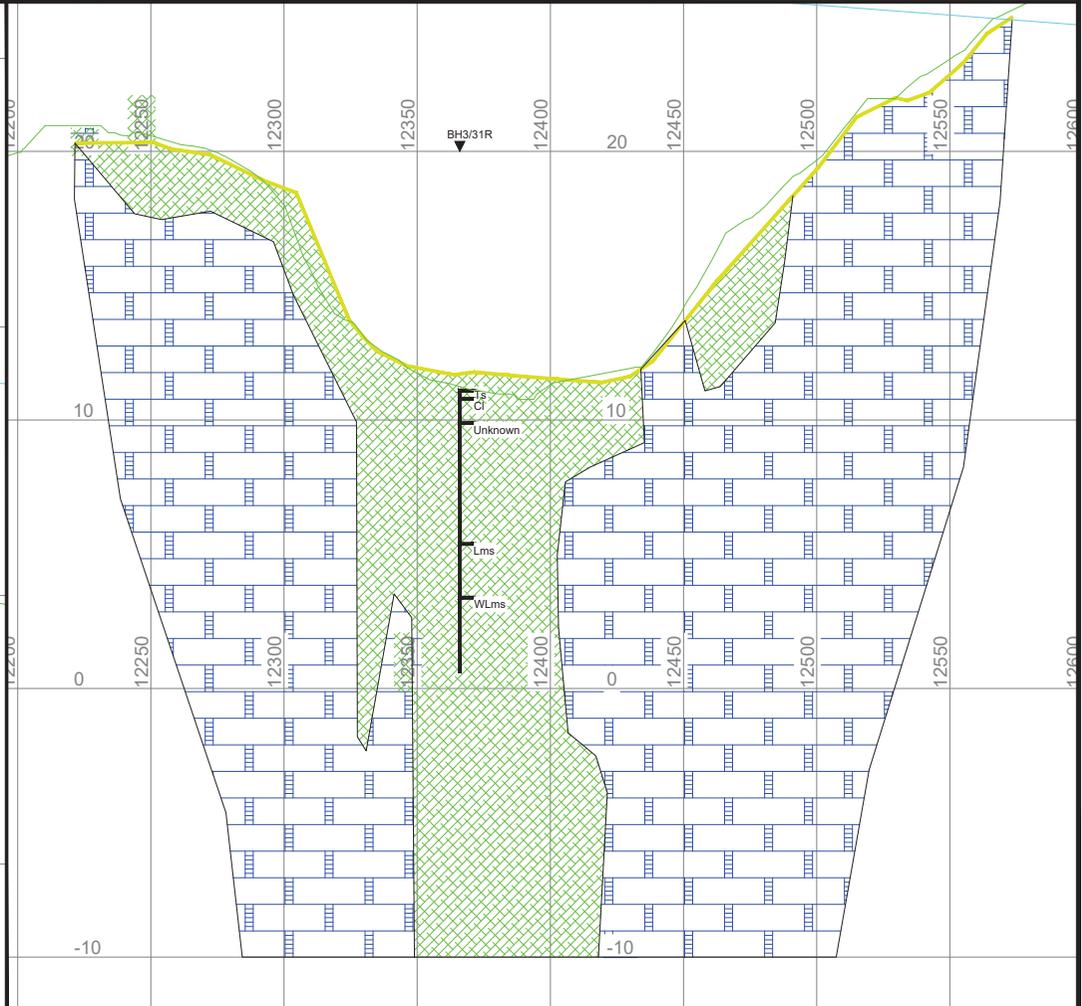
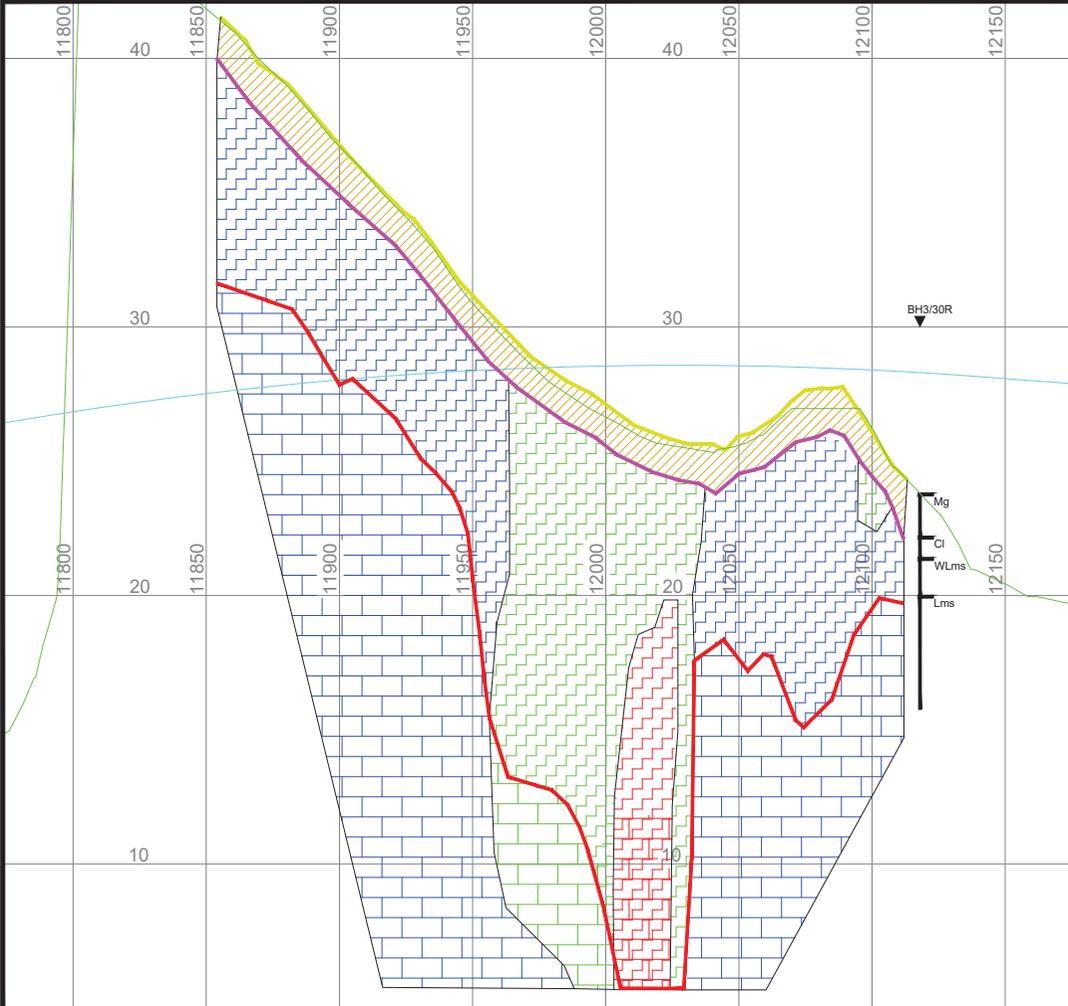
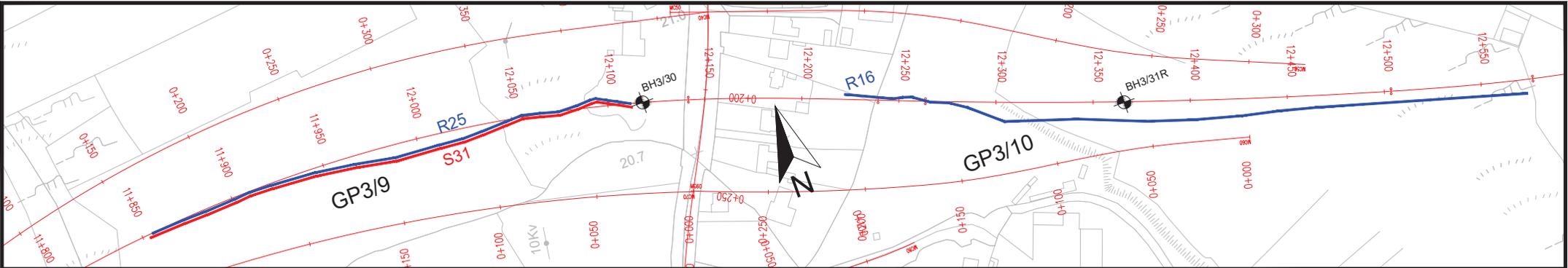
Pr	Peat	Sl	Silt
Cl	Clay	Lms	Limestone
Ts	Topsoil	WLms	Weathered Limestone
Mg	Made Ground	Gn	Granite
Gr	Gravel	WGr	Weathered Granite
Sd	Sand		

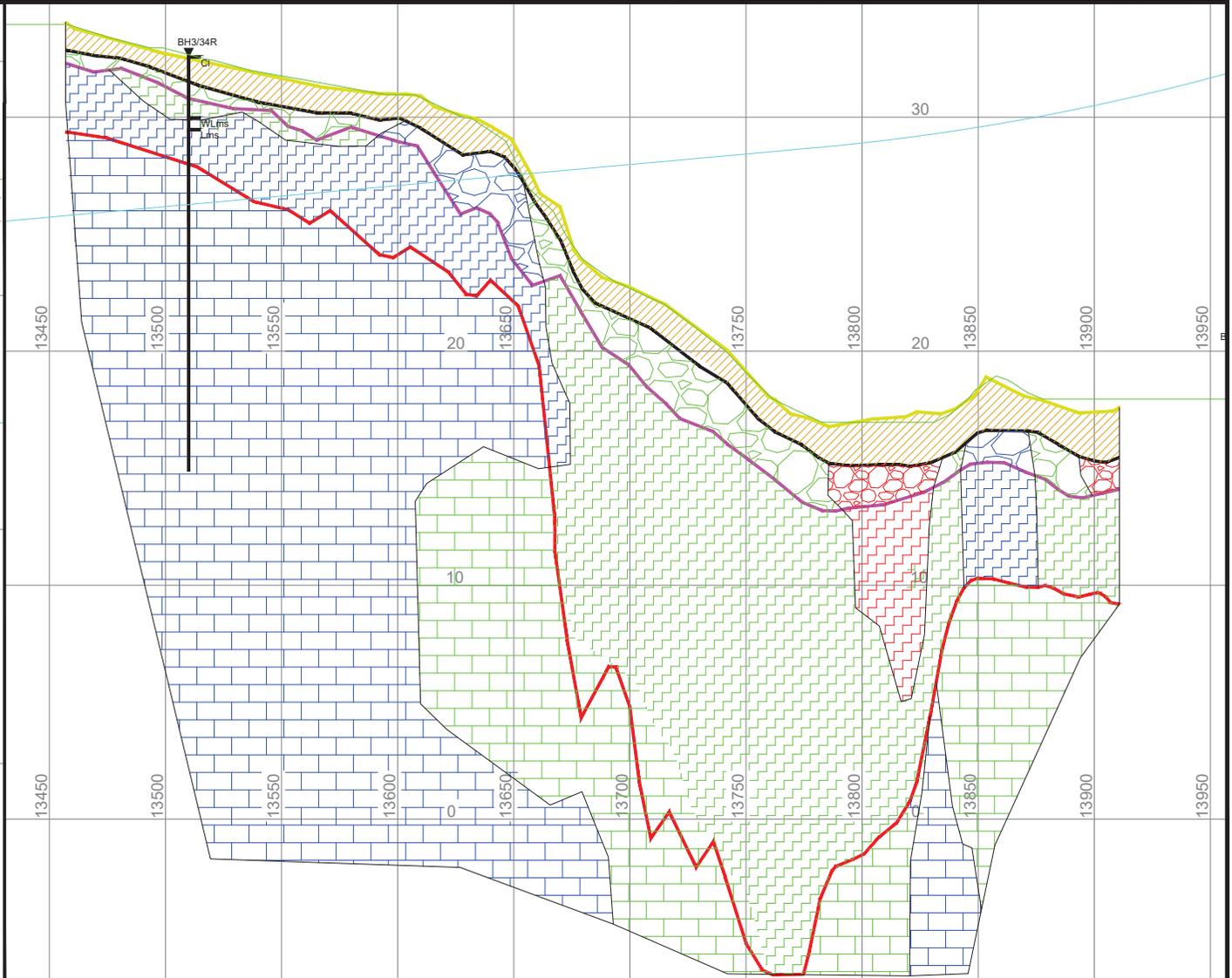
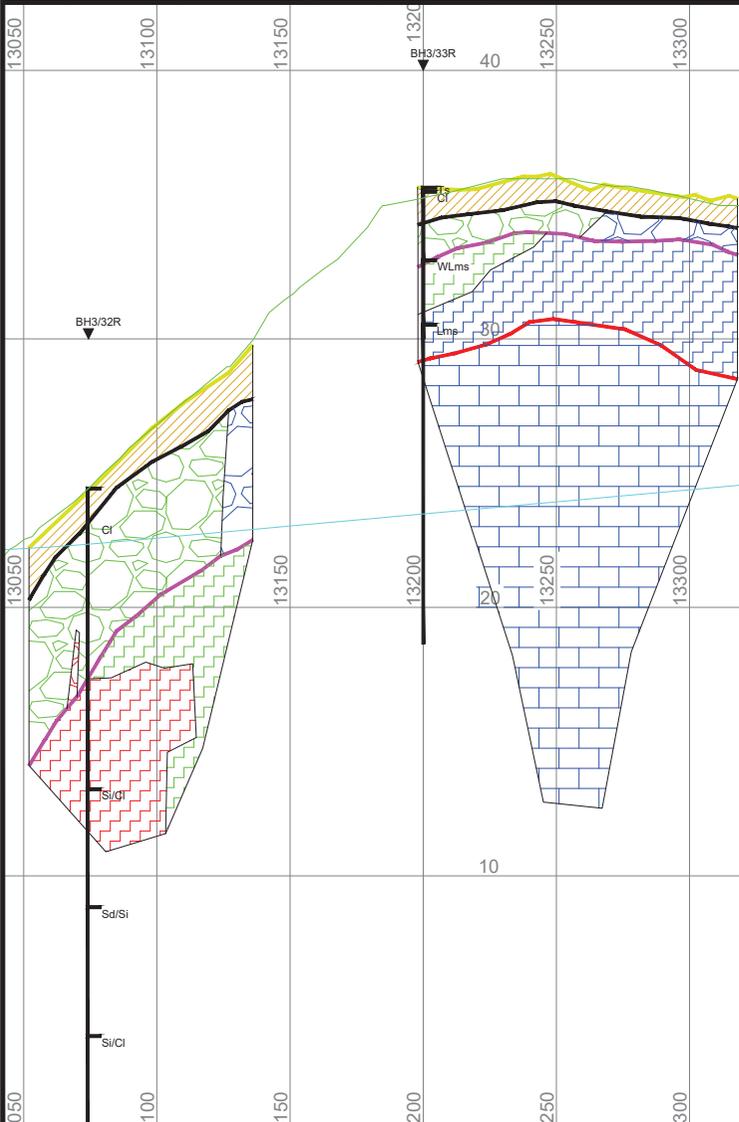
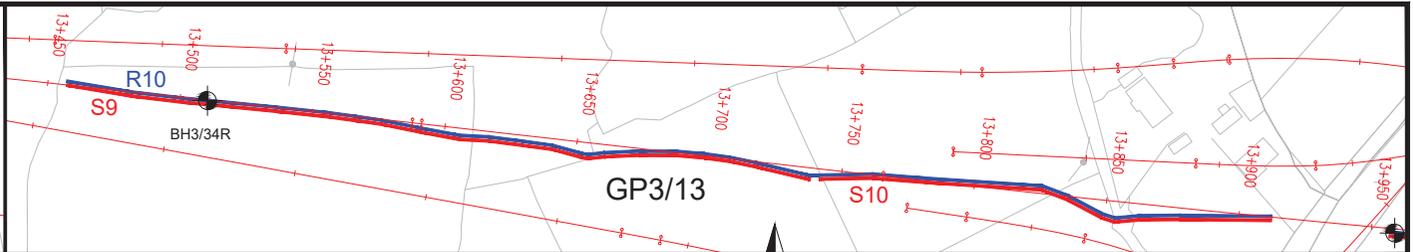
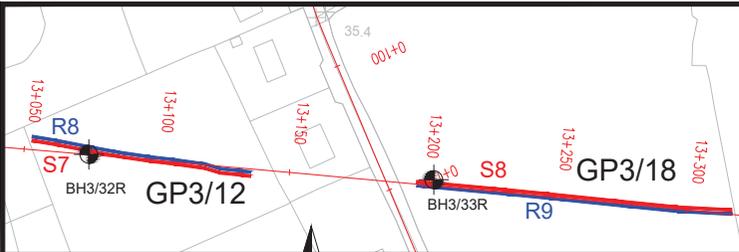


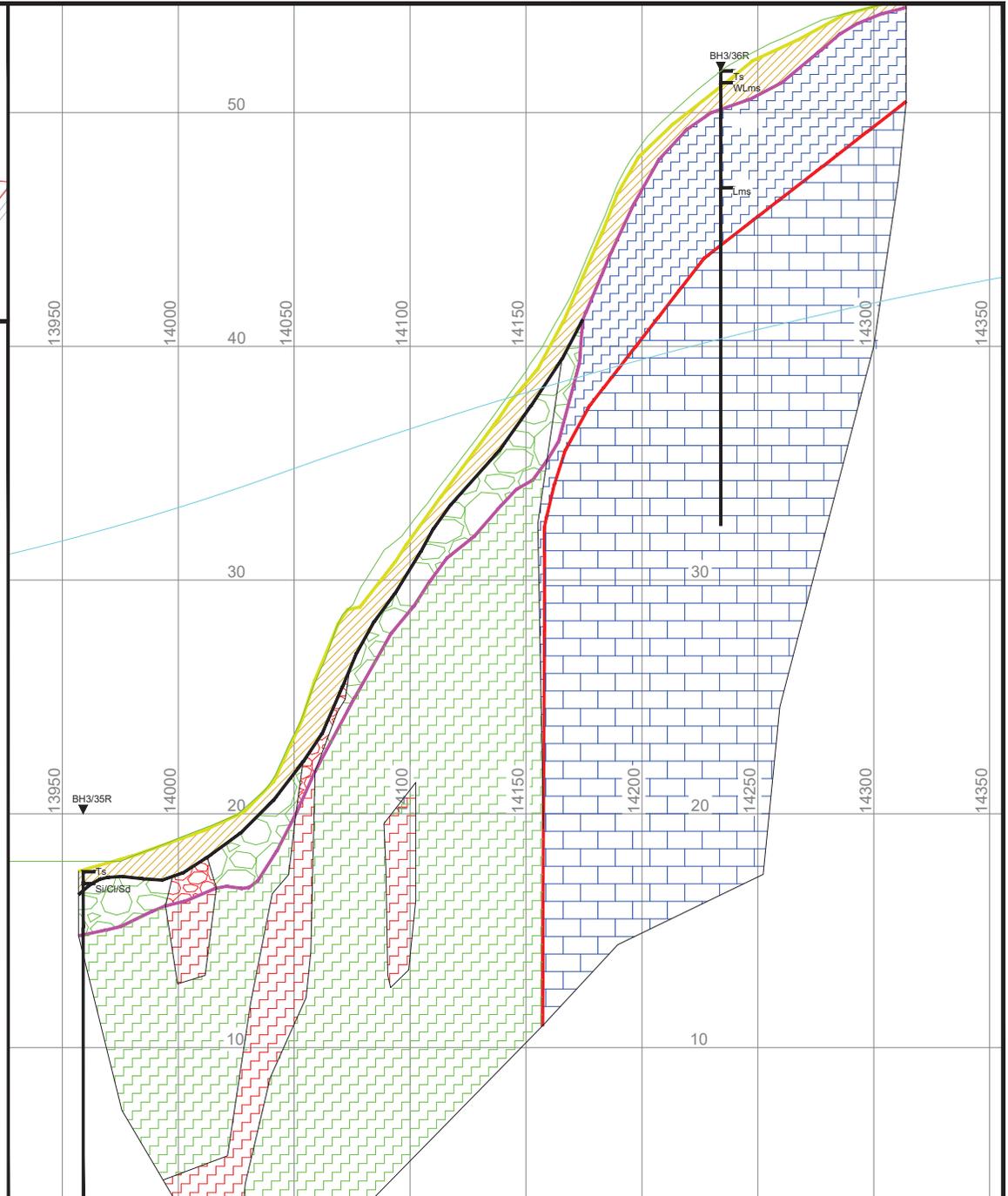
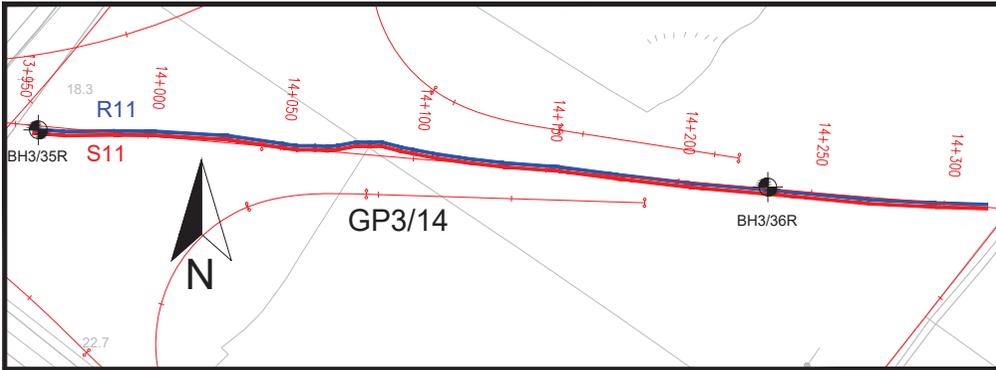


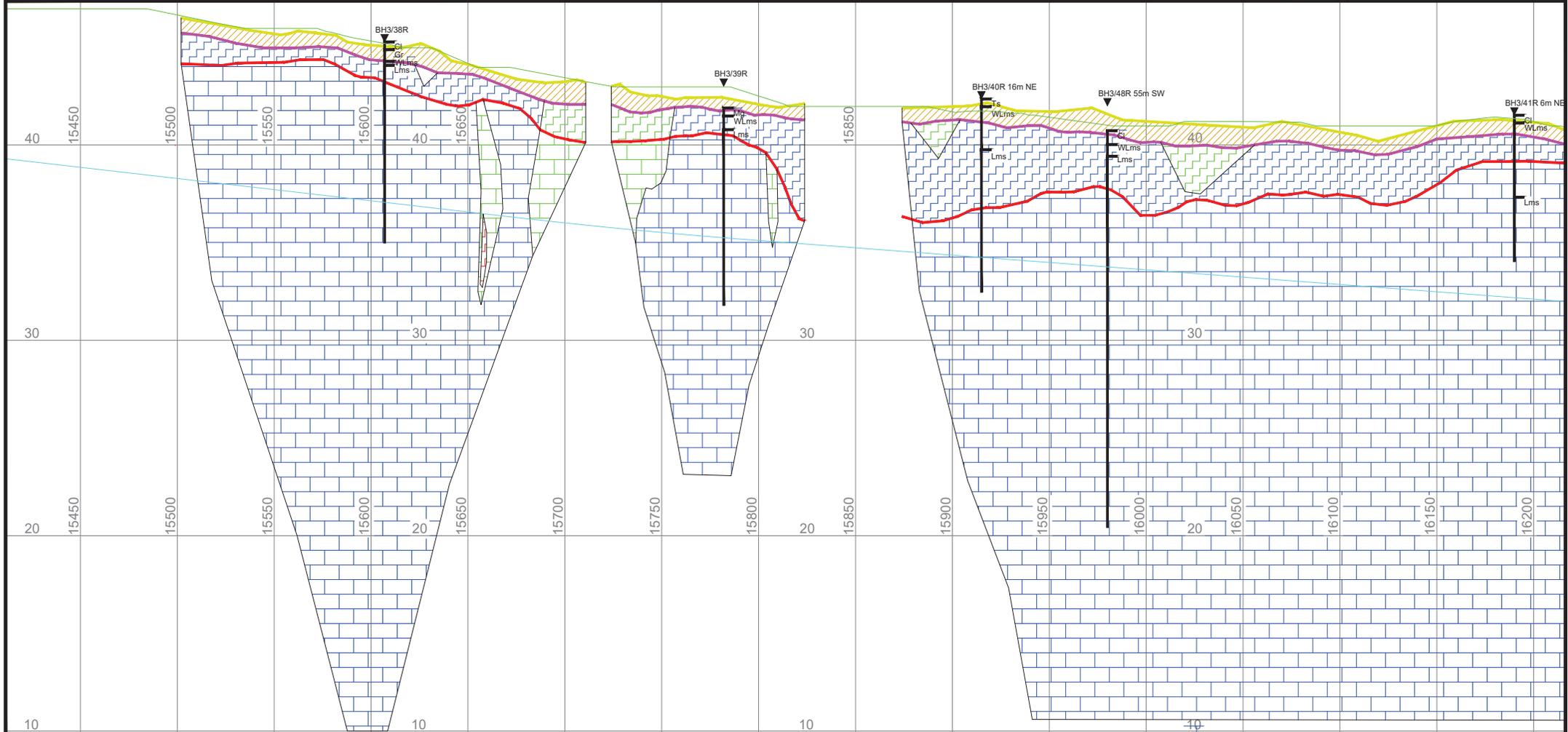
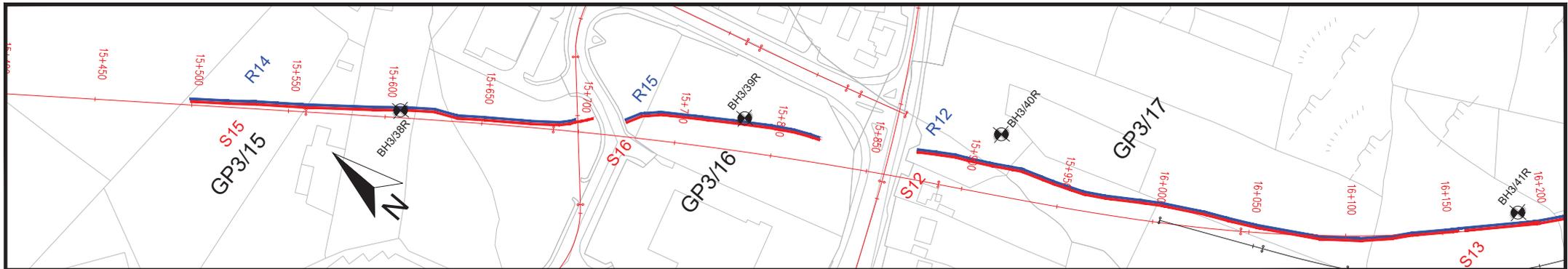
<p>Minerex Geophysical Limited 10000 16th Avenue NW Edmonton, Alberta T5A 0P6 Canada Tel: (780) 443-1000 Email: info@minerex.com</p>	<p>CLIENT: FCSL AXCP</p>	<p>SCALE: 1:1000 (AS SHOWN) PROJECT: 003 DRAWN: RJ DATE: 18/06/2016 MAX. SCALE: 8000/1:1000 STATES: Final</p>	<p>Geophysical Survey Locations: 2D-Resistivity Profile Seismic Refraction Profile</p>	<p>Geophysical Survey Locations: Ground Surface along Survey Profile 2D Resistivity Profile 2D Seismic Refraction Profile Proposed Well Locations (Green Dots) Proposed Well Spacing (Green Line) 2D Resistivity and Seismic Refraction results are Proposed Well Spacing (Green Line)</p>	<p>Layers from Seismic Refraction Model: Ground Surface Top of Layer 1 (200 - 300 m) Top of Layer 2 (300 - 500 m) Ground Surface Top of Layer 3 (500 - 1000 m) Top of Layer 4 (1000 - 2000 m) Seismic Velocity Profile 1000</p>	<p>Interpretation: 1. Soil or loose Topsoil or Overburden 2. Gravelly Clay Overburden 3. Sand or Gravel Overburden 4. Wetland Lithology or Sand or Gravel Overburden 5. Wetland Lithology or Sand or Gravel Overburden 6. Wetland Lithology or Sand or Gravel Overburden 7. Wetland Lithology or Sand or Gravel Overburden 8. Wetland Lithology or Sand or Gravel Overburden 9. Wetland Lithology or Sand or Gravel Overburden 10. Wetland Lithology or Sand or Gravel Overburden 11. Wetland Lithology or Sand or Gravel Overburden 12. Wetland Lithology or Sand or Gravel Overburden 13. Wetland Lithology or Sand or Gravel Overburden 14. Wetland Lithology or Sand or Gravel Overburden 15. Wetland Lithology or Sand or Gravel Overburden 16. Wetland Lithology or Sand or Gravel Overburden 17. Wetland Lithology or Sand or Gravel Overburden 18. Wetland Lithology or Sand or Gravel Overburden 19. Wetland Lithology or Sand or Gravel Overburden 20. Wetland Lithology or Sand or Gravel Overburden 21. Wetland Lithology or Sand or Gravel Overburden 22. Wetland Lithology or Sand or Gravel Overburden 23. 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Wetland Lithology or Sand or Gravel Overburden 100. Wetland Lithology or Sand or Gravel Overburden</p>	<p>Abbreviated GI Logs: P: Peat S: Sand G: Gravel M: Mud C: Clay L: Limestone W: Wetland O: Overburden T: Topsoil R: Road B: Bedrock S: Sand G: Gravel M: Mud C: Clay L: Limestone W: Wetland O: Overburden T: Topsoil R: Road B: Bedrock</p>
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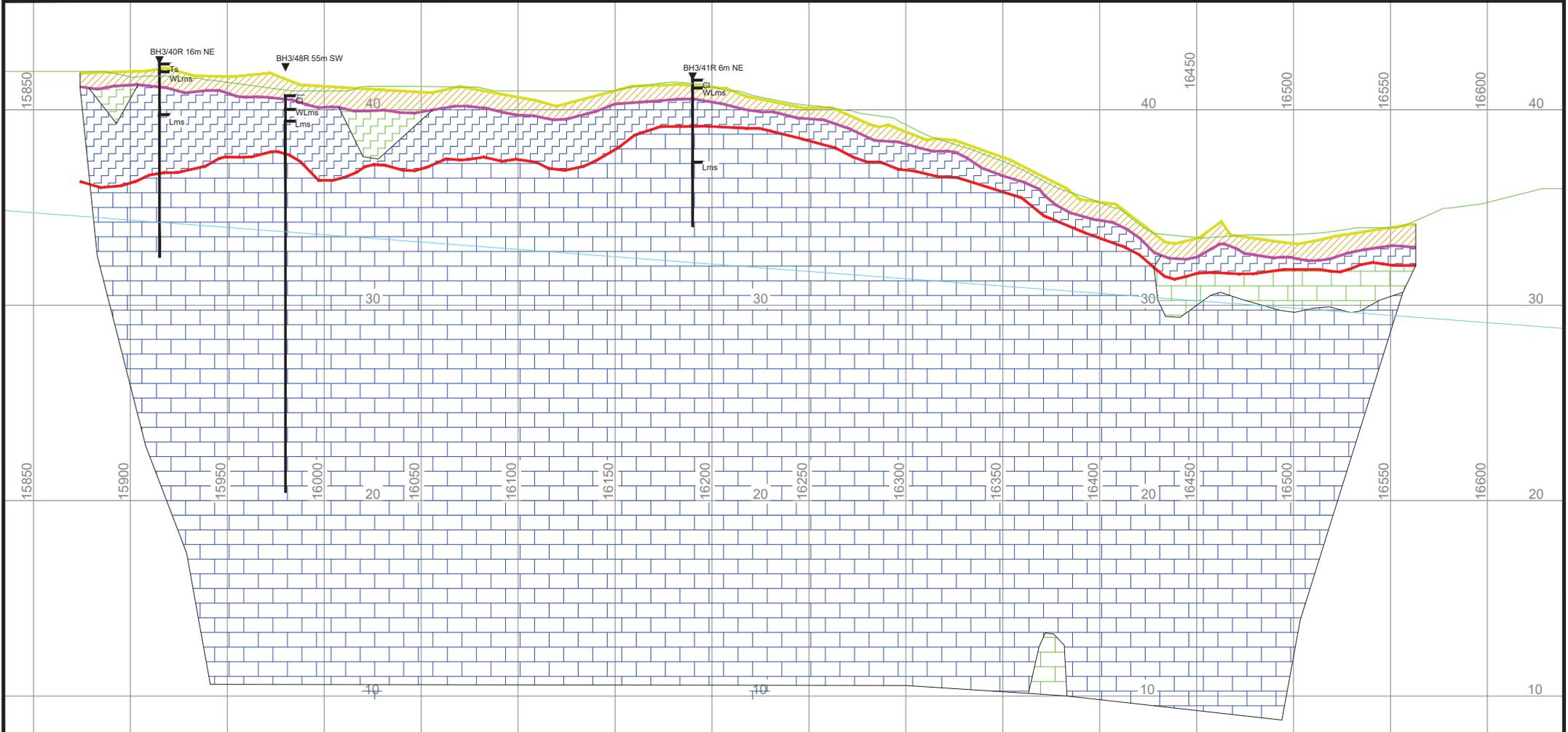
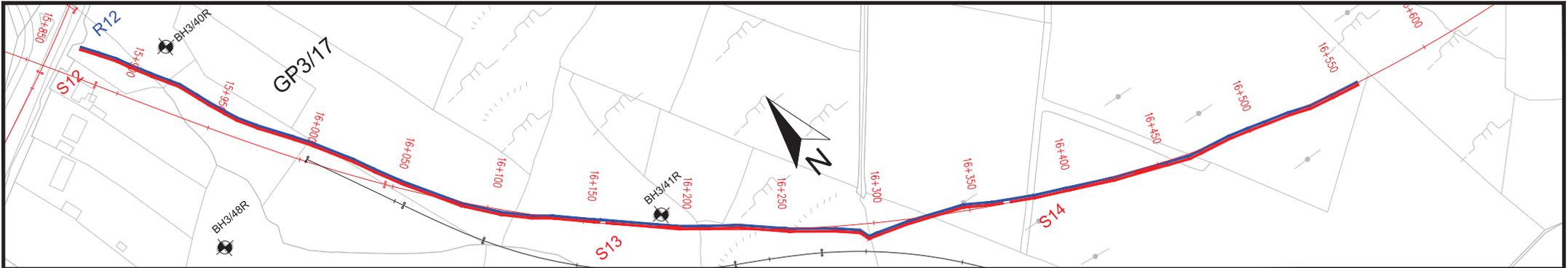


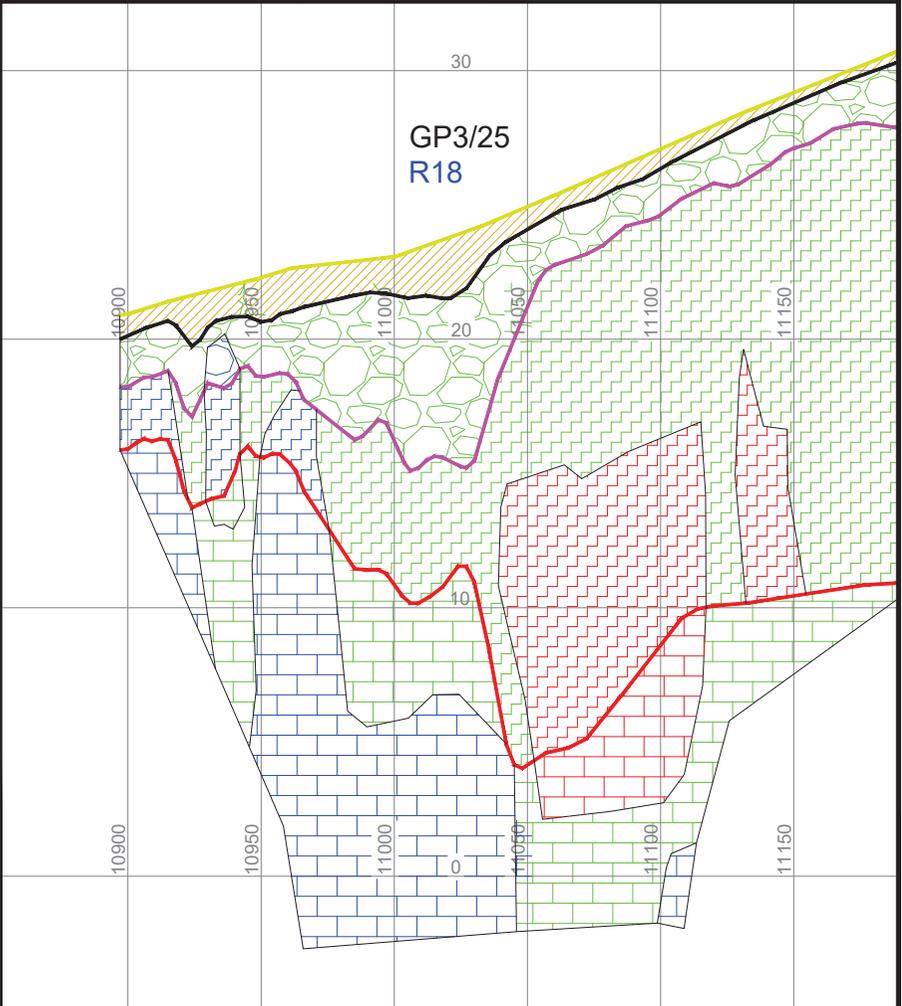
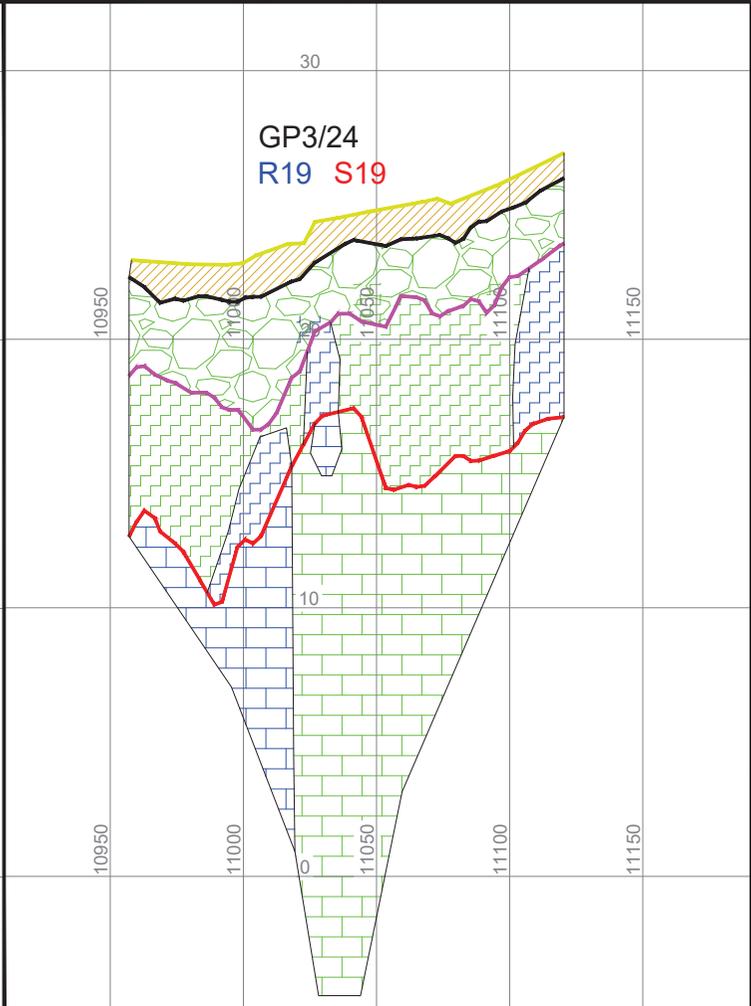
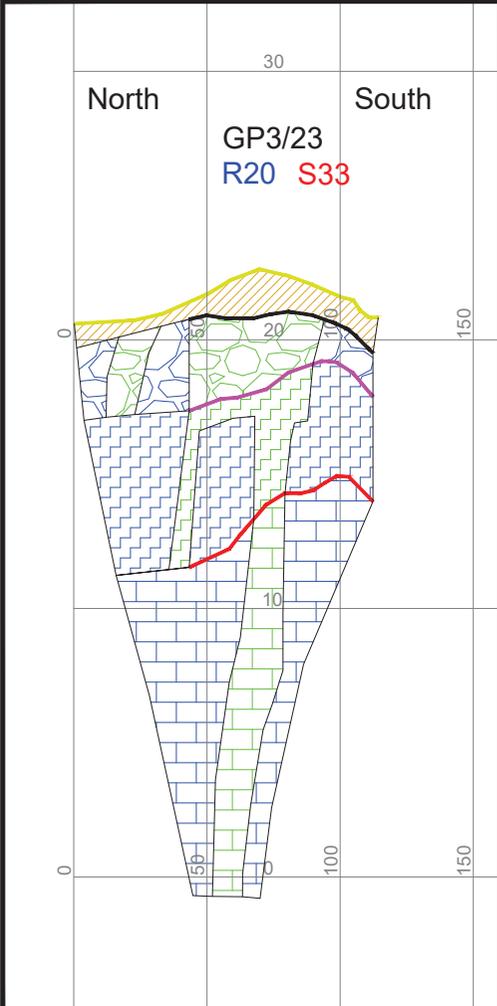
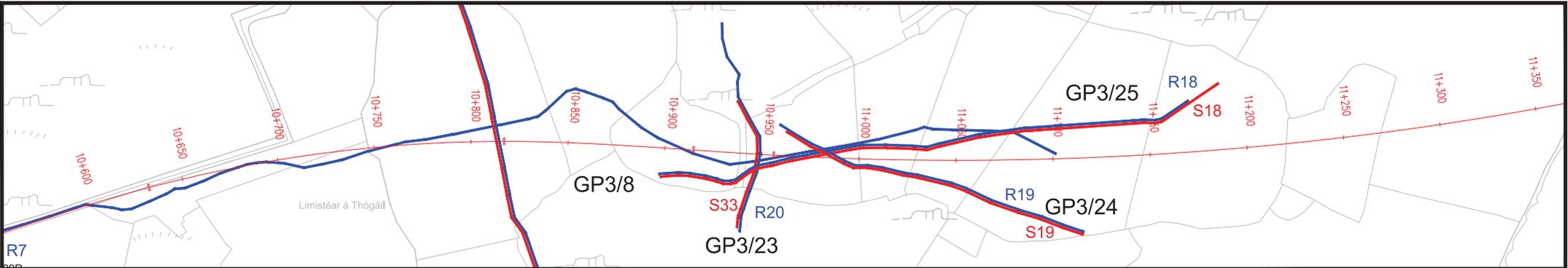










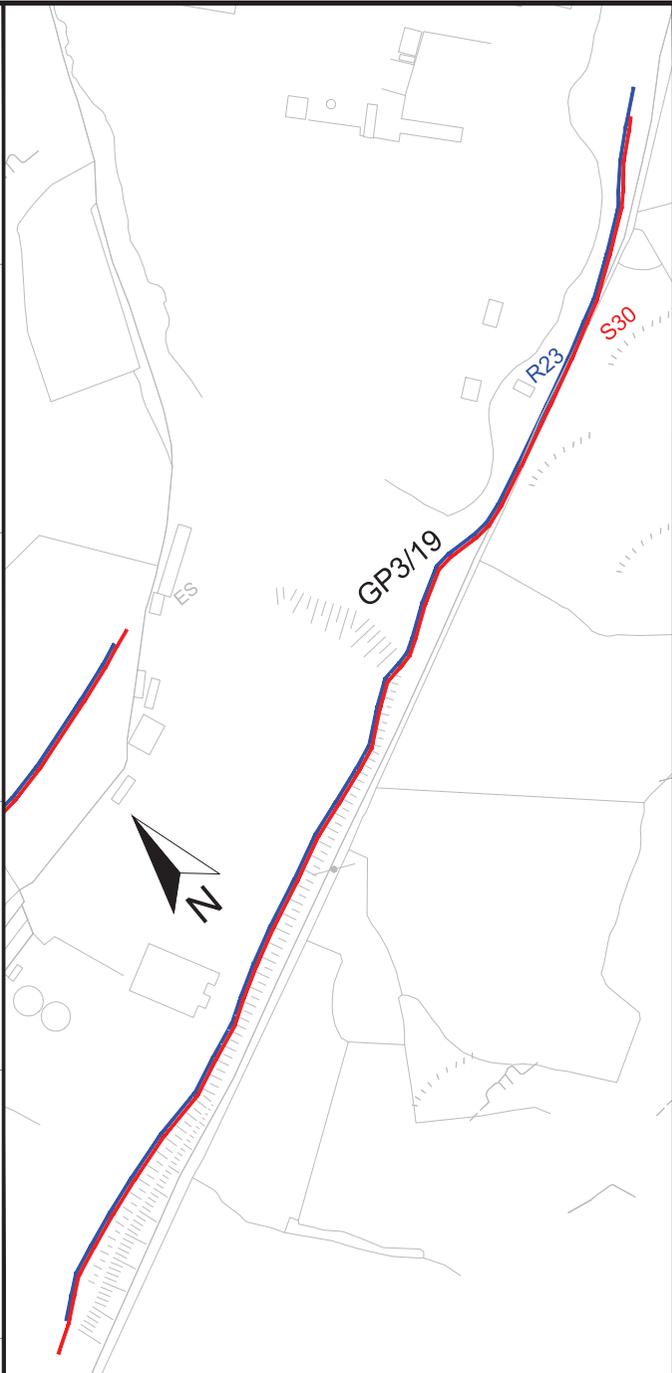
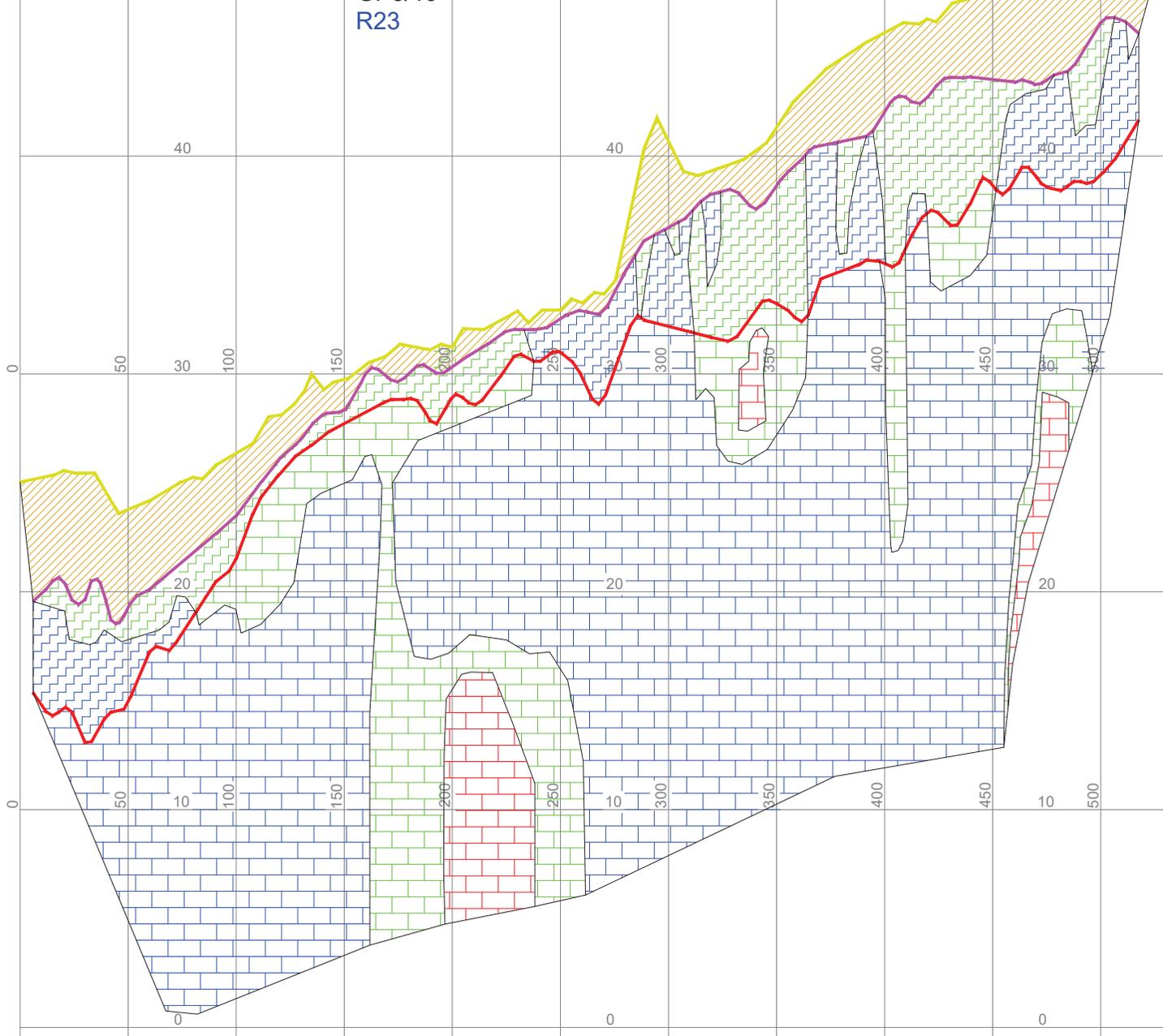


<p>Unit F4, Maynooth Business Campus Maynooth, Co. Kildare Tel: 001 85310030 Fax: 011 85310033 Email: info@mgp.ie Web: www.mgp.ie</p>	<p>CLIENT: IGSL ARUP</p>	<p>SCALE: Hor 1:1000 @ A1, Ver 1:100 @ A1, VE x 10</p>	<p>LEGEND:</p> <p>— R2 2D-Resistivity Profile</p> <p>— S1 Seismic Refraction Profile</p>	<p>Geophysical Survey Locations:</p> <p>— Ground Surface along Survey Profile</p> <p>— Existing Ground Level along Centre Line</p> <p>— Proposed Vertical Alignment Centre Line</p> <p>2D Resistivity and Seismic Refraction results are projected onto the Centre Line</p>	<p>Layers from Seismic Refraction Model:</p> <p>— Ground Surface/Top of Layer 1 (200 - 340 m/s)</p> <p>— Top of Layer 2 (800 - 1200 m/s)</p> <p>— Top of Layer 3 (2000 - 2400 m/s)</p> <p>— Top of Layer 4 (4000 - 5000 m/s)</p> <p>1800 Seismic Velocity in m/s</p>	<p>Interpretation:</p> <p>■ 1 Soft or loose Topsoil or Overburden</p> <p>■ 2a Clay or Silt Overburden</p> <p>■ 2b Gravely Clay Overburden</p> <p>■ 2c Sand or Gravel Overburden</p> <p>■ 3a Clay Filled Weathered Limestone or Clay or Silt Overburden</p> <p>■ 3b Infilled Weathered Limestone or Gravely Clay Overburden</p> <p>■ 3c Weathered Limestone or Sand or Gravel Overburden</p> <p>■ 4a Clay Filled Strong Limestone</p> <p>■ 4b Infilled Strong Limestone</p> <p>■ 4c Fresh Strong Limestone</p>	<p>Abbreviated GI Logs:</p> <table border="1"> <thead> <tr> <th colspan="4">BH31/8R Borehole Name and Location</th> </tr> <tr> <th>Pr</th> <th>Peat</th> <th>Ss</th> <th>Silt</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>Clay</td> <td>Lms</td> <td>Limestone</td> </tr> <tr> <td>Ts</td> <td>Topsoil</td> <td>Wlms</td> <td>Weathered Limestone</td> </tr> <tr> <td>Mg</td> <td>Made Ground</td> <td>Gn</td> <td>Granite</td> </tr> <tr> <td>Gr</td> <td>Gravel</td> <td>WGr</td> <td>Weathered Granite</td> </tr> <tr> <td>Sd</td> <td>Sand</td> <td></td> <td></td> </tr> </tbody> </table>	BH31/8R Borehole Name and Location				Pr	Peat	Ss	Silt	C	Clay	Lms	Limestone	Ts	Topsoil	Wlms	Weathered Limestone	Mg	Made Ground	Gn	Granite	Gr	Gravel	WGr	Weathered Granite	Sd	Sand		
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Gr	Gravel	WGr	Weathered Granite																																
Sd	Sand																																		
<p>PROJECT: N6 GCTP Phase 3 Geophysical Survey</p>	<p>DRAWN: RJ</p> <p>DATE: 18/06/2016</p>	<p>MGX FILE: 6021C_Plan.dwg</p> <p>STATUS: Final</p>	<p>Changes based on Alignment received 12.02.2016</p> <p>Locations are to N60 Transverse Meridian. Elevations are to mOD (Belfast Head)</p>																																
<p>TITLE: Plan 2m: Survey Locations and Interp for GP3/23, GP3/24, GP3/25</p>																																			

West

East

GP3/19
R23



Minerex
Geophysics Limited
Unit F4, Maynooth Business Campus
Maynooth, Co. Kildare
Tel: 011 9161000
Fax: 011 9161003
Email: info@minerex.ie
Web: www.mgp.ie

CLIENT: IGSL
ARUP
PROJECT: N6 GCTP Phase 3
Geophysical Survey
TITLE: Plan 2a: Survey Locations and
Interpretation for GP3/19

SCALE: Hor 1:1000 @ A1, Ver 1:100 @ A1, VE x 10
PROJECT: 6651
DRAWN: RJ
DATE: 18/01/2016
MGN FILE: 6651C_Plan2a.dwg
STATUS: Final

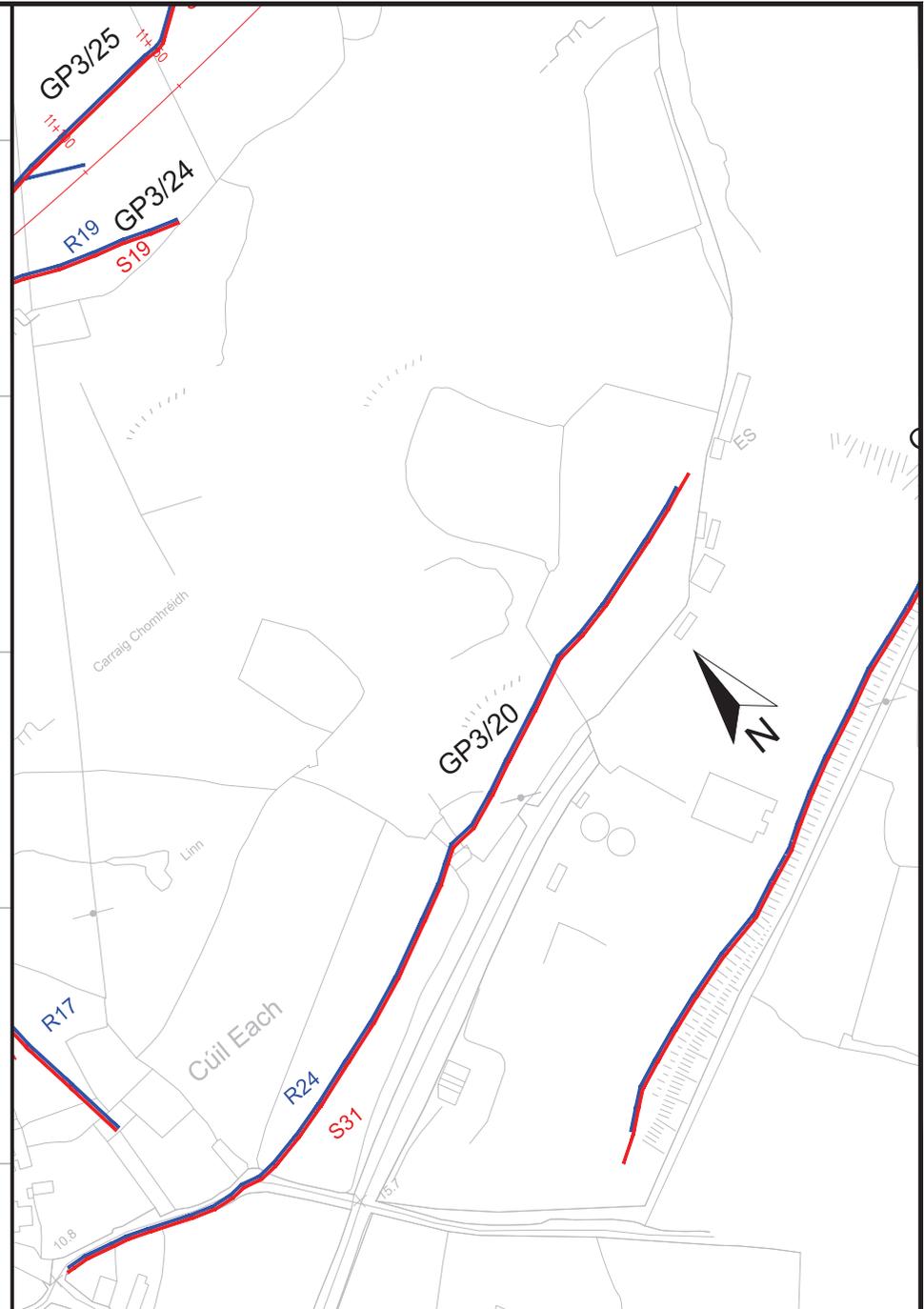
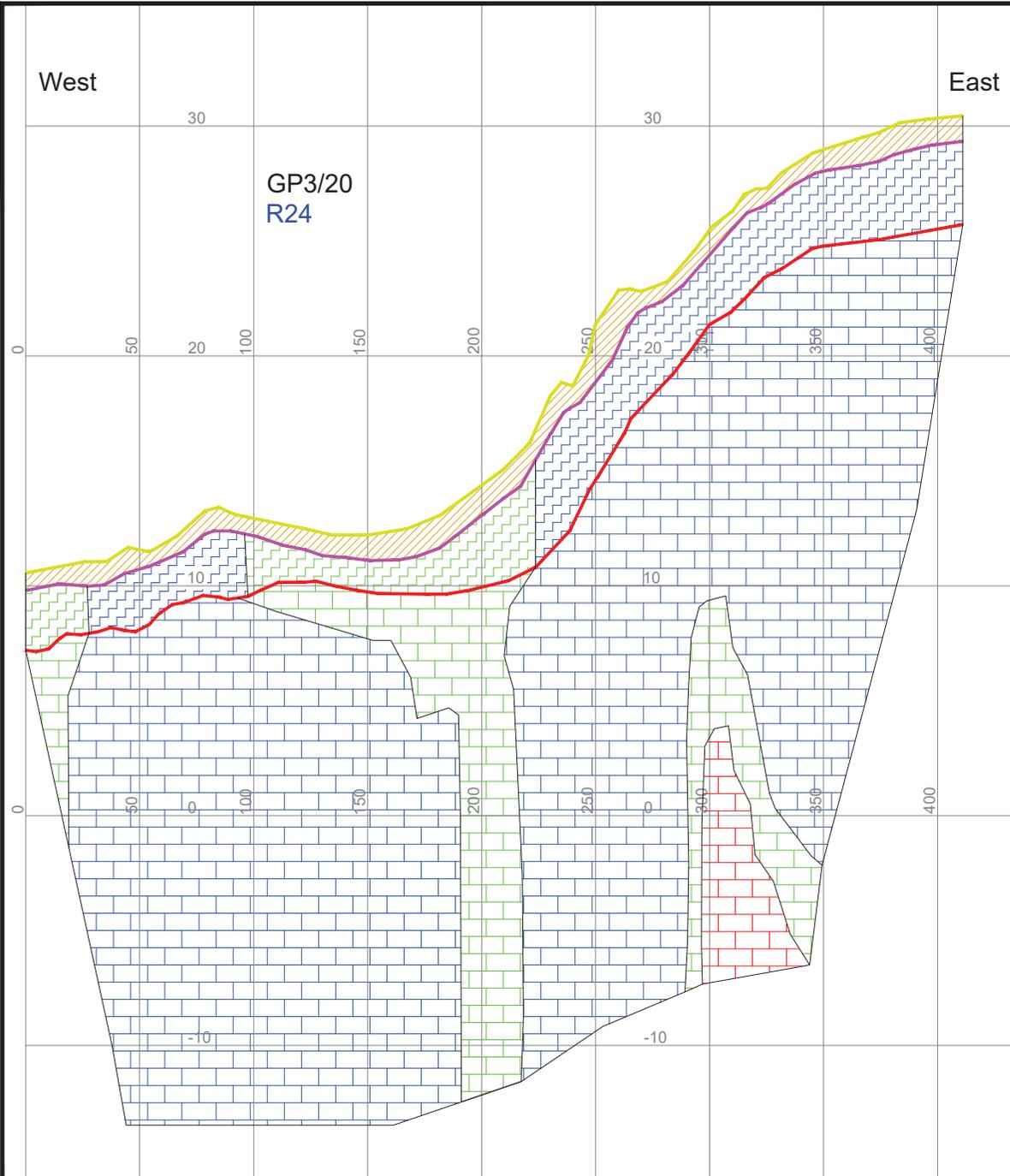
Geophysical Survey Locations:
R2 2D-Resistivity Profile
S1 Seismic Refraction Profile
Change based on Alignment received 12.02.2016
Locations are to N66 Transverse Meridian. Elevations are to mOD (Bath. Head)

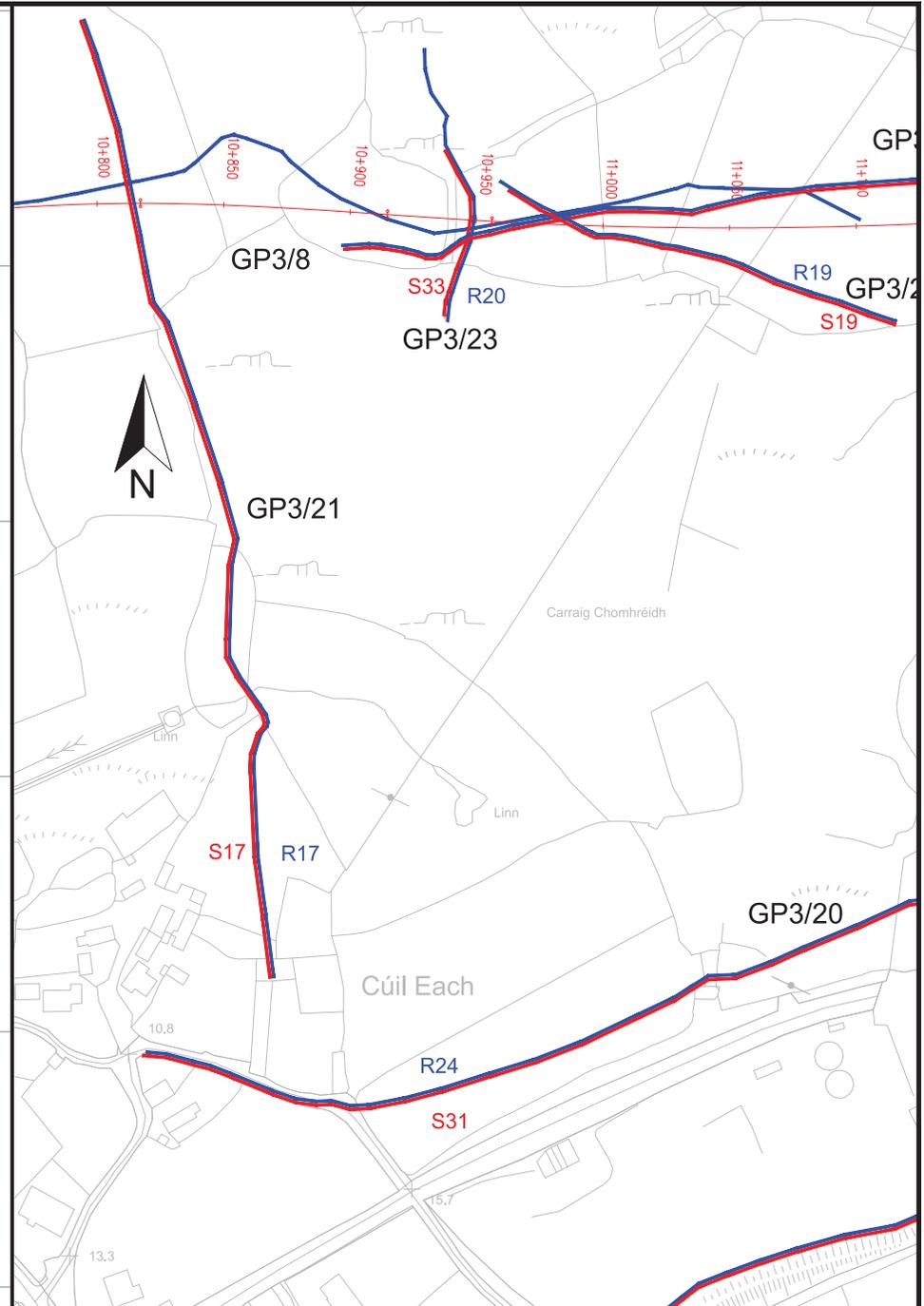
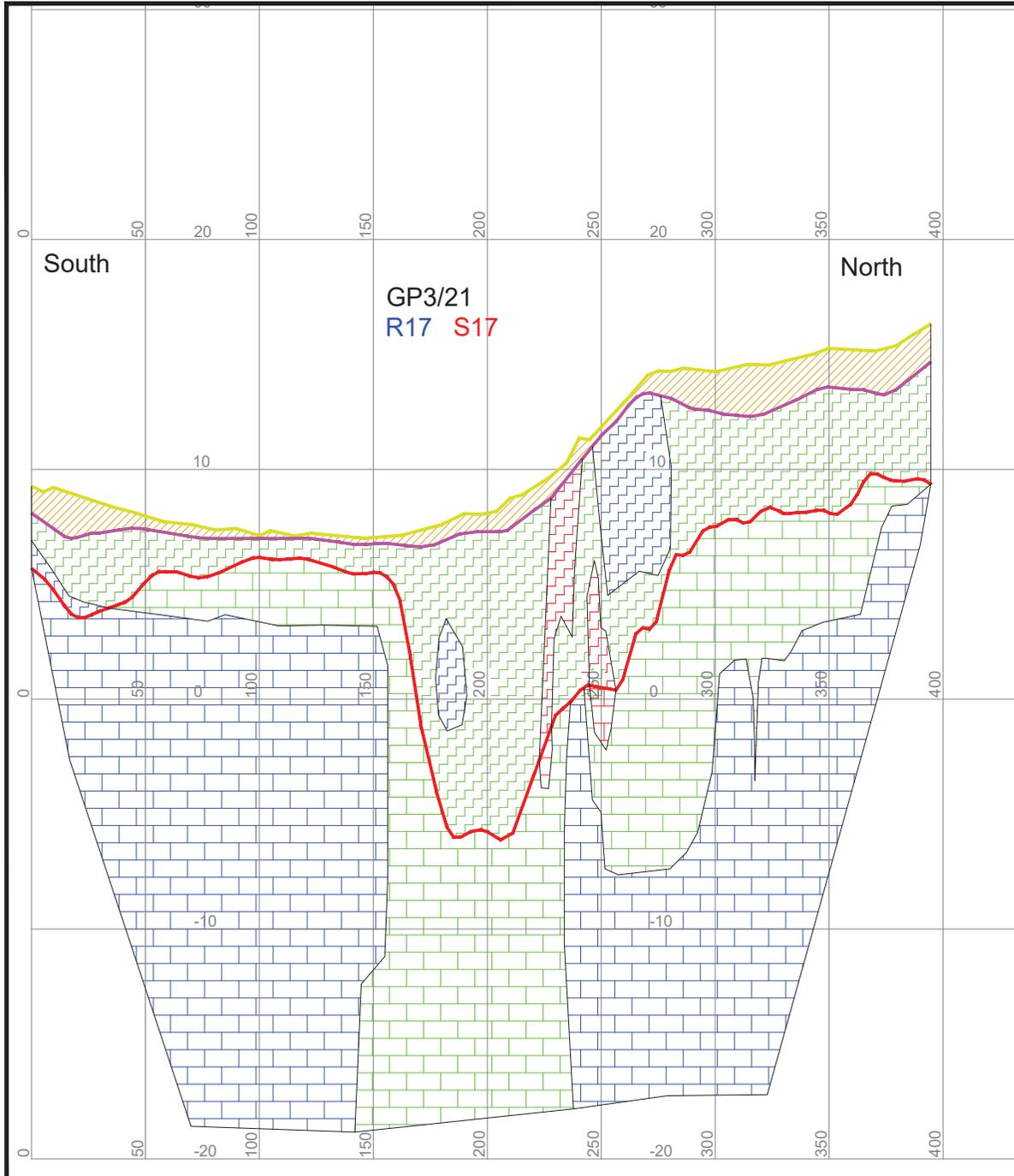
Geophysical Survey Locations:
Ground Surface along Survey Profile
Existing Ground Level along Centre Line
Proposed Vertical Alignment Centre Line
2D Resistivity and Seismic Refraction results are projected onto the Centre Line

Layers from Seismic Refraction Model:
Ground Surface/Top of Layer 1 (200 - 340 m/s)
Top of Layer 2 (600 - 1200 m/s)
Top of Layer 3 (2000 - 2400 m/s)
Top of Layer 4 (4000 - 5000 m/s)
1800 Seismic Velocity in m/s

Interpretation:
1 Soft or loose Topsoil or Overburden
2a Clay or Silt Overburden
2b Gravely Clay Overburden
2c Sand or Gravel Overburden
3a Clay Filled Weathered Limestone or Clay or Silt Overburden
3b Infilled Weathered Limestone or Gravely Clay Overburden
3c Weathered Limestone or Sand or Gravel Overburden
4a Clay Filled Strong Limestone
4b Infilled Strong Limestone
4c Fresh Strong Limestone

Abbreviated GI Logs:
BH3/18R Borehole Name and Location
Pt Peat Si Silt
Cl Clay Lms Limestone
Ts Topsoil Wlms Weathered Limestone
Mg Made Ground Gn Granite
Gr Gravel WGrn Weathered Granite
Sd Sand





Appendix 12

Groundwater Measurements

Water Readings



Project Name GCTP Phase 3
 Project No. 18963
 Engineer ARUP

Borehole No.	Date										
	11/03/2016	16/03/2016	21/03/2016	14-15/04/2016	25/05/2016	13-14/06/2016	18-19/07/2016	18-19/08/2016	29/09/2016	09/11/2016	
Borehole No.	m bgl / m OD										
BH3/04R	0.46		0.52	0.47	0.59	0.58	0.48	0.54	0.50	0.12	
BH3/06R	0.87			0.95	1.14	1.22	1.10	1.14	1.08	0.96	
BH3/08R	1.52			0.66	2.02	2.19	1.8	2.2	2.2	1.69	
BH3/10R				3.14	2.43	2.63	2.35	2.59	2.44	1.85	
BH3/11R	0.97		1.28	1.11	1.40	1.41	1.15	1.38	1.3	1.14	
BH3/13R				1.71	5.38	5.80	1.99	4.66		1.53	
BH3/16R				3.92	3.94	4.02	3.94	3.99	3.78	3.21	
BH3/17R			2.61	2.47	2.79	2.87	2.65	2.85	2.84	2.83	
BH3/18R			2.61	1.53	no access	2.55	2.3	2.58	2.48	2.3	
BH3/20R				3.02	3.50	3.8	3.16	3.65	3.55	3.15	
BH3/21 [CP]				1.32	1.55	dry	1.27	dry	dry	1.35	
BH3/23R			3.47	4.31	4.55	4.61	4	4.52	4.3	4.10	
BH3/24R			2.52	2.39	3.40	3.24	3.25	4.19	4.1	3.06	
BH3/27R				2.69	2.97	3.2	2.9			2.71	
BH3/29R				6.19	no access	dry	dry	dry	dry	4.50	
BH3/31R				1.53	no access	1.63	1.3	no access	no access	no access	
BH3/32R				dry (14.0)	dry (14.0)	dry	dry	14.19	dry	dry	
BH3/34R				7.52	7.78	8.04	6.66	12.88	8.50	7.70	
BH3/35R				8.91	9.10	9.61	9.14	9.49	9.20	8.37	
BH3/36R		18.98		18.52	18.07	17.96	17.90	17.93	17.90	17.78	
BH3/38R	2.26	2.35		2.58	2.66	2.69	2.28	2.72	2.60	1.44	
BH3/40R	2.66	2.95		2.96	no access	3.04	2.65	3.00	3.05	2.46	
BH3/41R	3.16	3.67		3.78	no access	4.01	3.43	no access	no access	3.20	
BH3/42R		2.72		2.97	2.72	3.15	2.53	2.85	2.80	2.66	
BH3/46R			12.78	12.71	12.75	13.00	12.74	13.01	13.00	12.49	
BH3/47R				10.05	10.16	10.19	10.00	dry	dry	10.02	
BH3/48R	1.41	1.45		1.55	no access	1.46	1.40	1.48	1.50	1.40	

NOTES

Appendix 13

Geotechnical Laboratory Testing

Lab 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. **R70242** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer GCC
 Samples Received: 01-02-16 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
TP3/01	AA37828	0.0	A16/0310	B	645								Dark brown/black sandy gravelly very fibrous PEAT
TP3/01	AA37829	1.0	A16/0311	B	12								Grey/brown clayey/silty, very sandy, GRAVEL
TP3/03	AA44474	0.5	A16/0312	D	54								Dark brown/black silty, very sandy, GRAVEL
TP3/03	AA44479	0.5	A16/0313	D	42	63	NP	NP	28	WS	4.4		Dark brown/black silty, very sandy, GRAVEL
TP3/03	AA44480	0.5	A16/0314	B	25								Dark brown/black silty, very sandy, GRAVEL
TP3/03	AA44481	1	A16/0315	D	80								Dark brown/black sandy gravelly SILT/CLAY
TP3/03	AA44482	1.6	A16/0316	D	26								Dark brown silty, very sandy, GRAVEL with occasional cobbles
TP3/03	AA44483	1.6	A16/0317	D	23	59	NP	NP	17	WS	4.4		Dark brown silty, very sandy, GRAVEL with occasional cobbles
TP3/03	AA44484	1.6	A16/0318	B	18								Dark brown silty, very sandy, GRAVEL with occasional cobbles
TP3/05	AA44473	0.5	A16/0319	D	892								Dark brown fibrous PEAT
TP3/05	AA44474	0.5	A16/0320	D	970								Dark brown/black fibrous PEAT
TP3/05	AA44475	0.5	A16/0321	B	912								Dark brown/black very fibrous PEAT
TP3/05	AA44476	1	A16/0322	D	30								Dark brown/grey clayey/silty, very sandy, GRAVEL
TP3/05	AA44477	1	A16/0323	B	30								Dark brown/grey clayey/silty, very sandy, GRAVEL
TP3/06	AA35350	0.5	A16/0324	D	855								Dark brown/black fibrous PEAT

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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 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 H Byrne (Quality Manager)	Approved by	Date	Page
			15-02-16	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. **R70244** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer Galway Co.Co.
 Samples Received: 01-02-16 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
TP3/06	AA37803	0.5	A16/0324	B	787								Dark brown/black PEAT
TP3/06	AA37804	1.1	A16/0325	D	22								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/06	AA37805	1.1	A16/0326	B	21								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/07	AA37806	0.2	A16/0327	D	31	42	NP	NP	40	WS	4.4		Brown silty, very gravelly, SAND with some cobbles
TP3/07	AA37807	0.2	A16/0328	B	27								Brown silty, very gravelly, SAND with some cobbles
TP3/08	AA37818	0.5	A16/0329	D	19								Dark brown clayey/silty, very sandy, GRAVEL with some cobbles
TP3/08	AA37819	0.5	A16/0330	B	12								Dark brown clayey/silty, very sandy, GRAVEL with some cobbles
TP3/08	AA37820	1.2	A16/0331	D	13								Light brown/grey clayey/silty, very sandy, GRAVEL
TP3/08	AA37821	1.2	A16/0332	B	12								Light brown/grey clayey/silty, very sandy, GRAVEL
TP3/11	AA37814	0.25	A16/0333	B	26								Dark brown clayey/silty, very sandy, GRAVEL with many cobbles
TP3/12	AA44457	0.1	A16/0334	B	90								Dark brown/black sandy gravelly organic SILT/CLAY
TP3/13	AA44458	0.1	A16/0335	D	246								Dark brown/black fibrous PEAT
TP3/13	AA44459	0.1	A16/0336	B	39								Dark brown/black slightly sandy, gravelly, SILT/CLAY with many cobbles
TP3/13	AA44460	0.5	A16/0337	D	25	27	NP	NP	59	WS	4.4		Light brown/grey sandy, slightly gravelly, SILT
TP3/13	AA44461	0.5	A16/0338	B	23								Light brown/grey sandy, slightly gravelly, SILT

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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 Opinions and interpretations are outside the scope of accreditation.
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Persons authorized to approve reports

H Byrne (Quality Manager)

Approved by

Date

15-02-16

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IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
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 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. **R70245** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer Galway Co. Co.
 Samples Received: 01-02-16 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
TP3/15	AA44485	0.1	A16/0340	D	210	247	NP	NP	46	WS	4.4		Dark brown/black PEAT
TP3/15	AA44486	0.1	A16/0341	B	140								Dark brown/black slightly gravelly PEAT
TP3/16	AA37816	0.2	A16/0342	D	44								Dark brown slightly clayey/silty, sandy, GRAVEL
TP3/16	AA37817	0.2	A16/0496	B	15								Dark brown slightly clayey/silty, sandy, GRAVEL
TP3/17	AA44487	0.5	A16/0509	D	17								Orange/brown clayey/silty, sandy, GRAVEL with some cobbles
TP3/17	AA44488	0.5	A16/0343	B	14								Orange/brown clayey/silty, sandy, GRAVEL with some cobbles
TP3/17	AA44489	0.5	A16/0344	B	18								Orange/brown clayey/silty, sandy, GRAVEL with some cobbles
TP3/18	AA37825	0.15	A16/0345	B	36								Dark brown/black sandy gravelly SILT/CLAY
TP3/18	AA37826	1	A16/0346	B	10								Brown clayey/silty, sandy, GRAVEL
TP3/18	AA37827	2	A16/0347	B	6.2								Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles
TP3/19	AA44490	0.5	A16/0348	D	11								Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles
TP3/19	AA44491	0.5	A16/0349	B	15								Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles
TP3/19	AA44492	0.5	A16/0350	B	14								Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles
TP3/20	AA37822	0.15	A16/0351	B	169								Dark brown/black very fibrous PEAT
TP3/20	AA37823	1	A16/0352	B	170								Dark brown/black very fibrous PEAT

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

Remarks:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 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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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. **R70246** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer GCC
 Samples Received: 01-02-16 Date Tested: 10-02-16

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
TP3/20	AA37824	1.0	A16/0353	B	11								Dark brown/grey very sandy GRAVEL
TP3/20	AA37824	1.0	A16/0354	E	11								Dark brown/grey very sandy GRAVEL
TP3/21	AA44493	0.2	A16/0355	D	15								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/21	AA44494	0.15	A16/0356	B	17								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/21	AA44495	0.15	A16/0357	B	19								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/22	AA39946	0.15	A16/0358	D	25	34	NP	NP	75	WS	4.4		Brown sandy, slightly gravelly, SILT
TP3/22	AA33947	0.15	A16/0359	B	24								Brown sandy, slightly gravelly, SILT
TP3/23	AA39940	0.5	A16/0360	D	17	29	NP	NP	77	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/23	AA33941	0.5	A16/0361	B	17								Light brown slightly sandy, slightly gravelly, SILT
TP3/23	AA33942	1.1	A16/0362	D	12	21	NP	NP	65	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/23	AA33943	1.1	A16/0363	B	11								Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/23	AA33944	2	A16/0364	D	6.6	19	NP	NP	54	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/23	AA33945	2	A16/0365	B	7.9								Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/25	AA33934	0.15	A16/0366	D	34	59	NP	NP	34	WS	4.4		Brown silty, very sandy, GRAVEL
TP3/25	AA33935	0.15	A16/0367	B	16								Brown silty, very 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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
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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. **R70247** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer Galway Co.Co.
 Samples Received: 01-02-16 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
TP3/25	AA33936	1.0	A16/0368	D	7.7	24	NP	NP	38	WS	4.4		Light brown/grey very sandy very gravelly SILT
TP3/25	AA33937	1.0	A16/0369	B	8.1								Light brown/grey very sandy very gravelly SILT
TP3/25	AA33938	2.0	A16/0370	D	7.9								Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles
TP3/25	AA33939	2.0	A16/0371	B	7.7								Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles
TP3/27	AA44451	0.5	A16/0372	D	15	34	NP	NP	64	WS	4.4		Brown slightly sandy, gravelly, SILT
TP3/27	AA44452	0.5	A16/0373	B	17								Brown slightly sandy, gravelly, SILT
TP3/27	AA44453	1.0	A16/0374	D	6.7	18	NP	NP	66	WS	4.4		Grey/brown slightly sandy, slightly gravelly, SILT
TP3/27	AA44454	1.0	A16/0375	B	9.2								Grey/brown slightly sandy, slightly gravelly, SILT
TP3/27	AA44455	2.0	A16/0376	D	6.4	18	NP	NP	73	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/27	AA44456	2.0	A16/0377	B	9.3								Light brown slightly sandy, slightly gravelly, SILT
TP3/28	AA37830	0.5	A16/0378	D	14	22	NP	NP	51	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/28	AA37831	0.5	A16/0379	B	11								Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/28	AA37832	1.0	A16/0380	D	13	22	NP	NP	64	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/28	AA37833	1.0	A16/0381	B	12								Light brown slightly sandy, slightly gravelly, SILT
TP3/28	AA37834	2.0	A16/0382	D	10	21	NP	NP	69	WS	4.4		Light brown 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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
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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. **R70248** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer GCC
 Samples Received: 01-02-16 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
TP3/28	AA37835	2.0	A16/0383	B	9.5								Light brown slightly sandy, gravelly, SILT/CLAY
TP3/28	AA37836	3.0	A16/0384	D	9.4	20	NP	NP	63	WS	4.4		Light brown slightly sandy, gravelly, SILT
TP3/28	AA37837	3.0	A16/0385	B	8.5								Light brown slightly sandy, gravelly, SILT
TP3/29	AA37808	0.5	A16/0386	D	316								Dark brown/black fibrous PEAT
TP3/29	AA37809	0.5	A16/0387	B	199								Dark brown/black fibrous PEAT
TP3/29	AA37810	1	A16/0388	D	45	38	23	15	49	WS	4.4	C I	Brown clayey/silty, sandy, GRAVEL with many cobbles
TP3/29	AA37811	1	A16/0389	B	27								Brown clayey/silty, sandy, GRAVEL with many cobbles
TP3/29	AA37812	1.6	A16/0390	D	29	55	NP	NP	46	WS	4.4		Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles
TP3/29	AA37813	1.6	A16/0391	B	27								Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles
TP3/33	AA35349	0	A16/0392	B	72								Black gravelly sandy organic SILT/CLAY
TP3/34	AA44464	0.5	A16/0393	D	653								Dark brown/black PEAT
TP3/34	AA44465	0.5	A16/0394	D	531								Dark brown/black PEAT
TP3/34	AA44466	0.5	A16/0395	B	493								Dark brown/black PEAT
TP3/34	AA44467	1	A16/0396	D	25	35	NP	NP	78	WS	4.4		Grey/brown slightly sandy, slightly gravelly, SILT
TP3/34	AA44468	1	A16/0397	B	23								Grey/brown slightly sandy, slightly gravelly, SILT

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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
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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. **R70249** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1

Customer GCC

Samples Received: 01-02-16 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
TP3/34	AA44469	2.0	A16/0398	D	15	33	NP	NP	24	WS	4.4		Grey clayey/silty, sandy, GRAVEL
TP3/34	AA44470	2.0	A16/0399	B	11								Grey clayey/silty, sandy, GRAVEL
TP3/34	AA44471	1.0	A16/0400	CBR	25								Dark brown very sandy very gravelly SILT/CLAY with root hairs
TP3/34	AA44472	1.0	A16/0401	CBR	25								Dark brown very sandy very gravelly SILT/CLAY with root hairs
TP3/35	AA44462	0.5	A16/0402	D	612								Dark brown/black PEAT
TP3/35	AA44463	0.5	A16/0403	B	643								Drk brown/black fibrous PEAT
0	0	0	0	0	0								0
TP3/14	AA37815	0.2	A16/0339	B	22								Dark brown/black clayey/silty, sandy, GRAVEL with many cobbles

<p>Notes: Preparation: WS - Wet sieved Sample Type: B - bulk disturbed AR - As received U - Undisturbed NP - Non plastic</p> <p>Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method</p>	<p>Remarks:</p> <p>NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 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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TEST REPORT

Determination of Particle Size Distribution

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

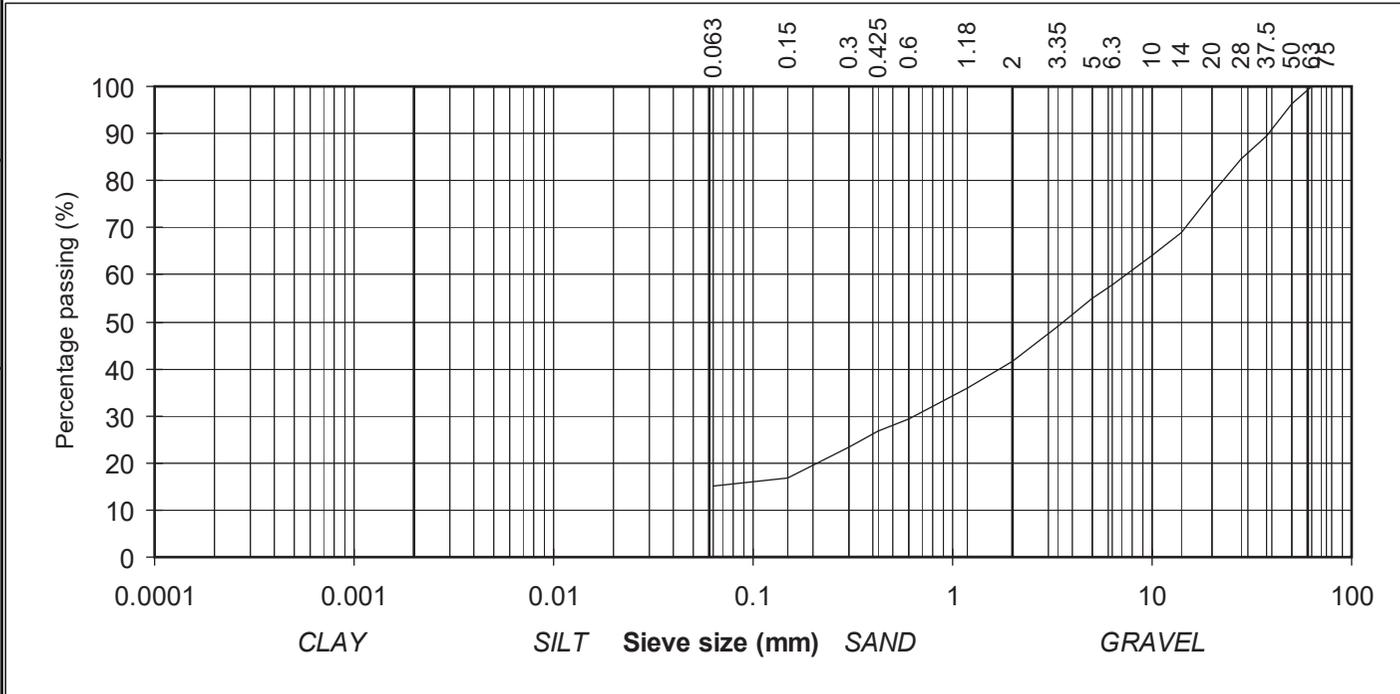
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	96	
37.5	89	GRAVEL
28	85	
20	77	
14	69	
10	64	
6.3	58	
5	55	
3.35	49	
2	42	
1.18	36	
0.6	29	SAND
0.425	27	
0.3	23	
0.15	17	SILT/CLAY
0.063	15	

Contract No: 18963 Report No. R70450
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/01
 Sample No. AA37824 Lab. Sample No. A16/0311
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 09-02-16
 Description: Grey/brown clayey/silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorised to approve report: 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

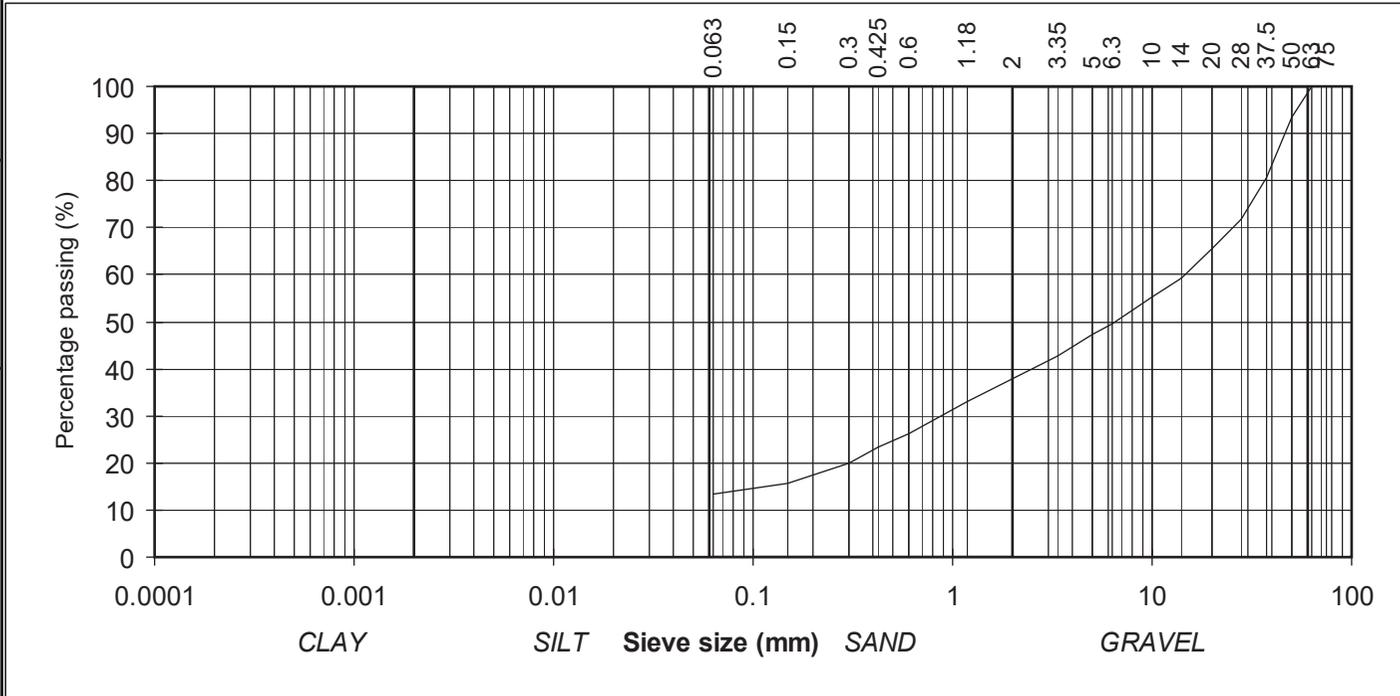
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	94	GRAVEL
37.5	81	
28	72	
20	65	
14	59	
10	55	
6.3	50	
5	47	
3.35	43	
2	38	
1.18	33	
0.6	26	
0.425	23	
0.3	20	SILT/CLAY
0.15	16	
0.063	13	

Contract No: 18963 Report No. R70496
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/03
 Sample No. AA Lab. Sample No. A16/0314
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Dark brown/black silty, very sandy, GRAVEL

Remarks



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Persons authorised to approve report: 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

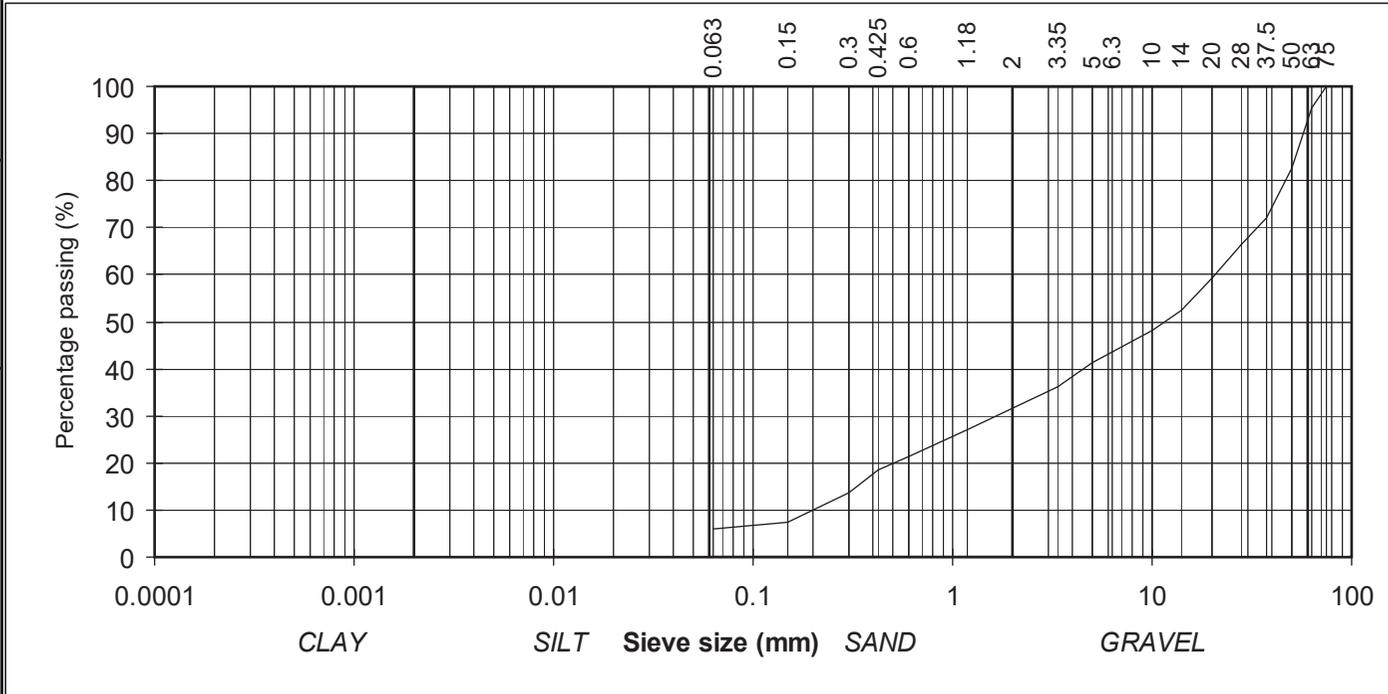
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	96	
50	83	
37.5	72	GRAVEL
28	66	
20	59	
14	52	
10	48	
6.3	44	
5	41	
3.35	36	SAND
2	32	
1.18	27	
0.6	21	
0.425	19	
0.3	14	SILT/CLAY
0.15	7	
0.063	6	

Contract No: 18963 Report No. R70449
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/03
 Sample No. AA44484 Lab. Sample No. A16/0318
 Sample Type: B
 Depth (m) 1.60 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Dark brown silty, very sandy, GRAVEL with occasional cobbles

Remarks



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Persons authorised to approve report: 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

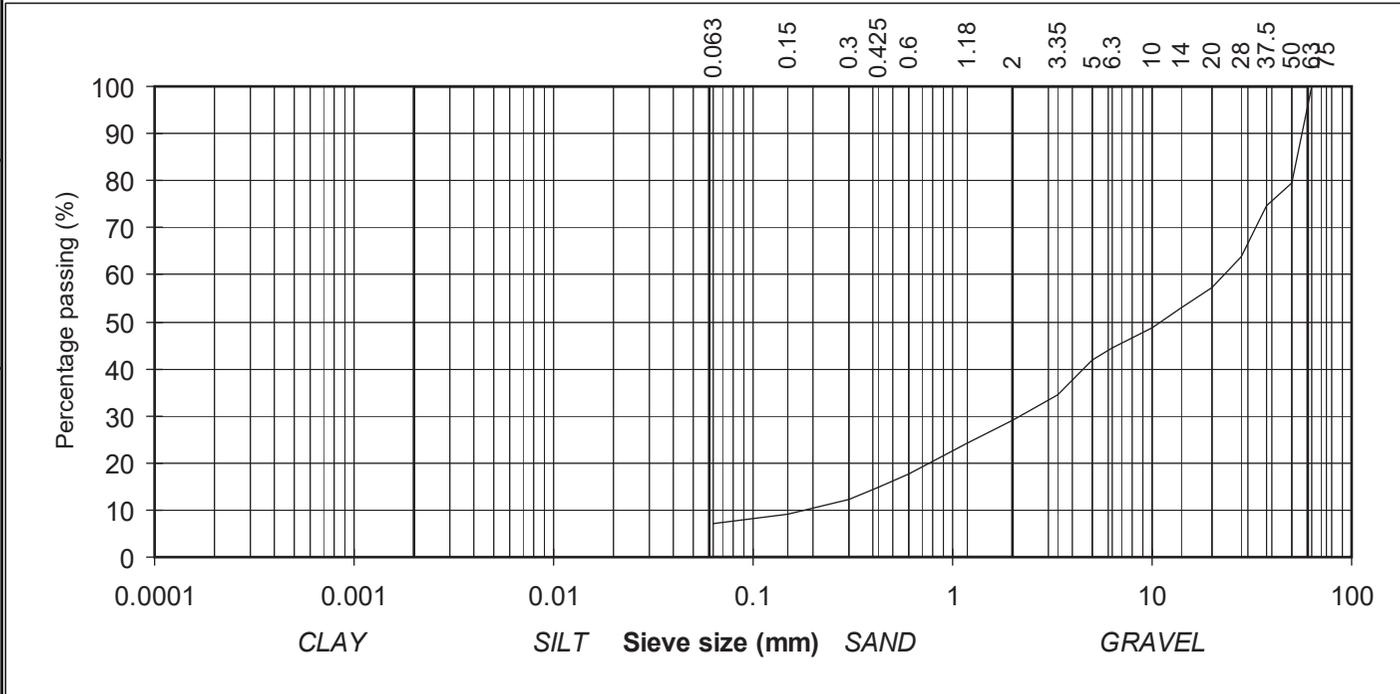
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	79	
37.5	75	GRAVEL
28	64	
20	57	
14	53	
10	49	
6.3	44	
5	42	
3.35	34	SAND
2	29	
1.18	24	
0.6	18	
0.425	15	SILT/CLAY
0.3	12	
0.15	9	
0.063	7	

Contract No: 18963 Report No. R70586
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/05
 Sample No. AA Lab. Sample No. A16/0485
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Dark brown/grey clayey/silty, very sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

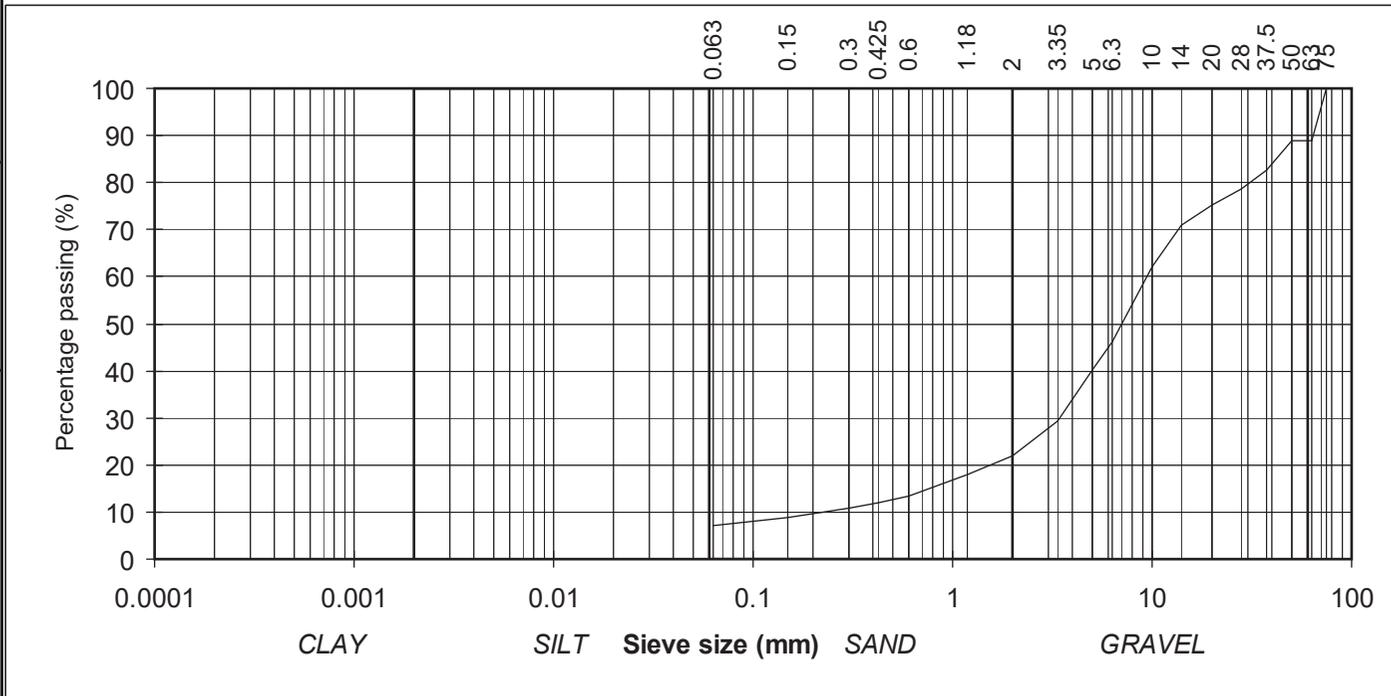
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	89	
50	89	
37.5	83	
28	79	GRAVEL
20	75	
14	71	
10	62	
6.3	46	
5	40	
3.35	29	
2	22	SAND
1.18	18	
0.6	13	
0.425	12	
0.3	11	SILT/CLAY
0.15	9	
0.063	7	

Contract No: 18963 Report No. R70372
 Contract: GCTP Phase 3 - Contact 1
 TP: TP3/06
 Sample No. AA37805 Lab. Sample No. A16/0325
 Sample Type: B
 Depth (m) 1.10 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles

Remarks: Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

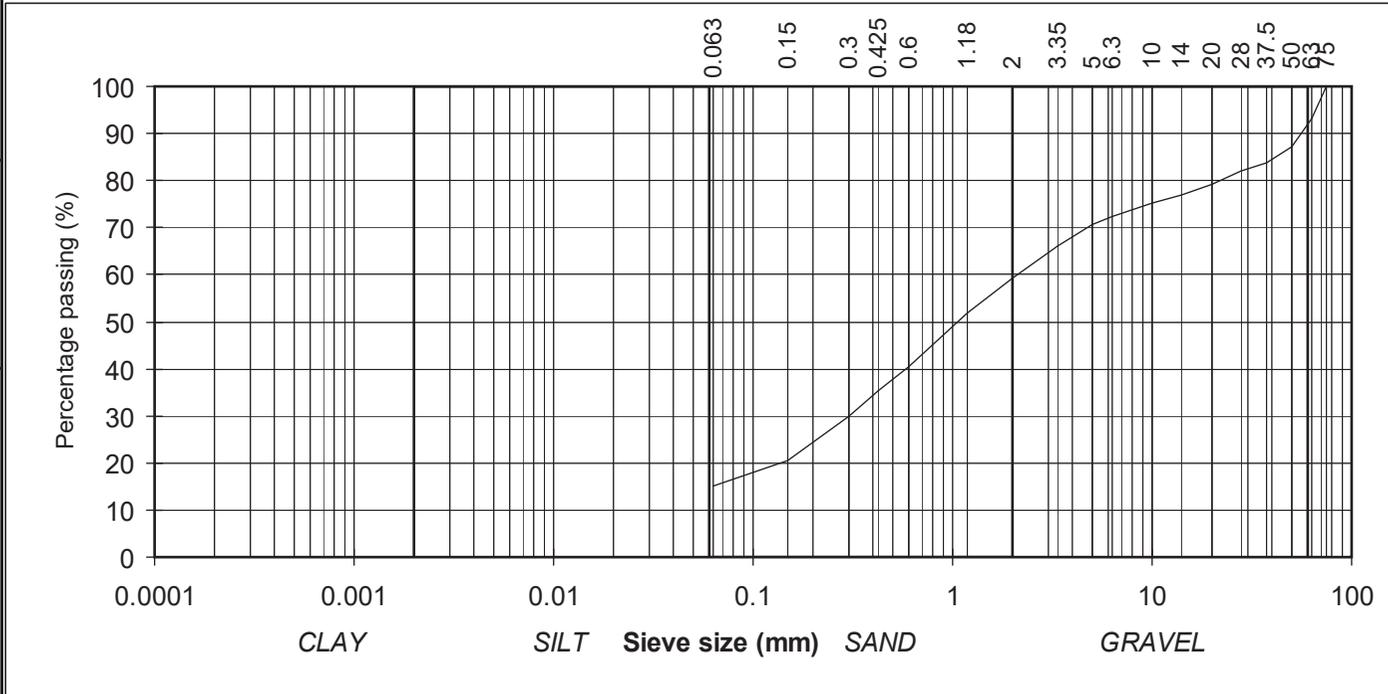
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	93	
50	87	
37.5	84	GRAVEL
28	82	
20	79	
14	77	
10	75	
6.3	72	
5	71	
3.35	66	SAND
2	59	
1.18	52	
0.6	41	
0.425	35	
0.3	30	SILT/CLAY
0.15	21	
0.063	15	

Contract No: 18963 Report No. R70587
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/07
 Sample No. AA Lab. Sample No. A16/0328
 Sample Type: B
 Depth (m) 0.20 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Brown silty, very gravelly, SAND with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

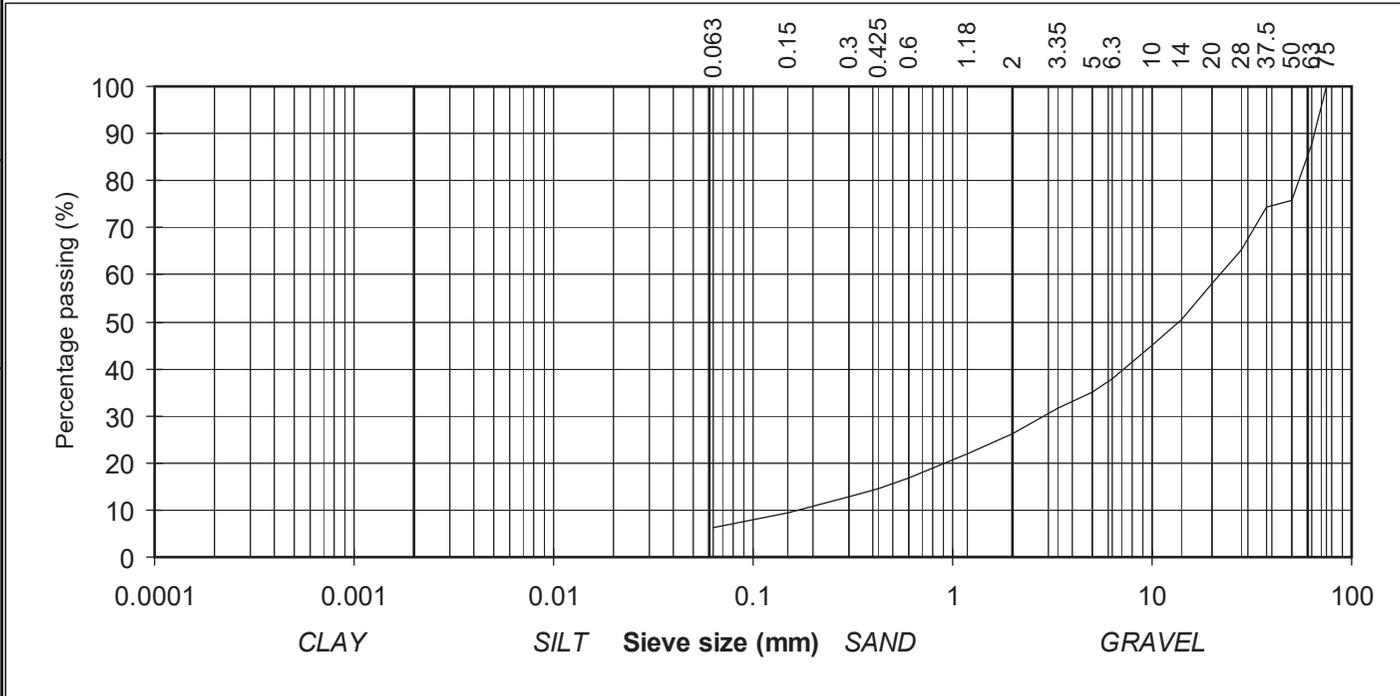
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	88	
50	76	
37.5	74	
28	65	GRAVEL
20	58	
14	50	
10	45	
6.3	38	
5	35	
3.35	32	
2	26	SAND
1.18	22	
0.6	17	
0.425	15	
0.3	13	SILT/CLAY
0.15	10	
0.063	6	

Contract No: 18963 Report No. R70499
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/8
 Sample No. AA37819 Lab. Sample No. A16/0330
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Dark brown clayey/silty, very sandy, GRAVEL with some cobbles

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

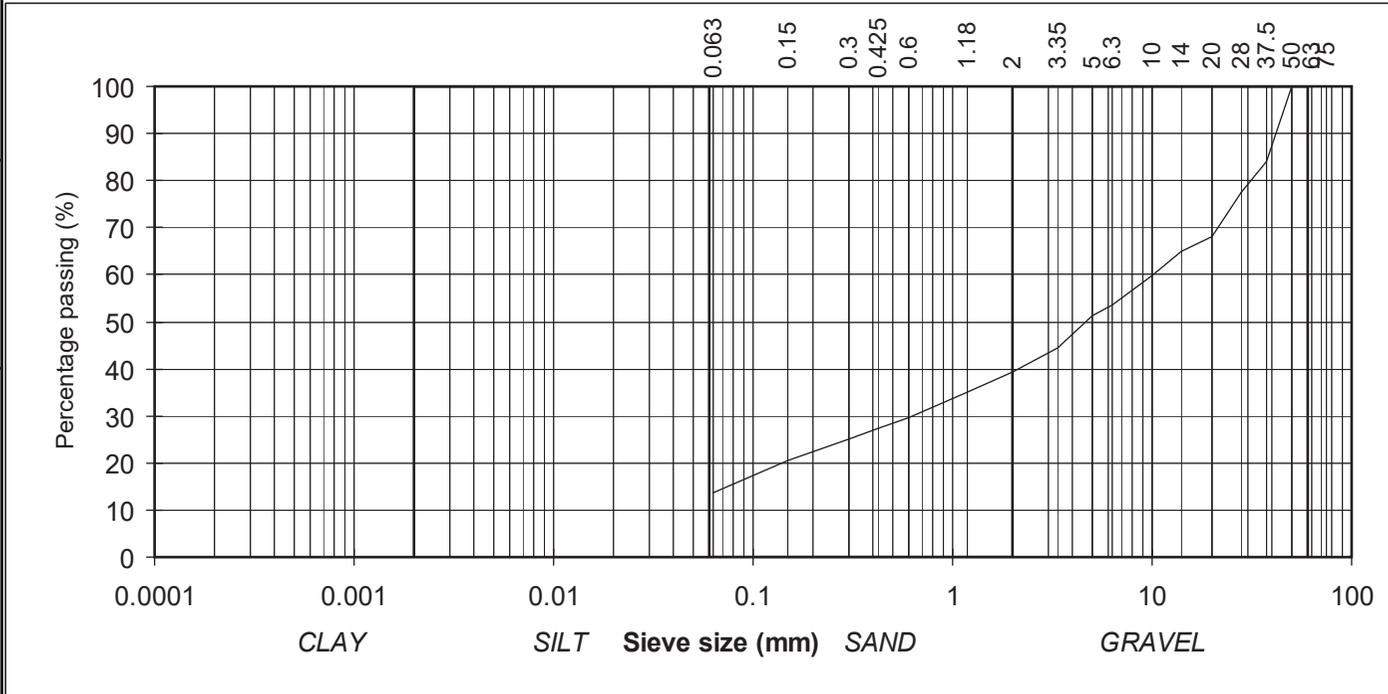
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	84	GRAVEL
28	77	
20	68	
14	65	
10	60	
6.3	54	
5	51	
3.35	45	
2	39	
1.18	35	
0.6	30	SAND
0.425	27	
0.3	25	
0.15	21	SILT/CLAY
0.063	14	

Contract No: 18963 Report No. R70373
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/08
 Sample No. AA37821 Lab. Sample No. A16/0332
 Sample Type: B
 Depth (m) 1.20 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown/grey clayey/silty, very sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
<i>H Byrne</i>	15-02-16	1 of 1

Persons authorised to approve report: 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

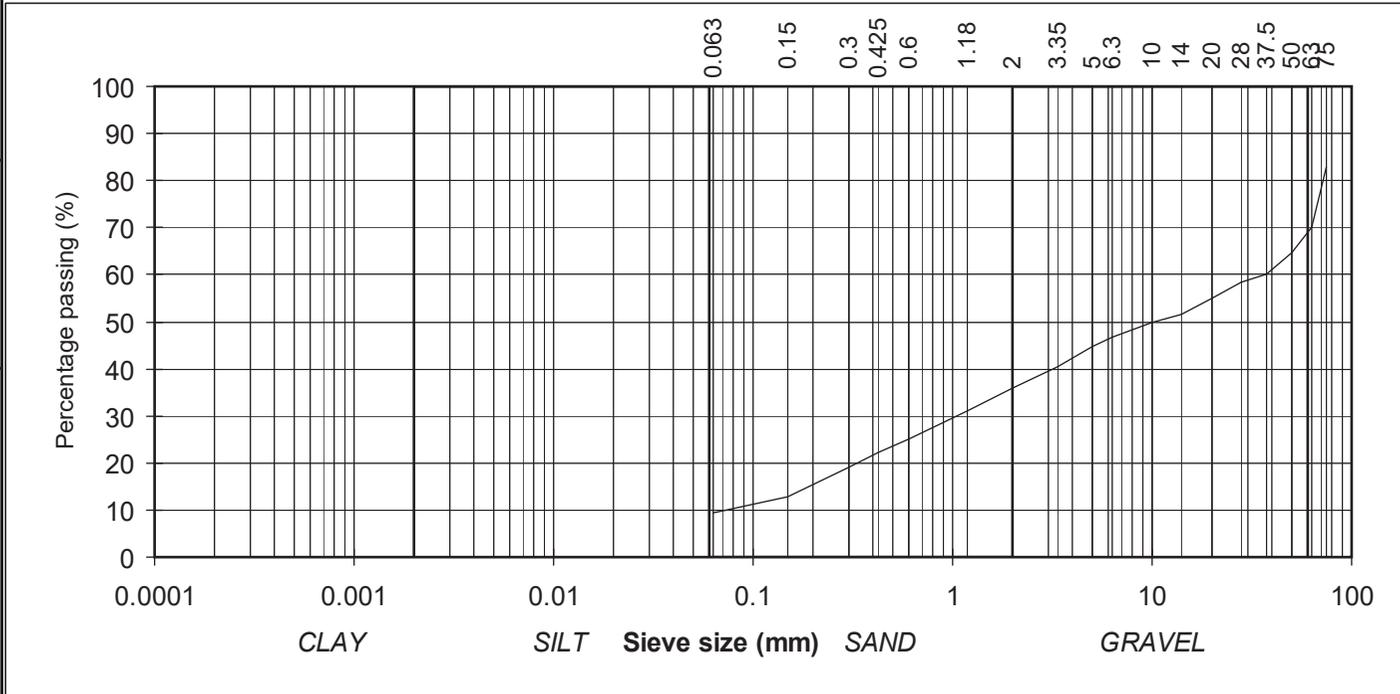
(note: Sedimentation stage not accredited)



particle size	% passing	
75	83	COBBLES
63	70	
50	65	
37.5	60	
28	58	GRAVEL
20	55	
14	52	
10	50	
6.3	47	
5	45	
3.35	41	
2	36	SAND
1.18	31	
0.6	25	
0.425	22	
0.3	19	SILT/CLAY
0.15	13	
0.063	9	

Contract No: 18963 Report No. R70588
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/11
 Sample No. AA37814 Lab. Sample No. A16/0333
 Sample Type: B
 Depth (m) 0.25 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Dark brown clayey/silty, very sandy, GRAVEL with many cobbles

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

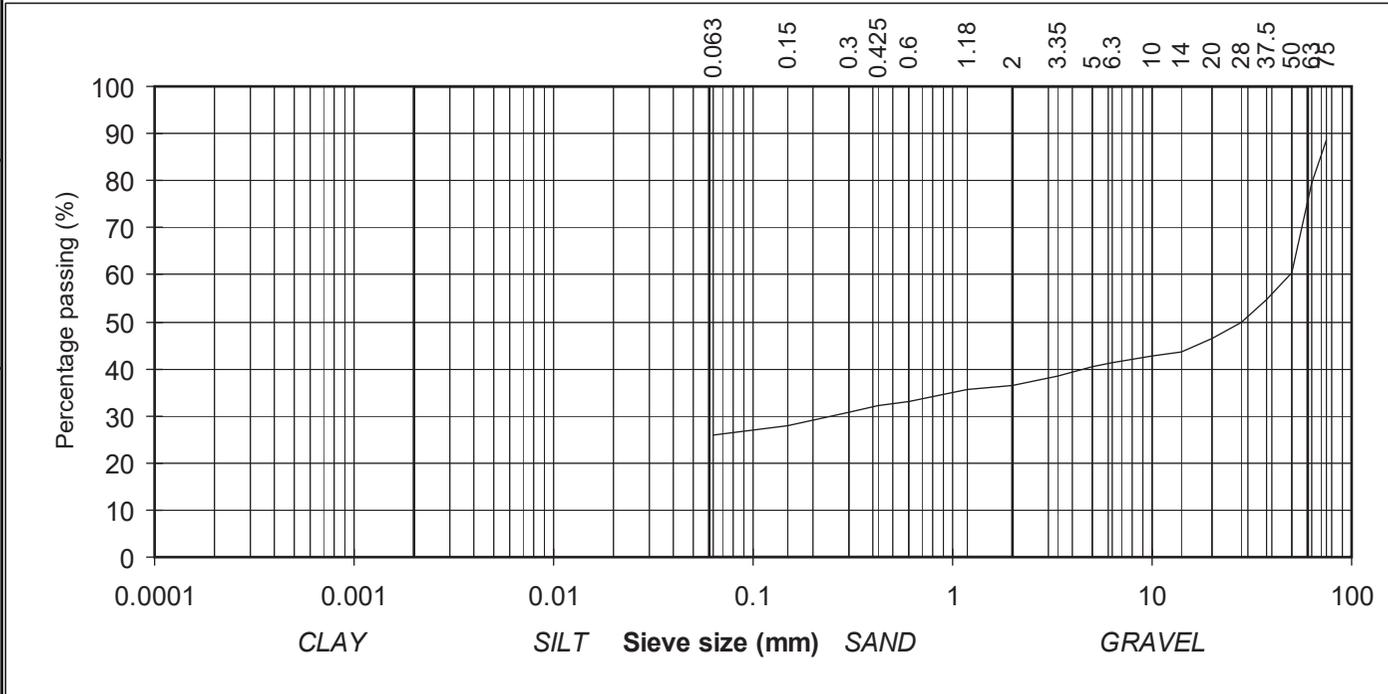
(note: Sedimentation stage not accredited)



particle size	% passing	
75	89	COBBLES
63	79	
50	60	
37.5	55	
28	50	
20	47	GRAVEL
14	43	
10	43	
6.3	41	
5	40	
3.35	39	SAND
2	36	
1.18	36	
0.6	33	
0.425	32	
0.3	31	SILT/CLAY
0.15	28	
0.063	26	

Contract No: 18963 Report No. R70661
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/13
 Sample No. AA44459 Lab. Sample No. A16/0336
 Sample Type: B
 Depth (m) 0.10 Customer: Galway Co.Co.
 Date Received 02-02-16 Date Testing started 09-02-16
 Description: Dark brown/black slightly sandy, gravelly, SILT/CLAY with many cobbles

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

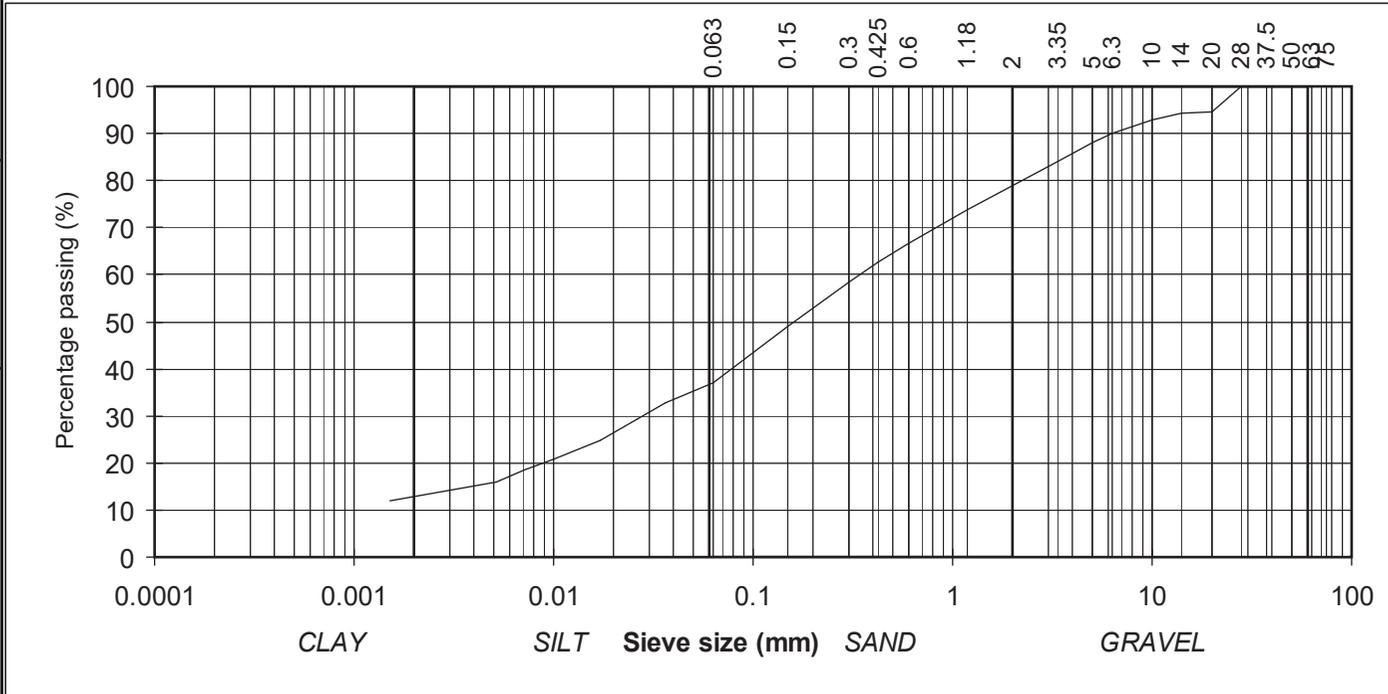
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	GRAVEL
20	94	
14	94	
10	93	
6.3	90	
5	88	
3.35	84	
2	79	SAND
1.18	74	
0.6	67	
0.425	63	
0.3	58	SILT/CLAY
0.15	49	
0.063	37	
0.036	33	
0.026	29	
0.017	25	
0.010	21	
0.007	19	
0.005	16	
0.002	12	

Contract No: 18963 Report No. R70400
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/13
 Sample No. AA44461 Lab. Sample No. A16/0338
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown/grey sandy, slightly gravelly, SILT

Remarks



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Persons authorised to approve report: 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

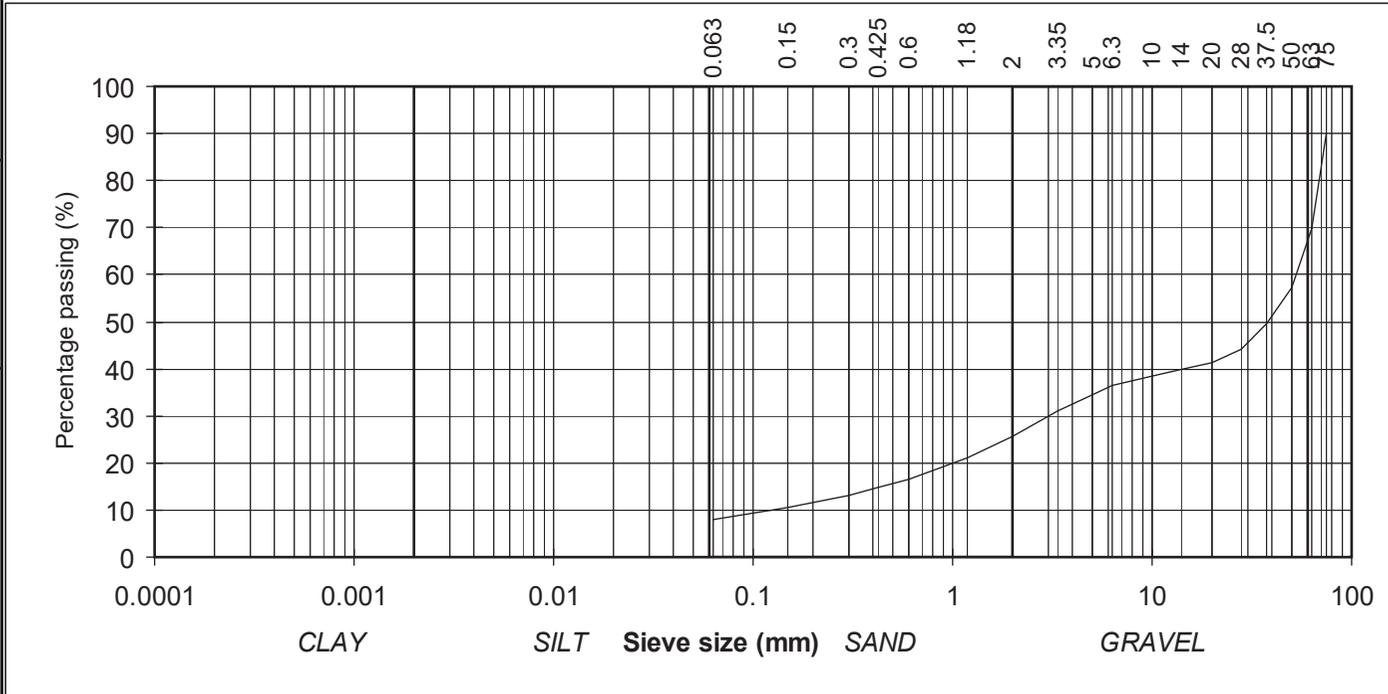
(note: Sedimentation stage not accredited)



particle size	% passing	
75	90	COBBLES
63	70	
50	57	
37.5	50	GRAVEL
28	44	
20	41	
14	40	
10	38	
6.3	36	
5	35	
3.35	31	
2	26	
1.18	21	
0.6	17	
0.425	15	
0.3	13	SILT/CLAY
0.15	11	
0.063	8	

Contract No: 18963 Report No. R70497
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/14
 Sample No. AA37815 Lab. Sample No. A16/0339
 Sample Type: B
 Depth (m) 0.20 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Dark brown/black clayey/silty, sandy, GRAVEL with many cobbles

Remarks



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Persons authorised to approve report: 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

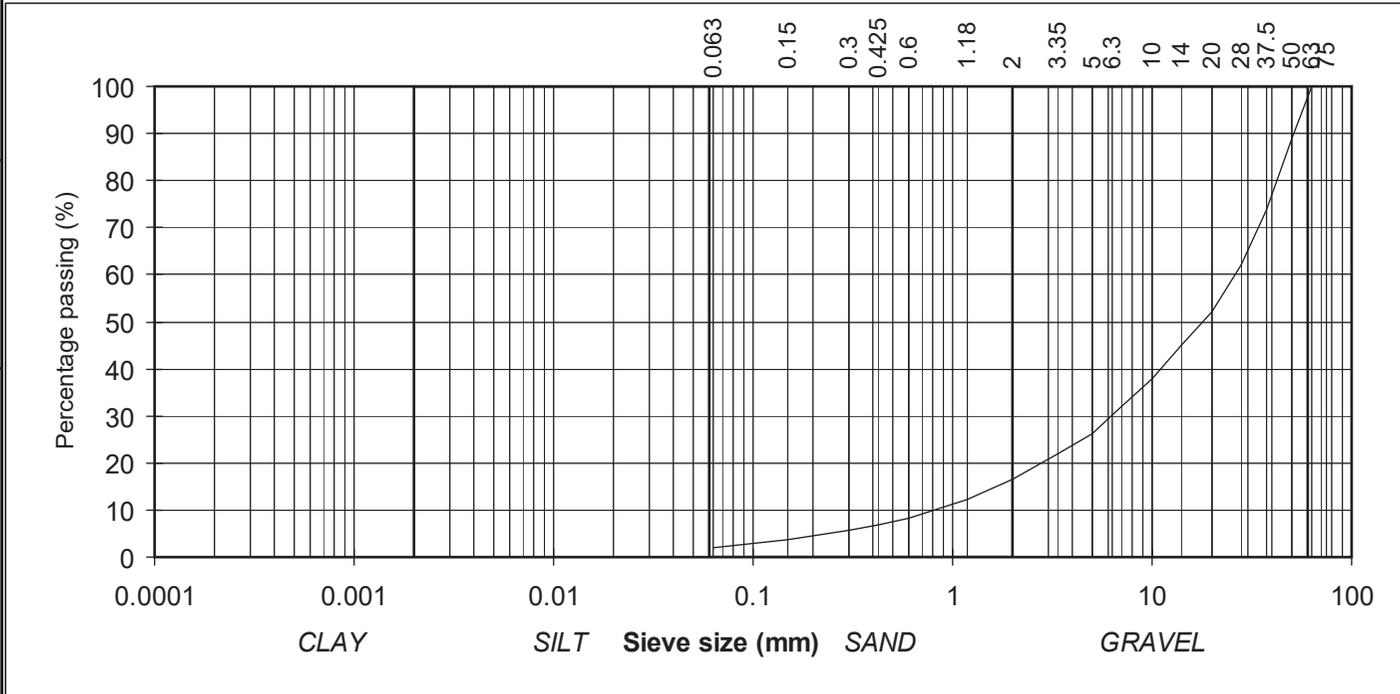
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	89	
37.5	74	GRAVEL
28	62	
20	52	
14	45	
10	38	
6.3	30	
5	26	
3.35	22	SAND
2	16	
1.18	12	
0.6	8	
0.425	7	SILT/CLAY
0.3	6	
0.15	4	
0.063	2	

Contract No: 18963 Report No. R70498
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/16
 Sample No. AA37817 Lab. Sample No. A16/0496
 Sample Type: B
 Depth (m) 0.20 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 09-02-16
 Description: Dark brown slightly clayey/silty, sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

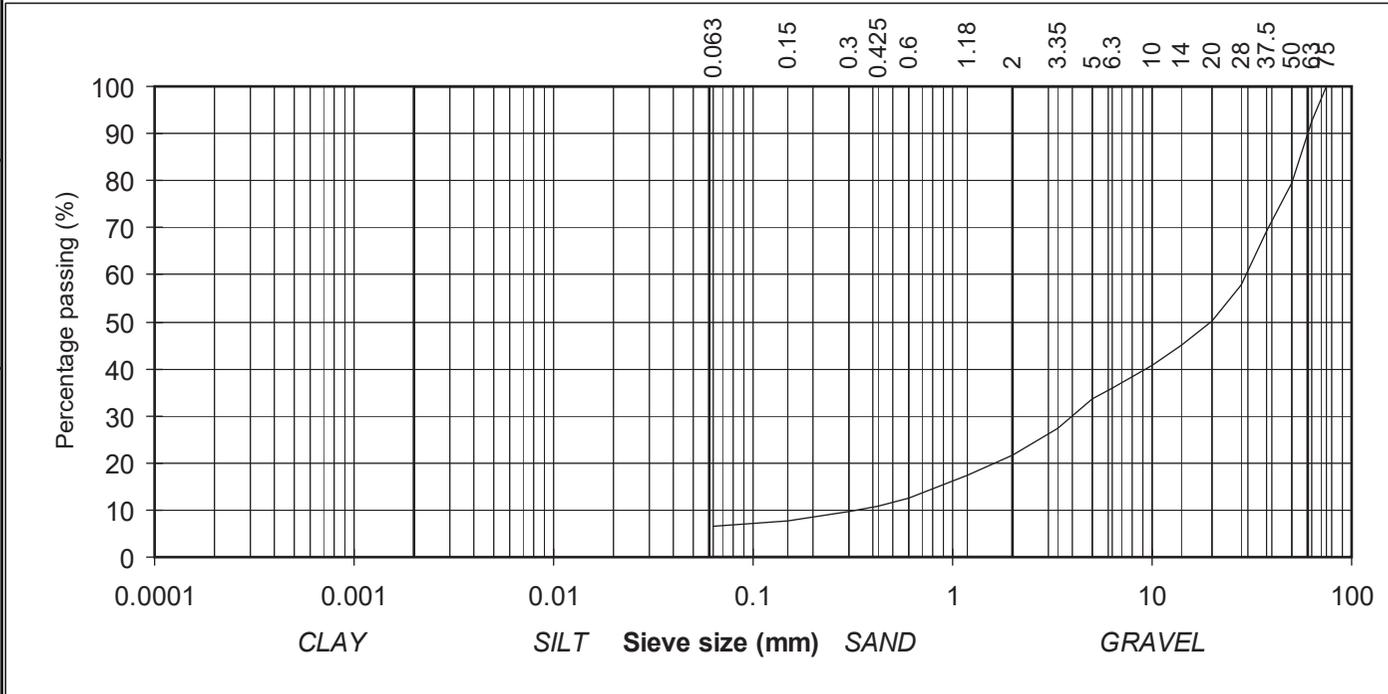
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	93	
50	79	
37.5	69	
28	58	
20	50	GRAVEL
14	45	
10	41	
6.3	36	
5	34	
3.35	27	
2	22	
1.18	17	
0.6	12	
0.425	11	
0.3	10	
0.15	8	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R70374
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/17
 Sample No. AA44488 Lab. Sample No. A16/0343
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles

Remarks



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Persons authorised to approve report: 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

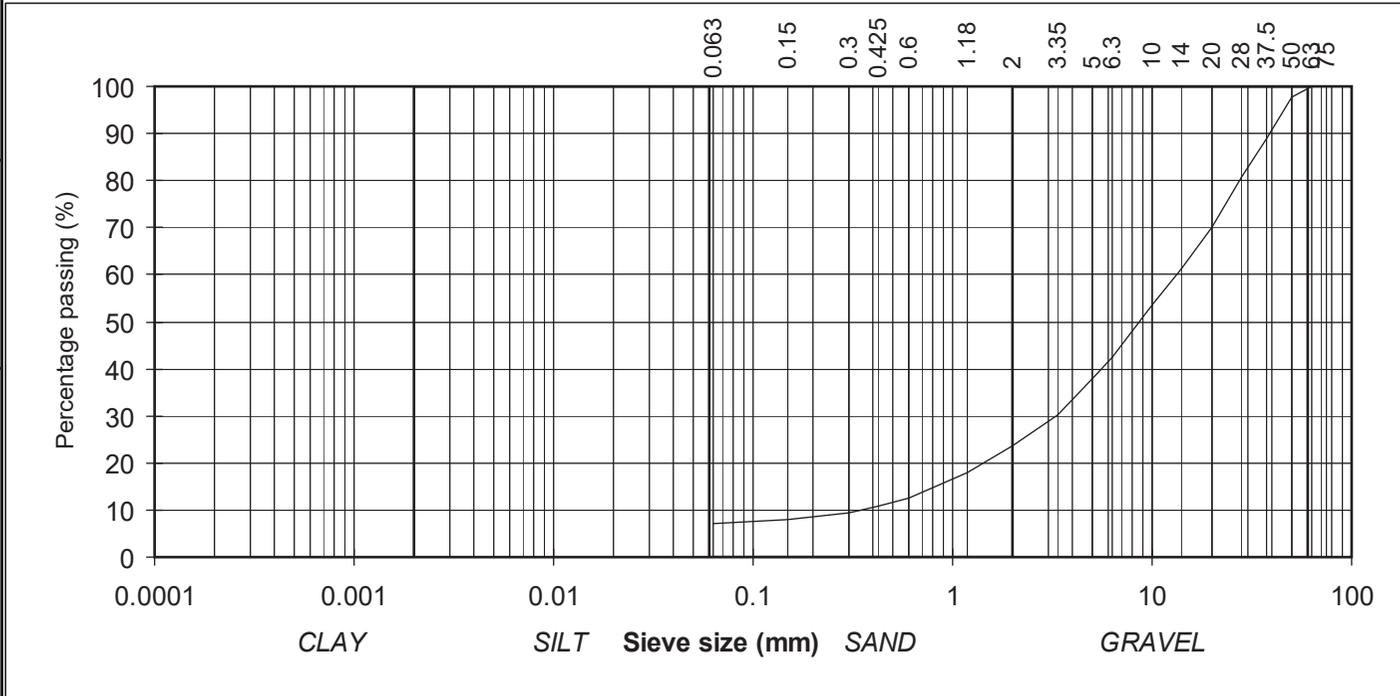
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	98	
37.5	89	GRAVEL
28	80	
20	70	
14	61	
10	53	
6.3	43	
5	38	
3.35	30	SAND
2	24	
1.18	18	
0.6	12	
0.425	11	SILT/CLAY
0.3	9	
0.15	8	
0.063	7	

Contract No: 18963 Report No. R70375
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/18
 Sample No. AA37826 Lab. Sample No. A16/0346
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Brown clayey/silty, sandy, GRAVEL

Remarks



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Persons authorised to approve report: 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

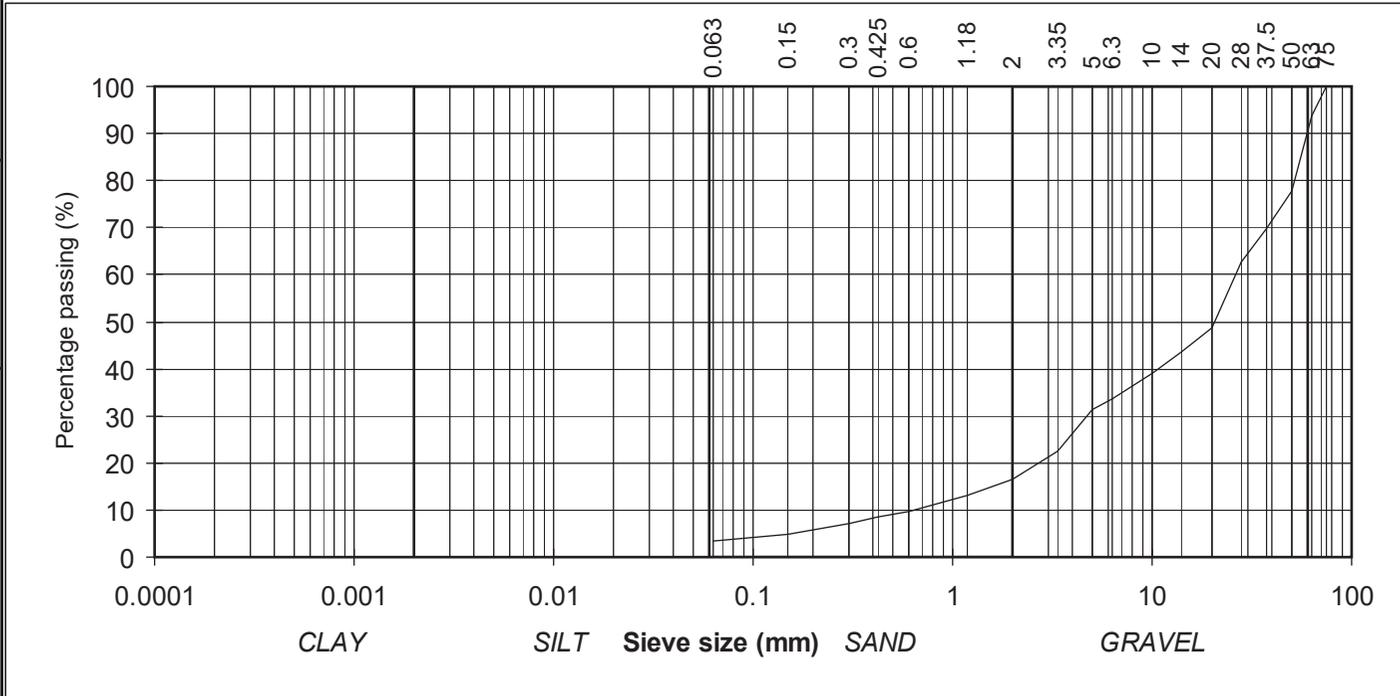
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	94	
50	78	
37.5	70	GRAVEL
28	63	
20	49	
14	44	
10	39	
6.3	34	
5	31	
3.35	23	SAND
2	17	
1.18	13	
0.6	10	
0.425	9	SILT/CLAY
0.3	7	
0.15	5	
0.063	3	

Contract No: 18963 Report No. R70376
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/18
 Sample No. AA37827 Lab. Sample No. A16/0347
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

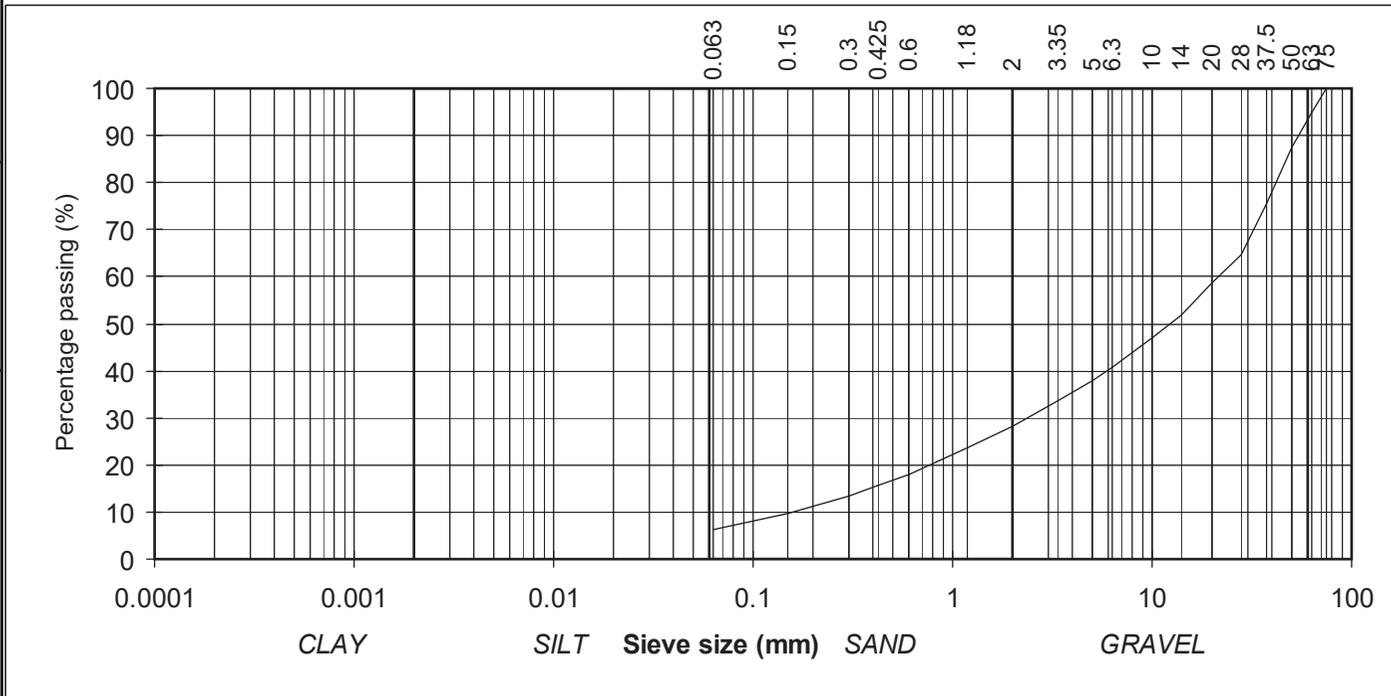
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	95	
50	87	
37.5	75	GRAVEL
28	65	
20	59	
14	52	
10	47	
6.3	41	
5	38	
3.35	34	SAND
2	28	
1.18	24	
0.6	18	
0.425	16	
0.3	13	SILT/CLAY
0.15	10	
0.063	6	

Contract No: 18963 Report No. R70495
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/19
 Sample No. AA44491 Lab. Sample No. A16/0349
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

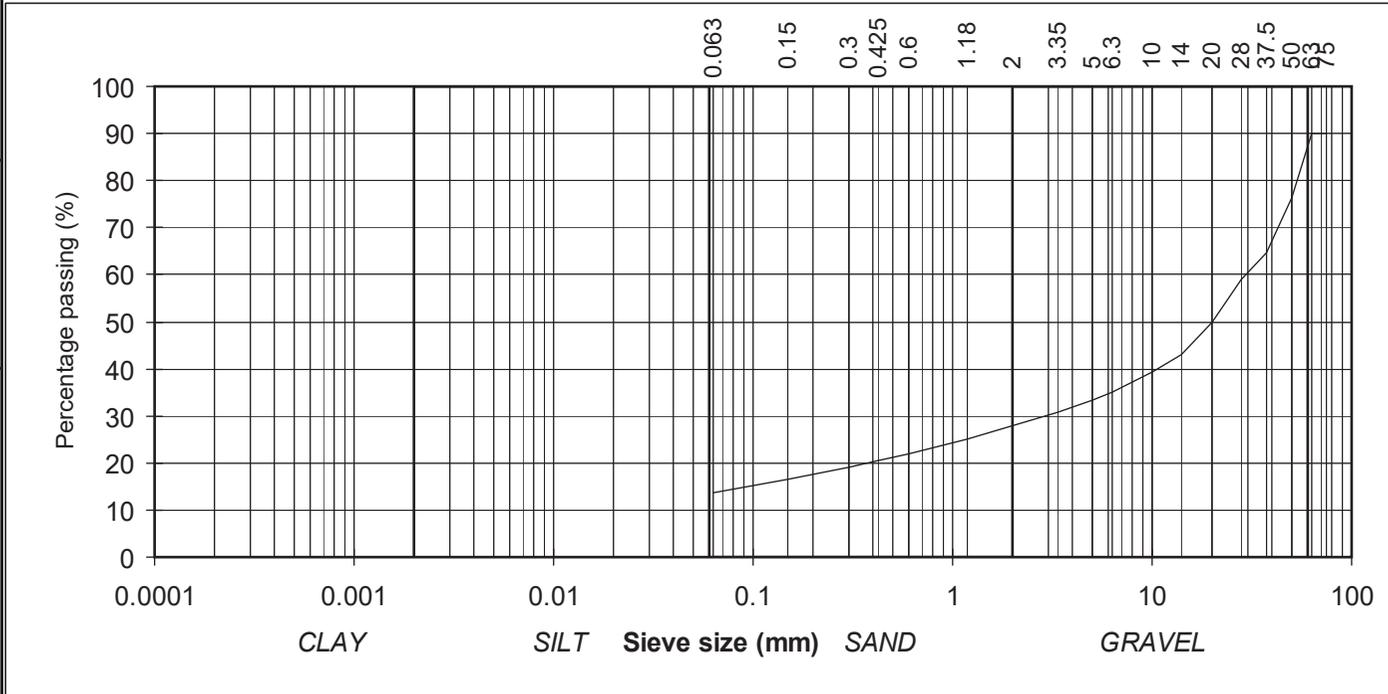
(note: Sedimentation stage not accredited)



particle size	% passing	
75	90	COBBLES
63	90	
50	76	
37.5	65	GRAVEL
28	59	
20	50	
14	43	
10	39	
6.3	35	
5	33	
3.35	31	SAND
2	28	
1.18	25	
0.6	22	
0.425	21	SILT/CLAY
0.3	19	
0.15	17	
0.063	14	

Contract No: 18963 Report No. R70662
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/21
 Sample No. AA44494 Lab. Sample No. A16/0356
 Sample Type: B
 Depth (m) 0.15 Customer: Galway Co.Co.
 Date Received 02-02-16 Date Testing started 04-02-16
 Description: Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles

Remarks



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Persons authorised to approve report: 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

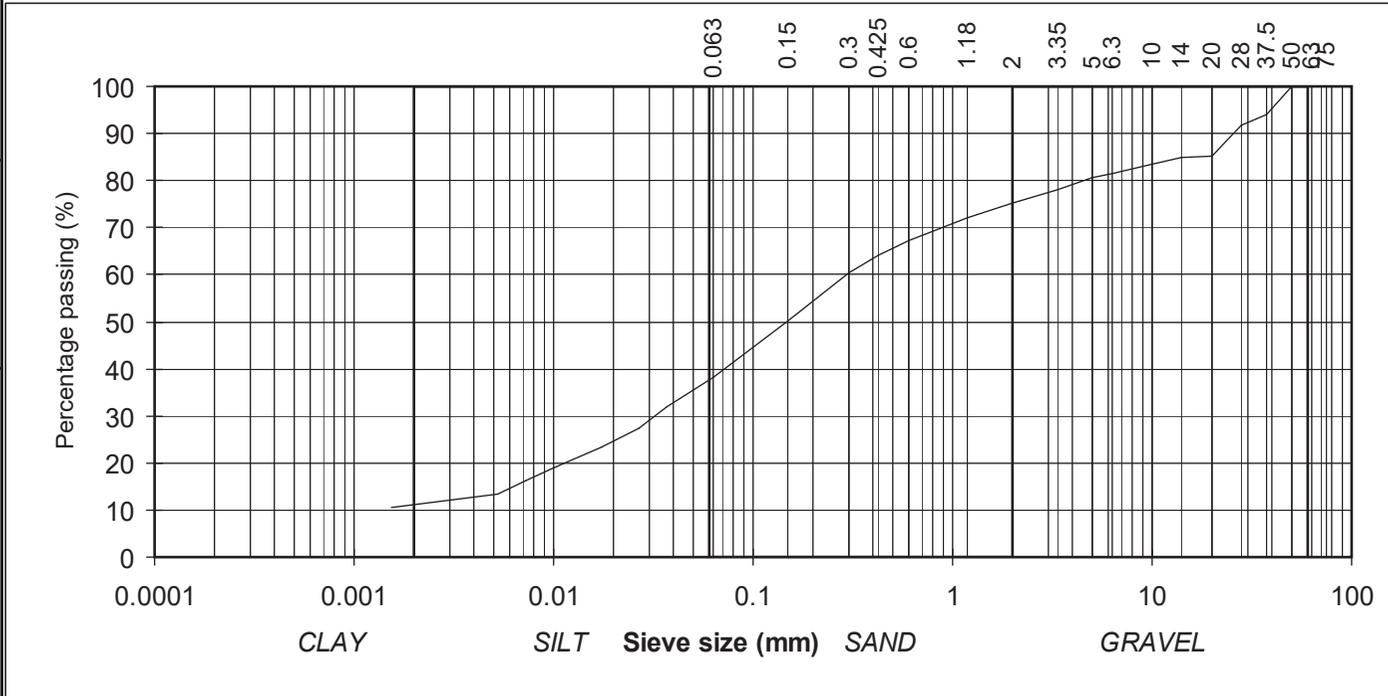
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	94	GRAVEL
28	92	
20	85	
14	85	
10	83	
6.3	81	
5	80	
3.35	78	
2	75	
1.18	72	
0.6	67	SAND
0.425	64	
0.3	60	
0.15	50	SILT/CLAY
0.063	38	
0.037	32	
0.027	27	
0.017	23	
0.010	19	
0.007	16	
0.005	13	
0.002	11	

Contract No: 18963 Report No. R70377
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/22
 Sample No. AA33947 Lab. Sample No. A16/0359
 Sample Type: B
 Depth (m) 0.15 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Brown sandy, slightly gravelly, SILT/CLAY

Remarks



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Persons authorised to approve report: 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

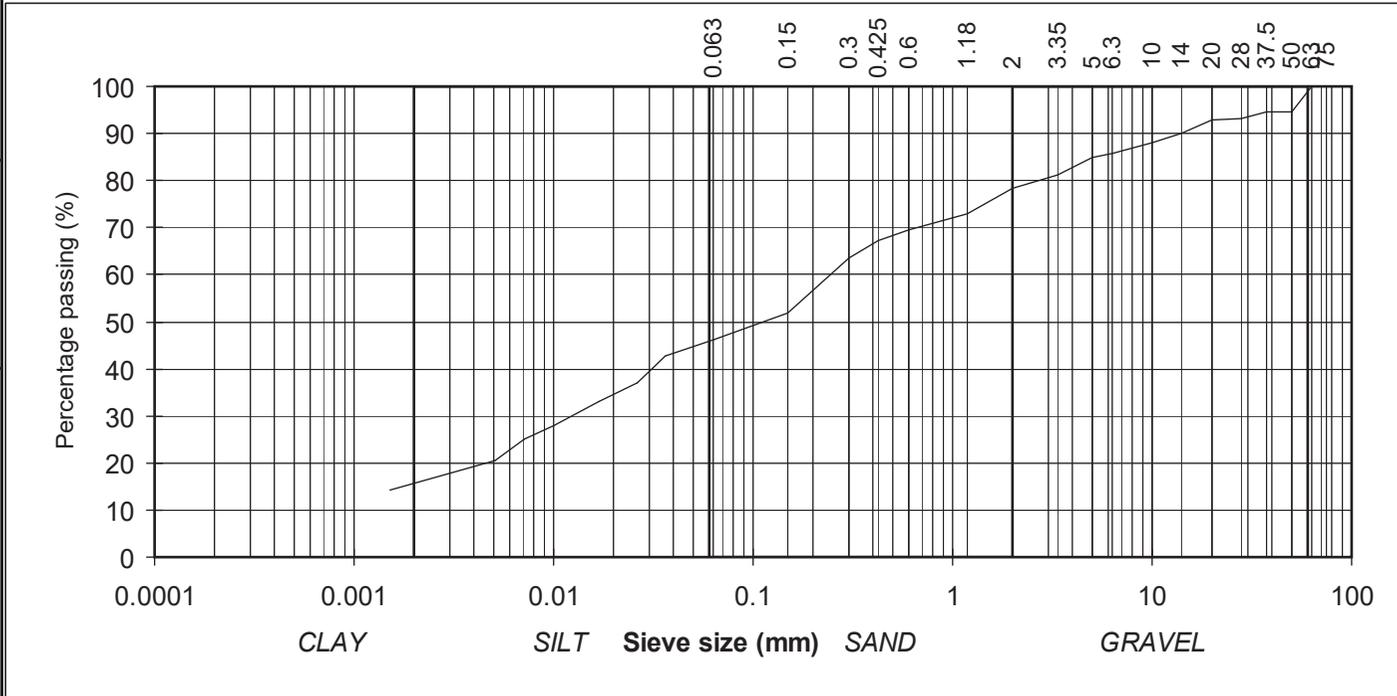
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	95	GRAVEL
37.5	95	
28	93	
20	93	
14	90	
10	88	
6.3	86	
5	85	
3.35	81	
2	78	
1.18	73	
0.6	69	
0.425	67	
0.3	64	
0.15	52	SILT/CLAY
0.063	46	
0.036	43	
0.026	37	
0.017	33	
0.010	28	
0.007	25	
0.005	21	
0.002	14	

Contract No: 18963 Report No. R70378
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/23
 Sample No. AA33941 Lab. Sample No. A16/0361
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Light brown slightly sandy, slightly gravelly, SILT

Remarks



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Persons authorised to approve report: 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

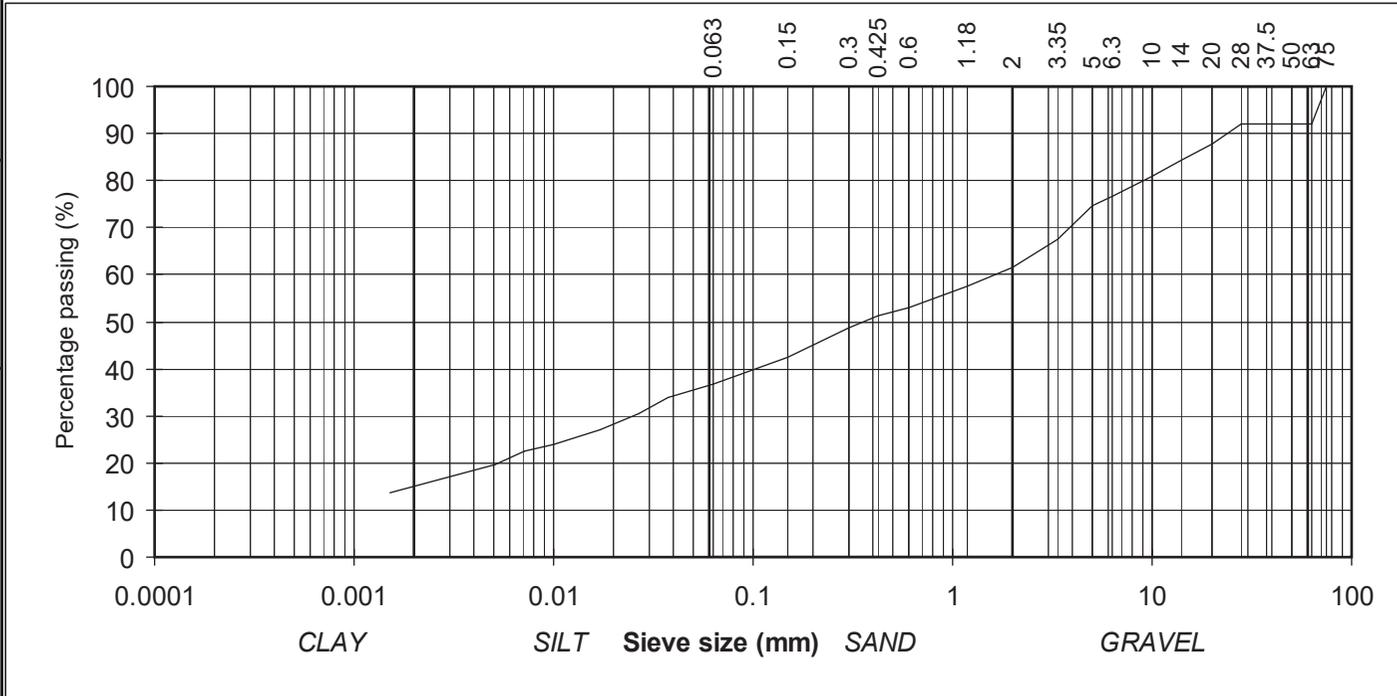
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	92	
50	92	
37.5	92	
28	92	GRAVEL
20	88	
14	84	
10	81	
6.3	77	
5	75	
3.35	67	
2	62	
1.18	57	
0.6	53	
0.425	51	SAND
0.3	49	
0.15	42	
0.063	37	SILT/CLAY
0.037	34	
0.027	31	
0.017	27	
0.010	24	
0.007	23	
0.005	20	
0.002	14	

Contract No: 18963 Report No. R70379
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/23
 Sample No. AA33943 Lab. Sample No. A16/0363
 Sample Type: B
 Depth (m) 1.10 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown slightly sandy, gravelly, SILT with some cobbles

Remarks



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Persons authorised to approve report: 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

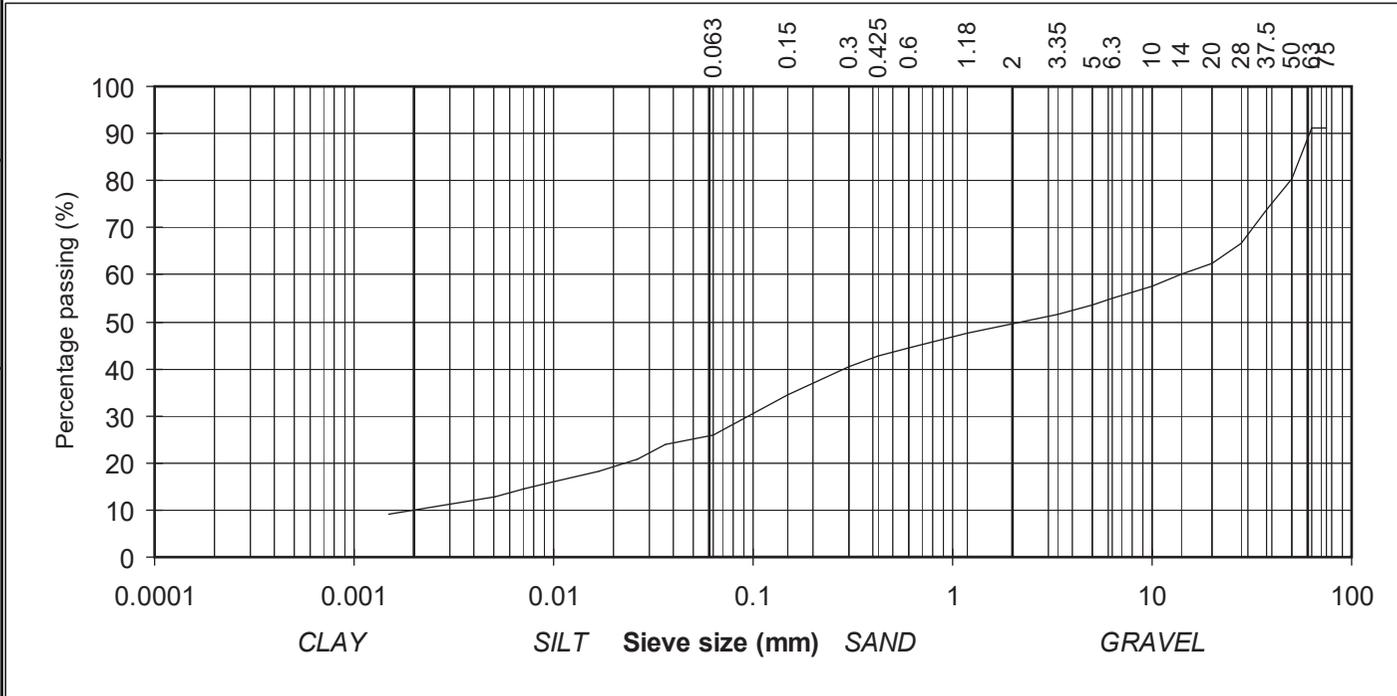
(note: Sedimentation stage not accredited)



particle size	% passing	
75	91	COBBLES
63	91	
50	80	
37.5	74	GRAVEL
28	67	
20	62	
14	60	
10	58	
6.3	55	
5	54	
3.35	52	SAND
2	50	
1.18	47	
0.6	44	
0.425	43	
0.3	40	SILT/CLAY
0.15	34	
0.063	26	
0.036	24	
0.026	21	
0.017	18	
0.010	16	
0.007	14	
0.005	13	
0.002	9	

Contract No: 18963 Report No. R70401
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/23
 Sample No. AA33945 Lab. Sample No. A16/0365
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown slightly sandy, gravelly, SILT with some cobbles

Remarks



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Persons authorised to approve report: 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

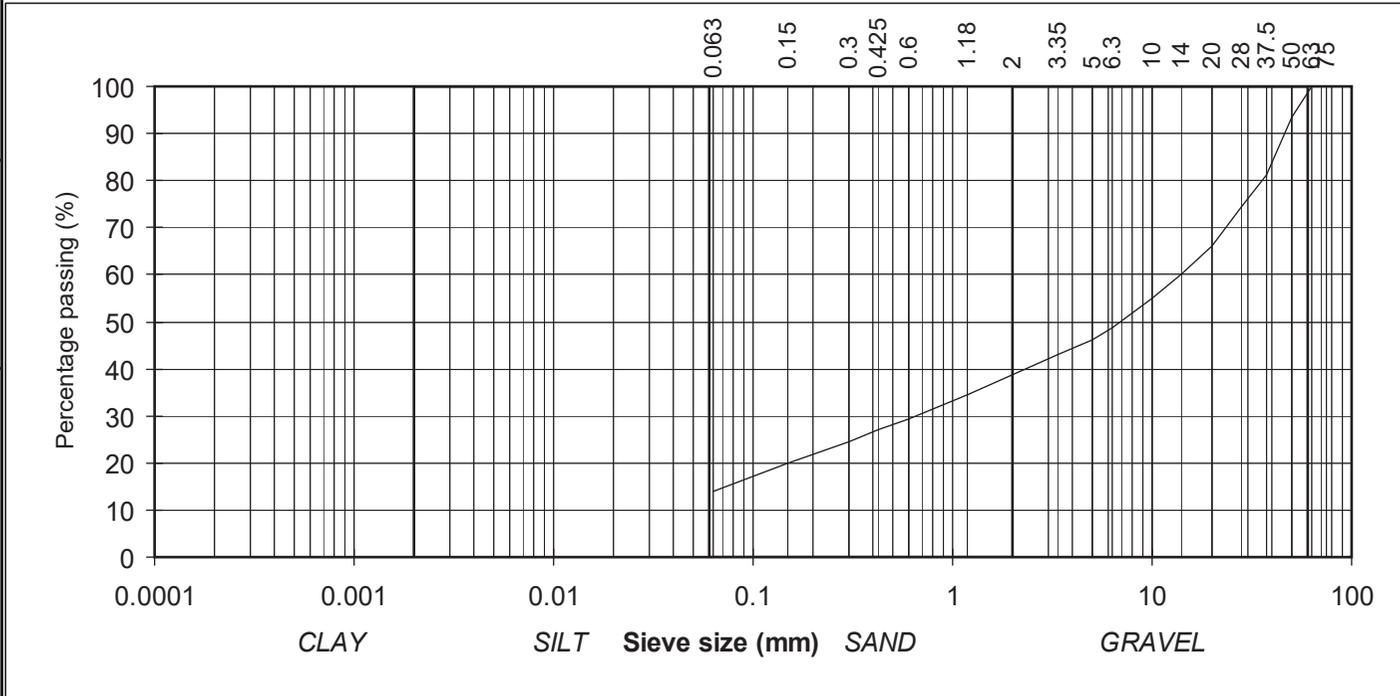
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	93	GRAVEL
37.5	81	
28	74	
20	66	
14	60	
10	55	
6.3	49	
5	46	
3.35	43	
2	39	
1.18	35	
0.6	29	
0.425	27	
0.3	25	SILT/CLAY
0.15	20	
0.063	14	

Contract No: 18963 Report No. R70402
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/25
 Sample No. AA33935 Lab. Sample No. A16/0367
 Sample Type: B
 Depth (m) 0.15 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Brown silty, very sandy, GRAVEL

Remarks



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Persons authorised to approve report: 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

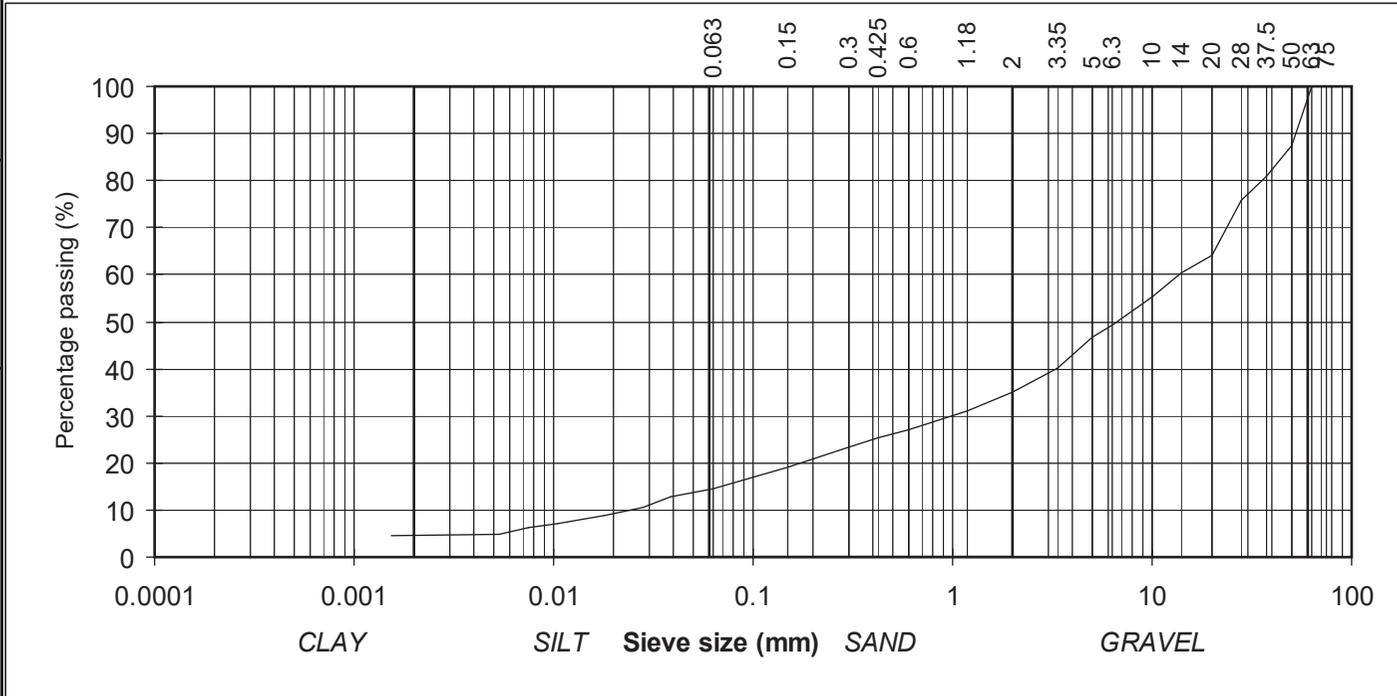
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	87	
37.5	81	GRAVEL
28	76	
20	64	
14	60	
10	55	
6.3	49	
5	47	
3.35	40	
2	35	
1.18	31	
0.6	27	SAND
0.425	25	
0.3	23	
0.15	19	SILT/CLAY
0.063	15	
0.039	13	
0.028	10	
0.018	9	
0.010	7	
0.007	6	
0.005	5	
0.002	5	

Contract No: 18963 Report No. R70380
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/25
 Sample No. AA33937 Lab. Sample No. A16/0369
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown/grey clayey/silty, very sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

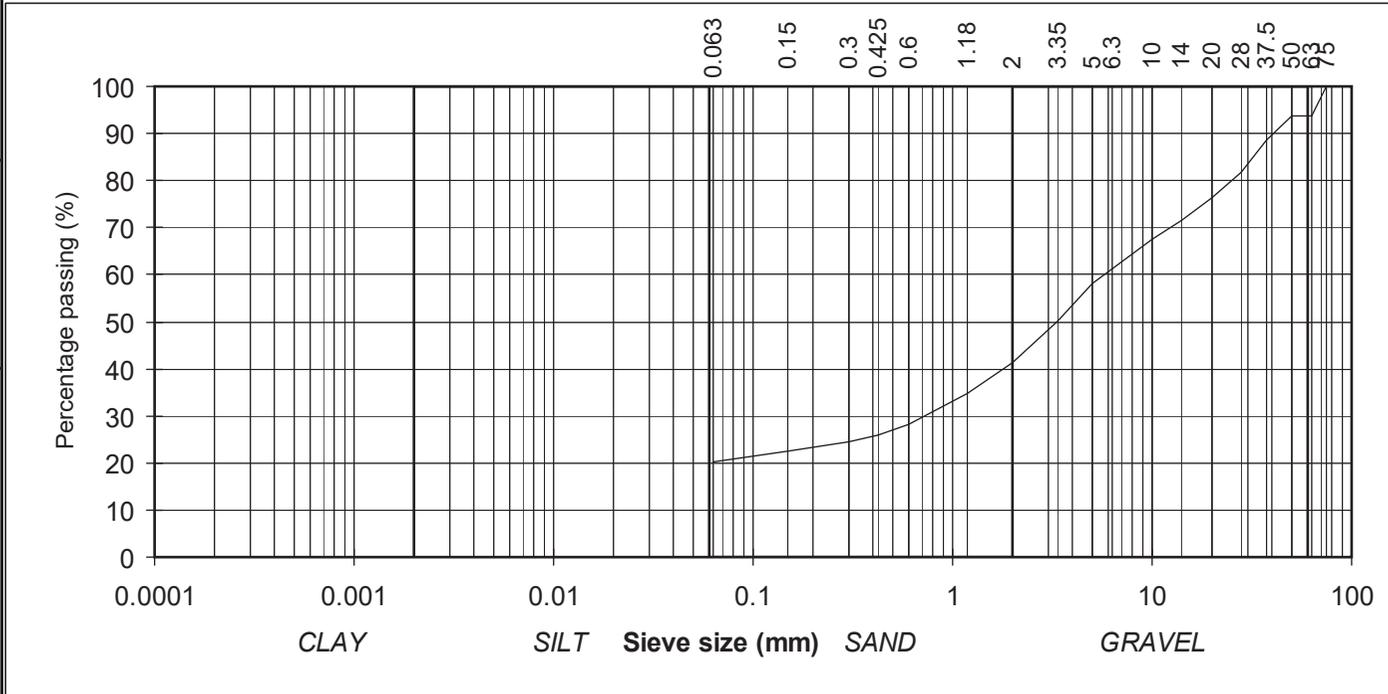
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	94	
50	94	
37.5	89	GRAVEL
28	82	
20	76	
14	71	
10	68	
6.3	61	
5	58	
3.35	50	SAND
2	41	
1.18	35	
0.6	28	
0.425	26	SILT/CLAY
0.3	25	
0.15	23	
0.063	20	

Contract No: 18963 Report No. R70381
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/25
 Sample No. AA33939 Lab. Sample No. A16/0371
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles

Remarks



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Persons authorised to approve report: 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

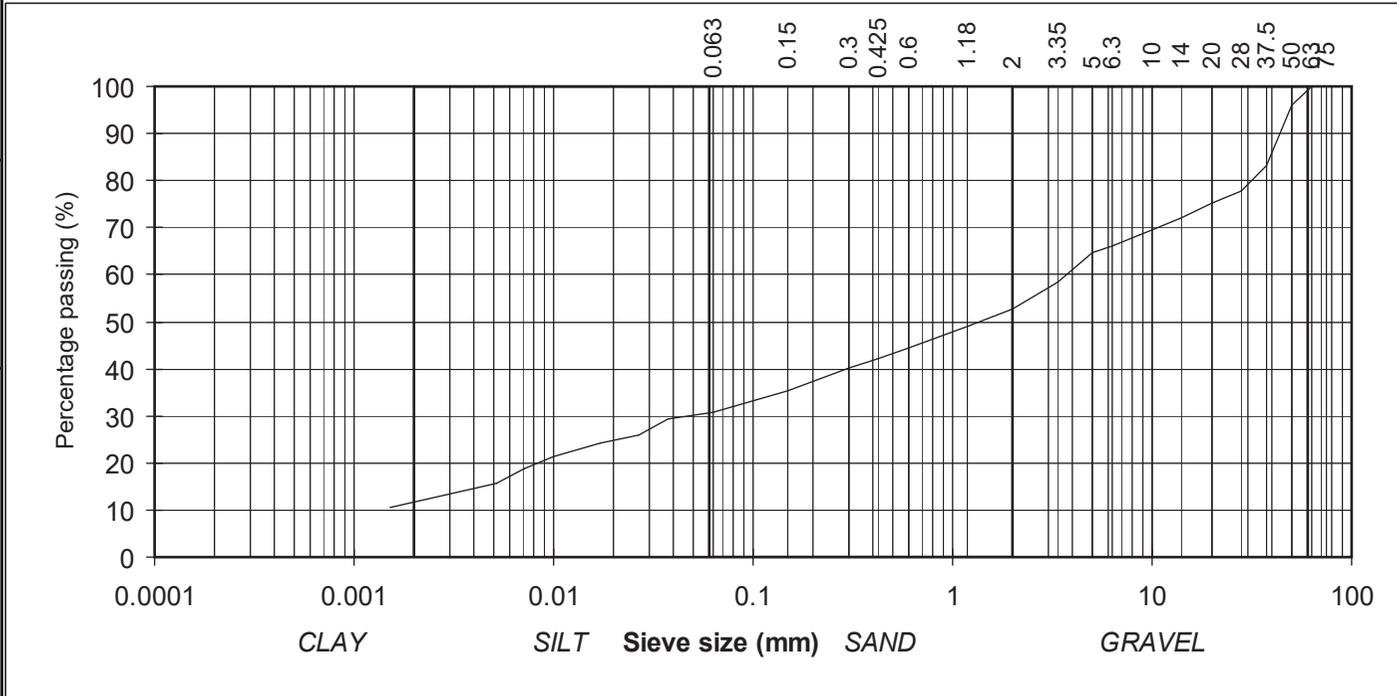
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	96	
37.5	83	GRAVEL
28	78	
20	75	
14	72	
10	69	
6.3	66	
5	65	
3.35	58	SAND
2	53	
1.18	49	
0.6	44	
0.425	42	
0.3	40	SILT/CLAY
0.15	35	
0.063	31	
0.037	29	
0.027	26	
0.017	24	
0.010	21	
0.007	19	
0.005	16	
0.002	11	

Contract No: 18963 Report No. R70382
 Contract: GCTP Phase 3 - Contact 1
 TP: TP3/27
 Sample No. AA44452 Lab. Sample No. A16/0373
 Sample Type: B
 Depth: 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks



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Persons authorised to approve report: 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

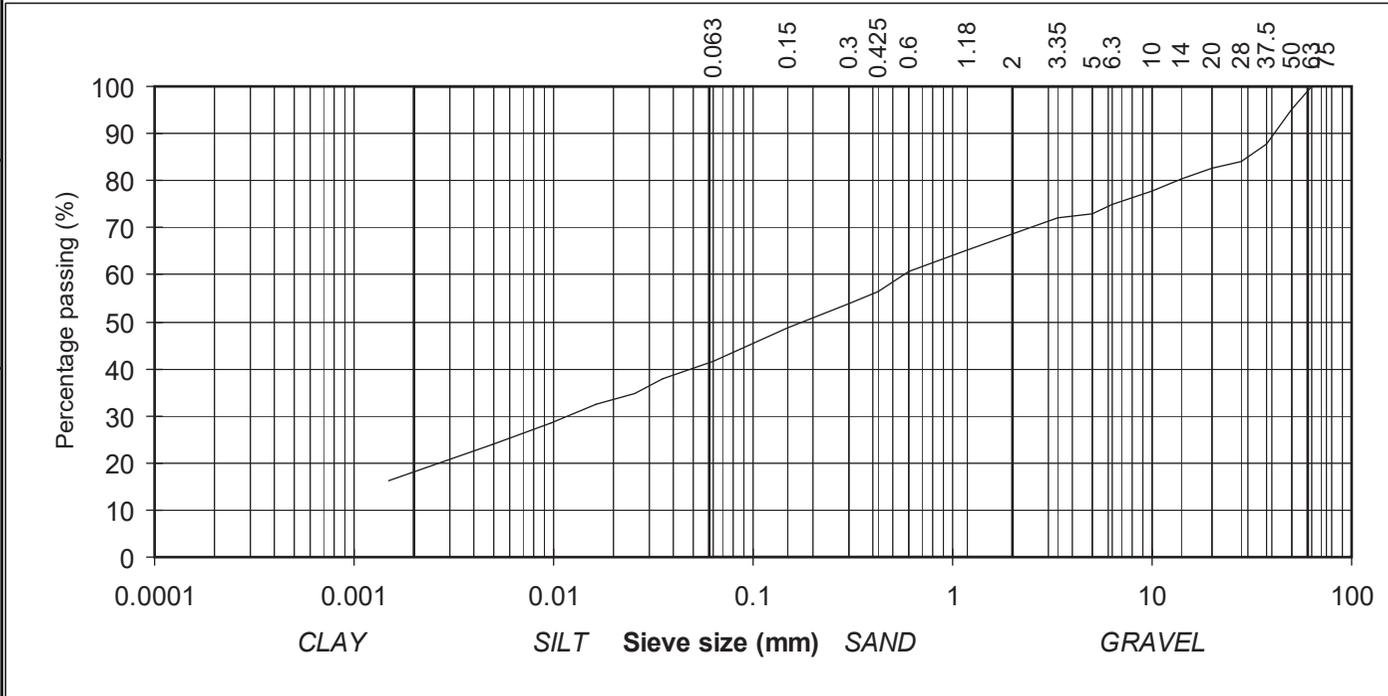
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	95	
37.5	88	
28	84	
20	83	GRAVEL
14	80	
10	78	
6.3	75	
5	73	
3.35	72	
2	69	
1.18	65	
0.6	61	
0.425	56	
0.3	54	
0.15	49	
0.063	42	
0.035	38	
0.026	35	SILT/CLAY
0.016	32	
0.010	29	
0.007	26	
0.005	24	
0.001	16	

Contract No: 18963 Report No. R70403
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03.27
 Sample No. AA44454 Lab. Sample No. A16/0375
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 09-02-16
 Description: Grey/brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



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Persons authorised to approve report: 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

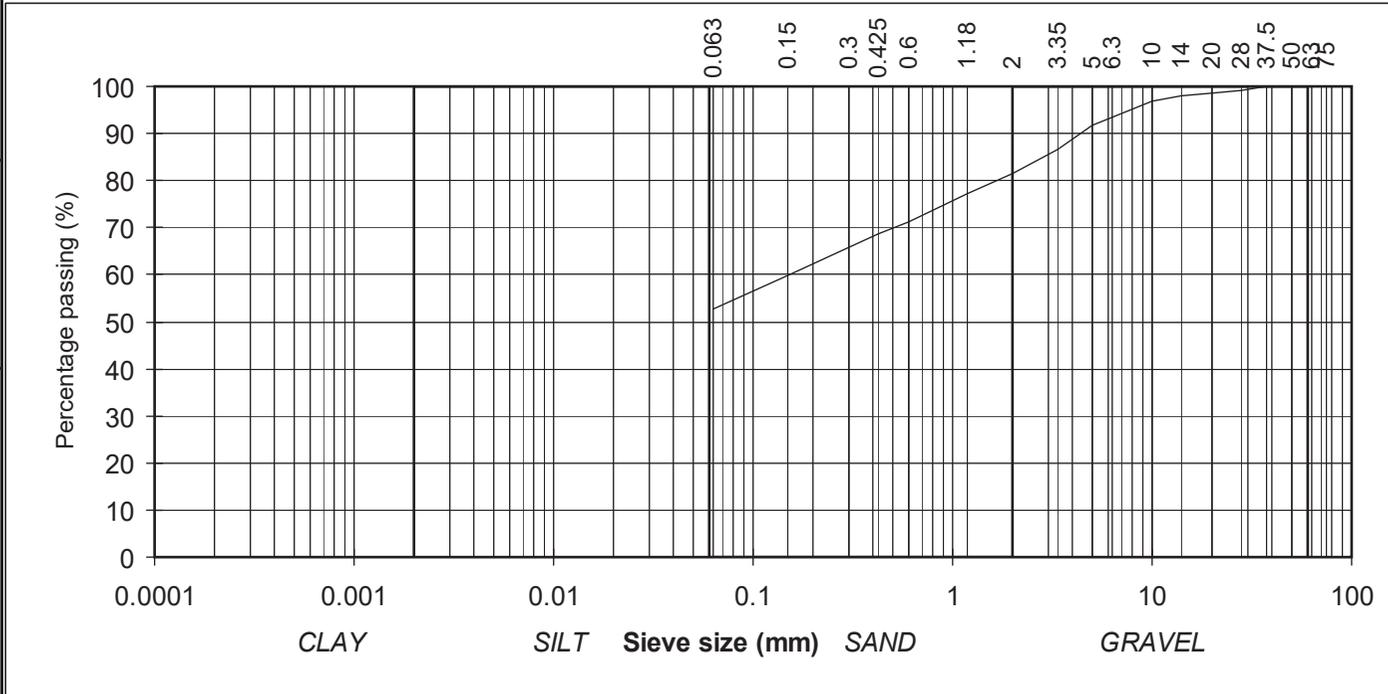
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	99	
20	99	GRAVEL
14	98	
10	97	
6.3	93	
5	92	
3.35	87	
2	82	
1.18	77	
0.6	71	
0.425	69	
0.3	66	
0.15	60	
0.063	53	SILT/CLAY

Contract No: 18963 Report No. R70383
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/27
 Sample No. AA44456 Lab. Sample No. A16/0377
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



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Persons authorised to approve report: 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

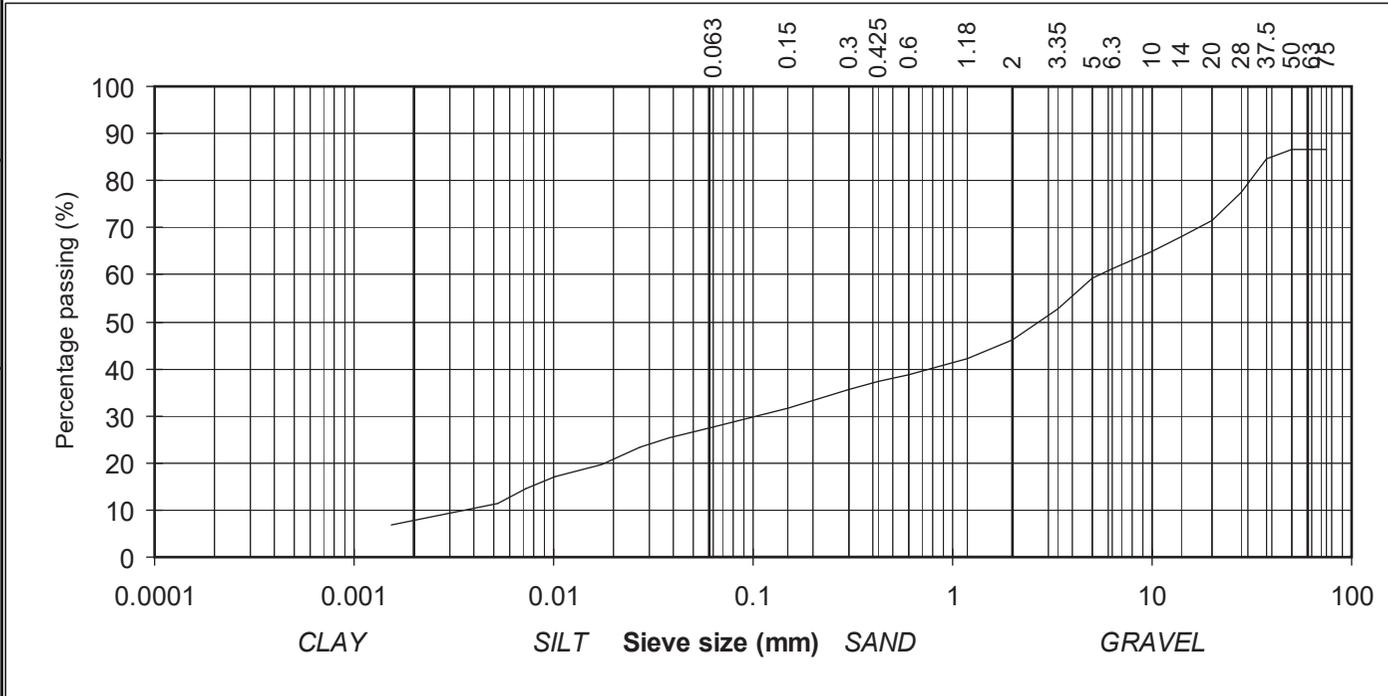
(note: Sedimentation stage not accredited)



particle size	% passing	
75	86	COBBLES
63	86	
50	86	
37.5	85	GRAVEL
28	78	
20	72	
14	68	
10	65	
6.3	61	
5	59	
3.35	53	SAND
2	46	
1.18	42	
0.6	39	
0.425	37	
0.3	36	SILT/CLAY
0.15	32	
0.063	28	
0.038	25	
0.027	23	
0.017	20	
0.010	17	
0.007	14	
0.005	11	
0.002	7	

Contract No: 18963 Report No. R70384
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/28
 Sample No. AA37831 Lab. Sample No. A16/0379
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Light brown slightly sandy, gravelly, SILT/CLAY with some cobbles

Remarks Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

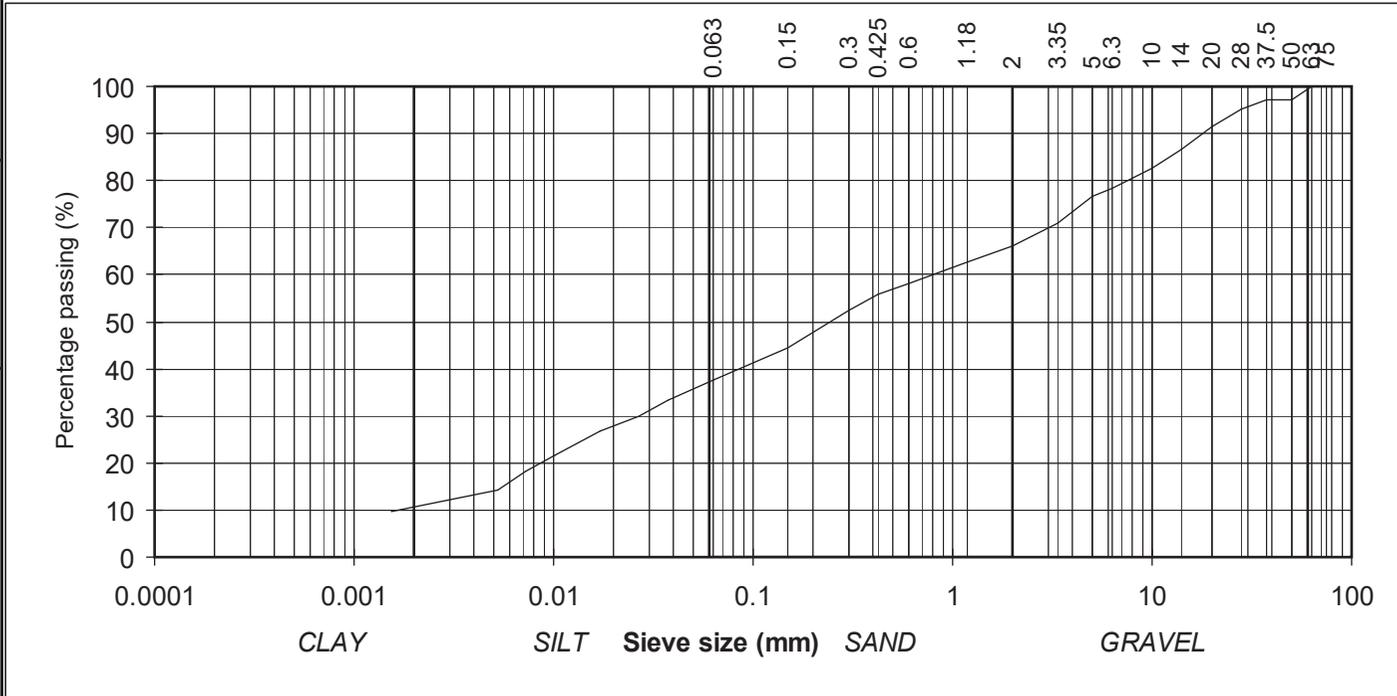
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	97	
37.5	97	GRAVEL
28	95	
20	92	
14	87	
10	83	
6.3	78	
5	77	
3.35	71	
2	66	
1.18	63	
0.6	58	
0.425	56	
0.3	52	
0.15	44	SILT/CLAY
0.063	38	
0.037	33	
0.027	30	
0.017	27	
0.010	22	
0.007	18	
0.005	14	
0.002	10	

Contract No: 18963 Report No. R70385
 Contract: GCTP Phase 3 - Contact 1
 TP: TP3/28
 Sample No. AA37833 Lab. Sample No. A16/0381
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Light brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



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Persons authorised to approve report: 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

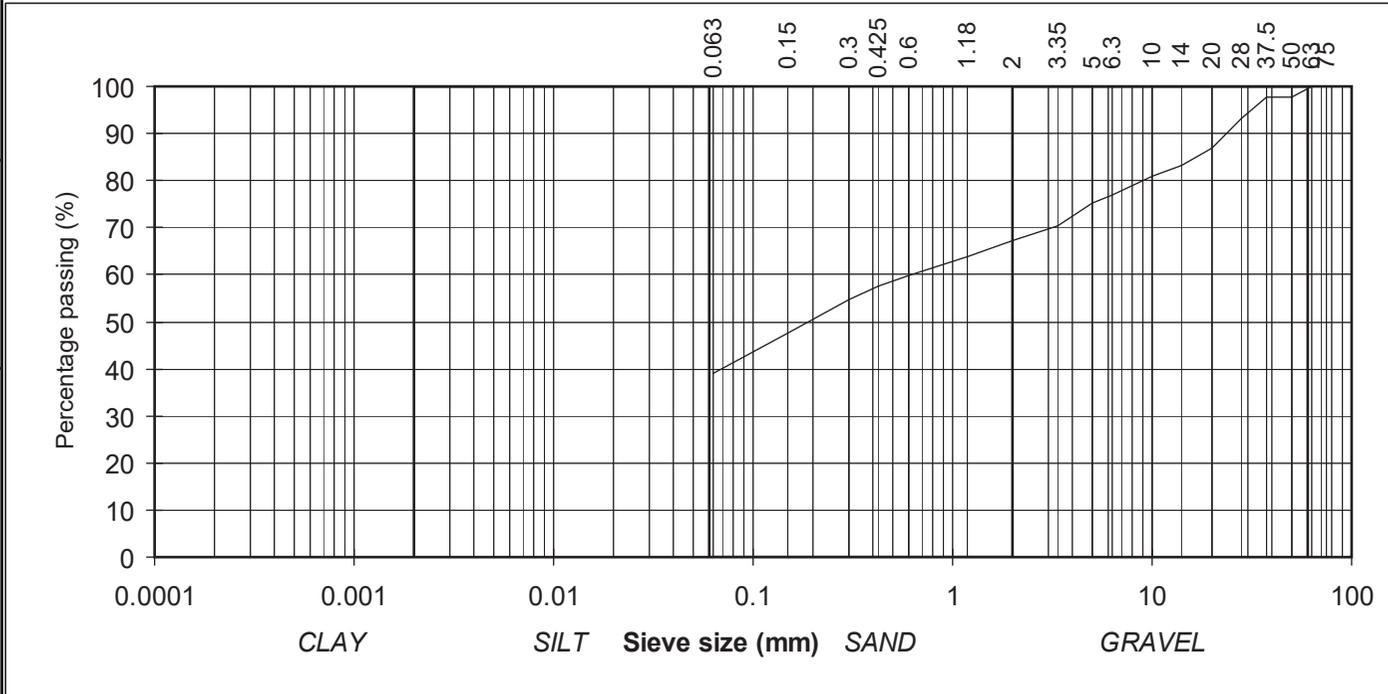
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	98	
37.5	98	GRAVEL
28	93	
20	87	
14	83	
10	81	
6.3	77	
5	75	SAND
3.35	70	
2	67	
1.18	64	
0.6	60	
0.425	57	
0.3	55	
0.15	48	
0.063	39	SILT/CLAY

Contract No: 18963 Report No. R70386
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/28
 Sample No. AA37835 Lab. Sample No. A16/0383
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 09-02-16
 Description: Light brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

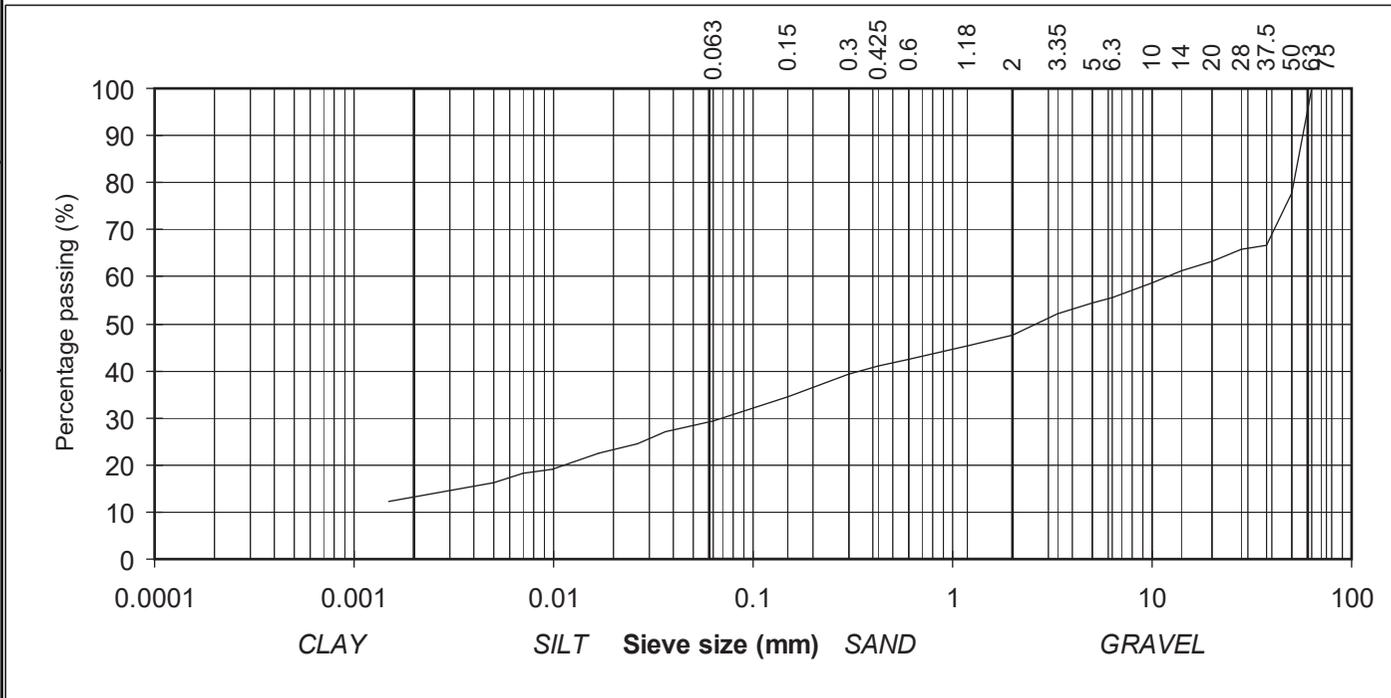
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	78	
37.5	67	
28	66	
20	63	GRAVEL
14	61	
10	59	
6.3	56	
5	54	
3.35	52	
2	47	
1.18	45	SAND
0.6	43	
0.425	41	
0.3	39	
0.15	34	SILT/CLAY
0.063	29	
0.036	27	
0.026	25	
0.017	22	
0.010	19	
0.007	18	
0.005	16	
0.001	12	

Contract No: 18963 Report No. R70387
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/28
 Sample No. AA37837 Lab. Sample No. A16/0085
 Sample Type: B
 Depth (m) 3.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Light brown slightly sandy, gravelly, SILT/CLAY

Remarks: Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

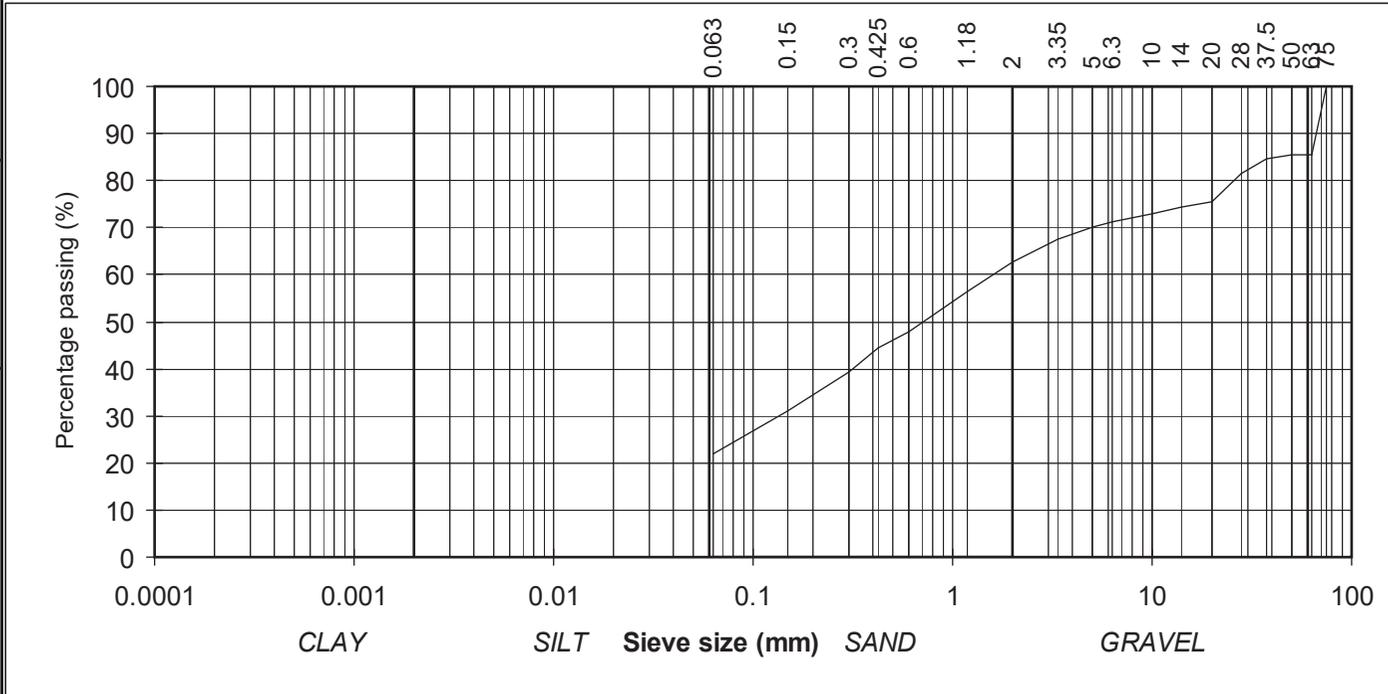
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	86	
50	86	
37.5	84	
28	81	
20	75	GRAVEL
14	74	
10	73	
6.3	71	
5	70	
3.35	67	SAND
2	63	
1.18	56	
0.6	48	
0.425	44	
0.3	39	SILT/CLAY
0.15	31	
0.063	22	

Contract No: 18963 Report No. R70508
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/29
 Sample No. AA37812 Lab. Sample No. A16/0389
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Mottled grey/brown sandy, gravelly, SILT/CLAY with some cobbles

Remarks: Sample Size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

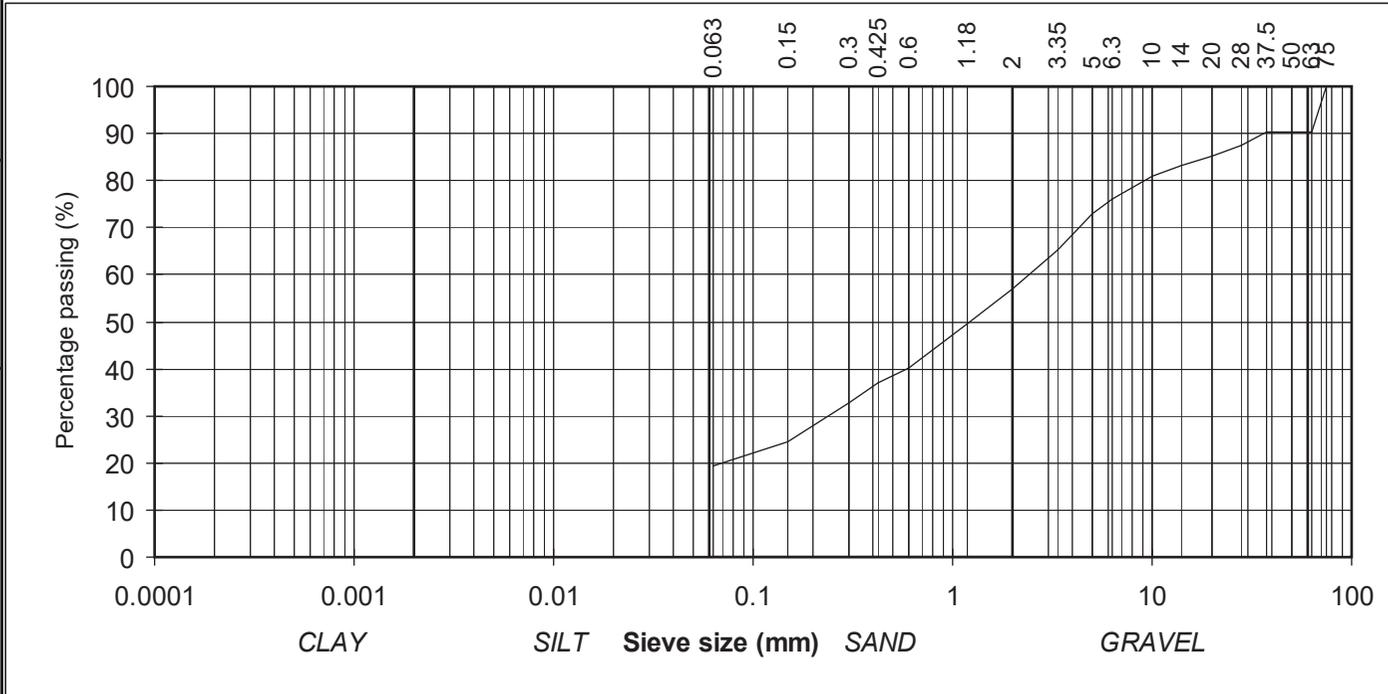
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	90	
50	90	
37.5	90	
28	87	
20	85	GRAVEL
14	83	
10	81	
6.3	76	
5	73	
3.35	65	
2	57	
1.18	49	
0.6	40	
0.425	37	
0.3	33	
0.15	24	
0.063	19	
		SILT/CLAY

Contract No: 18963 Report No. R70448
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/29
 Sample No. AA37813 Lab. Sample No. A16/0391
 Sample Type: B
 Depth (m) 1.60 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles

Remarks



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Persons authorised to approve report: 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

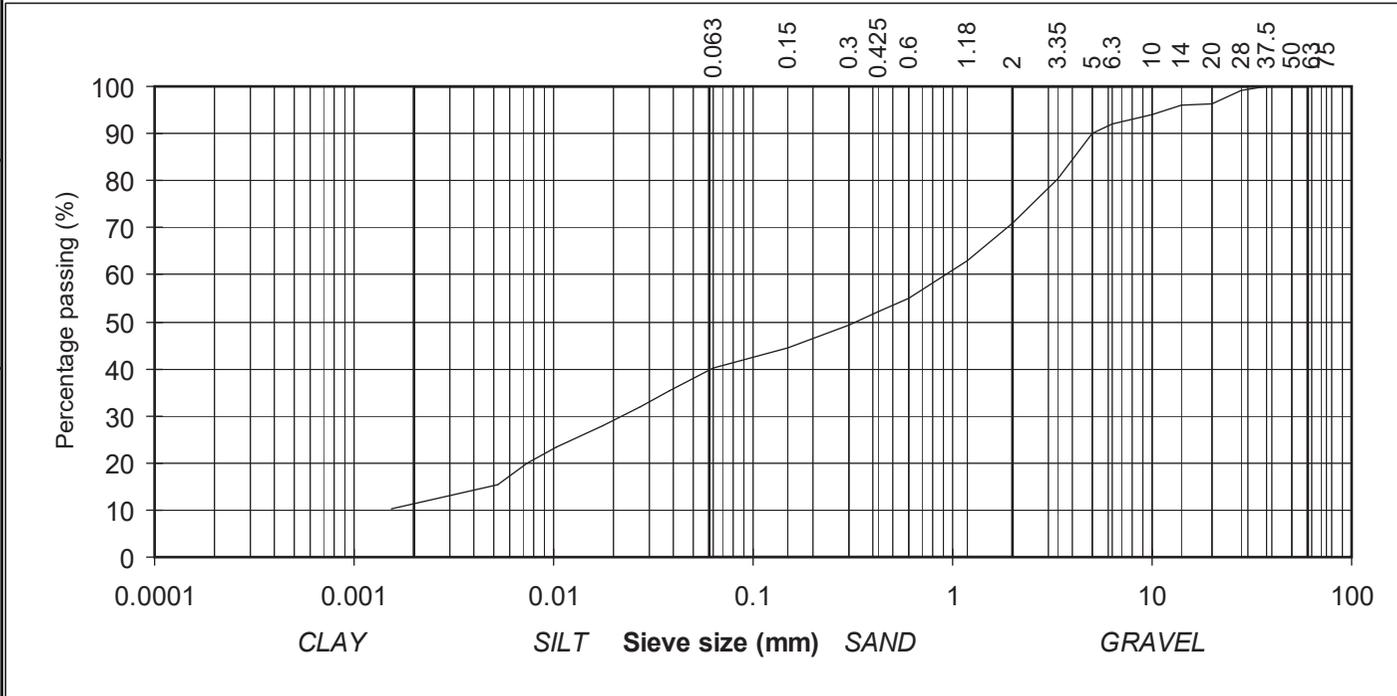
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	GRAVEL
28	99	
20	96	
14	96	
10	94	
6.3	92	
5	90	
3.35	80	SAND
2	71	
1.18	63	
0.6	55	
0.425	52	
0.3	49	SILT/CLAY
0.15	44	
0.063	40	
0.038	35	
0.027	32	
0.018	28	
0.010	23	
0.007	20	
0.005	15	
0.002	10	

Contract No: 18963 Report No. R70388
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/34
 Sample No. AA44468 Lab. Sample No. A16/0397
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 04-02-16
 Description: Grey/brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

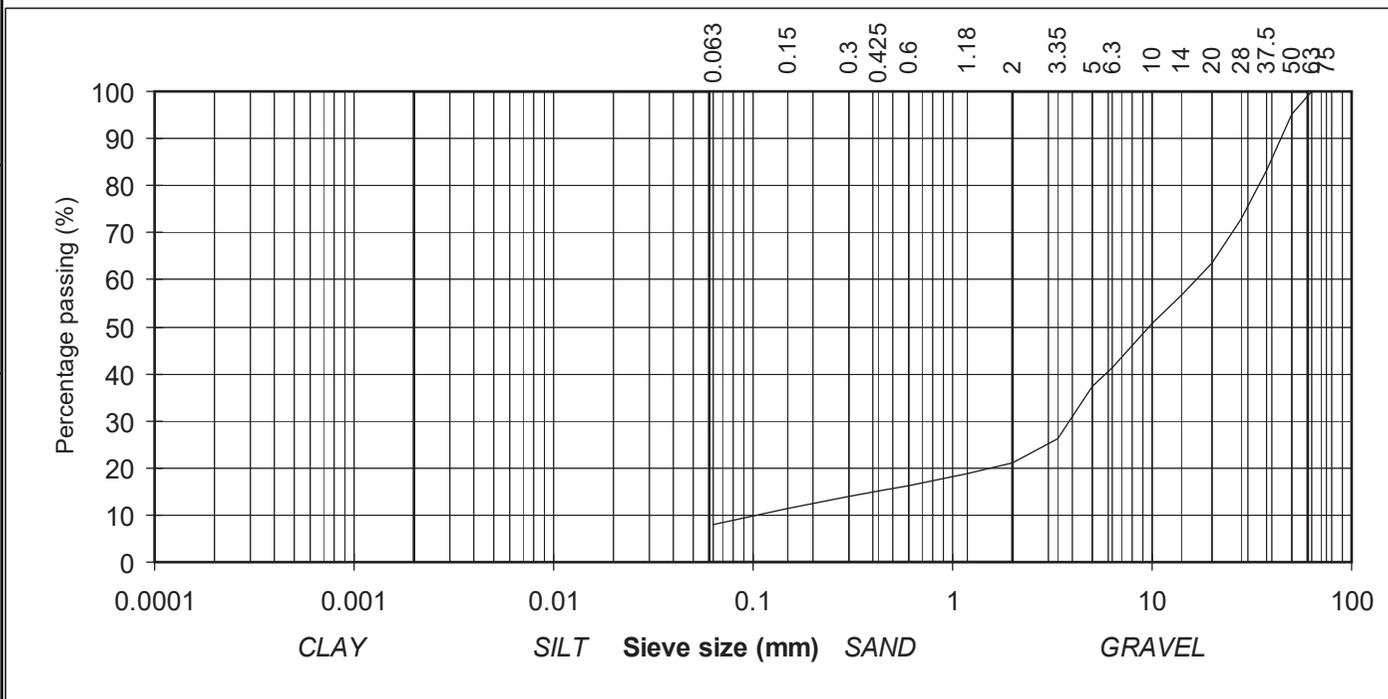
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	95	
37.5	83	GRAVEL
28	73	
20	64	
14	57	
10	51	
6.3	41	
5	37	
3.35	26	SAND
2	21	
1.18	19	
0.6	16	
0.425	15	SILT/CLAY
0.3	14	
0.15	11	
0.063	8	

Contract No: 18963 Report No. R70389
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/34
 Sample No. AA44470 Lab. Sample No. A16/0399
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 01-02-16 Date Testing started 05-02-16
 Description: Grey clayey/silty, sandy, GRAVEL

Remarks



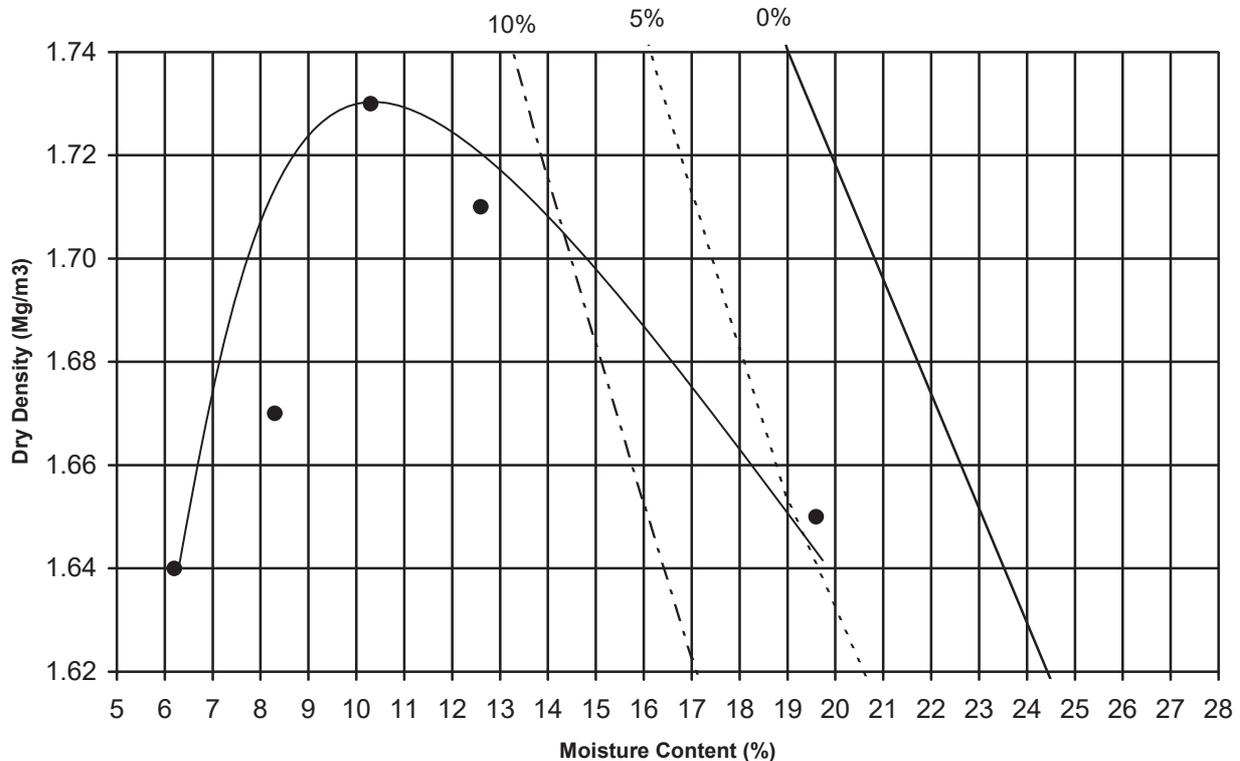
IGSL Ltd Materials Laboratory

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

Report No. R70469 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/03
 Sample No. AA44484 Depth (m) 1.6 Material Type B
 Lab sample no. A16/0318 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 08-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.49	1.67	1.73	1.71	1.64	1.65	
Moisture Content (%)	28	8.3	10	13	6.2	20	



Maximum Dry Density (Mg/m³): 1.73 Optimum Moisture Content (%): 10

Description: Dark brown silty, very sandy, GRAVEL with occasional cobbles

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

Particle Density (Mg/m³): 2.60 Particle Density: Assumed

% retained on 20/37.5mm sieve: 30

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

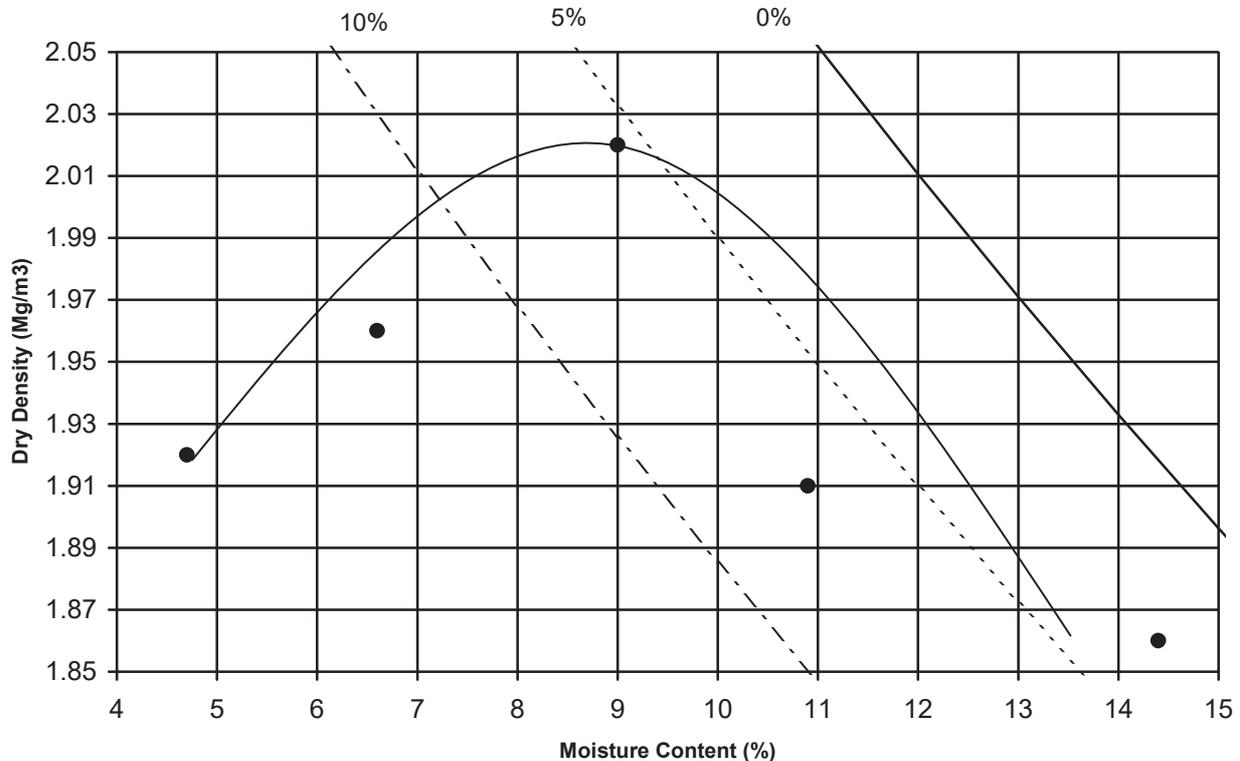
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R71145 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/08
 Sample No. AA37821 Depth (m) 0.5 Material Type B
 Lab sample no. A16/0332 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 19-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.86	1.96	1.91	2.02	1.92		
Moisture Content (%)	14	6.6	11	9.0	4.7		



Maximum Dry Density (Mg/m³): 2.02 Optimum Moisture Content (%): 9

Description: Light brown/grey clayey/silty, very sandy, GRAVEL

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

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

% retained on 20/37.5mm sieve: 24

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

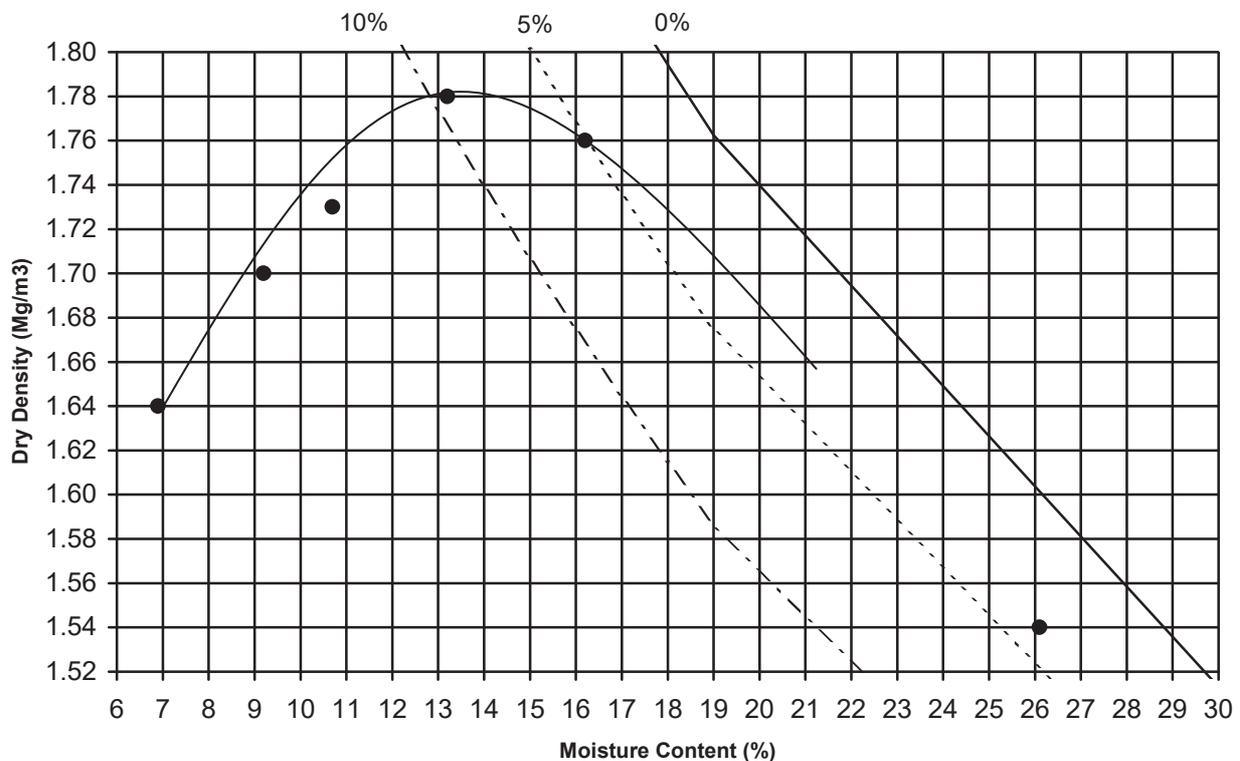
Approved by

Date Page

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Report No. R71142 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/11
 Sample No. AA37814 Depth (m) 0.25 Material Type B
 Lab sample no. A16/333 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 09-03-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.54	1.64	1.70	1.73	1.78	1.76	
Moisture Content (%)	26	6.9	9.2	11	13	16	



Maximum Dry Density (Mg/m³): 1.78 Optimum Moisture Content (%): 13

Description: Dark brown clayey/silty, very sandy, GRAVEL with many cobbles

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

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

% retained on 20/37.5mm sieve: 21

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

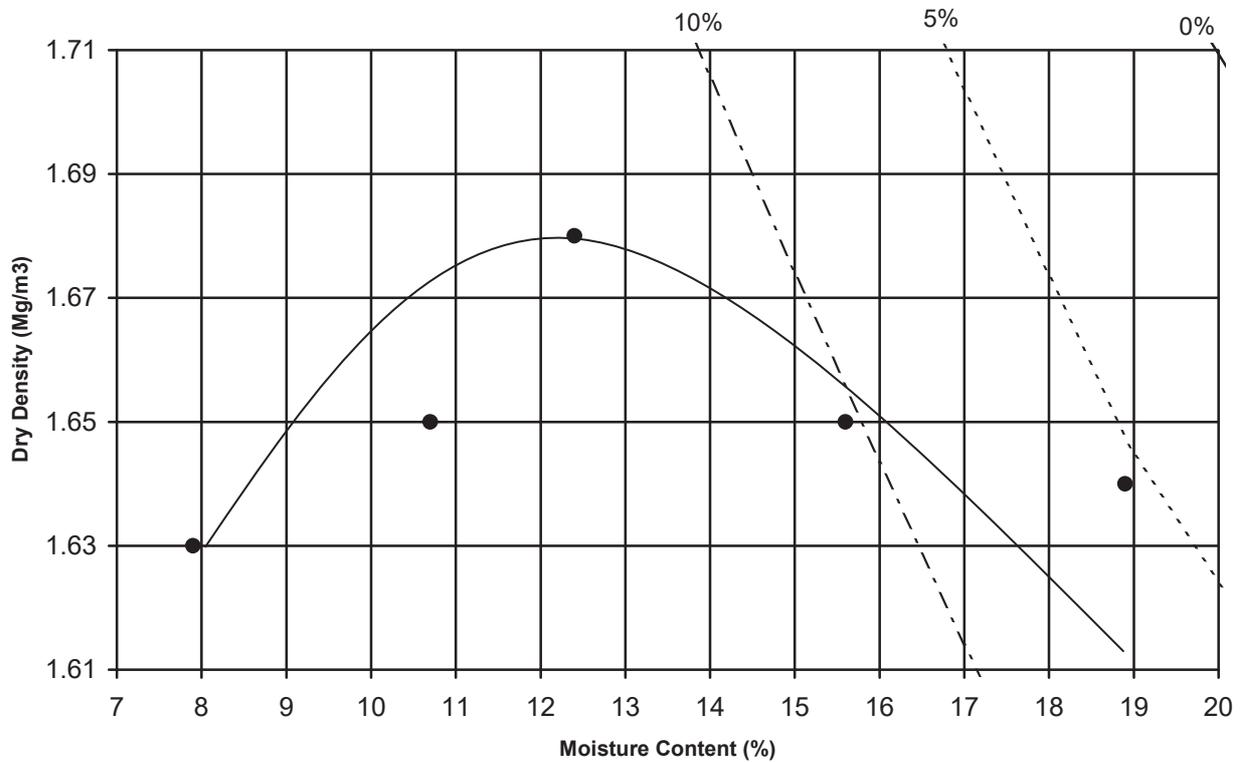
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R70463 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/17
 Sample No. AA44489 Depth (m) 0.5 Material Type B
 Lab sample no. A16/0344 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 08-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.49	1.63	1.65	1.68	1.65	1.64	
Moisture Content (%)	27	7.9	11	12	16	19	



Maximum Dry Density (Mg/m³): 1.68 Optimum Moisture Content (%): 12

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles

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

Particle Density (Mg/m³): 2.58 Particle Density: Assumed

% retained on 20/37.5mm sieve: 34.8

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)

IGSL Materials Laboratory

Approved by

Date

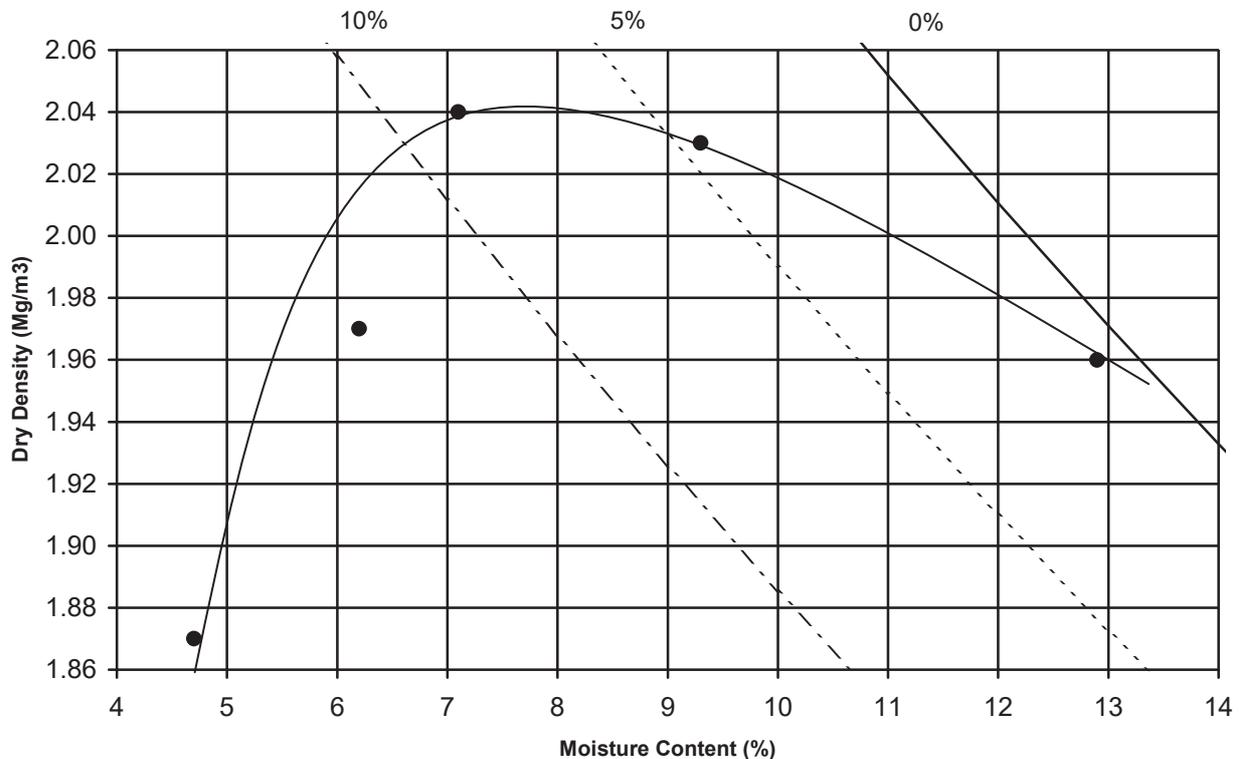
17-02-16

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Report No. R71003 Contract No. 18963
Contract Name: GCTP Phase 3 - Contract 1 GI
Lab Contract No. 18963 Location: TP03/18
Sample No. AA37826 Depth (m) 1 Material Type B
Lab sample no. A16/0346 Customer: Galway Co.Co.
Date Received: 01-02-16 Test Method: 2.5 KG Rammer
Date Tested: 19-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.96	1.97	2.04	2.03	1.87		
Moisture Content (%)	13	6.2	7.1	9.3	4.7		



Maximum Dry Density (Mg/m³): 2.04 Optimum Moisture Content (%): 7

Description: Brown clayey/silty, sandy, GRAVEL

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

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

% retained on 20/37.5mm sieve: 37

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

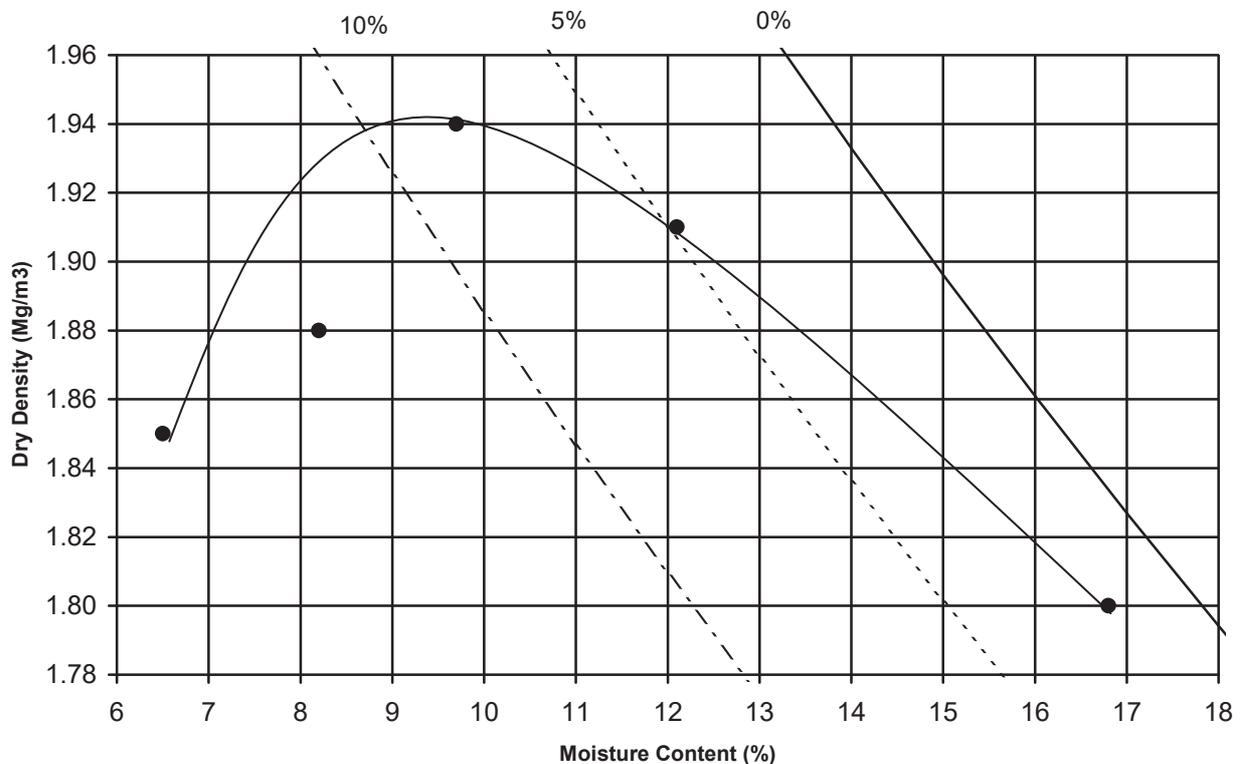
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R70464 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/19
 Sample No. AA44492 Depth (m) 0.5 Material Type B
 Lab sample no. A16/0350 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 08-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.80	1.88	1.94	1.91	1.85		
Moisture Content (%)	17	8.2	10	12.1	6.5		



Maximum Dry Density (Mg/m³): 1.94 Optimum Moisture Content (%): 10

Description: Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles

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

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

% retained on 20/37.5mm sieve: 42.6

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

Persons authorised to approve reports
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H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by

H Byrne

Date

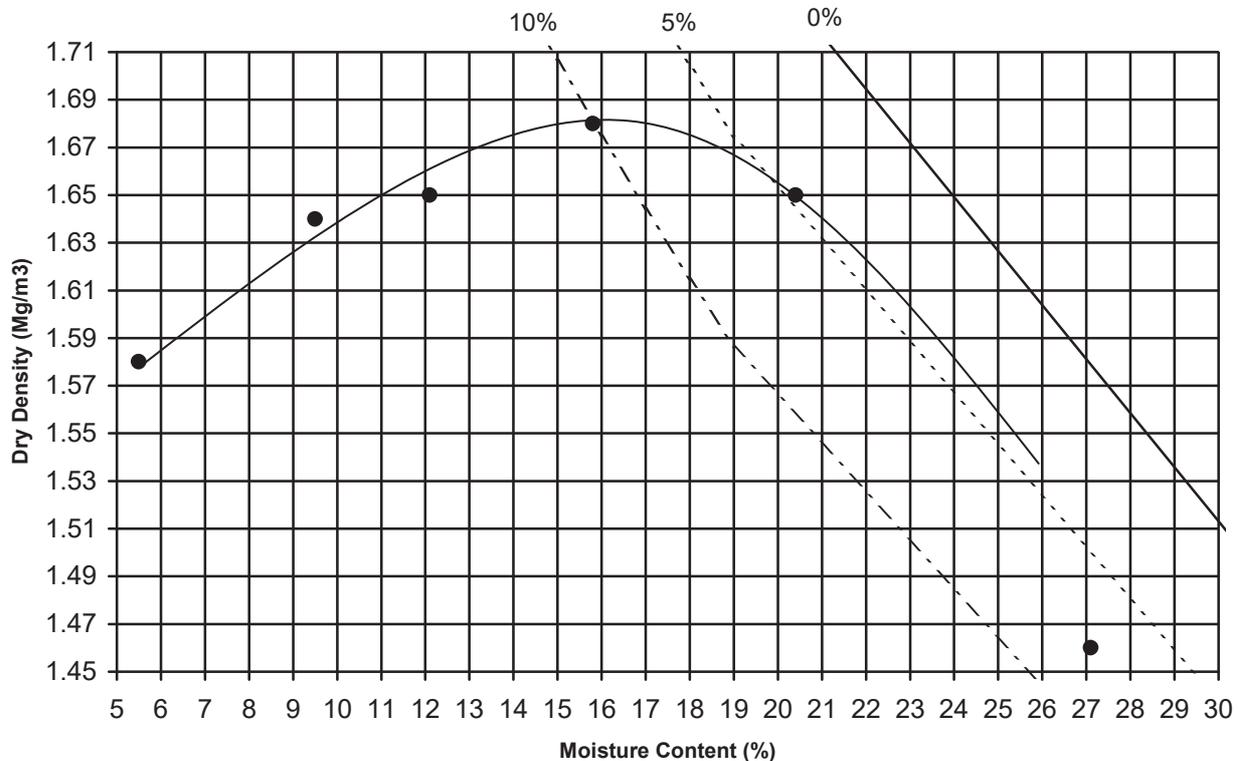
17-02-16

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Report No. R70462 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/21
 Sample No. AA44495 Depth (m) 0.15 Material Type B
 Lab sample no. A16/0357 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 12-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.46	1.58	1.64	1.65	1.68	1.65	
Moisture Content (%)	27	5.5	10	12	16	20	



Maximum Dry Density (Mg/m³): 1.68 Optimum Moisture Content (%): 16
 Description: Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
 Sample Preparation: Material passing 20mm Single / Separate samples used
 Particle Density (Mg/m³): 2.65 Particle Density: Assumed
 % retained on 20/37.5mm sieve: 51

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

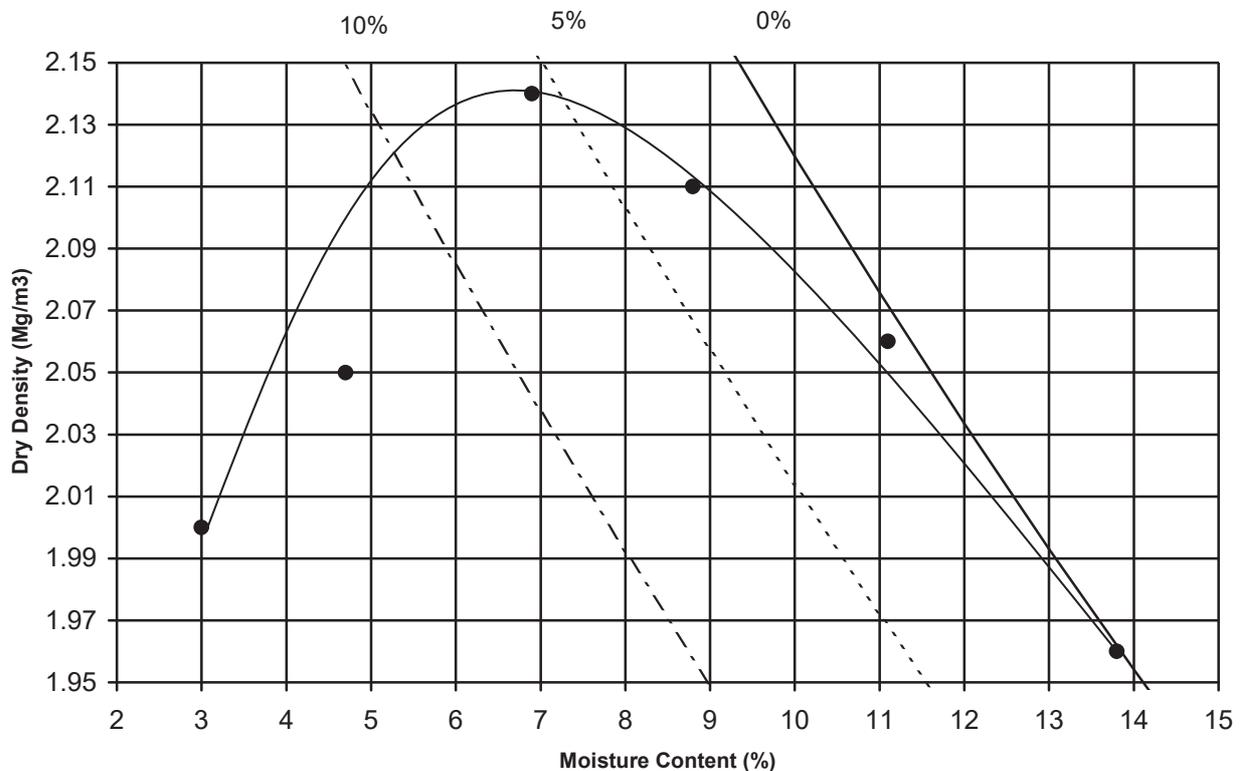
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R70465 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/25
 Sample No. AA33937 Depth (m) 1 Material Type B
 Lab sample no. A16/0369 Customer: Galway Co.Co.
 Date Received: 01-02-16 Test Method: 2.5 KG Rammer
 Date Tested: 12-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	2.06	2.11	1.96	2.05	2.14	2.00
Moisture Content (%)	11	8.8	14	4.7	6.9	3.0



Maximum Dry Density (Mg/m³): 2.14 Optimum Moisture Content (%): 7

Description: Light brown/grey very sandy very gravelly SILT

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

Particle Density (Mg/m³): 2.69 Particle Density: Assumed

% retained on 20/37.5mm sieve: 25.6

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

Persons authorised to approve reports
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H Byrne (Quality Manager)

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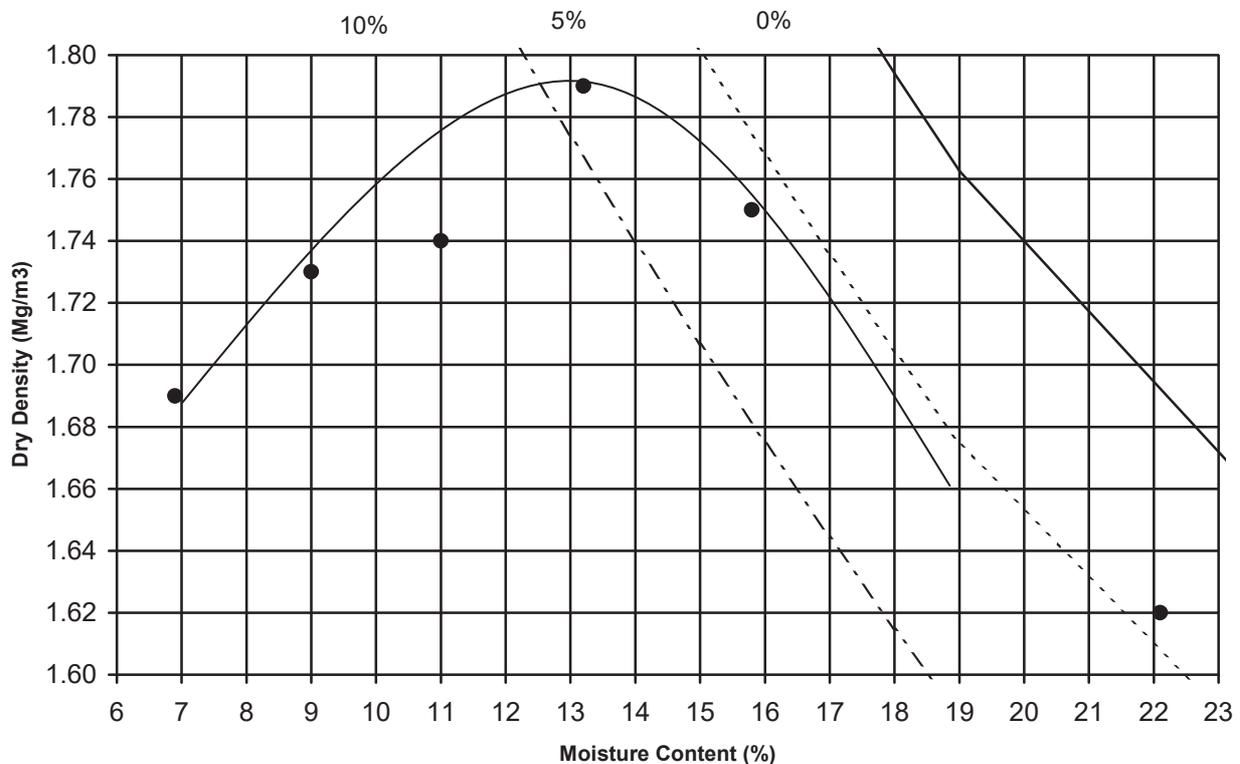
Date Page

17-02-16

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Report No. R71146 Contract No. 18963
Contract Name: GCTP Phase 3 - Contract 1 GI
Lab Contract No. 18963 Location: TP03/16
Sample No. AA37817 Depth (m) 0.2 Material Type B
Lab sample no. A16/0342 Customer: Galway Co.Co.
Date Received: 01-02-16 Test Method: 2.5 KG Rammer
Date Tested: 19-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.62	1.69	1.73	1.74	1.79	1.75	
Moisture Content (%)	22	7	9	11.0	13	16	



Maximum Dry Density (Mg/m³): 1.79 Optimum Moisture Content (%): 11

Description: Dark brown slightly clayey/silty, sandy, GRAVEL

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

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

% retained on 20/37.5mm sieve: 43

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

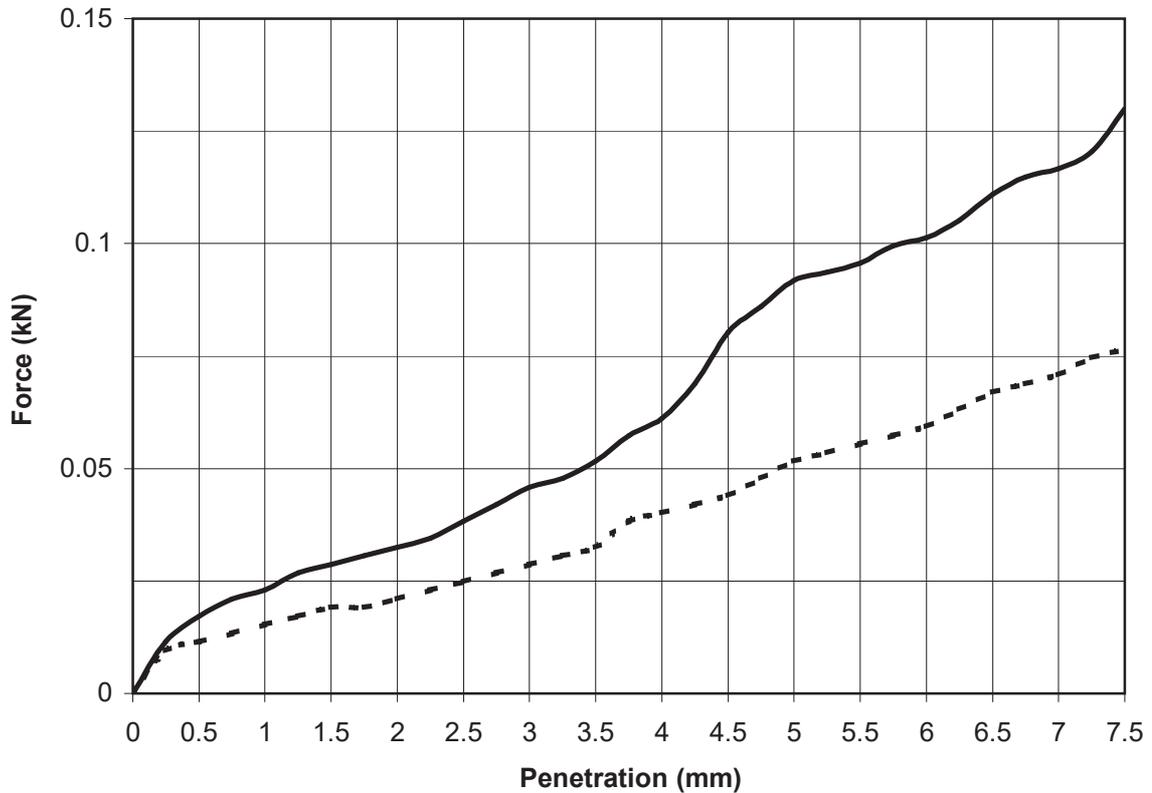
Persons authorised to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70466 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 08-02-16
 BH/TP No. TP03/34 Sample No. AA44472 Type: B
 Depth (m) 1.00 Lab sample No. A16/0401



Key: ————— Top - - - - - Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked Point 1 of 5	
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.96
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.56
% Material >20mm:	10		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	0.5	0.3
Moisture Content %	25	25

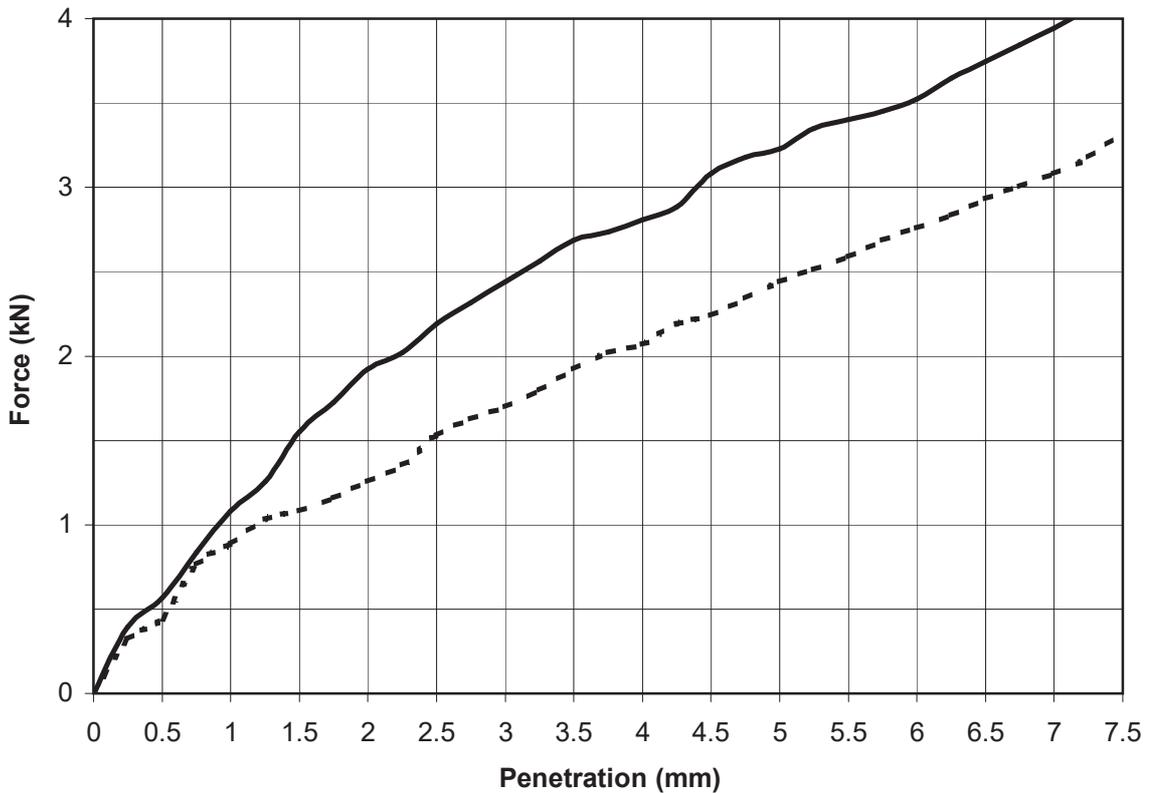
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70466 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 09-02-16
 BH/TP No. TP03/34 Sample No. AA44472 Type: B
 Depth (m) 1.00 Lab sample No. A16/0401



Key: ————— Top - - - - - Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked Point 2 of 5	
Moisture Content (%):	8	Bulk Density (Mg/m ³):	1.86
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.72
% Material >20mm:	10.2		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	17	12
Moisture Content %	8.1	8.2

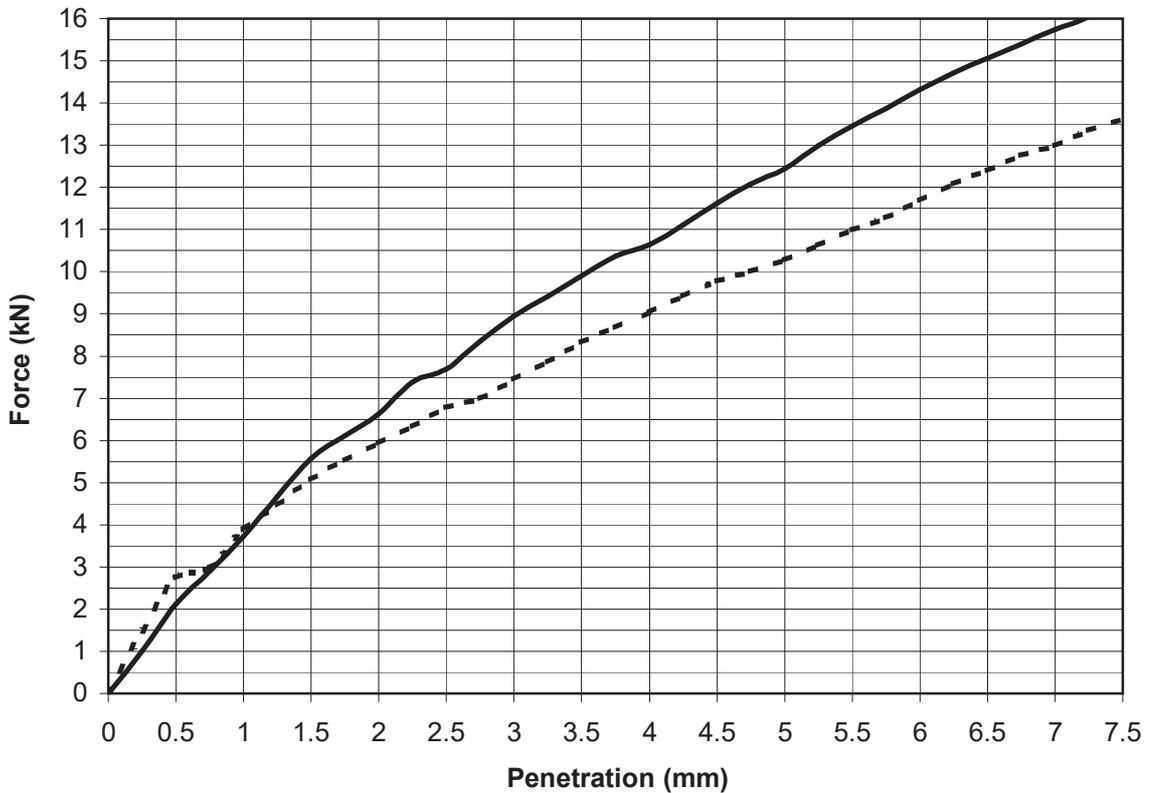
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70466 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 10-02-16
 BH/TP No. TP03/34 Sample No. AA44472 Type: B
 Depth (m) 1.00 Lab sample No. A16/0401



Key: ————— Top - - - - - Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked Point 3 of 5	
Moisture Content (%):	10	Bulk Density (Mg/m ³):	1.95
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.78
% Material >20mm:	10		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	62	51
Moisture Content %	10	10

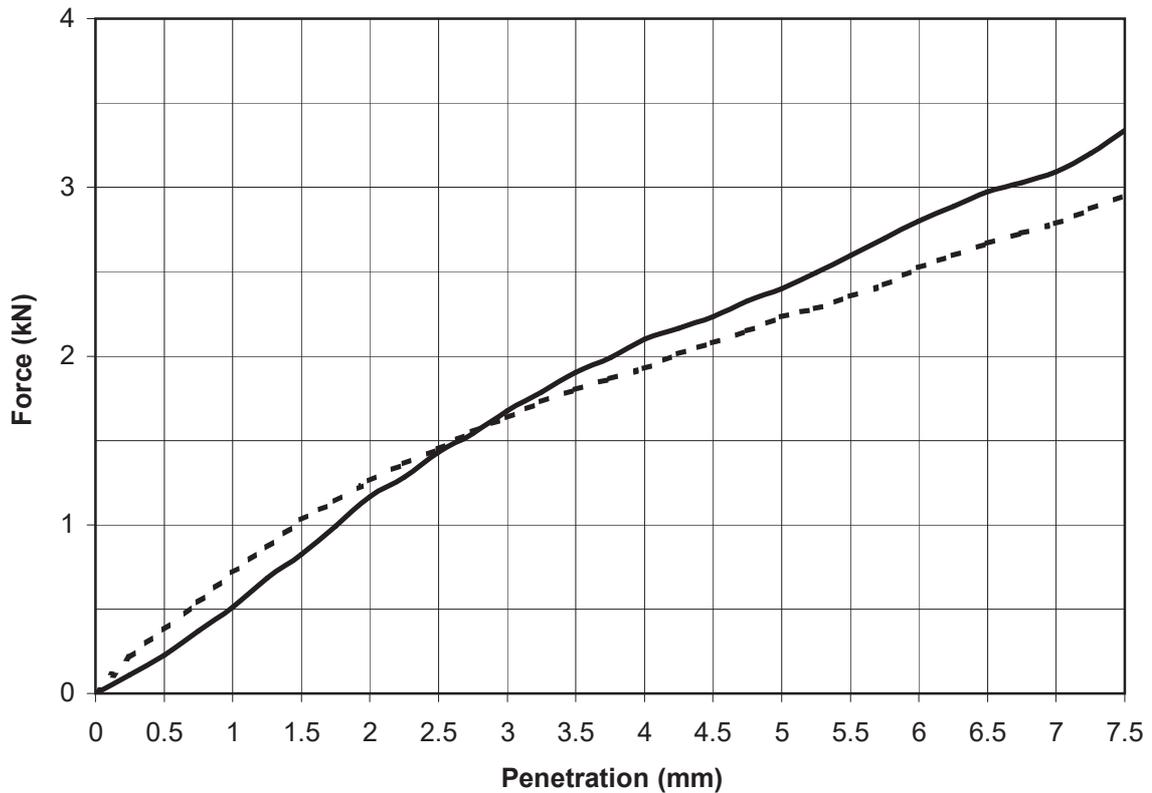
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70466 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 10-02-16
 BH/TP No. TP03/34 Sample No. AA44472 Type: B
 Depth (m) 1.00 Lab sample No. A16/0401



Key: ————— Top - - - - - Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked Point 4 of 5	
Moisture Content (%):	12	Bulk Density (Mg/m ³):	1.99
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.77
% Material >20mm:	10		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	12	11
Moisture Content %	12	13

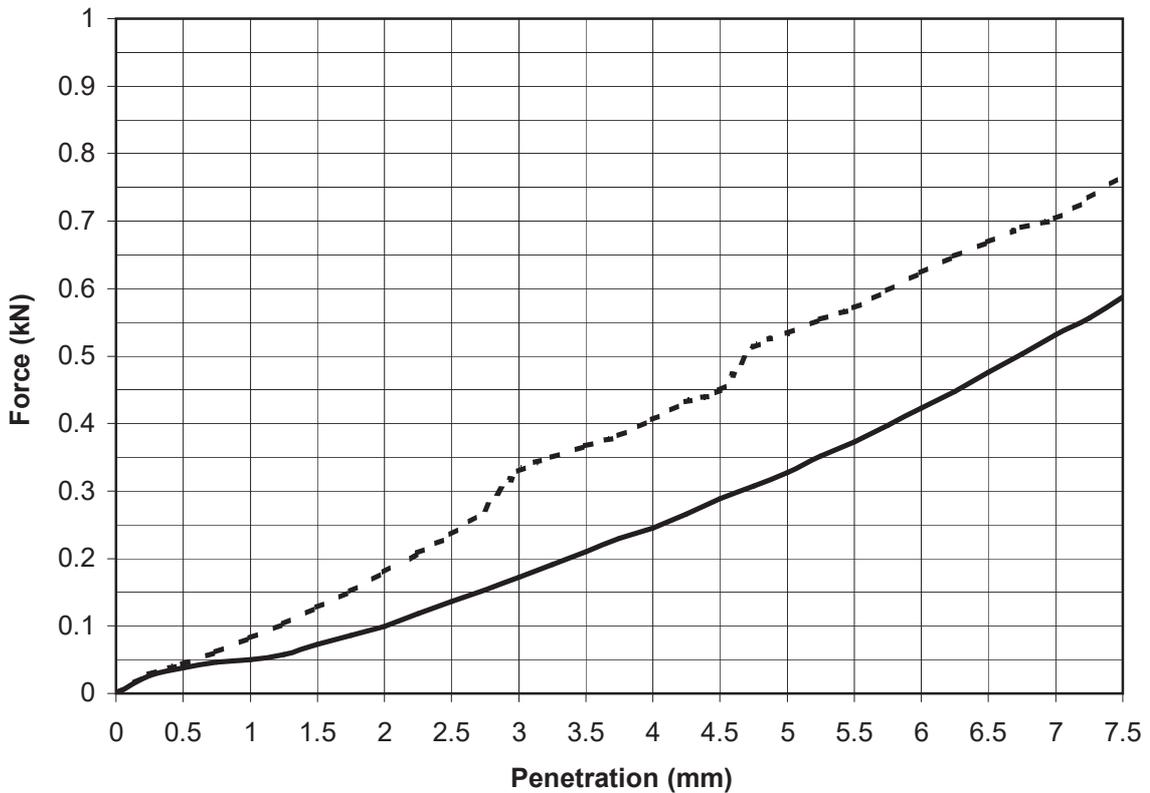
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70466 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 10-02-16
 BH/TP No. TP03/34 Sample No. AA44472 Type: B
 Depth (m) 1.00 Lab sample No. A16/0401



Key: ————— Top - - - - - Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked Point 5 of 5	
Moisture Content (%):	16	Bulk Density (Mg/m ³):	2.04
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.76
% Material >20mm:	10.2		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	1.6	2.7
Moisture Content %	16	17

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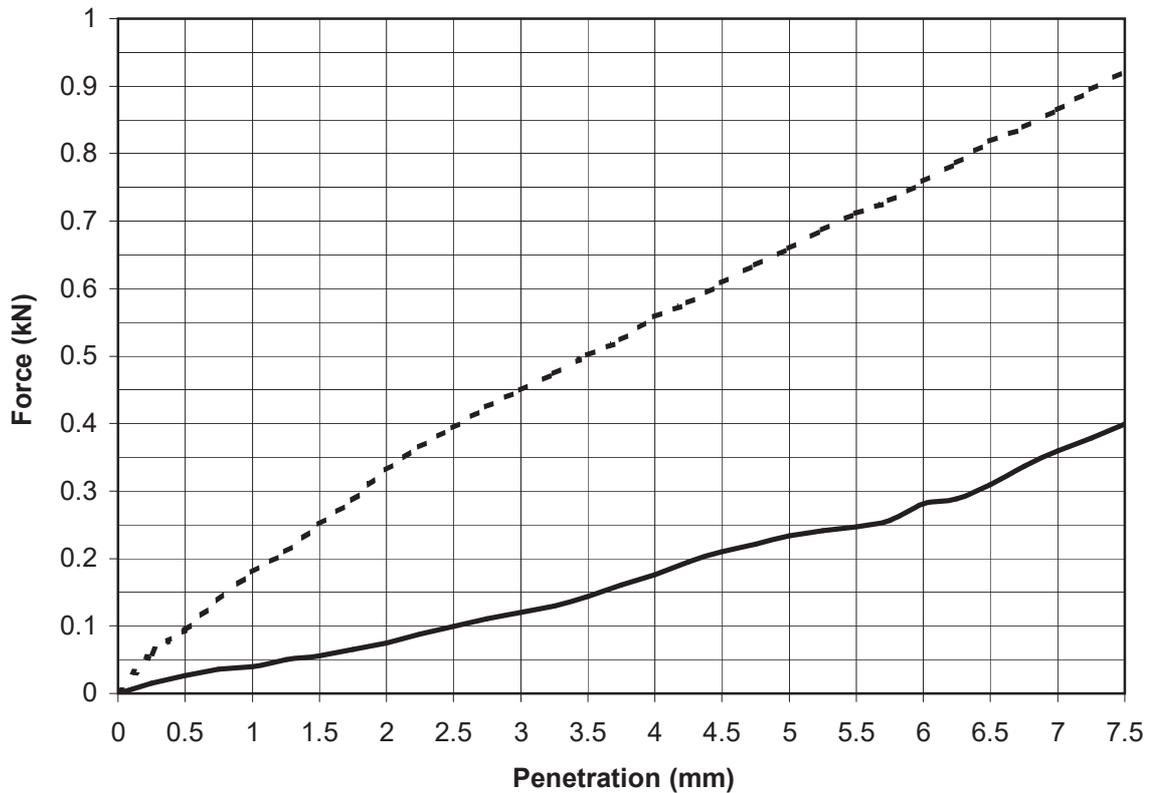
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70467	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	08-02-16
BH/TP No.	TP03/17	Sample No.	AA44488 Type: B
Depth (m)	0.50	Lab sample No.	A16/0343



Key: ————— Top - - - - - Base

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 1 of 5	
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.93
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54
% Material >20mm:	41		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	1.2	3.3
Moisture Content %	24	27

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

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
	<i>H Byrne</i>	17-02-16	1 of 5

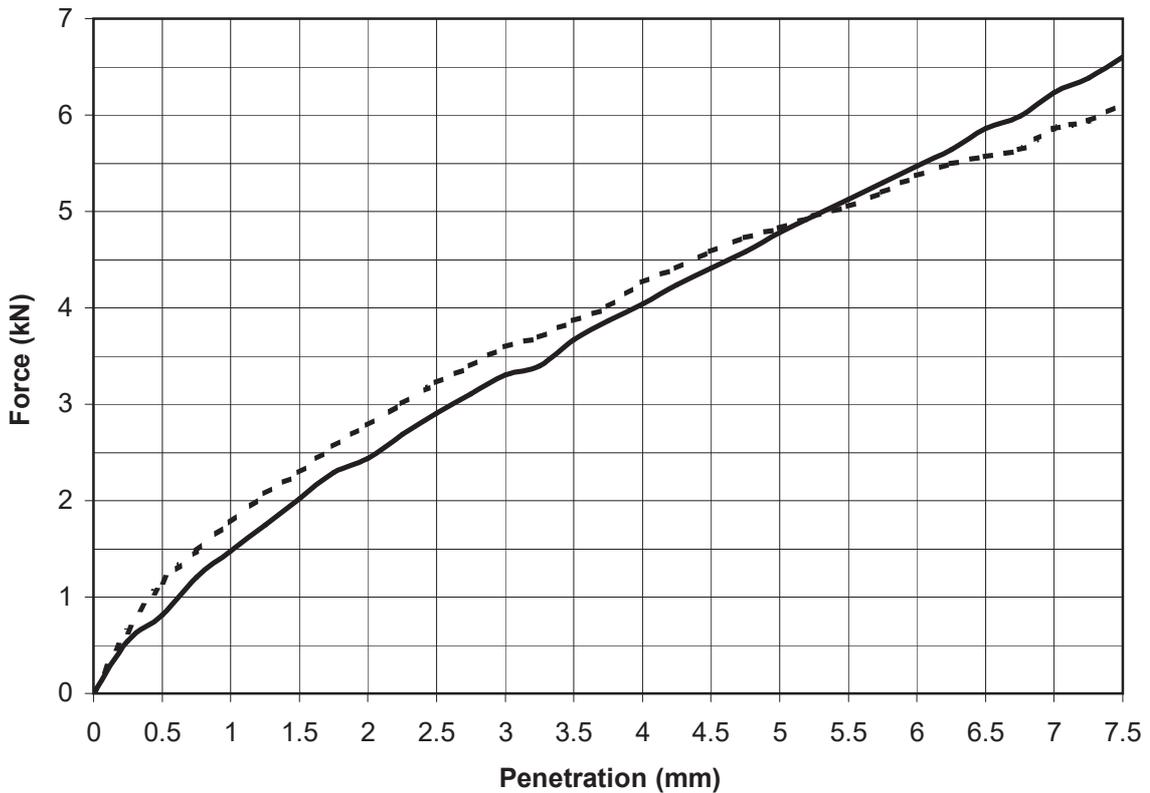
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 Materials Laboratory
 Unit J5,M7 Business Park
 Naas Co.Kildare
 045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70467 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 08-02-16
 BH/TP No. TP03/17 Sample No. AA44488 Type: B
 Depth (m) 0.50 Lab sample No. A16/0343



Key: ————— Top - - - - - Base

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 2 of 5	
Moisture Content (%):	8	Bulk Density (Mg/m ³):	1.74
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.61
% Material >20mm:	41		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	24	24
Moisture Content %	8.1	7.5

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
<i>H Byrne</i>	17-02-16	2 of 5

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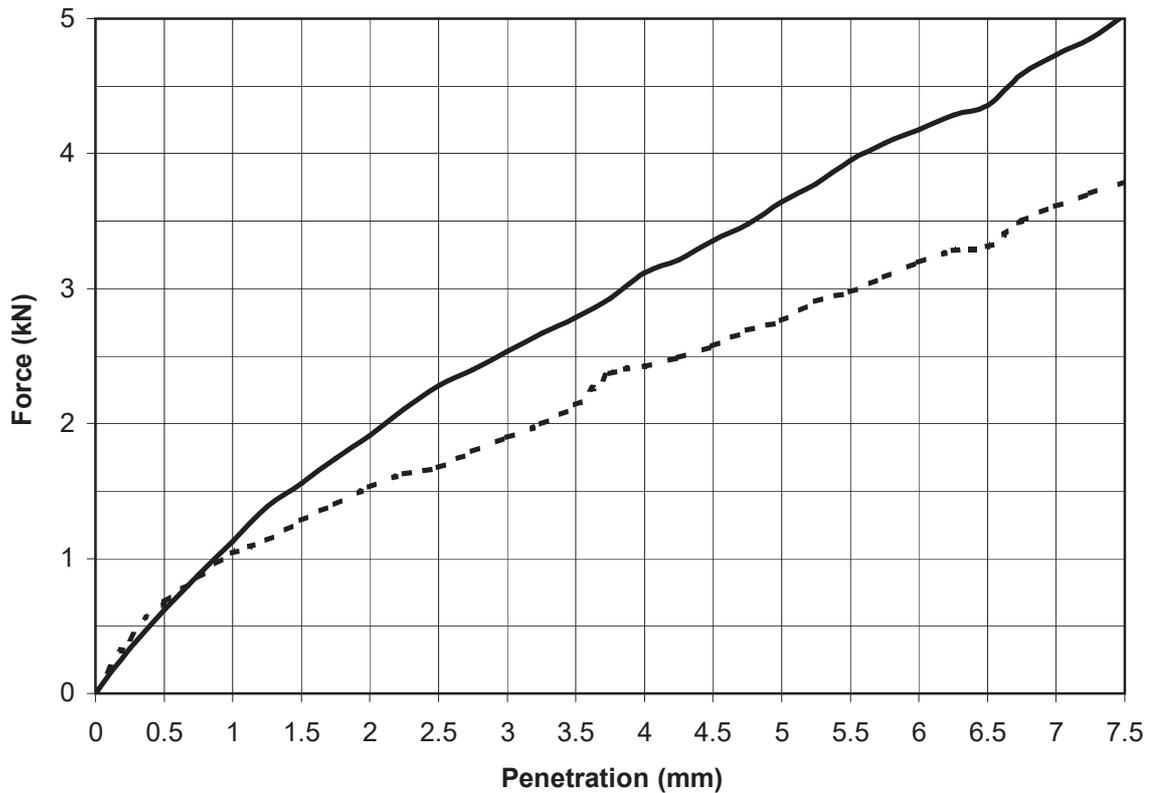
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70467	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	08-02-16
BH/TP No.	TP03/17	Sample No.	AA44488 Type: B
Depth (m)	0.50	Lab sample No.	A16/0343



Key: ————— Top - - - - - Base

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 3 of 5	
Moisture Content (%):	10	Bulk Density (Mg/m ³):	1.77
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.61
% Material >20mm:	41		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	18	14
Moisture Content %	9.4	10

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

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
	<i>H Byrne</i>	17-02-16	3 of 5

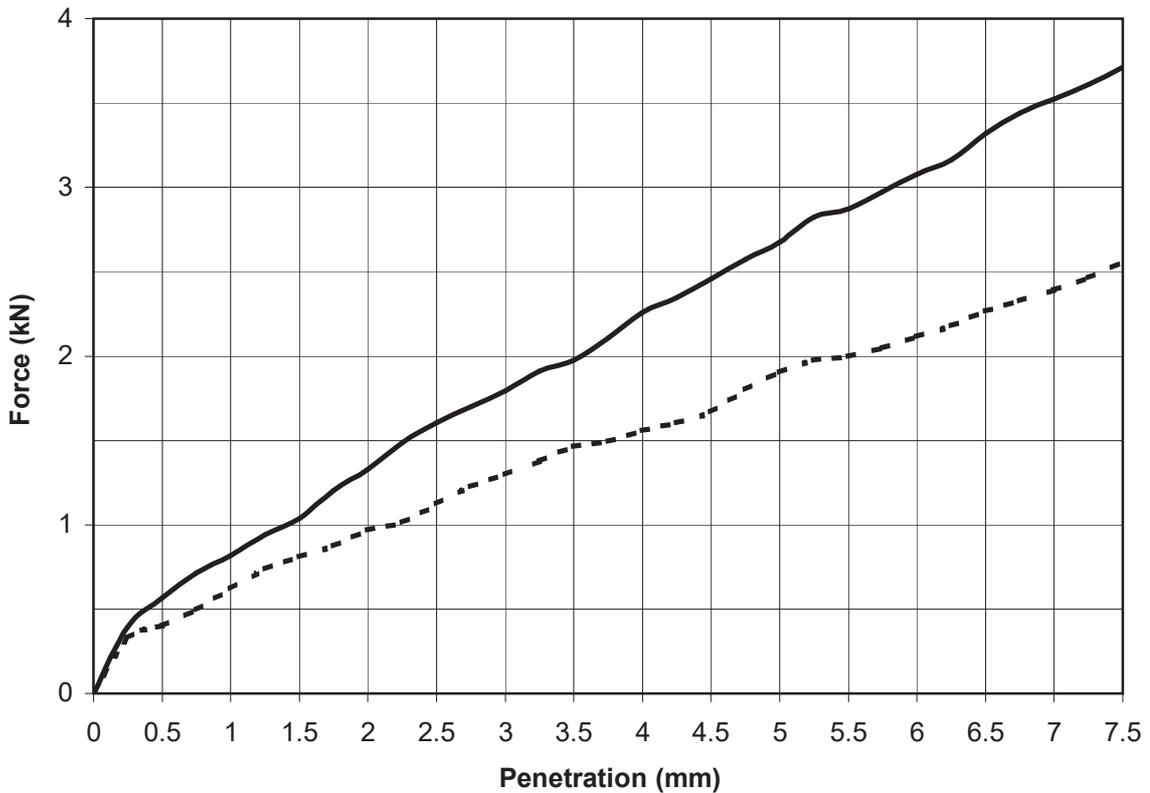
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70467 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 08-02-16
 BH/TP No. TP03/17 Sample No. AA44488 Type: B
 Depth (m) 0.50 Lab sample No. A16/0343



Key: ————— Top - - - - - Base

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 4 of 5	
Moisture Content (%):	13	Bulk Density (Mg/m ³):	1.86
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.64
% Material >20mm:	41		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	13	10
Moisture Content %	13	13

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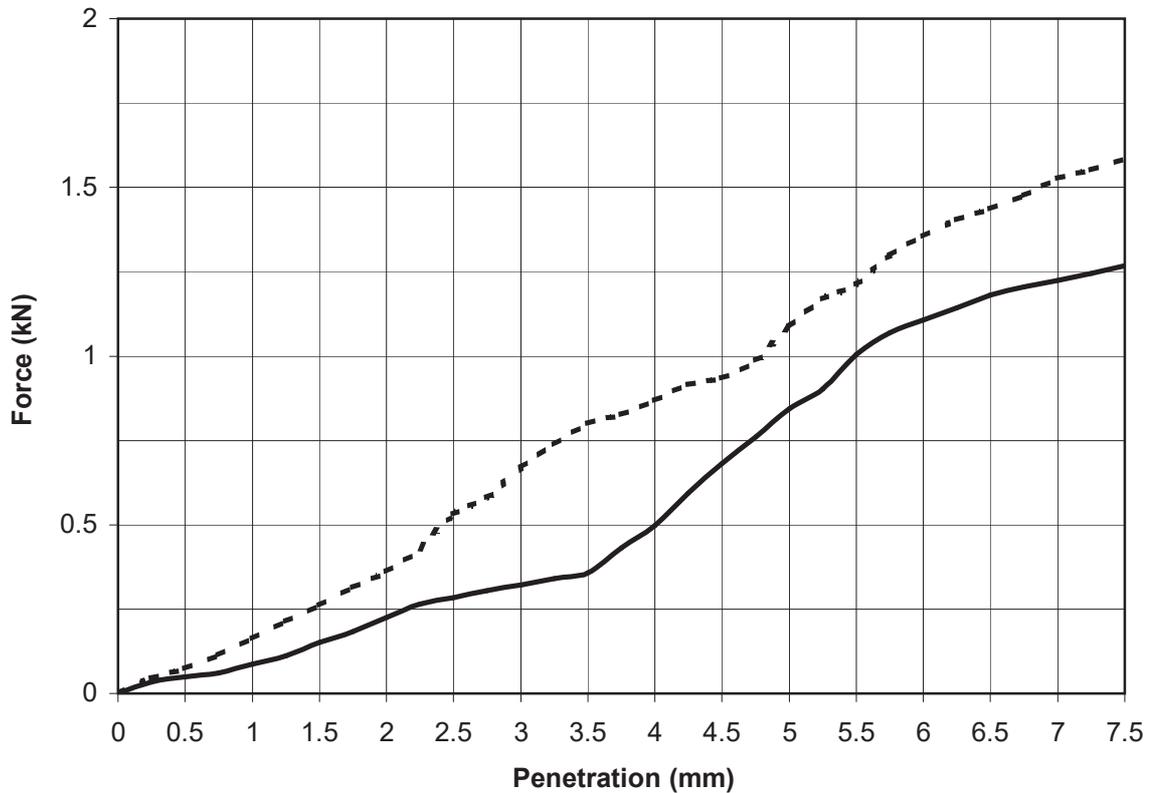
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<i>H Byrne</i>	17-02-16	4 of 5

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70467 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 08-02-16
 BH/TP No. TP03/17 Sample No. AA44488 Type: B
 Depth (m) 0.50 Lab sample No. A16/0343



Key: ————— Top - - - - - Base

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 5 of 5	
Moisture Content (%):	16	Bulk Density (Mg/m ³):	2.06
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.78
% Material >20mm:	41		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	4.2	5.5
Moisture Content %	16	16

Persons authorized to approve reports
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 H Byrne (Quality Manager)

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<i>H Byrne</i>	17-02-16	5 of 5

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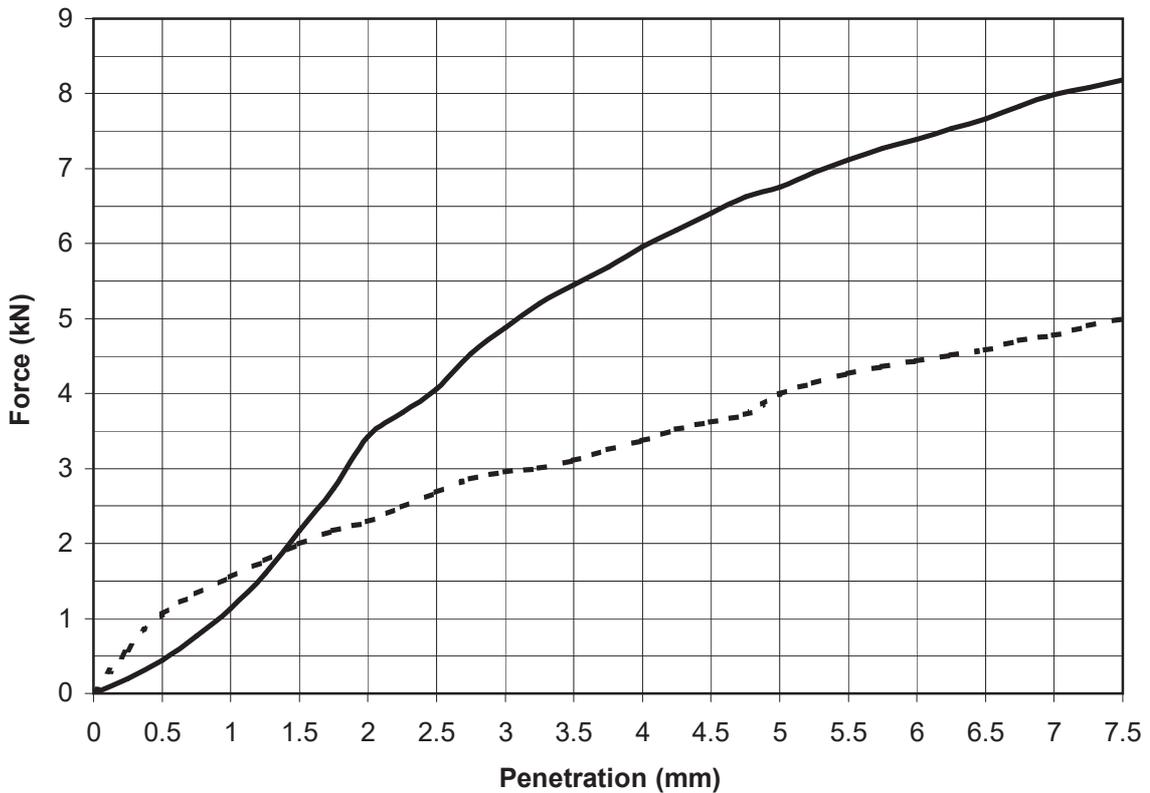
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70623	Contract	GCTP Phase 3 - Contact 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	01-02-16	Date Tested	12-02-16	
BH/TP No.	TP03/01	Sample No.	AA37829	Type: B
Depth (m)	1.00	Lab sample No.	A16/0343	



Key: ————— Top - - - - - Base

Description: Grey/brown clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 1 of 5	
Moisture Content (%):	6	Bulk Density (Mg/m ³):	1.91
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.81
% Material >20mm:	25		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	34	20
Moisture Content %	5.4	5.7

Persons authorized to approve reports
 J Barrett (Dep. Quality Manager)
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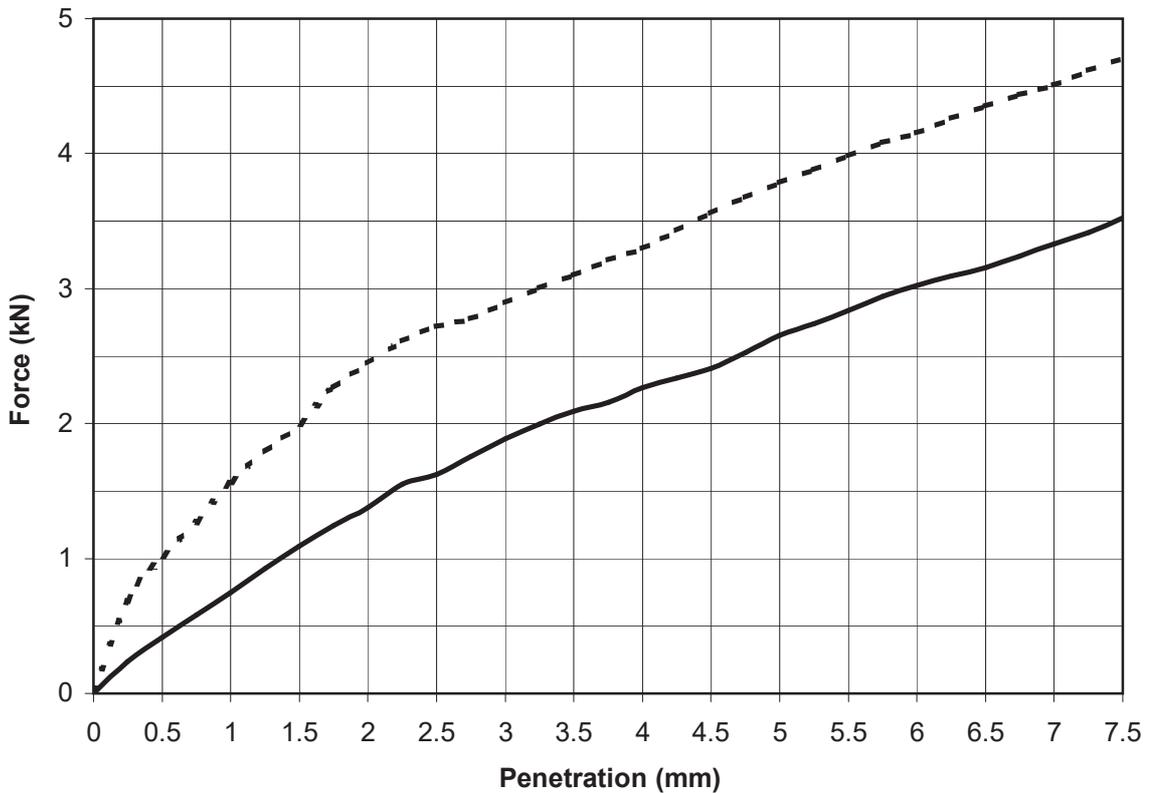
IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
	<i>H Byrne</i>	24-02-16	1 of 5

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No.	R70623	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	12-02-16
BH/TP No.	TP03/01	Sample No.	AA37829 Type: B
Depth (m)	1.00	Lab sample No.	A16/0343



Key: ————— Top - - - - - Base

Description: Grey/brown clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 2 of 5	
Moisture Content (%):	9	Bulk Density (Mg/m ³):	2.02
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.86
% Material >20mm:	25		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	13	21
Moisture Content %	8.0	9.3

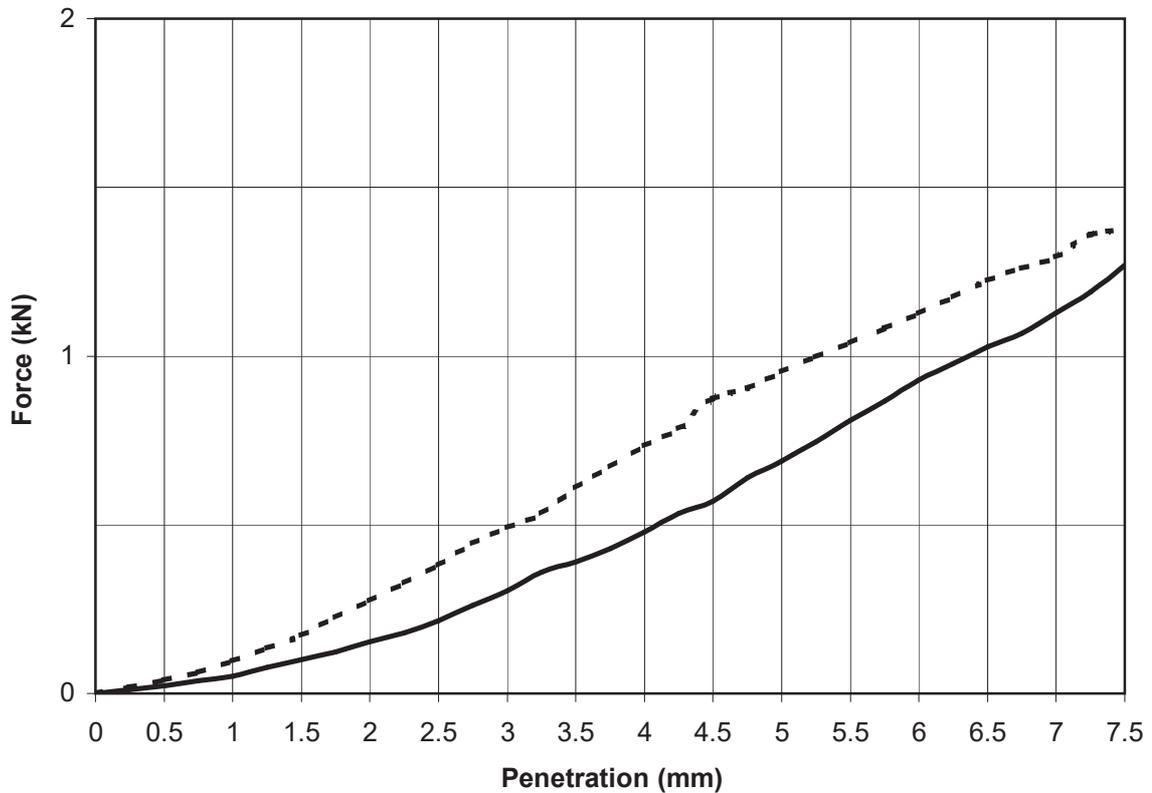
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70623 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 12-02-16
 BH/TP No. TP03/01 Sample No. AA37829 Type: B
 Depth (m) 1.00 Lab sample No. A16/0343



Key: ————— Top - - - - - Base

Description: Grey/brown clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 3 of 5	
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.19
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.97
% Material >20mm:	25		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	3.5	4.8
Moisture Content %	11	11

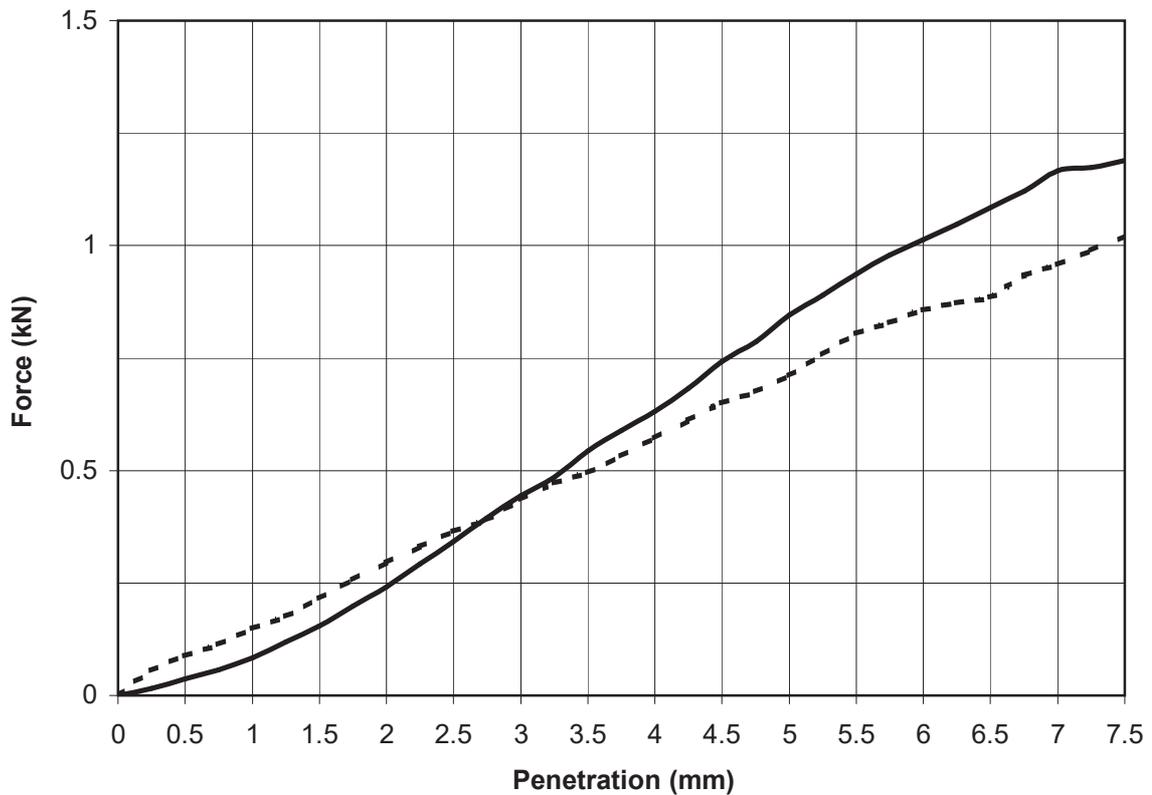
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70623 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 11-02-16
 BH/TP No. TP03/01 Sample No. AA37829 Type: B
 Depth (m) 1.00 Lab sample No. A16/0343



Key: ————— Top - - - - - Base

Description: Grey/brown clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 4 of 5	
Moisture Content (%):	13	Bulk Density (Mg/m ³):	2.17
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.92
% Material >20mm:	25		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	4.2	3.6
Moisture Content %	13	14

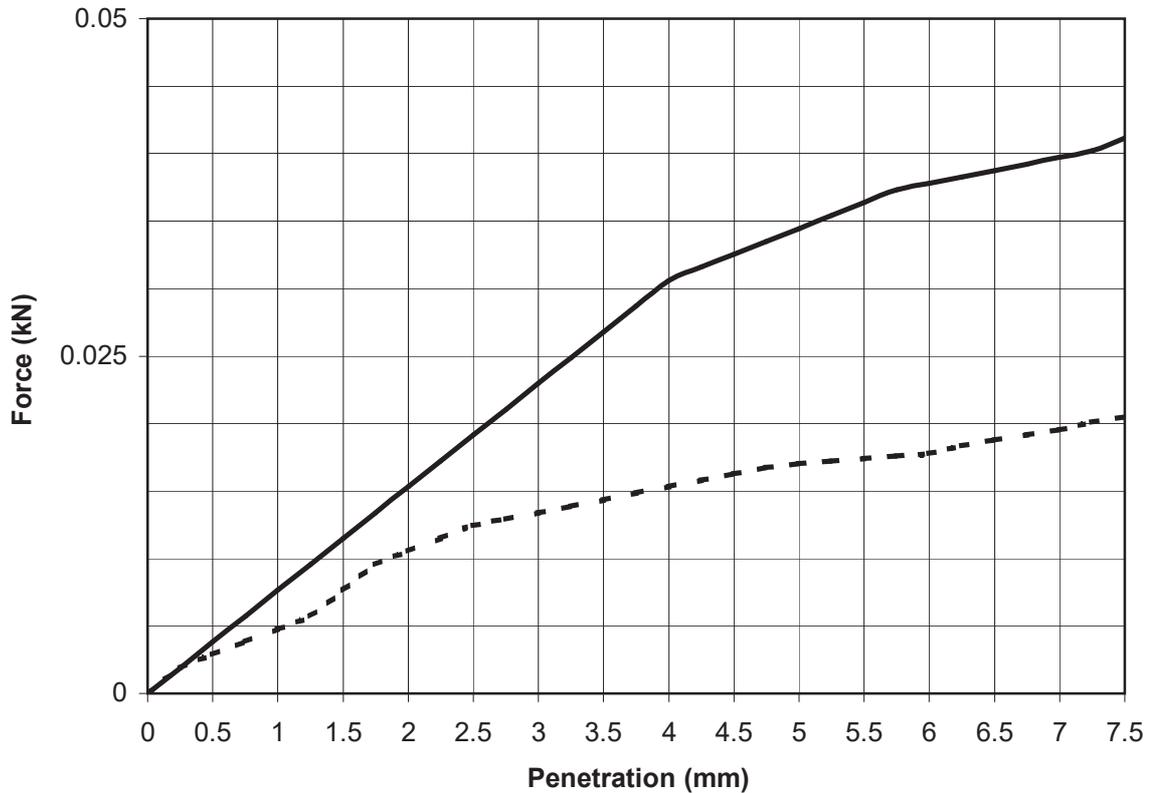
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70623 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 12-02-16
 BH/TP No. TP03/01 Sample No. AA37829 Type: B
 Depth (m) 1.00 Lab sample No. A16/0343



Key: ————— Top - - - - - Base

Description: Grey/brown clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 5 of 5	
Moisture Content (%):	17	Bulk Density (Mg/m ³):	2.14
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.88
% Material >20mm:	25		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	0.2	0.9
Moisture Content %	16	17

Persons authorized to approve reports
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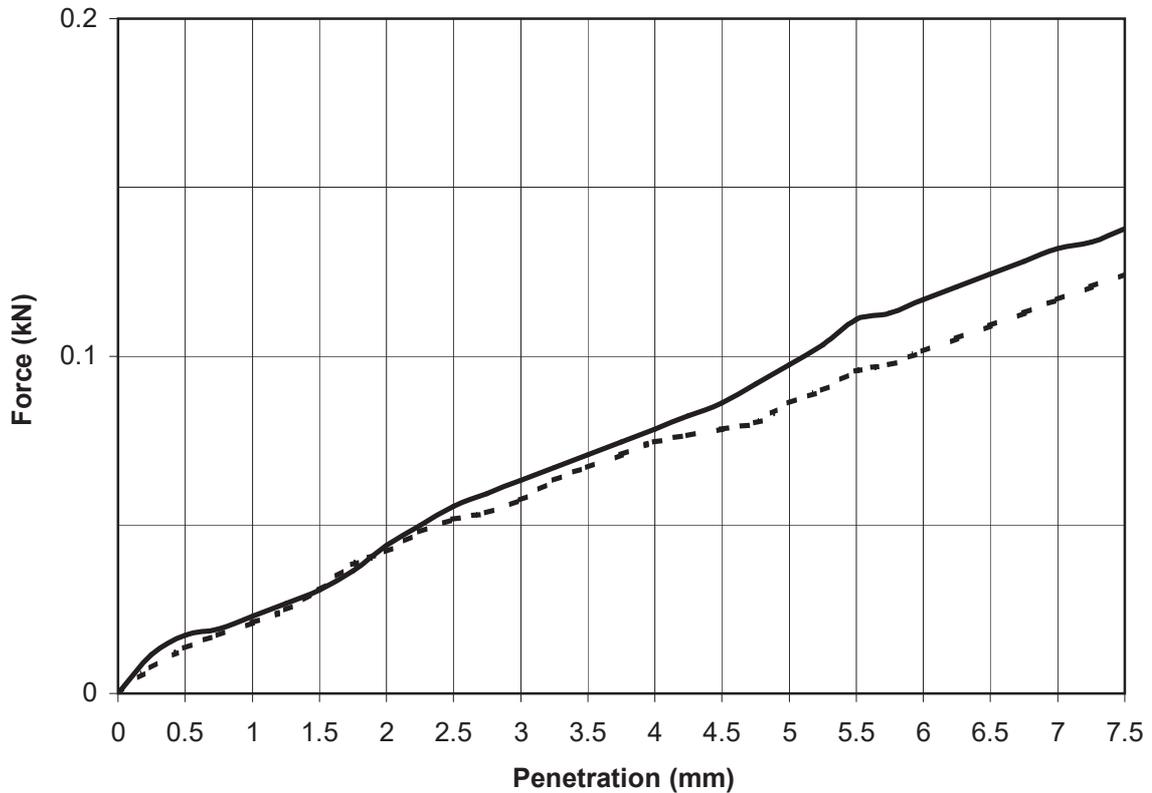
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71175	Contract	GCTP Phase 3 - Contact 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	01-02-16	Date Tested	21-03-16	
BH/TP No.	TP03/05	Sample No.	AA44477	Type: B
Depth (m)	1.00	Lab sample No.	A16/0485	



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Natural Unsoaked Point 1 of 5	
Moisture Content (%):	39	Bulk Density (Mg/m ³):	1.79
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.29
% Material >20mm:	28		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	0.5	0.4
Moisture Content %	42	36

Persons authorized to approve reports
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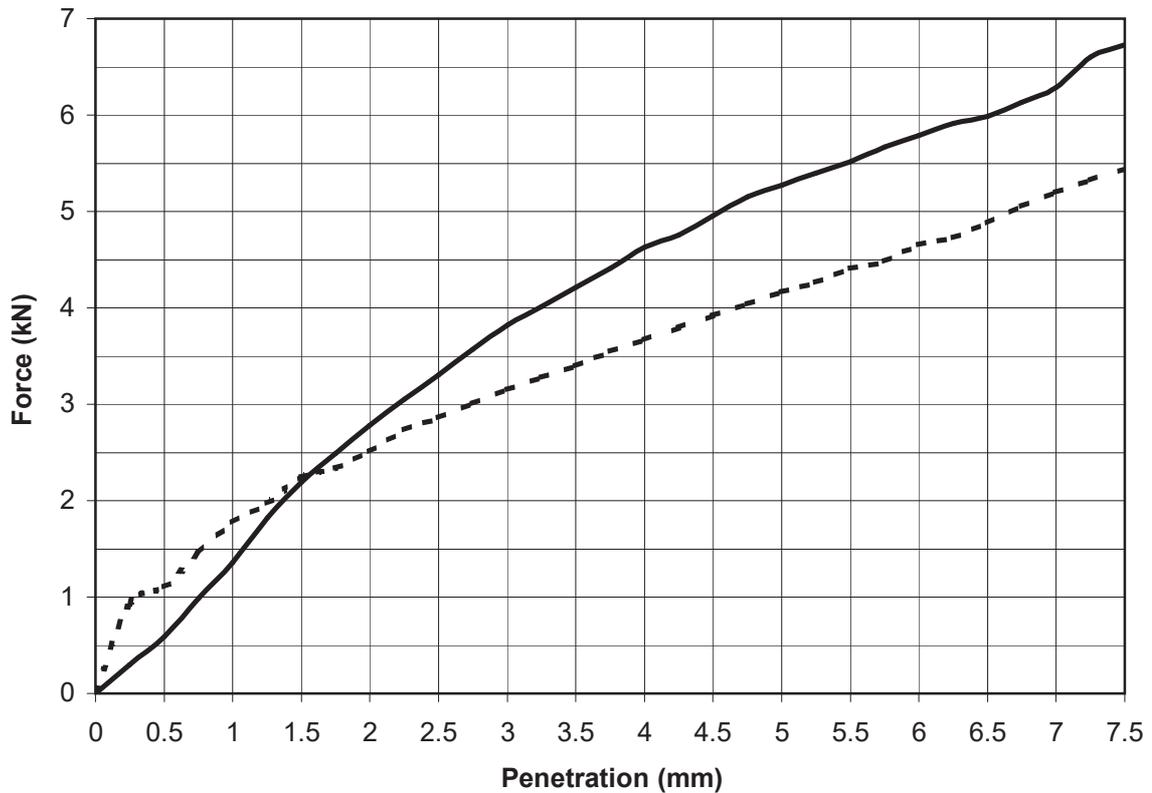
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71175 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 29-03-16
 BH/TP No. TP03/05 Sample No. AA44477 Type: B
 Depth (m) 1.00 Lab sample No. A16/0485



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 2 of 5	
Moisture Content (%):	5	Bulk Density (Mg/m ³):	1.61
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54
% Material >20mm:	28		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	26	22
Moisture Content %	4.7	4.7

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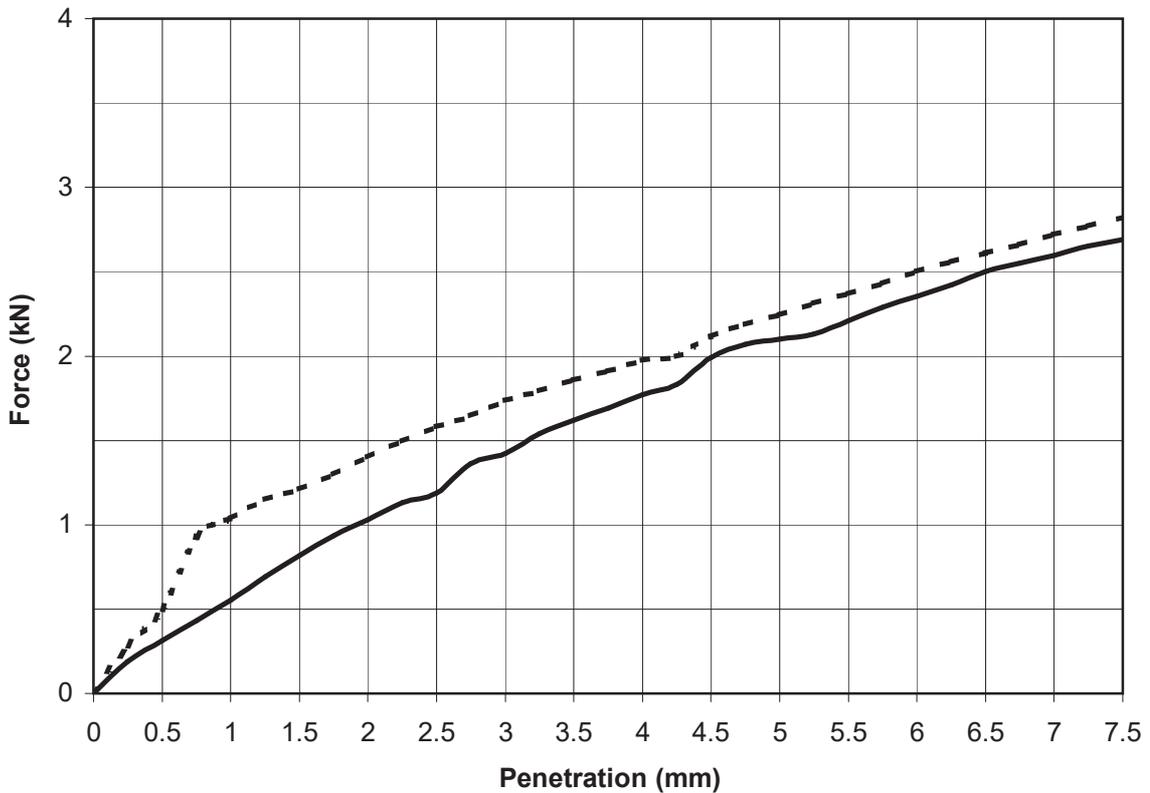
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71175 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 23-03-16
 BH/TP No. TP03/05 Sample No. AA44477 Type: B
 Depth (m) 1.00 Lab sample No. A16/0485



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 3 of 5	
Moisture Content (%):	10	Bulk Density (Mg/m ³):	1.74
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.59
% Material >20mm:	28		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	11	12
Moisture Content %	10	10

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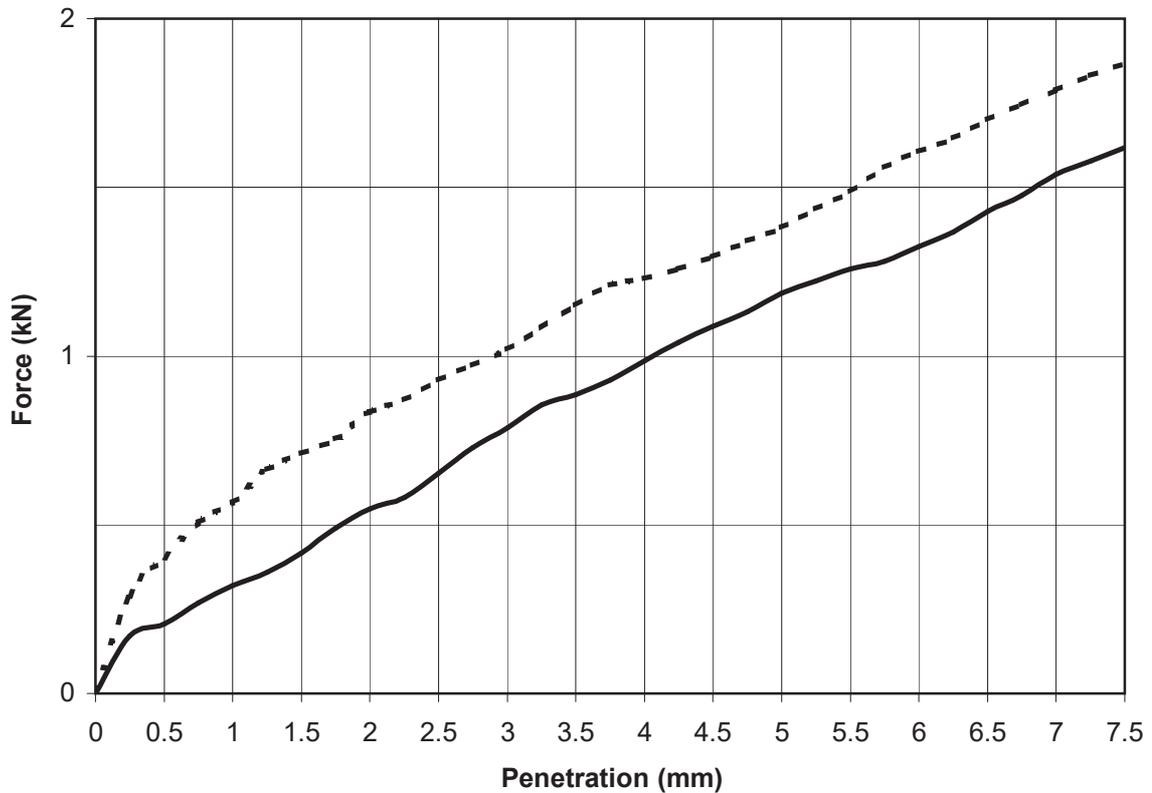
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71175	Contract	GCTP Phase 3 - Contact 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	01-02-16	Date Tested	23-03-16	
BH/TP No.	TP03/05	Sample No.	AA44477	Type: B
Depth (m)	1.00	Lab sample No.	A16/0485	



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 4 of 5	
Moisture Content (%):	16	Bulk Density (Mg/m ³):	1.85
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.59
% Material >20mm:	28		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	6	7
Moisture Content %	16	16

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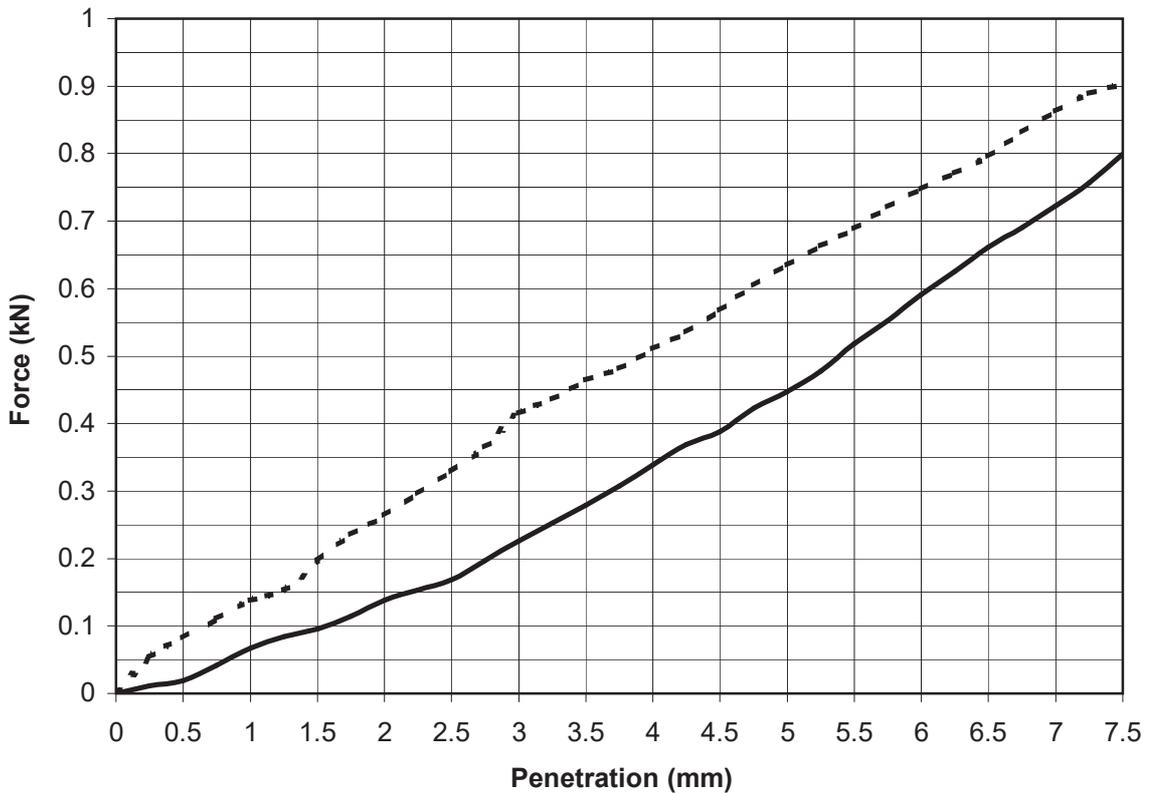
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No.	R71175	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	23-03-16
BH/TP No.	TP03/05	Sample No.	AA44477 Type: B
Depth (m)	1.00	Lab sample No.	A16/0485



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked Point 5 of 5	
Moisture Content (%):	20	Bulk Density (Mg/m ³):	1.94
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.62
% Material >20mm:	28		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	2.2	3.2
Moisture Content %	17	22

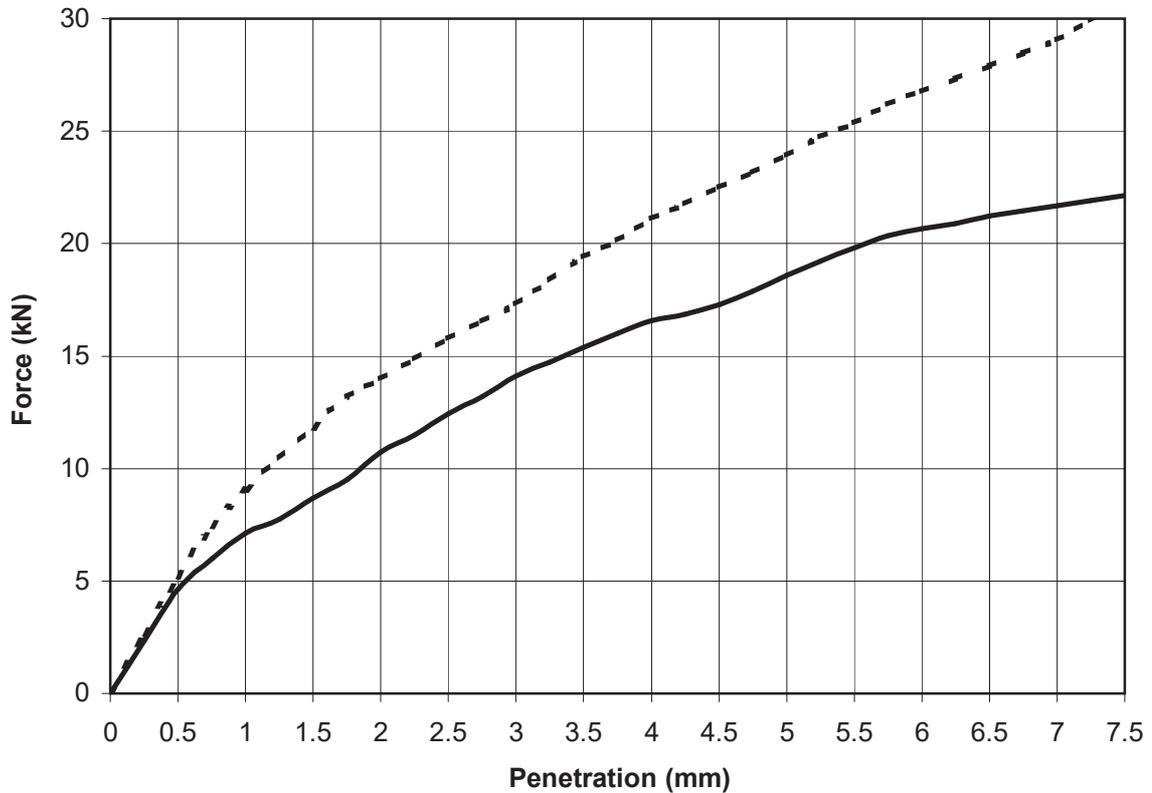
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71189 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 23-03-16
 BH/TP No. TP03/18 Sample No. AA37827 Type: B
 Depth (m) 2.00 Lab sample No. A16/0347



Key: ————— Top - - - - - Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 1 of 5	
Moisture Content (%):	6	Bulk Density (Mg/m ³):	1.95
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.84
% Material >20mm:	24		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	93	120
Moisture Content %	6	6

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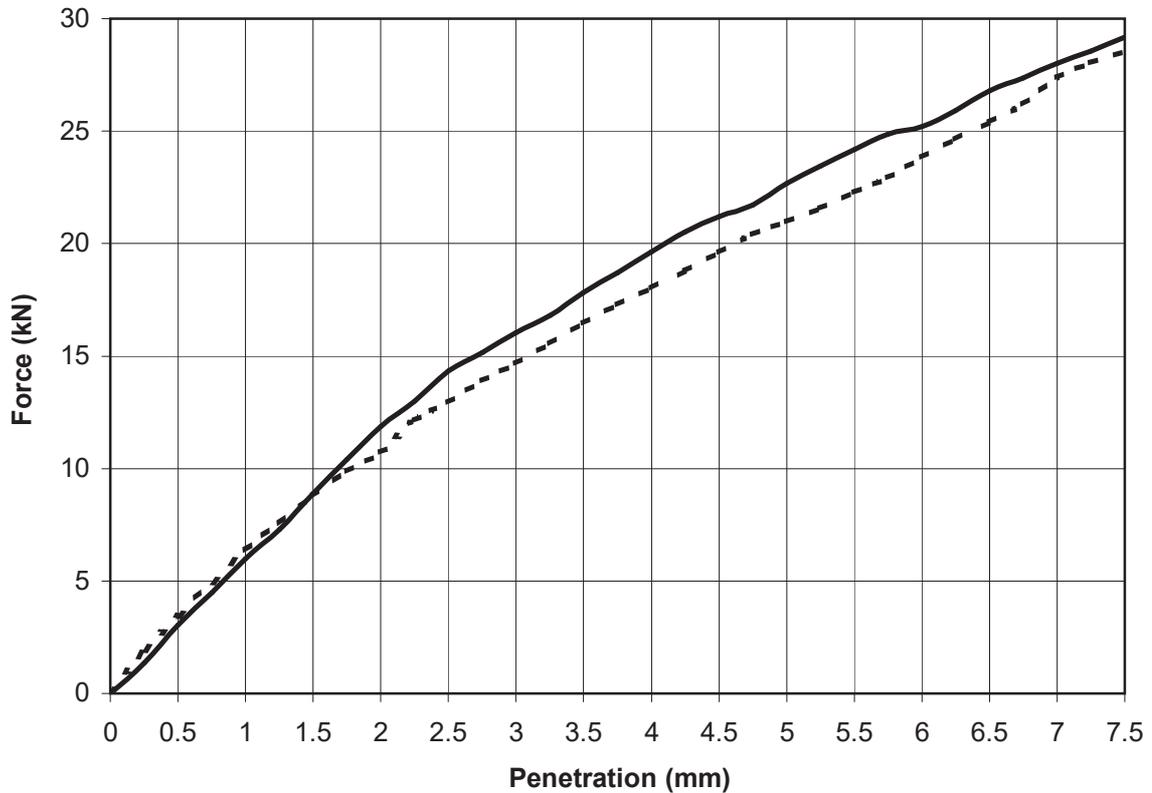
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71189	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	24-03-16
BH/TP No.	TP03/18	Sample No.	AA37827 Type: B
Depth (m)	2.00	Lab sample No.	A16/0347



Key: ————— Top - - - - - Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 2 of 5	
Moisture Content (%):	7	Bulk Density (Mg/m ³):	2.01
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.88
% Material >20mm:	24		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	114	106
Moisture Content %	7	7

Persons authorized to approve reports
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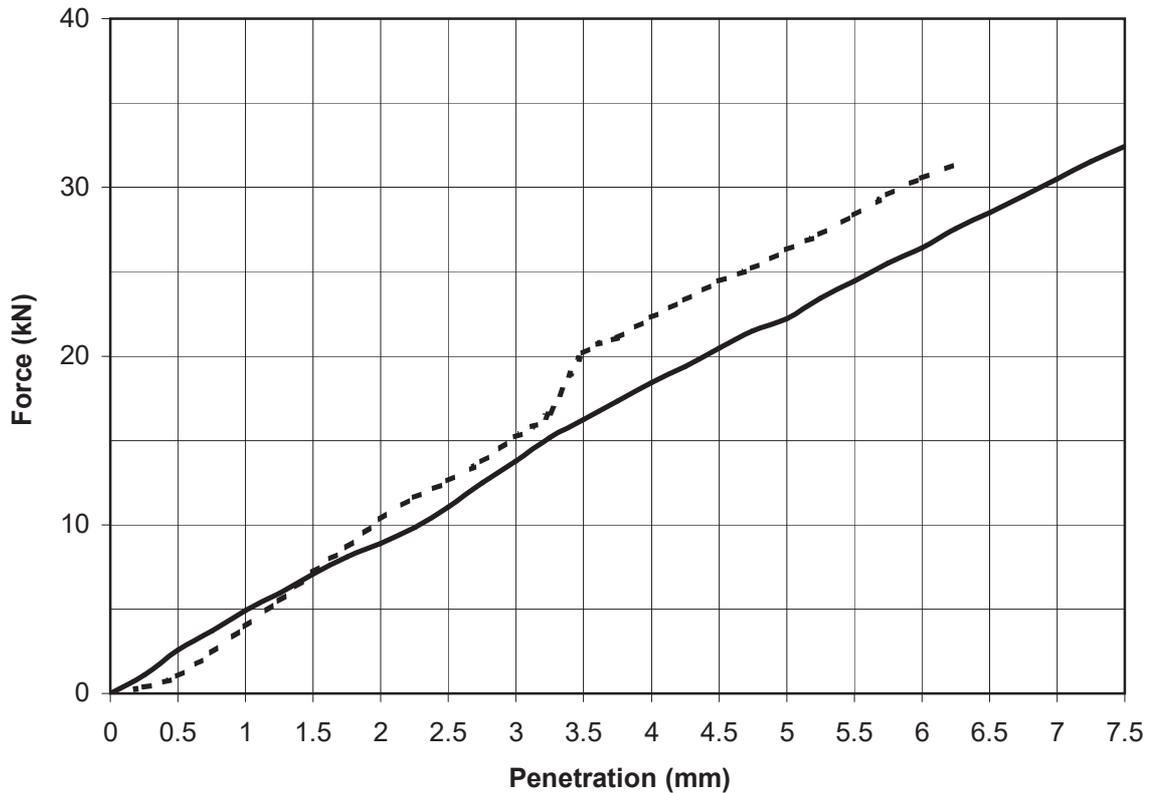
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71189 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 29-03-16
 BH/TP No. TP03/18 Sample No. AA37827 Type: B
 Depth (m) 2.00 Lab sample No. A16/0347



Key: ———— Top - - - - - Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 3 of 5	
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.06
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.91
% Material >20mm:	24		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	111	132
Moisture Content %	8	8

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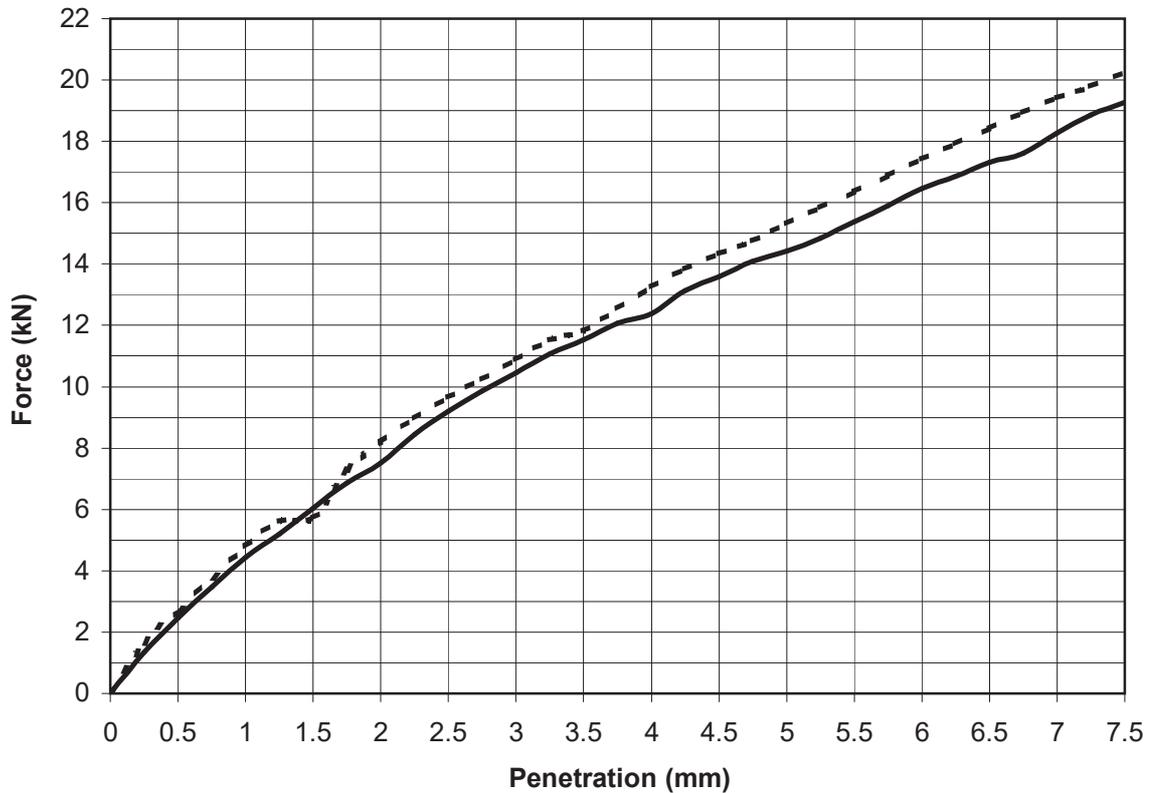
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71189	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	29-03-16
BH/TP No.	TP03/18	Sample No.	AA37827 Type: B
Depth (m)	2.00	Lab sample No.	A16/0347



Key: ————— Top - - - - - Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 4 of 5	
Moisture Content (%):	9	Bulk Density (Mg/m ³):	2.12
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.94
% Material >20mm:	24		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	72	77
Moisture Content %	9	9

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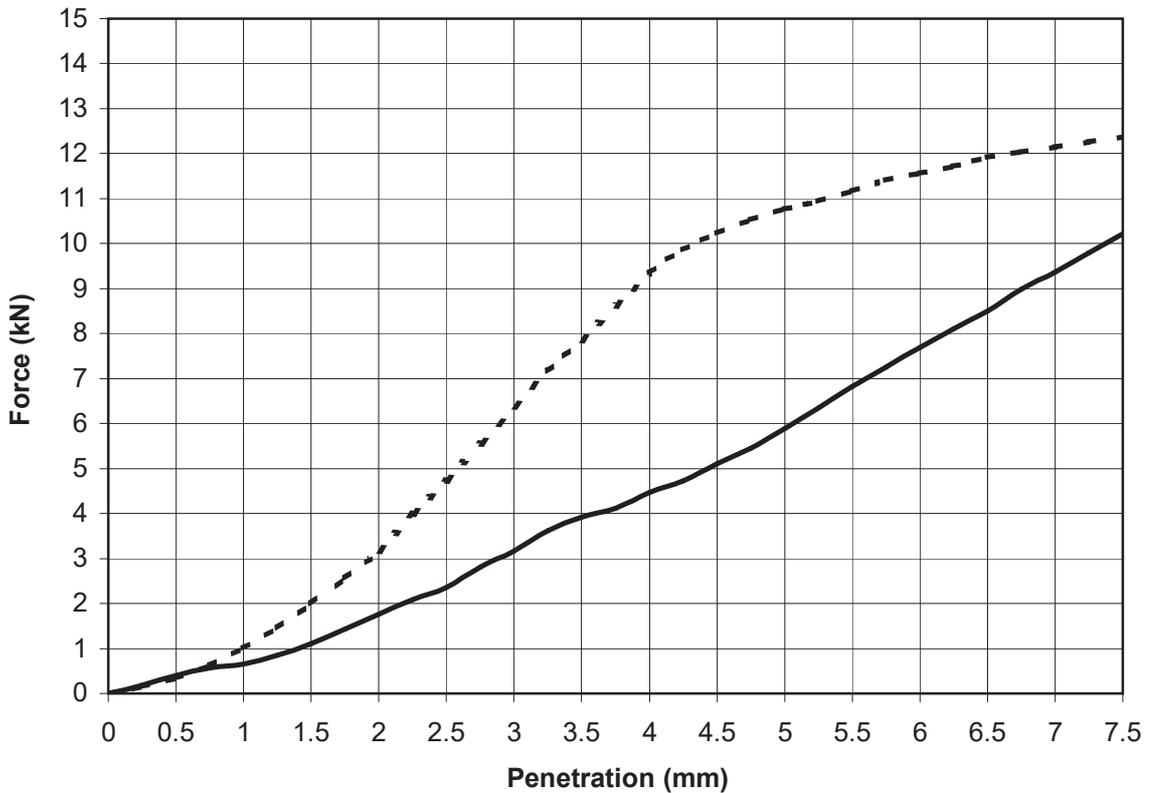
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71189 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 29-03-16
 BH/TP No. TP03/18 Sample No. AA37827 Type: B
 Depth (m) 2.00 Lab sample No. A16/0347



Key: ————— Top - - - - - Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked Point 5 of 5	
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.16
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.90
% Material >20mm:	24		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	30	54
Moisture Content %	11	11

Persons authorized to approve reports
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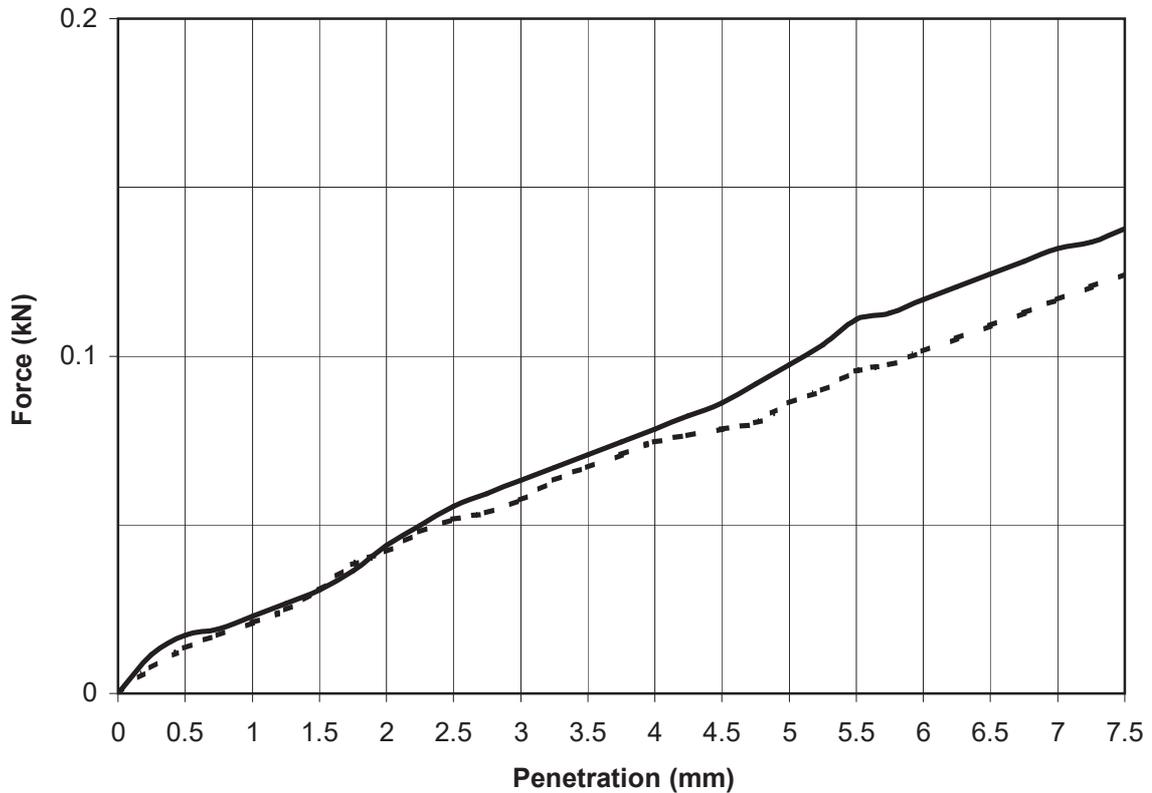
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71385	Contract	GCTP Phase 3 - Contact 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	01-02-16	Date Tested	21-03-16	
BH/TP No.	TP03/05	Sample No.	AA44477	Type: B
Depth (m)	1.00	Lab sample No.	A16/0485	



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked	
Moisture Content (%):	39	Bulk Density (Mg/m ³):	1.79
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.29
% Material >20mm:	28		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.5	0.4
Moisture Content %	42	36

Persons authorized to approve reports
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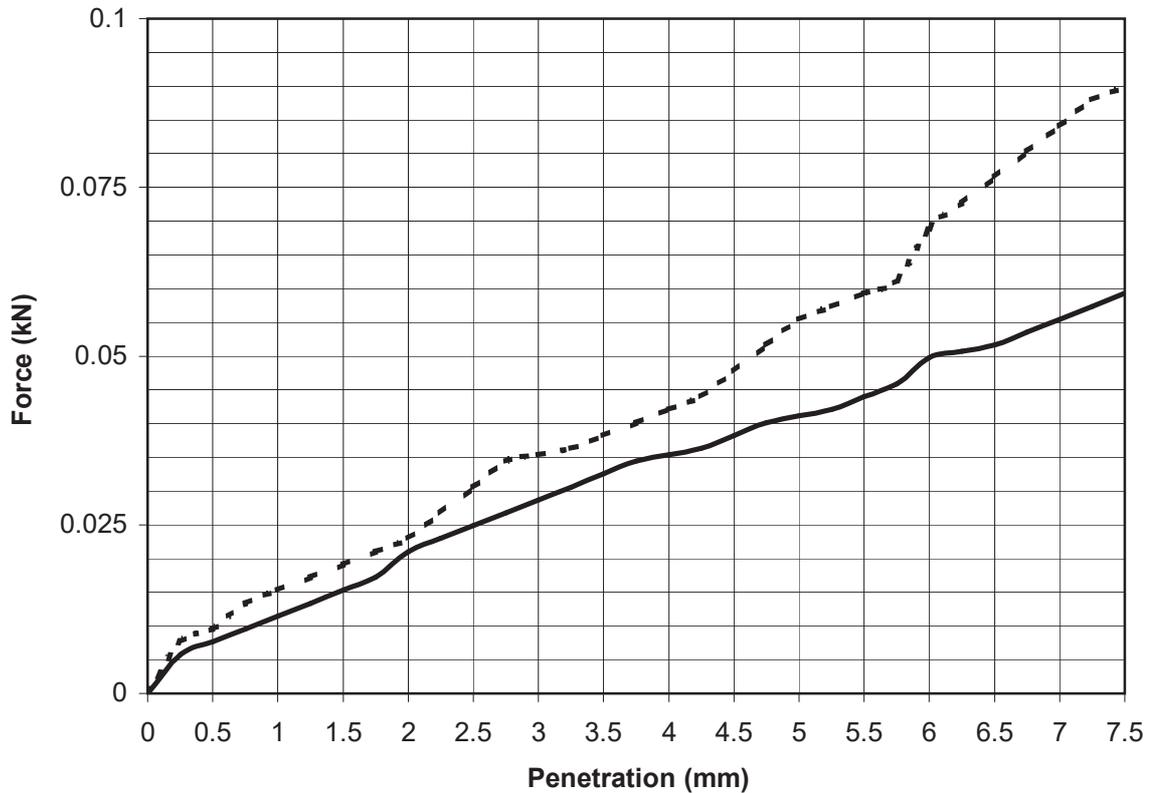
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70468	Contract	GCTP Phase 3 - Contact 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	08-02-16
BH/TP No.	TP03/03	Sample No.	AA44484 Type: B
Depth (m)	1.60	Lab sample No.	A16/0318



Key: ————— Top - - - - - Base

Description: Dark brown silty, very sandy, GRAVEL with occasional cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	30	Bulk Density (Mg/m ³):	1.88
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.45
% Material >20mm:	30		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.2	0.3
Moisture Content %	30	29

Persons authorized to approve reports
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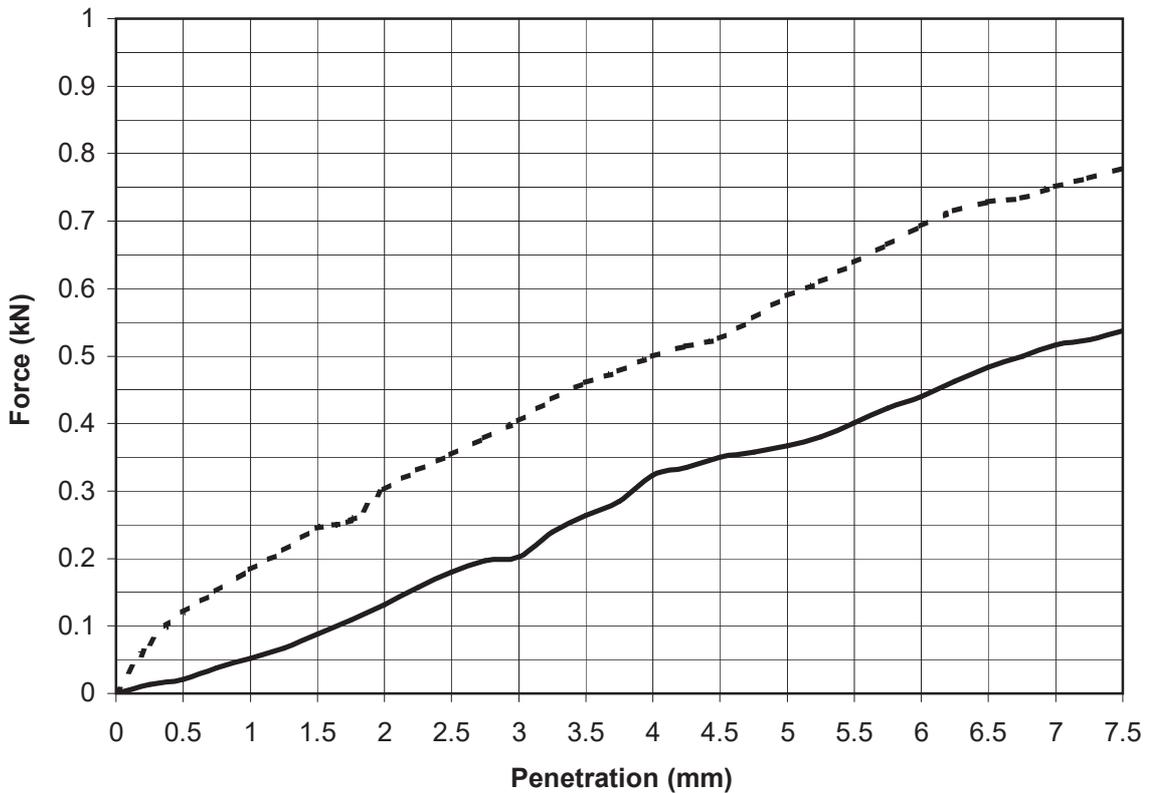
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70616 Contract GCTP Phase 3 - Contract 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 22-02-16
 BH/TP No. TP3/06 Sample No. AA37805 Type: B
 Depth (m) 1.10 Lab sample No. A16/0325



Key: ————— Top - - - - - Base

Description: Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	26	Bulk Density (Mg/m ³):	1.98
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.57
% Material >20mm:	25		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	1.8	3.0
Moisture Content %	28	24

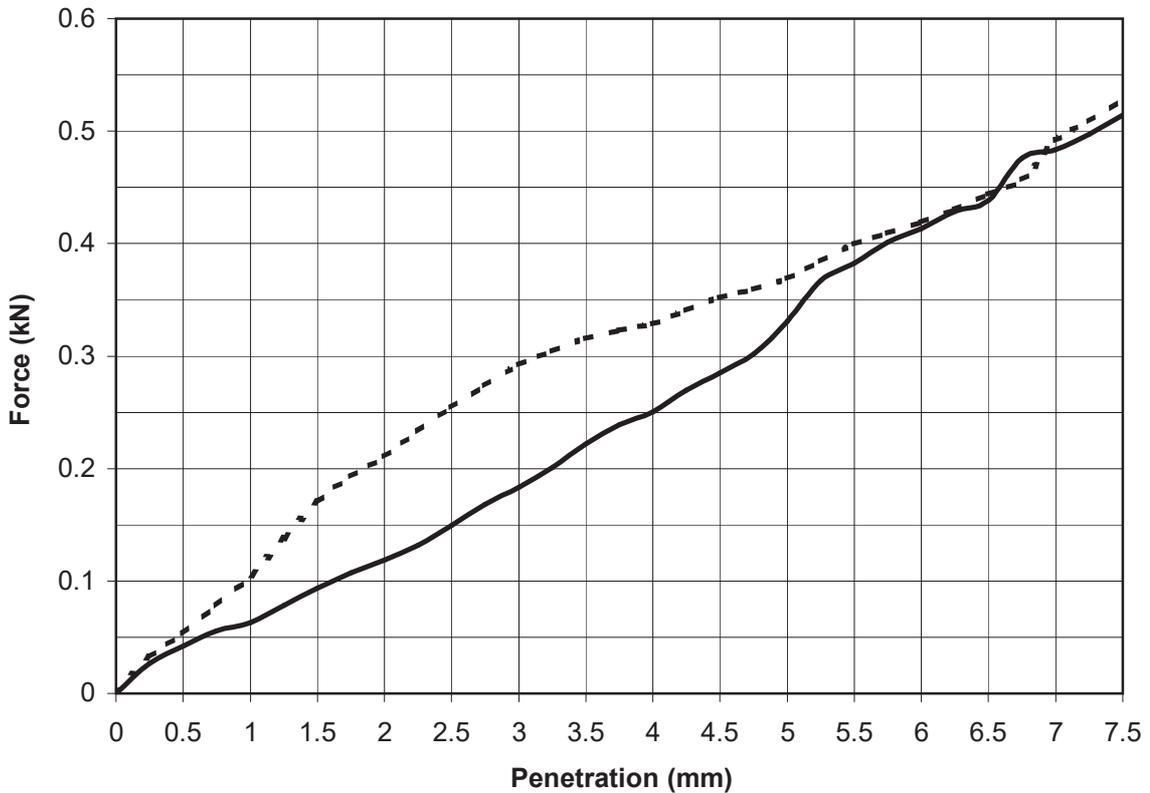
Persons authorized to approve reports
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70617 Contract GCTP Phase 3 - Contract 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 22-02-16
 BH/TP No. TP03/08 Sample No. AA37821 Type: B
 Depth (m) 1.20 Lab sample No. A16/0332



Key: ————— Top - - - - - Base

Description: Light brown/grey clayey/silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked	
Moisture Content (%):	16	Bulk Density (Mg/m ³):	2.12
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.83
% Material >20mm:	24		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	1.7	1.9
Moisture Content %	15	16

Persons authorized to approve reports
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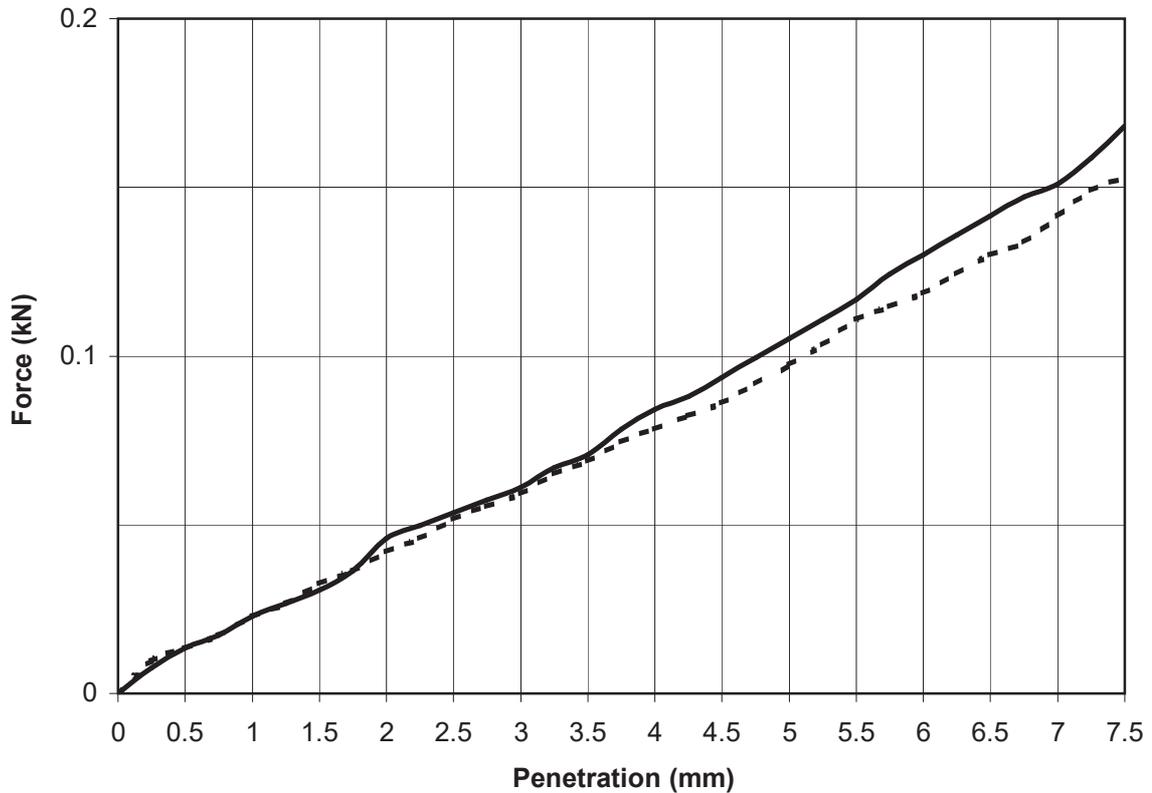
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71143	Contract	GCTP Phase 3 - Contact 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	01-02-16	Date Tested	09-03-16	
BH/TP No.	TP3/11	Sample No.	AA37814	Type: B
Depth (m)	0.25	Lab sample No.	A16/0333	



Key: ————— Top - - - - - Base

Description: Dark brown clayey/silty, very sandy, GRAVEL with many cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	26	Bulk Density (Mg/m ³):	1.94
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54
% Material >20mm:	21		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.5	0.5
Moisture Content %	26	26

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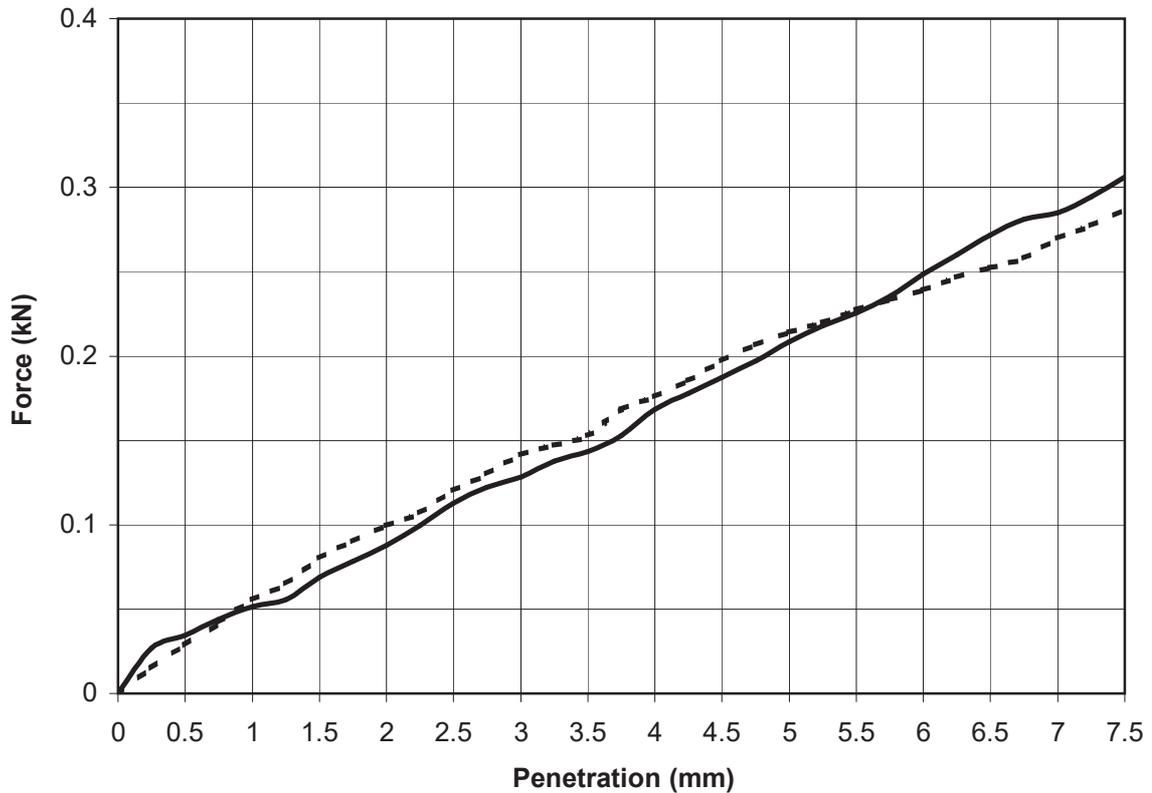
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70280	Contract	N6 Galway
Contract No.	18963	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	08-02-16
BH/TP No.	TP3/21	Sample No.	AA44494 Type: B
Depth (m)	0.15	Lab sample No.	A16/0356



Key: ————— Top - - - - - Base

Description: Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	39	Bulk Density (Mg/m ³):	1.74
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.25
% Material >20mm:	53		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	1.0	1.1
Moisture Content %	36	43

Persons authorized to approve reports
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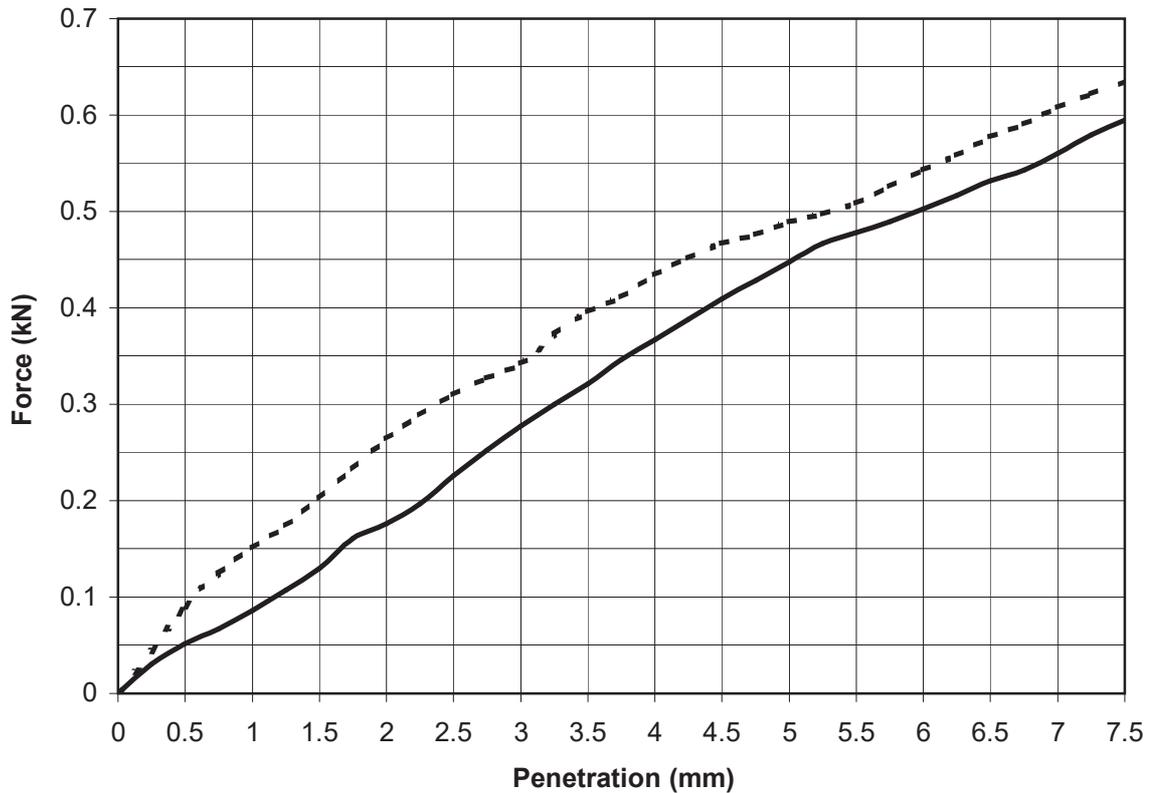
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71004 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 09-03-16
 BH/TP No. TP03/22 Sample No. AA33947 Type: B
 Depth (m) 0.15 Lab sample No. A16/0559



Key: ———— Top - - - - - Base

Description: Brown sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked	
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.92
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54
% Material >20mm:	2		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	2.2	2.5
Moisture Content %	25	26

Persons authorized to approve reports
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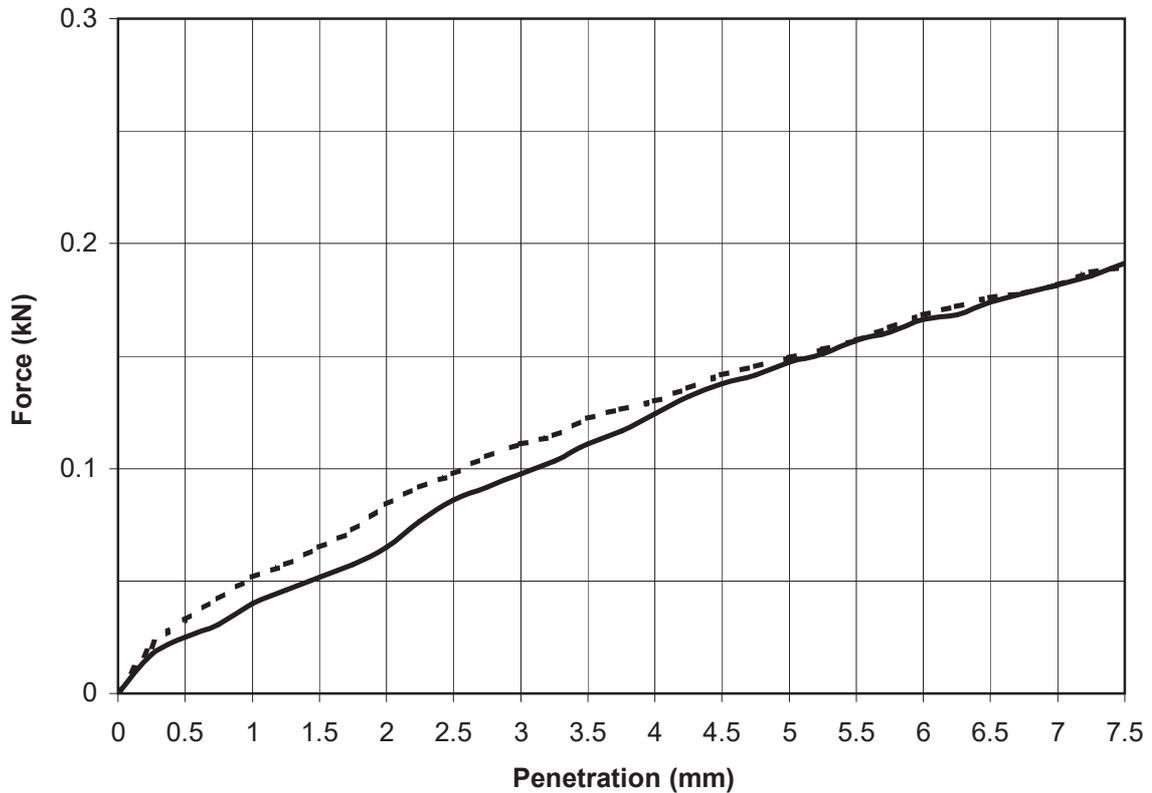
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70618 Contract GCTP Phase 3 - Contract 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 19-02-16
 BH/TP No. TP03/23 Sample No. AA33941 Type: B
 Depth (m) 0.50 Lab sample No. A16/0361



Key: ————— Top - - - - - Base

Description: Light brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked	
Moisture Content (%):	18	Bulk Density (Mg/m ³):	2.11
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.79
% Material >20mm:	6.1		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.7	0.8
Moisture Content %	19	18

Persons authorized to approve reports
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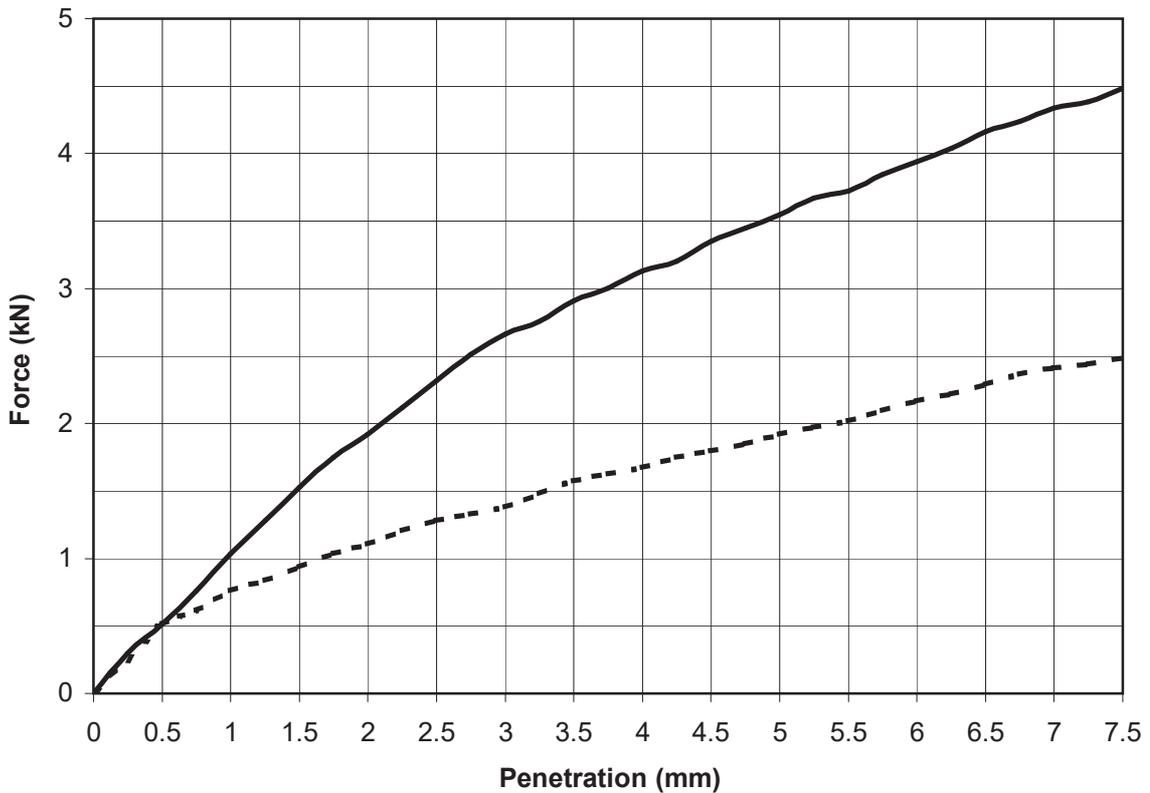
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70619	Contract	GCTP Phase 3 - Contract 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	12-02-16	Date Tested	22-02-16
BH/TP No.	TP03/25	Sample No.	AA43895 Type: B
Depth (m)	2.00	Lab sample No.	A16/0371



Key: ————— Top - - - - - Base

Description: Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles

Initial Condition:	Unsoaked		
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.21
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.05
% Material >20mm:	15.7		
Method of compaction:	Static Compaction Method 2		

Test Result	Top	Base
CBR %	18	10
Moisture Content %	7.6	7.9

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

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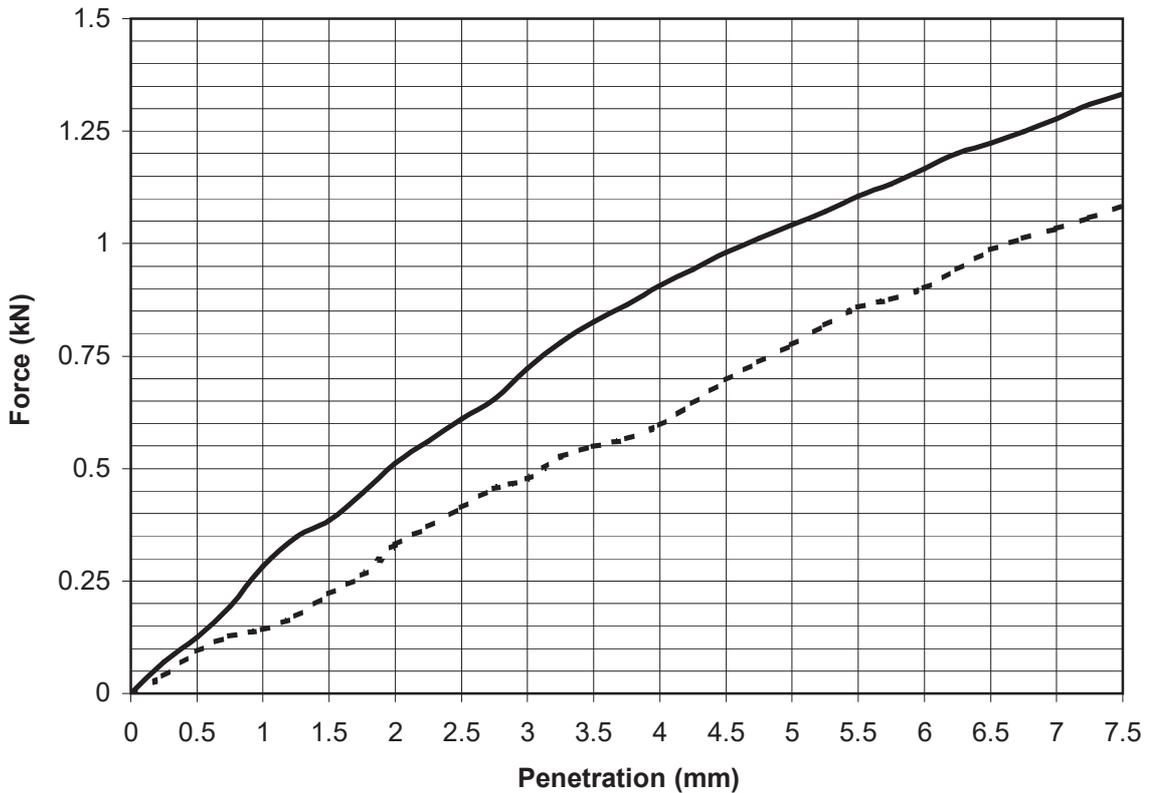
Approved by	Date	Page No.
<i>H Byrne</i>	24-02-16	1 of 1

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70620 Contract GCTP Phase 3 - Contract 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 19-02-16
 BH/TP No. TP03/27 Sample No. AA44456 Type: B
 Depth (m) 2.00 Lab sample No. A16/0377



Key: ————— Top - - - - - Base

Description: Light brown slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked	
Moisture Content (%):	9	Bulk Density (Mg/m ³):	2.26
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.08
% Material >20mm:	2.6		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	5.2	3.9
Moisture Content %	8.7	8.7

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

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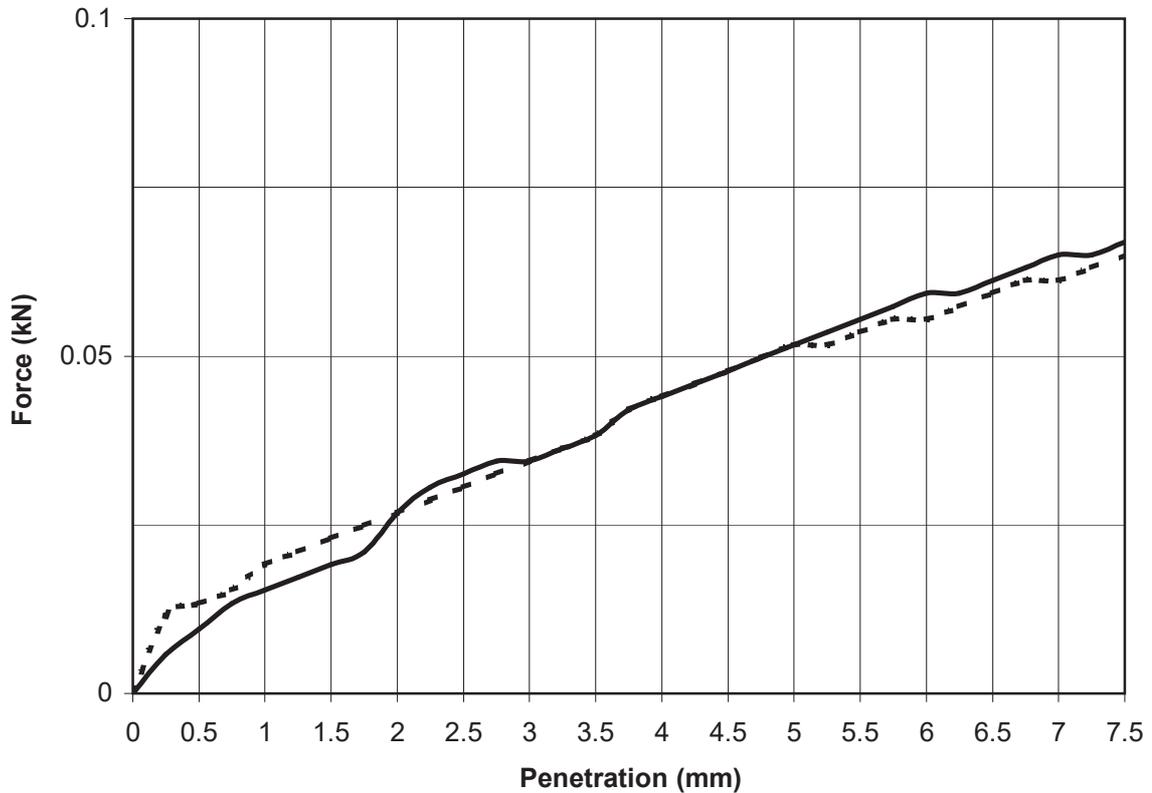
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70643	Contract	GCTP Phase 3 - Contact 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	01-02-16	Date Tested	28-02-16	
BH/TP No.	TP03/29	Sample No.	0	Type: B
Depth (m)	1.60	Lab sample No.	A16/0391	



Key: ————— Top - - - - - Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	28	Bulk Density (Mg/m ³):	1.89
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.47
% Material >20mm:	11		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.3	0.3
Moisture Content %	28	29

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

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
	<i>H Byrne</i>	25-02-16	1 of 1

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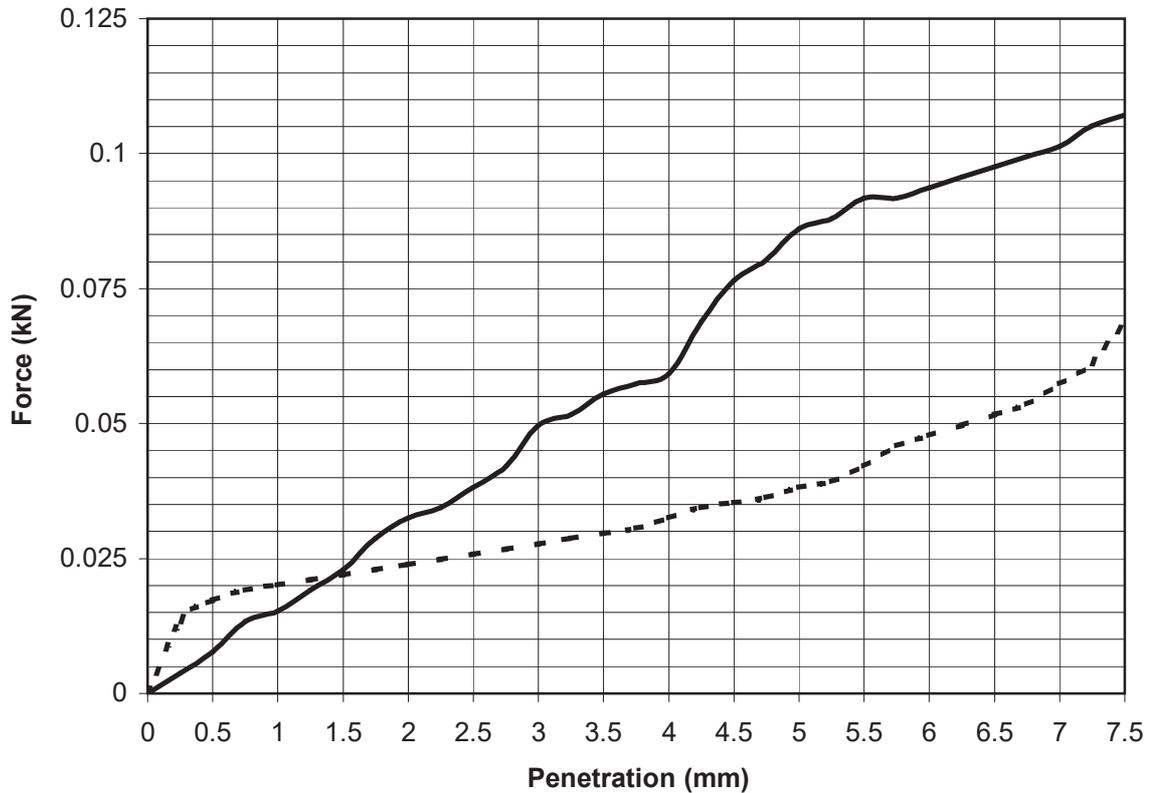
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70279	Contract	N6 Galway
Contract No.	R70279	Customer	Galway Co.Co.
Date received	01-02-16	Date Tested	08-02-16
BH/TP No.	TP3/34	Sample No.	AA44472 Type: B
Depth (m)	1.00m	Lab sample No.	A16/0400



Key: ————— Top - - - - - Base

Description: Dark brown very sandy very gravelly SILT/CLAY with root hairs			
Initial Condition:		Unsoaked	
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.97
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.57
% Material >20mm:	17		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	0.4	0.2
Moisture Content %	25	25

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

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Approved by	Date	Page No.
<i>H Byrne</i>	03-03-16	1 of 1

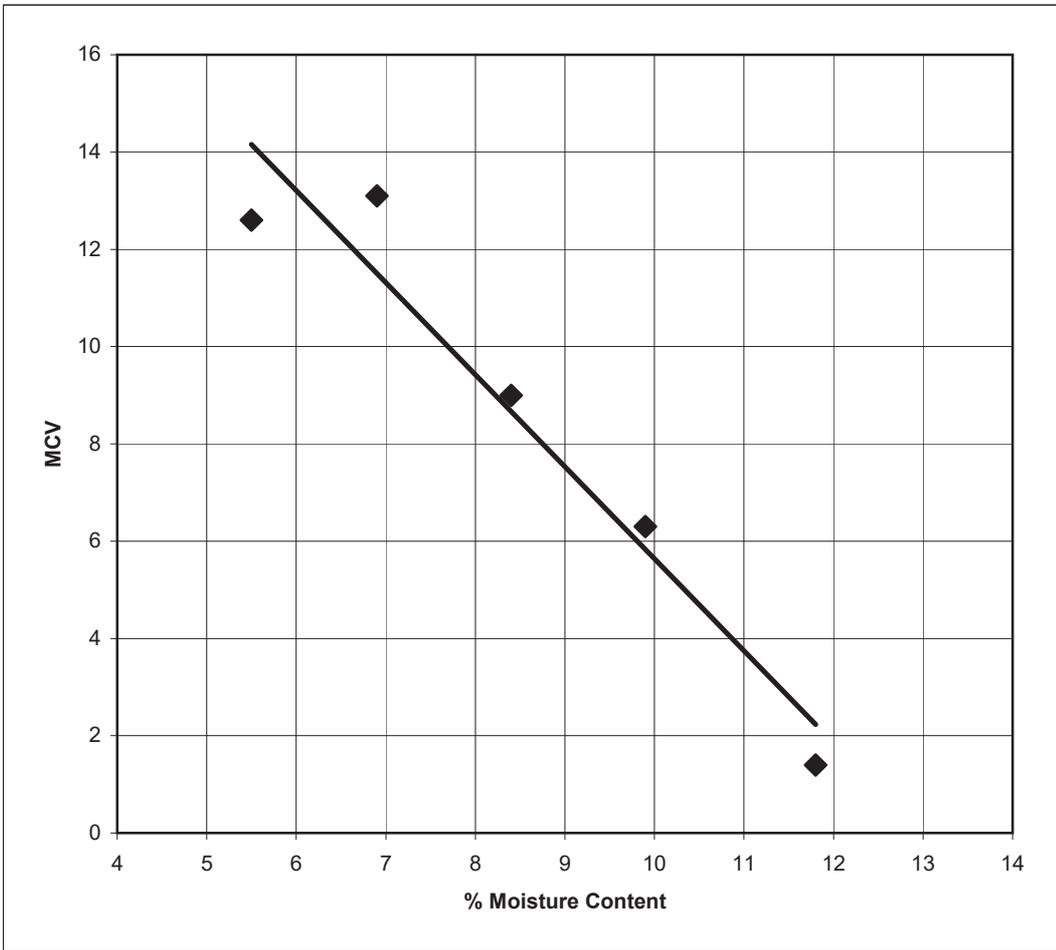
IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

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

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

Report No. R70763 Contract GCTP Phase 3 Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 16-02-16
 BH/TP No. TP3/23 Sample No. AA33943 Type: B
 Depth (m) 1.10 Lab sample No. A16/0363

MC%	12	5.5	6.9	8.4	9.9
MCV	1.4	12.6	13.1	9.0	6.3



% material >20mm 3.5

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

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Approved by	Date	Page No.
<i>H Byrne</i>	01-03-16	1 of 1

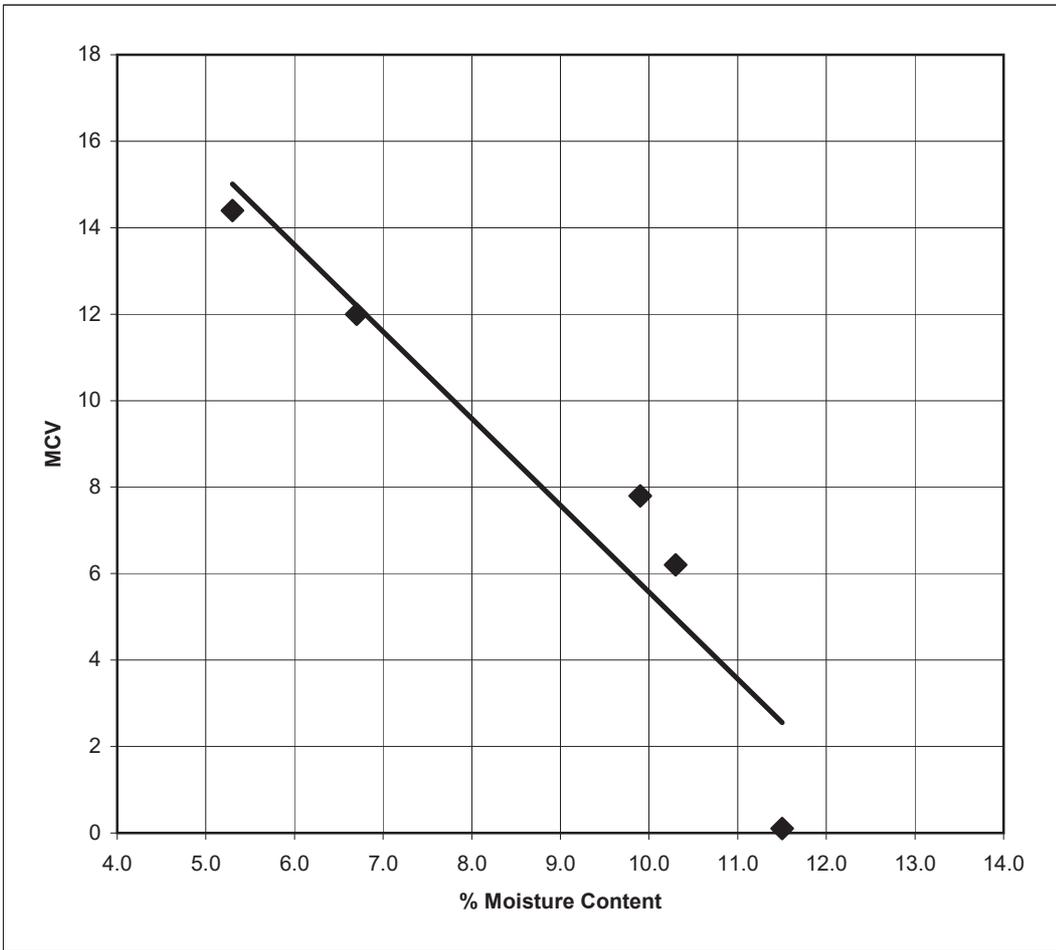
IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

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

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

Report No. R70622 Contract GCTP Phase 3 Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 18-06-16
 BH/TP No. TP3/23 Sample No. AA33943 Type: B
 Depth (m) 2.00 Lab sample No. A16/0365

MC%	9.9	12	6.7	5.3	10.30
MCV	7.8	0.1	12	14.4	6.2



% material >20mm 16.2

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

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Approved by	Date	Page No.
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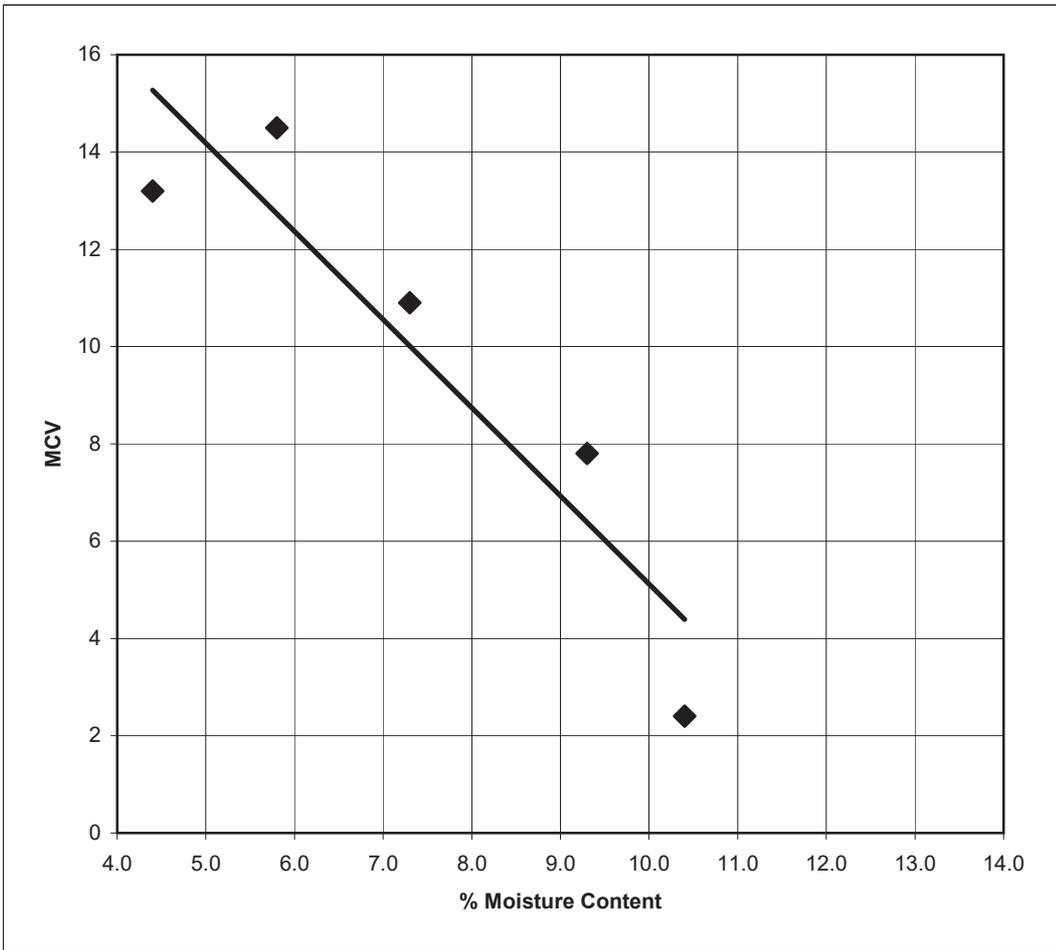
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 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

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

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

Report No. R70766 Contract GCTP Phase 3 Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 16-02-16
 BH/TP No. TP3/27 Sample No. AA44454 Type: B
 Depth (m) 1.00 Lab sample No. A16/0375

MC%	5.8	7.3	10	4.4	9.3
MCV	14.5	10.9	2.4	13.2	7.8



% material >20mm 6.4

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

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Approved by	Date	Page No.
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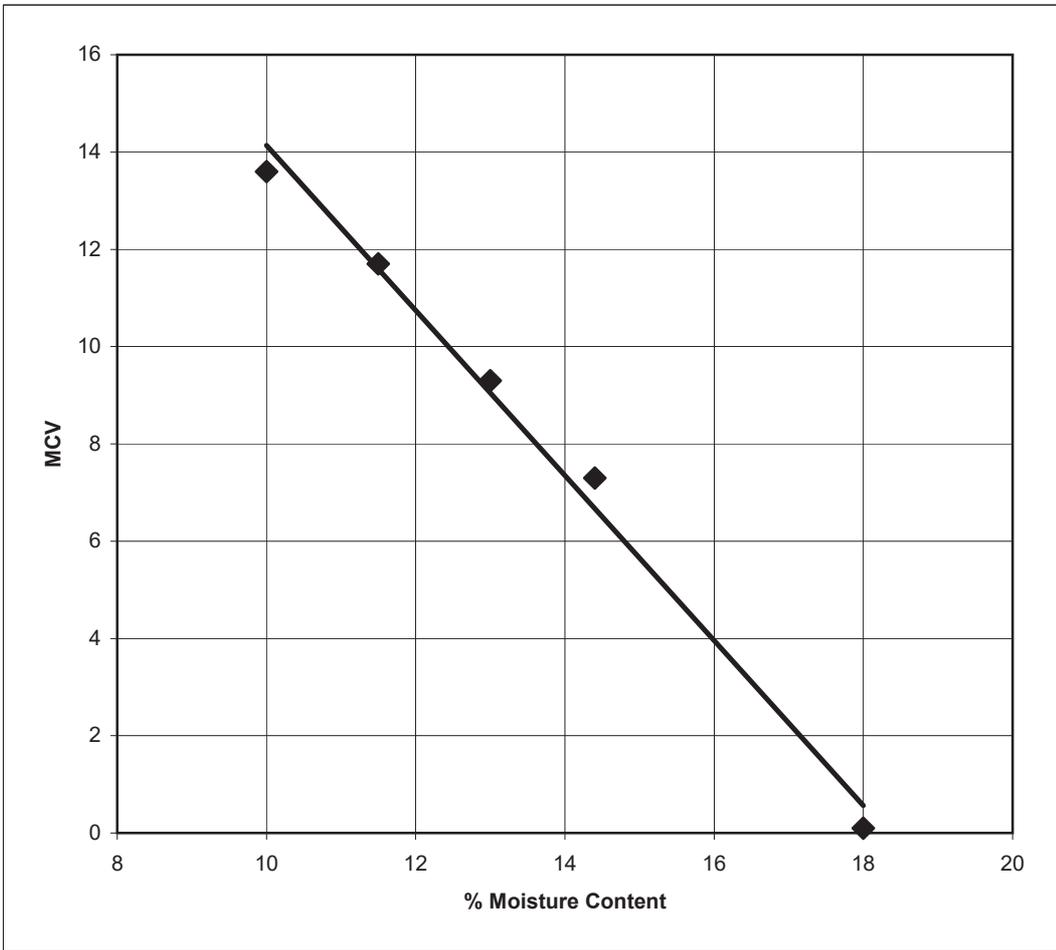
IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

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

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

Report No. R70760 Contract GCTP Phase 3 Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01-02-16 Date Tested 16-02-16
 BH/TP No. TP3/34 Sample No. AA44468 Type: B
 Depth (m) 1.00 Lab sample No. A16/0397

MC%	14	13	12	10	18
MCV	7.3	9.3	11.7	13.6	0.1



% material >20mm 11.1

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
<i>H Byrne</i>	01-03-16	1 of 1

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park Naas Co. Kildare 045 899324	Test Report		 <small>ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331</small>
	Determination of Moisture Condition Value at Natural Moisture Content		
	Tested in accordance with BS1377:Part 4:1990, clause 5.4		

Report No.	R70281
Contract No.	18963
Contract Name:	N6 Galway
Customer:	Galway Co. Co.
BH/TP	TP3/07
Sample No.	AA37807
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A16/0328
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	01-02-16
Date Tested:	08-02-16
Sample Cert:	N/A
Moisture Content (%):	32
% Particles > 20mm (By dry mass):	5.6
MCV:	<1
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown silty, very gravelly, SAND with some cobbles

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.	Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)
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IGSL Ltd Materials Laboratory	Approved by	Date	Page
		09-02-16	1 of 1

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park Naas Co. Kildare 045 899324	Test Report		 <small>ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331</small>
	Determination of Moisture Condition Value at Natural Moisture Content		
	Tested in accordance with BS1377:Part 4:1990, clause 5.4		

Report No.	R70761
Contract No.	18963
Contract Name:	GCTP Phase 3 - Contract 1 SI
Customer:	Galway Co.Co
BH/TP	TP03/13
Sample No.	AA44461
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A16/0338
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	01-02-16
Date Tested:	18-02-16
Sample Cert:	N/A
Moisture Content (%):	23
% Particles > 20mm (By dry mass):	0
MCV:	<1
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Light brown/grey sandy, slightly gravelly, SILT

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.

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

IGSL Ltd Materials Laboratory	Approved by	Date	Page
		03-03-16	1 of 1

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park Naas Co. Kildare 045 899324	Test Report		
	Determination of Moisture Condition Value at Natural Moisture Content		
	Tested in accordance with BS1377:Part 4:1990, clause 5.4		

Report No.	R70762
Contract No.	18963
Contract Name:	GCTP Phase 3 - Contract 1 SI
Customer:	Galway Co.Co
BH/TP	TP03/25
Sample No.	AA33935
Depth (m)	0.15
Sample Type:	B
Lab Sample No.	A16/0367
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	01-02-16
Date Tested:	18-02-16
Sample Cert:	N/A
Moisture Content (%):	22
% Particles > 20mm (By dry mass):	50
MCV:	5
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown silty, very sandy, GRAVEL

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.	Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)
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IGSL Ltd Materials Laboratory	Approved by	Date	Page
		03-03-16	1 of 1

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park Naas Co. Kildare 045 899324	Test Report		 <small>ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331</small>
	Determination of Moisture Condition Value at Natural Moisture Content		
	Tested in accordance with BS1377:Part 4:1990, clause 5.4		

Report No.	R70765
Contract No.	18963
Contract Name:	GCTP Phase 3 - Contract 1 SI
Customer:	Galway Co.Co
BH/TP	TP03/27
Sample No.	AA44452
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A16/0373
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	01-02-16
Date Tested:	16-02-16
Sample Cert:	N/A
Moisture Content (%):	19
% Particles > 20mm (By dry mass):	12
MCV:	6
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown slightly sandy, gravelly, SILT

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.	Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)
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IGSL Ltd Materials Laboratory	Approved by	Date	Page
		03-03-16	1 of 1

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park Naas Co. Kildare 045 899324	Test Report			 <small>ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331</small>																																					
	Determination of Moisture Condition Value at Natural Moisture Content																																								
	Tested in accordance with BS1377:Part 4:1990, clause 5.4																																								
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Report No.</td> <td style="width: 50%;">R70764</td> </tr> <tr> <td>Contract No.</td> <td>18963</td> </tr> <tr> <td>Contract Name:</td> <td>GCTP Phase 3 - Contract 1 SI</td> </tr> <tr> <td>Customer:</td> <td>Galway Co.Co</td> </tr> <tr> <td>BH/TP</td> <td>TP03/29</td> </tr> <tr> <td>Sample No.</td> <td>AA37812</td> </tr> <tr> <td>Depth (m)</td> <td>1.00</td> </tr> <tr> <td>Sample Type:</td> <td>B</td> </tr> <tr> <td>Lab Sample No.</td> <td>A16/0389</td> </tr> <tr> <td>Source (if applicable)</td> <td>unknown</td> </tr> <tr> <td>Material Type (if applicable):</td> <td>B</td> </tr> <tr> <td>Sample Received:</td> <td>01-02-16</td> </tr> <tr> <td>Date Tested:</td> <td>16-02-16</td> </tr> <tr> <td>Sample Cert:</td> <td>N/A</td> </tr> <tr> <td>Moisture Content (%):</td> <td>29</td> </tr> <tr> <td>% Particles > 20mm (By dry mass):</td> <td>6.9</td> </tr> <tr> <td>MCV:</td> <td><1</td> </tr> <tr> <td>Interpretation of Plot:</td> <td>Steepest Straight Line</td> </tr> <tr> <td>Description of Soil:</td> <td>Brown clayey/silty, sandy, GRAVEL with many cobbles</td> </tr> </table>				Report No.	R70764	Contract No.	18963	Contract Name:	GCTP Phase 3 - Contract 1 SI	Customer:	Galway Co.Co	BH/TP	TP03/29	Sample No.	AA37812	Depth (m)	1.00	Sample Type:	B	Lab Sample No.	A16/0389	Source (if applicable)	unknown	Material Type (if applicable):	B	Sample Received:	01-02-16	Date Tested:	16-02-16	Sample Cert:	N/A	Moisture Content (%):	29	% Particles > 20mm (By dry mass):	6.9	MCV:	<1	Interpretation of Plot:	Steepest Straight Line	Description of Soil:	Brown clayey/silty, sandy, GRAVEL with many cobbles
Report No.	R70764																																								
Contract No.	18963																																								
Contract Name:	GCTP Phase 3 - Contract 1 SI																																								
Customer:	Galway Co.Co																																								
BH/TP	TP03/29																																								
Sample No.	AA37812																																								
Depth (m)	1.00																																								
Sample Type:	B																																								
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Source (if applicable)	unknown																																								
Material Type (if applicable):	B																																								
Sample Received:	01-02-16																																								
Date Tested:	16-02-16																																								
Sample Cert:	N/A																																								
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Description of Soil:	Brown clayey/silty, sandy, GRAVEL with many cobbles																																								
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.			Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)																																						
IGSL Ltd Materials Laboratory	Approved by	Date	Page																																						
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Appendix 13

Geotechnical Laboratory Testing

Lab 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. **R70322** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer Galway Co.Co.
 Samples Received: 12/02/16 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
TP3/02	AA44496	0.5	A16/0560	D	17								Brown clayey/silty, very sandy, GRAVEL
TP3/02	AA44497	0.5	A15/0561	B	12								Brown clayey/silty, very sandy, GRAVEL
TP3/04	AA44498	0.5	A16/0562	D	218								Dark brown/black PEAT
TP3/04	AA44499	0.5	A15/0563	D	208								Dark brown/black PEAT
TP3/04	AA44500	0.5	A16/0564	B	175								Dark brown /black PEAT
TP3/04	AA49501	0.8	A15/0565	D	30								Grey/brown clayey/silty, very gravelly, SAND
TP3/04	AA49502	0.8	A16/0566	B	26								Grey/brown clayey/silty, very gravelly, SAND
TP3/09	AA49503	0.5	A15/0567	D	136								Dark brown slightly gravelly PEAT
TP3/09	AA49504	0.5	A16/0568	D	140								Dark brown slightly sandy slightly gravelly CLAY
TP3/09	AA49505	0.5	A15/0569	B	190								Dark brown/black PEAT
TP3/24	AA49456	0.5	A16/0570	D	9.7								Brown clayey/silty, sandy, GRAVEL
TP3/24	AA49457	0.5	A15/0571	B	11								Brown clayey/silty, sandy, GRAVEL
TP3/31	AA49458	0.5	A16/0572	D	11	23	NP	NP	66	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/31	AA49459	0.5	A15/0573	B	10								Light brown slightly sandy, slightly gravelly, SILT
TP3/31	AA49460	1.5	A16/0574	D	9.5	20	NP	NP	46	WS	4.4		Light brown sandy very 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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 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	Approved by	Date	Page
	H Byrne (Quality Manager)	<i>H Byrne</i>	18/02/16	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. **R70323** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer Galway Co.Co.
 Samples Received: 12/02/16 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
TP3/31	AA49461	1.5	A16/0575	B	7.6								Light brown sandy very gravelly SILT
TP3/31	AA49462	2.5	A16/0576	D	9.1	21	NP	NP	61	WS	4.4		Light brown slightly sandy, gravelly, SILT
TP3/31	AA49463	2.5	A16/0577	B	8.5								Light brown slightly sandy, gravelly, SILT
TP3/31	AA49464	3.5	A16/0578	D	11	22	NP	NP	52	WS	4.4		Light brown slightly sandy, gravelly, SILT
TP3/31	AA49465	3.5	A16/0579	B	8.3								Light brown slightly sandy, gravelly, SILT
TP3/32	AA49466	0.4	A16/0580	D	23	39	NP	NP	70	WS	4.4		Brown sandy slightly gravelly SILT
TP3/32	AA49467	0.4	A16/0581	D	27	38	NP	NP	81	WS	4.4		Brown sandy slightly gravelly SILT
TP3/32	AA49468	0.4	A16/0582	B	28	32	NP	NP	70	WS	4.4		Brown 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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 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	Approved by	Date	Page
	H Byrne (Quality Manager)	<i>H Byrne</i>	19/02/16	1 of 1

TEST REPORT

Determination of Particle Size Distribution

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

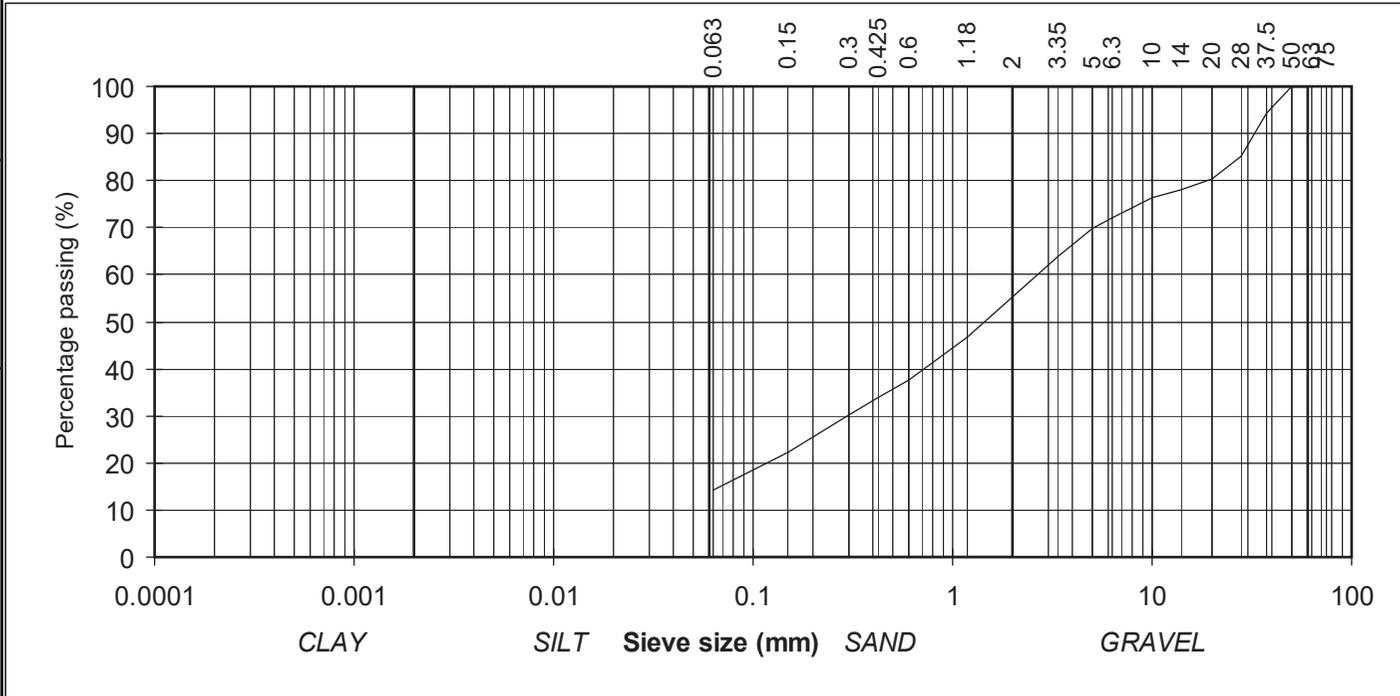
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	94	
28	85	GRAVEL
20	80	
14	78	
10	76	
6.3	72	
5	70	
3.35	64	
2	55	
1.18	47	
0.6	38	
0.425	34	SAND
0.3	30	
0.15	22	
0.063	14	SILT/CLAY

Contract No: 18963 Report No. R70659
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/02
 Sample No. AA44497 Lab. Sample No. A16/0561
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 18/02/2016
 Description: Brown clayey/silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	29/02/16	1 of 1

Persons authorised to approve report: 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

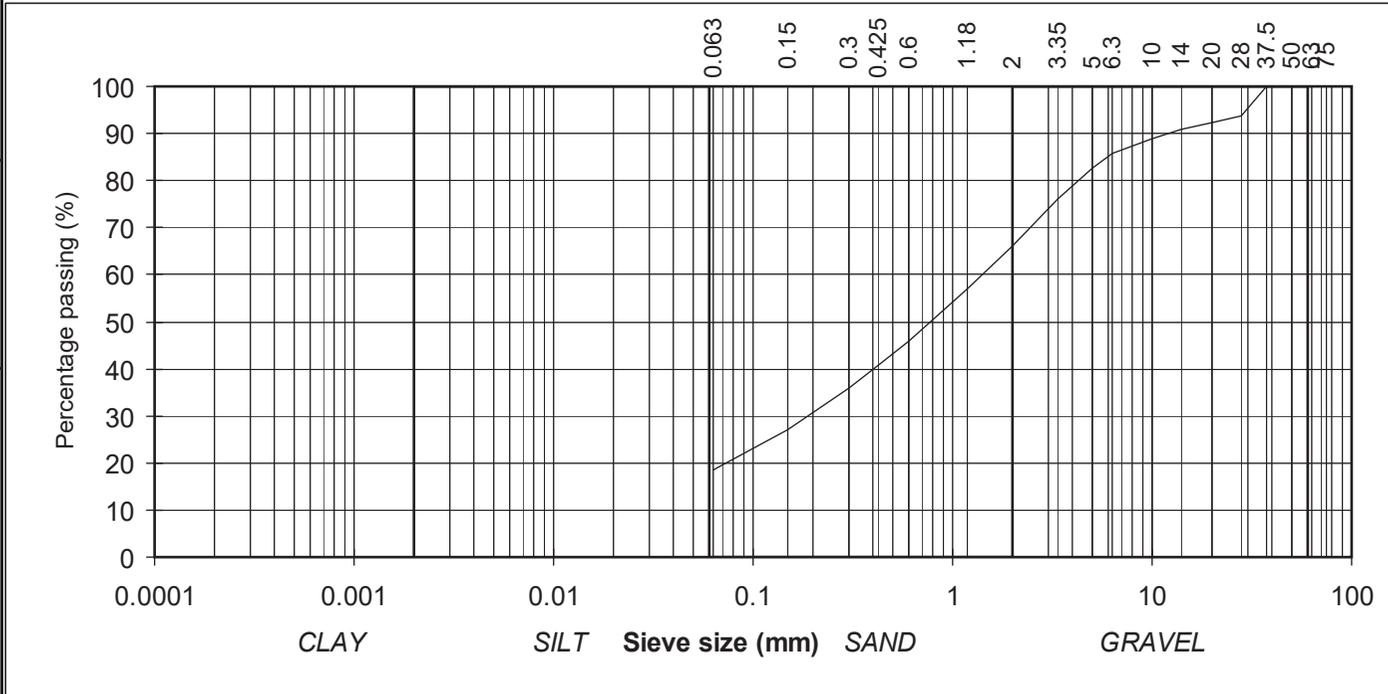
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	94	
20	92	GRAVEL
14	91	
10	89	
6.3	86	
5	83	
3.35	76	
2	66	
1.18	57	
0.6	46	
0.425	41	
0.3	36	
0.15	27	
0.063	19	SILT/CLAY

Contract No: 18963 Report No. R70660
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/04
 Sample No. AA49502 Lab. Sample No. A16/0566
 Sample Type: B
 Depth (m) 0.80 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 18/02/2016
 Description: Grey/brown clayey/silty, very gravelly, SAND

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	29/02/16	1 of 1

Persons authorised to approve report: 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

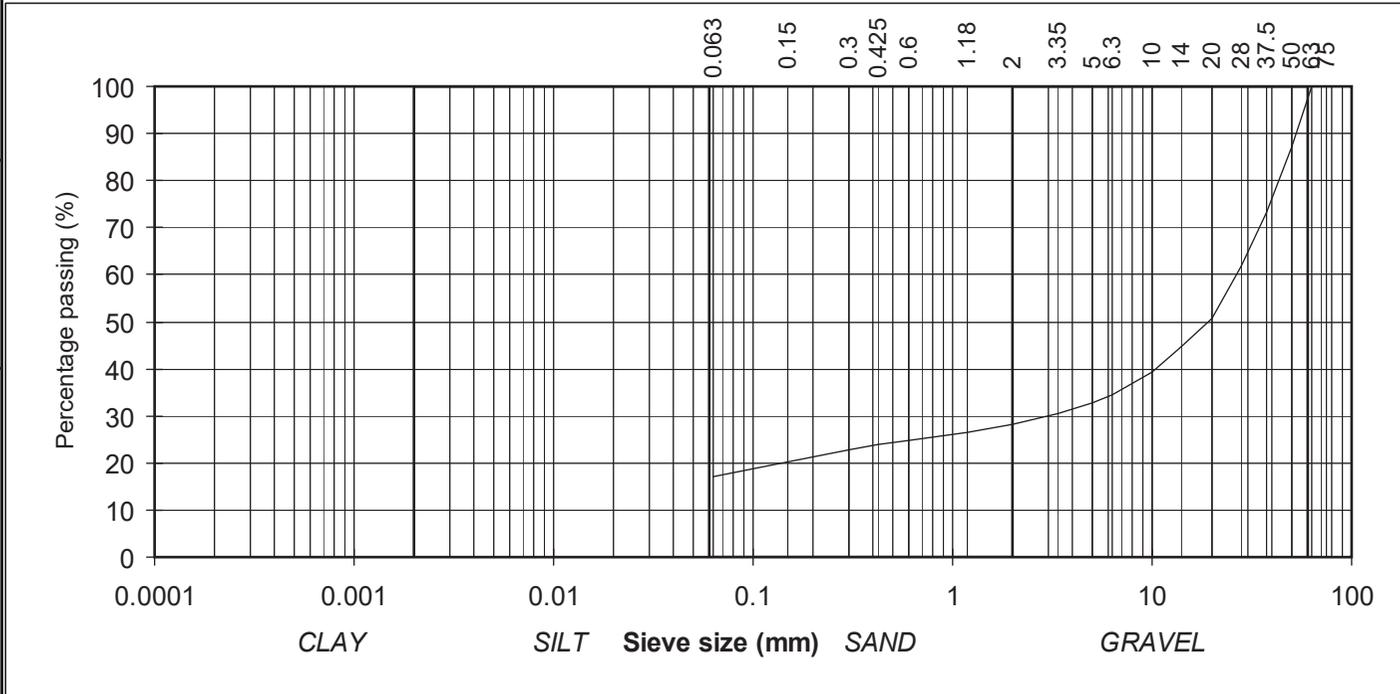
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	87	GRAVEL
37.5	73	
28	62	
20	51	
14	45	
10	39	
6.3	35	
5	33	
3.35	31	
2	28	
1.18	26	
0.6	25	
0.425	24	
0.3	23	SILT/CLAY
0.15	20	
0.063	17	

Contract No: 18963 Report No. R70663
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/24
 Sample No. AA49457 Lab. Sample No. A16/0571
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 18/02/2016
 Description: Brown clayey/silty, sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
<i>H Byrne</i>	29/02/16	1 of 1

Persons authorised to approve report: 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

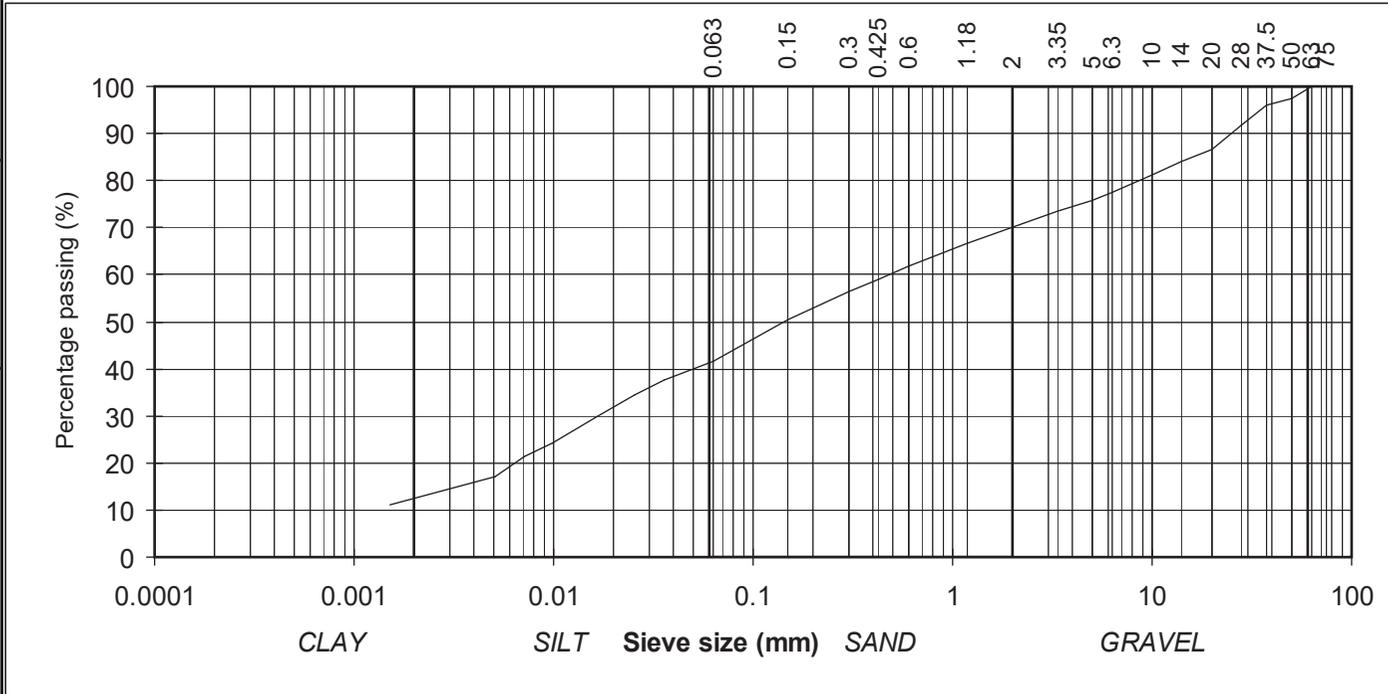
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	98	
37.5	96	GRAVEL
28	92	
20	87	
14	84	
10	81	
6.3	78	
5	76	
3.35	74	SAND
2	70	
1.18	67	
0.6	62	
0.425	59	
0.3	57	SILT/CLAY
0.15	50	
0.063	42	
0.036	38	
0.026	35	
0.017	30	
0.010	24	
0.007	21	
0.005	17	
0.002	11	

Contract No: 18963 Report No. R70664
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/31
 Sample No. AA49459 Lab. Sample No. A16/0573
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 18/02/2016
 Description: Light brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	29/02/16	1 of 1

Persons authorised to approve report: 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

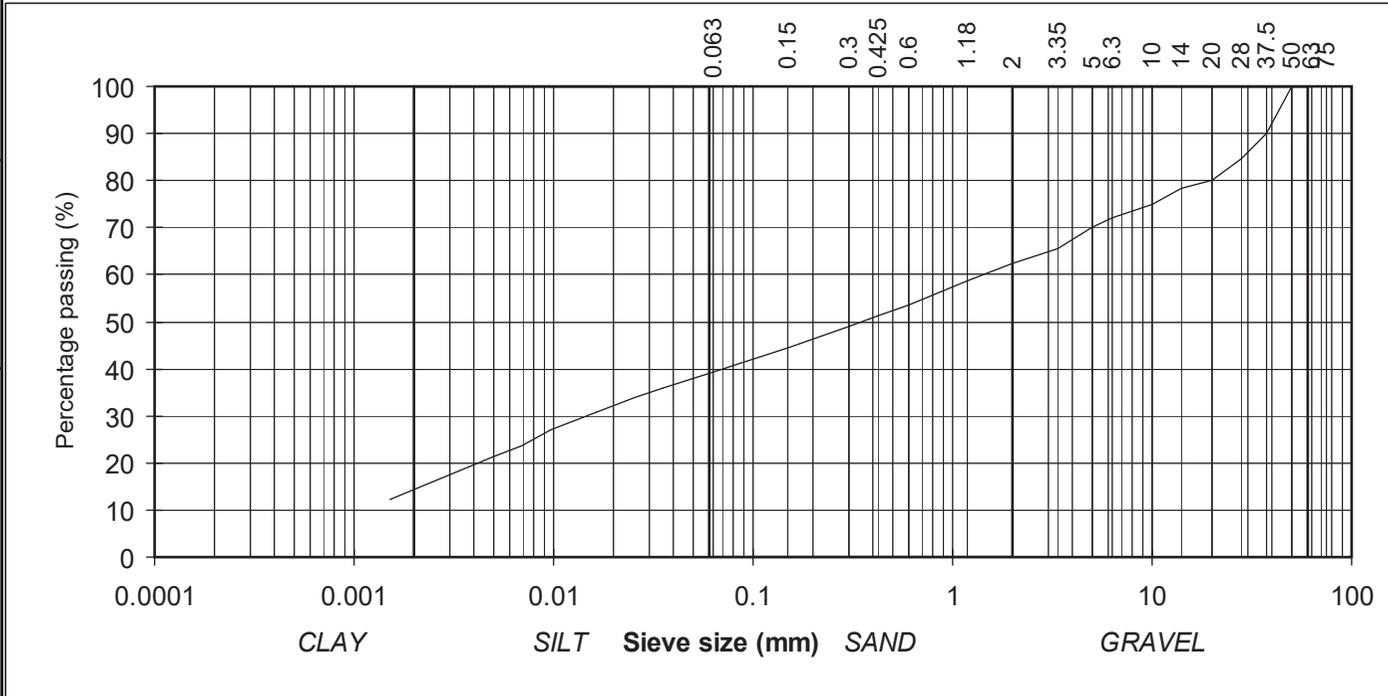
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	90	GRAVEL
28	85	
20	80	
14	78	
10	75	
6.3	72	
5	70	
3.35	65	SAND
2	62	
1.18	59	
0.6	54	
0.425	51	
0.3	49	SILT/CLAY
0.15	44	
0.063	39	
0.035	36	
0.025	34	
0.016	31	
0.010	27	
0.007	24	
0.005	21	
0.002	12	

Contract No: 18963 Report No. R70540
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/31
 Sample No. AA49463 Lab. Sample No. A16/0577
 Sample Type: B
 Depth (m) 2.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 16/02/2016
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	23/02/16	1 of 1

Persons authorised to approve report: 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

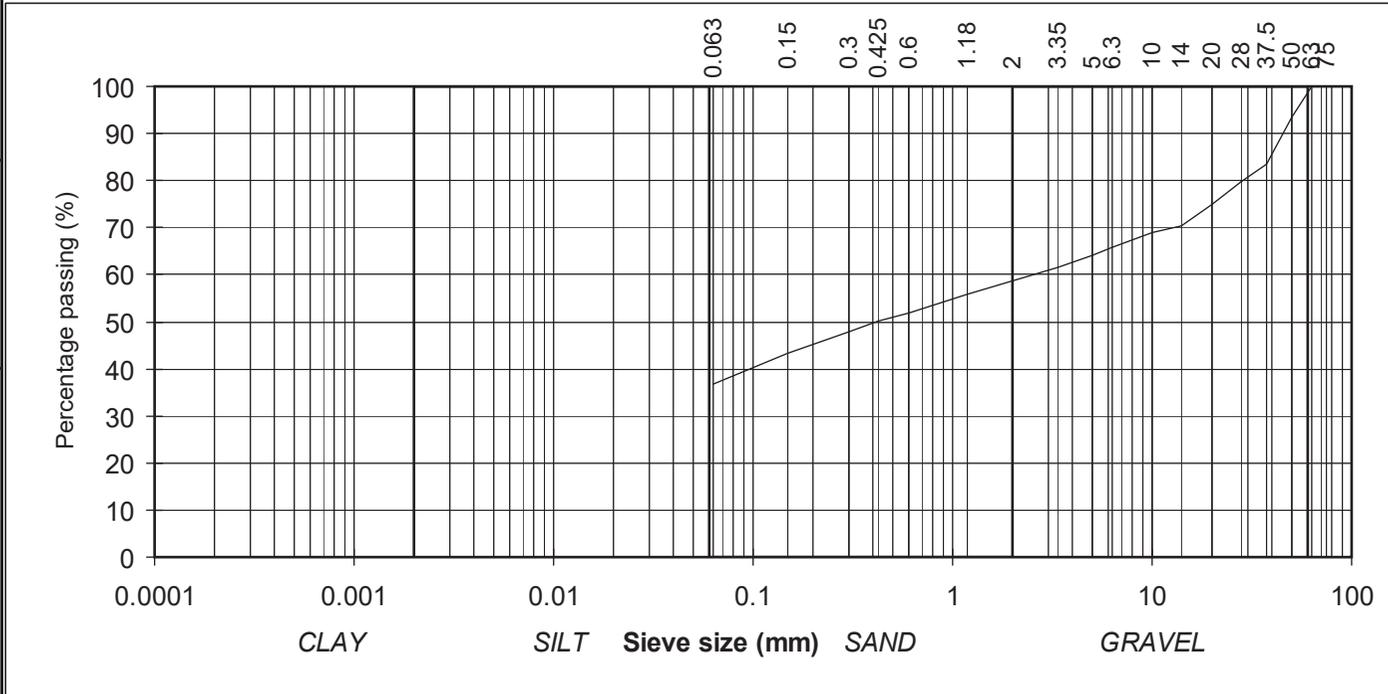
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	93	
37.5	83	GRAVEL
28	80	
20	75	
14	70	
10	69	
6.3	66	
5	64	
3.35	62	SAND
2	59	
1.18	56	
0.6	52	
0.425	50	SILT/CLAY
0.3	48	
0.15	43	
0.063	37	

Contract No: 18963 Report No. R70665
 Contract: GCTP Phase 3 - Contact 1
 TP: TP03/31
 Sample No. AA49465 Lab. Sample No. A16/0579
 Sample Type: B
 Depth (m) 3.50 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 18/02/2016
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	29/02/16	1 of 1

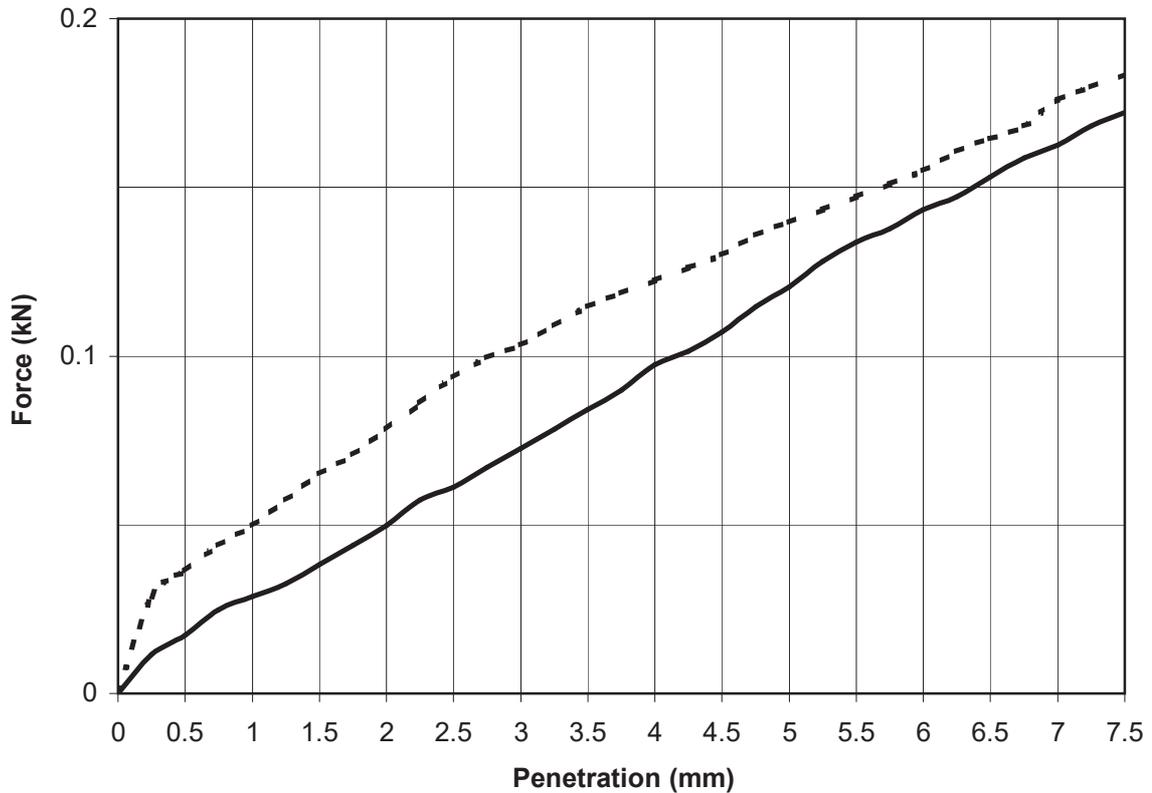
Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71005 Contract GCTP Phase 3 - Contact 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 01/02/16 Date Tested 09/03/16
 BH/TP No. TP03/31 Sample No. AA49459 Type: B
 Depth (m) 0.50 Lab sample No. A16/0573



Key: ——— Top - - - - - Base

Description: Light brown slightly sandy, slightly gravelly, SILT/CLAY			
Initial Condition:		Unsoaked	
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.31
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.08
% Material >20mm:	20		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.6	0.7
Moisture Content %	11	11

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

IGSL Ltd Materials Laboratory

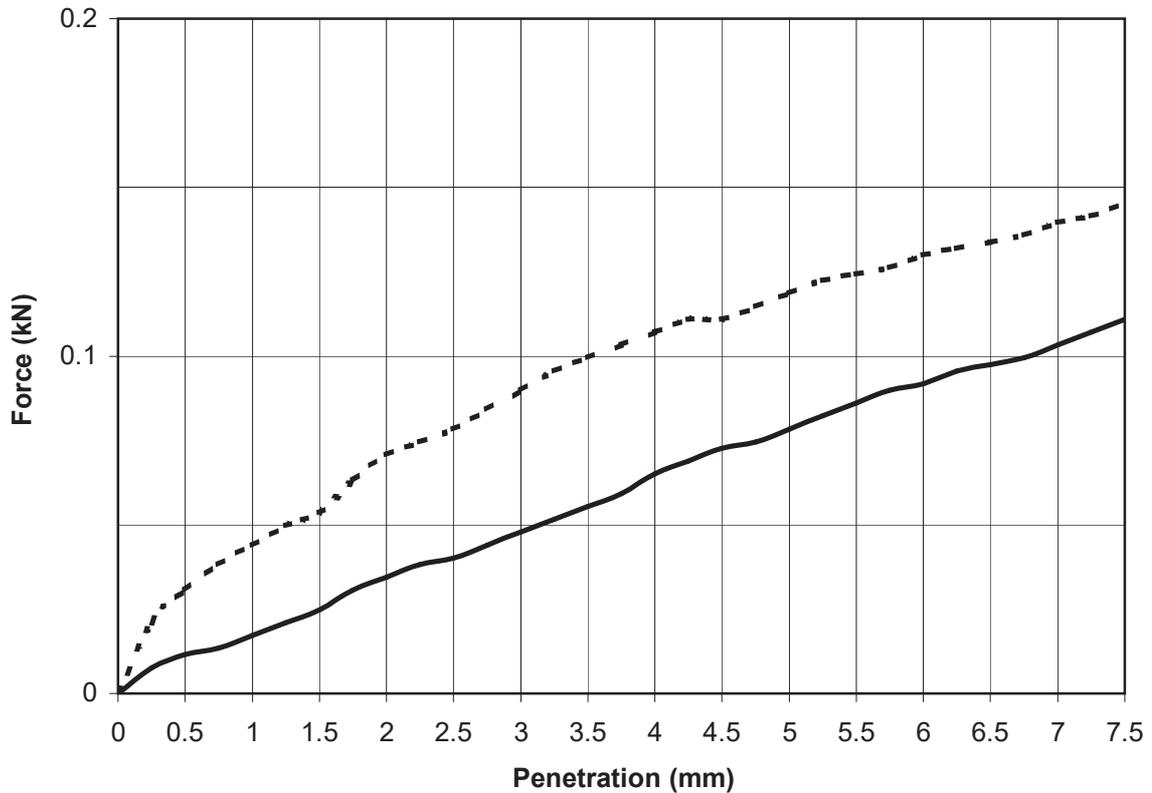
Approved by	Date	Page No.
<i>H Byrne</i>	15/03/16	1 of 1

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R70621 Contract GCTP Phase 3 - Contract 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 12/02/16 Date Tested 22/02/16
 BH/TP No. TP3/31 Sample No. AA49465 Type: B
 Depth (m) 3.50 Lab sample No. A16/0579



Key: ————— Top - - - - - Base

Description: Light brown slightly sandy, gravelly, SILT			
Initial Condition:		Unsoaked	
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.29
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.07
% Material >20mm:	18		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	0.4	0.6
Moisture Content %	10	11

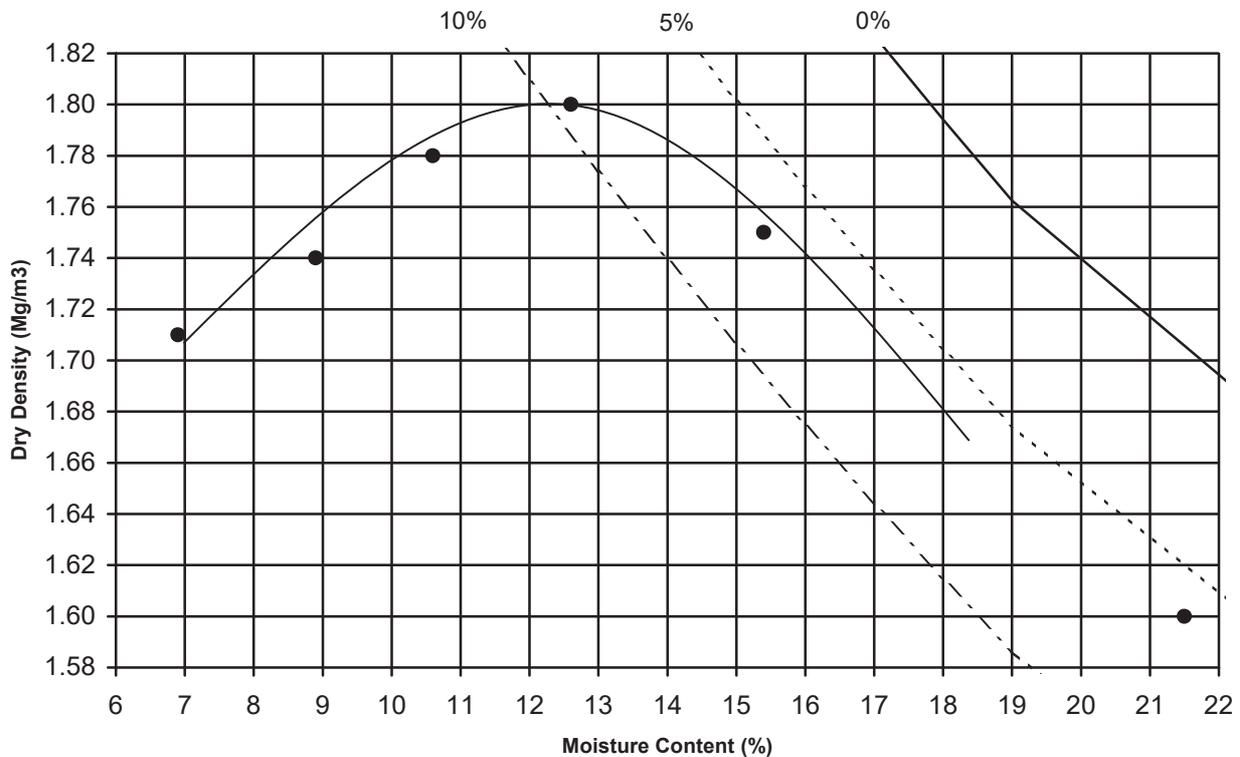
Persons authorized to approve reports
 J Barrett (Dep. Quality Manager)
 H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
<i>H Byrne</i>	24/02/16	1 of 1

Report No. R71144 Contract No. 18963
 Contract Name: GCTP Phase 3 - Contract 1 GI
 Lab Contract No. 18963 Location: TP03/02
 Sample No. AA44497 Depth (m) 0.5 Material Type B
 Lab sample no. A16/0561 Customer: Galway Co.Co.
 Date Received: 12/02/2016 Test Method: 2.5 KG Rammer
 Date Tested: 09/03/2016 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.60	1.71	1.74	1.78	1.80	1.75	
Moisture Content (%)	22	6.9	8.9	11	13	15	



Maximum Dry Density (Mg/m³): 1.80 Optimum Moisture Content (%): 13

Description: Brown clayey/silty, very sandy, GRAVEL

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

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

% retained on 20/37.5mm sieve: 9

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



Date Page

29/03/16 1 of 1



Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 30014

Client's Reference: **18963 PO: 8215**

Report Date: **08-03-2016**

Client **Irish Geotechnical Services Limited**
M7 Business Park
Naas
Co. Kildare
Ireland

Contract Title: **GCTP Phase 3**
For the attention of: **Hugh Byrne**

Date Received: **22-02-2016**
Date Commenced: **22-02-2016**
Date Completed: **08-03-2016**

Test Description	Qty
Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only) <small>Non Accredited Test - @ Non Accredited Test</small>	3
Disposal of Samples on Project	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

Borehole: BH3/09 Depth (m) from: 1.00
 Sample Number : A16/0586 Depth (m) to: 1.30

Sample Type:	D
Particle Density - Mg/m ³ :	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:

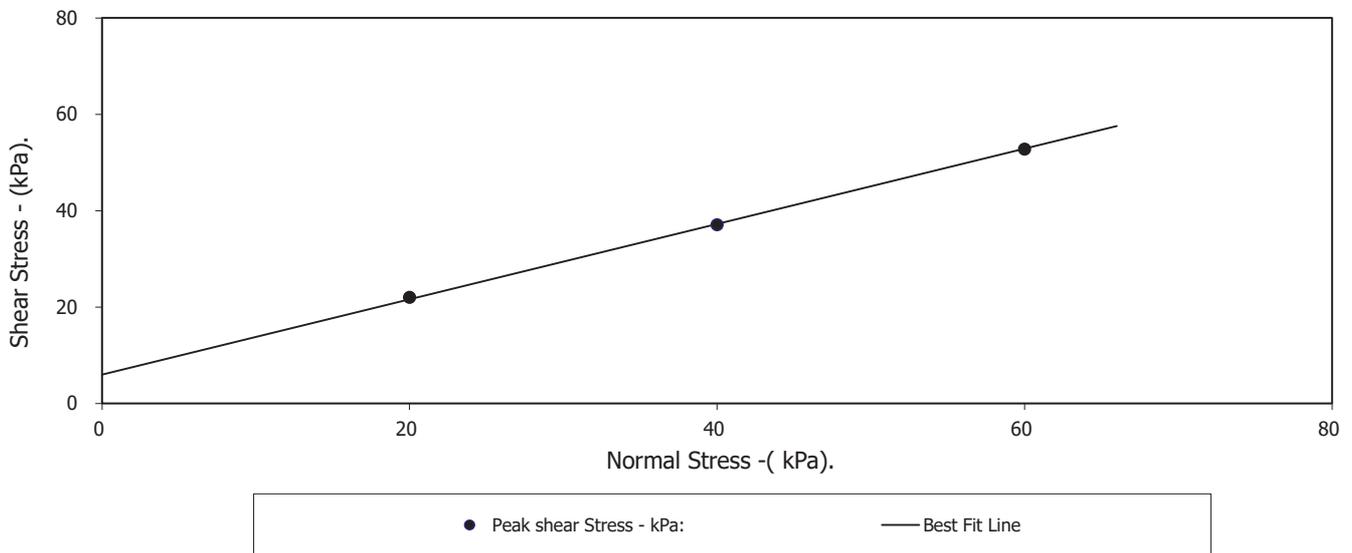
Light brown grey sandy (fine-medium) gravelly (fine-coarse/angular-subangular) CLAY

STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	11	11	11
Bulk Density - Mg/m ³ :	2.31	2.31	2.31
Dry Density - Mg/m ³ :	2.09	2.09	2.09
Voids Ratio:	0.2705	0.2704	0.2701
Normal Pressure- kPa	20	40	60
Consolidation			
Consolidated Height - mm:	24.43	24.09	23.75
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.45	10.03	9.60
Peak shear Stress - kPa:	22	37	53

PEAK

Angle of Shearing Resistance:(θ)	38.0
Effective Cohesion - kPa:	6

FAILURE CONDITIONS



DP Gnan 08/03/16

Checked Page 1 by: Date

DP Gnan 08/03/16

Approved Page 1 by: Date

Contract No.:
30014

GCTP Phase 3

Client Ref Number:
18963

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

Borehole: TP3/31 Depth (m) from: 1.50
 Sample Number : A16/0575 Depth (m) to:

Sample Type:	D
Particle Density - Mg/m ³ :	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:

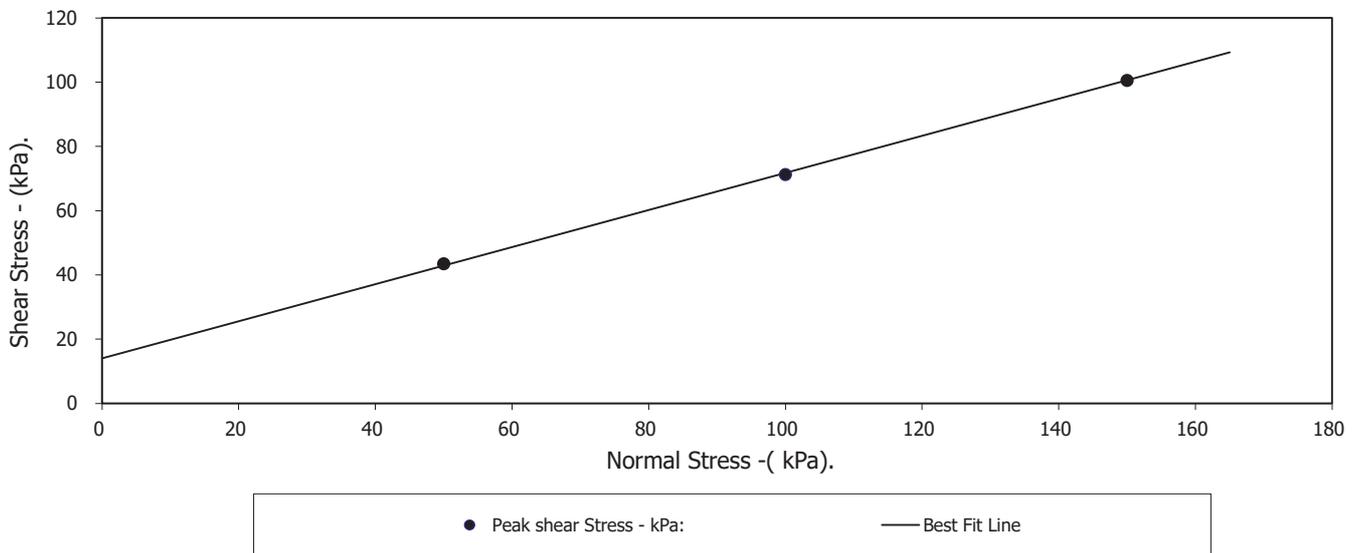
Light brown grey sandy (fine-medium) gravelly (fine-coarse/angular-subangular) CLAY

STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	11	11	11
Bulk Density - Mg/m ³ :	2.31	2.31	2.31
Dry Density - Mg/m ³ :	2.09	2.09	2.09
Voids Ratio:	0.2699	0.2672	0.2655
Normal Pressure- kPa	50	100	150
Consolidation			
Consolidated Height - mm:	24.09	23.48	22.87
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.38	9.92	9.46
Peak shear Stress - kPa:	43	71	101

PEAK

Angle of Shearing Resistance:(θ)	30.0
Effective Cohesion - kPa:	14

FAILURE CONDITIONS



DP Gnan 08/03/16

Checked Page 1 by: Date

DP Gnan 08/03/16

Approved Page 1 by: Date

Contract No.:
30014

GCTP Phase 3

Client Ref Number:
18963

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

Borehole: TP3/31 Depth (m) from: 2.50
 Sample Number : A16/0577 Depth (m) to:

Sample Type:	D
Particle Density - Mg/m ³ :	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:

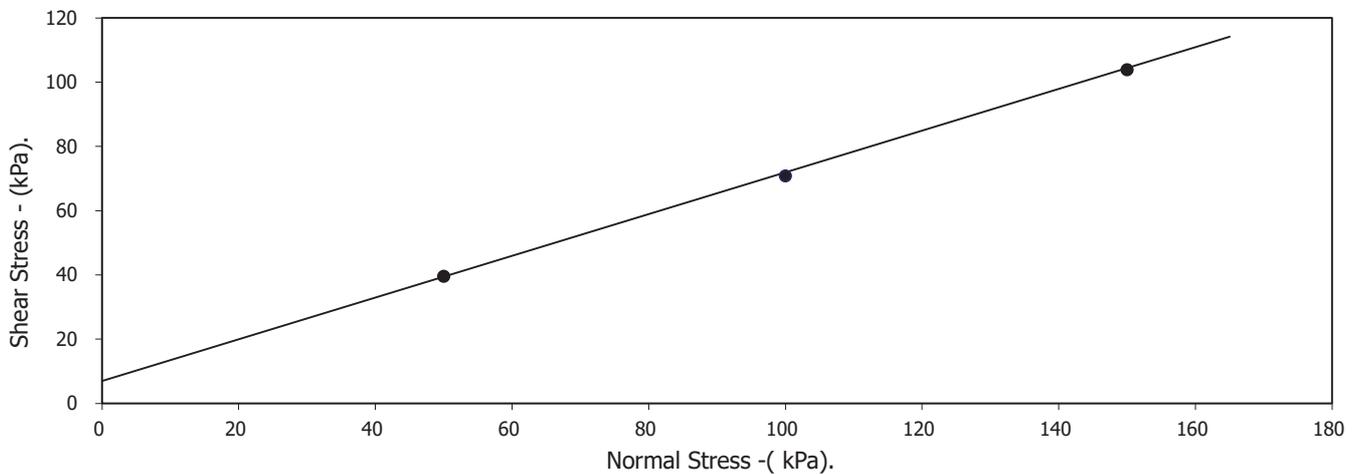
Light brown grey sandy (fine-medium) gravelly (fine-coarse/angular-subangular) CLAY

STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	10	10	10
Bulk Density - Mg/m ³ :	2.29	2.30	2.30
Dry Density - Mg/m ³ :	2.08	2.08	2.08
Voids Ratio:	0.2750	0.2745	0.2734
Normal Pressure- kPa	50	100	150
Consolidation			
Consolidated Height - mm:	24.18	23.69	23.21
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.43	10.45	10.47
Peak shear Stress - kPa:	40	71	104

PEAK

Angle of Shearing Resistance:(θ)	33.0
Effective Cohesion - kPa:	7

FAILURE CONDITIONS



DP Gnan 08/03/16

Checked Page 1 by: Date

DP Gnan 08/03/16

Approved Page 1 by: Date

Contract No.:
30014

Client Ref Number:
18963

GCTP Phase 3

Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 3

NOTE:

For BH3/09 Shearbox see *GSTL Report 30014* featured in Appendix 13, 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. **R70324** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer GCC
 Samples Received: 12/02/16 Date Tested: 14/03/16

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
BH3/06	AA43886	0.5	A16/0583	B	15	35	NP	NP	25	WS	4.4		Brown silty, very sandy, GRAVEL
BH3/08	AA38885	0.5	A16/0584	B	28								Dark brown clayey/silty, very sandy, GRAVEL with some cobbles
BH3/09	AA43887	0.5	A16/0585	D	28	51	NP	NP	13	WS	4.4		Mottled grey/brown slightly peaty very sandy gravelly SILT
BH3/09	AA43888	1.0	A16/0586	B	15								Mottled grey/brown clayey/silty, very sandy, GRAVEL
BH3/09	AA43889	1.3	A16/0587	D	11	32	NP	NP	40	WS	4.4		Light brown sandy gravelly SILT
BH3/11	AA43876	1.0	A16/0588	B	519								Dark brown/black slightly gravelly PEAT
BH3/11	AA43877	1.0	A16/0589	D	98								Dark brown/black slightly gravelly PEAT
BH3/11	AA43878	2.0	A16/0590	D	7.0								Dark brown slightly clayey/silty, sandy, GRAVEL with some cobbles
BH3/11	AA43879	2.0	A16/0591	B	6.8								Dark brown slightly clayey/silty, sandy, GRAVEL with some cobbles
BH3/12	AA43880	0.5	A16/0592	D	93	130	NP	NP	43	WS	4.4		Black slightly gravelly organic SILT
BH3/12	AA43881	0.5	A16/0593	B	23								Dark brown/black slightly silty, sandy, GRAVEL with many cobbles
BH3/12	AA43882	1.5	A16/0594	D	15	37	NP	NP	30	WS	4.4		Dark brown/grey silty, sandy, GRAVEL
BH3/12	AA43883	1.5	A16/0595	B	15								Dark brown/grey silty, sandy, GRAVEL
BH3/25	AA43893	0.5	A16/0596	B	15	32	NP	NP	41	WS	4.4		Mottled brown silty, very sandy, GRAVEL with some cobbles
BH3/25	AA43894	1.0	A16/0597	B	12	31	NP	NP	41	WS	4.4		Mottled brown silty, sandy, GRAVEL 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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 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

H Byrne (Quality Manager)

Approved by

Date

18/02/16

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. **R70325** Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1
 Customer GCC
 Samples Received: 12/02/16 Date Tested: 00/01/00

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
BH3/25	AA43895	2.0	A16/0598	B	9.5	15	NP	NP	62	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/25	AA43896	3.0	A16/0599	B	7.7	18	NP	NP	47	WS	4.4		Light brown/grey slightly sandy, gravelly, SILT with many cobbles
BH3/29	AA43890	1.0	A16/0600	B	12.1	37	NP	NP	64	WS	4.4		Brown silty, sandy, GRAVEL with many cobbles
BH3/29	AA43891	1.5	A16/0601	B	9.4	23	NP	NP	37	WS	4.4		Light brown silty, sandy, GRAVEL with many cobbles
BH3/29	AA43892	2.5	A16/0602	B	23.1	35	19	16	82	WS	4.4	C L	Light brown slightly sandy, slightly gravelly, CLAY with many cobbles

<p>Notes: Preparation: WS - Wet sieved Sample Type: B - bulk disturbed AR - As received U - Undisturbed NP - Non plastic</p> <p>Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method</p>	<p>Remarks:</p> <p>NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 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	Approved by	Date	Page
	H Byrne (Quality Manager)		05/01/16	1 of 1

TEST REPORT

Determination of Particle Size Distribution

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

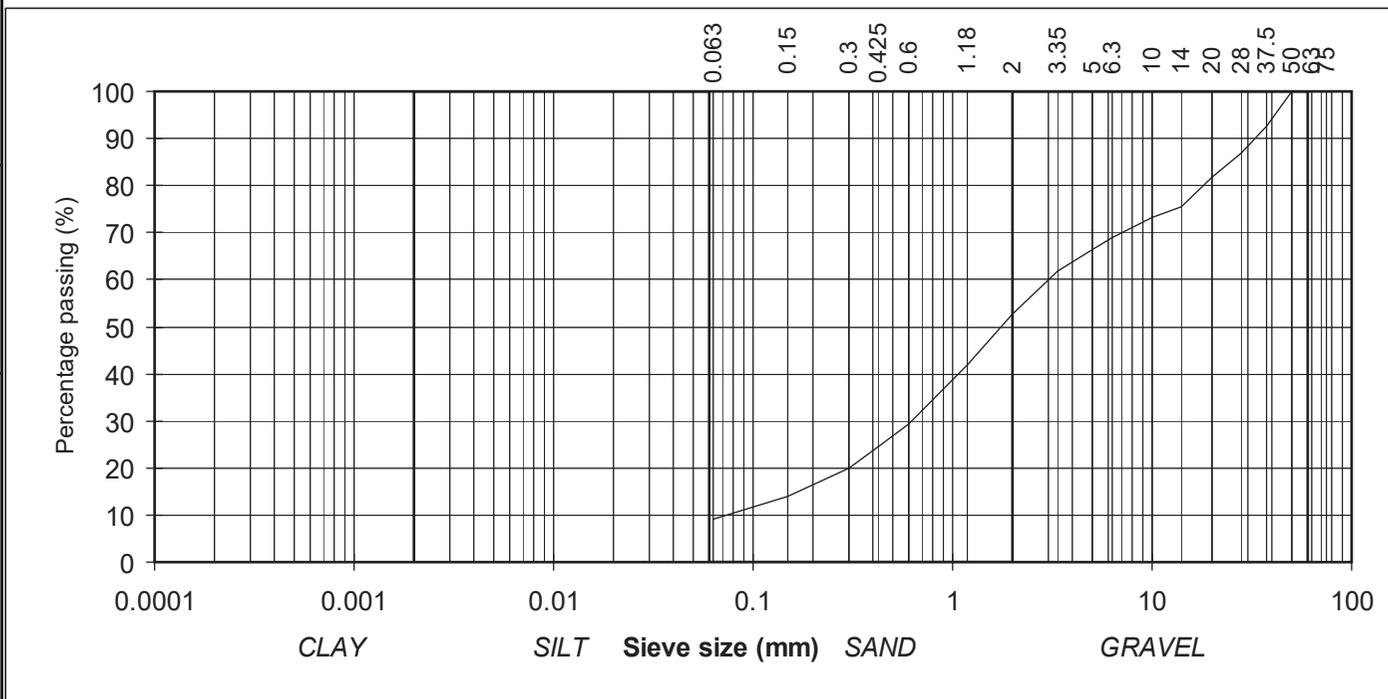
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	93	
28	87	GRAVEL
20	82	
14	76	
10	73	
6.3	69	
5	66	
3.35	62	
2	53	
1.18	42	
0.6	29	
0.425	24	SAND
0.3	20	
0.15	14	
0.063	9	SILT/CLAY

Contract No: 18963 Report No. R70736
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/06
 Sample No. AA43886 Lab. Sample No. A16/0583
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 24/02/2016
 Description: Brown silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	03/03/16	1 of 1

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

TEST REPORT

Determination of Particle Size Distribution

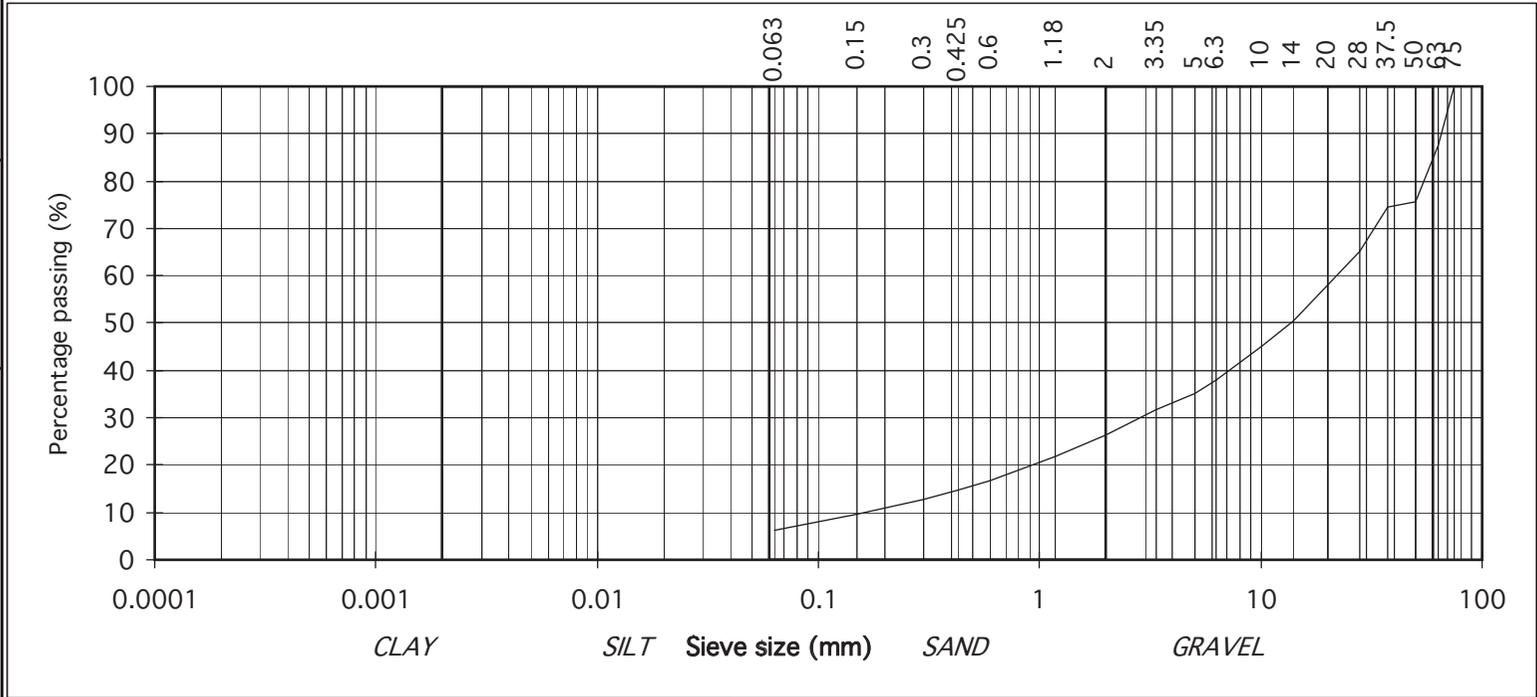
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	88	
50	76	GRAVEL
37.5	74	
28	65	
20	58	
14	50	
10	45	
6.3	38	
5	35	
3.35	32	
2	26	
1.18	22	
0.6	17	
0.425	15	
0.3	13	SILT/CLAY
0.15	10	
0.063	6	

Contract No: 18963 Report No. R70499
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/08
 Sample No. AA43885 Lab. Sample No. A16/0330
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 02-02-16 Date Testing started 05-02-16
 Description: Dark brown clayey/silty, very sandy, GRAVEL with some cobbles

Remarks: Sample size did not meet the requirements of BS1377



TEST REPORT

Determination of Particle Size Distribution

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

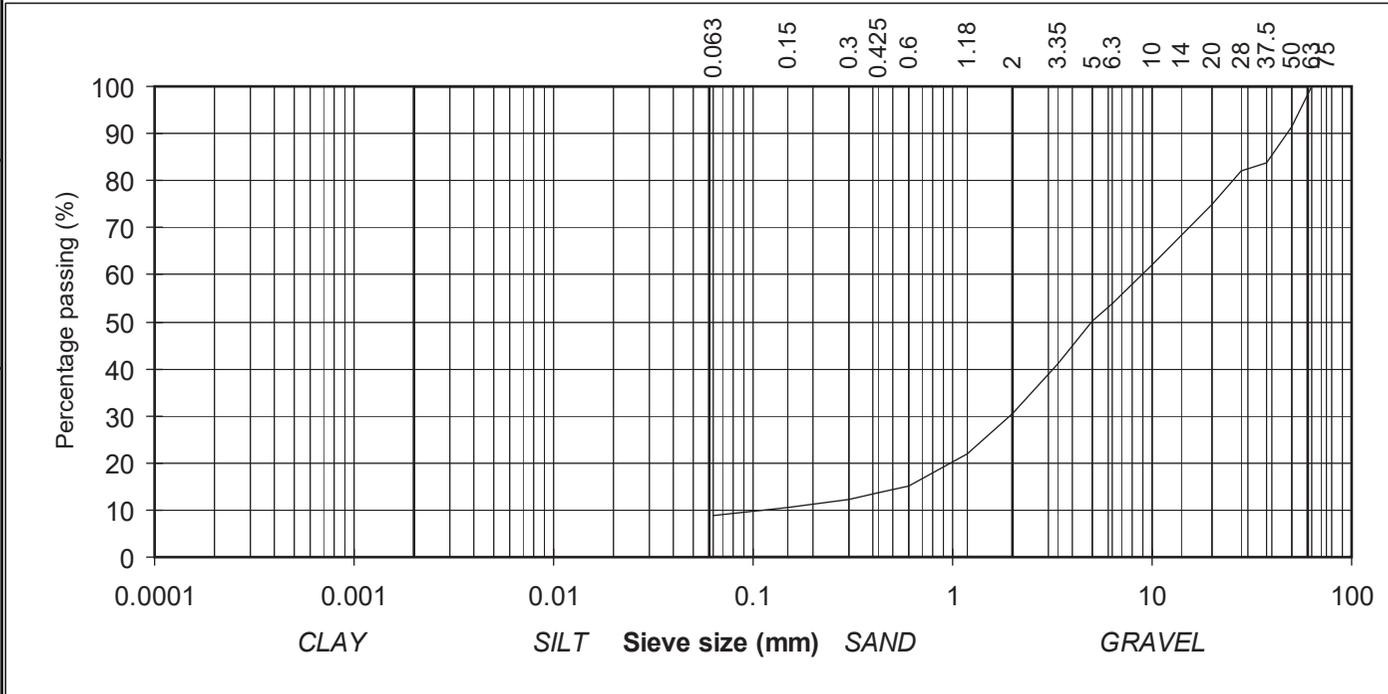
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	91	
37.5	84	GRAVEL
28	82	
20	75	
14	69	
10	62	
6.3	54	
5	50	
3.35	41	SAND
2	30	
1.18	22	
0.6	15	
0.425	14	SILT/CLAY
0.3	12	
0.15	10	
0.063	9	

Contract No: 18963 Report No. R70737
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/09
 Sample No. AA43888 Lab. Sample No. A16/0586
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 24/02/2016
 Description: Mottled grey/brown clayey/silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	03/03/16	1 of 1

Persons authorised to approve report: 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

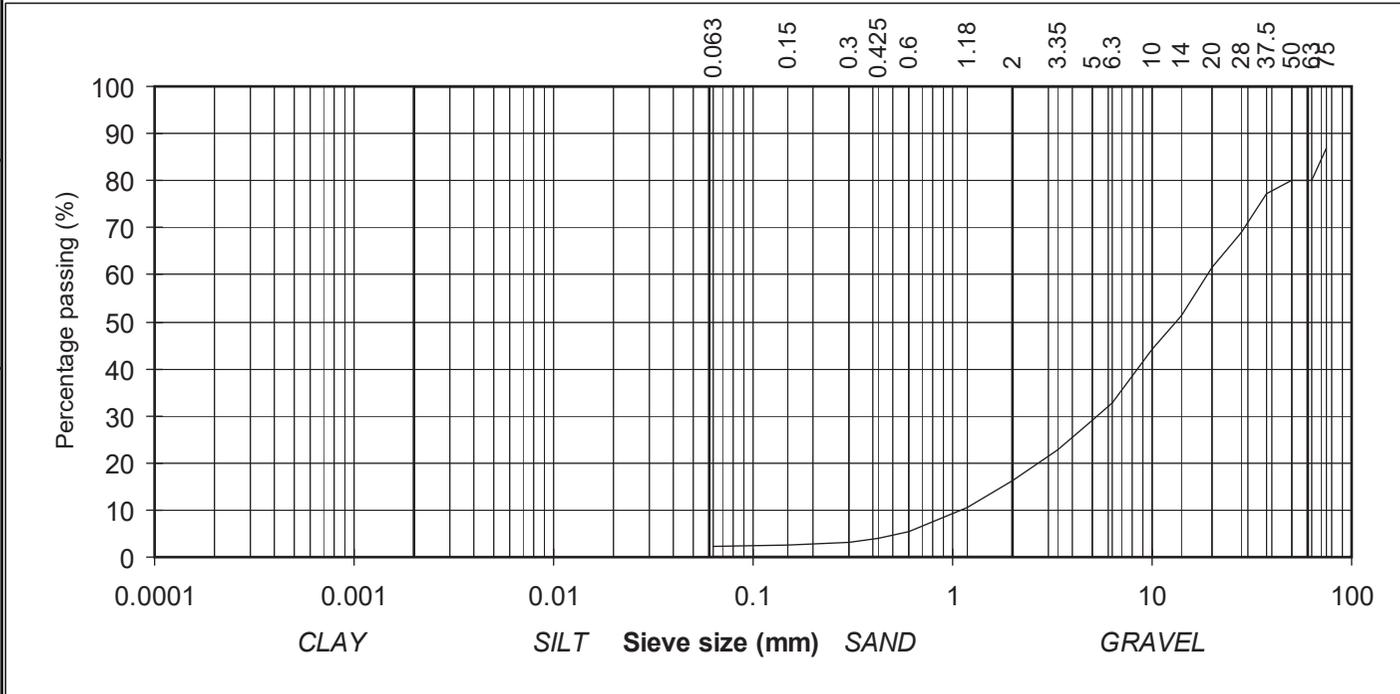
(note: Sedimentation stage not accredited)



particle size	% passing	
75	87	COBBLES
63	80	
50	80	
37.5	77	
28	69	
20	62	GRAVEL
14	51	
10	44	
6.3	33	
5	29	
3.35	23	
2	16	
1.18	11	
0.6	5	
0.425	4	
0.3	3	
0.15	3	
0.063	2	SILT/CLAY

Contract No: 18963 Report No. R71176
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/11
 Sample No. AA43879 Lab. Sample No. A16/0591
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 15/03/2016
 Description: Dark brown slightly clayey/silty, sandy, GRAVEL with some cobbles

Remarks Sample size did not meet the Requirements of BS1377



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	20/03/16	1 of 1

Persons authorised to approve report: 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

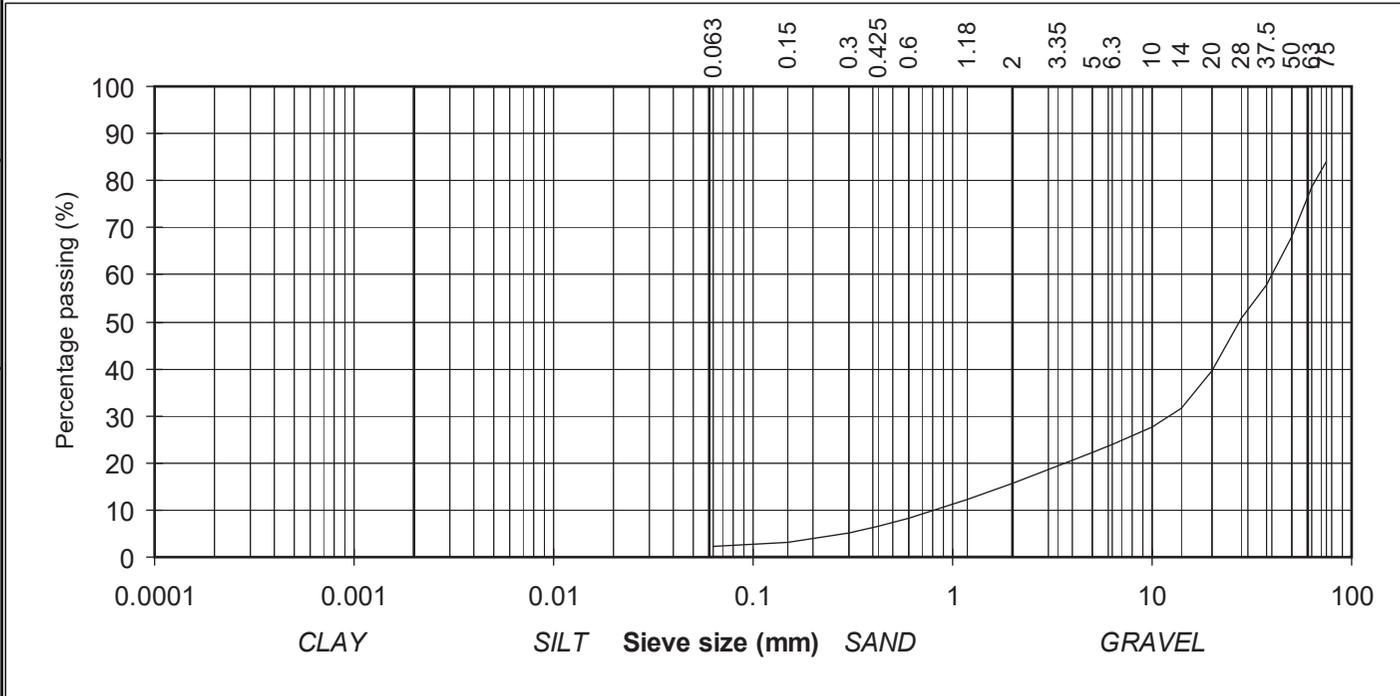
(note: Sedimentation stage not accredited)



particle size	% passing	
75	84	COBBLES
63	79	
50	68	
37.5	58	
28	51	GRAVEL
20	40	
14	32	
10	28	
6.3	24	
5	22	
3.35	19	
2	16	SAND
1.18	12	
0.6	8	
0.425	6	
0.3	5	SILT/CLAY
0.15	3	
0.063	2	

Contract No: 18963 Report No. R71177
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/12
 Sample No. AA43881 Lab. Sample No. A16/0593
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 14/03/2016
 Description: Dark brown/black slightly clayey/silty, sandy, GRAVEL with many cobbles

Remarks: Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	30/03/16	1 of 1

Persons authorised to approve report: 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

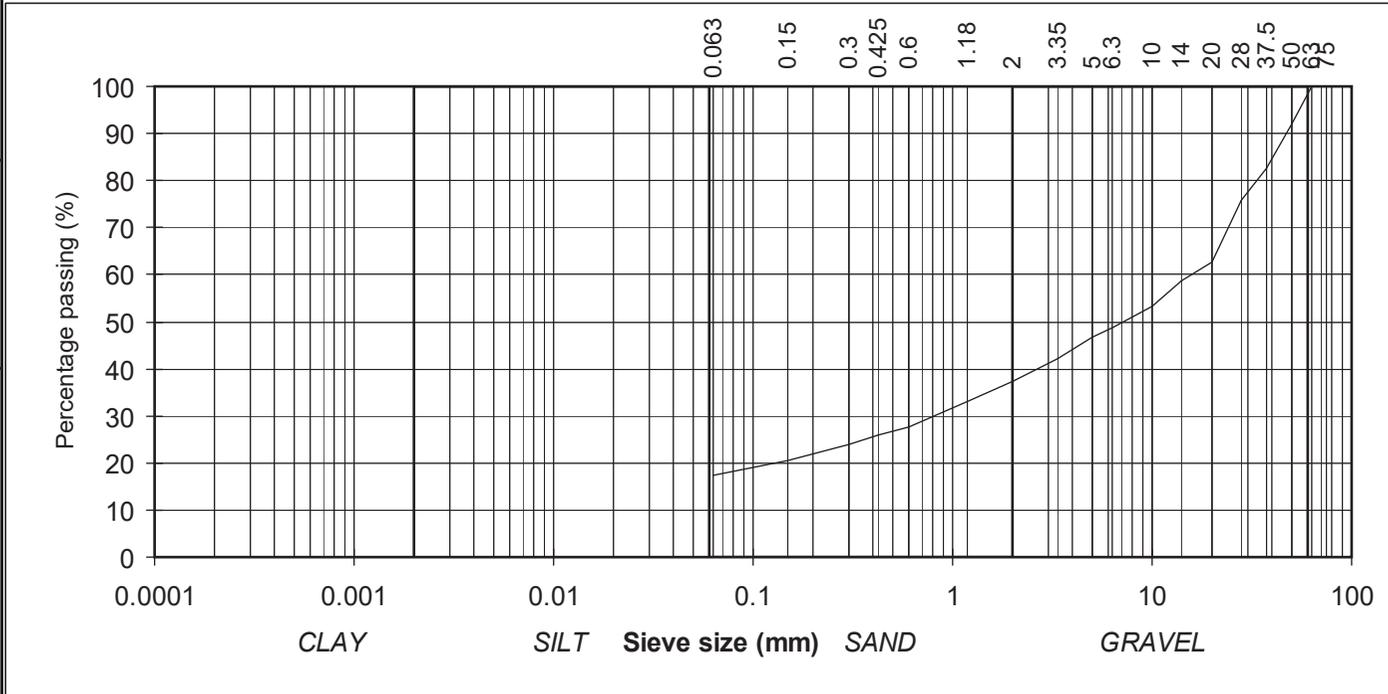
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	92	
37.5	83	
28	76	GRAVEL
20	63	
14	59	
10	53	
6.3	49	
5	47	
3.35	42	
2	37	
1.18	33	
0.6	28	
0.425	26	
0.3	24	
0.15	20	SILT/CLAY
0.063	17	

Contract No: 18963 Report No. R71126
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/12
 Sample No. AA43883 Lab. Sample No. A16/0595
 Sample Type: B
 Depth (m) 1.50 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 14/03/2016
 Description: Dark brown/grey silty, sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	04/04/16	1 of 1

Persons authorised to approve report: 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

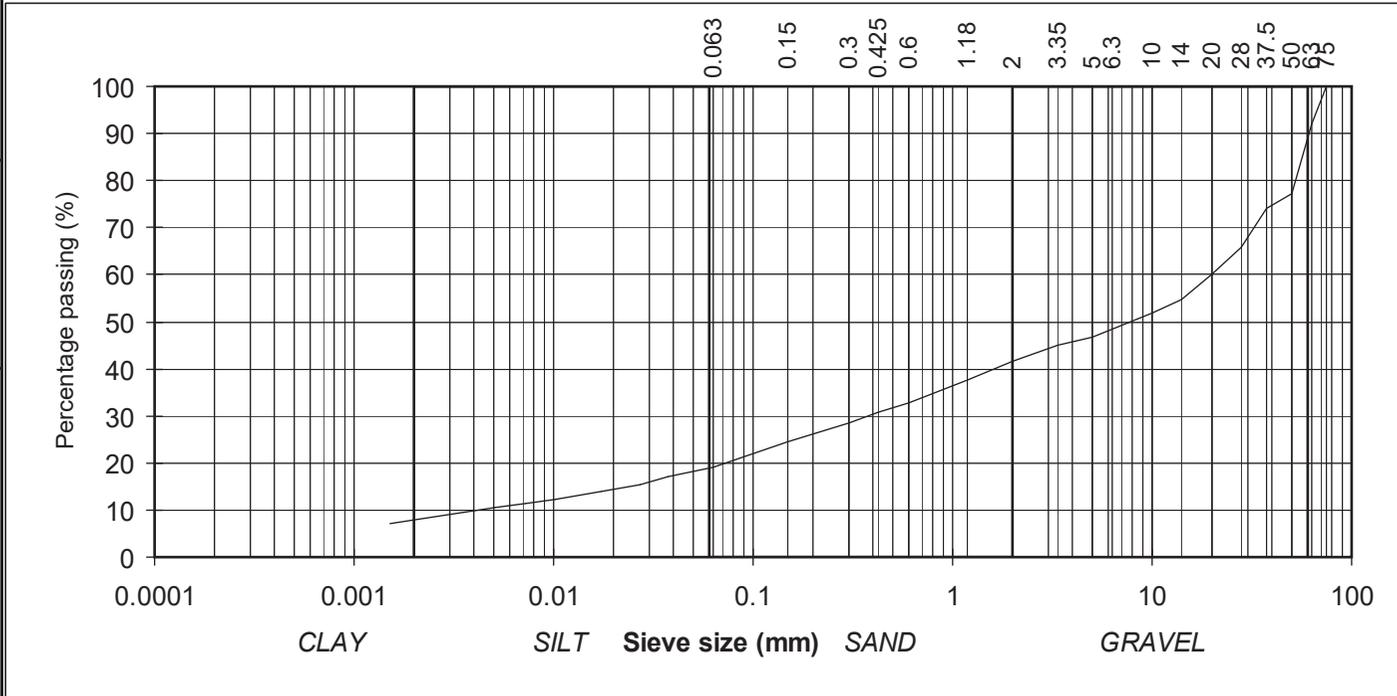
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	92	
50	77	
37.5	74	GRAVEL
28	66	
20	60	
14	55	
10	52	
6.3	49	
5	47	
3.35	45	SAND
2	42	
1.18	38	
0.6	33	
0.425	31	
0.3	28	SILT/CLAY
0.15	24	
0.063	19	
0.038	17	
0.027	16	
0.017	14	
0.010	12	
0.007	11	
0.005	10	
0.002	7	

Contract No: 18963 Report No. R70738
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/25
 Sample No. AA43893 Lab. Sample No. A16/0596
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 26/02/2016
 Description: Mottled brown silty, very sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	04/03/16	1 of 1

Persons authorised to approve report: 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

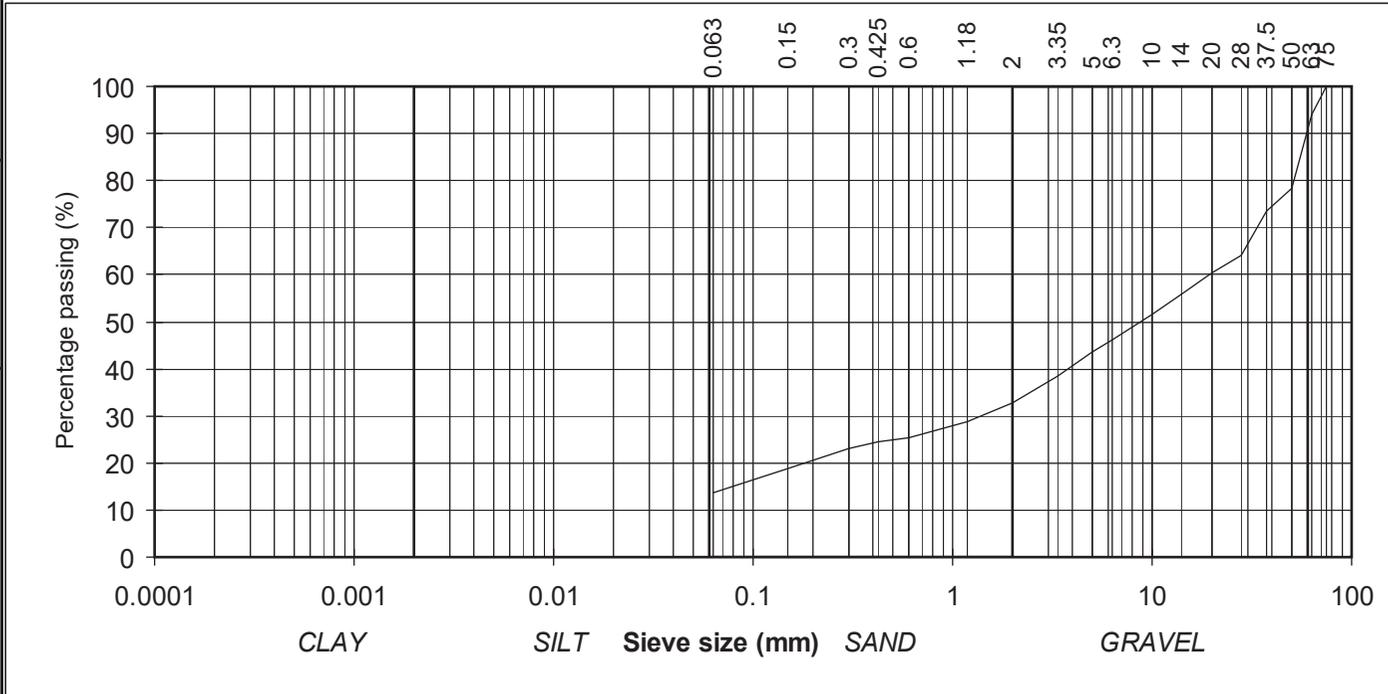
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	94	
50	78	
37.5	74	
28	64	GRAVEL
20	60	
14	56	
10	52	
6.3	46	
5	44	
3.35	39	
2	33	SAND
1.18	29	
0.6	25	
0.425	24	
0.3	23	SILT/CLAY
0.15	19	
0.063	14	

Contract No: 18963 Report No. R70756
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/25
 Sample No. AA45894 Lab. Sample No. A16/0597
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 24/02/2016
 Description: Mottled brown silty, sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
<i>H Byrne</i>	10/03/16	1 of 1

Persons authorised to approve report: 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

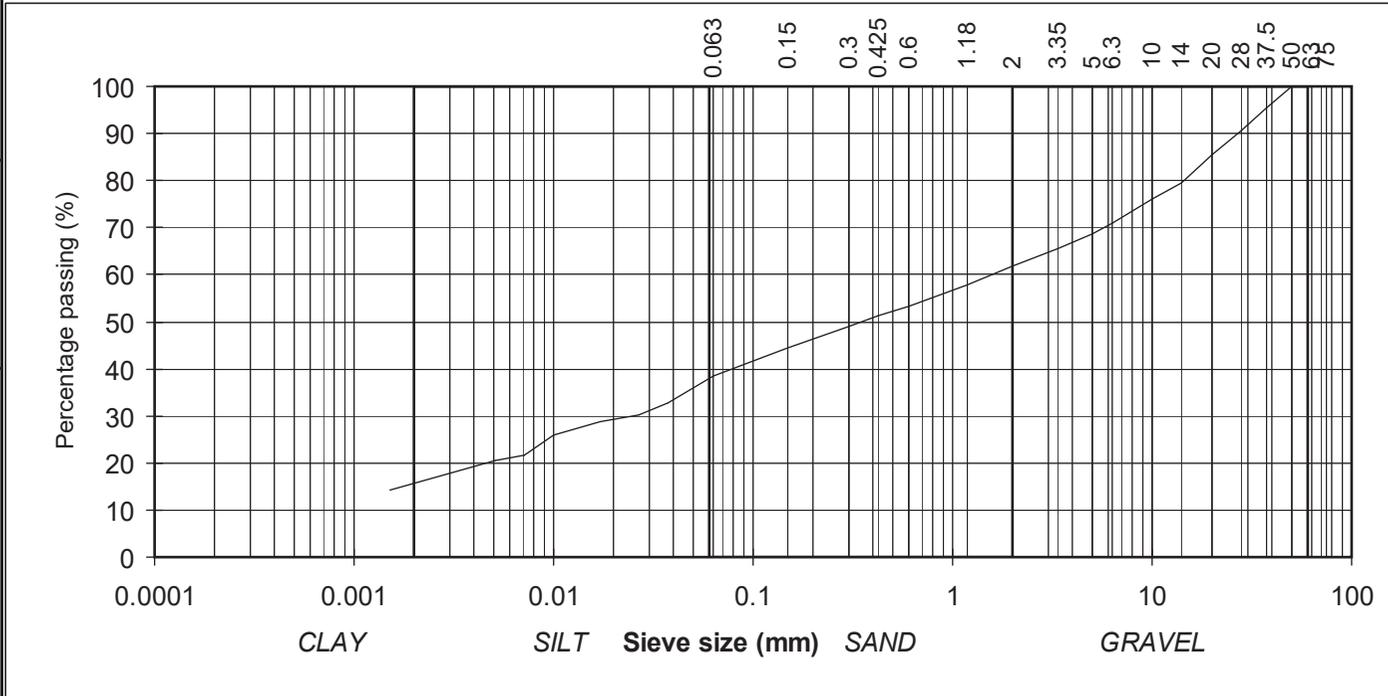
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	95	GRAVEL
28	90	
20	86	
14	80	
10	76	
6.3	71	
5	69	
3.35	66	SAND
2	62	
1.18	58	
0.6	53	
0.425	51	
0.3	49	SILT/CLAY
0.15	44	
0.063	38	
0.037	33	
0.027	30	
0.017	29	
0.010	26	
0.007	22	
0.005	20	
0.002	14	

Contract No: 18963 Report No. R70757
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/25
 Sample No. AA43895 Lab. Sample No. A16/0598
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 24/02/2016
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	03/03/16	1 of 1

Persons authorised to approve report: 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

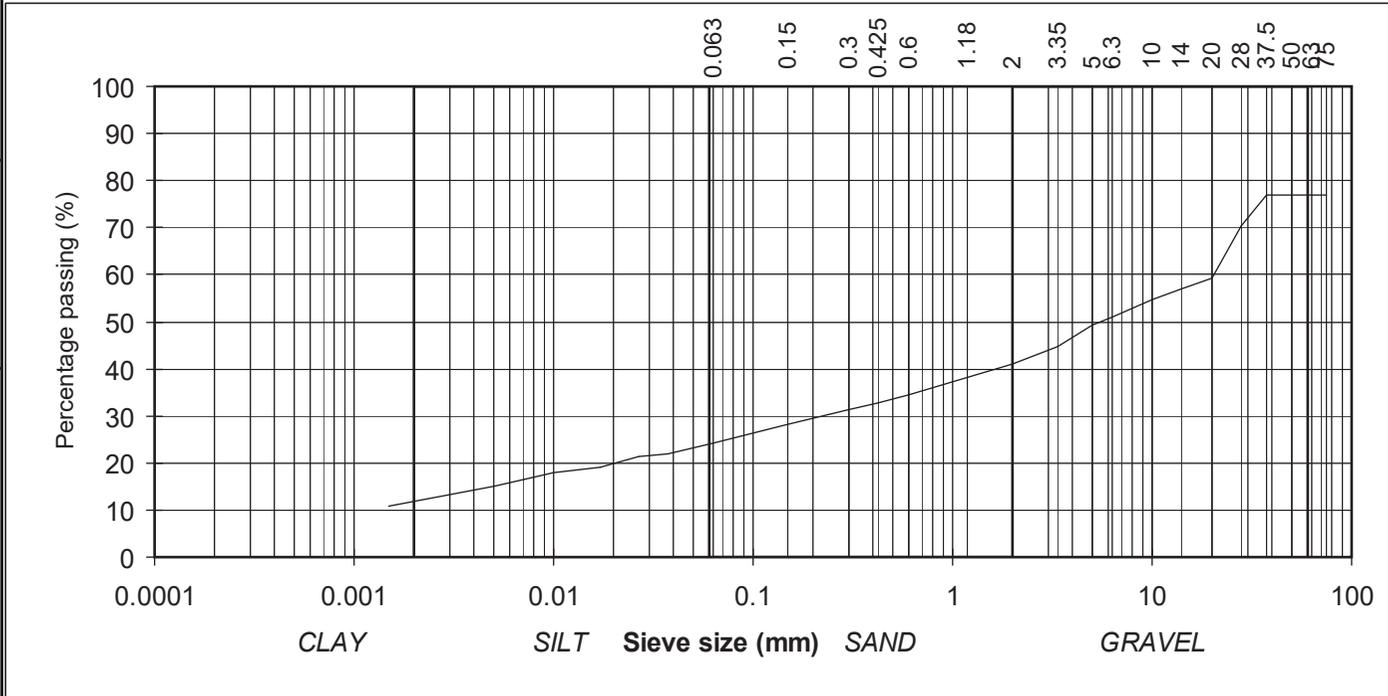
(note: Sedimentation stage not accredited)



particle size	% passing	
75	77	COBBLES
63	77	
50	77	
37.5	77	
28	70	
20	59	GRAVEL
14	57	
10	55	
6.3	51	
5	49	
3.35	45	SAND
2	41	
1.18	38	
0.6	34	
0.425	33	
0.3	31	SILT/CLAY
0.15	28	
0.063	24	
0.037	22	
0.027	21	
0.017	19	
0.010	18	
0.007	17	
0.005	15	
0.002	11	

Contract No: 18963 Report No. R71078
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/25
 Sample No. AA43896 Lab. Sample No. A16/0599
 Sample Type: B
 Depth (m) 3.00 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 14/03/2016
 Description: Light brown/grey slightly sandy, gravelly, SILT with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	22/03/16	1 of 1

Persons authorised to approve report: 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

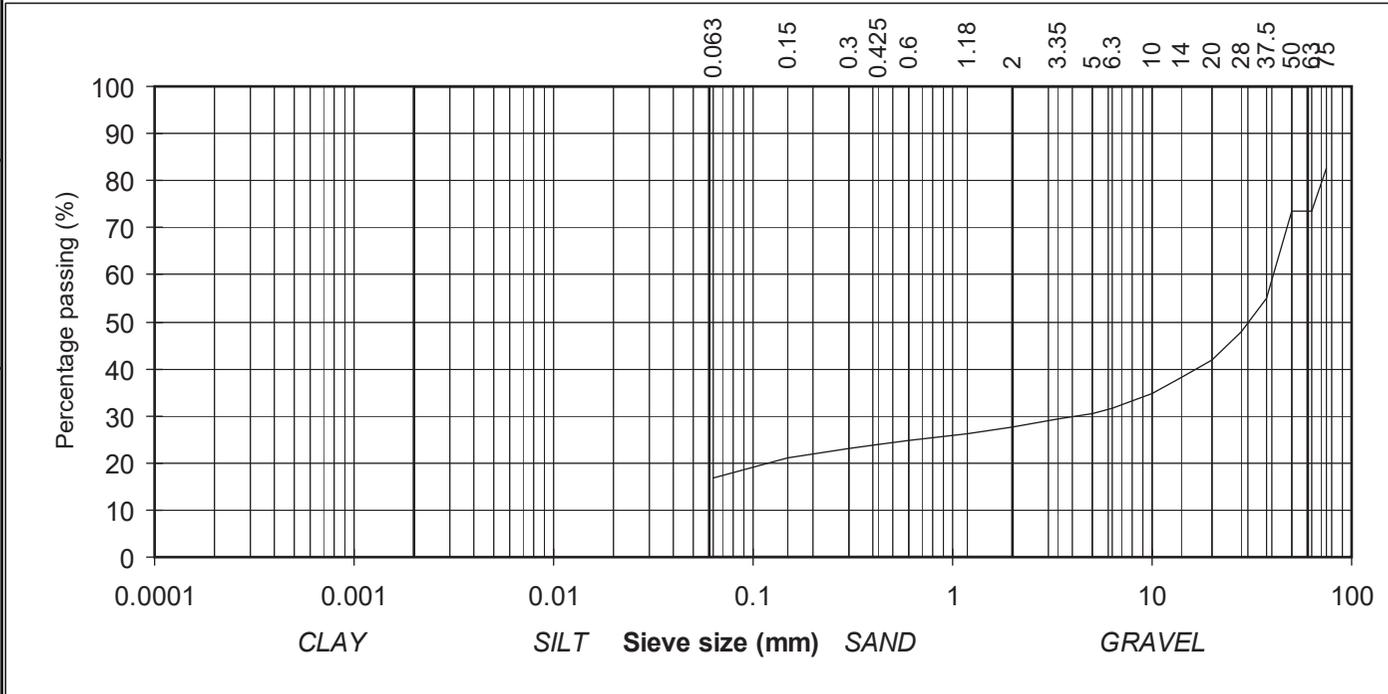
(note: Sedimentation stage not accredited)



particle size	% passing	
75	83	COBBLES
63	73	
50	73	
37.5	55	
28	48	
20	42	GRAVEL
14	38	
10	35	
6.3	32	
5	31	
3.35	29	SAND
2	28	
1.18	26	
0.6	25	
0.425	24	
0.3	23	SILT/CLAY
0.15	21	
0.063	17	

Contract No: 18963 Report No. R70739
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/29
 Sample No. AA43890 Lab. Sample No. A16/0600
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 24/02/2016
 Description: Brown silty, sandy, GRAVEL with many cobbles

Remarks: Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	03/03/16	1 of 1

Persons authorised to approve report: 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

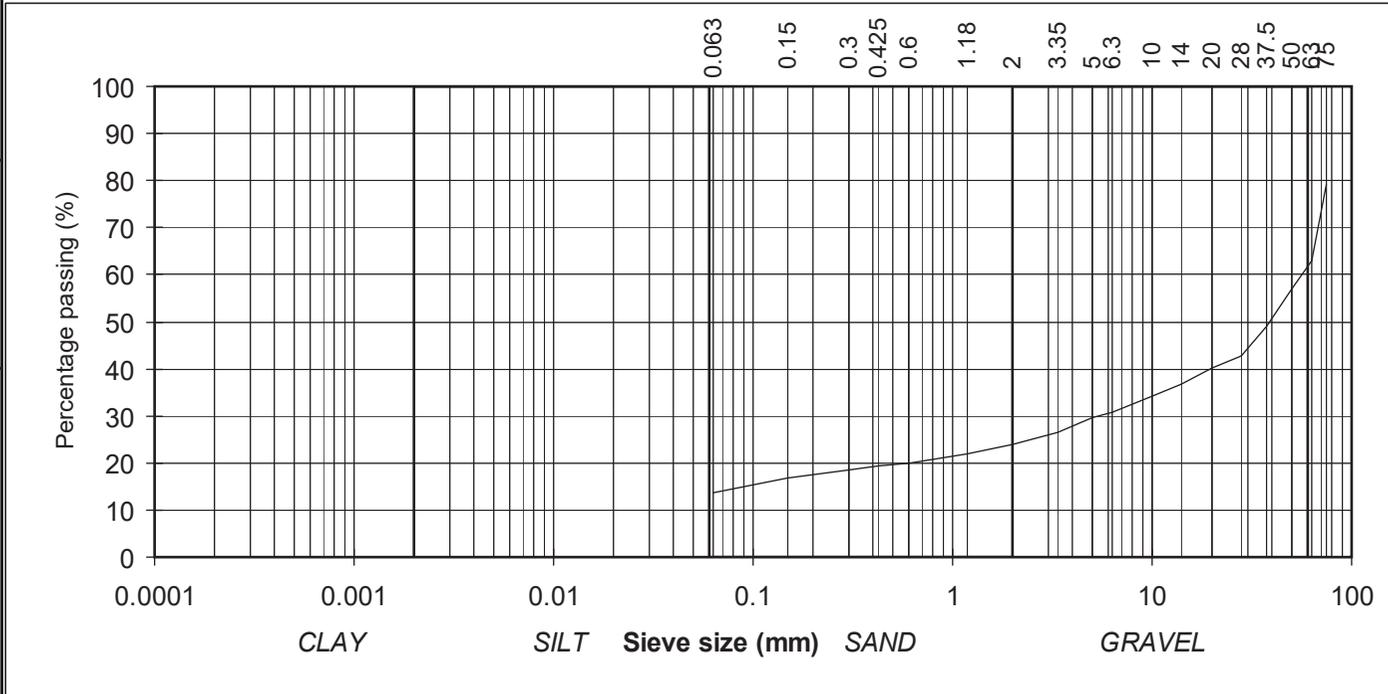
(note: Sedimentation stage not accredited)



particle size	% passing	
75	79	COBBLES
63	63	
50	57	
37.5	49	
28	43	
20	40	GRAVEL
14	37	
10	34	
6.3	31	
5	29	
3.35	26	SAND
2	24	
1.18	22	
0.6	20	
0.425	19	
0.3	19	SILT/CLAY
0.15	17	
0.063	14	

Contract No: 18963 Report No. R70759
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/29
 Sample No. AA43891 Lab. Sample No. A16/0601
 Sample Type: B
 Depth (m) 1.50 Customer: Galway Co.Co.
 Date Received 02/02/2016 Date Testing started 24/02/2016
 Description: Light brown silty, sandy, GRAVEL with many cobbles

Remarks: Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	10/03/16	1 of 1

Persons authorised to approve report: 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

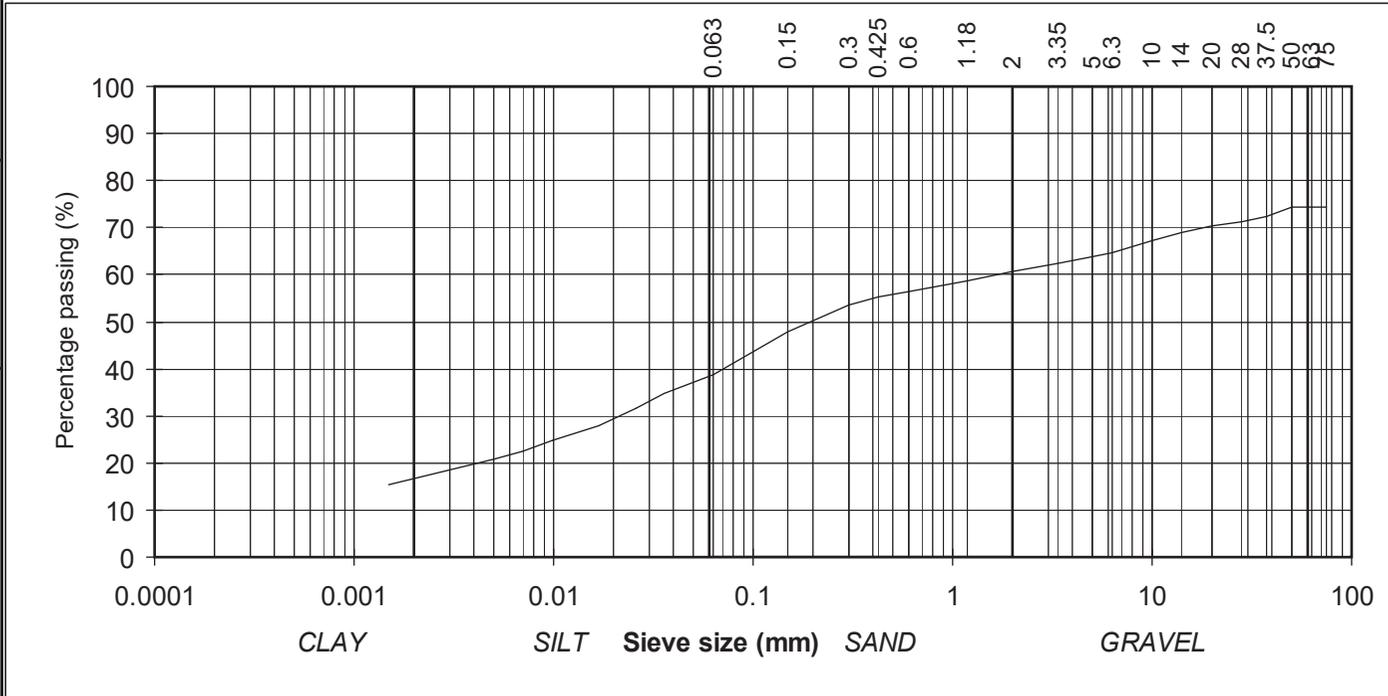
(note: Sedimentation stage not accredited)



particle size	% passing	
75	74	COBBLES
63	74	
50	74	
37.5	72	
28	71	GRAVEL
20	70	
14	69	
10	67	
6.3	65	
5	64	
3.35	62	
2	61	SAND
1.18	59	
0.6	57	
0.425	55	
0.3	53	SILT/CLAY
0.15	48	
0.063	39	
0.036	35	
0.026	32	
0.017	28	
0.010	25	
0.007	23	
0.005	21	
0.001	16	

Contract No: 18963 Report No. R70740
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/29
 Sample No. AA43892 Lab. Sample No. A16/0602
 Sample Type: B
 Depth (m) 2.50 Customer: Galway Co.Co.
 Date Received 12/02/2016 Date Testing started 26/02/2016
 Description: Light brown slightly sandy, slightly gravelly, CLAY with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	04/03/16	1 of 1

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

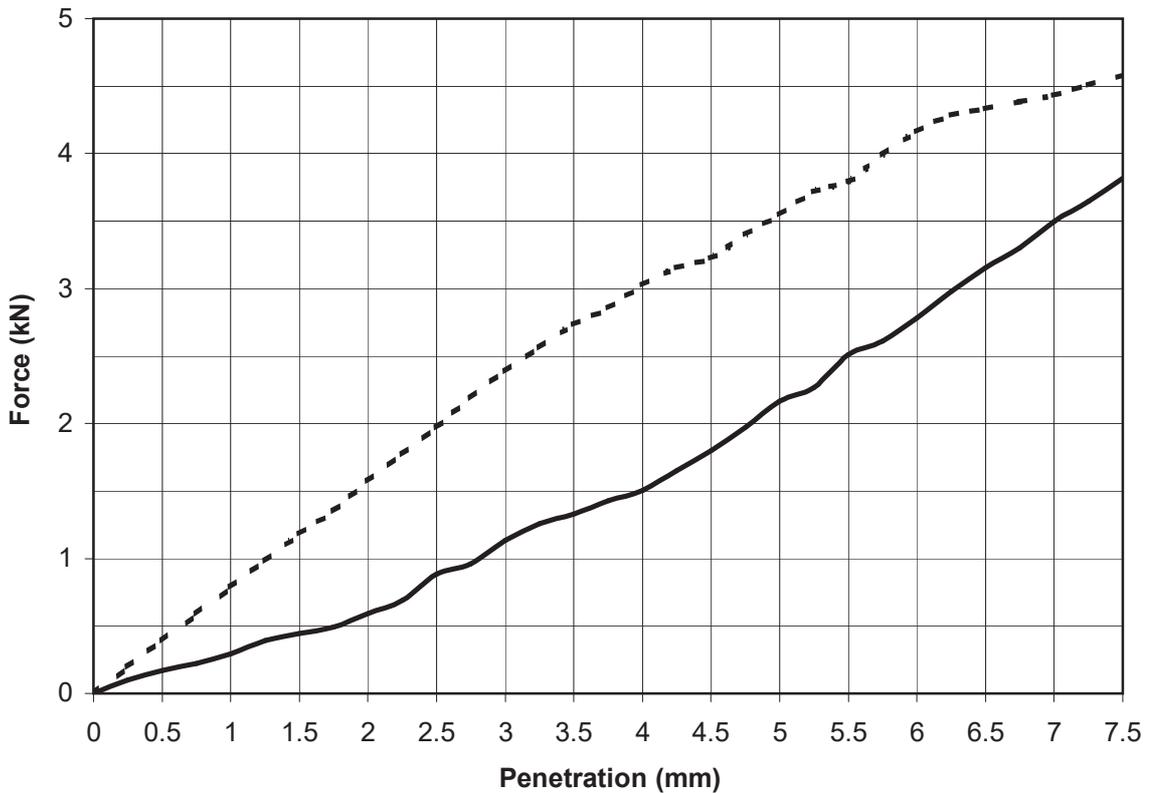
IGSL Ltd
 Materials Laboratory
 Unit J5,M7 Business Park
 Naas Co.Kildare
 045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No. R71002 Contract GCTP Phase 3 - Contract 1
 Contract No. 18963 Customer Galway Co.Co.
 Date received 12/02/16 Date Tested 01/03/16
 BH/TP No. BH03/06 Sample No. AA43886 Type: B
 Depth (m) 0.50 Lab sample No. A16/0583



Key: ————— Top - - - - - Base

Description: Brown silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked	
Moisture Content (%):	15	Bulk Density (Mg/m ³):	1.97
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.73
% Material >20mm:	37		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	11	18
Moisture Content %	14	16

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
<i>H Byrne</i>	15/03/16	1 of 1

IGSL Ltd
 Materials Laboratory
 Unit J5,M7 Business Park
 Naas Co.Kildare
 045 899324

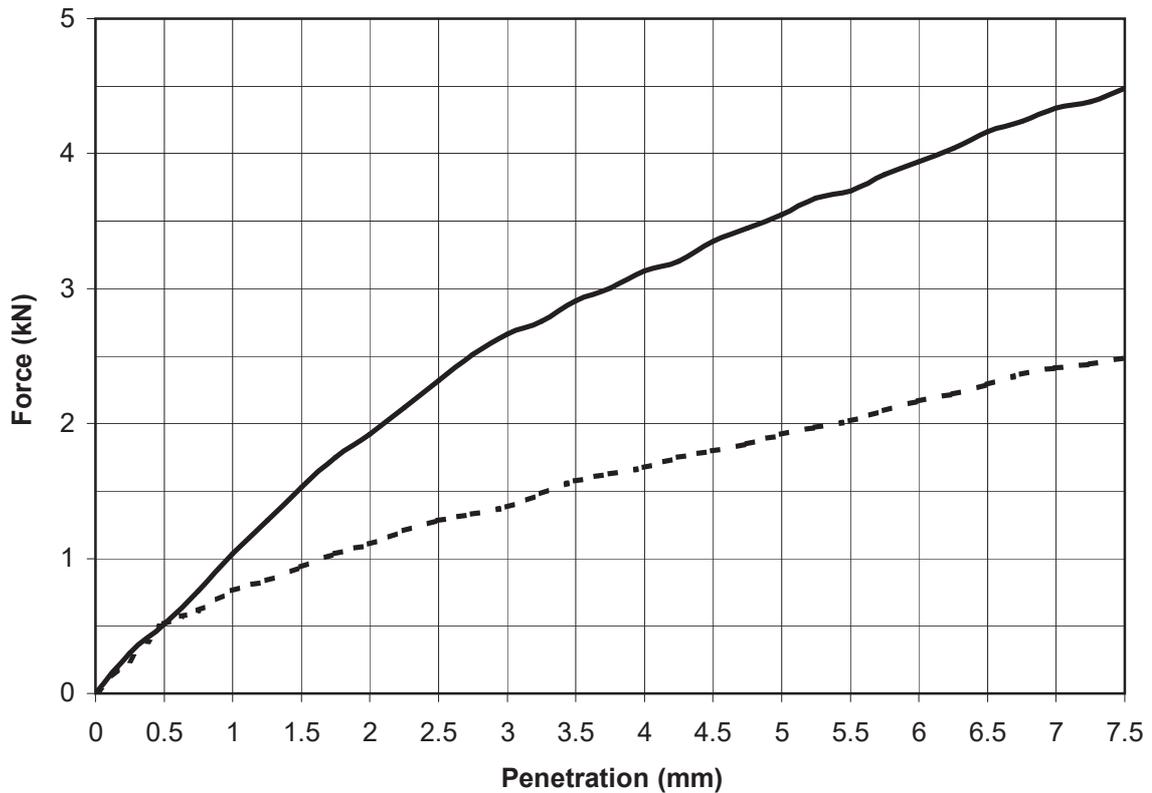
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R70619	Contract	GCTP Phase 3 - Contract 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	12/02/16	Date Tested	22/02/16
BH/TP No.	BH03/29	Sample No.	AA43890 Type: B
Depth (m)	1.00	Lab sample No.	A16/0600



Key: ————— Top - - - - - Base

Description: Brown silty, sandy, GRAVEL with many cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.21
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.05
% Material >20mm:	16		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	18	10
Moisture Content %	8	8

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

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
	<i>H Byrne</i>	24/02/16	1 of 1

Appendix 13

Geotechnical Laboratory Testing

Lab 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. **R70973** Contract No. 18963 Contract Name: GCTP Phase 3 Contract 1 GI
 Customer Galway Co.Co.
 Samples Received: 12-02-16 Date Tested: 14-03-16

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
BH3/23	AA32640	1.0	A16/0952	B	17	51	NP	NP	11	WS	4.4		Dark brown silty, very sandy, GRAVEL
BH3/23	AA32641	2.0	A16/0953	B	12	34	NP	NP	24	WS	4.4		Brown silty, very sandy, GRAVEL with some cobbles
BH3/23	AA32643	3.0	A16/0954	B	12								Brown clayey/silty, very sandy, GRAVEL
BH3/32	AA48851	0.5	A16/0955	B	12	21	NP	NP	60	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/32	AA48852	1.0	A16/0956	B	8.9	20	NP	NP	55	WS	4.4		Mottled light brown slightly sandy, gravelly, SILT with some cobbles
BH3/32	AA48853	2.0	A16/0957	B	9.3	15	NP	NP	56	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/32	AA48854	3.0	A16/0958	B	6.7	16	NP	NP	45	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/32	AA48855	4.0	A16/0959	B	12	22	NP	NP	67	WS	4.4		Mottled grey/brown slightly sandy, slightly gravelly, SILT
BH3/32	AA48856	4.5	A16/0960	D	23								Grey/brown sandy gravelly SILT/CLAY
BH3/32	AA48857	5.0	A16/0961	B	25	34	21	13	95	WS	4.4	C L	Grey/brown slightly sandy, slightly gravelly, CLAY
BH3/32	AA48858	6.0	A16/0962	B	24	35	NP	NP	89	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
BH3/32	AA48859	7.0	A16/0963	B	24	40	NP	NP	95	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
BH3/32	AA48860	8.0	A16/0964	B	29	45	NP	NP	94	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
BH3/32	AA48861	9.0	A16/0965	B	29	45	22	23	89	WS	4.4	C I	Mottled light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/32	AA48862	10.0	A16/0966	B	30	53	NP	NP	97	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT

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:
 NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
 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

H Byrne (Quality Manager)

Approved by

Date

05-04-16

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. **R70974** Contract No. 18963 Contract Name: GCTP Phase 3 Contract 1 GI
 Customer Galway Co.Co.
 Samples Received: 12/2/166 Date Tested: 14-03-16

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
BH3/33	AA48863	0.5	A16/0967	B	8.9	21	NP	NP	45	WS	4.4		Light brown/grey slightly sandy, gravelly, SILT
BH3/33	AA48864	1.0	A16/0968	B	6.4	23	NP	NP	41	WS	4.4		Light brown/grey silty, very sandy, GRAVEL
BH3/33	AA48865	2.0	A16/0969	B	5.6	18	NP	NP	39	WS	4.4		Light brown silty, sandy, GRAVEL with some cobbles
BH3/34	AA48866	0.5	A16/0970	B	13	23	NP	NP	55	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/34	AA48867	1	A16/0971	B	10	19	NP	NP	59	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/34	AA48868	2	A16/0972	B	8.6	19	NP	NP	49	WS	4.4		Light brown slightly sandy, gravelly, SILT

<p>Notes: Preparation: WS - Wet sieved Sample Type: B - bulk disturbed AR - As received U - Undisturbed NP - Non plastic</p> <p>Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method</p>	<p>Remarks:</p> <p>NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 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 H Byrne (Quality Manager)	Approved by 	Date 05-04-16	Page 1 of 1
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TEST REPORT

Determination of Particle Size Distribution

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

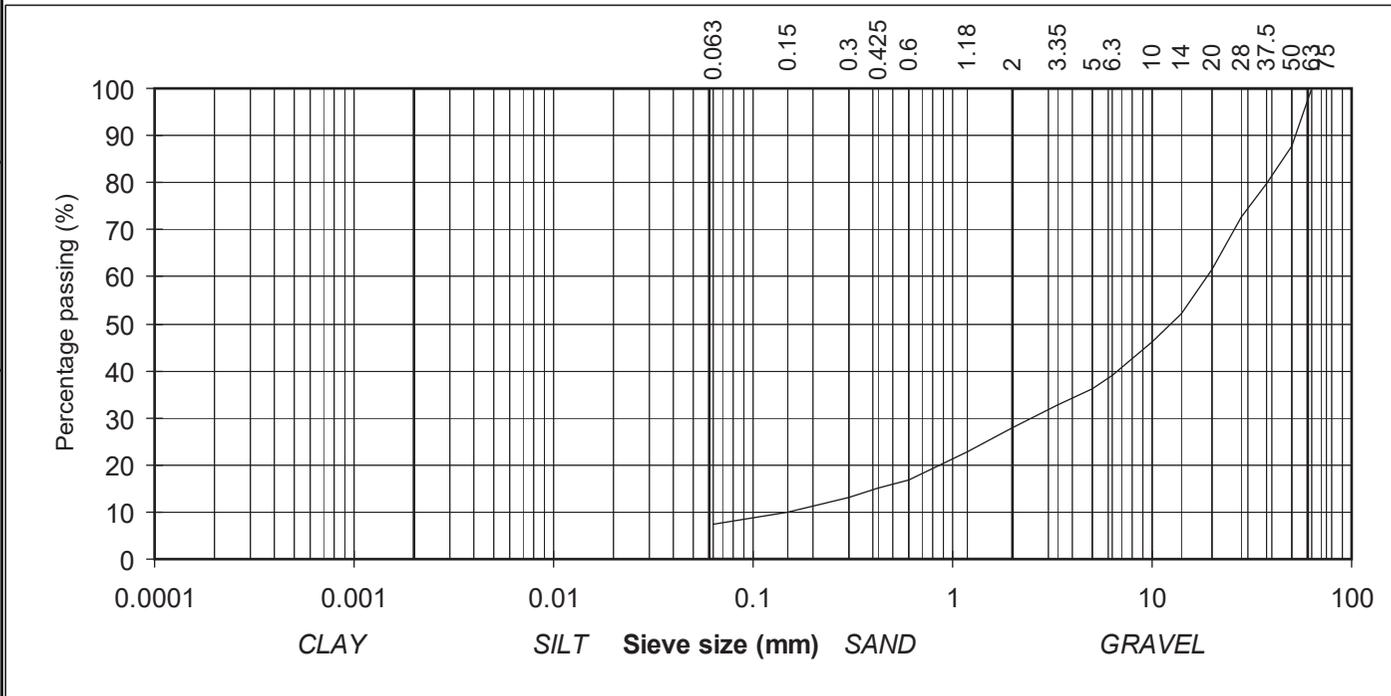
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	88	
37.5	80	GRAVEL
28	73	
20	62	
14	52	
10	46	
6.3	39	
5	36	
3.35	33	SAND
2	28	
1.18	23	
0.6	17	
0.425	15	SILT/CLAY
0.3	13	
0.15	10	
0.063	7	

Contract No: 18963 Report No. R71181
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/23
 Sample No. AA32640 Lab. Sample No. A16/0952
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Dark brown silty, very sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: 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

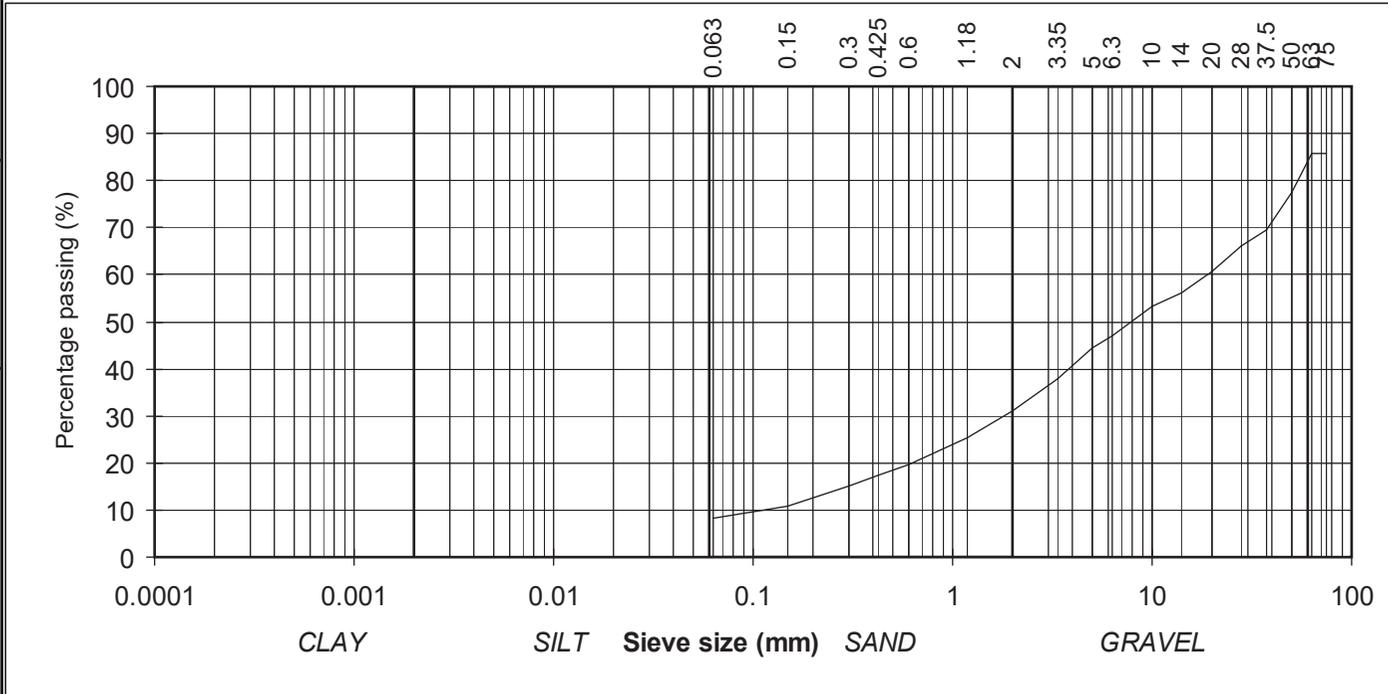
(note: Sedimentation stage not accredited)



particle size	% passing	
75	86	COBBLES
63	86	
50	78	
37.5	70	GRAVEL
28	66	
20	61	
14	56	
10	53	
6.3	47	
5	44	
3.35	38	SAND
2	31	
1.18	25	
0.6	20	
0.425	17	SILT/CLAY
0.3	15	
0.15	11	
0.063	8	

Contract No: 18963 Report No. R71182
 Contract: GCTP Phase 3 - Contact 1
 BH: BH 03/23
 Sample No. AA32641 Lab. Sample No. A16/0953
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Brown silty, very sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: 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

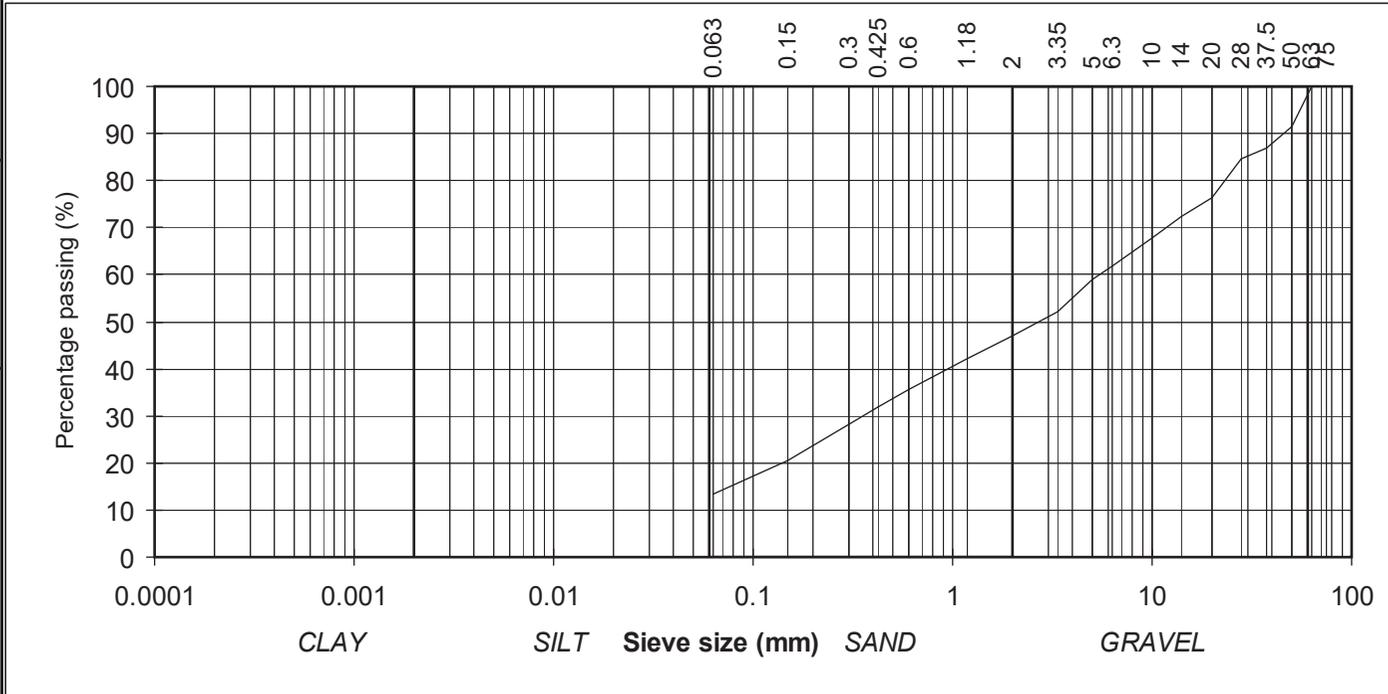
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	91	
37.5	87	GRAVEL
28	84	
20	76	
14	72	
10	68	
6.3	62	
5	59	
3.35	52	SAND
2	47	
1.18	42	
0.6	36	
0.425	32	SILT/CLAY
0.3	28	
0.15	21	
0.063	13	

Contract No: 18963 Report No. R71128
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/23
 Sample No. AA32643 Lab. Sample No. A16/0954
 Sample Type: B
 Depth (m) 3.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Brown clayey/silty, very sandy, GRAVEL

Remarks



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Persons authorised to approve report: 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

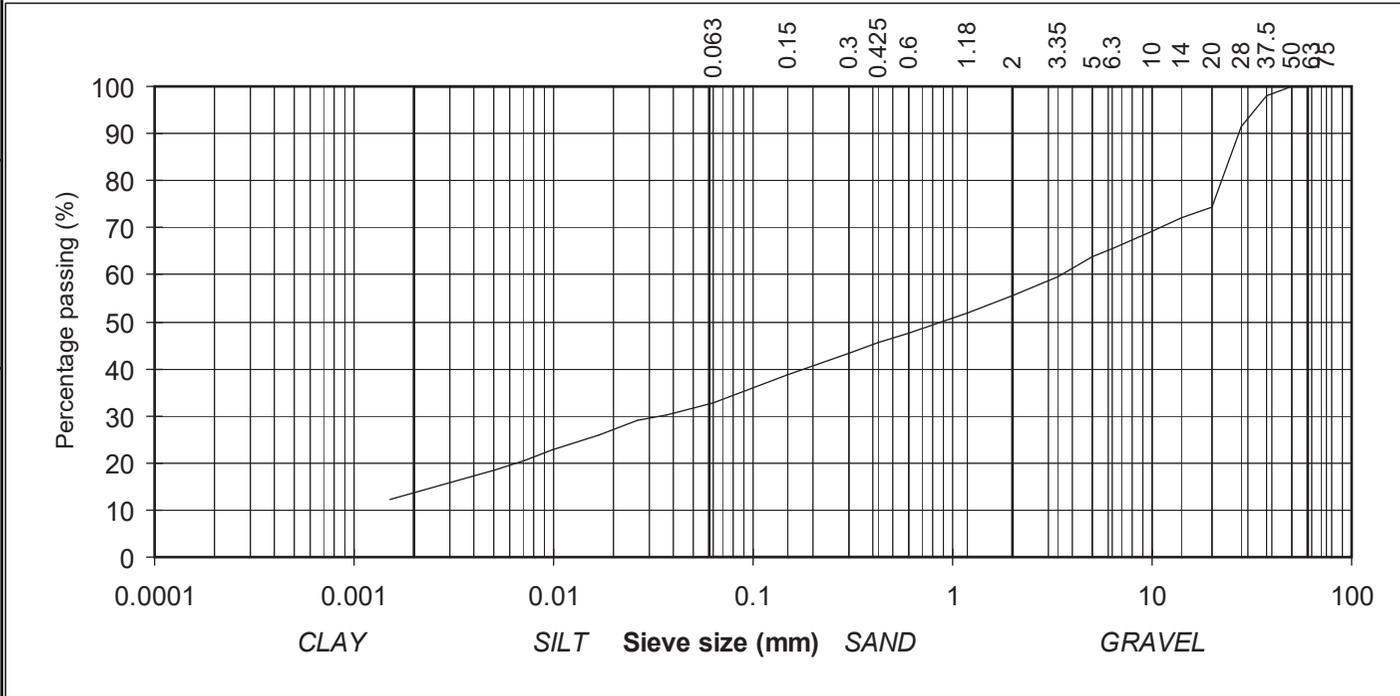
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	98	GRAVEL
28	91	
20	74	
14	72	
10	69	
6.3	66	
5	64	
3.35	59	SAND
2	55	
1.18	52	
0.6	48	
0.425	46	SILT/CLAY
0.3	43	
0.15	39	
0.063	33	
0.037	30	
0.026	29	
0.017	26	
0.010	23	
0.007	21	
0.005	18	
0.002	12	

Contract No: 18963 Report No. R71129
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/32
 Sample No. AA48851 Lab. Sample No. A16/0955
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorised to approve report: 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

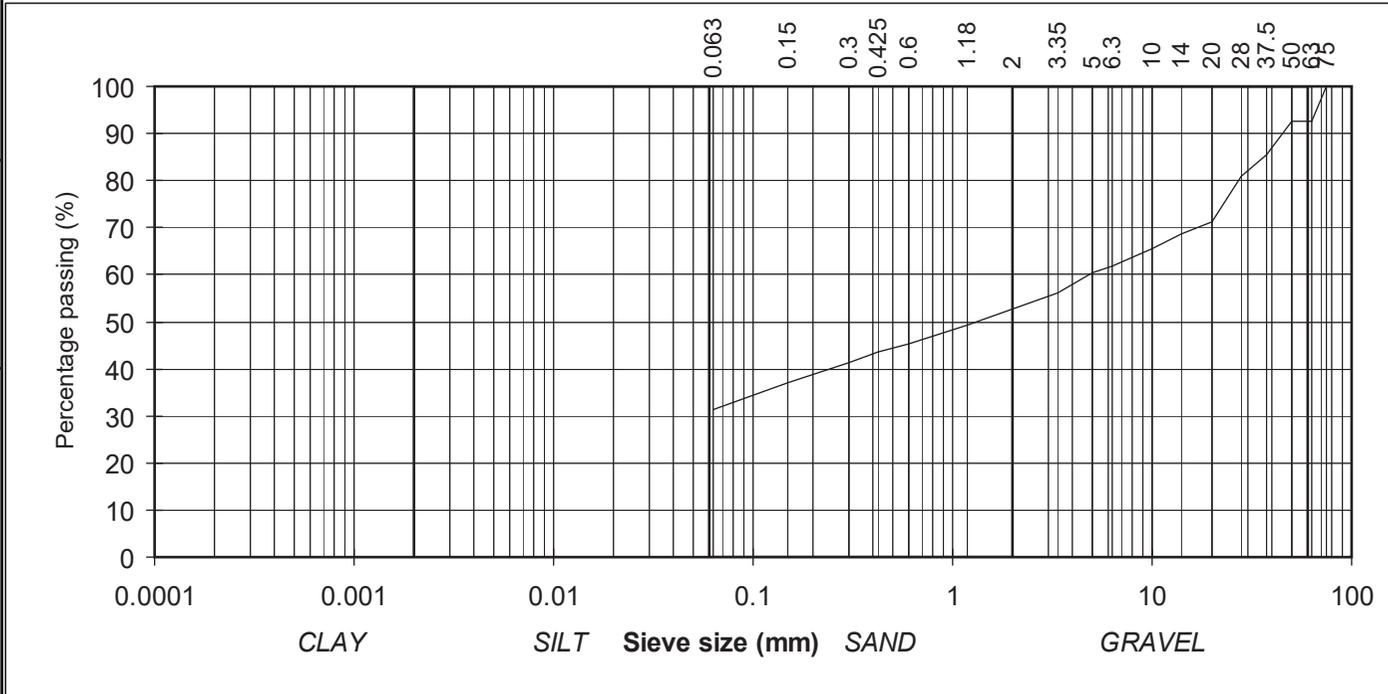
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	93	
50	93	
37.5	86	GRAVEL
28	81	
20	71	
14	69	
10	66	
6.3	62	
5	60	SAND
3.35	56	
2	53	
1.18	49	
0.6	45	
0.425	44	
0.3	41	SILT/CLAY
0.15	37	
0.063	31	

Contract No: 18963 Report No. R71183
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/32
 Sample No. AA48852 Lab. Sample No. A16/0956
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 15-03-16
 Description: Mottled light brown slightly sandy, gravelly, SILT with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

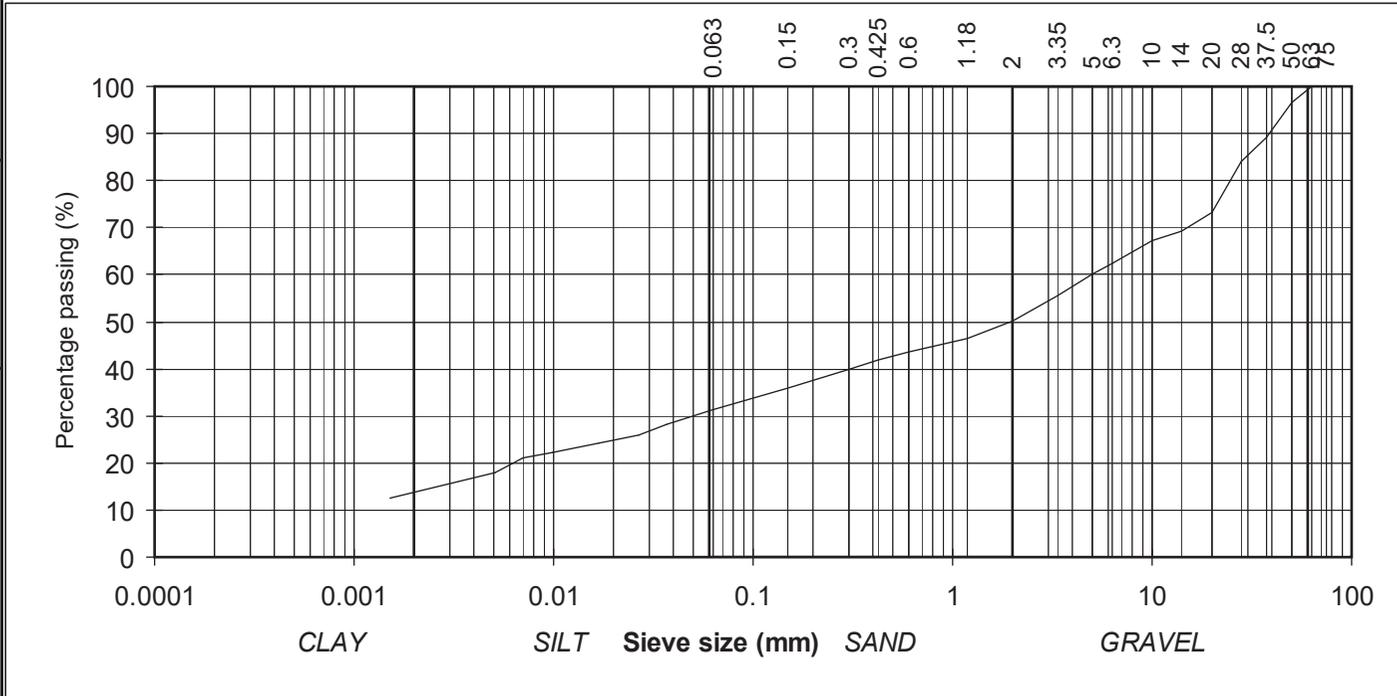
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	97	
37.5	89	GRAVEL
28	84	
20	73	
14	69	
10	67	
6.3	62	
5	60	
3.35	56	SAND
2	50	
1.18	46	
0.6	44	
0.425	42	SILT/CLAY
0.3	40	
0.15	36	
0.063	31	
0.037	28	
0.027	26	
0.017	24	
0.010	22	
0.007	21	
0.005	18	
0.002	12	

Contract No: 18963 Report No. R71079
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/32
 Sample No. AA48853 Lab. Sample No. A16/0957
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

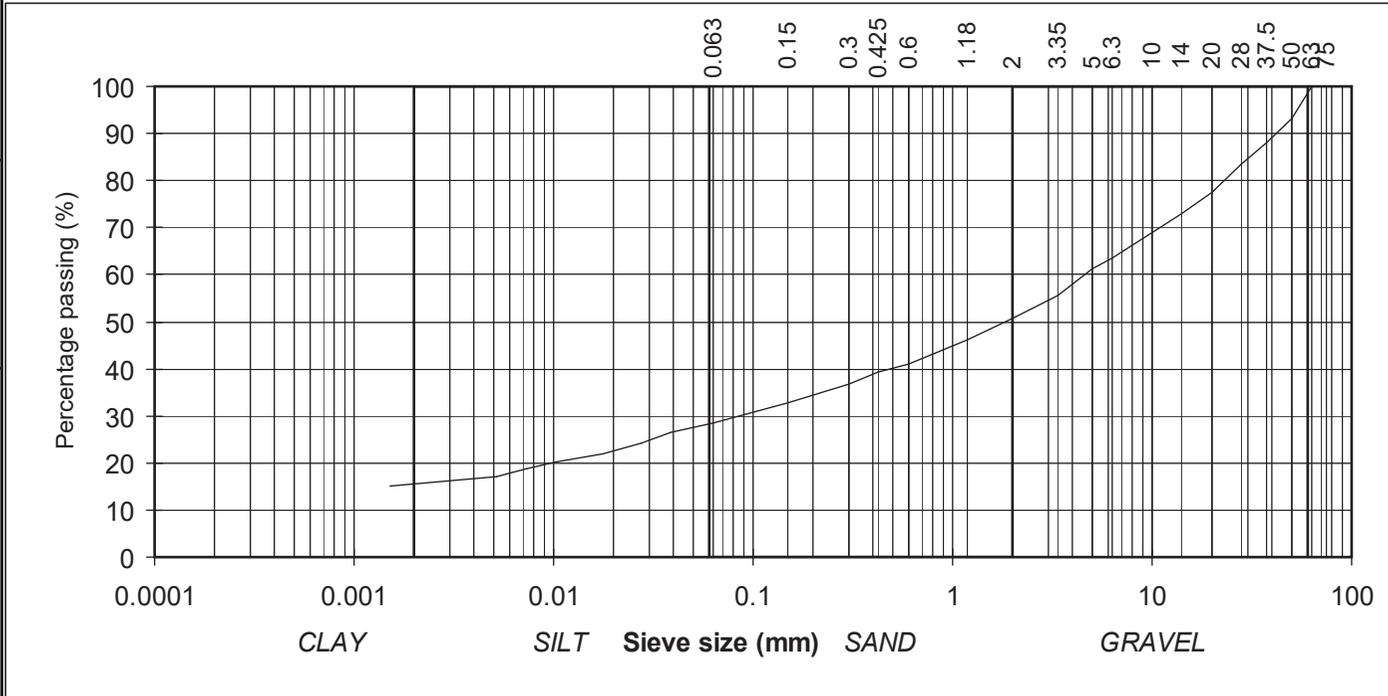
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	93	
37.5	88	GRAVEL
28	83	
20	77	
14	73	
10	69	
6.3	64	
5	61	
3.35	56	SAND
2	51	
1.18	46	
0.6	41	
0.425	39	SILT/CLAY
0.3	37	
0.15	33	
0.063	28	
0.039	26	
0.028	24	
0.018	22	
0.010	20	
0.007	19	
0.005	17	
0.002	15	

Contract No: 18963 Report No. R71080
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/32
 Sample No. AA48854 Lab. Sample No. A16/0958
 Sample Type: B
 Depth (m) 3.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



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Persons authorised to approve report: 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

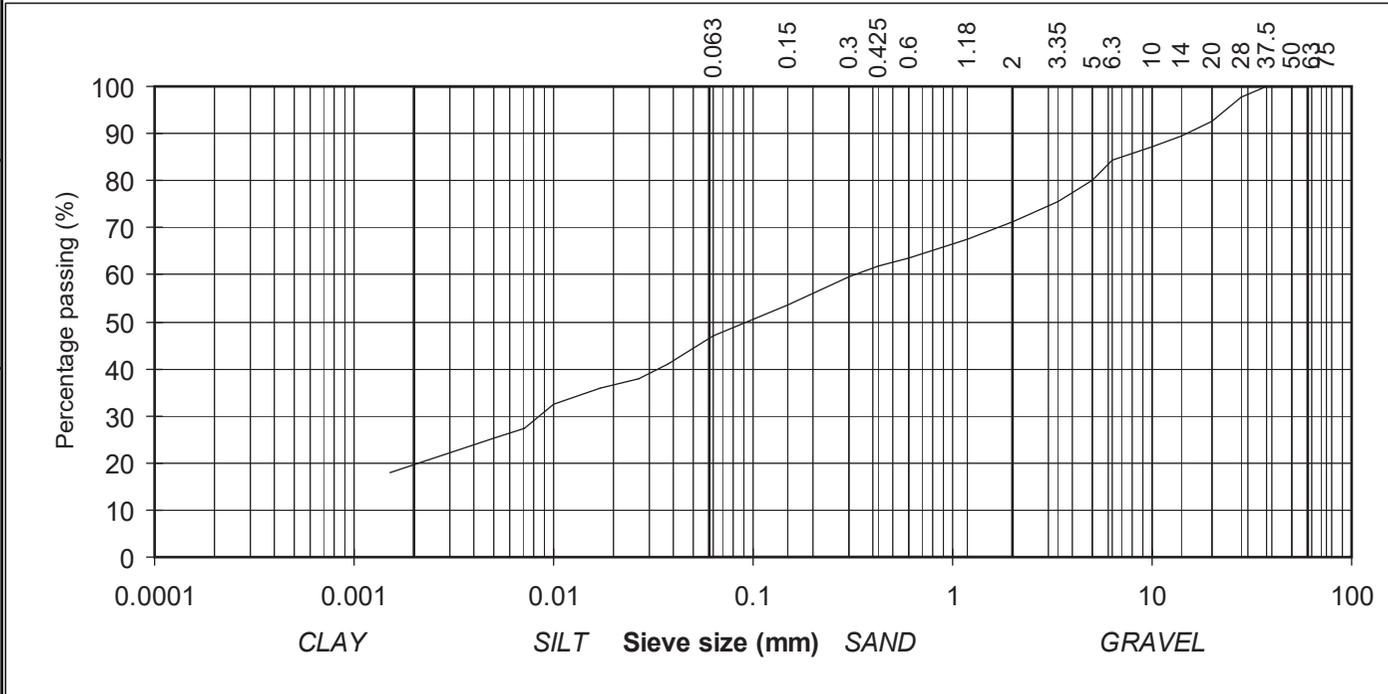
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	98	
20	93	GRAVEL
14	90	
10	87	
6.3	84	
5	80	
3.35	75	
2	71	
1.18	68	SAND
0.6	64	
0.425	62	
0.3	60	
0.15	54	SILT/CLAY
0.063	47	
0.037	41	
0.027	38	
0.017	36	
0.010	32	
0.007	27	
0.005	25	
0.002	18	

Contract No: 18963 Report No. R71081
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/32
 Sample No. AA48855 Lab. Sample No. A16/0959
 Sample Type: B
 Depth (m) 4.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Mottled grey/brown slightly sandy, slightly gravelly, SILT

Remarks



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Persons authorised to approve report: 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

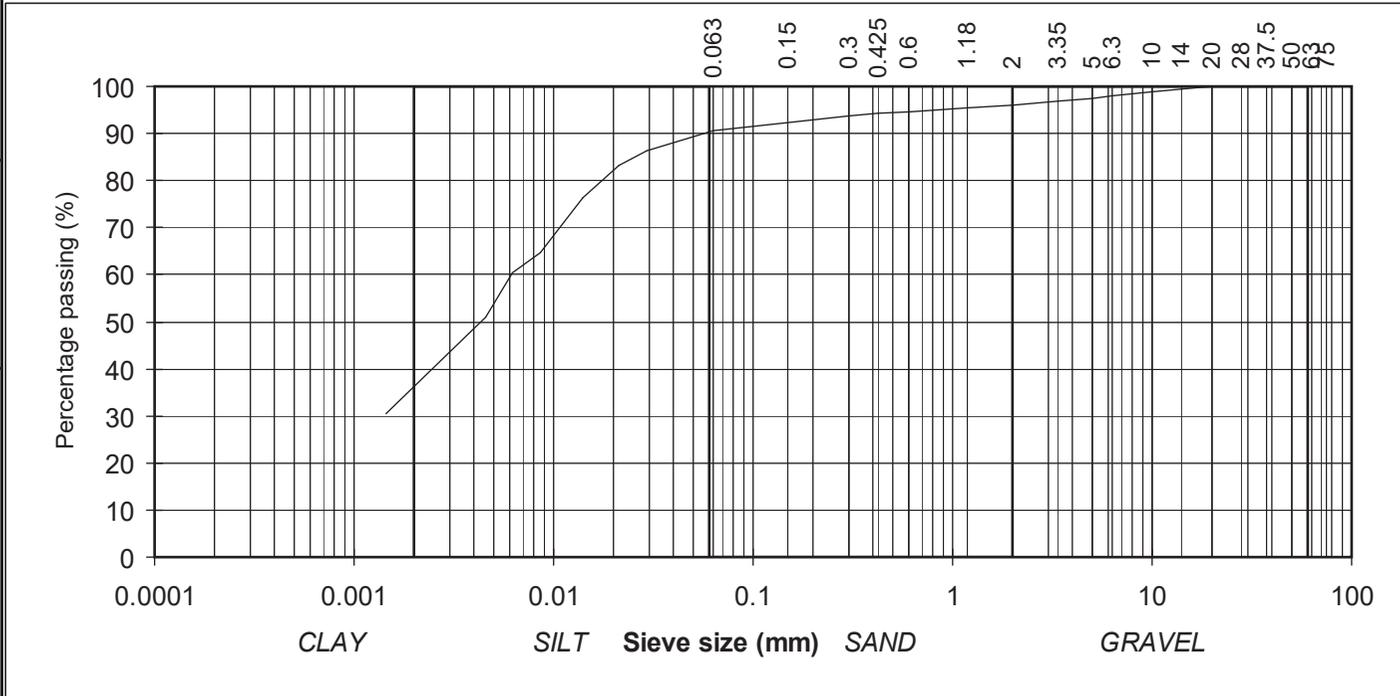
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	
20	100	GRAVEL
14	99	
10	99	
6.3	98	
5	98	
3.35	97	
2	96	
1.18	95	
0.6	95	
0.425	94	
0.3	94	
0.15	92	
0.063	91	SILT/CLAY
0.029	86	
0.021	83	
0.014	76	
0.009	65	
0.006	60	
0.005	51	
0.001	30	

Contract No: 18963 Report No. R71581
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3.32
 Sample No. AA48857 Lab. Sample No. A16/0961
 Sample Type: B
 Depth (m) 5.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 12-04-16
 Description: Grey/brown slightly sandy, slightly gravelly, CLAY

Remarks



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Persons authorised to approve report: 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

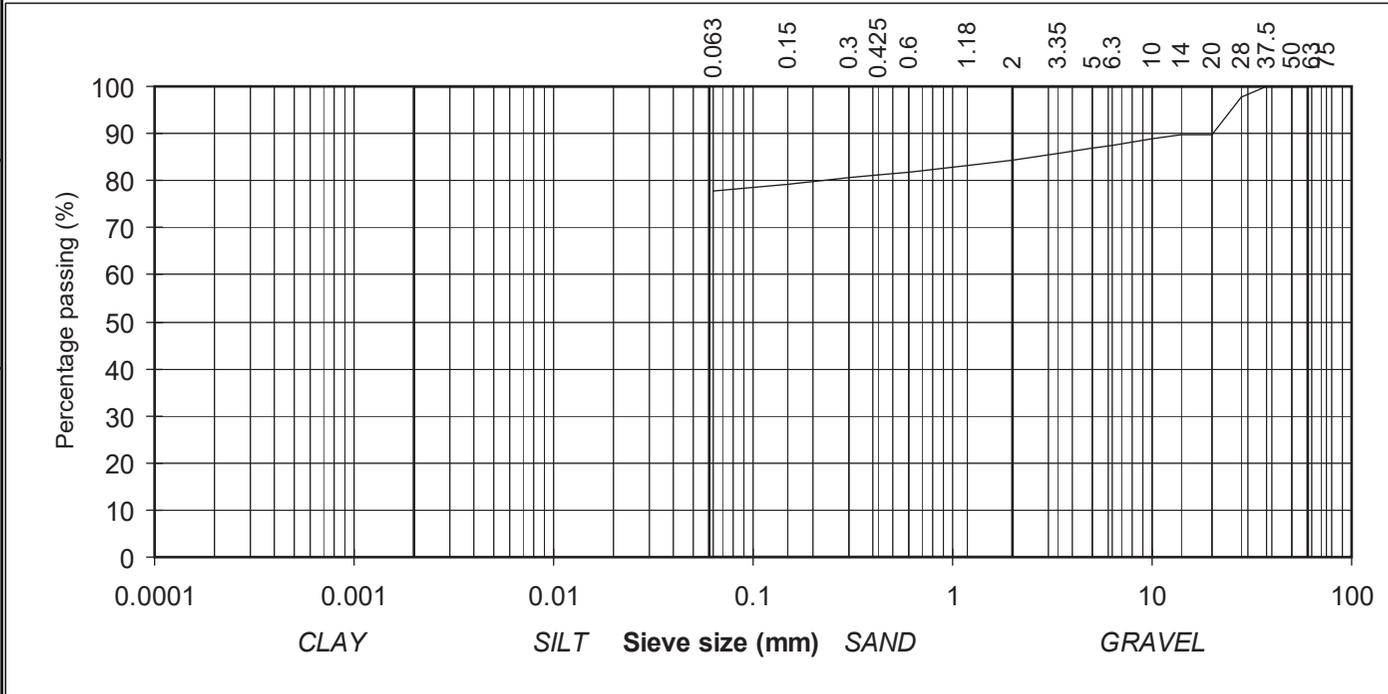
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	98	
20	90	GRAVEL
14	90	
10	89	
6.3	87	
5	87	
3.35	86	
2	84	
1.18	83	
0.6	82	
0.425	81	
0.3	81	
0.15	79	
0.063	78	SILT/CLAY

Contract No: 18963 Report No. R71184
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/32
 Sample No. AA48858 Lab. Sample No. A16/0962
 Sample Type: B
 Depth (m) 6.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Dark brown/grey slightly sandy, slightly gravelly, SILT

Remarks



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Persons authorised to approve report: 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

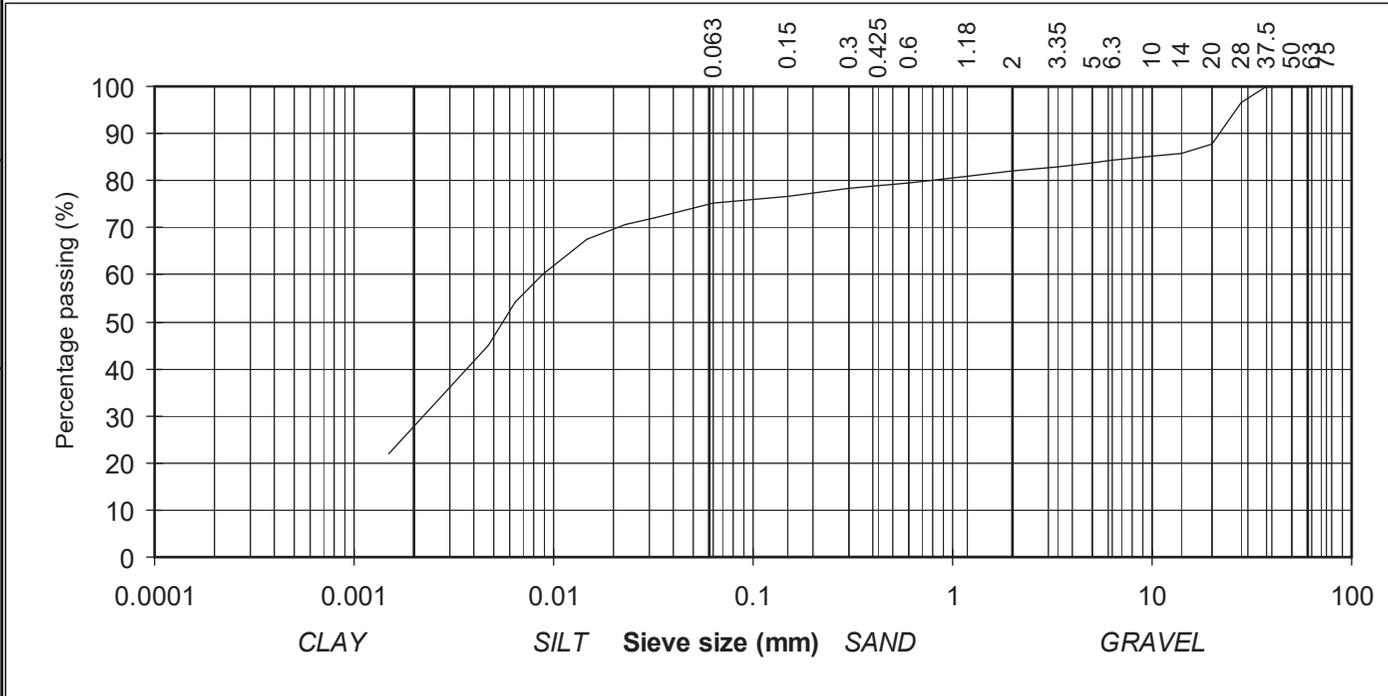
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	97	
20	88	GRAVEL
14	86	
10	85	
6.3	84	
5	84	
3.35	83	
2	82	
1.18	81	
0.6	80	
0.425	79	
0.3	78	
0.15	77	
0.063	75	
0.032	72	SILT/CLAY
0.023	71	
0.015	68	
0.009	60	
0.006	54	
0.005	45	
0.001	22	

Contract No: 18963 Report No. R71185
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/32
 Sample No. AA48859 Lab. Sample No. A16/0963
 Sample Type: B
 Depth (m) 7.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Dark brown/grey slightly sandy, slightly gravelly, SILT

Remarks



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Persons authorised to approve report: 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

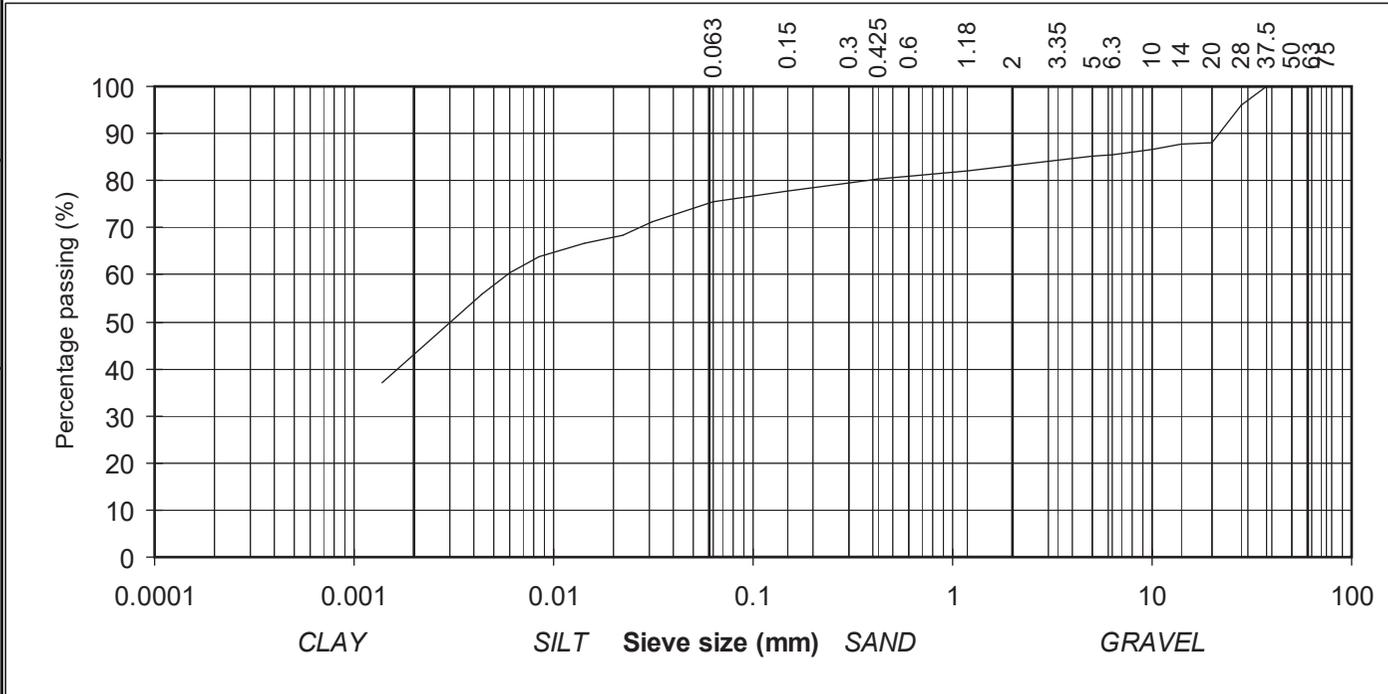
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	96	
20	88	GRAVEL
14	88	
10	87	
6.3	86	
5	85	
3.35	84	
2	83	
1.18	82	
0.6	81	
0.425	80	
0.3	80	
0.15	78	
0.063	76	SILT/CLAY
0.031	71	
0.022	68	
0.014	67	
0.008	64	
0.006	60	
0.004	56	
0.001	37	

Contract No: 18963 Report No. R71187
 Contract: GCTP Phase 3 - Contact 1
 BH: BH03/32
 Sample No. AA48861 Lab. Sample No. A16/0965
 Sample Type: B
 Depth (m) 9.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 15-03-16
 Description: Mottled light brown/grey slightly sandy, slightly gravelly, CLAY

Remarks



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Persons authorised to approve report: 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

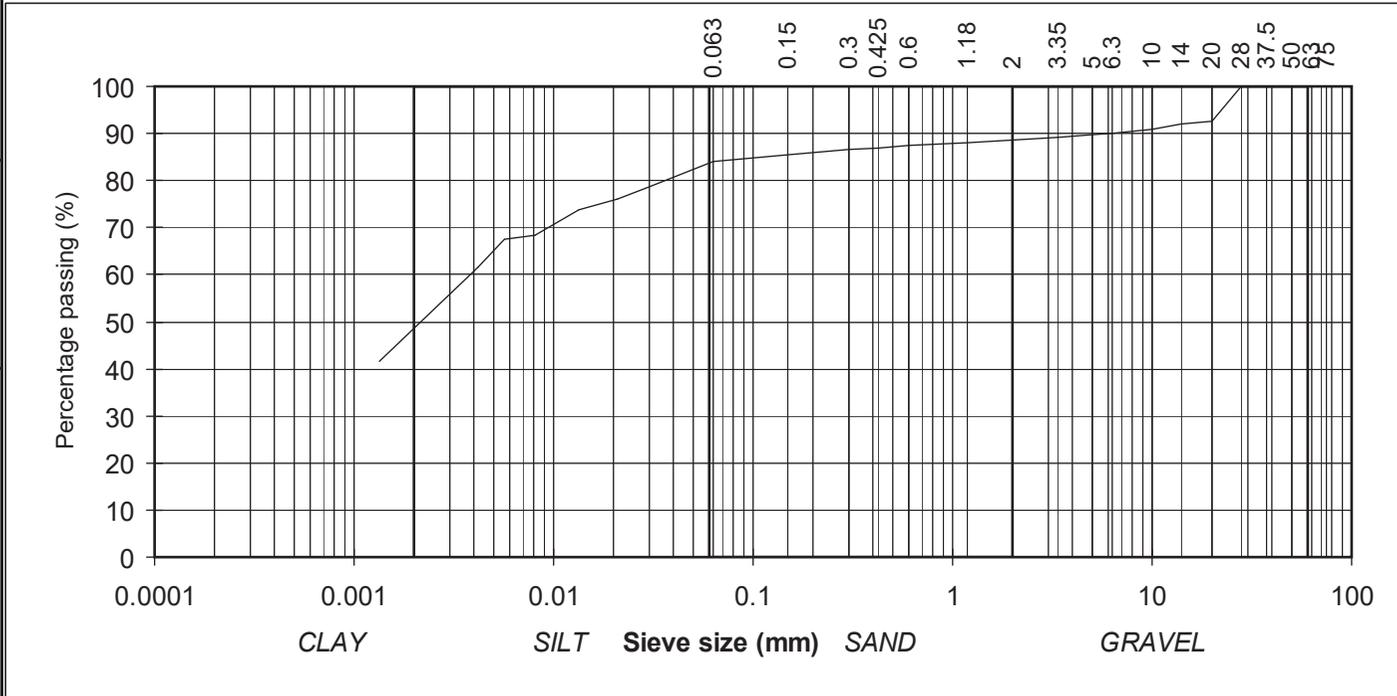
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	
20	93	GRAVEL
14	92	
10	91	
6.3	90	
5	90	
3.35	89	SAND
2	89	
1.18	88	
0.6	87	
0.425	87	
0.3	87	SILT/CLAY
0.15	85	
0.063	84	
0.029	78	
0.021	76	
0.013	74	
0.008	68	
0.006	67	
0.004	62	
0.001	42	

Contract No: 18963 Report No. R71130
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/32
 Sample No. AA48862 Lab. Sample No. A16/0966
 Sample Type: B
 Depth (m) 10.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Dark brown/grey slightly sandy, slightly gravelly, SILT

Remarks



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Persons authorised to approve report: 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

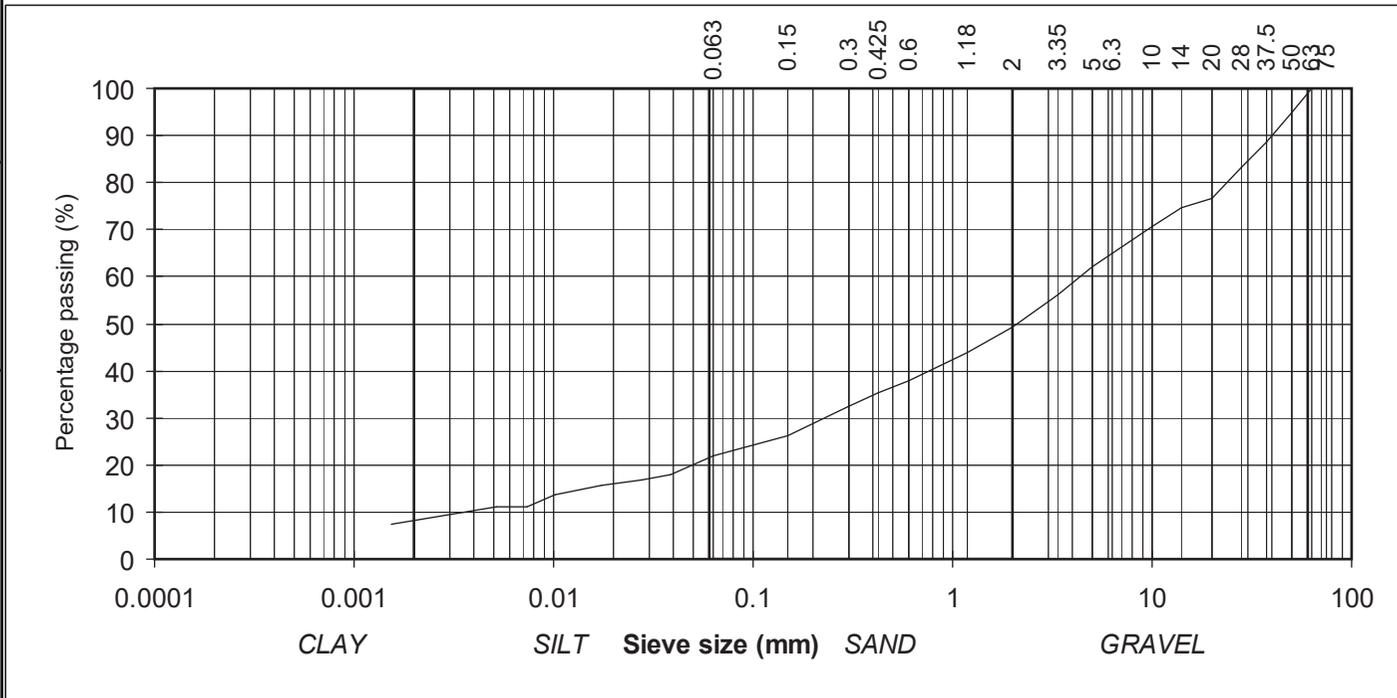
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	95	
37.5	89	GRAVEL
28	83	
20	77	
14	75	
10	71	
6.3	65	
5	62	
3.35	56	SAND
2	49	
1.18	44	
0.6	38	
0.425	35	SILT/CLAY
0.3	32	
0.15	26	
0.063	22	
0.038	18	
0.027	17	
0.017	16	
0.010	14	
0.007	11	
0.005	11	
0.002	7	

Contract No: 18963 Report No. R71131
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/33
 Sample No. AA48863 Lab. Sample No. A16/0967
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown/grey slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: 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

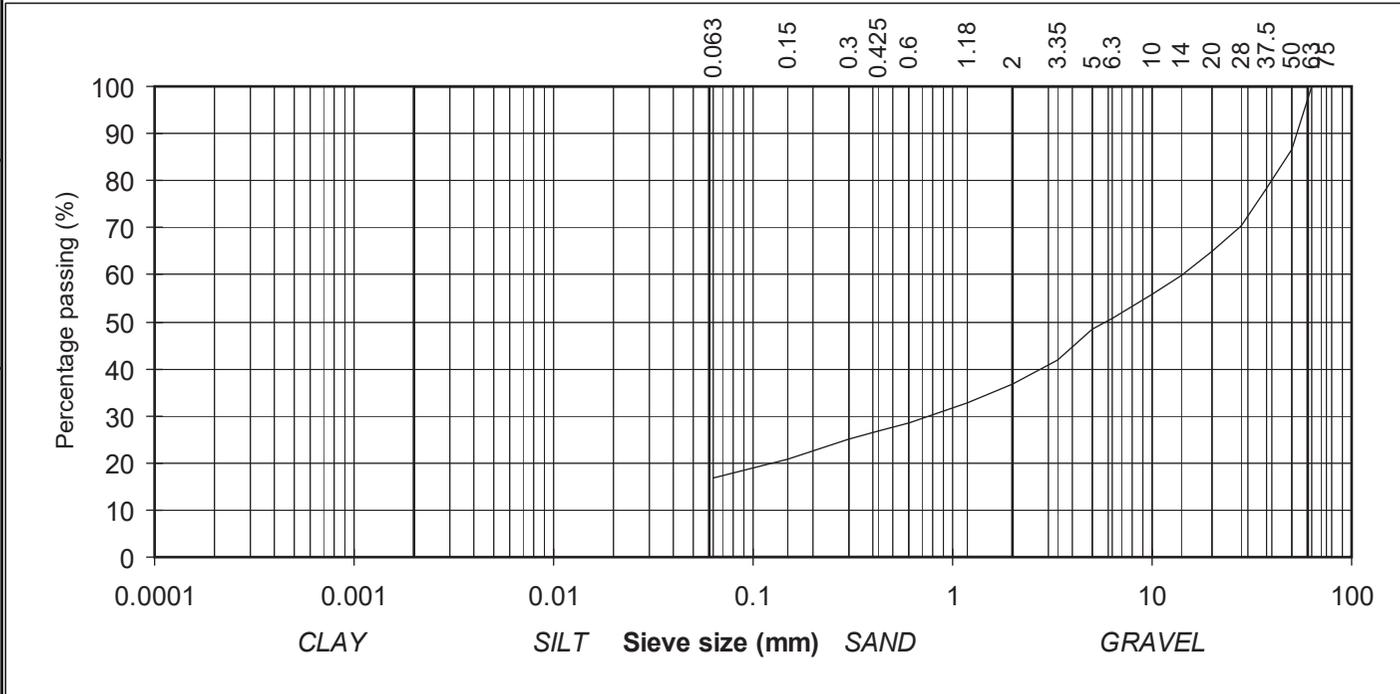
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	86	
37.5	78	GRAVEL
28	70	
20	65	
14	60	
10	56	
6.3	51	
5	48	
3.35	42	SAND
2	37	
1.18	33	
0.6	29	
0.425	27	SILT/CLAY
0.3	25	
0.15	21	
0.063	17	

Contract No: 18963 Report No. R71332
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/33
 Sample No. AA48864 Lab. Sample No. A16/0968
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 30-03-16
 Description: Light brown/grey silty, very sandy, GRAVEL

Remarks: Sample size did not meet the requirements of BS1377



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Persons authorised to approve report: 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

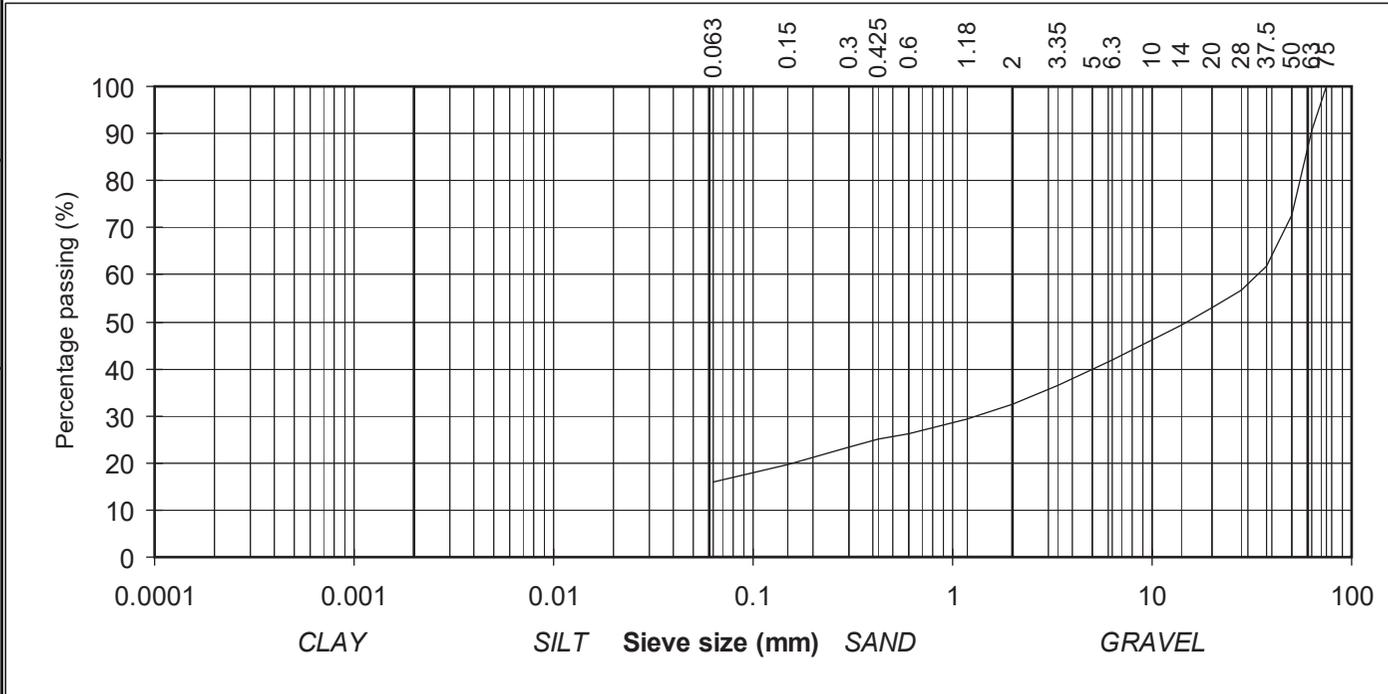
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	91	
50	73	
37.5	62	
28	57	
20	53	GRAVEL
14	49	
10	46	
6.3	42	
5	40	
3.35	37	
2	33	
1.18	29	
0.6	26	
0.425	25	
0.3	23	
0.15	20	
0.063	16	SILT/CLAY

Contract No: 18963 Report No. R71082
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/33
 Sample No. AA48865 Lab. Sample No. A16/0969
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown silty, sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	01-04-16	1 of 1

Persons authorised to approve report: 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

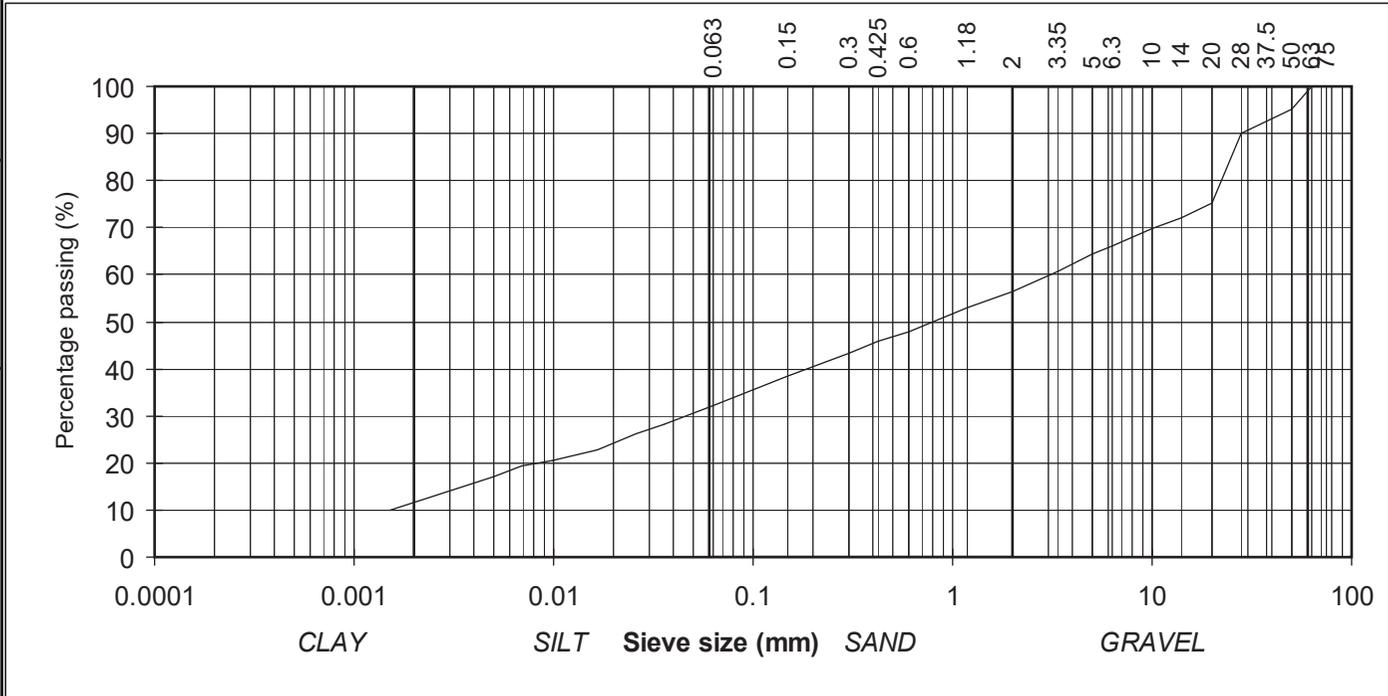
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	95	
37.5	93	GRAVEL
28	90	
20	75	
14	72	
10	70	
6.3	66	
5	64	
3.35	61	SAND
2	56	
1.18	53	
0.6	48	
0.425	46	SILT/CLAY
0.3	43	
0.15	39	
0.063	32	
0.036	28	
0.026	26	
0.017	23	
0.010	20	
0.007	19	
0.005	17	
0.002	10	

Contract No: 18963 Report No. R71083
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/34
 Sample No. AA48866 Lab. Sample No. A16/0970
 Sample Type: B
 Depth (m) 0.50 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	29-03-16	1 of 1

Persons authorised to approve report: 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

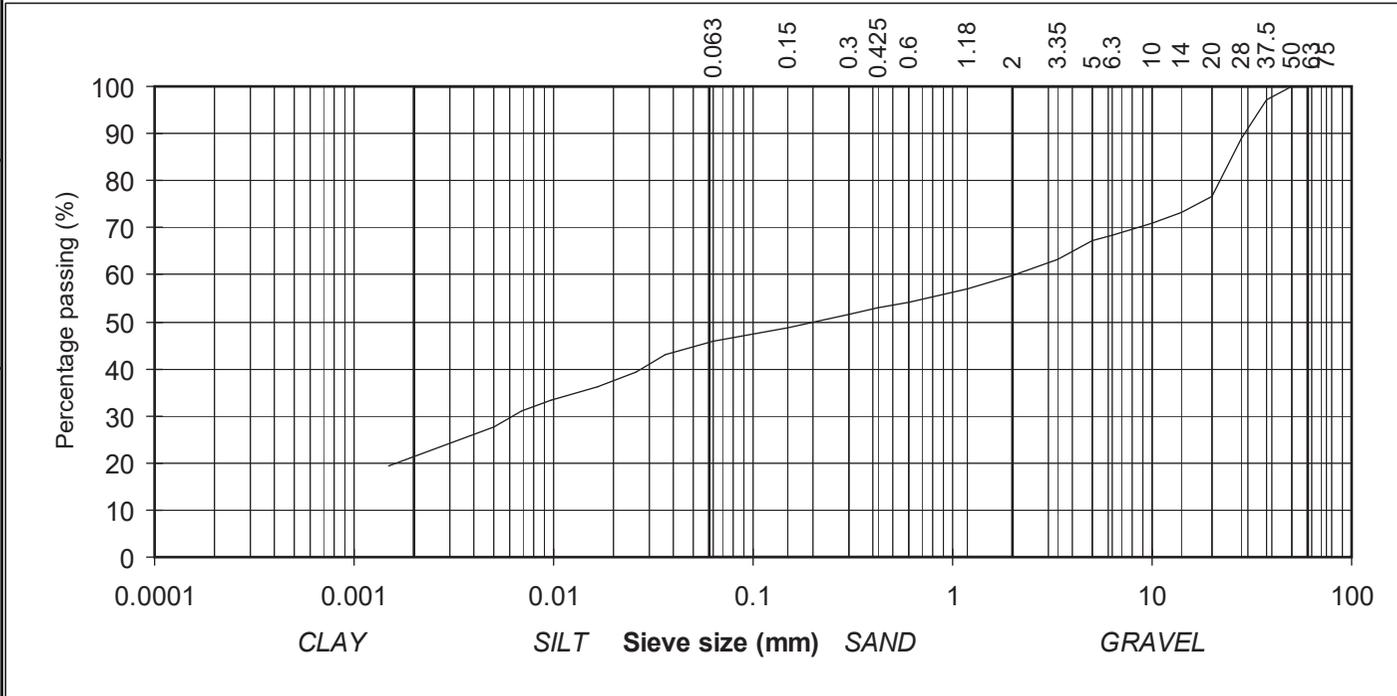
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	97	GRAVEL
28	89	
20	77	
14	73	
10	71	
6.3	68	
5	67	
3.35	63	SAND
2	60	
1.18	57	
0.6	54	
0.425	53	SILT/CLAY
0.3	51	
0.15	49	
0.063	46	
0.036	43	
0.026	39	
0.017	36	
0.010	33	
0.007	31	
0.005	28	
0.001	19	

Contract No: 18963 Report No. R71084
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/34
 Sample No. AA48867 Lab. Sample No. A16/0971
 Sample Type: B
 Depth (m) 1.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	23-03-16	1 of 1

Persons authorised to approve report: 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

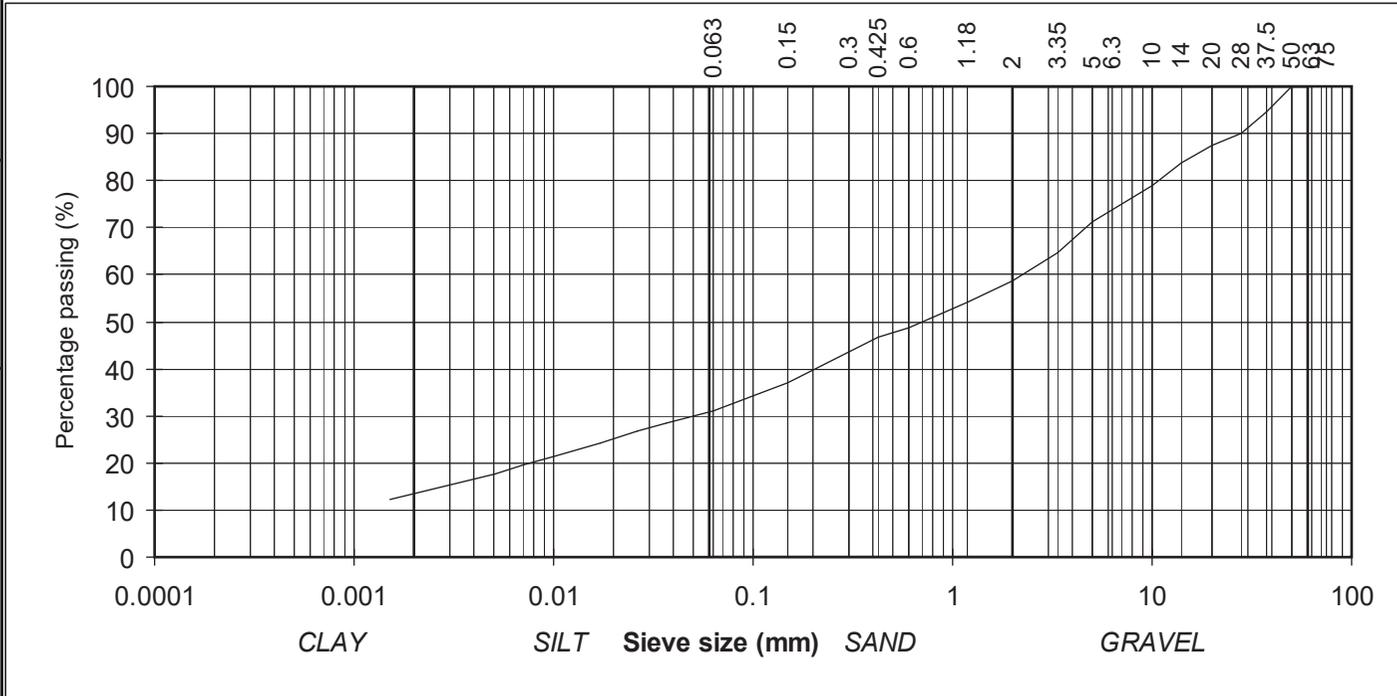
(note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	95	GRAVEL
28	90	
20	87	
14	84	
10	79	
6.3	74	
5	71	
3.35	65	SAND
2	59	
1.18	54	
0.6	49	
0.425	47	SILT/CLAY
0.3	44	
0.15	37	
0.063	31	
0.037	29	
0.026	27	
0.017	24	
0.010	21	
0.007	20	
0.005	18	
0.002	12	

Contract No: 18963 Report No. R71085
 Contract: GCTP Phase 3 - Contact 1
 BH: BH3/34
 Sample No. AA48868 Lab. Sample No. A16/0972
 Sample Type: B
 Depth (m) 2.00 Customer: Galway Co.Co.
 Date Received 12-02-16 Date Testing started 14-03-16
 Description: Light brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	<i>H Byrne</i>	01-04-16	1 of 1

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

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 Unit J5,M7 Business Park
 Naas Co.Kildare
 045 899324

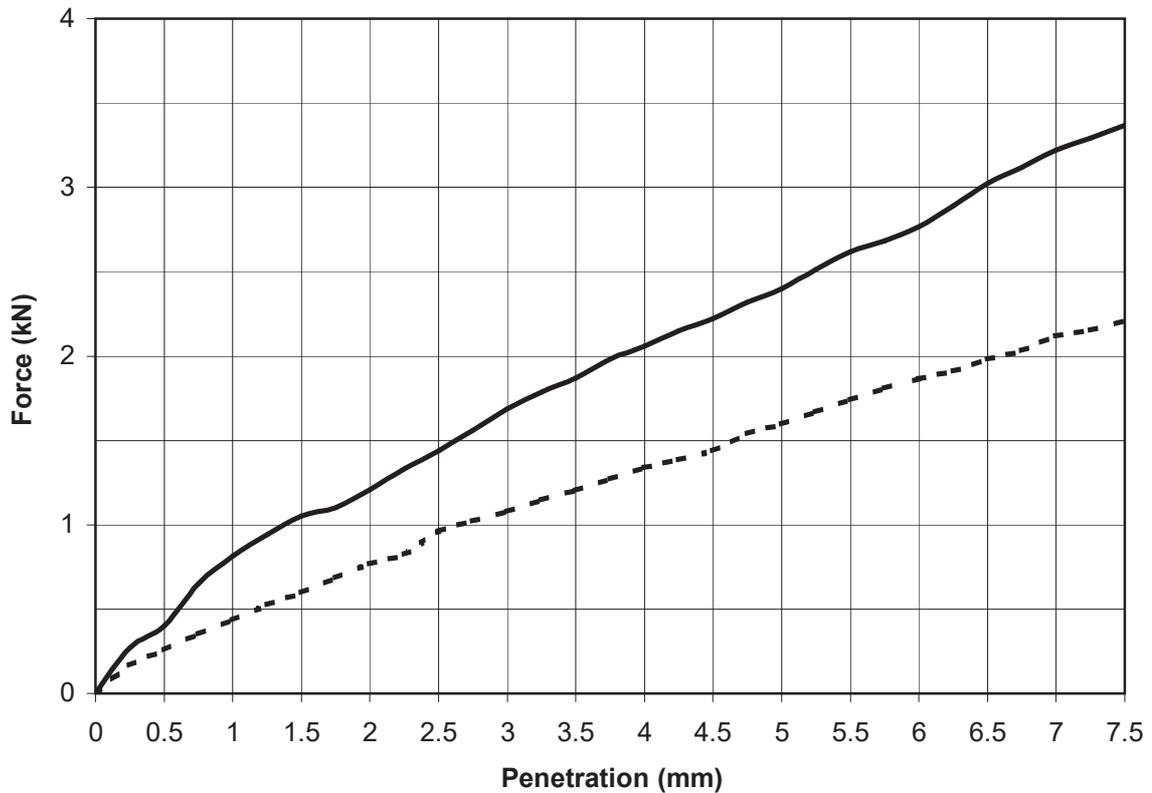
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71512	Contract	GCTP Phase 3 - Contract 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	12-02-16	Date Tested	14-04-16	
BH/TP No.	BH3/23	Sample No.	AA32640	Type: B
Depth (m)	1.00	Lab sample No.	A16/0952	



Key: ————— Top - - - - - Base

Description: Dark brown silty, very sandy, GRAVEL			
Initial Condition:		Unsoaked	
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.27
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.04
% Material >20mm:	26		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	12	8
Moisture Content %	11	12

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

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
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 045 899324

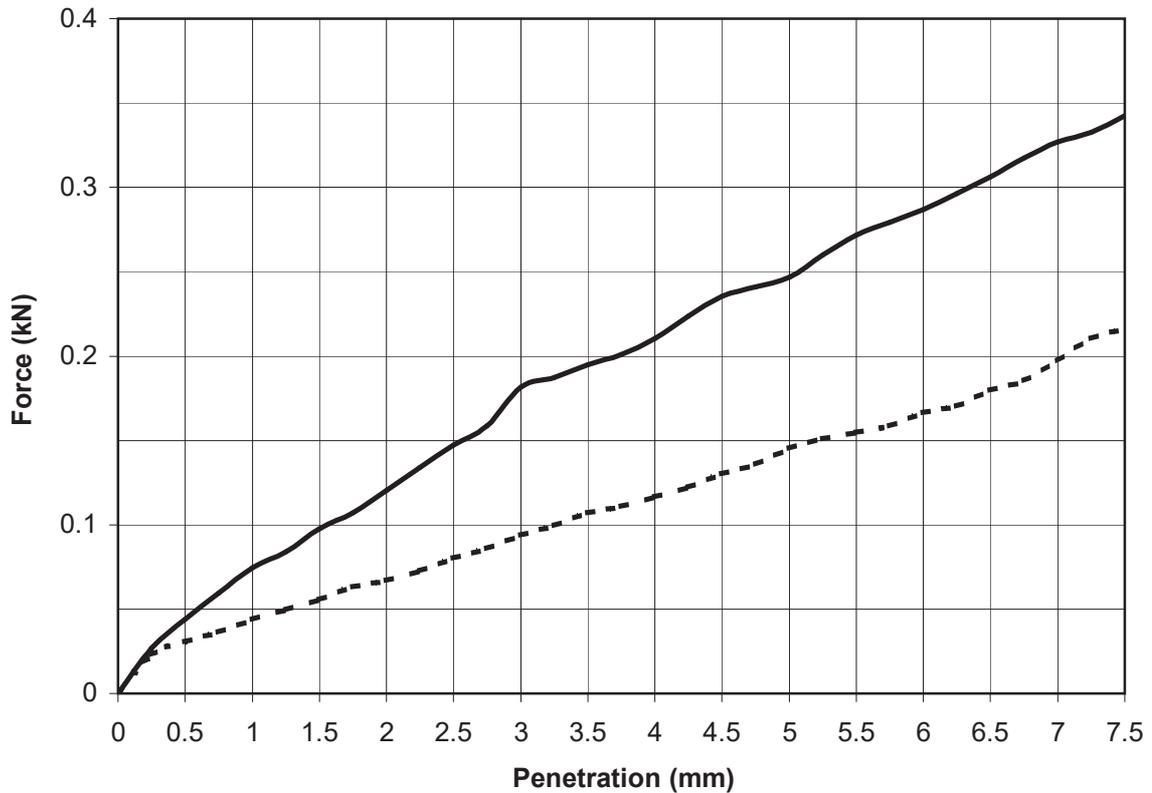
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71419	Contract	GCTP Phase 3 - Contract 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	12-02-16	Date Tested	06-04-16
BH/TP No.	BH3/32	Sample No.	AA48852 Type: B
Depth (m)	1.00	Lab sample No.	A16/0956



Key: ————— Top - - - - - Base

Description: Mottled light brown slightly sandy, gravelly, SILT with some cobbles			
Initial Condition:		Unsoaked	
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.22
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.06
% Material >20mm:	16		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	1.2	0.7
Moisture Content %	8	8

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

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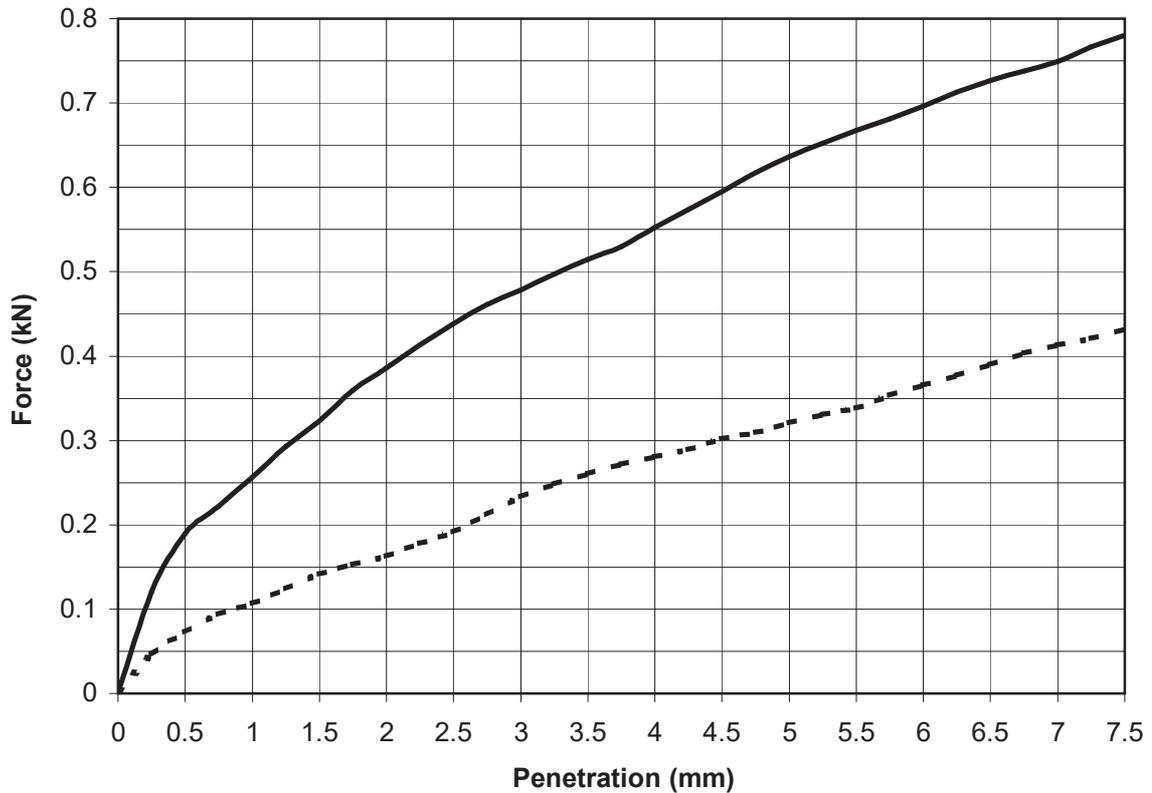
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TEST REPORT
Determination of California Bearing Ratio (CBR)



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

Report No.	R71420	Contract	GCTP Phase 3 - Contract 1
Contract No.	18963	Customer	Galway Co.Co.
Date received	12-02-16	Date Tested	06-04-16
BH/TP No.	BH3/32	Sample No.	AA48859 Type: B
Depth (m)	7.00	Lab sample No.	A16/0963



Key: ————— Top - - - - - Base

Description: Dark brown/grey slightly sandy, slightly gravelly, SILT			
Initial Condition:		Unsoaked	
Moisture Content (%):	29	Bulk Density (Mg/m ³):	1.91
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.48
% Material >20mm:	4.9		
Method of compaction: Static Compaction Method 2			

Test Result	Top	Base
CBR %	3.3	1.6
Moisture Content %	28	31

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

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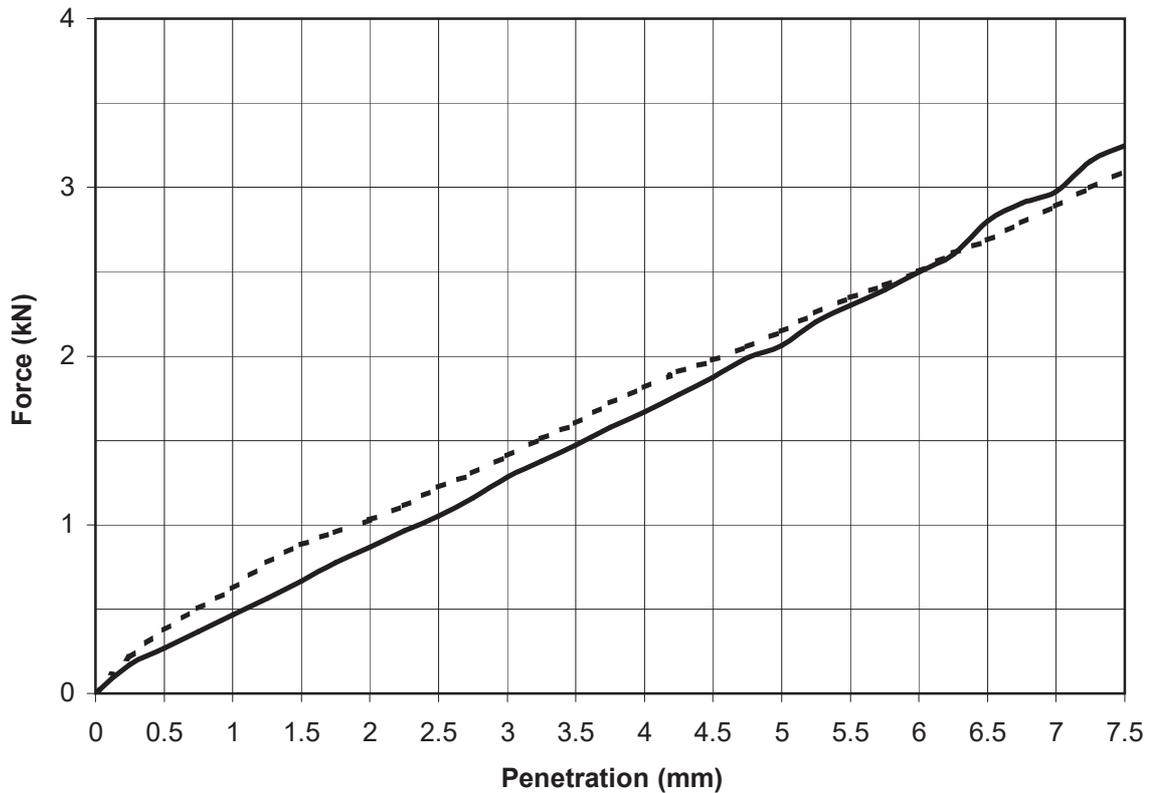
TEST REPORT

Determination of California Bearing Ratio (CBR)



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

Report No.	R71514	Contract	GCTP Phase 3 - Contract 1	
Contract No.	18963	Customer	Galway Co.Co.	
Date received	12-02-16	Date Tested	14-04-16	
BH/TP No.	BH3/33	Sample No.	AA48863	Type: B
Depth (m)	0.50	Lab sample No.	A16/0967	



Key: ————— Top - - - - - Base

Description: Light brown/grey slightly sandy, gravelly, SILT			
Initial Condition:		Unsoaked	
Moisture Content (%):	14	Bulk Density (Mg/m ³):	2.31
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.02
% Material >20mm:	37		
Method of compaction:		Static Compaction Method 2	

Test Result	Top	Base
CBR %	10	11
Moisture Content %	14	15

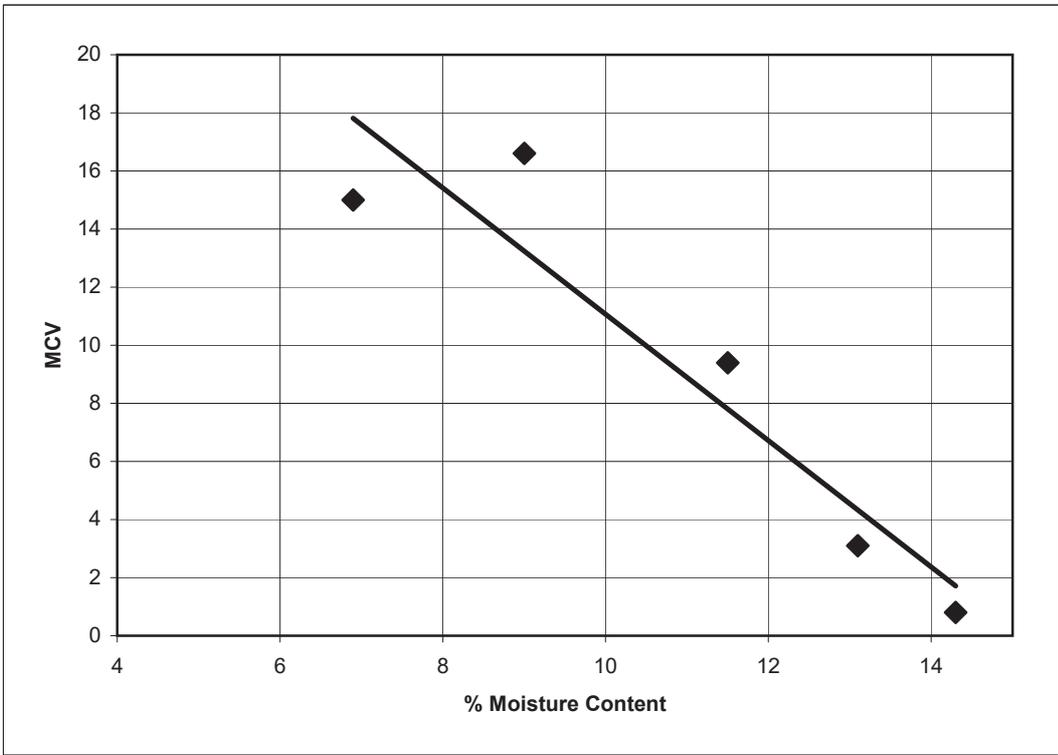
Persons authorized to approve reports
 J Barrett (Dep. Quality Manager)
 H Byrne (Quality Manager)

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. R71513 Contract GCTP Phase 3 - Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 12-02-16 Date Tested 06-04-16
 BH/TP No. BH3/32 Sample No. AA48854 Type: B
 Depth (m) 3.00 Lab sample No. A16/0958

MC%	12	6.9	9.0	13	14
MCV	9.4	15.0	16.6	3.1	0.8



% material >20mm 39

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

IGSL Ltd Materials Laboratory

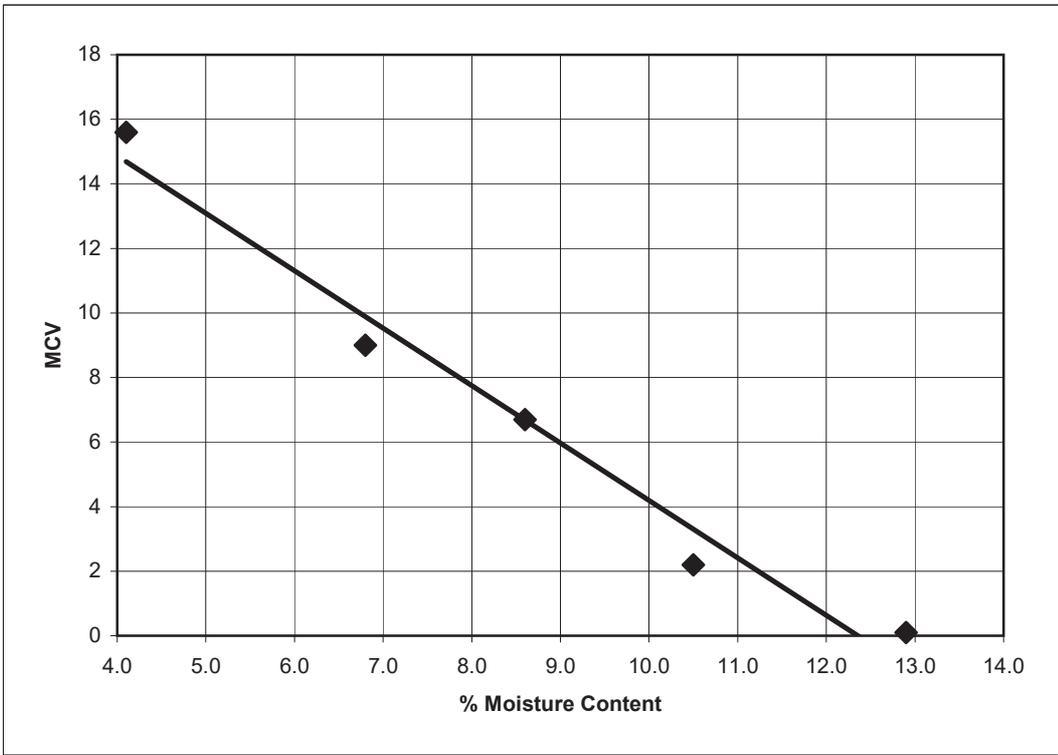
Approved by	Date	Page No.
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IGSL Ltd
 Materials Laboratory
 M7 Business Park
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 045 846176

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

Report No.	R71515	Contract	GCTP Phase 3 - Contract 1 GI
Contract No.	18963	Customer	Galway Co.Co.
Date received	12-02-16	Date Tested	05-04-16
BH/TP No.	BH3/33	Sample No.	AA48864 Type: B
Depth (m)	1.00	Lab sample No.	A16/0968

MC%	8.6	4.1	6.8	11	13
MCV	6.7	15.6	9.0	2.2	0.1



% material >20mm 26

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

IGSL Ltd Materials Laboratory

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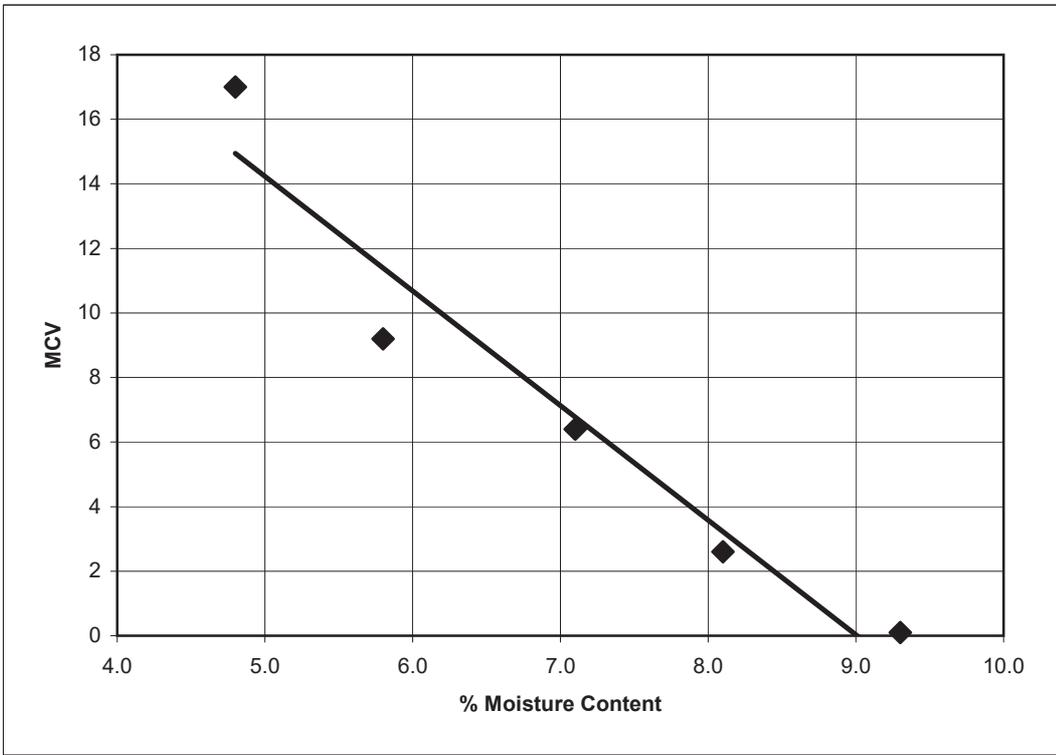
IGSL Ltd
 Materials Laboratory
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 045 846176

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

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

Report No. R71583 Contract GCTP Phase 3 - Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 12-02-16 Date Tested 13-04-16
 BH/TP No. BH3/33 Sample No. AA48865 Type: B
 Depth (m) 2.00 Lab sample No. A16/0969

MC%	4.8	8.1	5.8	9.3	7.1
MCV	17	2.6	9.2	0.1	6.4



% material >20mm 16

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

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Approved by	Date	Page No.
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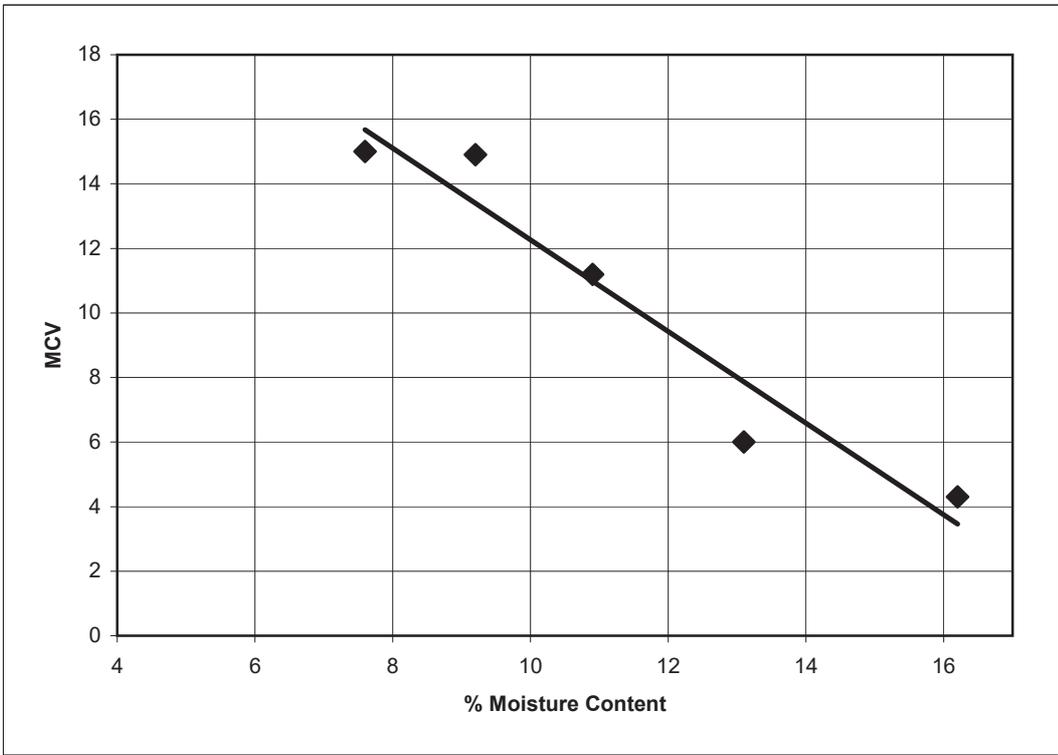
IGSL Ltd
 Materials Laboratory
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 045 846176

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

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

Report No.	R71517	Contract	GCTP Phase 3 - Contract 1 GI
Contract No.	18963	Customer	Galway Co.Co.
Date received	12-02-16	Date Tested	12-04-16
BH/TP No.	BH3/34	Sample No.	AA48867 Type: B
Depth (m)	1.00	Lab sample No.	A16/0971

MC%	13	11	9.2	7.6	16
MCV	6	11.2	14.9	15	4.3



% material >20mm 6.6

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
<i>H Byrne</i>	15-04-16	1 of 1

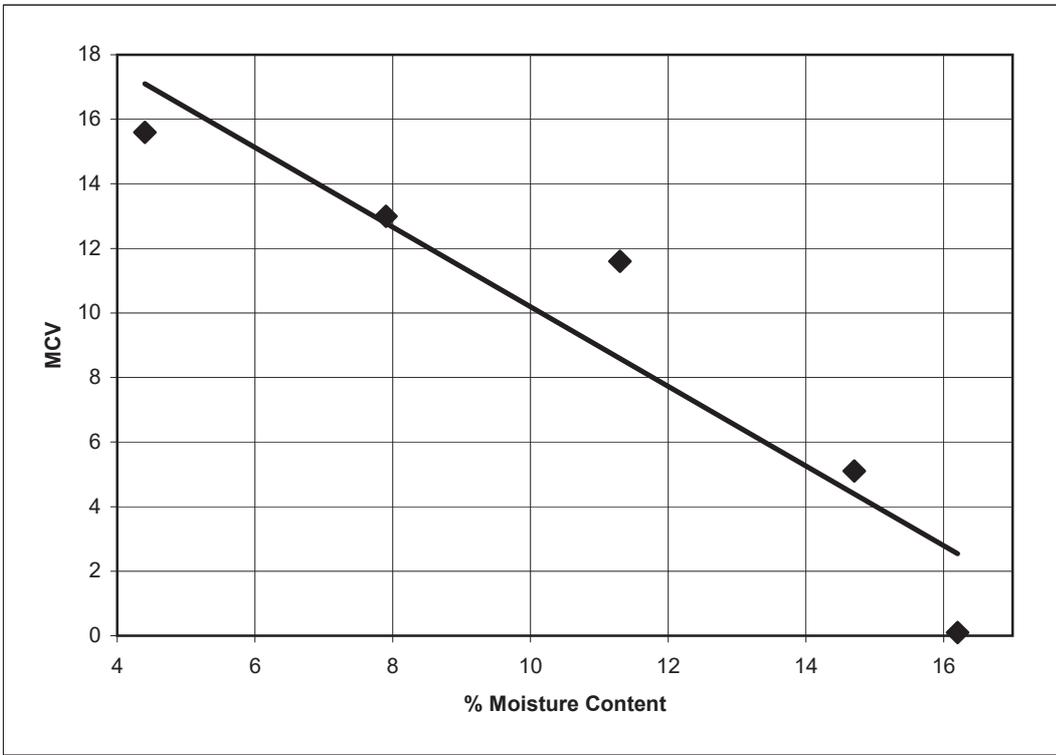
IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

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

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

Report No. R71516 Contract GCTP Phase 3 - Contract 1 GI
 Contract No. 18963 Customer Galway Co.Co.
 Date received 12-02-16 Date Tested 14-04-16
 BH/TP No. BH3/34 Sample No. AA48868 Type: B
 Depth (m) 1.00 Lab sample No. A16/0972

MC%	16	11	7.9	4.4	15
MCV	0	11.6	13	15.6	5.1



% material >20mm 33

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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One dimensional Consolidation

BS1377:Part 5:1990

Report No. R71371

Contract: GCTP Phase 3

Contract number: 18963

BH: 3/32 Sample number: AA48857

Depth (m): 5.0

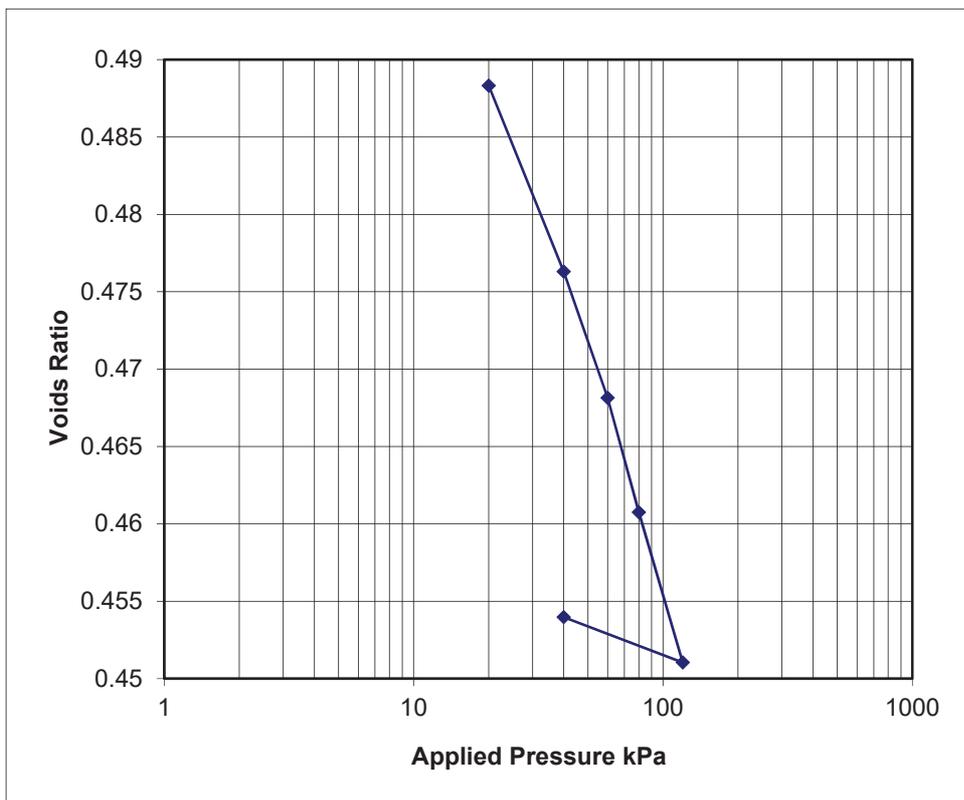
Description Grey sandy SILT

Specimen Height (mm) 20.0 Specimen diameter (mm) 75.0

	Initial	Final
Moisture content %	24	20
Bulk density Mg/m ³	2.13	2.21
Dry density Mg/m ³	1.72	1.84
Void ratio	0.541	0.454

Assumed Particle density Mg/m³ 2.65

Applied Pressure (kPa)	m_v (m ² /MN)	c_v (m ² /year)	Voids Ratio
0 - 20	1.695	9.752	0.48832
20 - 40	0.404	12.846	0.47631
40 - 60	0.277	20.275	0.46814
60 - 80	0.252	11.145	0.46075
80 - 120	0.166	13.674	0.45104
120 - 40	0.025	32.892	0.45397





Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 30319

Client's Reference: **18963 PO 8443**

Report Date: **03-04-2016**

Client **Irish Geotechnical Services Limited**
M7 Business Park
Naas
Co. Kildare
Ireland

Contract Title: **G.C.T.P**
For the attention of: **Hugh Byrne**

Date Received: **18-03-2016**
Date Commenced: **18-03-2016**
Date Completed: **03-04-2016**

Test Description	Qty
Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only) Non Accredited Test - @ Non Accredited Test	4
Disposal of Samples on Project	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

Test Report: Quick Shearbox Test

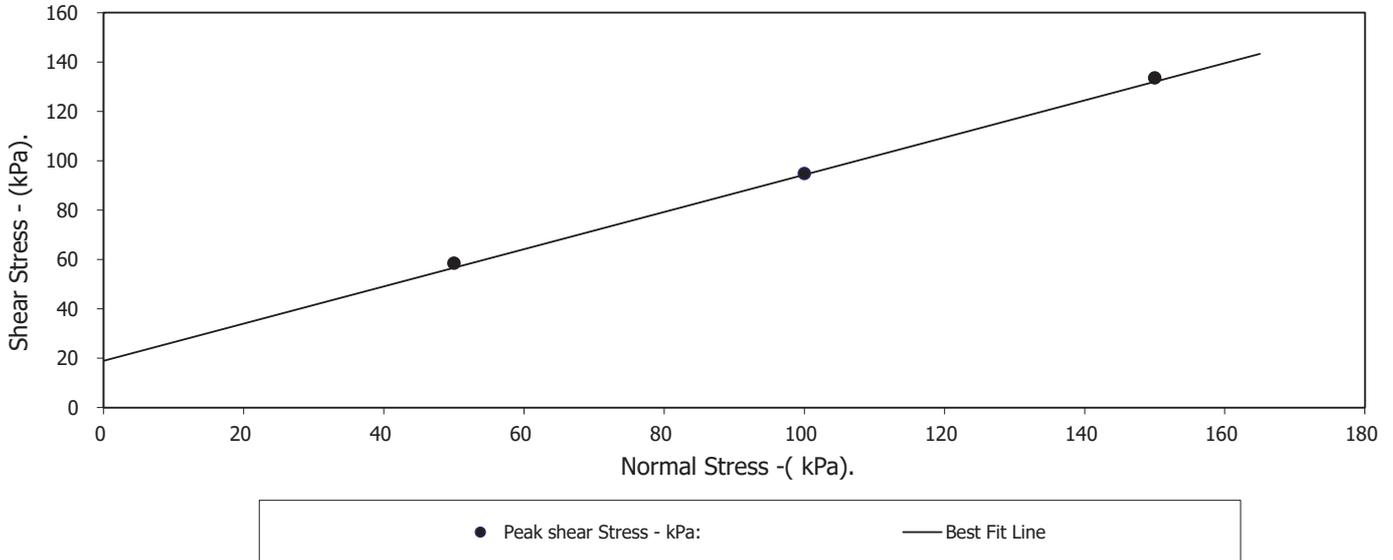
BS1377:Part 7:4.5 :1990.

Borehole: BH3/22 Depth (m) from: 0.30
 Sample Number : A16/0986 Depth (m) to: 0.00

Sample Type:	D		
Particle Density - Mg/m3:	2.65 (Assumed)		
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed		
Sample Description: Brown silty clayey sandy (fine-coarse) GRAVEL (fine-coarse/angular-subangular)			
STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	13	13	13
Bulk Density - Mg/m3:	1.95	1.95	1.95
Dry Density - Mg/m3:	1.73	1.73	1.73
Voids Ratio:	0.5346	0.5344	0.5340
Normal Pressure- kPa	50	100	150
Consolidation			
Consolidated Height - mm:	23.95	23.58	23.21
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.11	9.85	9.58
Peak shear Stress - kPa:	59	95	134

PEAK	
Angle of Shearing Resistance:(θ)	37.0
Effective Cohesion - kPa:	19

FAILURE CONDITIONS



DP Gans 01/04/16
 Checked Page 1 by: Date

DP Gans 01/04/16
 Approved Page 1 by: Date

Contract No.:
30319

Client Ref Number:
8443



G.C.T.P

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

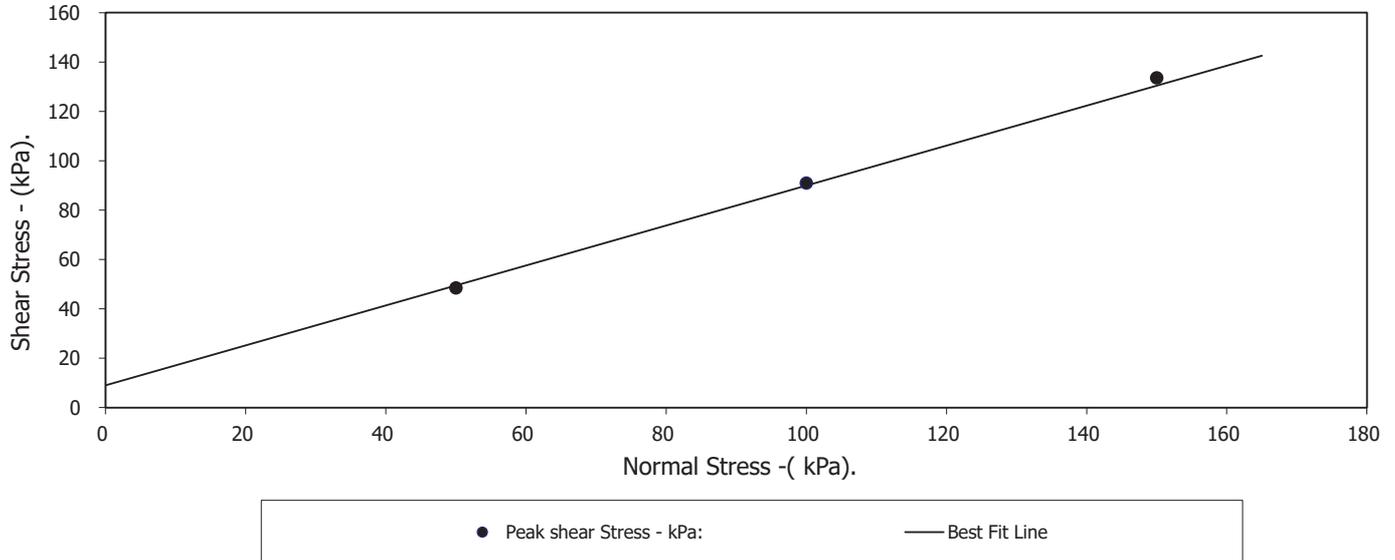
Borehole: BH3/23 Depth (m) from: 3.50
 Sample Number : A16/0954 Depth (m) to: 0.00

Sample Type:	D
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description: Light brown sandy (fine-medium) silty GRAVEL (fine-coarse/subangular-subrounded)			
STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	14	14	14
Bulk Density - Mg/m3:	2.20	2.20	2.20
Dry Density - Mg/m3:	1.94	1.93	1.93
Voids Ratio:	0.3694	0.3709	0.3726
Normal Pressure- kPa	50	100	150
Consolidation			
Consolidated Height - mm:	24.11	23.86	23.60
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.20	10.06	9.92
Peak shear Stress - kPa:	48	91	134

PEAK	
Angle of Shearing Resistance:(θ)	39.0
Effective Cohesion - kPa:	9

FAILURE CONDITIONS



DP Gans 01/04/16
 Checked Page 1 by: Date
DP Gans 01/04/16
 Approved Page 1 by: Date



G.C.T.P

Contract No.:
30319

Client Ref Number:
8443

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

Borehole: BH3/32 Depth (m) from: 2.00
 Sample Number : A16/0957 Depth (m) to: 0.00

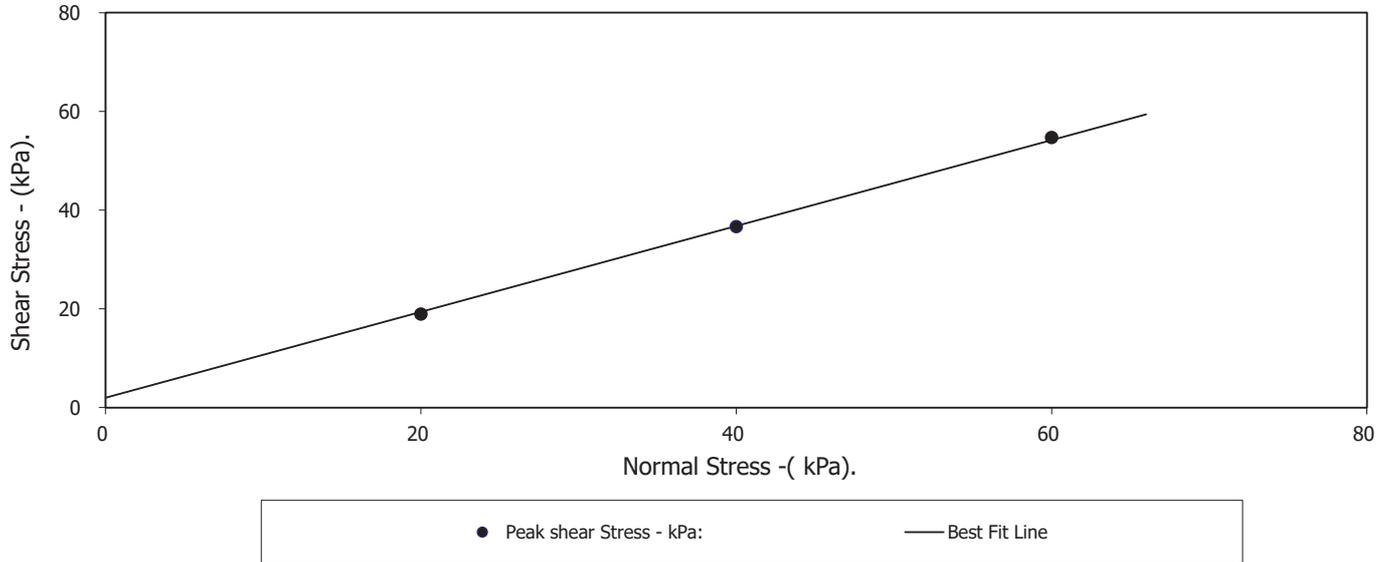
Sample Type:	D
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:
Light brown grey sandy (fine-medium) gravelly (fine-coarse/subangular-subrounded) silty CLAY

STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	12	12	12
Bulk Density - Mg/m3:	2.22	2.22	2.22
Dry Density - Mg/m3:	1.97	1.97	1.98
Voids Ratio:	0.3432	0.3425	0.3407
Normal Pressure- kPa	20	40	60
Consolidation			
Consolidated Height - mm:	24.46	24.24	24.03
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.87	10.49	10.10
Peak shear Stress - kPa:	19	37	55

PEAK	
Angle of Shearing Resistance:(θ)	41.0
Effective Cohesion - kPa:	2

FAILURE CONDITIONS



DP Gans 01/04/16
 Checked Page 1 by: Date

DP Gans 01/04/16
 Approved Page 1 by: Date



G.C.T.P

Contract No.:
30319

Client Ref Number:
8443

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

Borehole: BH3/35 Depth (m) from: 1.00
 Sample Number : A16/0991 Depth (m) to: 0.00

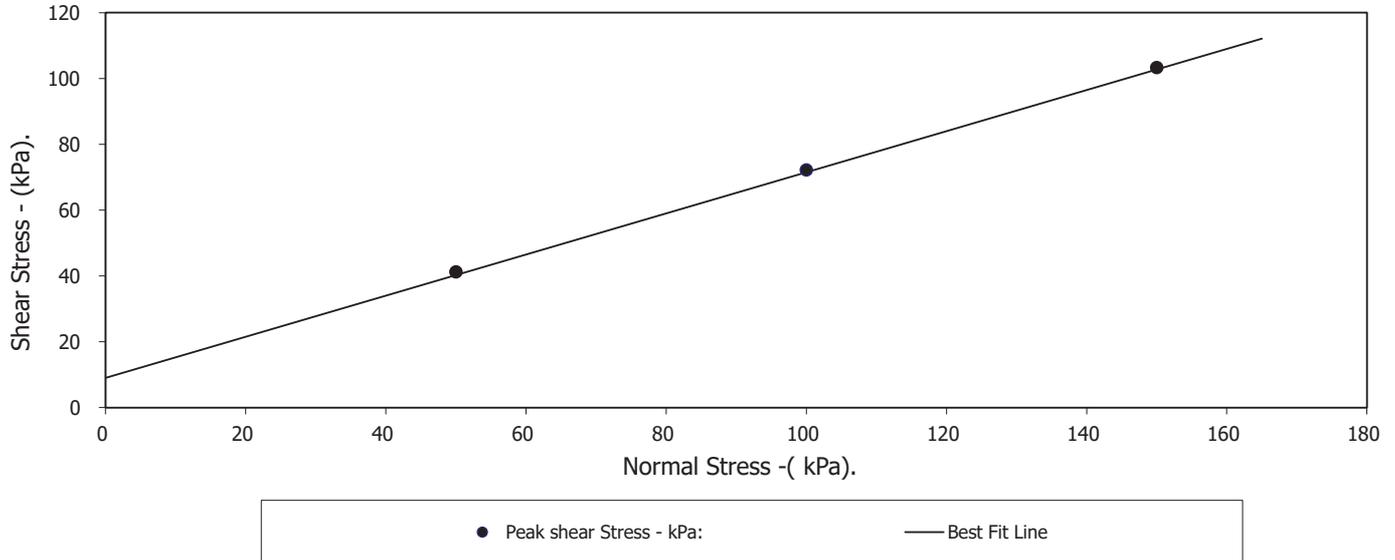
Sample Type:	D
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:
Light brown grey gravelly (fine-coarse/angular-subrounded) silty CLAY

STAGE	1	2	3
Initial Conditions			
Height - mm:	24.50	24.50	24.50
Length - mm:	59.90	59.90	59.90
Moisture Content - %:	11	11	11
Bulk Density - Mg/m3:	2.22	2.22	2.22
Dry Density - Mg/m3:	1.99	2.00	2.00
Voids Ratio:	0.3289	0.3276	0.3264
Normal Pressure- kPa	50	100	150
Consolidation			
Consolidated Height - mm:	24.20	23.82	23.44
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	10.38	9.95	9.51
Peak shear Stress - kPa:	41	72	103

PEAK	
Angle of Shearing Resistance:(θ)	32.0
Effective Cohesion - kPa:	9

FAILURE CONDITIONS



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Contract No.:
30319

Client Ref Number:
8443



G.C.T.P