



EIAR Volume 6: Onshore Infrastructure
Technical Appendices
Appendix 6.5.3–3:
Cable Route Ground Investigation

Kish Offshore Wind Ltd

RWE #SLR GOBe

**APEM**Group



# THIRD PARTY COVERSHEET

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# **Dublin Array Onshore Cable Route Ground Investigation**

Client: Dublin Array

Client's Representative: Gavin & Doherty Geosolutions (GDG)

Report No.: 23-0343

Date: February 2024

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# **Document Control Sheet**

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The works were conducted in accordance with:

UK Specification for Ground Investigation 2<sup>nd</sup> Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015+A1:2020, Code of practice for ground investigations.

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

Laboratory testing was conducted in accordance with:

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





# METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015+A1:2020, The Code of Practice for Ground Investigation.

Abbreviations used	on exploratory hole logs
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
В	Bulk disturbed sample.
LB	Large bulk disturbed sample.
SB	Sonic bulk disturbed sample.
D	Small disturbed sample.
С	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V VR	Shear vane test (borehole). Shear strength stated in kPa. V: undisturbed vane shear strength  VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of Nx5=Cu is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
$\overline{}$	Water strike: initial depth of strike.
_	Water strike: depth water rose to.
Abbreviations relating t	o rock core – reference Clause 36.4.4 of BS 5930: 2015+A1:2020
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.





# **Dublin Array Onshore Cable Route**

#### 1 **AUTHORITY**

On the instructions of Gavin & Doherty Geosolutions, ("the Client's Representative"), acting on the behalf of Dublin Array ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of onshore elements for a proposed offshore windfarm.

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

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

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

#### 2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, trial pits, slit trenches, soil and rock core sampling, environmental sampling, groundwater monitoring, in-situ and laboratory testing, and the preparation of a factual report on the findings.

#### 3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted across various sites along the proposed cable route from the proposed sub-station at the most western extent, located west of Carrickmines Retail Park, adjacent to Ballyogan Landfill, to the proposed landfall site at the most eastern extent, located at Shanganagh Allotments, south of Shanganah/Bray Wastewater Treatment Plant.

Works were completed within grass areas of council parks and private property.





#### 4 SITE OPERATIONS

#### 4.1 Summary of site works

Site operations, which were conducted between 11th September and 15th November 2023, comprised:

- fifteen boreholes
  - three light cable percussion boreholes (2 of which were inspection pits only)
  - ten boreholes by light cable percussive extended by rotary follow-on drilling methods
  - two boreholes by rotary drilling methods only
- a standpipe installation in one borehole
- fifteen machine dug trial pits/slit trenches; and
- GPR surveys

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

#### 4.2 Boreholes

A total of fifteen boreholes were put down in a minimum diameter of 150mm through soils and rock strata to their completion depths by a combination of methods, including light cable percussion boring by a Dando 2000 rig and rotary drilling by a Comacchio 405 tracked rotary drilling rig.

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

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

#### 4.2.1 Light cable percussion boreholes

Three boreholes, as listed in Table 1 below, were put down to completion in minimum 200mm diameter using a Dando 2000 light cable percussion boring rig. All boreholes were terminated on encountering virtual refusal on obstructions, including large boulders and weathered bedrock.



Table 1 Summary of cable percussion boreholes completed

GI Ref	Туре	Depth (mbgl)
WP03_BH11A	CP (Inspection pit only)	0.30
WP03_BH11B	CP (Inspection pit only)	0.80
WP03_BH14A	СР	2.80

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

Disturbed (bulk and small bag) samples were taken within the encountered strata. Environmental samples were taken at standard intervals, as directed by the Client's Representative.

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals using the split spoon sampler ( $SPT_{(s)}$ ) or solid cone attachment ( $SPT_{(c)}$ ). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix H.

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

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

Appendix B presents the borehole logs.

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

Ten boreholes as listed in Table 2 below, were put down to completion by a combination of light cable percussion boring using a Dando 2000 light cable percussion boring rig and rotary follow-on drilling techniques with core recovery in overburden and bedrock using a Comacchio 405 rotary drilling rig.



Table 2 Summary of cable percussion with rotary follow-on boreholes completed

GI Ref	Type	Depth (mbgl)
WP03_BH01	CP + RC	9.80
WP03_BH02	CP + RC	9.80
WP03_BH05	CP + RC	10
WP03_BH07	CP + RC	8
WP03_BH08	CP + RC	8
WP03_BH09	CP + RC	8
WP03_BH10	CP + RC	5.3
WP03_BH11	CP + RC	20.3
WP03_BH13	CP + RC	25
WP03_BH14	CP + RC	25

WP03\_BH10 was terminated due to encountering a possible service at 5.30mbgl and re-drilled at the location of WP03\_BH10A as a rotary only borehole.

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

Disturbed (bulk and small bag) samples were taken within the encountered strata. Undisturbed (U100) samples were taken where appropriate and as directed within fine soils. Environmental samples were taken at standard intervals, as directed by the Client's Representative.

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals throughout the overburden using the split spoon sampler ( $SPT_{(s)}$ ) or solid cone attachment ( $SPT_{(c)}$ ). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix H.

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

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

Where granular material was encountered that was not suitable for coring, rotary percussive drilling techniques were employed to advance the borehole to scheduled depth. SPTs were carried out at standard intervals throughout these sections, with small and bulk disturbed samples obtained where possible through the soil strata.





Where coring was carried out from the base of the cable percussion borehole to recover core samples of overburden and/or bedrock, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015+A1:2020: Code of practice for ground investigations*.

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

#### 4.2.3 Rotary drilled boreholes

Two boreholes as listed in Table 3 below, were put to their completion by rotary drilling techniques only using a Comacchio 405 rotary drilling rig.

**Table 3 Summary of rotary only boreholes** 

GI Ref	Type	Depth (mbgl)
WP03_BH06	RC Only	21.80
WP03_BH10A	RC Only	20.30

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

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the casing system to achieve a sufficient flush seal, after which rotary coring was employed to recover core samples of the overburden and bedrock. SPTs were carried out at standard intervals throughout the overburden in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals throughout the overburden using the split spoon sampler (SPT $_{(s)}$ ) or solid cone attachment (SPT $_{(c)}$ ). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix H.

Where coring was carried out within bedrock strata, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015+A1:2020: Code of practice for ground investigations*.

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





### 4.3 Standpipe installations

A groundwater monitoring standpipe was installed in WP03\_BH06.

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

#### 4.4 Trial pit/Slit trenches

Fifteen trial pit/slit trenches, as listed below in Table 4, were excavated by a combination of hand digging and mechanical excavation using a compact 3t tracked excavator fitted with a 600mm wide toothless bucket, to investigate the extent of the existing landfill site.

Table 4 Summary of trial pit/slit trenches completed.

GI Ref	GI Ref
WP03_TP01	WP03_TP05
WP03_TP02	WP03_TP06
WP03_TP03	WP03_TP06A
WP03_TP04	WP03_TP07
WP03_TP04A	WP03_TP07A
WP03_TP04B	WP03_TP08
WP03_TP04C	WP03_TP08A
	WP03_TP09

Environmental samples were taken at depths of as indicated by the Client in specific pits/trenches.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Drawing of the trenches and any elements of the landfill construction encountered during excavation are shown along with the slit trench logs in Appendix D, with photographs presented in Appendix E.

#### 4.5 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R10 GPS system employing VRS and real time kinetic (RTK) techniques.

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





#### 4.6 Groundwater monitoring

Following completion of site works, a groundwater data logger was installed in WP03\_BH06 to monitor groundwater levels over the course of 12 months. Ground water monitoring was carried out using a water interface probe.

Data from the logger will be downloaded and issued to the Client electronically at specified months throughout the year.

#### 4.7 GPR Surveys

Several phases of GPR surveys were completed across the proposed cable route from March to November 2023, by Scantech Geoscience Ltd to identify location and type of any services present.

Results of the survey have been presented to the Client electronically and are not presented within this report.

#### 5 LABORATORY WORK

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

### 5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **thermal resistivity:** single point and five-point thermal resistivity tests

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

The test results are presented in Appendix F.

# 5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- point load index
- unconfined compressive strength (UCS) tests





cherchar abrasivity testing

Table 5 Rock testing undertaken

Test	Test carried out in accordance with		
Point load index	ISRM Suggested Methods (1985) Suggested method for determining point-load		
	strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60		
Uniaxial	ISRM Suggested Methods (1981) Suggested method for determining		
compression	deformability of rock materials in uniaxial compression, Part 2		
strength tests	and		
	ISRM (2007) Ulusay R, Hudson JA (eds) The complete ISRM suggested methods		
	for rock characterization, testing and monitoring, 2007		
Cherchar Abrasivity	ASTM D7625-10; Standard Test Method for Laboratory Determination of		
Index	Abrasiveness of Rock Using the CERCHAR Method.		

The test results are presented in Appendix F.

# 5.3 Environmental laboratory testing of soils

Environmental testing, as specified by the Client's Representative was conducted on selected soil samples by Derwentside Environmental Testing Services in Consett, Durham.

Testing was carried out according to suites set out by the Client's Representative:

- Soil Analysis Suite
- Leachate Analysis Suite
- Inert WAC

Results of environmental laboratory testing are presented in Appendix G.

#### **6 GROUND CONDITIONS**

#### 6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise glacial till and alluvium. These deposits are underlain by Leinster Granite to the east and slates, phyllites and schists of the Maulin Formation to the east towards the coast.

# 6.2 Ground types encountered during investigation of the site

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





- **Topsoil:** encountered across the site in either it's natural state or reworked state with a thickness range of 100-300mm.
- **Made Ground (sub-base):** aggregate fill was encountered within some of the slit trenches in the landfill site, generally surrounding services.
- Made Ground (fill): generally reworked sandy gravelly clay fill or gravelly clayey sand encountered to various extents across the site. Pieces of plastic were encountered within the strata in WP03\_TP04A and WP03\_TP08. Encountered greatest in extent in WP03\_BH07, where the driller noted a hydrocarbon odour from the strata, WP03\_BH10 adjacent to the M50 motorway likely built up during construction, and WP03\_BH05, the location of an old construction compound.
- **Alluvium:** Medium dense to dense sand and gravel encountered adjacent to a stream in WP03\_BH07 and WP03\_BH08 to depth of 8.00mbgl.
- **Glacial Sands & Gravels:** Extensive sand and gravel deposits encountered in WP03\_BH14 to a depth of 25.00mbgl.
- **Glacial Till:** sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth, often with lenses of dense granular material.
- **Bedrock (Granite):** Granite of various strengths was encountered across the site from 2.30m in WP03\_BH02 to depths of 20.30m in WP03\_BH06, with depth to bedrock generally increasing eastwards across the site towards the Irish Sea.

#### 6.3 Groundwater

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

Groundwater was encountered during the ground investigation as water strikes at depths as shown in Table 6 below.

Table 6 Summary of groundwater strikes encountered during the ground investigation.

GI Ref	Water Level	Comments
GI KEI	(mbgl)	
WP03_BH05	1.00	
WP03_BH05	5.00	Rose to 4.80m after 20 mins
WP03_BH08	3.00	
WP03_BH10A	6.90	Rose to 6.00m after 20 mins
WP03_BH14	17.30	Major strike





WP03_TP01	1.750	
WP03_TP02	1.30	
WP03_TP04A	1.00	
WP03_TP08A	1.20	

Groundwater was not noted during drilling at some of the borehole locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any/additional groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out. It should also be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Groundwater was not noted in any of the other trial pit or slit trench excavations.

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

#### 7 REFERENCES

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

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. National Standards Authority of Ireland.

BS 5930: 2015+A1:2020: Code of practice for ground investigations. British Standards Institution.

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

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

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

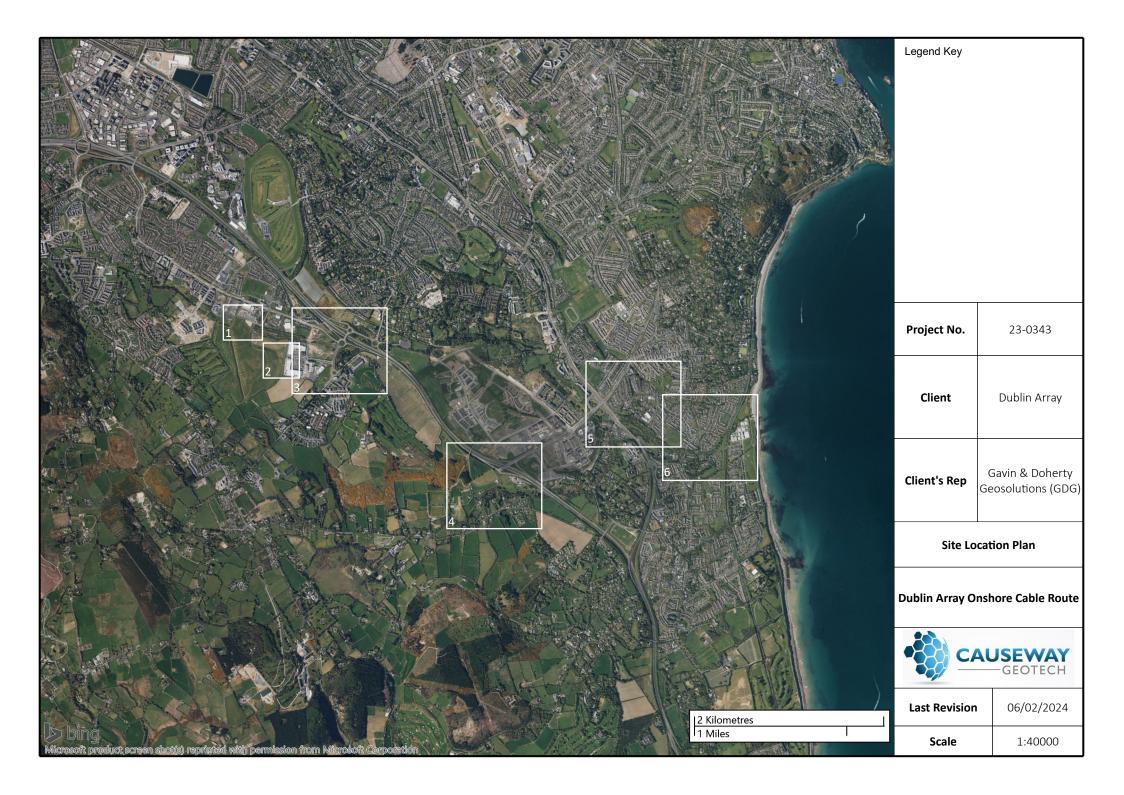
BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

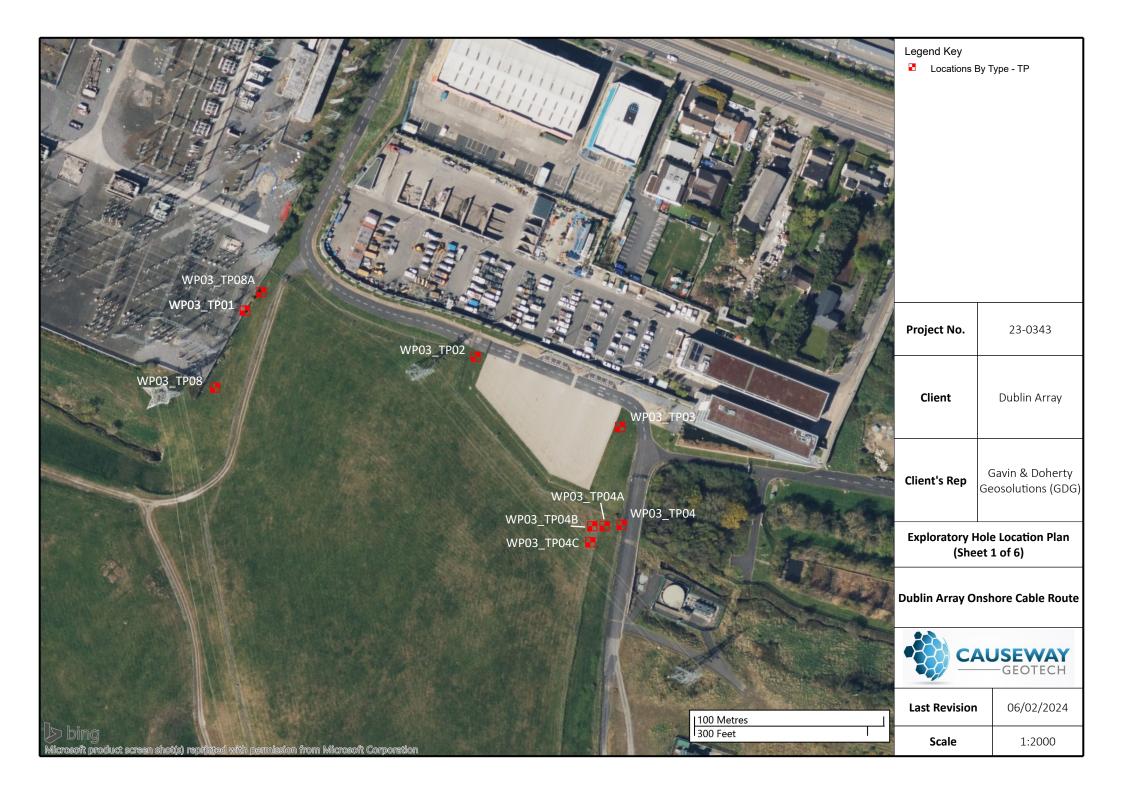
BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

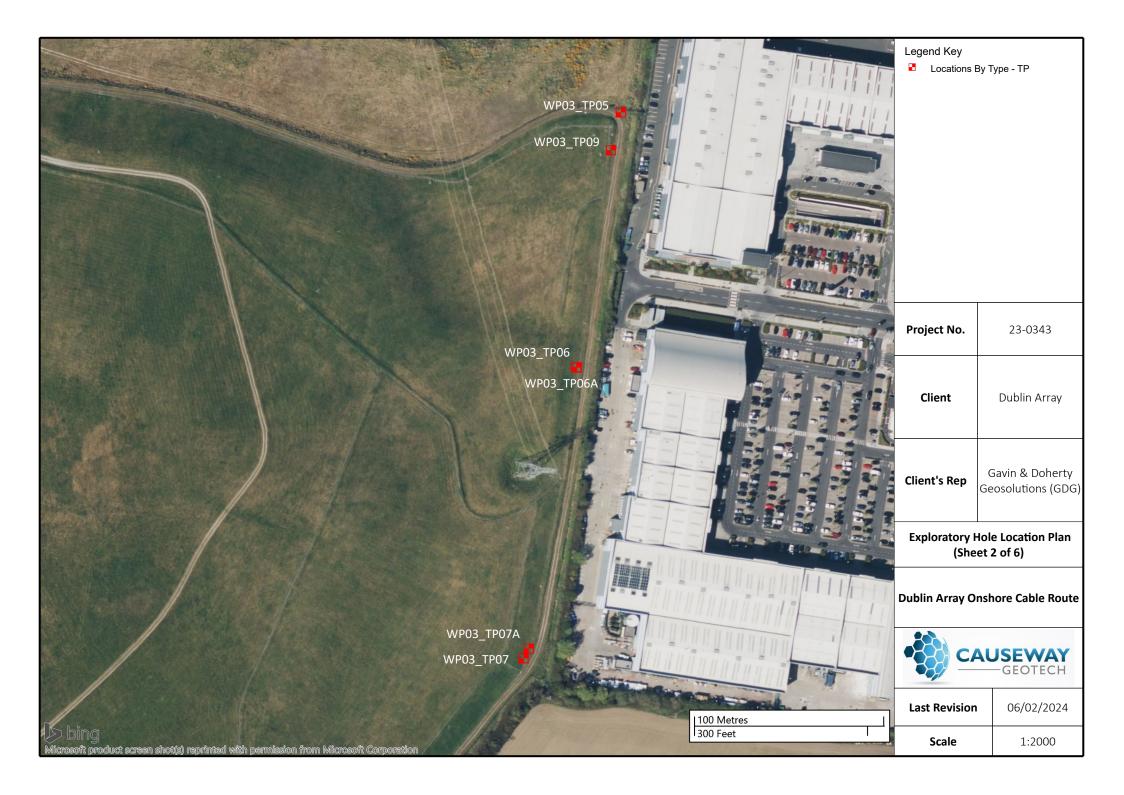


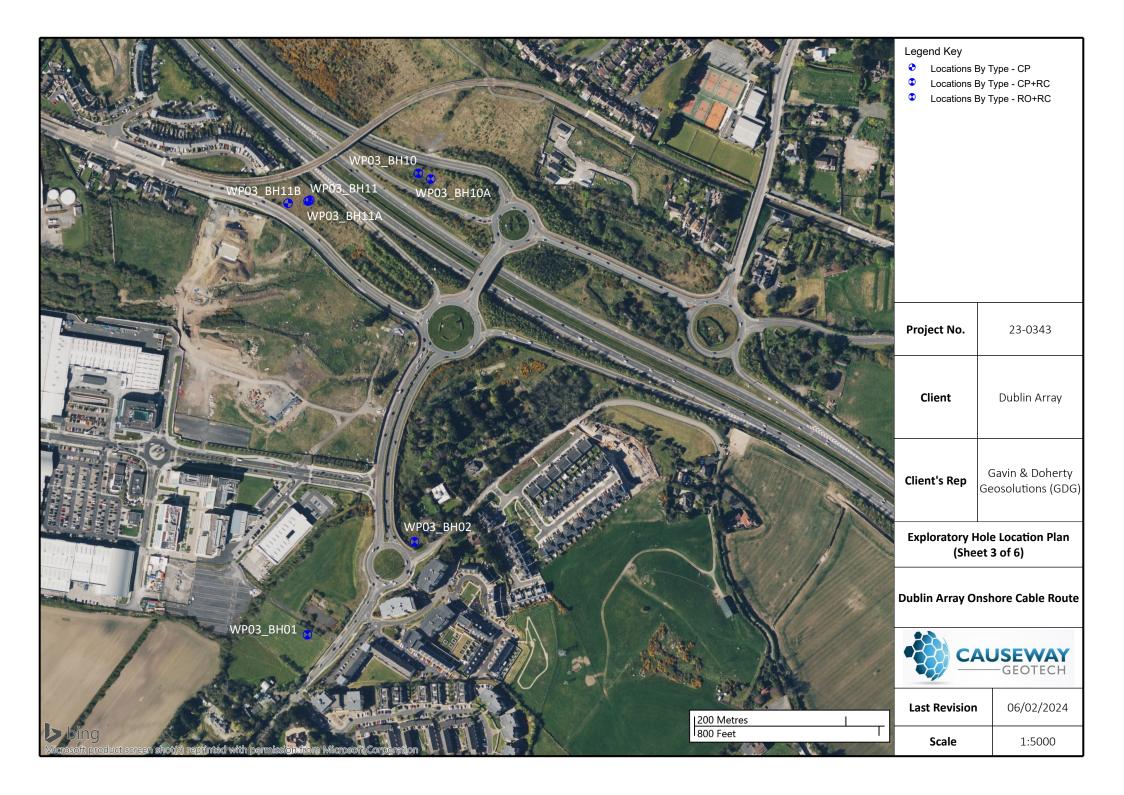
# APPENDIX A SITE AND EXPLORATORY HOLE LOCATION PLANS

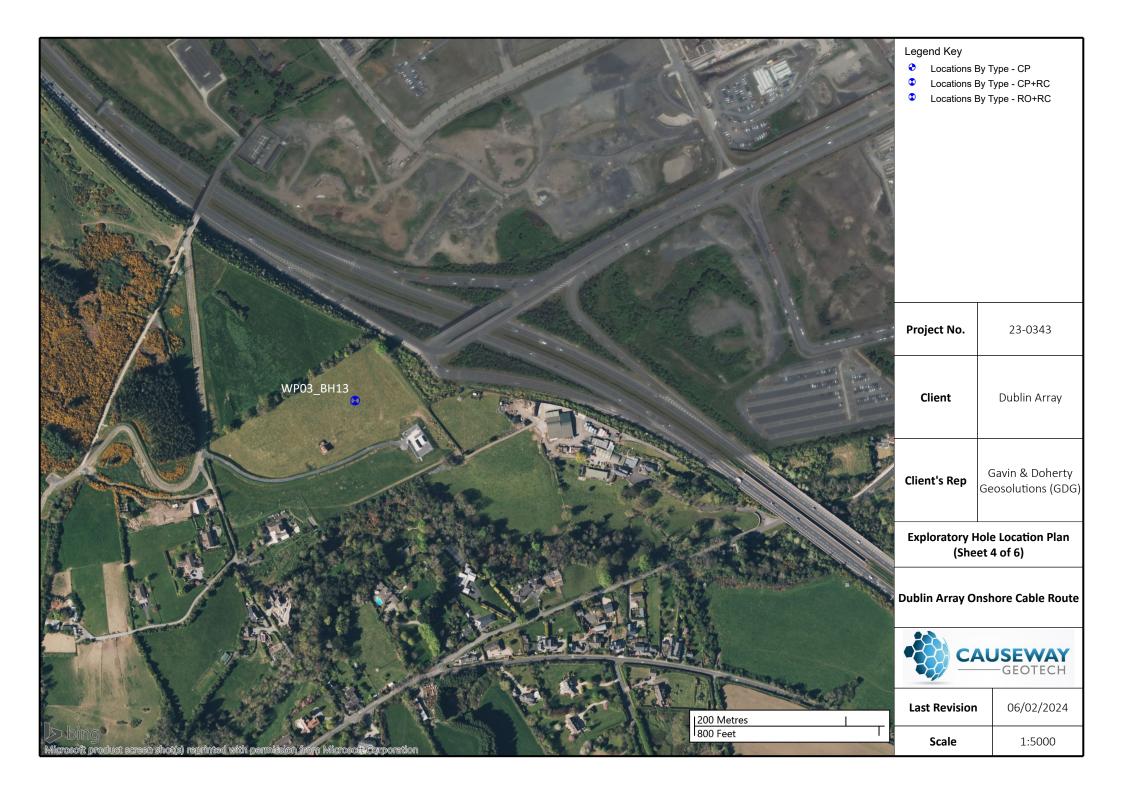


















APPENDIX B
BOREHOLE LOGS



		AUS	E	W ITC	<b>A</b>	Y				ect No. 0343	Project Client:	Name: Dublin A		re Cable Rout	te			orehole	
			3 [ (	<i>7</i> 1 1		П					Client's	Rep: Gavin &	Doherty Ge	osolutions (G	GDG)				
Meth Cable Per Rotary C	cussion	Plant L Dando Comacch	2000	)	0.	(m) 00 90	<b>Base</b> 3.9 9.8	90		dinates 76.66 E	Final De	<b>pth:</b> 9.80 m	Start Date:	05/10/2023	Driller:	CB +SMW		heet 1 o Scale: 1:	
							1			50.52 N	Elevatio	<b>n:</b> 85.74 mOD	End Date:	05/10/2023	Logger:	AK	_	FINAL	<u> </u>
Depth (m)	Sample / Tests	Fie	eld Re	cords			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	TORSON III (		cription			Water	Backfill	
0.20 - 1.20 0.20 - 1.20 0.50	B12 B5 ES1								85.54	0.20		TOPSOIL: with fine Soft becoming firm Sand is fine to coars	dark brown sl	ightly sandy slig		y CLAY.			0.5 -
1.00 1.00 1.20 - 1.65 1.20 - 2.00 1.20 - 1.65	ES2 D3 B7	N=15 (1,2/2, 1411	2,5,6	) Ham	nmer		0.00	Dry	84.54	1.20		Stiff dark brown slig coarse. Gravel is sul			AY. Sand is	fine to			1.5 -
2.00 2.00 - 2.45 2.00 - 3.00	D9 U6 B8	1411 2.00 Ublow=100 0% Recovery 2.00 3.00 3.00																	2.0 -
3.00 3.00 - 3.80 3.00 - 3.45	B11 SPT (C) N=36 (3,4/5,6,12,13) Hammer SN = 1411 SPT (C) 50 (25 for 9m/m/5φ for φmm) 3.90						3.00	Dry	82.74	3.00		Dense dark greyish medium cobble consubrounded.	itent. Sand is f	ine to coarse. Co	obbles are				3.0 -
3.80 3.90 - 3.92	SPT (C)	50 (25 for 9n Hammer SN			9mm		3.90	2.80	81.94	3.80	3 0	Stiff light brown slig Gravel is subangula			is fine to o	coarse.			4.0 —
			94	15	15	N/A			80.74	5.00	• + + + + + + ·	Very strong grey sp weathered: slightly			TE. Modera	ately			4.5 <del>-</del> 5.0 <del>-</del>
5.30			100	88	67	7					+ + + + + + + +	Discontinuities: 1. 20-30 degree joir rough, with 5mm th	nts, closely spa	ced (20/130/57		ting,			6.0 -
5.80			100	100	62	16					+ + + + + + + + + + + + + + + + + + +								7.0 -
8.30						12					+ + + + + + + + + + + + + + + +								8.0
				100		6			76.44	9.30	+ + + + + + + + + + + + + + + +								9.0 -
	Water	r Strikes	TCR	SCR	RQD	FI	Chis	ellin	g Details	ш,	Remarks								Щ
Casing I	Casing to (m	Time (min) Water	Add		n) F	rom ( 2.10 3.80	m)	To ( 2.3 3.9	m) Tin	ne (hh:mm) 00:45 01:00	Inspection	pit hand dug to 1.20 dwater encountered -		during rotary dri	illing.				
3.90 9.80	200 146	1.20		3.90	_	Core	Barr	el	Flush	Type	Terminat	ion Reason				Last Up	ndate	d 💻	<del></del>
						Core	Dail	CI	riusfi	Type	ieriiiiidl	ion neason				Last Up	Juale	.u	لا_

								Pr	oject No.	Project	Name: Dublin A	Array Onsho	re Cable Rout	e		В	orehole	ID
		AUS	E	W	A	Y		2	3-0343	Client:	Dublin A	Array				WI	P03_BI	101
		(	E(	) I E	C	Н				Client's	Rep: Gavin &	Doherty Ge	osolutions (G	DG)				
<b>Meth</b> Cable Per Rotary (	rcussion	Plant Dando Comacch	2000	)	0.	( <b>m) l</b> 00 90	3.90 9.80		oordinates 1376.66 E	Final De	<b>pth:</b> 9.80 m	Start Date:	05/10/2023	Driller:	CB +SMW	1	heet 2 of Scale: 1:5	
Rotary	Comig	Comacci	110 40		Э.	50	5.60		3650.52 N	Elevatio	<b>n:</b> 85.74 mOD	End Date:	05/10/2023	Logger:	AK		FINAL	
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Wate Depth Depti (m) (m)	Lev mO	el Depth D (m)	Legend		Des	cription			Water	Backfill	
.80	Water	·Strikes	TCR	SCR	RQD	FI	Chiselli			Remarks		End of Bore	ehole at 9.80m					9.5 10.0 - 10.5 11.0 - 11.5 12.0 - 13.5 14.0 - 15.5 16.0 - 17.5 18.0 -
Casing I	Details	) Time (min)  Water	Add	ed	n)  F	rom (r 2.10 3.80	1	2.30 3.90	Time (hh:mm) 00:45 01:00		pit hand dug to 1.20		during rotary dri	lling.				
	Diam (mm) 200 146	1.20		o (m) 3.90		Core	Barrel	Flu	ush Type	Terminat	ion Reason				Last Up	date	ed 🔳	<u></u>
		1			1		(6L			Terminate						/2024		₽

	C	AUS	E	<b>VV</b> DTE	A	Y				ct No. 0343	Client:	Dublin A	ırray					orehole P <mark>03_B</mark> I	
Meth	nod	Plant I	Icod		Ton	(m)	Base	(m)	Coord	linates	Client's	Rep: Gavin &	Donerty Ge	eosolutions (G	JDG)		c	heet 1 o	
Cable Per Rotary C	cussion	Dando Comacch	2000	)	0.		2.3 9.8	30		.6.28 E	Final De	<b>pth:</b> 9.80 m	Start Date:	11/10/2023	Driller:	CB +SMW	1	Scale: 1:	
,									72377	7.40 N	Elevatio	<b>n:</b> 84.29 mOD	End Date:	11/10/2023	Logger:	AK		FINAL	
Depth (m)	Tests Field Records Department							Water Depth (m)	Level mOD	Depth (m)	Legend	TORCOUL		cription			Water	Backfill	
0.20 - 1.20 0.50 00	B6 ES1 D4								84.09	0.20		TOPSOIL: with very Soft to firm dark bri fine to coarse. Grav	ownish slightly	y sandy slightly g		AY. Sand is			0.5
1.00 1.20 - 2.30 1.20 - 1.20	ES2 B7 SPT (S)	50 (25 for 0r Hammer SN	nm/5 = 141	0 for (	0mm		0.00	Dry											1.5
2.00 2.00 - 2.45 2.00 - 2.28	45 D3						2.00	Dry	81.99	2.30	++++	Very strong light greweathered: slightly Discontinuities:			E. Slightly		-		2.0 -
											++++	1. 5-10 degree joint rough, clean (no inf		aced (20/350/96	60), undula	ting,			3.0 -
3.80			04								+ + + + + + + + + + + + + + + + + + + +								4.0 =
5.30			94	88	88						+++								5.0 -
			93	91	82	2					+ + + + + + + + + + + + + + + + + + +								5.5 6.0 -
5.80											+ + + + + + + + + + + + + + + + + + + +								6.5 7.0 -
120			91	79	68	6 >20					+ + + + + + + + + + + + + + +	7.83-7.95m: Highly weath	hered granite	<u>-</u>					7.5 8.0 =
3.30			100	100	100	2					+ + + + + + + + + + + + + + + + + + +								8.5 9.0 -
			TCR	SCR	RQD						***								
ruck at (m) (		r Strikes ) Time (min)	Rose	e to (n	n) F		m)	To ( 1.5 2.5	50 (	e (hh:mm) 01:00 01:00		pit hand dug to 1.20 Iwater encountered -		during rotary dri	illing.				
To (m) 2.30 9.80	Details Diam (mm) 200 146	Water ) From (m)		ed o (m)		Core	Barre	el	Flush	Type	Terminat	ion Reason				Last Up	odate	ed 🔳	<b>_</b>
						S	K6L		Wat	ter	Terminated	d at scheduled depth	1.			06/02,	/2024	A	Ř

									Proje	ct No.	Project N	<b>lame:</b> Dublin A	rray Onsho	re Cable Rout	e		В	orehole	ID
		A	Y			23-0	343	Client:	Dublin A	rray				wı	P03_B	H02			
		CAUS	GEC	OTE	C	Н					Client's F	Rep: Gavin &	Doherty Ge	osolutions (G	iDG)				
Met		Plant					Base		Coord	inates			S	11/10/2022	5 '''	СВ	S	heet 2 o	f 2
Cable Pe Rotary	rcussion Coring	Dando Comacc				00 30	2.3 9.8		72151	6 28 F	Final Dep	th: 9.80 m	Start Date:	11/10/2023	Driller:	+SMW		Scale: 1:	50
,									72377		Elevation	: 84.29 mOD	End Date:	11/10/2023	Logger:	AK		FINAL	-
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend		Desc	cription			Water	Backfill	
80									74.49	9.80	++++		End of Bore	ehole at 9.80m			-		9.5
																			10.5
																			11.0 ·
																			11.5
																			12.5
																			13.0
																			13.5
																			14.0
																			15.0
																			15.5
																			16.0
																			16.5 17.0
																			17.5
																			18.0
			TCP	SCR	ROD	FI													18.5
ıck at (m)		r Strikes				rom ( 1.20 2.30	(m) )	To (1.5 2.5	0 (	(hh:mm) 01:00 01:00		it hand dug to 1.20 rater encountered -		during rotary dri	lling.		<u> </u>	1	
	Details Diam (mm	Water ) From (m)		led o (m)															
9.80	146				-	Core	Barre	el	Flush	Туре	Terminatio	n Reason				Last Up	date	ed 📕	T
						c	K6L		Wat	or	Torminated	at scheduled depth				06/02/	/2024	A	æ

		AUSEW	/AY			ject No. -0343	· '	Borehole ID VP03_BH0
		——GEOT					Client's Rep: Gavin & Doherty Geosolutions (GDG)	_
Meth	od	Plant Used	Top (m)	Base (m	) Coo	rdinates	SMCW	Sheet 1 of 2
Cable Pero Rotary D		Dando 2000 Comacchio 405	0.00 0.60	0.60 10.00	724	340.35 E	Final Depth: 10.00 m Start Date: 17/10/2023 Driller: 3NICW +CB	Scale: 1:50
notary B	8	comacemo 403	0.00	10.00		413.74 N	Elevation: 18.34 mOD End Date: 02/11/2023 Logger: SR	FINAL
Depth (m)	Sample / Tests	Field Records	5	Casing Wate Depth Depti (m) (m)	Level mOD	Depth (m)	Legend Description	Backfill
0.00		02-11-2023			18.14	0.20	TOPSOIL  MADE GROUND: Firm dark greyish brown slightly sandy gravelly CLAY	
1.00 - 2.50 1.00 - 2.50	B1 ES1	Strike at 1.00m.			17.74	0.60	with low cobble content. Sand is fine to coarse. Gravel is rounded  fine to coarse of granite.  MADE GROUND: Medium dense greyish brown gravelly slightly clayey fine to coarse SAND. (Driller's description)	1.0
2.50 - 2.95 2.50 - 4.00 2.50 - 4.00 2.50 - 2.95		N=21 (4,3/6,5,5,5) Hai 0208	mmer SN =	2.50 2.4	0			2.5
4.00 - 4.45 4.00 - 5.50 4.00 - 5.50 4.00 - 4.45		N=41 (3,3/8,8,15,10) F SN = 0208	Hammer	4.00 2.8	0			4.5
		Strike at 5.00m.				E		Z 5.0
5.50 - 5.95 5.50 - 7.00 5.50 - 5.95		N=40 (5,11/8,8,10,14) SN = 0208	Hammer	5.50 3.1	13.04	5.30	Dense yellowish brown gravelly silty fine to coarse SAND. (Driller's description)	5.5
7.00 - 7.35 7.00 - 8.50 7.00 - 7.32		50 (5,9/50 for 175mm SN = 0208	) Hammer	7.00 5.3	11.34	7.00	Very dense yellowish brown sandy silty GRAVEL. (Driller's description)	7.0 7.5
8.50 - 10.00 8.50 - 8.62	B6 SPT (C)	50 (25 for 100mm/50 Hammer SN = 0208	for 25mm)	8.50 5.3	0			8.5 9.0
	Water	· Strikes		Chisalli	ng Deta	ils	Remarks	
	asing to (m	) Time (min) Rose to (	m) From (			ime (hh:mm)	Inspection pit hand dug to 0.60m.	
1.00 5.00	2.50 5.00	20 20 4.80					No groundwater encountered. 7 attempts at a hand pit were undertaken, all terminated on concrete, bitmac or grani	ite boulders.
	Diam (mm)	Water Added From (m) To (m)						
10.00	200		Core	Barrel	Flus	h Type	Termination Reason Last Upda	ated 🔳 🔳
						Air	Terminated at scheduled depth. 06/02/20	Poi

	C	AUSEW GEOT	/AY			ect No. 0343	Project Na Client: Client's Ro	Dublin A	rray Onshore rray Doherty Geos				Borehole ID /P03_BH0
Meth	cussion	Plant Used Dando 2000	<b>Top (m)</b> 0.00	0.60		dinates	Final Depth		Start Date: 17		Driller: Si	MCW CB	Sheet 2 of 2 Scale: 1:50
Rotary D	rilling	Comacchio 405	0.60	10.00		40.35 E 13.74 N	Elevation:	18.34 mOD	End Date: 02	2/11/2023	Logger: S	3	FINAL
Depth (m)	Sample / Tests	Field Records	3	Casing Wate Depth Dept (m) (m)	Level mOD	Depth (m)	Legend		Descrip	tion		Water	Backfill
					8.34				End of Borehold	e at 10.00m			9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 14.5 15.0 16.0 16.5 17.0 17.5 18.0
	Casing to (m)	Strikes Time (min) Rose to (		ction pit h	and dug to								
1.00	2.50 5.00	20 4.80	No gro	oundwate	r encounte	ered.	taken, all termi	inated on concret	e, bitmac or grani	te boulders.			
Casing D To (m) D 10.00	Details Diam (mm) 200	Water Added From (m) To (m)											
10.00	200		Core	Barrel	Flush	Туре	Termination	n Reason				Last Upda	ted <b>I</b>
					Д	ir	Terminated at	t scheduled depth	l.			06/02/202	24 AG

	S	AUS	E	W.	A	<b>Y</b>			-	ct No. 0343	Project Client:		rray	re Cable Rout				orehole	
Metho		Plant U			Тор	(m)	Base	(m)	Coord	linates					Driller:	CNACIAL	S	heet 1 c	of 3
Rotary Pero Rotary Co		Comacch Comacch			0.0 4.0		4.0 21.			0.80 E 5.65 N	Final De			03/11/2023	Logger:		:	Scale: 1: FINAI	
Depth (m)	Sample / Tests	Fie	eld Rec	ords			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend		Des	cription			Water	Backfill	
0.00 - 1.00	B1						()	()		(,		TOPSOIL					>		
1.00 - 2.50	B2								27.54	0.80		Very soft brown slig Gravel is subrounded Firm light brown slid description)	ed fine to coar	se. (Driller's desc	cription)				1.0
2.50 - 2.95 2.50 - 4.00 2.50 - 2.95		N=19 (3,4/4, 0208	5,5,5)	Hamı	mer S	SN =	2.50		24.94	2.90		Stiff greyish brown cobble content. (Dr			CLAY with	low			2.5
4.00 - 4.45 4.00 - 4.45 4.00		N=31 (5,5/6, 0208 03-11-2023	8,8,9) 88	Hamı	mer s		4.00 4.00		23.84	4.00		Very stiff brown slig coarse. Gravel is su Very stiff greyish br	bangular fine	to medium. andy slightly grav	velly CLAY.		-		4.0 =
5.30			100									fine to coarse. Grav	el is subrounc	led fine to mediu	ım.				5.5
i.80 i.80 - 7.25	SPT(C) N (4,6/8,9 Hamme		95				6.80	3.20											7.0 -
			100																9.0 -
	Moto	Ctribos	TCR	SCR	_		rks												
Casing D	asing to (m	Strikes Time (min) Water From (m)	Adde		) In		tion p		nd dug to encounter		r added du	ring drilling.							
4.00 21.80	200 146	4.00		L.80	(		<b>Barr</b> K6L	el	<b>Flush</b> Polyr			cion Reason d at scheduled depth	ı.			<b>Last U</b> p			£5

	C	AUS	E	VV DTI	A ECI	Y				ect No. 0343	Client:	Name: Dublin A  Dublin A  Rep: Gavin &	rray	eosolutions (G				orehole ID PO3_BH0
Metho		Plant U					Base		Coor	dinates	Final Dep	-		03/11/2023		SMCW	5	Sheet 2 of 3
Rotary Perco Rotary Co		Comacch Comacch			0. 4.		21			40.80 E 15.65 N	Elevation			07/11/2023	Logger:			Scale: 1:50 FINAL
Depth							Casing	Water	Level	Depth		27.84 11100			LOGGET.	AK	ie	
(m)	Samples /	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	mOD	(m)	Legend		Des	scription			Water	Backfill
	SPT(C) N= (7,10/10, Hammer		100				9.80	3.40										9.5 10.0 10.5
1.30			80						15.84	12.00		Brown very gravelly fine to medium.	silty fine to c	oarse SAND. Gra	vel is subro	ounded		11.5
.2.80 .2.80 - 13.06	for 115m		65				12.8	3.80	14.24	13.60		Very stiff dark brow Gravel is subrounde		gravelly CLAY. Sar	nd is fine t	o coarse.		12.5 13.0
.4.30 .4.30	07-11-20:	23	64				14.3	0.00										14.5 15.0
	for 120m		52				15.8	12.4	12.04	15.80		Dense dark brown : Cobbles are subang (Fines likely washed	ular of mixed	lithologies.	cobble co	ntent.		15.5
17.30			17															17.5
	Water 9	Strikes	TCR	SCR	RQD		Chis	ellina	g Detail	s	Remarks						1	
	etails	Water From (m)	<b>Add</b>	<b>ed</b>	n) F			To (		me (hh:mm)	Inspection	pit hand dug to 1.20 water encountered-		during drilling.				
4.00 21.80	200 146	4.00		1.80		Core	Barı	rel	Flush	туре	Terminati	on Reason				Last Up	date	ed <b>I</b>

	C	AUS	E	W DTI	A	Y				ect No. ·0343		orehole ID P03_BH0
Meth		Plant l						e (m)	Coor	dinates		Sheet 3 of 3
Rotary Per Rotary C		Comacch Comacch			0.0 4.0		4.0 21		7245	40.80 E	Final Depth: 21.80 m Start Date: 03/11/2023 Driller: SMCW	Scale: 1:50
				_						15.65 N	Elevation: 27.84 mOD End Date: 07/11/2023 Logger: AK	FINAL
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend Description	Backfill
18.80 18.80 - 19.1	for 175r	00 (11,14/50 nm) r SN = 0208	100				18.8	13.2	9.04	18.80	Very stiff dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.	19.0 19.5 20.0
20.30			97	47					7.54	20.30	Extremely weak light grey GRANITE. Highly weathered: greatly reduced strength.  - + + + + Discontinuities: - + + + + + + + + + + + + + + + + + + +	20.5
21.80 21.80	07-11-2	022					21.8		6.04	21.80	+ + + + + + + + + + + + + + + + + + +	22.0
												23.5 24.0 24.5 25.0 25.5 26.0 27.0
		Strikes		SCR	<u>'                                    </u>			elling	, Detail		Remarks	
Casing <b>E</b>		Water From (m)  4.00	<b>Add</b>		n) Fi	rom (	m)	To (	m) Tii	me (hh:mm)	nspection pit hand dug to 1.20m. Io groundwater encountered- water added during drilling.	
21.80	146	4.00	2	1.60	-	Core	Barı	rel	Flush	туре	Termination Reason Last Updat	ed <b>I</b>
						S	K6L			ymer	erminated at scheduled depth. 06/02/202	Poi

		AUSEW	/ <b>/</b> \\				ct No. 0343		: Name: Dublin A		re Cable Rout	ie			orehole	
8		GEOT	ECH			<b>23-</b> (	,343	Client:	Dublin A	•		.D.C.)		VV I	⊦∩o_B	nu/
Meth	od	Plant Used	Top (m)	Rass	(m)	Coord	linates	Client's	<b>кер:</b> Gavin &	Donerty Ge	osolutions (G	υG)		_	heet 1 o	f 1
Cable Pero	cussion	Dando 2000 Comacchio 405	0.00 6.00	6.0 8.0	00		2.67 E	Final De	<b>epth:</b> 8.00 m	Start Date:	18/10/2023	Driller:	CB +SMCW		Scale: 1:	
							5.32 N	Elevatio	n: 11.61 mOD	End Date:	10/11/2023	Logger:	SR	-	FINAL	-
Depth (m)	Sample / Tests	Field Records		Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	TOPSOIL: with very		cription			Water	Backfill	
0.20 - 1.20	B4					11.41	0.20		MADE GROUND: So	•	•	gravelly C	LAY with			
).50	ES1								low cobble content to coarse. Cobbles			is subroun	ded fine			0.5
1.00 1.00	D2 ES2			0.00	0.00											1.0 -
1.20 - 1.65 1.20 - 2.00	D5 B6			0.00	0.00											
20 - 1.65		N=6 (1,2/2,1,1,2) Ham	mer SN =													1.5
2.00	D10	1411		2.00	Dry											20-
2.00	ES3			2.00	DIY											2.0
2.00 - 2.45 2.00 - 3.00	U7 B9	Ublow=31 0% Recover	У				Ė									2.5
																2.3
3.00	D11			3.00	1.00		-									3.0 -
3.00	ES4	N=10/1 3/3 3 3 3 1 :	nome - Chi		2.00	8.41	3.20		Loose becoming me	adium dense a	ark grov voru so	ndy cliab+l	, cilty			1
3.00 - 3.45		N=10 (1,2/3,3,2,2) Han 1411	nmer SN =				[		angular to subangu	lar fine to coa	rse GRAVEL. San	d is fine to	coarse.			3.5
3.20 - 4.00	В8						E	0,000	Driller notes very st	rong hydrocar	bon smell from	3.20-5.50n	n.			
1.00	D12			4.00	3.20		_									4.0 -
.00	ES5			4.00	3.20											4.0
1.00 - 5.00 1.00 - 4.45	B15 SPT (C)	N=23 (2,3/3,8,9,3) Han	nmer SN =				-									4.5
		1411					<u> </u>	0.00								
5.00	D13			5.00	1.80		<u> </u>									5.0 —
5.00	ES6			3.00	1.00		Ė									3.0
5.00 - 5.80 5.00 - 5.45	B16 SPT (C)	N=20 (4,4/4,5,5,6) Han	nmer SN =			6.11	5.50	0,000								5.5
5.50	ES7	1411				0.11	5.30	$\times \times \times \times$	Very stiff grey sand	y SILT. Sand is	fine to medium.					. د.د
5.00 - 6.06		50 (25 for 35mm/50 fo	ır 20mm)				6.00	XXXX								6.0 —
		Hammer SN = 0208	20111111)			5.61	5.00	× × ×	Very dense dark brodescription)	ownish grey sa	ndy silty GRAVE	L. (Driller's				0.0
6.30 - 7.00	B21						Ė	× × ×								6.5 -
								× × ×								0.5
7.00 - 8.00	B22							× × ×								7.0 -
7.00 - 8.00 7.00 - 7.06	B22 SPT (C)	50 (25 for 35mm/50 fo	r 20mm)	7.00			Ė	××××								7.0
		Hammer SN = 0208					Ė	× × ×								7.5
							Ė	××××								1.3
3.00 - 8.06	SPT (C)	50 (25 for 35mm/50 fo	r 20mm)	8.00		3.61	8.00	×. ×. ×.								8.0
0.00	51 1 (C)	Hammer SN = 0208	. 2011111)	0.00		5.01	5.50			End of Bore	ehole at 8.00m					
							<u> </u>									8.5 -
																9.0
							É									
		C. II.				<b>.</b>	<u> </u>									
ruck at (m)		r Strikes n) Time (min) Rose to (i	m) From		elling To (	m) Tim	e (hh:mm)	Remarks	i n pit hand dug to 1.20	)m						
(,	J .= (	, , , , , , , , , , , , , , , , , , , ,	5.8		6.0		01:00		dwater encountered.							
Casing D		Water Added														
To (m) [	Diam (mm 200	) From (m) To (m) 1.20 5.80	7													
8.00	146	3.80	Core	e Barr	el	Flush	Туре	Terminat	tion Reason				Last Up	date	ed 🔳	_
						Ai			ed at scheduled depth	1			06/02/			<u> </u>
						AI		ici i i i i i ate	a at someduied depti				00/02/	_524	(A)	9

		GEOT	AY			-	ct No. 0343	Client:	Name: Dublin A  Dublin A  Rep: Gavin &	ırray	eosolutions (G			w	P03_BI	H <b>0</b> 8
Metho		Plant Used Dando 2000	<b>Top (m)</b> 0.00	<b>Base (</b> 3.00		Coord	linates	Final De	<b>pth:</b> 8.00 m	Start Date:	18/10/2023	Driller:	CB	l	heet 1 o	
Rotary D		Comacchio 405	3.00	8.00			9.48 E 7.56 N	Elevatio			09/11/2023	Logger:	+SMCW SR		Scale: 1:	
Depth (m)	Sample / Tests	Field Records		Casing V Depth D	Vater lepth (m)	Level mOD	Depth (m)	Legend	-	Des	cription		1	Water	Backfill	
).00 ).20 - 1.20	B1	08-11-2023		5.50 3	.00	8.94	0.20		TOPSOIL: with very	•	•			_		
00	ES5					0.54	0.20		Firm dark brownish cobble content. Sar medium Cobbles ar	nd is fine to co	arse. Gravel is su					0.5
00 20 - 1.65 20 - 2.00 20 - 1.65	ES6 D9 B2	N=9 (2,2/2,2,2,3) Hami 1411	mer SN =	0.00	Dry											1.5
2.00 2.00 - 2.45 2.00 - 3.00	D8 U4 B3	Ublow=100 70% Recov	ery	2.00	Dry											2.0 -
3.00 - 4.00 3.00 - 3.00		50 (25 for 0mm/50 for Hammer SN = 1411 Strike at 3.00m.	0mm)			6.14	3.00		Very dense yellowis to medium GRAVEL			ty subangu	ular fine	•		3.0 -
1.00 1.00 - 5.50 1.00 - 4.36	D12 B11 SPT (S)	50 (2,9/50 for 205mm) SN = 1411	Hammer	4.00 3	.00											4.0 -
5.50 - 7.00 5.50 - 5.85		50 (4,10/50 for 200mn Hammer SN = 1411	n)	5.50 3	.00											5.0 -
7.00 - 8.00 7.00 - 7.30	B14 SPT (C)	50 (12,12/50 for 147m Hammer SN = 1411	m)	7.00 3	.00											7.0 -
3.00 - 8.36 3.00	SPT (C)	50 (25 for 140mm/50 f 225mm) Hammer SN = 09-11-2023		8.00 3 8.00 3		1.14	8.00	(3°, 2°, 6°, 6°, 6°, 6°, 6°, 6°, 6°, 6°, 6°, 6		End of Bore	ehole at 8.00m					8.0 -
		r Strikes				Details		Remarks								9.0 -
3.00 Casing D	3.00	Name   Name	m) From ( 2.80	(m)	To (m 3.00	) Tim	e (hh:mm) 01:00	Inspection	pit hand dug to 1.20	)m.						
3.00 8.00	200 200	1.20 3.00	Core	Barre	1	Flush	Type	Terminat	ion Reason				Last Up	date	ed 💻	_
			Core	. Daile	'	Ai			d at scheduled depth				06/02/			뷝

		CAUS	EV	V.	AY CH				ect No. 0343	Project Client: Client's		ırray	re Cable Rou				orehole PO3_BI	
Metho		Plant U			op (m)	_		Coor	dinates	Final De	9.00 m	Start Date:	09/10/2023	Driller:	СВ	SI	neet 1 of	f 1
Rotary Pero Rotary Co	cussion	Dando 2 Comacch Comacch	io 405	;	0.00 6.30 6.70	6.3 6.3 8.0	70		63.29 E 93.00 N	Elevatio			15/11/2023	Logger:	+SMCW SR	9	FINAL	
Depth (m)	Sample / Tests	Fie	ld Reco	rds		Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	,		cription			Water	Backfill	
0.20 - 1.20	B2							12.55	0.20		TOPSOIL: with very Soft dark brownish			CLAV Cand	is fine to			İ
0.50	ES6										coarse. Gravel is su			CLAY. Sand	is line to			0.5
									Ē									
1.00 1.00	D4 ES7								E									1.0 -
.20 - 1.65	D1					0.00	Dry				SPT at 1.20m due to cob	ble /boulder	<del>-</del> -					
.20 - 2.00 .20 - 1.62	B15 SPT (S)	50 (1,1/50 fo	r 268m	ım) Ha	ammer													1.5
		SN = 1411		•														
.00	D5					2.00	Dry		F									2.0 -
.00 - 2.45 .00 - 3.00	D3 B16								-									
.00 - 2.45	SPT (S)	N=6 (1,1/1,1, 1411	,2,2) Ha	amme	r SN =				Ē									2.5
		1411																ĺ
.00	D12					3.00	Dry		-									3.0
.00 - 3.45 .00 - 4.00	U9 B17	Ublow=63 10	00% Red	covery	/													
00 - 4.00	617							į.									3.5	
00	D13					4.00	Dny	8.95	3.80		Very stiff dark brow			ly CLAY. Sai	nd is fine			4.0
00 - 4.45	D10					4.00	ыу		ŧ		to coarse. Gravel is	rounded fine	to mealum.					4.0
00 - 5.00 00 - 4.45	B18 SPT (S)	N=31 (2,3/5,6	6 9 11)	Hamr	mer SN				[									İ
.00 4.45	31 1 (3)	= 1411	0,3,11,		ner siv				Ē									4.5
.00 .00 - 5.45	D14 U10	Ublow=79 10	∩% Pa	cover	,	5.00	Dry		Ė									5.0
.00 - 6.30	B19	Obiow-75 10	7070 NC	covery	,				-									ĺ
																		5.5
									E									
.00	D15								F									6.0
.30 - 6.30	SPT (C)	50 (25 for 0m	<del>m/50 1</del>	for On	<del>m)</del>	6.30	Drv		6.30									
	(0)	Hammer SN					,	6.45			Very stiff brown sar	ndy gravelly CL	AY. (Driller's des	cription)				6.5
								6.05	6.70		Very stiff brown slig	htly sandy gra	velly CLAY Sand	l is fine to c	narse			
											Gravel is subrounde			113 11110 10 0	ourse.			7.0 -
									E									
			50						Ē									7.5
									E									7.5
00																		l
.00 .00 - 8.45	SPT(S) N	I=42		$\top$	$\exists$	8.00 6.80		4.75	8.00	*		End of Bore	ehole at 8.00m					8.0 -
	(6,8/9,1	0,11,12) r SN = 0208							Ė									
.00	15-11-2								ŧ									8.5
									E									9.0 -
	-		TCR S	CP P	QD FI	-			F									
	Water	Strikes	ICK S	ok   R	ųυ H	Chis	ellin	g Detail	s	Remarks	<u> </u>							_
ruck at (m) Ca		) Time (min)	Rose to	o (m)		(m)	To (	m) Tir	ne (hh:mm)		r pit hand dug to 1.20	)m.						
	_				1.6 6.2		2.0 6.3		01:00 01:00		dwater encountered -		during drilling.					
					0.2		0.5	.5	51.00									
Casing D	etails	Water	Added	t														
To (m) D	iam (mm		To (ı															
6.30 6.70	200 200	1.20	6.0	IU .	Com	) Par	ol I	Floral	Tuna	Tormina	tion Reason				Lock III	data	. I	_
8.00	146					e Barr	CI		Туре						Last Up		" <b> </b>	Ļ
					:	SK6L		Wate	er/Air	Terminate	d at scheduled depth	١.			06/02/	2024	A	<u>٦٢</u> ,

	<u> </u>	<b>EAUS</b>	EW	ECH	-		2	oject No. <b>3-0343</b>	Project Name: Dublin Array Onshore Cable Route  Client: Dublin Array  Client's Rep: Gavin & Doherty Geosolutions (GDG)		orehole ID P03_BH1
Metho Cable Perc		Plant U		<b>Top</b>	_	2.00	n) Co	ordinates	Final Depth: 5.30 m Start Date: 12/10/2023 Driller: CB +SMC		Sheet 1 of 1
Rotary Co		Comacch		2.0		5.30		1508.20 E 4265.95 N	Elevation: 74.88 mOD End Date: 24/10/2023 Logger: AK		Scale: 1:50 FINAL
Depth (m)	Sample / Tests	Fie	eld Records			Casing Wate Depth Dept (m) (m)	Leve mO		Legend Description	Water	Backfill
0.20 - 1.20 0.50	B1 ES2						74.6	58 0.20	TOPSOIL: with very fine roots (<0.5mm).  MADE GROUND: Firm dark brownish slightly sandy gravelly CLAY wit low cobble content. Sand is fine to coarse. Gravel is rounded fine to coarse. Cobbles are subrounded of granite.	n	0.5
00 20 - 1.70 20 - 1.20	ES4 B5 SPT (C)	50 (25 for 0m Hammer SN :		0mm)		0.00 Dr	73.1		MADE GROUND: Grey BOULDER of granite. Recovered through chiselling as subangular gravel.		1.5
2.00 2.00		<del>23-10-2023</del> 23-10-2023					72.8	ļ.	MADE GROUND: Grey BOULDER of granite. (Driller's description)		2.0 -
			30				72.5 72.5	F	MADE GROUND: Light grey speckled dark grey BOULDER of granite.  Low recovery. Driller notes MADE GROUND: Stiff brown sandy gravelly CLAY.		3.0 -
3.80			26								4.0 -
5.30							69.5		Strong light brownish grey CONCRETE. 50-60% aggregate of angular to subangular fine to medium gravel. 1-5% small voids.  End of Borehole at 5.30m		5.5
ruck at (m) Ca		Strikes ) Time (min)	TCR SCR	n) Fr	_	n) To	ing Det o (m) 1.50 2.00	ails Time (hh:mm) 00:45 01:00	Remarks nspection pit hand dug to 1.20m. No groundwater encountered.		8.0 - 8.5
Casing D To (m) D 2.00 5.30	Details Diam (mm) 200 146	Water From (m) 1.20	Added To (m) 1.70		Core I	Barrel		<b>ish Type</b> Polymer		<b>Jpdate</b> 2/2024	

					Proje	ct No.	Project	Name: Dublin Array Onshore Cable Route		Во	rehole	ID
		AUSEW	AY		23-	0343	Client:	Dublin Array		WP	03_BF	H10
		——GEOT	ECH				Client's	Rep: Gavin & Doherty Geosolutions (GDG)			Α	
Metho Rotary Perc		Plant Used Comacchio 405	<b>Top (m)</b> 0.00	<b>Base (m</b> 8.50	) Coord	dinates	Final De	oth: 20.30 m Start Date: 24/10/2023 Driller:	SMCW		neet 1 of cale: 1:5	
Rotary Co	oring	Comacchio 405	8.50	20.30		25.11 E 58.83 N	Elevatio	n: 75.71 mOD <b>End Date</b> : 25/10/2023 <b>Logger</b> :	AK		FINAL	
Depth (m)	Sample / Tests	Field Records	<u> </u>	Casing Water Depth Depth (m) (m)	Level mOD	Depth (m)	Legend	Description		Water	Backfill	
0.00		24-10-2023			75.51	0.20		MADE GROUND: Reworked TOPSOIL with rootlets.				
					73.31	. 0.20		MADE GROUND: Firm brown sandy gravelly CLAY with low content. (Driller's description)	obble			1.0 -
2.50 - 2.95	D1	N-26 /F 2/4 6 0 40 \ U =	aman ar SN	2.50	73.91	1.80		MADE GROUND: Stiff yellowish brown sandy gravelly CLAY v cobble content. (Driller's description)	vith low			2.0 —
2.50 - 2.95	SPT (S)	N=26 (5,2/1,6,9,10) Ha = 0208	ammer SN	2.50								3.0 —
					72.51	3.20		Stiff dark brown slightly sandy slightly gravelly CLAY. Sand is coarse. Gravel is subrounded fine to medium.	fine to			3.5
												}
1.00 1.00 - 4.45	D2 SPT (S)	N=22 (3,3/4,5,6,7) Har	nmer SN =	4.00								4.0 -
		0208				Ē						4.5
						Ė						4.5
						Ē						5.0 —
5.50 - 5.95	D3											5.5
5.50 - 5.95	SPI (S)	N=17 (6,4/5,4,4,4) Har 0208	nmer SN =	5.50								
						E						6.0 -
						Ē						6.5
'.00 - 7.07	D4	Strike at 6.90m.			68.71	7.00		V CAN (D. III.)				7.0 -
.00 - 7.07		50 (25 for 35mm/50 fo	or 35mm)	7.00 6.0	0			Very stiff dark grey slightly sandy slightly gravelly CLAY. (Drill description)	er's			}
		Hammer SN = 0208				Ē		Driller thought he was on possible concrete.				7.5
						Ė						
						F						8.0 —
						_						
3.50 - 8.95 3.50 - 8.95	<del>D5</del> SPT (S)	N=48 (6,6/10,12,12,14	Hammer	8.50 5.4	67.21	8.50		Very stiff light brown slightly sandy gravelly CLAY. Sand is fin coarse. Gravel is subangular fine to medium.	e to			8.5
3.50		SN = 0208 25-10-2023 93		8.50 4.9	66.86	8.85	a × , a × , a	Dense brown sandy clayey subangular fine to coarse GRAVE	L. Sand is			9.0 -
				]		Ē	**************************************	fine to coarse.				
	Water	TCR SCR	RQD FI	ırks								
	sing to (m	Time (min) Rose to (			and dug to	1.20m.						
6.90	7.00	20 6.00										
	iam (mm	Water Added ) From (m) To (m)										
8.50 20.30	200 146		Core	Barrel	Flush	Туре	Terminat	on Reason	Last Upo	dated		J
					Polym		l	at scheduled depth.	06/02/2			. T

	C	AUS	E	W TTC	A	Y				ct No. 0343	Client:	Name: Dublin A	ırray					orehol P03_E A	
				- 1 1							Client's	Rep: Gavin &	Doherty Ge	eosolutions (G	GDG)			A	
Rotary Perc Rotary Co	cussion	Comacch Comacch	io 40		0.	(m) 00 50	<b>Base</b> 8.5 20.	50		5.11 E	Final De	<b>pth:</b> 20.30 m	Start Date:	24/10/2023	Driller:	SMCW		Sheet 2 ( Scale: 1	
Depth							Casing	Water	72425 Level	8.83 N Depth	Elevatio	<b>n:</b> 75.71 mOD		25/10/2023	Logger:	AK	la la	FINA	_
(m)	Samples / F	ield Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	mOD	(m)	Legend		Des	cription			Water	Backfill	
9.80 9.80 - 9.85	SPT(S) 50 ( 20mm/50 30mm) Ha = 0208	for	07	45	45	NA	9.80	3.00	65.27	10.44		Strong light grey sp	eckled dark gr	rev GRANITE					9.5
11.20			87	45	45						+ + + + + + + + + + + + + + + +	Discontinuities:  1. 0-10 degree joint rough, with 10mm	ts, medium sp	aced (20/526/56		ting,			11.0 -
11.30		100 95 77 8													11.5				
12.80				63.21  12.50  + + + +   Strong light grey speckled orangish brown GRANITE.													13.0 -		
14.20			96	68	15	>20					++++	thick white calcite r	mineralization		surraces, w	ith 40mm			13.5 14.0 -
14.30			90	79	28	9					+ + + + + + + + + + + + + + + + + + + +								14.5 15.0 <b>-</b>
5.80			88	86	57						+ + + + + + + + + + + + + + + + + + +								16.0 - 16.5 17.0 -
7.30			100	98	24	4			58.41	17.30	+ + + + + + + + + + + + + + + + + + +	Strong light grey sp Discontinuities: 1. 10-20 degree joir rough, with 10mm i 2. 70-80 degree joir rough, with 20mm i	nts, medium s thick dark gre nts, medium s	paced (230/370/ y clay infill on so paced (100/230/	me joints.				17.5 18.0 -
	1		TCR	SCR	RQD	FI				<u> </u>									l
Casing De	7.00		Add	.00	n) F	rom (		elling To (	g Details	e (hh:mm)	Remarks Inspection	pit hand dug to 1.20	θm.						
8.50 20.30	200 146					Core	Barr	el	<b>Flush</b> Polym			ion Reason d at scheduled depth	1.			<b>Last Up</b>			(H.

			GEC	OTI	EC	Н			23-	ect No. 0343	Project Na Client: Client's Re	Dublin A  Dublin A  Pp: Gavin &	array	re Cable Rou			W	orehole P03_B A	H10
Metho Rotary Pero Rotary Co	cussion	Comacch Comacch	nio 40	)5	0.	(m) 00 50	8.5 20.	50	72152	25.11 E 58.83 N	Final Depth			24/10/2023	Driller:			Scale: 1:	50
Depth		/ Field Records		SCR			Casing Depth (m)	Water Depth (m)	Level	Depth	Elevation:	75.71 MOD		25/10/2023 	Logger:	AK	Water	FINAL	-
(m) .8.80			100		94		(m)	(m)	mOD	(m)	+ + + + + + + + + + + + + + + + + + +						M		19.0 -
ruck at (m) C 6.90		Strikes Time (min) 20	Rose	scr (r 5.00				elling To (	g Details m) Tim	20.30	Remarks Inspection pit	hand dug to 1.20		hole at 20.30m					20.5 21.0 - 21.5 22.0 - 22.5 23.0 - 24.0 - 25.5 26.0 - 27.5
Casing D To (m) D 8.50 20.30	Details Diam (mm) 200 146	Water From (m)		ed o (m)				, ,										. 1	
20.30	140					Core	Barr	el	<b>Flush</b> Polym		Termination Terminated at	Reason  scheduled depth	1.			<b>Last Up</b> 06/02,			H

									Proje	ct No.	Project	Name: Dublin A	rray Onsho	re Cable Rout	:e		Вс	orehole	ID
	C	AUS	E	W	A	Y			23-0	0343	Client:	Dublin A	rray				WF	<b>203_B</b> I	H11
		C	EC	OTE	ECI	Н					Client's	Rep: Gavin &	Doherty Ge	osolutions (G	GDG)				
Metho	od	Plant U	Jsed		Тор	(m)	Base	(m)	Coord	linates		-				CB+SMW	SI	heet 1 o	f 3
Cable Percu Rotary Dri	I	Dando Comacch				00 30	0.3 2.3		72136	54.91 E	Final De	<b>pth:</b> 20.30 m	Start Date:	11/10/2023	Driller:	+SMW	9	Scale: 1:	50
Rotary Co	- 1	Comacch				30	20.			26.52 N	Elevatio	<b>n:</b> 75.53 mOD	End Date:	19/10/2023	Logger:	AK		FINAL	-
Depth (m)	Sample / Tests	Fie	eld Re	cords			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend			cription			Water	Backfill	
.00 - 0.30 .30	B1	17-10-2023							75.43	0.10		TOPSOIL: with very	fine roots (<0.	5mm).					
.30									75.23			Firm dark brownish cobble content. San coarse. Cobbles are Firm dark brown sa	nd is fine to co- subrounded.	arse. Gravel is su	ibrounded				1.0 -
.30 - 2.75							2.30	0.00	73.23	2.30		Medium dense sand is fine to coarse.		-					2.5
	18											(Driller notes a clay,	fines likely wa	ashed out during	g drilling pr	ocess)			3.0
.80 .80 - 4.25	SPT(S) N=19 (2,4/4,5,5,5) Hammer SN = 0208						3.80	0.40											4.0
	Hamme	r SN = 0208	46																4.5
.30 .30 - 5.75	SPT(S) N (3,3/4,5	,5,5)					5.30	0.50	70.23	5.30		Stiff light brown slig content. Sand is fine							5.5
	натте	r SN = 0208	100	48	34	3			69.48	6.05	+ + + + + + + + + + + + + + + + + + +	Driller notes poor recore barell.  Very strong light greweathered: slightly veining up to 60mm Discontinuities:	ey speckled da closer fracture	rk grey GRANITE e spacing, light g	E. Slightly				6.0
.80			98	94	94						+ + + + + + + + + + + + + + + + + + +	20-30 degree joir with faint light brown light brown clay infi     0-10 degree join rough, with 20mm to	vn staining on II on some joi ts, closely spa	joint surfaces, w nts. ced (80/180/600	vith up to 3 )), undulati	mm thick			7.0
.30						8					+ + + + + + + + + + + + + + + +								8.0
			100	87	43						++++								9.0
	\A/a+a	Ctribos	TCR	SCR	RQD	FI	Chic	oli:	r Doto!!-		Pome ele-								
Casing De	etails	Time (min)  Water	Add	ed	m) Fi	rom (		elling To (	g Details m) Tim	e (hh:mm)		pit hand dug to 0.30  water encountered -		during rotary dri	lling.				
To (m) Di 2.30	iam (mm) 146	From (m)	То	(m)	_	Coro	Barr	ا اه	Flush	Type	Terminat	ion Reason			1	Last Up	dato	d  ==	<u> </u>
		1	I		- 1 '	core	Darr	CI	riusn	·ype	reminid	IOII NEdSUII				Last UD	uale	u	

	C	AUS	E	W OTI	A EC	<b>Y</b>				ct No. 0343	Project N Client: Client's R	Dublin A  Dublin A  ep: Gavin &	Array	re Cable Route				orehole P03_B	
Metho Cable Perc Rotary Dr Rotary Co	cussion rilling	Plant I Dando Comacch Comacch	2000 nio 40	) 05	0. 0.	(m) 00 30 30	0.3 2.3 20.	30 30	72136	linates 64.91 E	Final Dept			11/10/2023	Driller:	CB +SMW +SMW	1	heet 2 o Scale: 1:	50
	OTTING	Comacci							72422 Level	.6.52 N Depth	Elevation:	75.53 mOD	End Date:	19/10/2023	Logger:	AK	ā	FINAL	—
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	mOD	(m)	Legend + + + ·		Des	cription			Water	Backfill	L
						>20					+ + + +								9.5 -
9.80 9.80	17-10-2	n23					9.80 9.80				+ + + +								
9.80	18-10-2						3.80	1.50			[++++								10.0 —
											[+]+]+]								
			100	96	55					Ē	+ + +								10.5
						11					+ + +								
										-	+ + +								11.0 -
11.30											+ + +								
											+ + +								11.5
											+ + + +								
			100	98	66						+ + + +								12.0 -
											+ + + +								
											+ + + +								12.5
.2.80						1					+ + + +								
						2				-	+ + + +								13.0
											+ + + +								
			100	100	78						+ + + +								13.5
											+ + + +								
											+ + + +								14.0
14.30										Ė	+ + + +								
											+ + + +								14.5
											+ + + +								
			100	92	70	7					+ + + +								15.0 -
			100	-	, ,	'					+ + + +								
											+ + + +								15.5
15.80							15.8	1 20			+ + + +								
15.80	19-10-2	023					15.6	1.50			+ + + +								16.0 -
											+ + + +								
											+ + + +								16.5
			100	77	13	12					+ + +								
						12					+ + +								17.0 -
										Ē	+ + +								17.0
7.30											+ + +								17.5
										Ė	+ + +								د. ب
			100	86	86					Ė	+++								10.0
											+++								18.0 -
										Ē	+ + +								
	-		TCR	SCR	ROD	FI	-			Ē	+++						-		18.5
		Strikes						ellin	g Details		Remarks						1	l .	
Casing D	etails	Vater	Add	ed	n) F	rom (	m)	To (	m) Tim	e (hh:mm)		t hand dug to 0.30 ater encountered		during rotary dri	lling.				
To (m) D	Diam (mm) 146	From (m)	To	o (m)	_	Core	Barr	el	Flush	Туре	Termination	n Reason				Last Up	date	ed 📕	T
							K6L		Polyr		Torminated a	t scheduled depth	_			06/02,			Ť.

		AUS	E	W	A	Y			23-	-0343	Client:	Dublin A					W	P03_B	Н1
				711							Client's	Rep: Gavin &	Doherty Ge	osolutions (G	iDG)				
	rcussion	Plant U Dando Comacch	2000	)	0.	00	0.			rdinates	Final Dep	<b>oth:</b> 20.30 m	Start Date:	11/10/2023	Driller:	CB +SMW +SMW		heet 3 o Scale: 1	
Rotary Rotary	Coring	Comacch				30 30	2. 20			64.91 E 26.52 N	Elevation	: 75.53 mOD	End Date:	19/10/2023	Logger:			FINA	L
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	,	Des	cription			Water	Backfill	
0.30			28	26	26	5			55.23	20.30	+ + + + + + + + + + + + + + + + + + +		End of Bore	hole at 20.30m					19.0 19.5 20.0 20.5 21.0 22.5 23.0 24.0 24.5 25.0 26.5 27.0
			TCR	SCR	ROD	FI													
	Wate	Strikes	.01	JUN			Chis	ellin	g Detai	ls	Remarks							I	_
Casing	Casing to (m	Time (min) Water	Add	ed	n) F			To (		me (hh:mm)	Inspection	oit hand dug to 0.30 water encountered -		during rotary dril	lling.				
To (m) 2.30	Diam (mm 146	From (m)	Тс	(m)	_	Core	Barı	rel	Flush	n Type	Terminati	on Reason				Last Up	date	ed 🔳	<b>-</b>
										/mer/									

_82							Proje	ct No.	Project	: <b>Name:</b> Dublin A	rray Onsho	re Cable Rout	ie.	В	orehole ID
	C	<b>AUS</b> I	EW.	AY			23-	0343	Client:	Dublin A	rray			w	P03_BH1
		GI	EOTE	СН					Client's	Rep: Gavin &	Doherty Ge	eosolutions (G	GDG)		Α
Meth		Plant Us		Гор (m)			Coor	dinates	Final De	unth: 0.20 m	Start Date:	11/10/2023	<b>Driller:</b> CB		Sheet 1 of 1
Cable Pero	cussion	Dando 20	000	0.00	0.3	0	72136	52.81 E	Fillal De	: <b>ptii:</b> 0.50 iii	Start Date.	11/10/2023	Driller. CB		Scale: 1:40
							72422	25.33 N	Elevatio	n: 75.61 mOD	End Date:	11/10/2023	Logger:		FINAL
Depth (m)	Sample / Tests	Field	Records		Casing N Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	1	Des	cription		Water	Backfill
.00 - 0.30	B1					,,,	75.51	0.10		TOPSOIL: with very	fine roots (<0	.5mm).	CLAV ith la		
							75.31	- 0.30		Firm dark brownish cobble content. Sar	nd is fine to co	arse. Gravel is su		:0	
								-		coarse. Cobbles are		of granite. ehole at 0.30m		-/	0.5
								-							
								-							
								-							1.0
								Ł							
								Ł							1.5
								-							1.5
								-							
								-							2.0
								-							
								-							2.5
								-							
															3.0
								-							
								ŀ							
								-							3.5
								-							
								F							
								-							4.0
								-							
								-							4.5
								ţ							
								-							
								-							5.0
								ŧ							
								-							
								-							5.5
								-							6.0
								F							6.5
								-							
								-							7.0
								-							
								-							
	Water						Details		Remarks						<u> </u>
ck at (m) C	Casing to (m)	Time (min) R	ose to (m)	From (	(m)	To (r	n) Tim	ne (hh:mm)		n pit hand dug to 0.30 dwater encountered.	)m.				
									-						
Casing D	<b>Details</b> Diameter	Water A	To (m)												
- ''			- 1/										1.		, ,
										tion Reason	nit Pote	malated at: '	221	st Updat	
							1		Terminate location.	d on boulder in hand	pit. Kotary co	inpieted at origir	Idl 0	6/02/202	

						P	roject	No.	Project	: Name: Dublin A	rray Onsho	re Cable Rout	te	В	orehole ID
	C	AUSE		AY			23-03	343	Client:	Dublin A	rray			w	P03_BH1
		——GE	OTE	СН					Client's	s Rep: Gavin &	Doherty Ge	eosolutions (G	GDG)		В
Metho Cable Perc		Plant Use		op (m)	<b>Base (</b> 1		oordir	nates	Final De	<b>epth:</b> 0.80 m	Start Date:	11/10/2023	<b>Driller:</b> CB		Sheet 1 of 1
Cable Felt	ussion	Danuo 20	00	0.00	0.30		21335	.86 E							Scale: 1:40
							24221	.82 N	Elevatio	<b>7</b> 5.22 mOD	End Date:	12/10/2023	Logger:		FINAL
Depth (m)	Sample / Tests	Field	Records		Casing Wa Depth De (m) (r	n) ITI	evel iOD	Depth (m)	Legend			cription		Water	Backfill
.00 - 0.80	B1					75	5.12	0.10		TOPSOIL: with very Firm dark brownish	fine roots (<0. slightly sandy	.5mm). slightly gravelly	CLAY. Sand is fir	ne	
							-			to coarse. Gravel is	subrounded fi	ine to coarse.			
.50	ES2						ļ								0.5
						74	.42	0.80							
							.42			Possible BEDROCK ( gravel)			drilling as angu	lar	1.0
							-				End of Bore	ehole at 0.80m			
							-								
							-								1.5
							ļ								
							-								2.0
					-										
															2.5
							ļ								
							-								3.0
							-								
							ļ								
							-								3.5
							ļ								
							F								4.0
							ļ								
							ļ								
							ļ								4.5
							ŀ								
							F								5.0
							F								
							ļ								
							ļ								5.5
							ļ								
							-								6.0
							F								
							ļ								
							F								6.5
							F								
							F								7.0
						F									
uck at (m) c	Water S	Strikes Time (min) Ro	se to (m)	From /	Chisel	l <b>ing De</b> To (m)		hh:mm)	Remarks		-				
ack at (III) Co	using to (III)	Time (IIIII) RC	,3C (III)	110111 (	,	· (111)	inne (			n pit hand dug to 0.80 dwater encountered.	nn.				
Casing D	etails	Water Ad	dded												
	Diameter		To (m)												
									Termina	tion Reason			Las	st Updat	ed 🔳
							1			d on boulder in hand			1		

		AUS	E	W	Ά	Y			•	ect No. 0343	Project I	<b>Name:</b> Dublin A		re Cable Rout	te			orehole	
		——-G	EC	OTE	Cl	-					Client's			osolutions (G	GDG)				
Metho Cable Percu	ussion	Plant L Dando	2000	)	0.0	00	Base	90		dinates	Final Dep	-		06/10/2023	Driller:	SMCW +CB		heet 1 o	
Rotary Dr Rotary Co	-	Comacch Comacch			1.9 4.0	- 1	4.0 20.			55.50 E 95.83 N	Elevation	: 77.22 mOD	End Date:	31/10/2023	Logger:	AK+SR		FINA	L
Depth (m)	Sample / Tests	Fie	eld Re	cords			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend			cription			Water	Backfill	
0.20 - 1.20 0.20 - 1.20 0.50 1.00 1.00 1.20 - 1.65 1.20 - 1.48	B3 B7 ES1 D5 ES2 D4 SPT (S)	50 (3,6/50 fo SN = 1411	ır 135	imm)	Hamı		0.00	Dry	77.02	0.20	X	TOPSOIL: with very Dense greyish brow subangular fine to r	n very gravelly		arse SAND.	Gravel is			0.5
1:88 - 4.00 2.00 - 2.02	B8	31-10-2023 50 (25 for 5m Hammer SN :			10mn	n)	2.00	Dry	75.32	1.90		Very dense brownis	th grey gravelly	r SAND. (Driller's	s descriptio	n)			2.0
4.00 - 4.03	SPT (C)	<del>50 (25 for 10</del> Hammer SN :			<del>r 20m</del>	m)	4.00		73.22	4.00		No Recovery: Driller	r notes yellow	ish brown grey g	ravelly SAN	ND.	-		4.0
5.30 5.30 - 5.34	10mm/	60 (25 for 50 for Hammer SN	70	62	23		5.30	5.30	71.52	5.70	+ + + + + + + + + + + + + + + + + + + +	Strong light grey spi slightly closer fractu Discontinuities: 1. 40-50 degree joir rough, with strong o with 2.5mm of brov	ure spacing. Ints, medium sy dark orange st	paced (30/240/1 aining on most j	.130), undu	ılating,			5.5
6.80			100	95	67						+ + + + + + + + + + + + + + + + + + +								7.0 —
8.30			100	100	53						+ + + + + + + + + + + + + + + + + + +								8.5 - 9.0 -
	1	· · · ·	TCR	SCR	RQD		6			<u> </u>									L
Casing De	asing to (m	Water	Add		n) Fr		m)	To (		ne (hh:mm) 01:00		pit hand dug to 1.20 water encountered.	0m.						
1.90	200	4.00		0.30			Barro K6L	el	Flush Air/Po			on Reason at scheduled depth	ı.			<b>Last Up</b>			GS

								Proje	ect No.	Project Na	ime: Dublin A	rray Onshor	e Cable Rout	ie .		Вс	rehole ID
	C	AUS	E	W	A	Y		23-	0343	Client: Dublin Array						WP	03_BH1
			GEC	OTE	Cl	Н				Client's Re	e <b>p:</b> Gavin & I	Doherty Ge	osolutions (G	GDG)			
Metho		Plant I			<b>Top</b>		ase (m) 1.90	Coor	dinates	Final Depth: 20.30 m Start Date: 06/10/2023 Driller: SMCW +CB							neet 2 of 3
Rotary Dr Rotary Co	rilling	Comacch Comacch			1.9 4.0		4.00 20.30		55.50 E 95.83 N	Elevation: 77.22 mOD End Date: 31/10/2023 Logger:			Logger: A			FINAL	
Depth (m)	Samples /	Field Records	TCR	SCR I	RQD	FI C	asing Water epth Depth (m) (m)	Level mOD	Depth (m)	Legend		Desc	ription	,		Water	Backfill
,							()		,	+ + + -						>	9.5
										+ + + +							3.3
.80										+ + + +							10.0
										+ + + +							
					-					+ + + +							10.5
			100	96	69					+ + + +							
										+ + + +							11.0
1.30										+ + + +							
1.30										+ + +							11.5
										+ + + +							
			100	100	95					++++							12.0
			100	100	33					+ + + +							
										+ + + +							12.5
2.80										+ + + +							
									-	+++							13.0
										+ + +							
			100	82	26					+++	3.50-13.54m: Gravel ban	nd					13.5
			100							+++							
									-	+ + + +							14.0
4.30										+ + + +							
										+ + + +							14.5
										+ + + +							
			100	100	87				F	++++							15.0
										+ + + +							
										+ + + +							15.5
5.80						.		61.42	15.80	+++	rong light grey spe	ackled dark gre	ov GRANITE Slig	htly weather	red:		
									-	+ + + - sli	ghtly closer fractu		y ONAMIE. SIIS	mily weather	icu.		16.0
										+++11.	scontinuities: 0-10 degree join						
			100	73	73				Ė	+ + + ro	ugh, with strong of to 10mm of light			joint surfaces	s, and		16.5
										+++		8 7	,				
									-	+ + + +							17.0
7.30										+ + + +							
										+ + + +							17.5
			100		05				-	+ + + +							
			100	93	85				E	+ + + +							18.0
									É	+ + +							
	_		TCP	SCR	ROD	FI			ŧ	+ + + +							18.5
	Water	Strikes			~-		hisellin	g Details	5	Remarks							
uck at (m) C	asing to (m)	Time (min)	Rose	to (m		rom (m 1.70		m) Tim	ne (hh:mm) 01:00		hand dug to 1.20 ter encountered.	m.					
Casin = D	otaila	14/	٠- ١- ٨														
To (m) D	Diam (mm) 200	From (m) 4.00	To	ed (m) 0.30													
4.00	200	4.00	20	J.JU	-	Core E	arrel	Flush	Туре	Termination	Reason				Last Upd	late	d I
						SK6	SL SL	Air/Po	lymer	Terminated at	scheduled depth.				06/02/2	024	AG

			GEC	DTI	EC	Н			23-	ect No. -0343	Client: Client's F	Dublin A  Dublin A  Rep: Gavin &	rray	eosolutions (G				P03_E	
Met Cable Pe	t <b>hod</b> ercussion	Plant U Dando				(m) 00		e (m) .90	Cooi	rdinates	Final Dep	<b>th:</b> 20.30 m	Start Date:	06/10/2023	Driller:	SMCW +CB		heet 3	
Rotary	Drilling Coring	Comacch	Comacchio 405 Comacchio 405		1.90 4.00		4.00 20.30		723155.50 E 722695.83 N		Elevation	: 77.22 mOD	End Date:	31/10/2023	Logger:			Scale: 1 FINA	
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend		Des	cription	'		Water	Backfill	Τ
0.30			100		62				56.92	20.30	+ + + + + + + + + + + + + + + + + + +		End of Bore	hole at 20.30m					19.0 19.5 20.0 21.5 22.0 22.5 23.0 24.5 24.5 25.0 26.5 27.0
ruck at (m)		Time (min)	Rose	to (r	n) F	rom (			g Detail	ne (hh:mm)	Remarks	oit hand dug to 1.20							
	Details Diam (mm	Water	<b>Add</b>			1.70		1.	90	01:00		oft nand dug to 1.20 vater encountered.							
4.00	200					Core	Barı	rel	Flush	туре	Terminatio	on Reason				Last Up	odate	ed	ī
						S	K6L		Air/P	olymer	Terminated	at scheduled depth				06/02	/2024	Λ	ē

		AUS	E	W.	A C	<b>Y</b>				ect No. 0343	Project Name: Dublin Array Onshore Cable Route  Client: Dublin Array  Client's Rep: Gavin & Doherty Geosolutions (GDG)  Borehol  WP03_I	
Cable Per Rotary	rcussion	Plant Dando Comacch	2000 nio 40	)5	<b>Top</b> 0.0 2.5	00	3.3 17.	30		26.04 E	Final Depth: 25.00 m Start Date: 20/10/2023 Driller: SMCW +CB Scale: 1	
Rotary Pe		Comacch	nio 40	)5	17.	30	25.			38.91 N	Elevation: 7.46 mOD End Date: 20/10/2023 Logger: SR+TG FINA	۱ <u>L</u>
Depth (m)	Sample / Tests	Fi	eld Rec	cords			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend Description Backfil  TOPSOIL: with very fine roots (<0.5mm).	1
0.20 - 1.20	ES1								7.26	0.20	Dark greyish brown slightly sandy silty subangular fine to coarse GRAVEL. Sand is fine to coarse. Cobbles are subrounded.	0.5
1.00 1.00 1.20 - 2.00 1.20 - 1.25		50 (25 for 10 Hammer SN			45m		0.00	Dry	6.26	1.20	Dense dark greyish brown slightly sandy silty subangular fine to coarse GRAVEL. Sand is fine to coarse. Cobbles are subrounded.	1.5
2.00 2.00 - 3.00 2.00 - 2.45 2.50		2.00 1 ) N=28 (4,6/7,7,6,8) Hammer SN = 0208 17-11-2023							4.96	2.50	Low recovery: Very dense grey slightly sandy subangular fine to	2.0
3.00 3.00 - 4.00 3.00 - 3.26		<del>50 (6,7/50 fc</del> SN = 0208	o <del>r 112</del> 25	<del>mm)  </del>	Hamr		3.00	1.20			coarse GRAVEL with low cobble content. Sand is fine to coarse.	3.0
3.80 3.80 - 4.07	for 115 Hamme	50 (8,8/50 mm) er SN = 0208					3.80	3.00	3.46	- 4.00	Low recovery: Very dense brown slightly sandy clayey subangular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.	4.0
4.00 - 5.00 5.00 - 6.00 5.30			10						1.96	5.50		5.0
5.00 - 7.00	B12		20								Low recovery: Very dense grey slightly sandy subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.	6.0
5.80 6.80 - 7.06 7.00 - 9.00	for 110 Hamme	50 (7,8/50 mm) er SN = 0208	20				6.80	6.50				7.0
3.30			25						-0.94	8.40	Low recovery: Very stiff greenish brown slightly sandy CLAY. Sand is fine to coarse.	8.5
9.00 - 11.00	0 B14											9.0
	147 :	. Ct!!	TCR	SCR	RQD	FI	<u> </u>	-10:	. D		D	
truck at (m) 17.30		Time (min)	Rose	to (m			m)	To ( 1.5 3.3	50	s me (hh:mm) 00:45 01:00	Remarks Inspection pit hand dug to 1.20m. Geobor-S carried out from 2.00-17.30m, very little recovery due to granular nature of the soil. Switched to symmetrix from 17.30m with bulk bags taken of the strata encountered.	
	Details Diam (mm 200 200	Water ) From (m) 1.20	То	e <b>d</b> (m)		Core	Barr	el	Flush	1 Туре	Termination Reason Last Updated	
						SI	K6L		Wat	er/Air	Terminated at scheduled depth. 06/02/2024	G

		AUS	E	VV OT E	A ECI	<b>Y</b>				ct No. 0343	Client's	Name: Dublin A  Dublin A  Rep: Gavin &	rray	eosolutions (G				orehole PO3_BI		
Metho Cable Percu Rotary Co	ission ring	Plant U Dando Comacch	2000 nio 40	)5	0.0 2.	00 50	17	30 .30		6.04 E	Final Dep	<b>oth:</b> 25.00 m	Start Date:	20/10/2023	Driller:	+CB Scale: 1:5				
Rotary Perci	ussion	Comacch	110 40	)5	17.	.30		.00		8.91 N	Elevation	7.46 mOD	End Date:	20/10/2023	Logger:	SR+TG		FINAL		
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend		Des	cription			Water	Backfill	_	
9.80 9.80 - 10.06	for 110r	0 (7,9/50 nm) r SN = 0208	20				9.80	9.00	-3.04	10.50		Low recovery: Very fine to coarse GRAV fine to coarse. Cobb	EL of limestor	ne with low cobb					9.5 10.0 <del>-</del> 10.5	
1.30 1.30 - 11.58	for 125r						11.3	5.30			0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0								11.0 <b>-</b> 11.5	
2.00 - 14.00	B15		66				40-				6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0								12.0 <b>-</b> 12.5	
2.80 2.80 - 13.04		0 (11,13/50 m) Hammer 08	25				12.8	3.40			4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0								13.0 - 13.5	
4.00 - 15.00	B16										9 9 0 9 9 9								14.0	
4.30							2.50	0.00			, a , a , a	14.30-25.00m: No recove	ery	_						
4.30 5.00 - 16.00	20-11-2 <sup>1</sup> B17	U23	0																14.5 15.0 ·	
15.80 15.80 - 15.94	85mm/5 60mm) = 0208						15.8	3.60											16.0 <b>-</b> 16.5	
7.00 - 18.00 7.30			0				13.0	0.00	-9.84	17.30		Very dense greyish	brown candy	-lightly cilty CDA	VEL /Drillor	, la	•		17.0 -	
₹:30 - 17.64 7.50 8.00 - 19.00	continu	ዓያት (25 for 85 ዋቴሐሕዊ የ የታ፤ የተፈ የታ፤ የተፈ የ የ የ የ የ የ የ የ የ የ የ የ የ የ የ የ የ የ	6mm/! = 020	50 for 18	r 60m	im)		4.50 8.40	-3.04			description)	or own same y	singifuly stifty GIVA	vel. (Dille)	3			17.5 18.0 -	
		Strikes			Ţ				Details		Remarks						1			
To (m) Castron	17.50	20 Water	Add		n) Fi	1.20 3.30	)	To (	50 (	e (hh:mm) 00:45 01:00	Geobor-S c	pit hand dug to 1.20 arried out from 2.00 o symmetrix from 17	0-17.30m, very					e soil.		
3.30 25.00	200 200 200	1.20		.30		Coro	Barı	ا اه	Flush	Type	Termina	on Reason			Т	Last Up	nda+c	d =	<u> </u>	
	-				'		<b>Barı</b> K6L	el	<b>Flush</b> Water			on Reason  at scheduled depth				06/02/			귀	

Metho		GEOT Plant Used	AY ECH	Ross	. (~)	Project 23-0	343	Project Name: Dublin Ar Client: Dublin Ar Client's Rep: Gavin & D		GDG)	WP03	hole ID B_BH14
Cable Percu Rotary Co Rotary Percu	ussion oring	Dando 2000 Comacchio 405 Comacchio 405	0.00 2.50 17.30		30 .30	72582 72313	6.04 E		Start Date: 20/10/2023 End Date: 20/10/2023	Driller: SMCW +CB Logger: SR+TG	Scal	et 3 of 3 e: 1:50
Depth (m)	Sample / Tests	Field Records		Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description		Mater Ba	ckfill
19.00 - 20.00												19.0 — ———————————————————————————————————
20.00 - 21.00	B22											20.0
20.50 - 20.60	SPT (C)	50 (25 for 50mm/50 fo Hammer SN = 0208	r 50mm)	20.5	4.50							20.5 —
21.00 - 22.00	B23											21.0
22.00 - 23.00	B24											22.0
23.50 - 23.59	SPT (C)	50 (25 for 50mm/50 fo Hammer SN = 0208	r 40mm)	23.5	5.00							23.5 —
25.00		23-11-2023		25.0	4.00	-17.54	25.00		End of Borehole at 25.00m			25.0 —
												25.5 — 26.0 — 26.5 — 27.0 — 27.5 —
	Wate	r Strikes	Rema	ırks								
Casing De	17.50 etails	Time (min)   Rose to (r   20	n) Inspec	tion p	arried		2.00-17.3	Om, very little recovery due to grawith bulk bags taken of the strata				
3.30 25.00	200 200	1.20 3.30	Core	Barı	rel	Flush	Туре	Termination Reason		Last U <sub>l</sub>	odated	
				K6L		Water	/Air	Terminated at scheduled depth.		06/02	/2024	AGS

CAUSEWA GEOTE Method Plant Used	Top (m) Base (m	23-0343		WP03_BH1			
Method Plant Used 1	Ton (m) Pass (			A			
Method Plant Osed		Coordinates	Client's Rep: Gavin & Doherty Geosolutions (GDG)				
	iop (iii) base (m		Final Depth: 2.80 m Start Date: 21/10/2023 Driller:	Sheet 1 of 1 Scale: 1:40			
		725828.33 E 723138.33 N	Elevation: 7.51 mOD End Date: 21/10/2023 Logger:	FINAL			
Depth Sample / Field Records	Casing Water Depth Depth (m) (m)	Level Depth mOD (m)	Legend Description	Backfill			
	Chisellir	Leve  moD   Depth (m)	TOPSOIL  Dense dark greyish brown slightly sandy very clayey subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subrounded.  End of Borehole at 2.80m  End of Borehole at 2.80m	Backfill			



# APPENDIX C CORE PHOTOGRAPHS





WP03\_BH01 3.80-5.30m Box 1



WP03\_BH01 5.30-6.80m Box 2



WP03\_BH01 6.80-8.30m Box 3



WP03\_BH01 8.30-9.30m Box 4





WP03\_BH02 2.30-3.80m Box 1



WP03\_BH02 3.80-5.30m Box 2



WP03\_BH02 5.30-6.80m Box 3



WP03\_BH02 6.80-8.30m Box 4



WP03\_BH02 8.30-9.80m Box 5





WP03\_BH06 3.80-5.30m Box 1



WP03\_BH06 5.30-6.80m Box 2



WP03\_BH06 6.80-8.30m Box 3



WP03\_BH06 9.30-9.80m Box 4



WP03\_BH06 9.80-11.30m Box 5





WP03\_BH06 11.30-12.80m Box 6



WP03\_BH06 12.80-14.30m Box 7



WP03\_BH06 14.30-15.80m Box 8



WP03\_BH06 15.80-17.30m Box 8



WP03\_BH06 17.30-18.80m Box 8



WP03\_BH06 18.80-20.30m Box 8





WP03\_BH06 20.30-21.80m Box 12



WP03\_BH09 6.70-8.00m Box 1



WP03\_BH10 2.30-3.80m Box 1



WP03\_BH10 3.80-5.30m Box 2





WP03\_BH10A 8.50-9.80m Box 1



WP03\_BH10A 9.80-11.30m Box 2



WP03\_BH10A 11.30-12.80m Box 3



WP03\_BH10A 12.80-14.30m Box 4



WP03\_BH10A 14.30-15.80m Box 5



WP03\_BH10A 15.80-17.30m Box 6





WP03\_BH10A 17.30-18.80m Box 7



WP03\_BH10A 18.80-20.30m Box 8





WP03\_BH11 2.30-3.80m Box 1



WP03\_BH11 3.80-5.30m Box 2



WP03\_BH11 5.30-6.80m Box 3



WP03\_BH11 6.80-8.30m Box 4



WP03\_BH11 8.30-9.80m Box 5



WP03\_BH11 9.80-11.30m Box 6





WP03\_BH11 11.30-12.80m Box 7



WP03\_BH11 12.80-14.30m Box 8



WP03\_BH11 14.30-15.80m Box 9



WP03\_BH11 15.80-17.30m Box 10



WP03\_BH11 17.30-18.80m Box 11



WP03\_BH11 18.80-20.30m Box 12





WP03\_BH13 5.30-6.80m Box 2



WP03\_BH13 6.80-8.30m Box 3



WP03\_BH13 8.30-9.80m Box 4



WP03\_BH13 9.80-11.30m Box 5



WP03\_BH13 11.30-12.80m Box 6



WP03\_BH13 12.80-14.30m Box 7





WP03\_BH13 14.30-15.80m Box 8



WP03\_BH13 15.80-17.30m Box 9



WP03\_BH13 17.30-18.80m Box 10



WP03\_BH13 18.80-20.30m Box 11





WP03\_BH14 2.30-3.80m Box 1



WP03\_BH14 3.80-5.30m Box 2



WP03\_BH14 5.30-6.80m Box 3



WP03\_BH14 6.80-8.30m Box 4



WP03\_BH14 8.30-9.80m Box 5





WP03\_BH14 9.80-11.30m Box 6



WP03\_BH14 11.30-12.80m Box 7



WP03\_BH14 12.80-14.30m Box 8

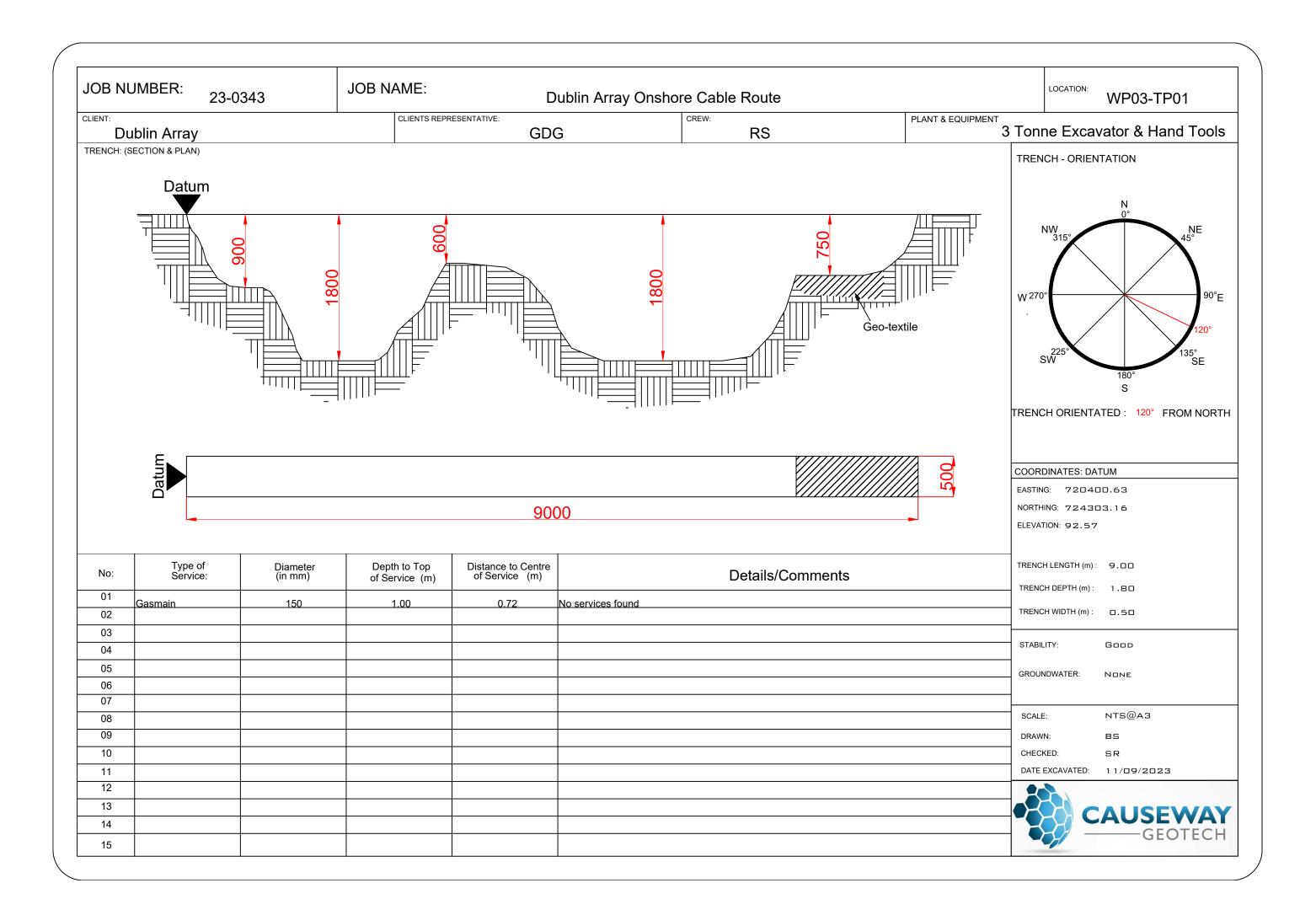




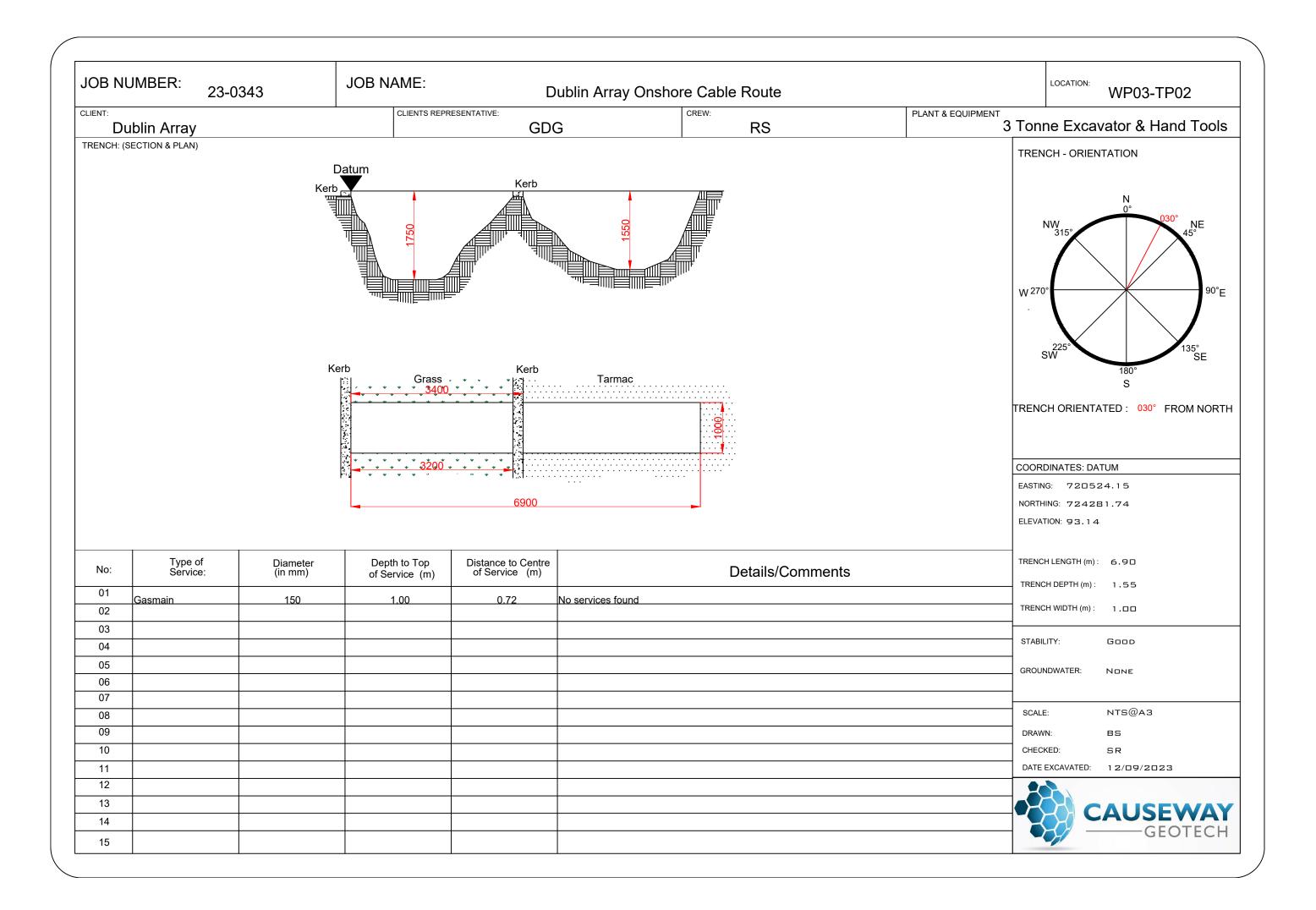
APPENDIX D
TRIAL PIT AND SLIT TRENCH
LOGS AND DRAWINGS



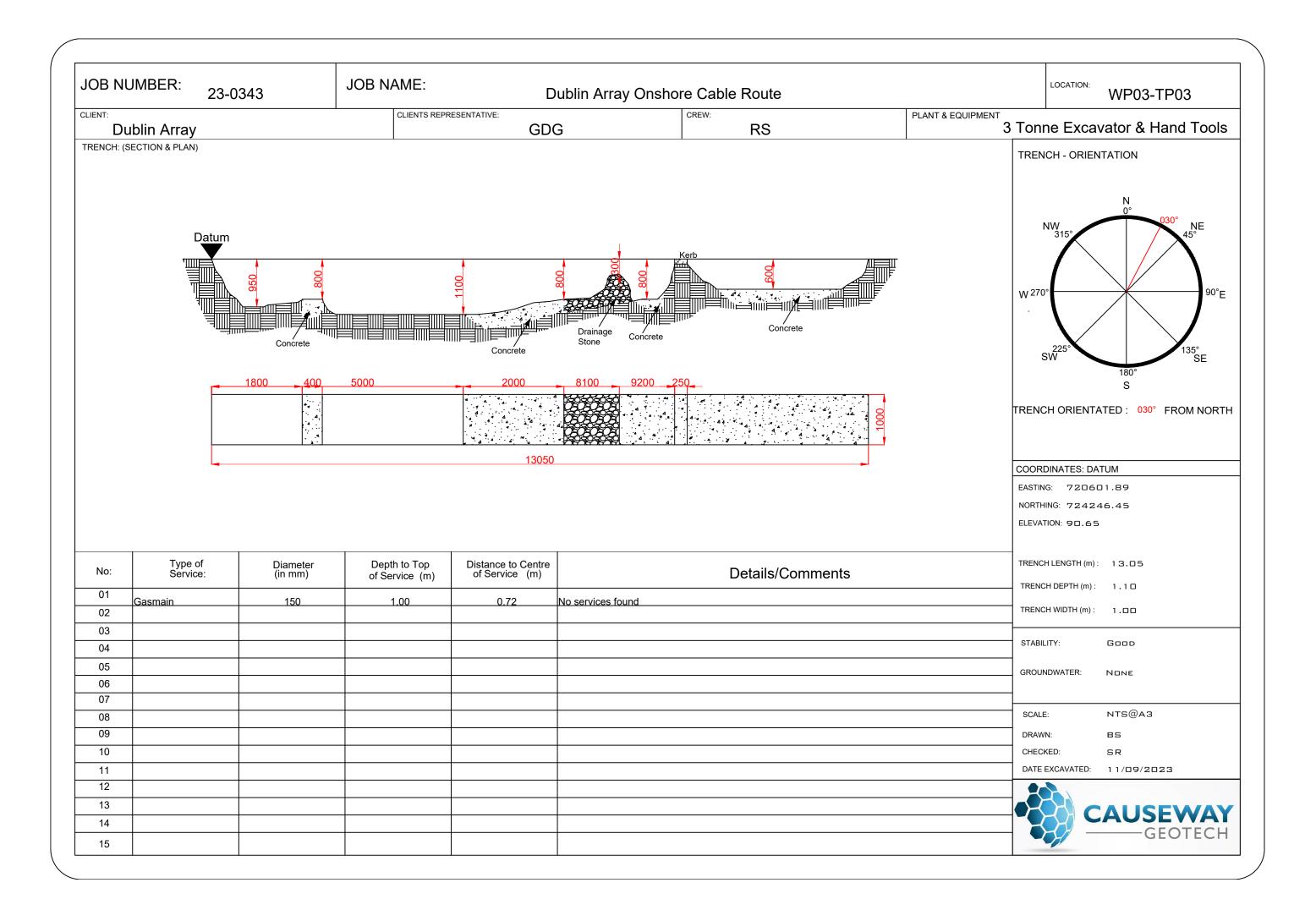
			Proj	ect No.	Project	Name:		Т	rial Pit ID
A A	CALIS	SEWAY	23	-0343	Dublin	Array Onshore Cable Route			
	CAUS	GEOTECH	Coor	dinates	Client:			WI	P03_TP01
			7204	00.63 E	Dublin				
<b>Method:</b> Slit Trenching				03.16 N	1	Representative: & Doherty Geosolutions (GDG)			eet 1 of 1
Plant:			Ele	vation	Date:				cale: 1:25
3t Tracked Exca	ıvator			7 mOD	11/09/				FINAL
Depth	Sample /	Field Records	Level	Depth	Legend	Description		Water	
0.50	Tests ES1	Seepage at 1.75m.	90.77	1.80	Legend	MADE GROUND: Reworked firm brown slightly sandy slightl CLAY with low cobble content. Sand is fine to coarse. Gravel subrounded fine to coarse. Cobbles are subrounded.  End of trial pit at 1.80m	y gravelly s	Mate Wate	1.0 —  2.0 —  3.5 —  4.0 —  4.5 —  4.5 —
				<u> </u>					=
	CA!I.		Par	narks:					
Water Struck at (m)	Strikes Remarks	<b>Depth:</b> 1.80		<b>narks:</b> E Liner exp	osed.				
1.75	Seepage a	Width: 0.60		19	•				
	1.75m.	Length: 9.00							
		Stability:	Terr	mination R	eason		Last Up	date	d T
		Stable	Tern	ninated due	to encoun	tering LDPE liner.	06/02/	2024	AGS



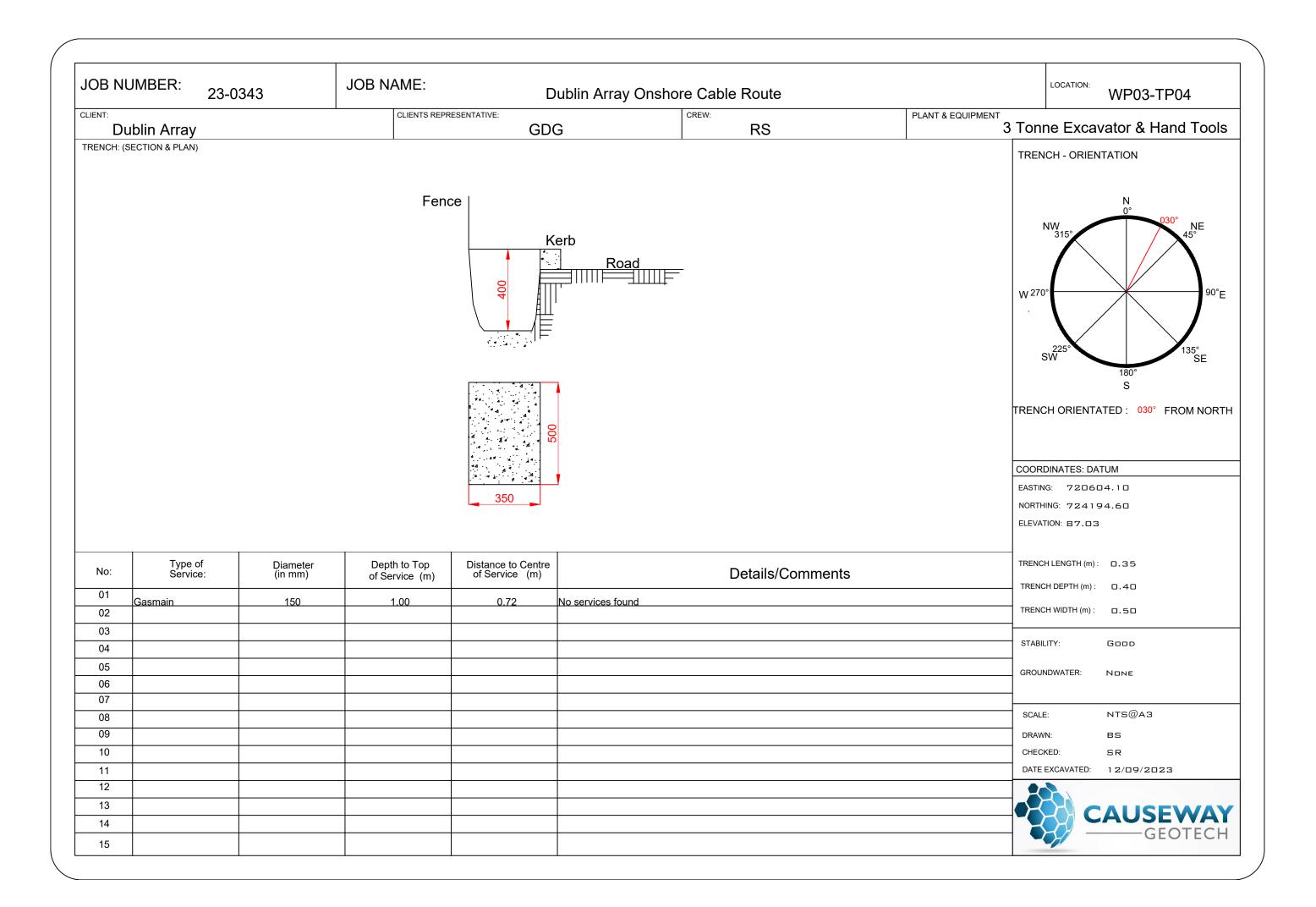
202				ect No.		t Name:		Т	rial Pit ID
	CAUS	SEWAY		-0343	Dublin Client:	Array Onshore Cable Route		\A/!	P03_TP02
	(	GEOTECH	Coor	dinates	Dublin			VVI	PU3_1PU2
/lethod:			7205	24.15 E		s Representative:		SŁ	neet 1 of 1
lit Trenching			7242	81.74 N		& Doherty Geosolutions (GDG)			cale: 1:25
lant:			Ele	vation	Date:	Log	ger:		
t Tracked Exc	avator		93.14	4 mOD	12/09/	2023 RS			FINAL
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	<b>Description</b> MADE GROUND: Stiff brown slightly sandy gravelly CLAY. Sa coarse. Gravel is subrounded fine to coarse.	nd is fine to	Water	
			92.84	0.30		MADE GROUND: Grey sandy very silty angular fine to coars Sand is fine to coarse.	e GRAVEL.		
0.50	ES1		92.69	0.45		MADE GROUND: Stiff brown slightly sandy slightly gravelly cobble content and rare sheets of plastic. Sand is fine to cosubrounded fine to coarse. Cobbles are subrounded.		-	0.5 —
1.00	В3	Slow seepage	91.94	1.20		MADE GROUND: Firm brownish grey slightly sandy slightly sand is fine to coarse. Gravel is subrounded fine to coarse.	gravelly CLAY.	<b>_</b>	1.0
1.50 1.50 1.50 - 1.50	B4 ES2 ES1		91.39	1.75					1.5 —
									2.0 —
									3.5 -
				-					4.5 -
	r Strikes	<b>Depth:</b> 1.75		narks:	on in	retranch FS at 1 FOre taken in the			
Struck at (m) 1.30	Remarks Slow seepa	Width: 0.50 Length: 6.90	LDP	E Liner exp	osed wit	ss trench. ES at 1.50m taken in the road. hin verge and road. road section.			
		Stability:	Terr	nination R	eason		Last Up	date	d
		Stable	Term	ninated on E	ngineer's	instruction.	06/02/	/2024	AG



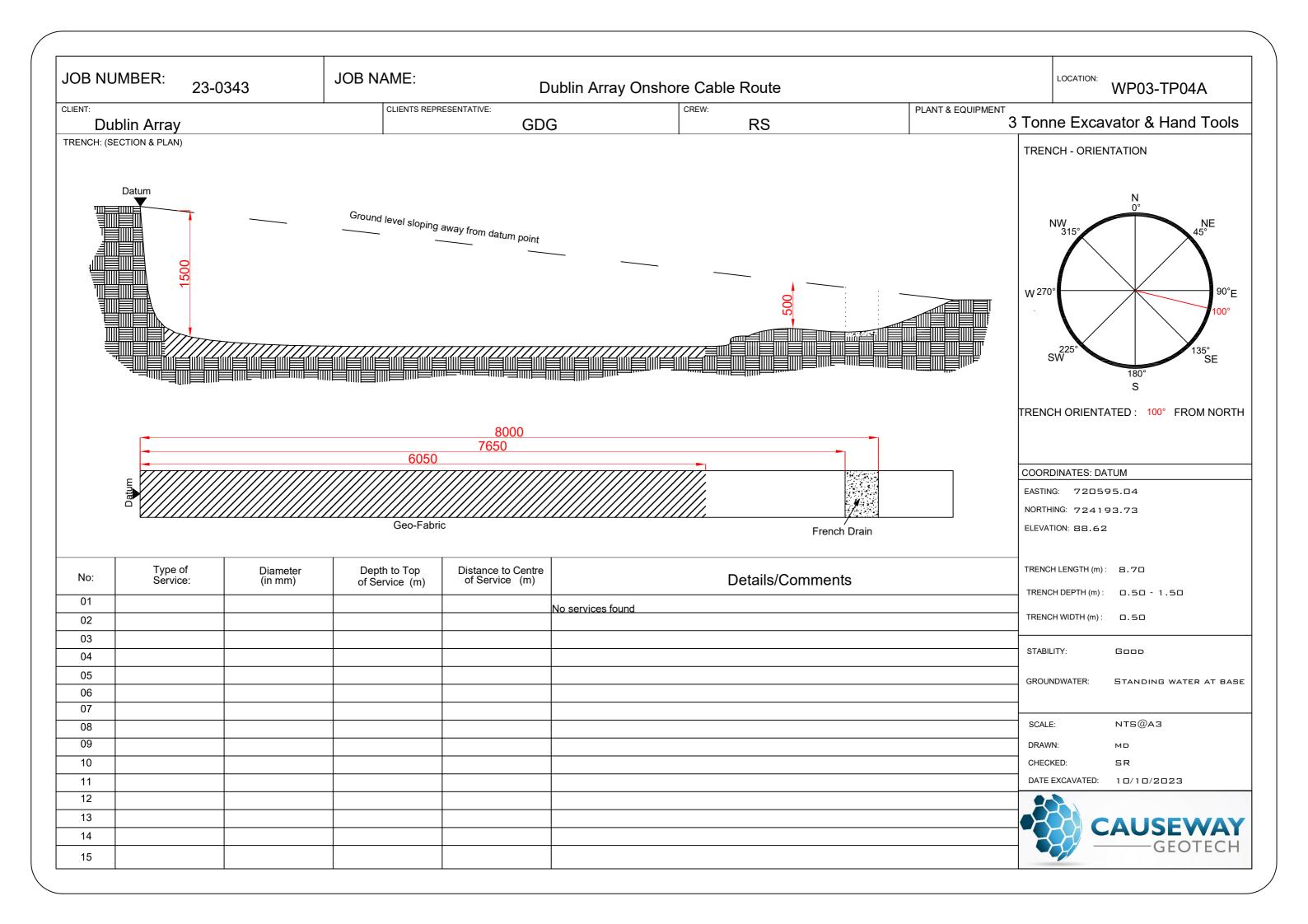
					1	Name:		Т	rial Pit ID
	CAUS	EWAY		-0343	Client:	Array Onshore Cable Route		۱۸/۵	P03_TP03
	———G	EOTECH		dinates	Dublin	Array		***	-03_11-03
/lethod:	<u> </u>		7206	01.89 E	1	s Representative:		Sh	neet 1 of 1
lit Trenching			7242	46.45 N		R Doherty Geosolutions (GDG)			cale: 1:25
Plant:			Ele	vation	Date:	Logge	r:		
Bt Tracked Exc				5 mOD	11/09/	2023 RS			FINAL
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	<b>Description</b> TOPSOIL: Stiff brown slightly sandy slightly gravelly CLAY. Sand	is fine to	Water	
).40	B2		90.50	0.15		coarse. Gravel is subrounded fine to coarse.  MADE GROUND: Grey sandy very silty angular fine to coarse G Sand is fine to coarse.			
0.40 0.50	ES3 ES1		90.20	0.45		MADE GROUND: Firm brown slightly sandy gravelly CLAY with content. Sand is fine to coarse. Gravel is subrounded fine to co Cobbles are subrounded.			0.5 —
			89.55	1.10		End of trial pit at 1.10m			
				-					1.5 —
				- - -					-
				-					2.0 —
				-					-
				-					
				-					2.5 -
				- - -					
				-					3.0
				-					
				-					3.5 —
				- - -					
				- - - -					4.0 —
				- - -					
				- - -					4.5 -
				-					
				-					
Wate Struck at (m)	er Strikes Remarks	Depth: 1.10 Width: 0.60	ES a	groundwat	er encou	in road. ES at 0.50m taken in grass trench. ntered. n grass section.			
		Length: 13.05 Stability:		nination R			Last Up	date	d 🔳 🖃
		Stable Stable		ninated at re		oncrete.	06/02/		VC



			Proj	ect No.	Project	Name:		Ti	ial Pit ID		
	CALIC		1	-0343	1	Array Onshore Cable Route					
	CAUS	EWAY	Coor	dinates	Client:			WF	03_TP04		
	G	EOTECH			Dublin	Array			_		
Method:				604.10 E	Client's	Representative:		Sh	eet 1 of 1		
Slit Trenching			7241	.94.60 N	Gavin 8	k Doherty Geosolutions (GDG)			cale: 1:25		
Plant:			Ele	vation	Date:	Lo	gger:				
Hand dug			87.0	3 mOD	12/09/	2023 RS			FINAL		
Depth	Sample /	Field Records	Level	Depth	Legend	Description		Water			
(m)	Tests		(mOD)	(m)		MADE GROUND: Stiff brown slightly sandy slightly gravelly		>			
				-		fine to coarse. Gravel is subrounded fine to coarse.			-		
0.40	ES1		86.63	0.40					_		
				-		End of trial pit at 0.40m			0.5 —		
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				ŀ					7		
				-					1.0		
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			1	<u>L</u>							
	Strikes	<b>Depth:</b> 0.40		<b>narks:</b> groundwate	er encou	ntered					
Struck at (m)	Remarks	<b>Width:</b> 0.35	140	<sub>5</sub> , ound Wdl	ci elicoù	mereu.					
		<b>Length:</b> 0.70									
		Stability:	Teri	mination R	eason		Last Upd	late			
		Stability: Stable			Terminated at refusal on concrete. 06/0						



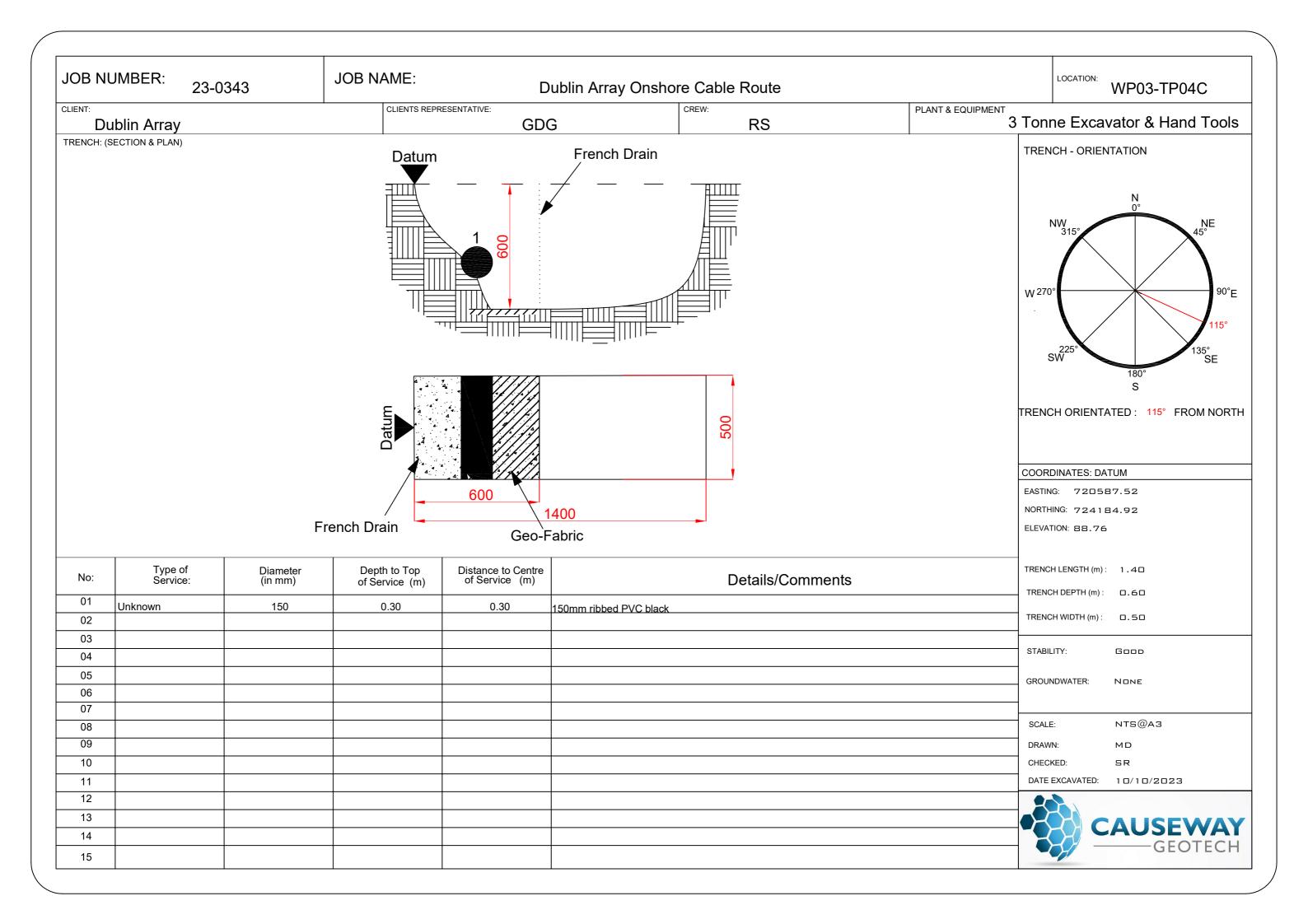
			Proj	ect No.	Project	: Name:		Т	rial Pit ID
	CALI	SEVA/AV		-0343	1	Array Onshore Cable Route		\A/F	.02 TD04
	CAU	SEWAY GEOTECH	Coor	dinates	Client:			vvi	P03_TP04 A
	`	GLOTECTI	7205	95.04 E	Dublin				^
Method:				.93.73 N	1	s Representative:		Sh	eet 1 of 1
Slit Trenching						& Doherty Geosolutions (GDG)		S	cale: 1:25
Plant:				vation	Date:		ger:		FINAL
3t Tracked Exc		1		2 mOD	10/10/	2023 RS			1110/12
Depth (m)	Sample / Tests	Field Records	(mOD)	Depth (m)	Legend	Description		Wate	
1.40 1.40 - 1.40	ES2 ES1	Slow	88.22 87.62	Depth (m) - 1.00 - 1.50	Legend	MADE GROUND: Soft brown slightly sandy gravelly CLAY w content and rare sheets of plastic. Sand is fine to coarse. G subrounded fine to coarse. Cobbles are subrounded.  MADE GROUND: Soft brown slightly sandy slightly gravelly fine to coarse. Gravel is subrounded fine to coarse.  MADE GROUND: Soft grey slightly sandy slightly gravelly Cl cobble content. Sand is fine to coarse. Gravel is subangular.  End of trial pit at 1.50m	CLAY. Sand is	◀ Water	1.0 — 1.5 — 2.0 — 2.5 — 4.0 — 4.5 —
				-					4
				-					-
				<u>L</u>					
	r Strikes	<b>Depth:</b> 1.50		narks:	0004				
Struck at (m)	Remarks	<b>Width:</b> 0.50	LDP	E liner exp	usea.				
1.00	Slow	Length: 8.70							
			Torr	mination R	asor		Last II-	data	, ,
		Stability:							<b>" [[]</b> ]
ĺ		Stable	Tern	ninated on E	ngineer's	instruction.	06/02/	2024	



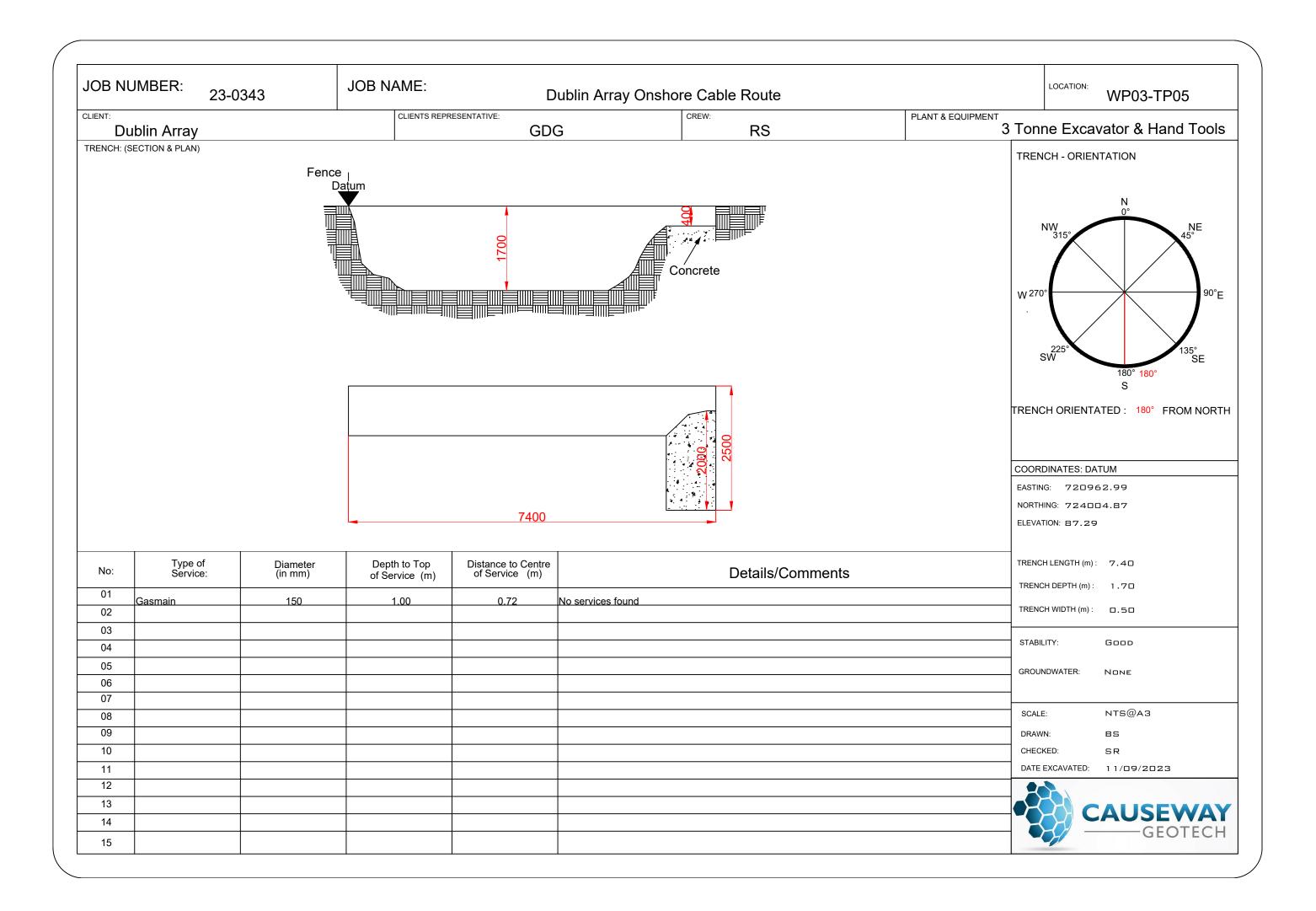
202			1			Name:		Tri	al Pit ID
A CAN	CALIS	EWAY	23	-0343	1	Array Onshore Cable Route		\A/D	03_TP04
HOH)		EWAY SEOTECH	Coor	dinates	Client:			VVP	B B
			7205	88.33 E	Dublin				
Method:				93.46 N	1	Representative:		She	et 1 of 1
Slit Trenching						k Doherty Geosolutions (GDG)		Sc	ale: 1:25
Plant:					Date:		Logger:		INAL
3t Tracked Exca	vator			0 mOD	10/10/	2023	RS		IIVAL
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water	
						MADE GROUND: Firm brown slightly sandy gravelly CL content. Sand is fine to coarse. Gravel is subrounded fi Cobbles are subrounded.	ne to coarse.		
			88.30	0.60					0.5 —
			00.00	-		End of trial pit at 0.60m			-
				ŀ					=
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				<u> </u>				_+	
Water		<b>Depth:</b> 0.60		narks:		ntarad			
Struck at (m)	Remarks	<b>Width:</b> 0.50		groundwate E liner expe		nterea.			
		Length: 1.00		۲.					
		Stability:	Terr	mination R	eason		Last Up	dated	
		Moderately stable		ninated on E		instruction.	06/02/2		AGS

JOB NU	MBER: 23-0	)343	JOB NAME:		ublin Array Onshor			LOCATION: WP03-TP04B
CLIENT:	olin Array		CLIENTS REF	PRESENTATIVE:	3	CREW:	PLANT & EQUIPMENT  3 Tor	nne Excavator & Hand Tools
	CTION & PLAN)		I	35				:NCH - ORIENTATION
				Datum	French Drain		W <sup>2</sup>	NW 315° 70° NE 45° 060° 90°E
			Geo-Fabric		000 ch Drain		COO EAST NOR	135° SE 180° S  NCH ORIENTATED: 060° FROM NORTH  RDINATES: DATUM  TING: 720588.33  THING: 724193.46  VATION: 88.90
No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)		Details/Comments		ICH LENGTH (m): 1.00
01					No services found			NCH DEPTH (m): 0.40  NCH WIDTH (m): 0.50
02 03							TNE	(ii). 1.31
04							STAI	BILITY: GOOD
05							GRO	UNDWATER: None
06							Onto	
07								NTC @AG
08				1			SCA	
09							DRA	
10 11								ECKED: SR E EXCAVATED: 10/10/2023
11				1			DAT	LLAVAVAILU. 10/10/2023
13								
14								CAUSEWAY ——GEOTECH
15			1					———GEOTECH

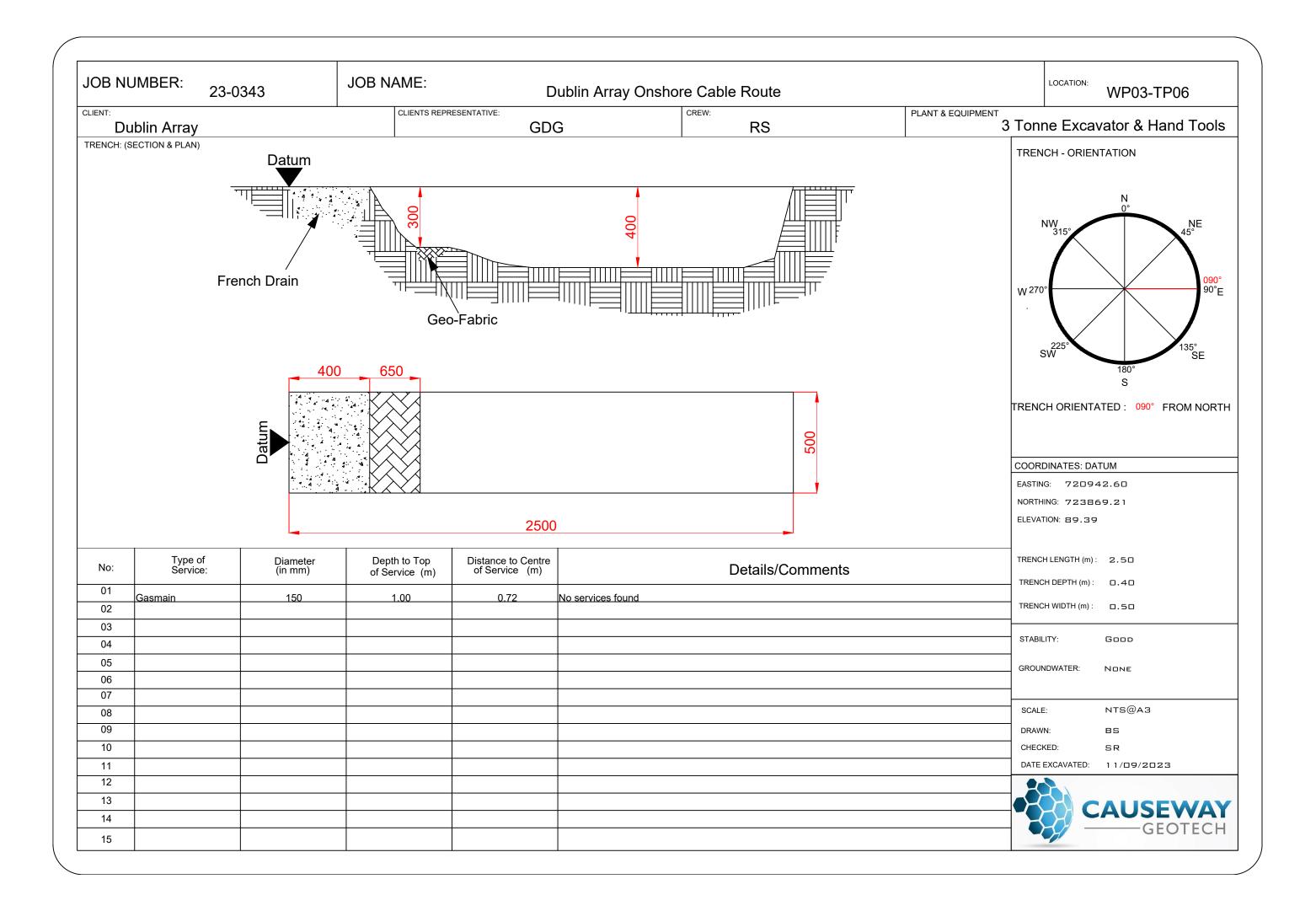
0.0			Proi	ect No.	p. Project Name:				Trial Pit ID		
				-0343	1	Array Onshore Cable Route					
	CAUS	<b>EWAY</b>		dinates	Client:			— WI	P03_TP04		
	——-G	EOTECH			Dublin				С		
Method:				87.53 E	1	s Representative:		C!	neet 1 of 1		
Slit Trenching			7241	84.92 N	1	& Doherty Geosolutions (GDG)			cale: 1:25		
Plant:			Ele	vation	Date:		Logger:	+			
3t Tracked Exca	vator		1	6 mOD	10/10/		RS		FINAL		
Depth	Sample /	Field Records	Level	Depth	Legend	Description		Water			
(m)	Tests		(mOD)	(m)		MADE GROUND: Firm brown slightly sandy slightly gra	velly CLAY. Sand i				
				ļ.		fine to coarse. Gravel is subangular fine to coarse.			-		
				E							
				<u> </u>					_		
				-					0.5 —		
			88.16	0.60		End of trial pit at 0.60m			-		
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14/-4	Ctribes		Pan	narks:							
Struck at (m)	Strikes Remarks	<b>Depth:</b> 0.60	No g	groundwate	er encou	ntered.					
	. ic.iidi ko	<b>Width:</b> 0.50	LDP	E liner exp	osed.						
		Length: 1.40									
		Stability:	Terr	mination R	eason		Last	Update	AGS		
						Engineer's instruction.					



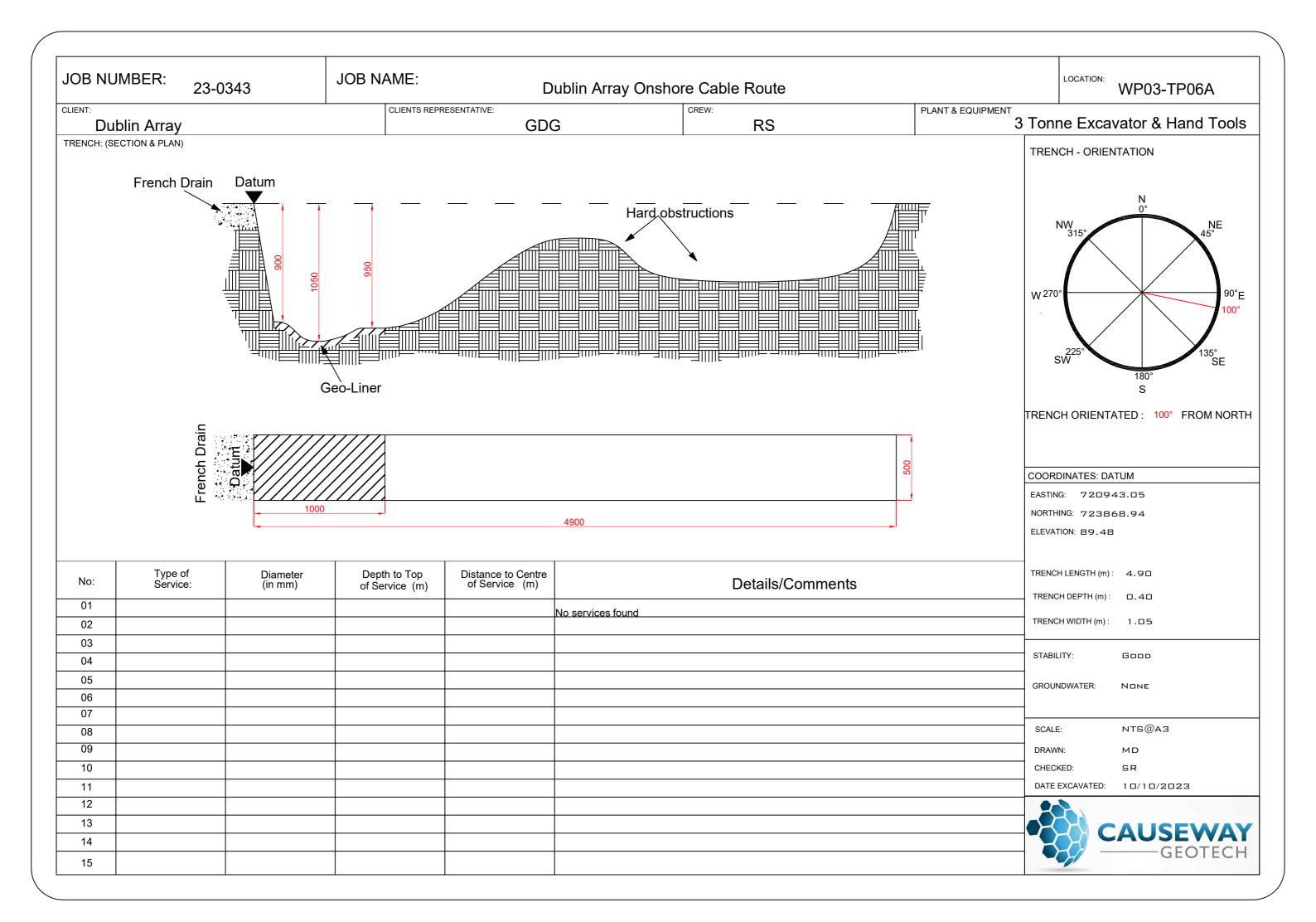
	20		Proi	ect No.	p. Project Name:				Trial Pit ID		
	CALIC			-0343	1	Array Onshore Cable Route					
	CAUS	EWAY	Coor	dinates	Client:			WP	03_TP05		
	G	EOTECH			Dublin	Array			_		
Method:				62.99 E 04.87 N	1	Representative:		Sh	eet 1 of 1		
Slit Trenching						& Doherty Geosolutions (GDG)		Sc	ale: 1:25		
Plant:			1	vation	Date:		ogger:		FINAL		
3t Tracked Exca				9 mOD	11/09/	2023 RS	S		IIIVAL		
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water			
		Field Records			Legend	MADE GROUND: Reworked stiff brown slightly sandy gralow cobble content. Sand is fine to coarse. Gravel is subacoarse.  MADE GROUND: Reworked brown gravelly very clayey fir SAND with low cobble content. Gravel is subrounded fine Cobbles are subrounded  End of trial pit at 1.70m	ngular fine to	Waa	1.0 — 1.5 — 2.0 — 3.5 — 4.0 — 4.5 —		
								$\dashv$			
Water	Strikes		Ren	narks:	1	<u> </u>					
Struck at (m)	Remarks	<b>Depth:</b> 1.70		LDPE liner							
, ,		<b>Width:</b> 0.50	No §	groundwate	er encou	ntered.					
		Length: 9.90									
		Stability:	Terr	nination R	eason		Last Upo	lated			
		Unstable	Term	Terminated on engineer's instruction. 06/02/							



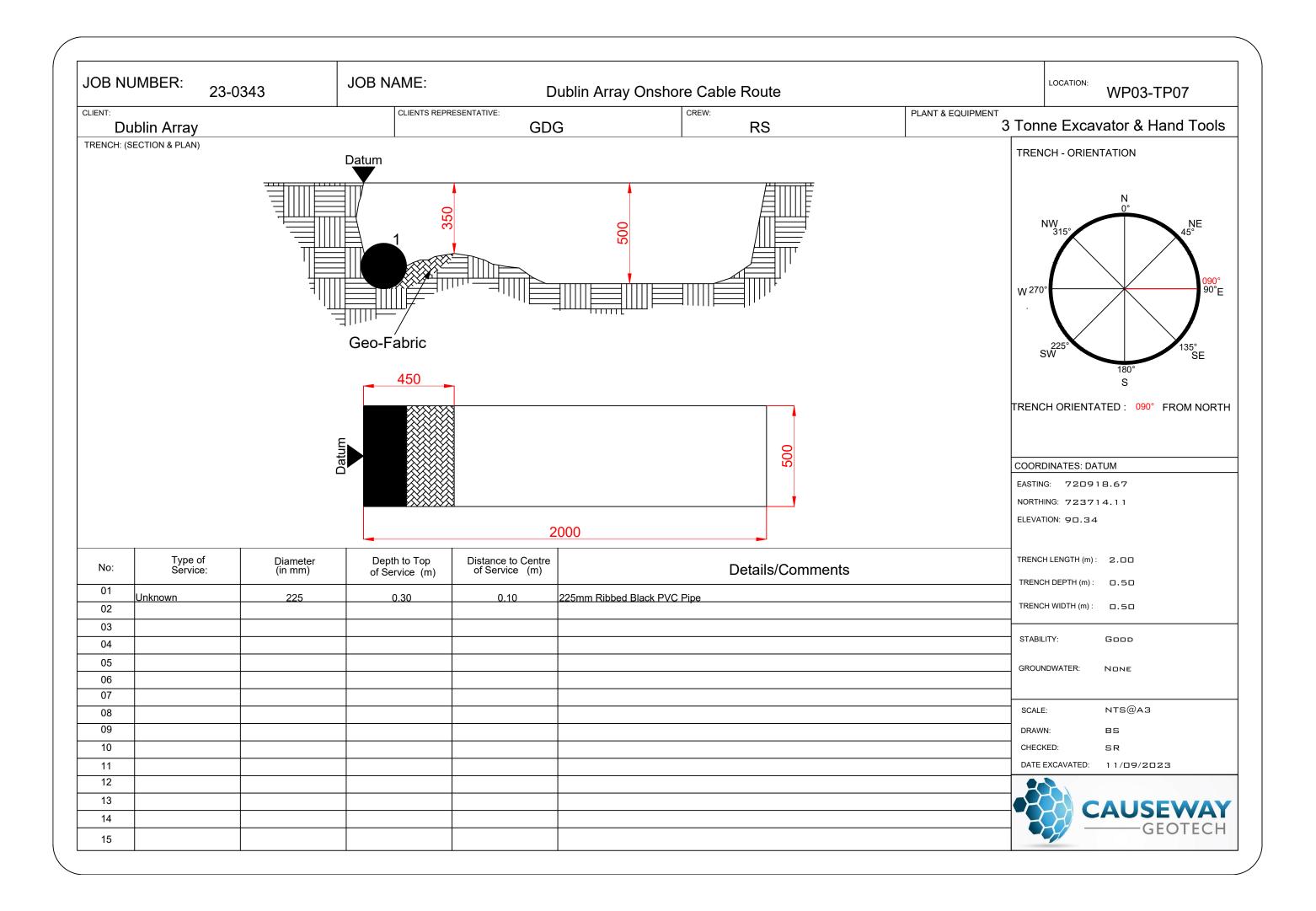
0-0			Proj	ject No.	Project	Name:		Т	rial Pit ID
	CALIC	TIA/AV		-0343	1	Array Onshore Cable Route			
	CAUS	EWAY SEOTECH		rdinates	Client:			w	P03_TP06
		BEOTECH			Dublin	Array			_
Method:				942.60 E	Client's	s Representative:		SI	neet 1 of 1
Slit Trenching			7238	869.21 N	Gavin 8	& Doherty Geosolutions (GDG)			cale: 1:25
Plant:			Ele	vation	Date:		Logger:		
3t Tracked Exc	avator		89.3	9 mOD	11/09/	2023	RS		FINAL
Depth	Sample /	Field Records	Level	Depth	Legend	Description		Water	
(m)	Tests		(mOD)	(m)		MADE GROUND: Stiff brown slightly sandy slightly grav	elly CLAY with low		
				-		cobble content. Sand is fine to coarse. Gravel is subrou coarse. Cobbles are subrounded.	nded fine to		
0.30	ES1			Ē		coarse. Cobbles are subrounded.			
0.50	L31		88.99	0.40		5-1-61-1-1-1-1-1-1-1			_
				-		End of trial pit at 0.40m			0.5 —
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				-					-
	- Chuil		Par	narks:					
Water Struck at (m)	Remarks	<b>Depth:</b> 0.40		<b>narks:</b> PE Liner exp	osed.				
Struck at (III)	Nemarks	<b>Width:</b> 0.50		groundwat		ntered.			
		Length: 2.80							
		Stability:	Teri	mination R	eason		Last U	pdate	d I
	Unstable		Tern	ninated at sc	heduled o	lepth.	06/0	2/2024	AGS



			Proi	ect No.	Project	Name:		Tr	ial Pit ID
				-0343		Array Onshore Cable Route			
	CAUS	EWAY EOTECH		dinates	Client:			—— WP	03_TP06
		BEOTECH			Dublin	Array			Α
Method:				43.05 E	Client's	Representative:		Sh	eet 1 of 1
Slit Trenching				68.95 N	Gavin 8	& Doherty Geosolutions (GDG)			cale: 1:25
Plant:				vation	Date:		ogger:		FINAL
3t Tracked Exca				8 mOD	10/10/	2023 R	S		FINAL
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water	
(m)	Tests		87.98	1.50		MADE GROUND: Soft brown slightly sandy gravelly CLAY. coarse. Gravel is subangular fine to coarse.  End of trial pit at 1.50m	Sand is fine		1.0 — 1.5 — 2.0 — 3.5 — 4.0 — 4.5 —
			-	-					
Water	Strikes	Dorth: 150		narks:	l				
Struck at (m)	Remarks	Depth: 1.50		groundwat		ntered.			
		Width: 0.50	LDP	E liner expo	osed.				
		Length: 4.90							
		Stability:	Terr	mination R	eason			st Updated	
		Stable	Tern	ninated on E	ngineer's	instruction.	(	06/02/2024	AGS



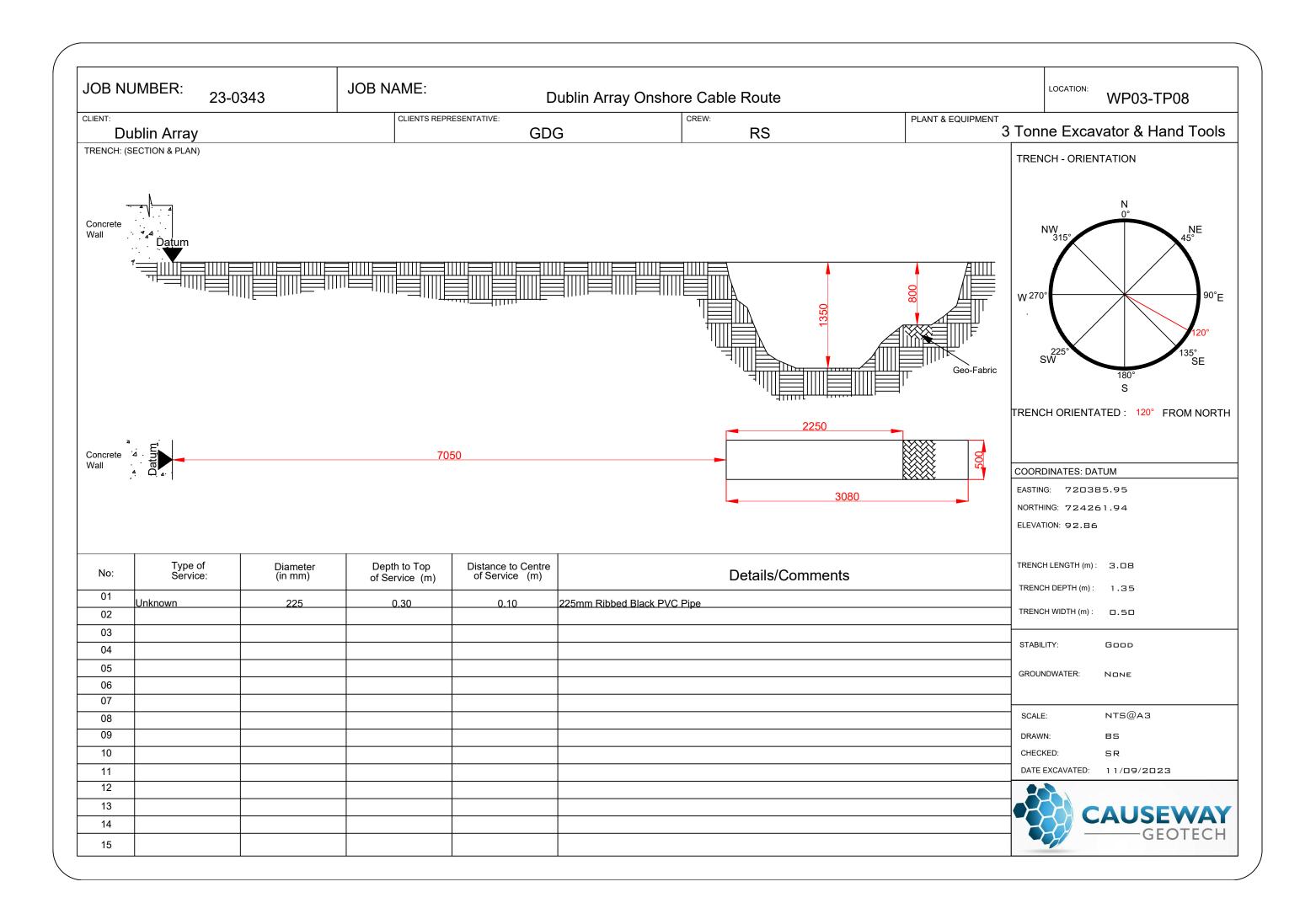
			Proi	ect No.	Project	Name:		Т	rial Pit ID
				-0343		Array Onshore Cable Route			
	CAUS	EWAY		dinates	Client:			WE	03_TP07
		GEOTECH			Dublin				
Method:			7209	18.67 E		s Representative:		Sh	eet 1 of 1
Slit Trenching			7237	14.11 N		& Doherty Geosolutions (GDG)			cale: 1:25
Plant:			Ele	vation	Date:		ogger:		
3t Tracked Exc	cavator			4 mOD	11/09/				FINAL
Depth	Sample /	Field Records	Level	Depth	Legend	Description		Water	
(m)	Tests		(mOD)	(m)	××××	MADE GROUND: Stiff brown slightly sandy slightly gravel	y CLAY. Sand is	>	
				-		fine to coarse. Gravel is subrounded fine to coarse.			-
				Ē					
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0.50 - 0.50	ES1		89.84	0.50		End of trial pit at 0.50m			0.5 —
						End of that pic at 0.00m			-
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Wate	er Strikes	Dorth: 050		narks:	1	L			
Struck at (m)	Remarks	Depth: 0.50 Width: 0.50		E Liner exp		ice encountered at 0.30m.			
		Length: 2.00		m ribbed b groundwat					
		Stability:		nination R			Last Upo	date.	, ,
						Lavab			
l		Moderately stable	ſern	ninated at so	neduled o	ieptn.	06/02/2	2024	AGS



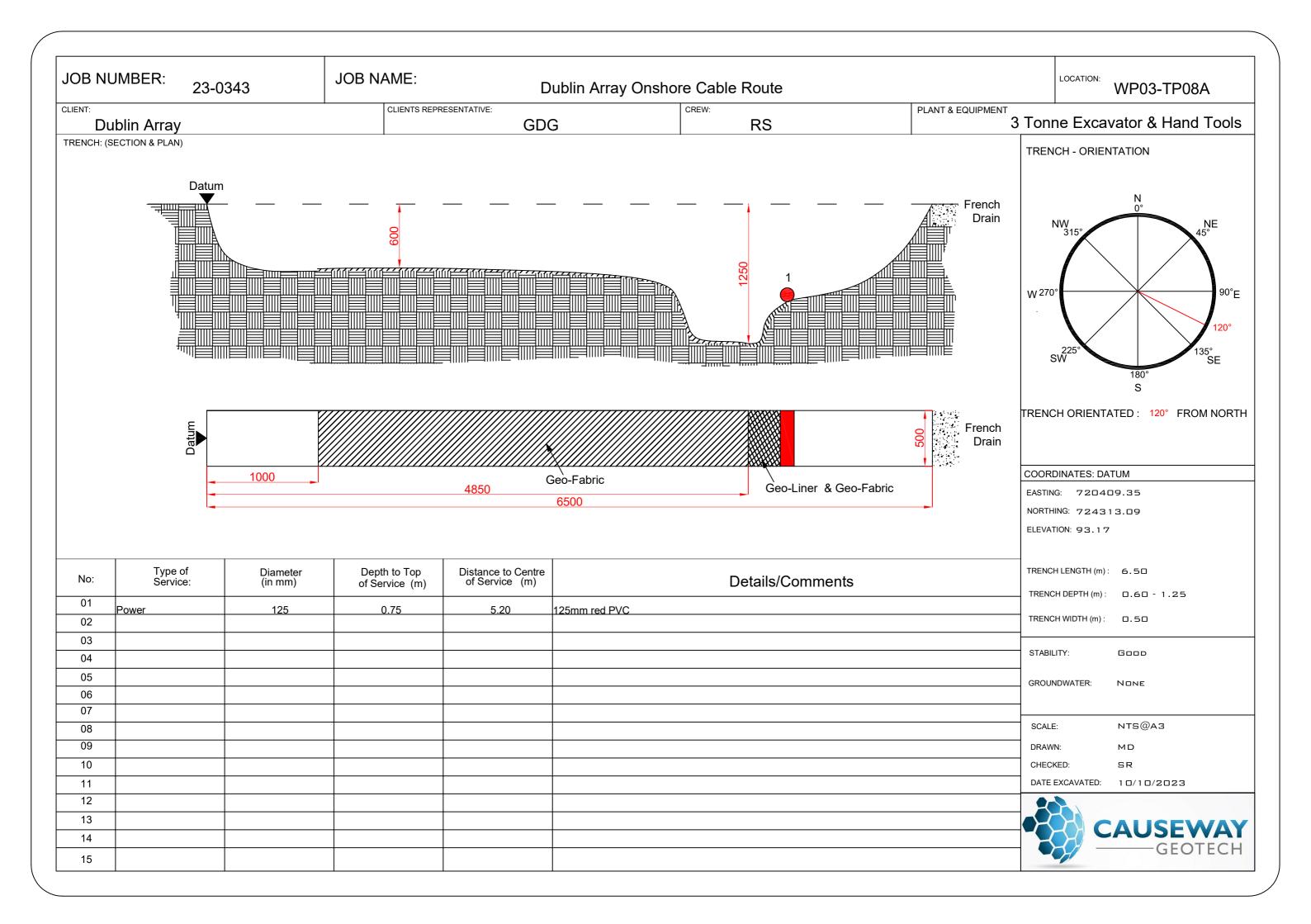
0-0			Proj	ect No.	Project	Name:		Tr	ial Pit ID	
	CALIC			-0343		Array Onshore Cable Route				
	CAUS	EWAY		rdinates	Client:			WP	03_TP07	
	G	EOTECH			Dublin	Array			Α	
Method:				21.21 E		Representative:		Sh	eet 1 of 1	
Slit Trenching			7237	'19.33 N	Gavin 8	& Doherty Geosolutions (GDG)			ale: 1:25	
Plant:			Ele	vation	Date:	Log	gger:			
3t Tracked Exca	vator		90.0	2 mOD	10/10/	2023 RS			FINAL	
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water		
(,	10313		(05)	- (,		MADE GROUND: Firm brown slightly sandy slightly gravell	CLAY. Sand is			
						fine to coarse. Gravel is subangular fine to coarse.				
				-					_	
			89.62	0.40		End of trial pit at 0.40m			-	
				-		·			0.5 —	
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	- I		P-	norks:						
Water Struck at (m)	Strikes Remarks	<b>Depth:</b> 0.40		narks: groundwate	er encou	ntered.				
Struck at (III)	nematks	<b>Width:</b> 0.40		LDPE liner						
		Length: 1.20								
		Stability:	Teri	mination R	eason		Last Upo	lated		
		Stable Terminated				instruction.	06/02/2	06/02/2024 <b>AGS</b>		

JOB NUMBER: 23-0343	JOB NAME:	Dublin Array Onshore Cable Route	LOCATION: WP03-TP07A
CLIENT: Dublin Array	CLIENTS REPRESENTATIVE:	DG RS	PLANT & EQUIPMENT  3 Tonne Excavator & Hand Tools
TRENCH: (SECTION & PLAN)		DG KS	
			TRENCH - ORIENTATION
	Datum	French Drain	NW 315° NE 45° 90°E
	French Drain 400	1200	TRENCH ORIENTATED: 110° FROM NORT  COORDINATES: DATUM  EASTING: 720921.21
		1200	NORTHING: 723719.32  ELEVATION: 90.02
No: Type of Diame Service: (in mn	ter Depth to Top Distance to Cer of Service (m) Distance to Cer	Details/Comments	TRENCH LENGTH (m): 1.20
01		No services found	TRENCH DEPTH (m): 0.40
02		110 OSI VISUS IOMIN	TRENCH WIDTH (m): 0.50
03			STABILITY: GOOD
04 05			
06			GROUNDWATER: NONE
07			
08			SCALE: NTS@A3
09			DRAWN: M.D.
10			CHECKED: SR  DATE EXCAVATED: 1 0/1 0/2 0 2 3
12			DATE ENGRAPHES. 10/10/2020
13 14 15			CAUSEWAY

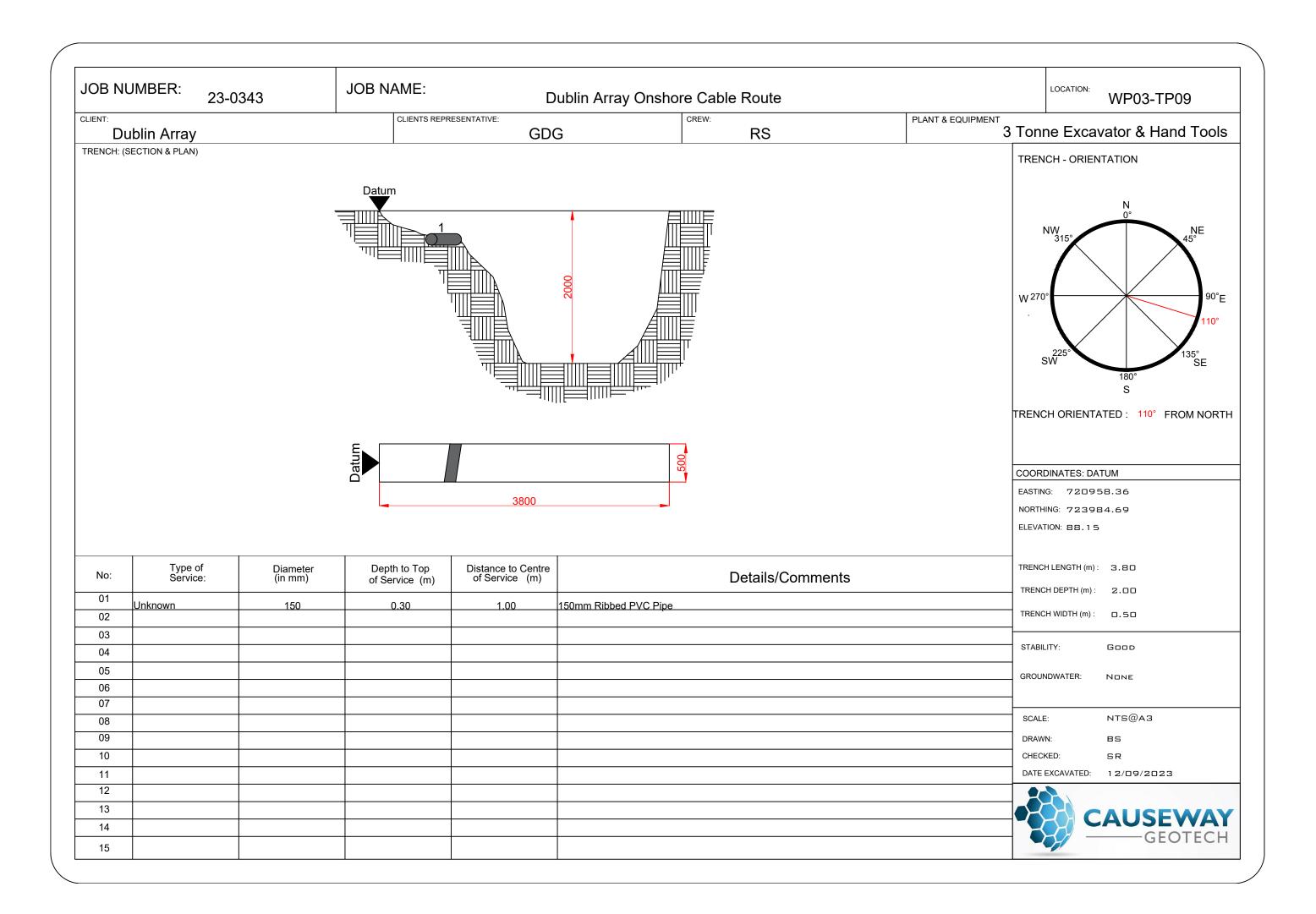
		Proi	ect No.	Proiect	: Name:		Trial Pit ID			
CAUSEWAY  GEOTECH		23-0343		Dublin Array Onshore Cable Route  Client:				WP03_TP08		
Method:				85.95 E	1	s Representative:		She	et 1 of 1	
Slit Trenching			7242	61.94 N		& Doherty Geosolutions (GDG)			le: 1:25	
Plant:			Elevation		Date:	Logge	r:			
3t Tracked Excavator			92.86 mOD		11/09/2023 RS			FINAI		
Depth (m)	Sample /	Field Records	Level	Depth (m)	Legend	Description		Vater		
(m)	ES1	Field Records	91.51	1.35	Legend	Description  MADE GROUND: Stiff brown slightly sandy slightly gravelly CLA cobble content and rare sheets of plastic. Sand is fine to coarse subrounded fine to coarse. Cobbles are subrounded.  End of trial pit at 1.35m	Y with low	Water	1.5 —  2.0 —  3.5 —  4.0 —  4.5 —  4.5 —	
				<u> </u>				$\perp$		
Water	Strikes		Rem	narks:						
Struck at (m)	Remarks	<b>Depth:</b> 1.35	LDP	E Liner exp						
		<b>Width:</b> 0.50		groundwate		ntered.				
		Length: 3.80								
		Stability:	Terr	mination R	eason		Last Upda	ited		
	Moderately stable	Term	Terminated at scheduled depth. 06/02					AGS		



		Project No.   Project Name:					Trial Pit ID				
CALISEWAY		23-0343  Coordinates  720409.36 E		Dublin Array Onshore Cable Route  Client: Dublin Array				WP03_TP08 A			
CAUSEWAY ——GEOTECH											
<b>-</b>											
Method:					1	Representative:		Sh	eet 1 of 1		
Slit Trenching		724313.09 N		Gavin & Doherty Geosolutions (GDG)				Scale: 1:25			
Plant:		Elevation		Date: Logger:		r:	FINAL				
3t Tracked Excavator		93.17 mOD		10/10/2023 RS							
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water			
		Slow	92.77	1.25		MADE GROUND: Firm brown slightly sandy gravelly CLAY with content. Sand is fine to coarse. Gravel is subrounded fine to co cobbles are subrounded.  MADE GROUND: Stiff brown slightly sandy slightly gravelly CL fine to coarse. Gravel is subrounded fine to coarse.  End of trial pit at 1.25m	oarse.	•	1.5 —  2.0 —  3.0 —  4.0 —  4.5 —  4.5 —		
				-					_		
,	Caulle		Pon	narks:							
Water Struck at (m)	Strikes Remarks	<b>Depth:</b> 1.25		<b>narks:</b> E liner expo	osed.						
Struck at (m) 1.20	Remarks Slow	<b>Width:</b> 0.50		er exp							
1.20	31000	Length: 6.50									
		Stability:	Terr	mination R	eason		Last Up	date	d <b>E</b>		
	Stability: Stable							2/2024 AGS			



		Project No.		Project Name:				Trial Pit ID			
CAUSEWAY				Dublin Array Onshore Cable Route  Client:  Dublin Array  Client's Representative:				WP03_TP09			
—— GЕОТЕСН											
Method:											
Slit Trenching			7239	84.69 N	1	k Doherty Geosolutions (GDG)			eet 1 of 1 cale: 1:25		
Plant:		Elevation		Date: Logger:		r:					
3t Tracked Excavator			88.15 mOD		12/09/2023 R				FINAL		
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water			
1.00	Tests  ES1  B2		87.10 86.15			MADE GROUND: Stiff brown slightly sandy gravelly CLAY with content. Sand is fine to coarse. Gravel is subrounded fine to co Cobbles are subrounded.  MADE GROUND: Stiff light brown sandy slightly gravelly CLAY. to coarse. Gravel is subrounded fine to coarse.  End of trial pit at 2.00m	arse.	M N N N N N N N N N N N N N N N N N N N	1.0 — 1.5 — 2.0 — 3.5 — 4.0 — 4.5 —		
				-					-		
			1-								
	Strikes	<b>Depth:</b> 2.00		narks: LDPE Liner	encount	ered.					
Struck at (m)	Remarks	<b>Width:</b> 0.50	50m	nm ribbed l	olack serv	vice encountered at 0.30m.					
		Length: 3.80	No g	groundwate	er encou	ntered.					
		Stability:	Terr	mination R	eason		Last Upo	late			
	Moderately stable			Terminated at scheduled depth. 06/02/							





APPENDIX E
TRIAL PIT AND SLIT TRENCH
PHOTOGRAPHS





WP03\_TP01





WP03\_TP01



WP03\_TP01





WP03\_TP01





WP03\_TP01





WP03\_TP01





WP03\_TP01





WP03\_TP01





WP03\_TP01



WP03\_TP02





WP03\_TP02



WP03\_TP02





WP03\_TP02





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WP03\_TP04





WP03\_TP04A





WP03\_TP04A





WP03\_TP04A



WP03\_TP04A





WP03\_TP04B





WP03\_TP04B





WP03\_TP04B





WP03\_TP04C



WP03\_TP04C





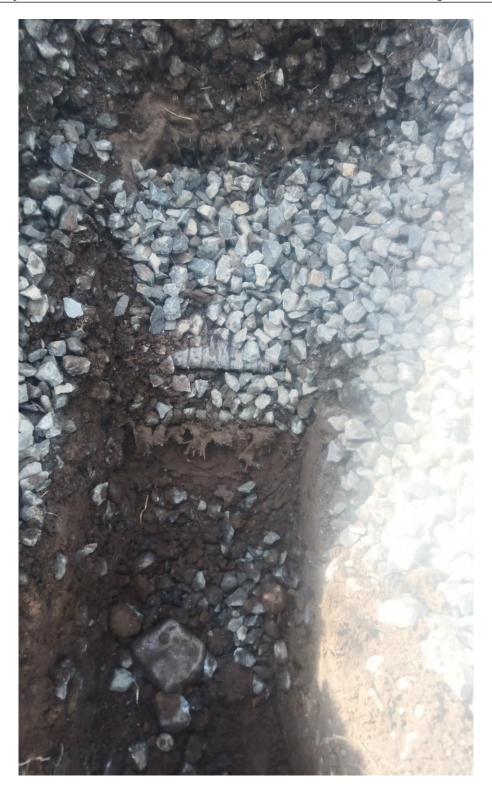
WP03\_TP04C





WP03\_TP04C





WP03\_TP04C





WP03\_TP05



WP03\_TP05





WP03\_TP05



WP03\_TP05





WP03\_TP05



WP03\_TP06





WP03\_TP06







WP03\_TP06



WP03\_TP06





WP03\_TP06A





WP03\_TP06A



WP03\_TP06A





WP03\_TP06A





WP03\_TP06A





WP03\_TP07







WP03\_TP07



WP03\_TP07





WP03\_TP07







WP03\_TP07



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WP03\_TP07A



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WP03\_TP07A





WP03\_TP07A



WP03\_TP08



WP03\_TP08





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WP03\_TP08A





WP03\_TP08A



WP03\_TP08A







WP03\_TP09



WP03\_TP09



WP03\_TP09







WP03\_TP09



WP03\_TP09



# APPENDIX F GEOTECHNICAL LABORATORY TEST RESULTS





## LABORATORY REPORT



Contract Number: PSL23/8486

Report Date: 25 October 2023

Client's Reference: 23-0343

Client Name: Causeway Geotech

8 Drumahiskey Road

Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 6/10/2023
Date Commenced: 6/10/2023
Date Completed: 25/10/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

#### Checked and Approved Signatories:

A Watkins R Berriman S Royle

(Director) (Quality Manager) (Laboratory Manager)

LHS

L Knight S Eyre T Watkins (Assistant Laboratory Manager) (Senior Technician) (Senior Technician)

Page 1 of

5-7 Hexthorpe Road,

Hexthorpe, Doncaster, DN4 0AR

Tel: 01302 768098

Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk

## **SUMMARY OF LABORATORY SOIL DESCRIPTIONS**

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03 TP02	3	В	1.00		Brown very gravelly sandy CLAY.
WP03 TP01	4	В	1.00		Brown slightly gravelly sandy CLAY.
WS03 TP05	2	В	1.00		Dark grey slightly clayey sandy GRAVEL.
WS03 TP09	2	В	1.00		Brown slightly gravelly sandy CLAY.





**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/8486
Client Ref:
23-0343

PSLRF011 Issue No.1 Approved by: L Pavey 03/01/2022

## **SUMMARY OF THERMAL PROPERTY TESTS**

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	Co	
WP03 TP02	3	В	1.00		19	1.99	1.67	1.917	52.2	20.8	
WP03 TP01	4	В	1.00		18	2.02	1.71	1.921	52.1	20.3	
WS03 TP05	2	В	1.00		5.3	1.85	1.76	1.708	58.6	21.4	
WS03 TP09	2	В	1.00		16	1.94	1.67	2.060	48.5	20.5	
									<u> </u>		



**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/8486
Client Ref:
23-0343

PSLRF021 Issue No.1 Approved by: L Pavey 03/01/2023



#### HEAD OFFICE Causeway Geotech Ltd

8 Drumahiskey Road Ballymoney Co. Antrim, N. Ireland, BT53 7QL **NI:** +44 (0)28 276 66640

> Registered in Northern Ireland. Company Number: NI610766

#### REGIONAL OFFICE Causeway Geotech (IRL) Ltd

Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI**: +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

## SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

28 November 2023

<b>Project Name:</b>	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 17/10/2023 and 28/11/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Schedule 2 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	3
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	2
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	2

#### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	1
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity (1- point test at optimum moisture content)	ASTM D5334	1



### **Summary of Classification Test Results**

Project No. Project Name

23-0343

**Dublin Array Onshore Cable Route** 

	Sample					Density w			Passing	LL	PL	ΡI		Casagrande
Hole No.	Ref	Тор	Base	Туре	Specimen Description	bulk Mg/m	dry 3	%	425µm %	%	%	%	density Mg/m3	Classification
WP03_BH01	4	1.00		D	Brown sandy slightly gravelly silty CLAY.			17	58	33 -1pt	19	14		CL
WP03_BH01	9	2.00		D	Brown sandy slightly gravelly silty CLAY.			16	65	29 -1pt	16	13		CL
WP03_BH13	5	1.00		D	Brown slightly gravelly slightly silty fine to coarse SAND.			15						

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

Key

Density test Liquid Limit Particle density

Approved By

Linear measurement unless:

wd - water displacement

4pt cone unless :

cas - Casagrande method

sp - small pyknometer

13/11/2023

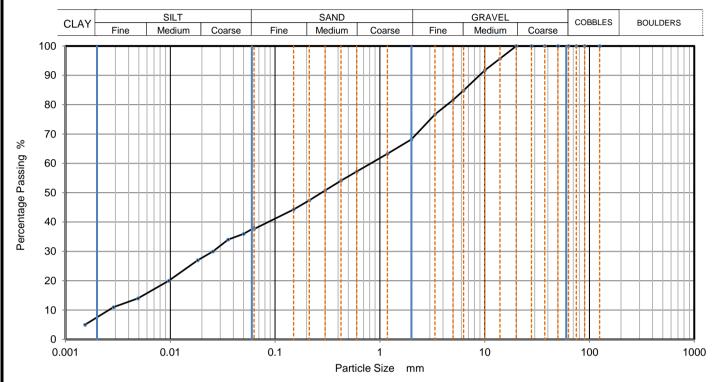
Date Printed

10122

wi - immersion in water 1pt - single point test gj - gas jar

Stephen Watson

CAUSEWAY	CAUSEWAY GEOTECH  PARTICLE SIZE DISTRIBUTION			Job Ref		23-0343	
—— GEOTECH				Borehole/Pit No.		WP03_BH01	
Site Name	Dublin Array Onshore Cable Route			Sample No.		5	
Specimen Description	Specimen Description Brown sandy slightly gravelly silty CLAY.			Sample	Тор	0.20	
Specimen bescription	Brown Sandy Slightly grav	own sandy slightly gravelly slity CLAY.			Depth (m)	Base	1.20
Specimen Reference	2 Specimen 0.2 m			Sample Type		В	
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID		Caus2023101742	



		Γ				
Siev	/ing	Sedimentation				
Particle Size mm	% Passing	Particle Size mm	% Passing			
125	100	0.06300	38			
90	100	0.05010	36			
75	100	0.03565	34			
63	100	0.02553	30			
50	100	0.01827	27			
37.5	100	0.00966	20			
28	100	0.00491	14			
20	100	0.00287	11			
14	96	0.00153	5			
10	92					
6.3	85					
5	82					
3.35	77					
2	68					
1.18	63					
0.6	57	Particle density	(assumed)			
0.425	54	2.65	Mg/m3			
0.3	51					
0.212	47					
0.15	44					
0.063	38					

Dry Mass of sample, g	522
Dry Mass of sample, g	522

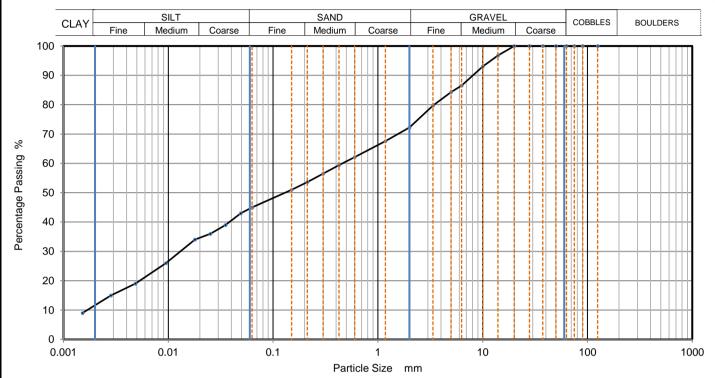
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	31.8
Sand	30.6
Silt	30.0
Clay	7.6

Grading Analysis		
D100	mm	
D60	mm	0.817
D30	mm	0.0245
D10	mm	0.00263
Uniformity Coefficient		310
Curvature Coefficient		0.28





CAUSEWAY	PARTICLE SIZE DISTRIBUTION			Job Ref		23-0343	
—— GEOTECH				Borehole/Pit No.		WP03_BH01	
Site Name	Dublin Array Onshore Cable Route			Sample No.		7	
Specimen Description	Specimen Description Brown sandy slightly gravelly silty CLAY.			Sample	Тор	1.20	
Specimen bescription	Brown Sandy Slightly grav	n sandy siigntiy graveliy siity CLAY.			Depth (m)	Base	2.00
Specimen Reference	2 Specimen 1.2 m			Sample Type		В	
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID		Caus2023101744	



Siev	ing	Sedimentation				
Particle Size mm	% Passing	Particle Size mm	% Passing			
125	100	0.06300	45			
90	100	0.04912	43			
75	100	0.03519	39			
63	100	0.02521	36			
50	100	0.01794	34			
37.5	100	0.00949	26			
28	100	0.00486	19			
20	100	0.00284	15			
14	97	0.00152	9			
10	93					
6.3	87					
5	84					
3.35	80					
2	72					
1.18	68					
0.6	62	Particle density	(assumed)			
0.425	59	2.65	Mg/m3			
0.3	57					
0.212	54	1				
0.15	51	1				
0.063	45	1				

Dry Mass of sample, g	524

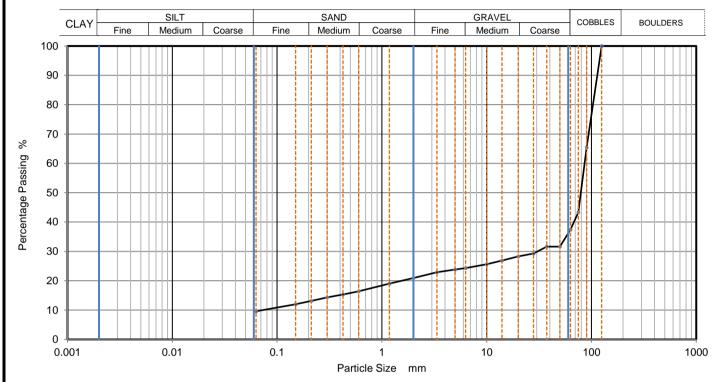
Sample Proportions	% dry mass			
Cobbles	0.0			
Gravel	27.8			
Sand	27.2			
Silt	33.1			
Clay	11.9			

Grading Analysis		
D100	mm	
D60	mm	0.46
D30	mm	0.013
D10	mm	0.00163
Uniformity Coefficient		280
Curvature Coefficient		0.23





CAUSEWAY	DARTICI E CIZE DICTRIBUTIONI			Job Ref		23-0343	
—— GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION –			Borehole/Pit No.		WP03_BH01
Site Name	Dublin Array Onshore Cable Route			Sample No.		11	
Specimen Description	Specimen Description Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL.			Sample	Тор	3.00	
Specimen bescription	Grey slightly sandy slightl	y ciayey subangulai	Time to coarse GRAVEL.		Depth (m)	Base	3.80
Specimen Reference	2	2 Specimen 3 m			Sample Type		В
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID		Caus2023101747	



Siev	/ing	Sedime	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	65		
75	43		
63	37		
50	32		
37.5	32		
28	29		
20	28		
14	27		
10	26		
6.3	24		
5	24		
3.35	23		
2	21		
1.18	19		
0.6	16		
0.425	15		
0.3	14		
0.212	13		
0.15	12		
0.063	10		

8483	
	8483

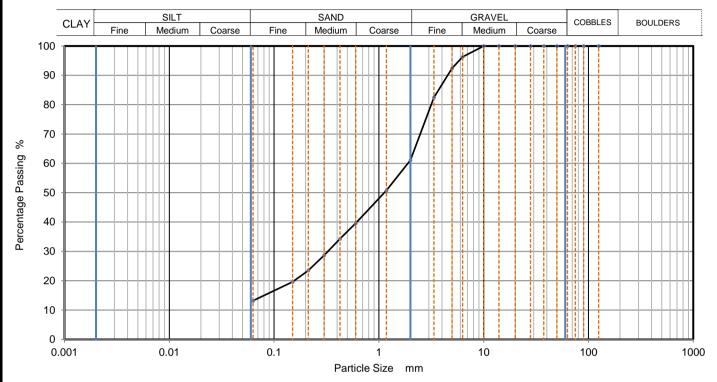
Sample Proportions	% dry mass			
Cobbles	62.6			
Gravel	16.5			
Sand	11.4			
Fines < 0.063mm	10.0			

Grading Analysis		
D100	mm	125
D60	mm	86.1
D30	mm	30.6
D10	mm	0.0736
Uniformity Coefficient		1200
Curvature Coefficient		150





CAUSEWAY	CALISEWAY DARTICLE CIZE DICTRIBUTION					Job Ref			23-0343
CAUSEWAY GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION -				WP03_BH13			
Site Name	Dublin Array Onshore (	Cable Route		Sample No	).	3			
Specimen Description	Continue Description Brown Stability on all alleball alle Continues CAND					0.20			
Specimen bescription	men Description Brown slightly gravelly slightly silty fine to coarse SAND.			Depth (m)	Base	1.20			
Specimen Reference	2	Specimen Depth	0.2 m	Sample Ty	pe	В			
Test Method	BS1377:Part 2:1990, claus	se 9.2		KeyLAB ID		Caus2023101748			



Siev	/ing	Sedime	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	96		
5	92		
3.35	83		
2	61		
1.18	51		
0.6	40		
0.425	34		
0.3	29		
0.212	24		
0.15	20		
0.063	13		

304	
	304

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	38.9
Sand	47.9
Fines <0.063mm	13.0

Grading Analysis		
D100	mm	
D60	mm	1.89
D30	mm	0.326
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		







### LABORATORY REPORT



Contract Number: PSL23/9060

Report Date: 28 November 2023

Client's Reference: 23-0343

Client Name: Causeway Geotech

8 Drumahiskey Road

Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 25/10/2023
Date Commenced: 25/10/2023
Date Completed: 28/11/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

### Checked and Approved Signatories:

A Watkins R Berriman S Royle

(Director) (Quality Manager) (Laboratory Manager)

Lho

L Knight S Eyre T Watkins (Assistant Laboratory Manager) (Senior Technician) (Senior Technician)

Page 1 of

5-7 Hexthorpe Road,

Hexthorpe, Doncaster, DN4 0AR

Tel: 01302 768098

Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk

## **SUMMARY OF LABORATORY SOIL DESCRIPTIONS**

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03_BH13	7	В	0.20	1.20	Brown slightly gravelly sandy CLAY.





**Dublin Army Onshore Cable Route** 

Contract No:	
PSL23/9060	
Client Ref:	
23-0343	

PSLRF054 Approved by: L Pavey Date: 03/01/2023 Issue No.1

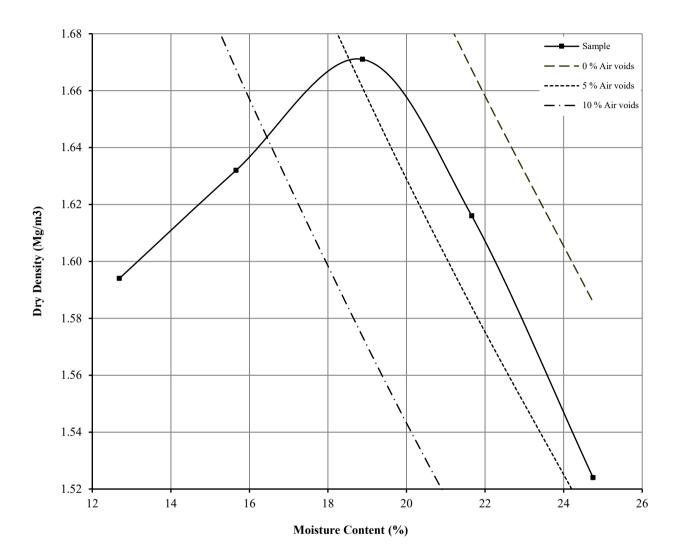
### DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377: Part 4: Clause 3.3: 1990

Hole Number: WP03\_BH13 Top Depth (m): 0.20

Sample Number: 7 Base Depth (m): 1.20

Sample Type: B



Initial Moisture Content:		25	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.61	Assumed	Material Retained on 37.5 mm Test Sieve	0	
Maximum Dry Density (Mg	/m3):	1.67	Material Retained on 20.0 mm Test Sieve	1	
Optimum Moisture Content	(%):	19			
D 1 C	11 1 1 11				

Remarks See summary of soil descriptions





**Dublin Army Onshore Cable Route** 

Contract PSL23/9060 Client Ref 23-0343

PSLRF007 Issue No.1 Approved By: L Pavey 03/01/2023

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp	Remarks
WP03_BH13	7	В	0.20	1.20	19	1.99	1.67	1.882	53.2	27.8	Optimum moisture content



**Dublin Army Onshore Cable Route** 

<b>Contract No:</b>	
PSL23/9060	
Client Ref:	
23-0343	

PSLRF021 Issue No.1 Approved by: L Pavey 03/01/2023



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> Registered in Northern Ireland. Company Number: NI610766

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Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI**: +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

28 November 2023

Project Name:	Dublin Array Onshore Cable Route				
Project No.:	23-0343				
Client:	Dublin Array				
Engineer:	GDG				

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 17/10/2023 and 28/11/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Schedule 3 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	11
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	6
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	5
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	5

### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	2
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity (3 Single Point tests at NMC)	ASTM D5334	2



### **Summary of Classification Test Results**

Project No. Project Name

23-0343

**Dublin Array Onshore Cable Route** 

		Sar	nple			Dens		W	Passing	LL	PL	PI	Particle	Casagrande
Hole No.	Ref	Тор	Base	Туре	Specimen Description	bulk Mg/m	dry n3	%	425μm %	%	%	%	density Mg/m3	Classification
WP03_BH02	6	0.20	1.20	В	Brown sandy slightly gravelly silty CLAY.			20						
WP03_BH02	5	2.00		D	Brown sandy slightly gravelly silty CLAY.			20	53	33 -1pt	20	13		CL
WP03_BH09	1	1.20	1.65	D	Brown sandy slightly gravelly silty CLAY.			20	64	36 -1pt	23	13		СІ
WP03_BH09	15	1.20	2.00	В	Brown sandy slightly gravelly silty CLAY.			19						
WP03_BH09	16	2.00	3.00	В	Brown sandy slightly gravelly silty CLAY.			19						
WP03_BH09	12	3.00		D	Brown sandy slightly gravelly silty CLAY.			18	61	30 -1pt	18	12		CL
WP03_BH09	10	4.00	4.45	D	Brown sandy slightly gravelly silty CLAY.			19	63	28 -1pt	18	10		CL
WP03_BH09	18	4.00	5.00	В	Brown sandy slightly gravelly silty CLAY.			19						
WP03_BH09	14	5.00			Brown sandy slightly gravelly silty CLAY.			20	68	30 -1pt	17	13		CL
WP03_BH10	1	0.20	1.20	В	Brown sandy slightly gravelly silty CLAY.			23						
WP03_BH10	6	1.70			Brown slightly sandy slightly silty subangular fine to coarse GRAVEL.			2.5						

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

LAB 01R Version 6

Key

Density test

Liquid Limit

Particle density

gj - gas jar

Date Printed

Approved By

Linear measurement unless:

4pt cone unless:

sp - small pyknometer

17/11/2023

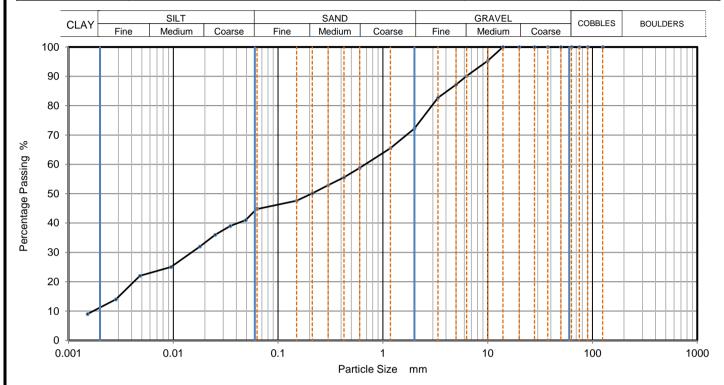
10122

wd - water displacement wi - immersion in water

cas - Casagrande method 1pt - single point test

Stephen Watson

CAUSEWAY DARTICLE SIZE DISTRIBUTION				Job Ref		23-0343	
——GEOTECH	PARTICLE SIZE DISTRIBUTION				Borehole/Pit No.		WP03_BH02
Site Name	Dublin Array Onshore		Sample No.		6		
Specimen Description	Brown sandy slightly gray	ally silty CLAV	cile. CLAV		Sample	Тор	0.20
Specimen bescription	Brown sandy slightly gravelly silty CLAY.				Depth (m)	Base	1.20
Specimen Reference	4 Specimen 0.2 m				Sample Type		В
Test Method	BS1377:Part 2:1990, claus	3S1377:Part 2:1990, clauses 9.2 and 9.5					Caus202311020



	_	II	_
Siev	/ing	Sedim	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	45
90	100	0.04912	41
75	100	0.03496	39
63	100	0.02505	36
50	100	0.01794	32
37.5	100	0.00949	25
28	100	0.00480	22
20	100	0.00284	14
14	100	0.00152	9
10	95		
6.3	90		
5	87		
3.35	83		
2	72		
1.18	66		
0.6	59	Particle density	(assumed)
0.425	56	2.65	Mg/m3
0.3	53		
0.212	50		
0.15	48		
0.063	45	1	

Mass of sample, g 526
Mass of sample, g 52

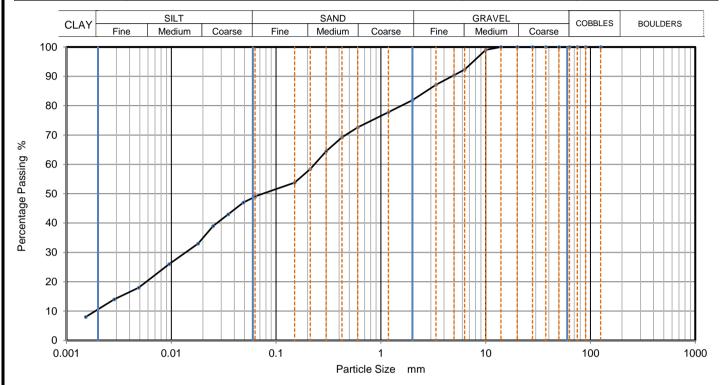
Sample Proportions	% dry mass		
Cobbles	0.0		
Gravel	27.8		
Sand	27.4		
Silt	33.5		
Clay	11.3		

Grading Analysis		
D100	mm	
D60	mm	0.675
D30	mm	0.0147
D10	mm	0.00171
Uniformity Coefficient		390
Curvature Coefficient		0.19





CAUSEWAY DARTICLE SIZE DISTRIBUTION				Job Ref		23-0343	
—— GEOTECH	PARTICLE SIZE DISTRIBUTION				Borehole/Pit No.		WP03_BH09
Site Name	Dublin Array Onshore		Sample No.		15		
Specimen Description	ally silty CLAV			Sample	Тор	1.20	
Specimen bescription	Brown sandy slightly gravelly silty CLAY.				Depth (m)	Base	2.00
Specimen Reference	4 Specimen 1.2 m			т	Sample Type		В
Test Method	BS1377:Part 2:1990, claus	3S1377:Part 2:1990, clauses 9.2 and 9.5					Caus202311024



	_	II	_
Siev	/ing	Sedim	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	49
90	100	0.04879	47
75	100	0.03496	43
63	100	0.02505	39
50	100	0.01805	33
37.5	100	0.00955	26
28	100	0.00489	18
20	100	0.00285	14
14	100	0.00153	8
10	99		
6.3	92		
5	90		
3.35	87		
2	82		
1.18	78		
0.6	73	Particle density	(assumed)
0.425	69	2.65	Mg/m3
0.3	65		
0.212	58		
0.15	54		
0.063	49	1	

Dry Mass of sample, g	344

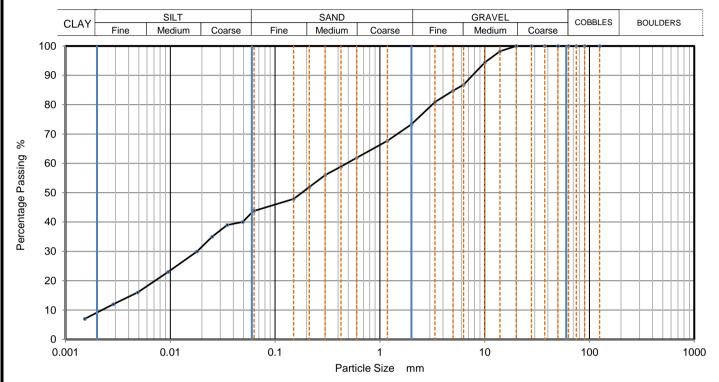
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	18.1
Sand	32.8
Silt	38.7
Clay	10.4

Grading Analysis		
D100	mm	
D60	mm	0.232
D30	mm	0.0137
D10	mm	0.00192
Uniformity Coefficient		120
Curvature Coefficient		0.42





CAUSEWAY	DARTICI E CIZE DISTRIBUTIONI		Jo	Job Ref Borehole/Pit No.		23-0343	
CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION					В	WP03_BH09
Site Name	Dublin Array Onshore Cable Route			Si	Sample No.		16
Specimen Description	Description and the state of th			S	Sample	Тор	2.00
Specimen bescription	Brown sandy slightly gravelly silty CLAY.		De	epth (m)	Base	3.00	
Specimen Reference	4 Specimen 2 m			n S	Sample Typ	e	В
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			К	KeyLAB ID		Caus202311025



	_	II	
Siev	Sieving		entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.04912	40
75	100	0.03496	39
63	100	0.02505	35
50	100	0.01805	30
37.5	100	0.00955	23
28	100	0.00489	16
20	100	0.00285	12
14	98	0.00153	7
10	94		
6.3	87		
5	85		
3.35	81		
2	73		
1.18	68		
0.6	62	Particle density	(assumed)
0.425	59	2.65	Mg/m3
0.3	56		
0.212	52		
0.15	48		
0.063	44		

Diviviass of sample, g	Dry Mass of sample, g	531
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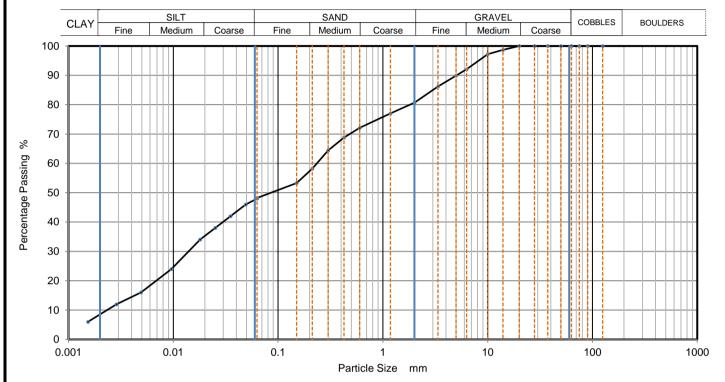
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	26.7
Sand	29.5
Silt	34.5
Clay	9.3

Grading Analysis		
D100	mm	
D60	mm	0.482
D30	mm	0.0183
D10	mm	0.00218
Uniformity Coefficient		220
Curvature Coefficient		0.32





CAUSEWAY	PARTICLE SIZE DISTRIBUTION -			Job Ref Borehole/Pit No.		23-0343	
—— GEOTECH						WP03_BH09	
Site Name	Dublin Array Onshore Cable Route			Sample No		18	
Specimen Description	Drown conductionable grouply site. CLAV			Sample	Тор	4.00	
Specimen bescription	Brown sandy slightly gravelly silty CLAY.			Depth (m)	Base	5.00	
Specimen Reference	4 Specimen 4 m			m	Sample Typ	oe	В
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			·	KeyLAB ID		Caus202311029



Siev	Sieving		entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	48
90	100	0.04912	46
75	100	0.03519	42
63	100	0.02521	38
50	100	0.01805	34
37.5	100	0.00961	24
28	100	0.00491	16
20	100	0.00287	12
14	99	0.00153	6
10	97		
6.3	92		
5	90		
3.35	86		
2	81		
1.18	77		
0.6	72	Particle density	(assumed)
0.425	69	2.65	Mg/m3
0.3	64		
0.212	58		
0.15	53		
0.063	48		

Dry Mass of sample, g	307

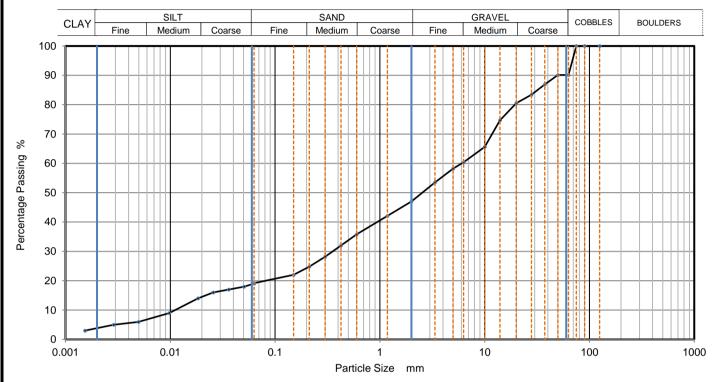
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	19.3
Sand	32.6
Silt	39.5
Clay	8.6

Grading Analysis		
D100	mm	
D60	mm	0.234
D30	mm	0.0139
D10	mm	0.00232
Uniformity Coefficient		100
Curvature Coefficient		0.36





CAUSEWAY DARTICLE SIZE DISTRIBUTION							23-0343
—— GEOTECH	PARTICLE SIZE DISTRIBUTION						WP03_BH10
Site Name	Dublin Array Onshore (	Cable Route			Sample No		1
Specimen Description	Brown sandy slightly grav	ally silty CLAV			Sample	Тор	0.20
Specimen bescription	Brown Sandy Slightly grav	elly slity CLAT.			Depth (m)	Base	1.20
Specimen Reference	4	Specimen Depth	0.2	m	Sample Type		В
Test Method	BS1377:Part 2:1990, claus	ses 9.2 and 9.5			KeyLAB ID		Caus2023110212



	_	II	_	
Siev	/ing	Sedim	entation	
Particle Size mm	% Passing	Particle Size mm	% Passing	
125	100	0.06300	19	
90	100	0.05074	18	
75	100	0.03610	17	
63	90	0.02568	16	
50	90	0.01838	14	
37.5	87	0.00977	9	
28	83	0.00497	6	
20	81	0.00288	5	
14	75	0.00153	3	
10	66			
6.3	60			
5	58			
3.35	54			
2	47			
1.18	42			
0.6	36	Particle density	(assumed)	
0.425	32	2.65	Mg/m3	
0.3	28			
0.212	25			
0.15	22			
0.063	19	1		

Dry Mass of sample, g	4664
-----------------------	------

Sample Proportions	% dry mass
Cobbles	9.9
Gravel	43.1
Sand	27.8
Silt	15.3
Clay	3.9

Grading Analysis		
D100	mm	
D60	mm	6.03
D30	mm	0.353
D10	mm	0.0109
Uniformity Coefficient		550
Curvature Coefficient		1.9







### LABORATORY REPORT



**Contract Number: PSL23/9483** 

Report Date: 28 November 2023

Client's Reference: 23-0343

Client Name: Causeway Geotech

8 Drumahiskey Road

Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 9/11/2023
Date Commenced: 9/11/2023
Date Completed: 28/11/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

### Checked and Approved Signatories:

A Watkins R Berriman S Royle

(Director) (Quality Manager) (Laboratory Manager)

LHA

L Knight S Eyre T Watkins (Assistant Laboratory Manager) (Senior Technician) (Senior Technician)

Page 1 of

5-7 Hexthorpe Road,

Hexthorpe, Doncaster, DN4 0AR

Tel: 01302 768098

Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk

## **SUMMARY OF LABORATORY SOIL DESCRIPTIONS**

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03_BH02	7	В	1.20	2.30	Brown gravelly sandy CLAY.
WP03_BH09	9	U	3.00	3.45	Brown gravelly very sandy CLAY.
WP03_BH09		U	5.00	5.45	Brown gravelly very sandy CLAY.
WP03_BH10	5	В	1.20	1.70	Brown slightly gravelly sandy CLAY.





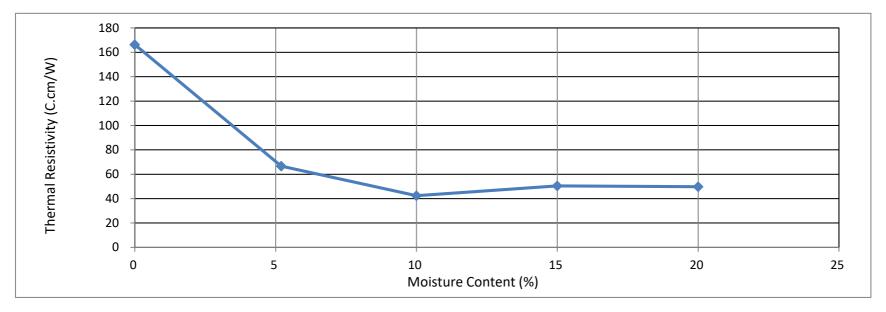
**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/9483
Client Ref:
23-0343

PSLRF011 Issue No.1 Approved by: L Pavey 03/01/2022

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH02	7	В	1.20	2.30	0	1.56	1.56	0.601	166.3	17.7	
WP03_BH02	7	В	1.20	2.30	5.2	1.79	1.70	1.499	66.7	19.5	
WP03_BH02	7	В	1.20	2.30	10	1.99	1.81	2.356	42.4	17.2	
WP03_BH02	7	В	1.20	2.30	15	2.05	1.78	1.984	50.4	16.6	
WP03_BH02	7	В	1.20	2.30	20	2.00	1.67	2.012	49.7	16.2	Natural





PSLRF100 Issue No.1 Approved by: L Pavey 03/01/2023

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$C_o$	
WP03_BH09	9	U	3.00	3.45	13	2.28	2.02	2.438	41.0	16.9	
WP03_BH09	9	U	3.00	3.45	13	2.28	2.02	2.297	43.5	16.8	
WP03_BH09	9	U	3.00	3.45	13	2.28	2.02	2.395	41.8	16.3	



**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/9483
Client Ref:
23-0343

PSLRF021 Issue No.1 Approved by: L Pavey 03/01/2023

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C}_{\mathbf{o}}$	
WP03_BH09	10	U	5.00	5.45	12	2.34	2.10	2.832	35.3	16.7	
WP03_BH09	10	U	5.00	5.45	12	2.34	2.10	2.949	33.9	17.0	
WP03_BH09	10	U	5.00	5.45	12	2.34	2.10	3.067	32.6	16.9	
						_					
	·										



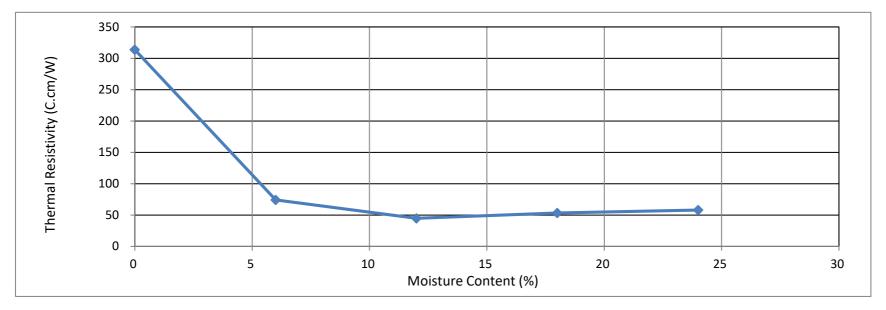
**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/9483
Client Ref:
23-0343

PSLRF021 Issue No.1 Approved by: L Pavey 03/01/2023

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH10	5	В	1.20	1.70	0	1.45	1.45	0.319	313.7	19.2	
WP03_BH10	5	В	1.20	1.70	6.0	1.73	1.63	1.348	74.2	21.5	
WP03_BH10	5	В	1.20	1.70	12	1.98	1.77	2.233	44.8	17.2	
WP03_BH10	5	В	1.20	1.70	18	1.97	1.67	1.881	53.2	16.5	
WP03_BH10	5	В	1.20	1.70	24	1.93	1.56	1.727	57.9	15.8	Natural





### **Dublin Array Onshore Cable Route**

Contract No:
PSL23/9483
Client Ref:
23-0343

PSLRF100 Issue No.1 Approved by: L Pavey 03/01/2023



### HEAD OFFICE Causeway Geotech Ltd

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> Registered in Northern Ireland. Company Number: NI610766

### REGIONAL OFFICE Causeway Geotech (IRL) Ltd

Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI:** +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

### 22 January 2024

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 15/11/2023 and 05/12/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Schedule 4 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	15
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	5
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	9
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	7

### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	4
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity (3 Single Point tests at NMC)	ASTM D5334	5



### **Summary of Classification Test Results**

Project No. Project Name

23-0343

**Dublin Array Onshore Cable Route** 

							, -							
I I - I - NI -		Sar	nple	1	On a single December the	Dens bulk	ity dry	W	Passing 425µm	LL	PL	PI	Particle density	Casagrande
Hole No.	Ref	Тор	Base	Туре	Specimen Description	Mg/m		%	%	%	%	%	Mg/m3	Classification
WP03_BH01		3.80	5.30	С	Brown sandy slightly gravelly silty CLAY.	3		11					-	
WP03_BH07	5	1.20	1.65	D	Brown sandy gravelly silty CLAY.			16	44	34 -1pt	20	14		CL
WP03_BH07	6	1.20	2.00	В	Brown sandy gravelly silty CLAY.			12						
WP03_BH07	8	3.20	4.00	В	Brown slightly clayey slightly sandy subangular fine to coarse GRAVEL.			10						
WP03_BH07	12	4.00		D	Brown slightly clayey slightly sandy subangular fine to coarse GRAVEL			10	23	35 -1pt	24	11		CL/CI/ML/MI
WP03_BH08	1	0.20	1.20	В	Brown sandy slightly gravelly silty CLAY.			15						
WP03_BH08	9	1.20	1.65	D	Brown sandy slightly gravelly silty CLAY.			13	66	26 -1pt	15	11		CL
WP03_BH08	4	2.00	2.45	U	Brown sandy slightly gravelly silty CLAY.			12						
WP03_BH09	15	1.20	2.00	В	Brown sandy slightly gravelly silty CLAY.			9.7						
WP03_BH09	3	2.00	2.45	D	Brown sandy slightly gravelly silty CLAY.			21	65	37 -1pt	24	13		CI
WP03_BH09	10	4.00	4.45	D	Brown sandy slightly gravelly silty CLAY.			11	71	30 -1pt	18	12		CL
WP03_BH09	18	4.00	5.00	В	Brown sandy slightly gravelly silty CLAY.			15						
		l	<u> </u>		l	<u> </u>			ı					

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

LAB 01R Version 6

Key

Density test

Liquid Limit

Particle density

gj - gas jar

Date Printed

Approved By

Linear measurement unless:

4pt cone unless:

sp - small pyknometer 12/05/2023 00:00 10122

wd - water displacement wi - immersion in water

1pt - single point test

cas - Casagrande method

Stephen Watson



### **Summary of Classification Test Results**

Project No. Project Name

23-0343

**Dublin Array Onshore Cable Route** 

WP03_BH11 10 3.80 5.30 C Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.		00.0					- 0.0	, 0							
Ref Top Base Type Specified Description Mg/m3 % % % % Mg/m3 Classification  WP03_BH09 19 5.00 6.30 B Brown sandy slightly gravelly silty  WP03_BH11 10 3.80 5.30 C Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.			Sar	nple					W	Passing	LL	PL	PI		Casagrande
WP03_BH09         19         5.00         6.30         B         Brown sandy slightly gravelly slity CLAY.         16           WP03_BH11         10         3.80         5.30         C         Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.         7.6	Hole No.	Ref	Тор	Base	Туре	Specimen Description		ļ	%		%	%	%		Classification
GRAVEL.	WP03_BH09	19	5.00	6.30	В	Brown sandy slightly gravelly silty CLAY.	g							J	
WP03_BH14	WP03_BH11	10	3.80	5.30	С	Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.			7.6						
	WP03_BH14	6	0.20	1.20	В	Brown sandy gravelly silty CLAY.			12						

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

LAB 01R Version 6

Key

Density test

Liquid Limit

Particle density

gj - gas jar

Date Printed

Approved By

Linear measurement unless:

4pt cone unless:

sp - small pyknometer

12/05/2023 00:00

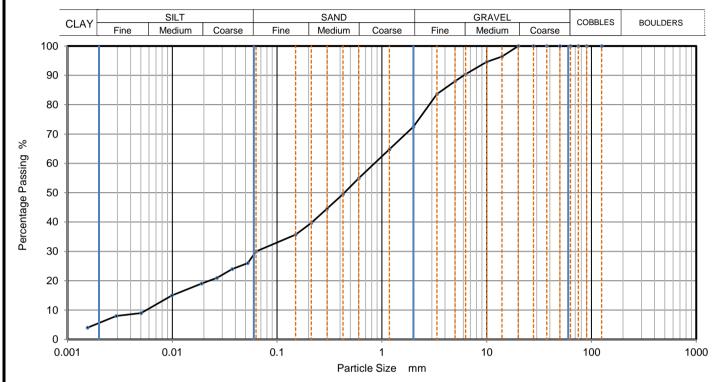


wd - water displacement wi - immersion in water

cas - Casagrande method 1pt - single point test

Stephen Watson

CAUSEWAY	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0343
—— GEOTECH					Borehole/P	it No.	WP03_BH01
Site Name	Dublin Array Onshore	Dublin Array Onshore Cable Route					
Specimen Description	Specimen Description Brown sandy slightly gravelly silty CLAY.				Sample	Тор	3.80
Specimen bescription	Brown Sandy Slightly grav		Depth (m)	Base	5.30		
Specimen Reference	4	Specimen Depth	3.8	m	Sample Type		С
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202311150



Siev	/ing	Sedimentation					
Particle Size mm	% Passing	Particle Size mm	% Passing				
125	100	0.06300	30				
90	100	0.05247	26				
75	100	0.03732	24				
63	100	0.02669	21				
50	100	0.01898	19				
37.5	100	0.00991	15				
28	100	0.00504	9				
20	100	0.00292	8				
14	96	0.00155	4				
10	95						
6.3	90						
5	88						
3.35	84						
2	73						
1.18	65						
0.6	55	Particle density	(assumed)				
0.425	50	2.65	Mg/m3				
0.3	45						
0.212	40	1					
0.15	36	1					
0.063	30	1					

Dry Mass of sample, g	538
, , , ,	

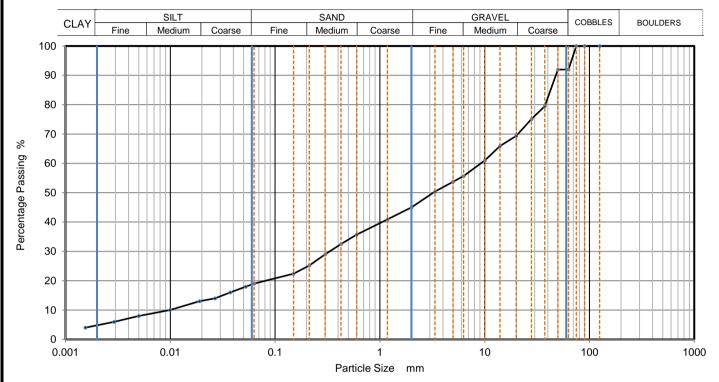
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.5
Sand	42.6
Silt	24.7
Clay	5.2

Grading Analysis		
D100	mm	
D60	mm	0.85
D30	mm	
D10	mm	0.00543
Uniformity Coefficient		160
Curvature Coefficient		





CAUSEWAY	SEWAY GEOTECH PARTICLE SIZE DISTRIBUTION -				Job Ref		23-0343
CAUSEWAY GEOTECH					Borehole/F	it No.	WP03_BH07
Site Name	Dublin Array Onshore (	Dublin Array Onshore Cable Route					6
Specimen Description	CLAV		Sample	Тор	1.20		
Specimen bescription	Brown salluy gravelly silty			Depth (m)	Base	2.00	
Specimen Reference	4	Specimen Depth	1.2	m	Sample Type		В
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202311152



	_	11	_
Siev	Sieving		entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	19
90	100	0.05247	18
75	100	0.03732	16
63	92	0.02669	14
50	92	0.01898	13
37.5	80	0.00991	10
28	75	0.00501	8
20	69	0.00291	6
14	66	0.00155	4
10	61		
6.3	56		
5	54		
3.35	50		
2	45		
1.18	41		
0.6	36	Particle density	(assumed)
0.425	33	2.65	Mg/m3
0.3	29		
0.212	25		
0.15	22		
0.063	19		

Dry Mass of sample, g 10259
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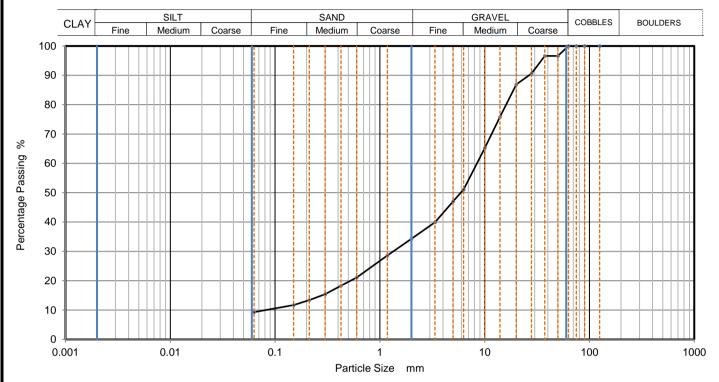
Sample Proportions	% dry mass
Cobbles	8.0
Gravel	47.0
Sand	26.0
Silt	14.2
Clay	4.8

Grading Analysis		
D100	mm	
D60	mm	9.13
D30	mm	0.332
D10	mm	0.00956
Uniformity Coefficient		960
Curvature Coefficient		1.3





CAUSEWAY	PARTICLE SIZE DISTRIBUTION -			Job Ref		23-0343	
—— GEOTECH				Borehole/Pit No.		WP03_BH07	
Site Name	Dublin Array Onshore	Dublin Array Onshore Cable Route			Sample No.		8
Specimen Description	Brown slightly clayey slightly sandy subangular fine to coarse GRAVEL.			Sample	Тор	3.20	
Specimen bescription					Depth (m)	Base	4.00
Specimen Reference	4 Specimen 3.2 m			n	Sample Typ	oe	В
Test Method	BS1377:Part 2:1990, clause 9.2				KeyLAB ID		Caus202311154



Sieving		Sedime	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	97		
28	91		
20	87		
14	76		
10	65		
6.3	51		
5	47		
3.35	40		
2	34		
1.18	29		
0.6	21		
0.425	18	1	
0.3	15		
0.212	13		
0.15	12		
0.063	9		

Dry Mass of sample, g	8916
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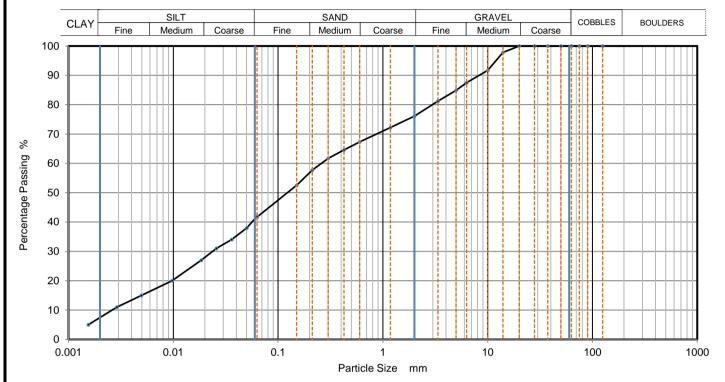
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	65.7
Sand	25.0
Fines < 0.063mm	9.0

Grading Analysis		
D100	mm	
D60	mm	8.44
D30	mm	1.35
D10	mm	0.0813
Uniformity Coefficient		100
Curvature Coefficient		2.6





CAUSEWAY	DARTICI E CIZE DICTRIBUTIONI		Job Ref		23-0343		
—— GEOTECH	PARTICLE SIZE DISTRIBUTION -			Borehole/Pit No.		WP03_BH08	
Site Name	Dublin Array Onshore Cable Route			Sample No.		1	
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample	Тор	0.20	
Specimen bescription					Depth (m)	Base	1.20
Specimen Reference	4 Specimen 0.2 m			m	Sample Typ	oe	В
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			·	KeyLAB ID		Caus202311157



	_		
Siev	Sieving		entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	42
90	100	0.05027	38
75	100	0.03600	34
63	100	0.02577	31
50	100	0.01844	27
37.5	100	0.00975	20
28	100	0.00496	15
20	100	0.00289	11
14	98	0.00155	5
10	92		
6.3	88		
5	85		
3.35	81		
2	76		
1.18	72		
0.6	67	Particle density	(assumed)
0.425	65	2.65	Mg/m3
0.3	62		
0.212	58	1	
0.15	53		
0.063	42		

Dry Mass of sample, g	538
Dry Mass of sample, g	538

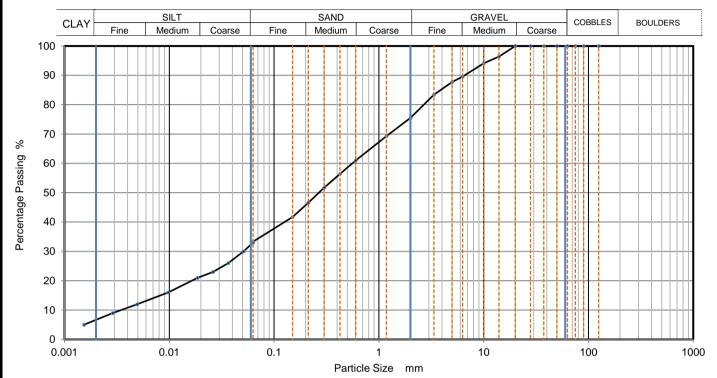
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	23.9
Sand	34.4
Silt	34.0
Clay	7.7

Grading Analysis		
D100	mm	
D60	mm	0.258
D30	mm	0.0239
D10	mm	0.00261
Uniformity Coefficient		99
Curvature Coefficient		0.84





CAUSEWAY	DARTICI E CIZE DISTRIBUTION			Job Ref Borehole/Pit No.		23-0343	
CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION -						WP03_BH09
Site Name	Dublin Array Onshore Cable Route				Sample No.		15
Specimen Description	Down and distall and the GAV				Sample	Тор	1.20
Specimen bescription	Brown sandy slightly gravelly silty CLAY.			Depth (m)	Base	2.00	
Specimen Reference	8 Specimen 1.2 m			m	Sample Typ	e	В
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202311024



Cio	ina	I Sodim	entation
Sieving		Seulin	T
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	33
90	100	0.05105	30
75	100	0.03655	26
63	100	0.02615	23
50	100	0.01860	21
37.5	100	0.00977	16
28	100	0.00494	12
20	100	0.00288	9
14	96	0.00153	5
10	94		
6.3	90		
5	88		
3.35	83		
2	76		
1.18	69		
0.6	61	Particle density	(assumed)
0.425	56	2.65	Mg/m3
0.3	52		
0.212	47	1	
0.15	42	]	
0.063	33	1	

Dry Mass of sample, g	572

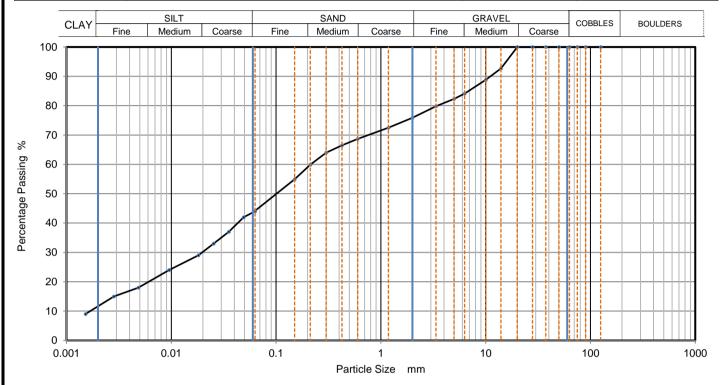
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	24.5
Sand	42.2
Silt	26.6
Clay	6.7

Grading Analysis		
D100	mm	
D60	mm	0.556
D30	mm	0.0517
D10	mm	0.00349
Uniformity Coefficient		160
Curvature Coefficient		1.4





CAUSEWAY	DARTICI E CIZE DICTRIBUTIONI		Job Ref		23-0343		
CAUSEWAY ——GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION			Borehole/Pit No.		WP03_BH09
Site Name	Dublin Array Onshore Cable Route			Sample No.		18	
Specimen Description	Brown sandy slightly gravelly silty CLAY.				Sample	Тор	4.00
Specimen bescription					Depth (m)	Base	5.00
Specimen Reference	Specimen 4 m Depth			m	Sample Typ	oe	В
Test Method	3S1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202311029



Siev	ving	Sedim	entation
310	71116	- Scanni	T
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.04912	42
75	100	0.03542	37
63	100	0.02537	33
50	100	0.01816	29
37.5	100	0.00955	24
28	100	0.00486	18
20	100	0.00284	15
14	93	0.00152	9
10	89		
6.3	84		
5	82		
3.35	80		
2	76		
1.18	73		
0.6	69	Particle density	(assumed)
0.425	67	2.65	Mg/m3
0.3	64		_
0.212	60	1	
0.15	55	1	
0.063	44	1	

Dry Mass of sample, g	545
Dry Mass of sample, g	545

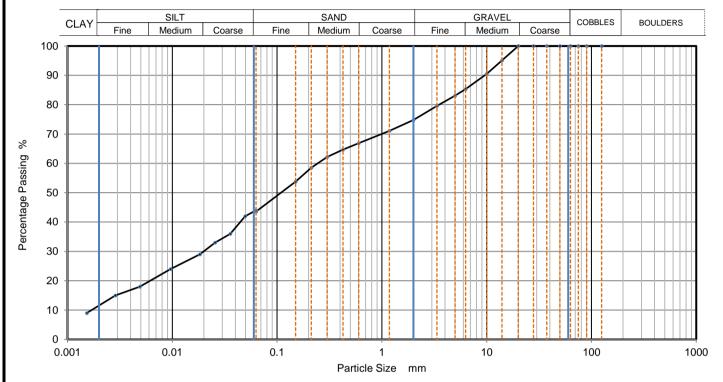
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	24.1
Sand	31.7
Silt	32.6
Clay	11.6

Grading Analysis		
D100	mm	
D60	mm	0.214
D30	mm	0.0191
D10	mm	0.00166
Uniformity Coefficient		130
Curvature Coefficient		1





CAUSEWAY	DARTICI E CIZE DISTRIBUTION			Job Ref		23-0343	
CAUSEWAY GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION —			Borehole/Pit No.		WP03_BH09
Site Name	Dublin Array Onshore (	Dublin Array Onshore Cable Route			Sample No.		19
Specimen Description	Specimen Description Brown sandy slightly gravelly silty CLAY.				Sample	Тор	5.00
Specimen bescription	Brown Sandy Slightly grav	elly slity CLAT.			Depth (m)	Base	6.30
Specimen Reference	4	Specimen Depth	5	Sample Type		В	
Test Method	BS1377:Part 2:1990, claus	3S1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID		Caus2023111512



Sion	ving	Sodim.	entation
Sie	villig	Jeulin	T
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.04962	42
75	100	0.03577	36
63	100	0.02561	33
50	100	0.01833	29
37.5	100	0.00964	24
28	100	0.00490	18
20	100	0.00286	15
14	95	0.00153	9
10	91		
6.3	85		
5	83		
3.35	80		
2	75		
1.18	71		
0.6	67	Particle density	(assumed)
0.425	65	2.65	Mg/m3
0.3	62		
0.212	59	1	
0.15	54	]	
0.063	44	1	

Dry Mass of sample, g	531
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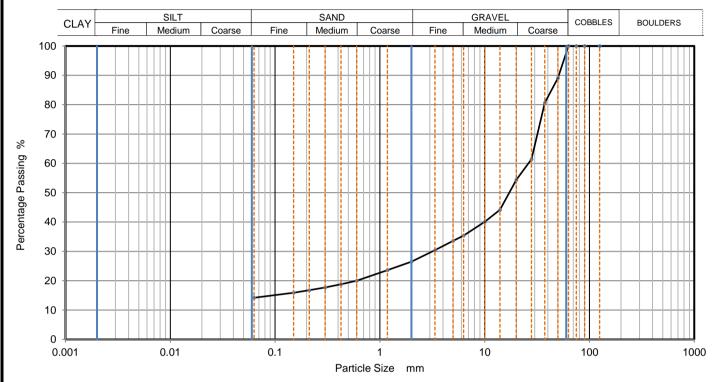
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	25.2
Sand	31.1
Silt	32.3
Clay	11.4

Grading Analysis		
D100	mm	
D60	mm	0.244
D30	mm	0.02
D10	mm	0.0017
Uniformity Coefficient		140
Curvature Coefficient		0.96





CAUSEWAY	DADTICLE CIZE DISTRIBUTION			Job Re	:	23-0343
CAUSEWAY GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION –			ole/Pit No.	WP03_BH11
Site Name	Dublin Array Onshore (	Dublin Array Onshore Cable Route			No.	10
Specimen Description	Specimen Description Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.			Sampl	Тор	3.80
Specimen bescription	Brown slightly sandy sligh	tiy clayey subaligul	al fille to coarse GNAVEE.	Depth (	n) Base	5.30
Specimen Reference	4 Specimen 3.8 m			Sample	Туре	С
Test Method	3S1377:Part 2:1990, clause 9.2			KeyLAI	3 ID	Caus2023111514



		П	
Siev	/ing	Sedimei	ntation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	89		
37.5	81		
28	61		
20	54		
14	44		
10	40		
6.3	35		
5	34		
3.35	30		
2	27		
1.18	24		
0.6	20	,	
0.425	19	1	
0.3	18		_
0.212	17	1	
0.15	16	1	
0.063	14	1	

Dry Mass of sample, g	5458
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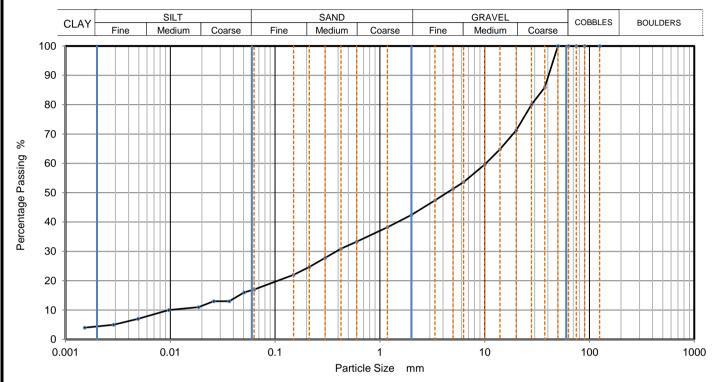
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	73.5
Sand	12.3
Fines < 0.063mm	14.0

Grading Analysis		
D100	mm	
D60	mm	26.2
D30	mm	3.16
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		





CAUSEWAY	DARTICI E CIZE DICTRIBUTION			Job Ref		23-0343	
CAUSEWAY GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION –			Borehole/Pit No.		WP03_BH14
Site Name	Dublin Array Onshore (	Dublin Array Onshore Cable Route			Sample No.		6
Specimen Description	Specimen Description Brown sandy gravelly silty CLAY.				Sample	Тор	0.20
Specimen bescription	Brown salluy gravelly silty	CLAT.			Depth (m)	Base	1.20
Specimen Reference	4 Specimen 0.2 m			Sample Type		В	
Test Method	BS1377:Part 2:1990, claus	3S1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID		Caus2023111515



	_	II	_		
Siev	/ing	Sedimentation			
Particle Size mm	% Passing	Particle Size mm	% Passing		
125	100	0.06300	17		
90	100	0.05074	16		
75	100	0.03655	13		
63	100	0.02600	13		
50	100	0.01860	11		
37.5	86	0.00966	10		
28	80	0.00491	7		
20	71	0.00287	5		
14	65	0.00153	4		
10	60				
6.3	54				
5	51				
3.35	47				
2	42				
1.18	38				
0.6	33	Particle density	(assumed)		
0.425	31	2.65	Mg/m3		
0.3	28				
0.212	25	1			
0.15	22				
0.063	17				

Dry Mass of sample, g	4153
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Sample Proportions	% dry mass
Cobbles	0.0
Gravel	57.6
Sand	25.4
Silt	12.7
Clay	4.3

Grading Analysis		
D100	mm	
D60	mm	10.3
D30	mm	0.384
D10	mm	0.0108
Uniformity Coefficient		950
Curvature Coefficient		1.3







### LABORATORY REPORT



Contract Number: PSL23/10111

Report Date: 19 January 2024

Client's Reference: 23-0343

Client Name: Causeway Geotech

8 Drumahiskey Road

Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 30/11/2023 Date Commenced: 30/11/2023 Date Completed: 19/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

### Checked and Approved Signatories:

A Watkins R Berriman S Royle

(Director) (Quality Manager) (Laboratory Manager)

Lho

L Knight S Eyre T Watkins (Assistant Laboratory Manager) (Senior Technician) (Senior Technician)

Page 1 of

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Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk

## **SUMMARY OF LABORATORY SOIL DESCRIPTIONS**

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03_BH07	9	В	2.00	3.00	Brown gravelly sandy CLAY.
WP03_BH07	15	В	4.00	5.00	Brown GRAVEL.
WP03_BH08	2	В	1.20	2.00	Brown gravelly sandy CLAY.
WP03_BH08	4	U	2.00	2.45	Brown sandy very clayey GRAVEL.
WP03_BH09	16	В	2.00	3.00	Brown gravelly sandy CLAY.
WP03_BH09	9	U	3.00	3.45	Brown gravelly sandy CLAY.
WP03_BH09	10	U	5.00	5.45	Brown gravelly sandy CLAY.
WP03_BH11		C	2.30	3.80	Brown very gravelly sandy CLAY.
WP03_BH14	7	В	1.20	2.00	Brown GRAVEL.





**Dublin Array Onshore Cable Route** 

Contract No:	
PSL23/10111	
Client Ref:	
23-0343	

PSLRF054 Approved by: L Pavey Date: 03/01/2023 Issue No.1

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C}_{\mathbf{o}}$	
WP03_BH07	15	В	4.00	5.00	6.7	1.97	1.85	2.652	37.7	13.9	
WP03_BH07	15	В	4.00	5.00	6.6	1.96	1.84	2.639	37.9	14.0	
WP03_BH07	15	В	4.00	5.00	6.4	1.98	1.86	2.674	37.4	14.0	
WP03_BH09	16	В	2.00	3.00	15	2.13	1.85	2.107	47.5	12.6	
WP03_BH09	16	В	2.00	3.00	15	2.13	1.85	2.092	47.8	12.7	
WP03_BH09	16	В	2.00	3.00	15	2.14	1.87	2.123	47.1	12.6	
WP03_BH09	9	U	3.00	3.45	16	2.12	1.83	2.517	39.7	12.2	
WP03_BH09	9	U	3.00	3.45	16	2.13	1.84	2.500	40.0	12.3	
WP03_BH09	9	U	3.00	3.45	16	2.11	1.82	2.525	39.6	12.1	
WP03_BH09	10	U	5.00	5.45	12	2.20	1.96	2.623	38.1	13.6	
WP03_BH09	10	U	5.00	5.45	12	2.21	1.98	2.604	38.4	14.0	
WP03_BH09	10	U	5.00	5.45	12	2.21	1.97	2.632	38.0	13.8	
WP03_BH14	7	В	1.20	2.00	10	2.01	1.82	2.123	47.1	12.2	
WP03_BH14	7	В	1.20	2.00	10	2.02	1.84	2.110	47.4	12.6	
WP03_BH14	7	В	1.20	2.00	11	2.01	1.82	2.119	47.2	12.4	

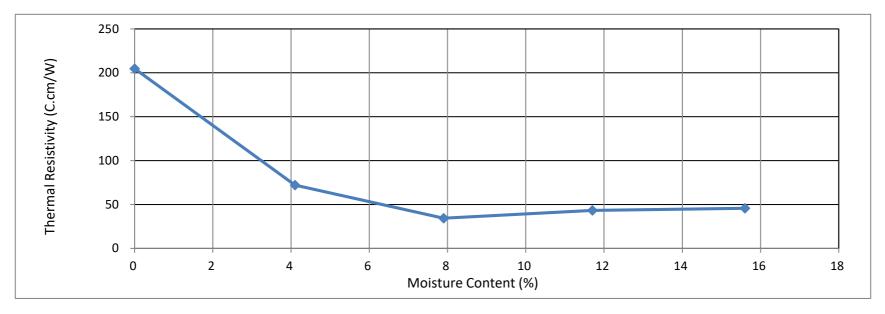


**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/10111
Client Ref:
23-0343

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH07	9	В	2.00	3.00	0	1.68	1.68	0.488	204.8	19.3	
WP03_BH07	9	В	2.00	3.00	4.1	1.94	1.86	1.386	72.2	22.6	
WP03_BH07	9	В	2.00	3.00	7.9	2.13	1.97	2.909	34.4	15.3	
WP03_BH07	9	В	2.00	3.00	12	2.16	1.93	2.312	43.3	15.4	
WP03_BH07	9	В	2.00	3.00	16	2.11	1.83	2.186	45.7	13.6	Natural



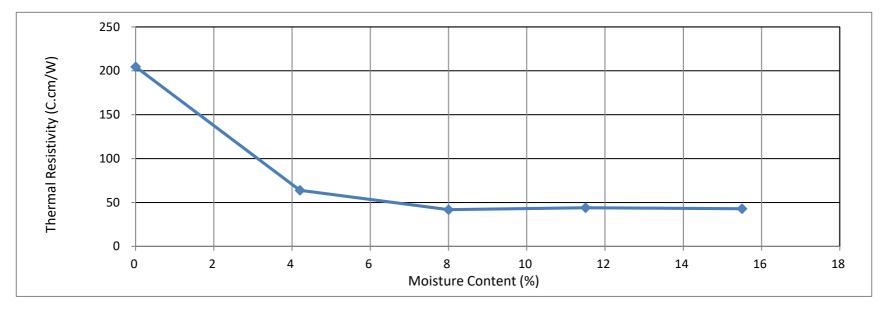


### **Dublin Array Onshore Cable Route**

Contract No:
PSL23/10111
Client Ref:
23-0343

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH08	2	В	1.20	2.00	0	1.66	1.66	0.489	204.6	19.2	
WP03_BH08	2	В	1.20	2.00	4.2	1.91	1.83	1.567	63.8	22.9	
WP03_BH08	2	В	1.20	2.00	8.0	2.10	1.94	2.389	41.9	19.8	
WP03_BH08	2	В	1.20	2.00	12	2.18	1.96	2.272	44.0	18.8	
WP03_BH08	2	В	1.20	2.00	16	2.18	1.89	2.336	42.8	13.6	Natural



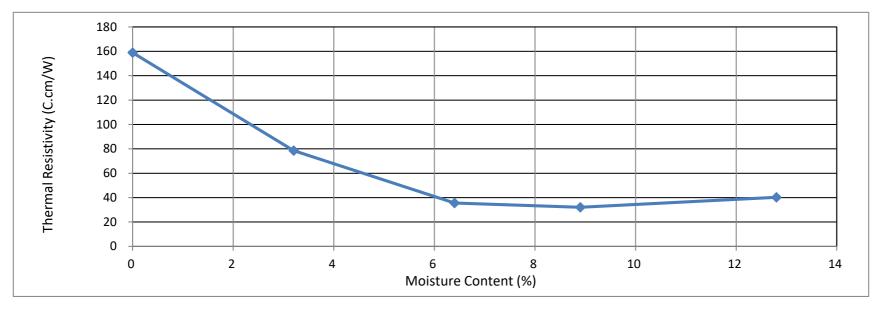


### **Dublin Array Onshore Cable Route**

Contract No:
PSL23/10111
Client Ref:
23-0343

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH08	4	U	2.00	2.45	0	1.71	1.71	0.629	158.9	18.3	
WP03_BH08	4	U	2.00	2.45	3.2	1.94	1.88	1.274	78.5	20.9	
WP03_BH08	4	U	2.00	2.45	6.4	2.04	1.92	2.816	35.5	19.3	
WP03_BH08	4	U	2.00	2.45	8.9	2.20	2.02	3.117	32.1	17.4	
WP03_BH08	4	U	2.00	2.45	13	2.18	1.93	2.486	40.2	15.2	Natural



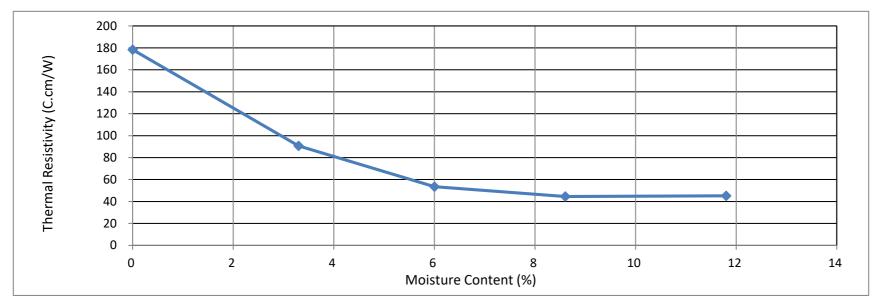


### **Dublin Array Onshore Cable Route**

Contract No:
PSL23/10111
Client Ref:
23-0343

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH11		C	1.20	2.00	0	1.76	1.76	0.561	178.4	17.1	
WP03_BH11		C	1.20	2.00	3.3	1.93	1.87	1.103	90.7	19.9	
WP03_BH11		C	1.20	2.00	6.0	2.02	1.91	1.868	53.5	17.9	
WP03_BH11		C	1.20	2.00	8.6	2.17	2.00	2.244	44.6	17.0	
WP03_BH11		C	1.20	2.00	11.8	2.24	2.00	2.214	45.2	12.7	Natural





### **Dublin Array Onshore Cable Route**

Contract No:
PSL23/10111
Client Ref:
23-0343



### HEAD OFFICE Causeway Geotech Ltd

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> Registered in Northern Ireland. Company Number: NI610766

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Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI**: +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

22 January 2024

Project Name:	Dublin Array Onshore Cable Route							
Project No.:	23-0343							
Client:	Dublin Array							
Engineer:	GDG							

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/11/2023 and 06/01/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Schedule 5 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	3
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	1
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	3
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	3

### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	1



## **Summary of Classification Test Results**

Project No.

Project Name

23-0343

Dublin Array Onshore Cable Route

20	20 0040 Bubility May Choline Gubic Noute			-	300111711	ia, c	11011010	Cabio	touto					
Hole No.		San	nple		Specimen Description	Dens bulk	ity dry	W	Passing 425µm	LL	PL	PI	Particle density	Casagrande
TIOIE NO.	Ref	Тор	Base	Туре	Specimen Description	Mg/m		%	%	%	%	%	Mg/m3	Classification
WP03_BH10A	1	2.50	2.95	D	Brown sandy slightly gravelly silty CLAY.			15	44	35 -1pt	24	11		CL/CI/ML/MI
WP03_BH10A	4	7.00		D	Brown sandy very gravelly silty CLAY.			16						
WP03_BH10A	4	8.50	9.80	С	Brown sandy slightly gravelly silty CLAY.			11						
	-	-												

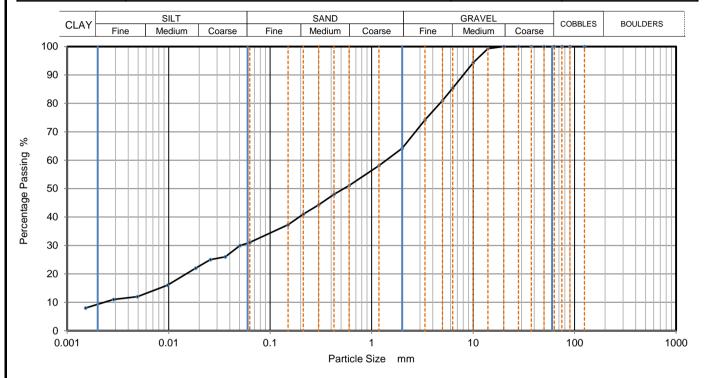
All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 6

Key Date Printed Approved By Density test Liquid Limit Particle density Linear measurement unless : 4pt cone unless : sp - small pyknometer 01/06/2024 00:00 wd - water displacement cas - Casagrande method gj - gas jar wi - immersion in water 1pt - single point test Stephen Watson



CAUSEWAY	DARTICLE CIZE DISTRIBUTION			Job Ref		23-0343	
———GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION			Borehole/Pit No.		WP03_BH10A
Site Name	Dublin Array Onshore	Dublin Array Onshore Cable Route					3
Specimen Description	Brown candy clightly gray	Brown sandy slightly gravelly silty CLAY.			Sample	Тор	5.50
specimen bescription	Brown Sandy Slightly grav				Depth (m)	Base	5.95
Specimen Reference	Specimen 5.5 m			m	Sample Type		D
Test Method	3S1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202311301



Siev	ring	Sedimentation			
Particle Size mm	% Passing	Particle Size mm	% Passing		
125	100	0.06300	31		
90	100	0.05058	30		
75	100	0.03621	26		
63	100	0.02577	25		
50	100	0.01844	22		
37.5	100	0.00975	16		
28	100	0.00493	12		
20	100	0.00286	11		
14	99	0.00152	8		
10	94				
6.3	85				
5	81				
3.35	74				
2	64				
1.18	58				
0.6	51	Particle density	(assumed)		
0.425	48	2.65	Mg/m3		
0.3	44				
0.212	41				
0.15	37	]			
0.063	31				

Approved

Stephen Watson

Dry Mass of sample, g	435
Sample Proportions	% dry mass

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	35.8
Sand	33.1
Silt	22.0
Clay	9.1

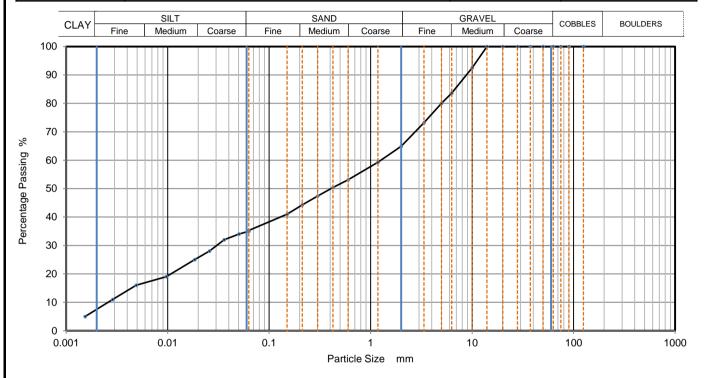
Grading Analysis		
D100	mm	
D60	mm	1.39
D30	mm	0.0538
D10	mm	0.00239
Uniformity Coefficient		580
Curvature Coefficient		0.87

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Combined with D2 4.0m.



CAUSEWAY	DARTICLE CIZE DISTRIBUTION			Job Ref		23-0343	
———GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION			Borehole/P	it No.	WP03_BH10A
Site Name	Dublin Array Onshore	Dublin Array Onshore Cable Route			Sample No.		4
Specimen Description	Brown candy clightly gray	Brown sandy slightly gravelly silty CLAY.			Sample	Тор	8.50
specimen bescription	Brown Sandy Slightly grav				Depth (m)	Base	9.80
Specimen Reference	6 Specimen 8.5 m			m	Sample Type		С
Test Method	3S1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202311303



Siev	ving	Sedimentation			
Particle Size mm	% Passing	Particle Size mm	% Passing		
125	100	0.06300	35		
90	100	0.05058	34		
75	100	0.03599	32		
63	100	0.02577	28		
50	100	0.01844	25		
37.5	100	0.00969	19		
28	100	0.00490	16		
20	100	0.00288	11		
14	100	0.00154	5		
10	93				
6.3	84				
5	80				
3.35	73				
2	65				
1.18	59				
0.6	53	Particle density	(assumed)		
0.425	50	2.65	Mg/m3		
0.3	47				
0.212	44				
0.15	41				
0.063	35				

Dry Mass of sample, g	447

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	35.1
Sand	29.6
Silt	27.8
Clay	7.5

Grading Analysis		
D100	mm	
D60	mm	1.26
D30	mm	0.0304
D10	mm	0.00268
Uniformity Coefficient		470
Curvature Coefficient		0.27

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

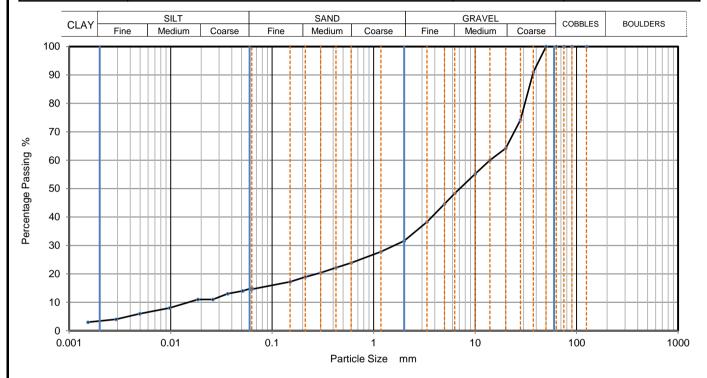




LAB 05R - Version 6

10122

CAUSEWAY GEOTECH PARTICLE SIZE DISTRIBUTION -				Job Ref		23-0343	
				Borehole/Pit No.		WP03_BH10A	
Site Name	Dublin Array Onshore Cable Route				Sample No.		4
Specimen Description	Specimen Description Brown sandy gravelly silty CLAY.				Sample Depth (m)	Тор	9.80
Specimen Description						Base	11.30
Specimen Reference	3 Specimen 9.8 m				Sample Typ	e	С
Test Method	BS1377:Part 2:1990, clau	S1377:Part 2:1990, clauses 9.2 and 9.5					Caus202311304



Siev	/ing	Sedime	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	15
90	100	0.05122	14
75	100	0.03644	13
63	100	0.02608	11
50	100	0.01855	11
37.5	91	0.00975	8
28	74	0.00495	6
20	64	0.00289	4
14	60	0.00153	3
10	55		
6.3	48		
5	45		
3.35	38		
2	32		
1.18	28		
0.6	24	Particle density	(assumed)
0.425	22	2.65	Mg/m3
0.3	20		
0.212	19		
0.15	17		
0.063	15		

Dry Mass of sample, g	3285
Dry Mass of sample, g	3285

Sample Proportions	% dry mass		
Cobbles	0.0		
Gravel	68.4		
Sand	17.0		
Silt	11.0		
Clay	3.6		

Grading Analysis		
D100	mm	
D60	mm	14
D30	mm	1.6
D10	mm	0.0161
Uniformity Coefficient		870
Curvature Coefficient		11

Preparation and testing in accordance with BS1377-2 :1990 unless noted below







### LABORATORY RESTRICTION REPORT

Projec	t Reference		23-0343			То	Sean Ross	
Project Name Dublin Array Onshore Cable Route		Position	Project Manager					
			Dubiin Array Orishore Cable Route			From	Joseph Nicholl	
TRı	TR reference 23-0343 / G05		Position	Laboratory Quality Manager				
The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.								
Hole	Samp	le	Test					

Number	Number	Depth (m)	Туре	Туре	Reason for Restriction	Required Action
WP03_B H10A	2 & 3	4.00 & 5.50	2 x D	TR - 5 point testing	Insufficient material for test	PSD carried out as per instructions on schedule
WP03_B H10A	4	7.00	D	Atterberg limits	Insufficient material for test, material was too granular	
For electr	onic repor	ting a forr	n of		Laboratory Signature Joseph Nicholl	Project Manager Signature Sean Ross

For electronic reporting a form of electronic signature or printed name is acceptable

Laboratory Signature	Project Manager Signature	
Joseph Nicholl	Sean Ross	
Date 08 December 2023	Date	



### HEAD OFFICE Causeway Geotech Ltd

8 Drumahiskey Road Ballymoney Co. Antrim, N. Ireland, BT53 7QL **NI:** +44 (0)28 276 66640

> Registered in Northern Ireland. Company Number: NI610766

#### REGIONAL OFFICE Causeway Geotech (IRL) Ltd

Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI:** +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

## SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

6 January 2024

<b>Project Name:</b>	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 27/11/2023 and 06/01/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Schedule 5 – INTERIM

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

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

### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	1
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity (3 Single Point tests at NMC)	ASTM D5334	4



## **Summary of Classification Test Results**

Project No.

Project Name

23-0343

Dublin Array Onshore Cable Route

	1		<u> </u>				- ,							
Hole No.	Ref	Top	nple Base	Туре	Specimen Description	Dens bulk	ity dry	W	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	IXCI	ТОР	Dasc	Турс		Mg/m	13	%	%	%	%	%	Mg/m3	
WP03_BH06	1	0.00	1.00	В	Brown sandy slightly gravelly silty CLAY.			26	65	42 -1pt	20	22		CI
WP03_BH08	14	7.00	8.00	В	Brown slightly gravelly clayey fine to coarse SAND.			16						
													LAF	2 01B Version 6

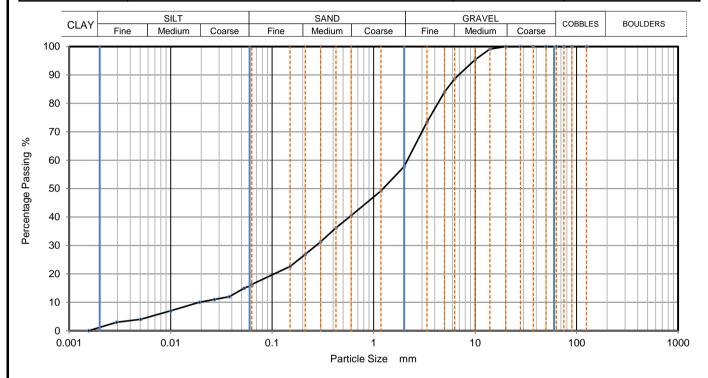
All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 6

Key Date Printed Approved By Density test Liquid Limit Particle density Linear measurement unless : 4pt cone unless : sp - small pyknometer 01/06/2024 00:00 wd - water displacement cas - Casagrande method gj - gas jar wi - immersion in water 1pt - single point test



CAUSEWAY	DARTI	CLE SIZE DIST	Job Ref		23-0343	
——GEOTECH	PARII	CLE SIZE DIST	RIBUTION	Borehole/F	it No.	WP03_BH08
Site Name	Dublin Array Onshore	Cable Route		Sample No		14
Specimen Description	Brown slightly gravelly cla	you fine to coarse	AND	Sample	Тор	7.00
specimen bescription	Brown Siightiy graveliy cia	iyey iiile to coarse s	SAND.	Depth (m)	Base	8.00
Specimen Reference	4	Specimen Depth	7 m	Sample Type		В
Test Method	BS1377:Part 2:1990, clau	KeyLAB ID		Caus2023113011		



Siev	/ing	Sedimentation			
Particle Size mm	% Passing	Particle Size mm	% Passing		
125	100	0.06300	16		
90	100	0.05301	15		
75	100	0.03791	12		
63	100	0.02696	11		
50	100	0.01917	10		
37.5	100	0.01001	7		
28	100	0.00506	4		
20	100	0.00293	3		
14	99	0.00156	0		
10	95				
6.3	89				
5	84				
3.35	73				
2	58				
1.18	49				
0.6	41	Particle density	(assumed)		
0.425	36	2.65	Mg/m3		
0.3	31				
0.212	27				
0.15	23				
0.063	16				

Dry Mass of sample, g 487	Dry Mass of sample, g	487
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Sample Proportions	% dry mass				
Cobbles	0.0				
Gravel	42.2				
Sand	41.5				
Silt	15.2				
Clay	1.1				

Grading Analysis		
D100	mm	
D60	mm	2.15
D30	mm	0.27
D10	mm	0.0217
Uniformity Coefficient		99
Curvature Coefficient	1.6	

Preparation and testing in accordance with BS1377-2 :1990 unless noted below







## LABORATORY REPORT



Contract Number: PSL23/10441

Report Date: 22 January 2024

Client's Reference: 23-0343

Client Name: Causeway Geotech

8 Drumahiskey Road

Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 13/12/2023
Date Commenced: 13/12/2023
Date Completed: 22/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

### Checked and Approved Signatories:

A Watkins R Berriman S Royle

(Director) (Quality Manager) (Laboratory Manager)

Lho

L Knight S Eyre T Watkins (Assistant Laboratory Manager) (Senior Technician) (Senior Technician)

Page 1 of

5 - 7 Hexthorpe Road,

Hexthorpe, Doncaster, DN4 0AR

Tel: 01302 768098

Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk

## **SUMMARY OF LABORATORY SOIL DESCRIPTIONS**

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03_BH05	2	В	2.50	4.00	Brown gravelly very sandy CLAY.
WP03_BH05	5	В	7.00	8.50	Brown gravelly silty SAND.
WP03_BH06	3	В	2.50	4.00	Brown gravelly very sandy CLAY.
WP03_BH07	21	В	6.30	7.00	Dark grey sandy silty GRAVEL.
WP03_BH08	11	В	4.00	5.50	Dark grey sandy silty GRAVEL.





**Dublin Array Onshore Cable Route** 

Contract No:
PSL23/10441
Client Ref:
23-0343

PSLRF054 Approved by: L Pavey Date: 03/01/2023 Issue No.1

In accordance with ASTM-D5334

Hole	Sample	Cample	Тор	Base	Moisture	Bulk	Dry	Thermal Conductivity	Thermal Resistivity	Test Temp	
Number	Number	Sample Type	Depth	Depth	Content %	Density Mg/m <sup>3</sup>	Density Mg/m <sup>3</sup>	Conductivity	Resistivity	Test Temp	Remarks
Trumber	1 (ulliber	1,100	m	m	70	IVIg/III	ivig/iii	W/m K	C.cm/W	$\mathbf{C}^{\mathbf{o}}$	
WP03_BH05	2	В	2.50	4.00	15	2.12	1.85	2.003	49.9	14.5	
WP03_BH05	2	В	2.50	4.00	15	2.12	1.84	2.075	48.2	14.9	
WP03_BH05	2	В	2.50	4.00	15	2.13	1.86	2.028	49.3	14.6	
WP03_BH05	5	В	7.00	8.50	9.4	2.01	1.84	2.500	40.0	14.5	
WP03_BH05	5	В	7.00	8.50	9.6	2.01	1.84	2.488	40.2	15.0	
WP03_BH05	5	В	7.00	8.50	9.7	2.02	1.84	2.519	39.7	14.8	
WP03_BH07	21	В	6.30	7.00	6.4	2.20	2.07	2.836	35.3	15.0	
WP03_BH07	21	В	6.30	7.00	6.4	2.20	2.07	2.817	35.5	15.8	
WP03_BH07	21	В	6.30	7.00	6.6	2.21	2.07	2.849	35.1	15.6	
WP03_BH08	11	В	4.00	5.50	7.1	2.27	2.12	3.008	33.2	15.9	
WP03_BH08	11	В	4.00	5.50	6.9	2.26	2.12	2.994	33.4	16.0	
WP03_BH08	11	В	4.00	5.50	7.2	2.27	2.12	3.030	33.0	15.9	

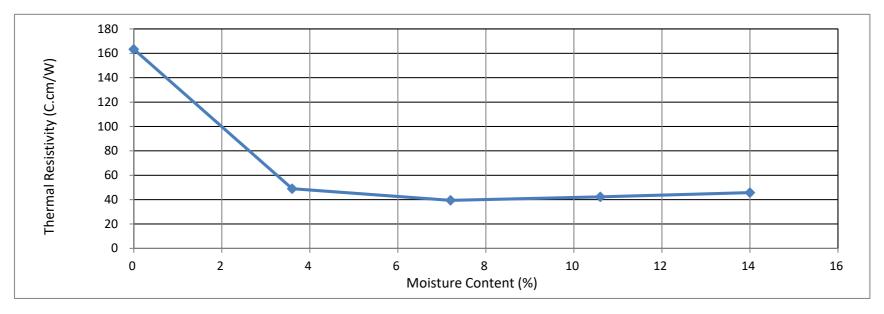


**Dublin Array Onshore Route** 

Contract No:
PSL23/10441
Client Ref:
23-0343

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH06	3	В	2.50	4.00	0	1.76	1.76	0.612	163.4	18.4	
WP03_BH06	3	В	2.50	4.00	3.6	1.94	1.87	2.045	48.9	20.2	
WP03_BH06	3	В	2.50	4.00	7.2	2.10	1.96	2.537	39.4	18.3	
WP03_BH06	3	В	2.50	4.00	11	2.19	1.98	2.367	42.2	17.5	
WP03_BH06	3	В	2.50	4.00	14	2.15	1.89	2.185	45.8	15.4	Natural





## **Dublin Array Onshore Cable Route**

<b>Contract No:</b>
PSL23/10441
Client Ref:
23-0343



### HEAD OFFICE Causeway Geotech Ltd

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> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

22 January 2024

Project Name:	Dublin Array Onshore Cable Route						
Project No.:	23-0343						
Client:	Dublin Array						
Engineer:	GDG						

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 27/11/2023 and 06/01/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Schedule 7 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	5
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	3
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	3

### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – subcontracted to Pro Soils Limited (UKAS 4043)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	1



## **Summary of Classification Test Results**

Project No.

Project Name

23-0343

Dublin Array Onshore Cable Route

		San	nple			Dens	ity	W	Passing	LL	PL	PI	Particle	Casagranda
Hole No.	Ref	Тор	Base	Туре	Specimen Description	bulk Mg/m	dry 3	%	425μm %	%	%	%	density Mg/m3	Casagrande Classification
WP03_BH06	1	4.00		С	Brown sandy slightly gravelly silty CLAY.			11	90	33 -1pt	15	18		CL
WP03_BH06	3	6.80		С	Brown sandy slightly gravelly silty CLAY.			12						
WP03_BH06	5	9.80		С	Brown sandy slightly gravelly silty CLAY.			14	84	26 -1pt	13	13		CL
WP03_BH06	8	14.30		С	Brown sandy slightly gravelly silty CLAY.			34	82	31 -1pt	15	16		CL
WP03_BH06	11	18.80		С	Brown sandy slightly gravelly silty CLAY.			9.2						
	<u> </u>													

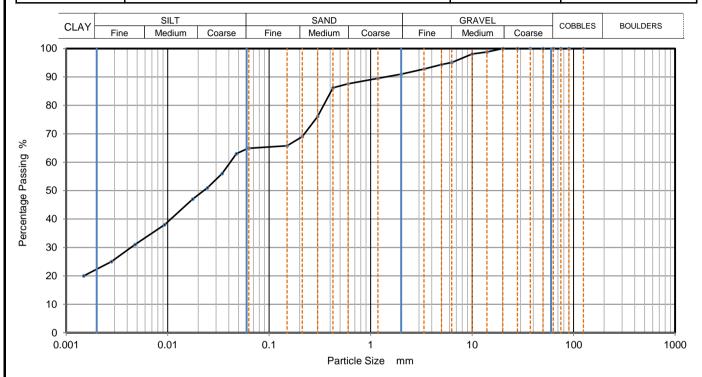
All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 6

Key Date Printed Approved By Density test Liquid Limit Particle density Linear measurement unless : 4pt cone unless : sp - small pyknometer 01/06/2024 00:00 wd - water displacement cas - Casagrande method gj - gas jar wi - immersion in water 1pt - single point test Stephen Watson



CAUSEWAY	DADTICLE SIZE DISTRIBUTION			Job Ref		23-0343	
———GEOTECH	PAI	PARTICLE SIZE DISTRIBUTION			Borehole/Pit No.		WP03_BH06
Site Name	Dublin Array Onsh	Dublin Array Onshore Cable Route					1
Specimen Description	Prown candy slightly	gravelly silty CLAV			Sample	Тор	4.00
Specimen Description	Brown salidy slightly	gravelly silty CLAT.			Depth (m)	Base	
Specimen Reference	3	3 Specimen 4 m			Sample Type		С
Test Method	3S1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus2023121837



Siev	/ing	Sedime	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	65
90	100	0.04762	63
75	100	0.03438	56
63	100	0.02464	51
50	100	0.01766	47
37.5	100	0.00935	38
28	100	0.00476	31
20	100	0.00280	25
14	99	0.00149	20
10	98		
6.3	95		
5	94		
3.35	93		
2	91		
1.18	90		
0.6	88	Particle density	(assumed)
0.425	86	2.65	Mg/m3
0.3	76		
0.212	69		
0.15	66		
0.063	65		

Dry Mass of sample, g	453
	•

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	9.0
Sand	26.1
Silt	42.7
Clay	22.2

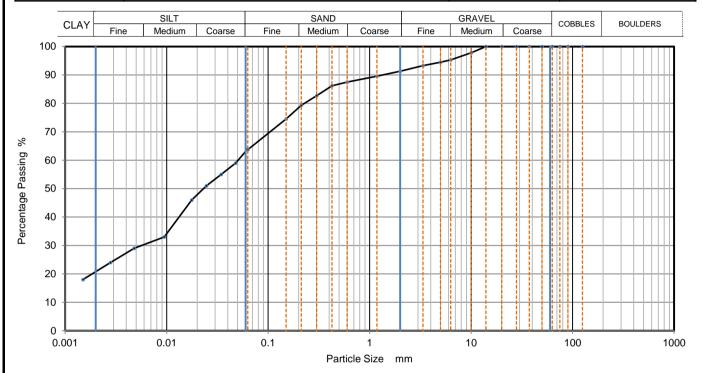
Grading Analysis		
D100	mm	
D60	mm	0.0419
D30	mm	0.00428
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Preparation and testing in accordance with BS1377-2 :1990 unless noted below





CAUSEWAY	DARTICLE CIZE DISTRIBUTION			Job Ref		23-0343	
———GEOTECH	PARII	PARTICLE SIZE DISTRIBUTION			Borehole/Pit No.		WP03_BH06
Site Name	Dublin Array Onshore	Dublin Array Onshore Cable Route					3
Specimen Description	Brown sandy slightly grav	December 11 of the CLAY			Sample	Тор	6.80
specimen bescription	Brown Sandy Slightly grav	relly silty CLAT.			Depth (m)	Base	
Specimen Reference	2 Specimen 6.8 m			Sample Type		С	
Test Method	3S1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus2023121838



Sievi	ing	Sedimentation			
Particle Size mm	% Passing	Particle Size mm	% Passing		
125	100	0.06300	64		
90	100	0.04796	59		
75	100	0.03438	55		
63	100	0.02464	51		
50	100	0.01766	46		
37.5	100	0.00947	33		
28	100	0.00479	29		
20	100	0.00280	24		
14	100	0.00150	18		
10	98				
6.3	95				
5	95				
3.35	93				
2	91				
1.18	90				
0.6	88	Particle density	(assumed)		
0.425	86	2.65	Mg/m3		
0.3	83				
0.212	79	1			
0.15	75	1			
0.063	64	]			

Dry Mass of sample, g	418		

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	8.7
Sand	27.6
Silt	43.1
Clay	20.6

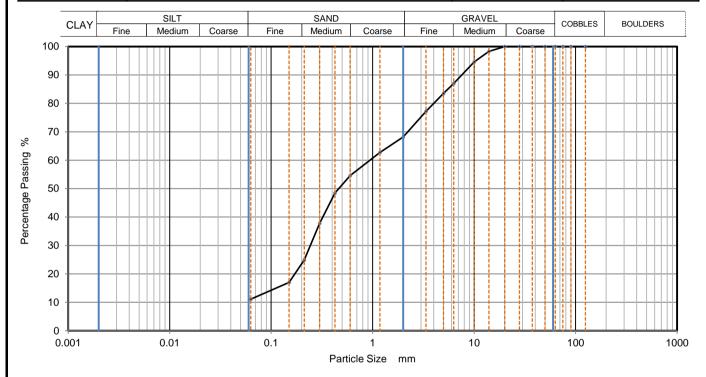
Grading Analysis		
D100	mm	
D60	mm	0.0501
D30	mm	0.00599
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Preparation and testing in accordance with BS1377-2 :1990 unless noted below





CAUSEWAY	PARTICLE SIZE DISTRIBUTION			Job Ref		23-0343	
———GEOTECH				Borehole/Pit No.		WP03_BH06	
Site Name	Dublin Array Onshore Cable Route				Sample No.		6
Specimen Description	Specimen Description Brown slightly gravelly slightly clayey fine to coarse SAND.			Sample Depth (m)	Тор	11.30	
specimen bescription					Base		
Specimen Reference	Specimen 11.3 m				Sample Typ	e	С
Test Method	BS1377:Part 2:1990, clause 9.2				KeyLAB ID		Caus2023121840



Siev	/ing	Sedime	entation
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	95		
6.3	87		
5	84		
3.35	77		
2	68		
1.18	63		
0.6	55		
0.425	49		
0.3	38		
0.212	25		
0.15	17		
0.063	11		

Dry Mass of sample, g 500	Dry Mass of sample, g	500
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Sample Proportions	% dry mass
Cobbles	0.0
Gravel	31.8
Sand	57.1
Fines <0.063mm	11.0

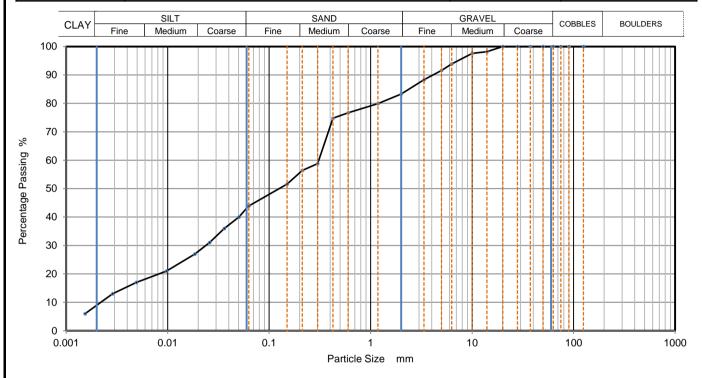
Grading Analysis		
D100	mm	
D60	mm	0.941
D30	mm	0.243
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Preparation and testing in accordance with BS1377-2 :1990 unless noted below





CAUSEWAY	PARTICLE SIZE DISTRIBUTION			Job Ref		23-0343	
———GEOTECH				Borehole/Pit No.		WP03_BH06	
Site Name	Dublin Array Onshore Cable Route				Sample No.		11
Specimen Description	Pressure and dislate and the CLAV			Sample	Тор	18.80	
Specimen Description Brown sandy slightly gravelly silty CLAY.			Depth (m)	Base			
Specimen Reference	Specimen 18.8 m				Sample Typ	e	С
Test Method	BS1377:Part 2:1990, clau			KeyLAB ID		Caus2023121842	



Siev	/ing	Sedime	entation	
Particle Size mm	% Passing	Particle Size mm	% Passing	
125	100	0.06300	44	
90	100	0.05058	40	
75	100	0.03621	36	
63	100	0.02592	31	
50	100	0.01855	27	
37.5	100	0.00975	21	
28	100	0.00493	17	
20	100	0.00288	13	
14	98	0.00154	6	
10	98			
6.3	94			
5	92			
3.35	88			
2	83			
1.18	80			
0.6	77	Particle density	(assumed)	
0.425	75	2.65	Mg/m3	
0.3	59			
0.212	56			
0.15	52			
0.063	44			

Dry Mass of sample, g	516
	·

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	16.7
Sand	39.4
Silt	35.0
Clay	8.9

Grading Analysis		
D100	mm	
D60	mm	0.308
D30	mm	0.0233
D10	mm	0.00223
Uniformity Coefficient		140
Curvature Coefficient		0.79

Preparation and testing in accordance with BS1377-2 :1990 unless noted below







## LABORATORY REPORT



84

**Contract Number: PSL24/0227** 

Report Date: 22 January 2024

Client's Reference: 23-0343

Client Name: Causeway Geotech

8 Drumahiskey Road

Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 10/1/2024 Date Commenced: 10/1/2024 Date Completed: 22/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins R Berriman S Royle

(Managing Director) (Associate Director) (Laboratory Manager)

L Knight S Eyre T Watkins
(Assistant Laboratory Manager) (Senior Technician) (Senior Technician)

5 – 7 Hexthorpe Road,

Hexthorpe,
Doncaster,

Doncaster, DN4 0AR

Tel: 01302 768098

Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk

## **SUMMARY OF LABORATORY SOIL DESCRIPTIONS**

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03_BH06		C	4.80	12.00	Brown gravelly sandy CLAY.





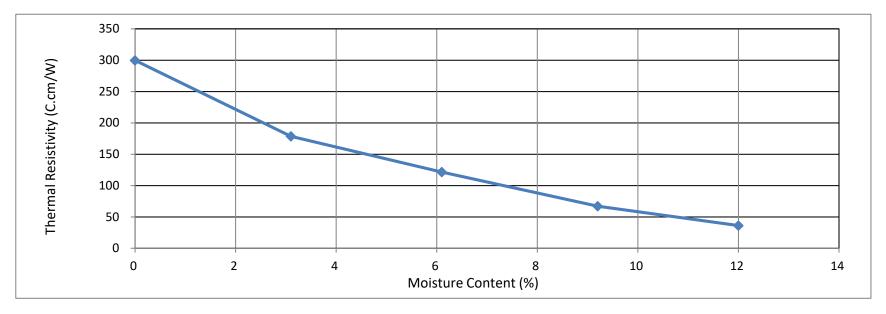
**Dublin Array Onshore Cable Route** 

Contract No:	
PSL24/0227	
Client Ref:	
23-0343	

PSLRF054 Approved by: L Pavey Date: 03/01/2023 Issue No.1

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth	Base Depth	Moisture Content %	Bulk Density Mg/m <sup>3</sup>	Dry Density Mg/m <sup>3</sup>	Thermal Conductivity	Thermal Resistivity	Test Temp	Remarks
			m	m				W/m K	C.cm/W	$\mathbf{C_o}$	
WP03_BH06		C	4.80	12.00	0.0	1.76	1.76	0.334	299.7	32.1	
WP03_BH06		C	4.80	12.00	3.1	1.76	1.71	0.560	178.5	26.9	
WP03_BH06		C	4.80	12.00	6.1	1.91	1.80	0.824	121.4	20.5	
WP03_BH06		C	4.80	12.00	9.2	1.97	1.80	1.493	67.0	18.8	
WP03_BH06		C	4.80	12.00	12	2.02	1.80	2.762	36.2	14.4	





### **Dublin Array Onshore Cable Route**

Contract No:	
PSL24/0227	
Client Ref:	
23-0343	

		Test Amenda	ment Notice Cause	way
Date:		19.1.24	? Stepho	- Jahan.
	tract Reference:	PSL 24/02	27	
Contract	Title:	DUBLEN ARRY	AY ONSHORE CABLE A	LOUTE
Engineer	/Client Details:			
Sample I	Details:	WP03-BH06	@ 15.30-18.80	)
Testing r	equired:	5 POINT T	HERMAL RESISTIL	ITY
		Details of U	nsuitability	
The abov	ve sample cannot b	e performed due to the follo	wing reasons:	
1 2 3 4 5	The sample has be The sample has be The sample is under the sample	not been received lent material for the required Sample Mass received (g) Sample Mass required (g) been previsouly tested been misplaced in the labora asuitable for testing becausi  NOT FOSSTRIE	itory SAMPLE IS COAR, TO PENETRATE	SE W#TH
Please ac	lvise action require	ed.		
1	Perform the testi	ng on the following sample		10.51.57.5
2		es has follows for testing:		
3		owing alternative testing:		*****
4	Perform a non st			
5	Take no further	action		
6	Undertake the fo	ollowing instructions:		4 (* * * * * * * * * * * * * * * * * * *
				********
Sign <del>e</del> d			Date	DSUN NEWSCHER
	(1	Project Engineer)		
				PSL

10073023

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Professional Soil Laboratory End 5.7 He thorpe Yould Dones, or DN4 1500



### HEAD OFFICE Causeway Geotech Ltd

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> Registered in Northern Ireland. Company Number: NI610766

#### REGIONAL OFFICE Causeway Geotech (IRL) Ltd

Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI**: +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

4 January 2024

<b>Project Name:</b>	Dublin Array Onshore Cable Route								
Project No.:	23-0343								
Client:	Dublin Array								
Engineer:	GDG								

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 05/12/2023 and 04/01/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Rock Schedule 4

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report		
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	6		

### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report			
ROCK – subcontracted to MATtest Limited (UKAS 2643)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	4			
ROCK – subcontracted to GEOLABS (UKAS 2643)	Cerchar Abrasivity Index	ASTM D7625 - 10	3			

CAUSEWAY GEOTECH					Point Load Strength Index Tests Summary of Results													
Project No.		Proje	ect Nam	е														
23-0343					Dublin Array Onshore Cable Route													
Borehole	Sample		Specimen				Test Type see ISRM			Dime	Dimensions		Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including	
No.	Depth	Ref.	Туре	Ref.	Depth	Rock Type	Type (D, A, I, B)	Direction (L, P or U)	Failure Valid (Y/N)	Lne	W	Dps	Dps'			Is	Is(5 0)	water content if measured)
WP03_BH01	6.80	1	С	2	6.80	GRANITE	D	U	YES	mm 91.7	mm 102.2	mm 102.2	mm 100.0	kN 26.8	mm 101.1	MPa 2.6	MPa 3.6	
WP03_BH02	2.70	3	С	2	2.70	GRANITE	А	U	YES		102.0	95.0	92.0	28.8	109.3	2.4	3.4	
WP03_BH02	9.60	5	С	2	9.60	GRANITE	D	U		113.3		101.5		27.5	99.2	2.8	3.8	
WP03_BH11	7.20	6	С	2	7.20	GRANITE	D	U				101.4		21.8	100.2		3.0	
WP03_BH11	12.80	8	С	2	12.80	GRANITE	A	U	YES		101.4	84.0	81.0	32.7	102.3		4.3	
WP03_BH11	18.80	10	С	2	18.80	GRANITE	A	U	YES		101.2		92.0	45.0	108.9		5.4	
WF03_BITT1	10.00	10			10.00				11.3		101.2	93.0	92.0	43.0	100.9	3.6	3.4	
Lne - Length from platens to nearest free end									ar lump	D <sub>ps</sub>								
											Date F	Printed		Appro	ved B	у		
Test performed in accordance with ISRM Suggested Methods: 1985, unless noted otherwise  Detailed legend for test and dimensions, based on ISRM, is shown above.										12/05/2023 00:00 UKAS					JKAS			

LAB 17R - Version 5

10122

Stephen Watson



### LABORATORY TEST CERTIFICATE

Certificate No : 23/1262 - 01-1

To: Stephen Watson

Client : Causeway Geotech Limited

8 Drumahiskey Road

Ballymoney Co. Antrim BT53 7QL 10 Queenslie Point Queenslie Industrial Estate 120 Stepps Road Glasgow G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org Website: www.mattest.org

### LABORATORY TESTING OF ROCK

### Introduction

We refer to samples taken from Dublin Array and delivered to our laboratory on 22nd November 2023.

### **Material & Source**

Sample Reference : See Report Plates

Sampled By : Client

Sampling Certificate : Not Supplied

Location : See Report Plates

Description : Rock Cores

Date Sampled : Not Supplied

Date Tested : 22nd November 2023 Onwards

Source : 23-0343 - Dublin Array

### **Test Results**

As Detailed On Page 2 to Page 4 inclusive

### Comments

The results contained in this report relate to the sample(s) as received Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

### Remarks

Approved for Issue

T McLelland (Director)

Date

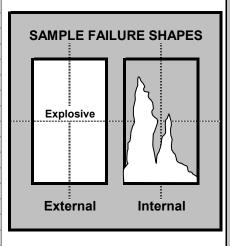
11/12/2023



Issue No. 01 Page 1 of 4



BOREHOLE		WP03_BH01
SAMPLE		C2
DEPTH	m	8.30-8.60
SAMPLE DIAMETER	mm	102.31
SAMPLE HEIGHT	mm	204.92
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.7
TEST DURATION	min.sec	12.58
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	526.7
UNCONFINED COMPRESSIVE STRENGTH	MPa	64.1
WATER CONTENT (ISRM Suggested Methods)	%	0.6
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.60
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.59



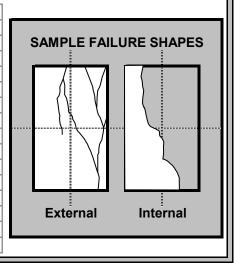
BOREHOLE			
SAMPLE			
DEPTH	m	SAMPLE FAIL	URE SHAPES
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%	External	Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

BOREHOLE				
SAMPLE				
DEPTH	m	SAMPLE FAIL	URE SHAPES	
SAMPLE DIAMETER	mm			
SAMPLE HEIGHT	mm			
TEST CONDITION				
RATE OF LOADING	kN/s			
TEST DURATION	min.sec			
DATE OF TESTING				
LOAD FRAME USED				
LOAD DIRECTION WITH RESPECT TO LITHOLOGY				
FAILURE LOAD	kN			
UNCONFINED COMPRESSIVE STRENGTH	MPa			
WATER CONTENT (ISRM Suggested Methods)	%	External	Internal	
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>			
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>			

Tested in accordance with ASTM D7012 - 14



BOREHOLE		WP03_BH02
SAMPLE		C4
DEPTH	m	5.30-5.60
SAMPLE DIAMETER	mm	101.32
SAMPLE HEIGHT	mm	205.41
TEST CONDITION		As Received
RATE OF LOADING	kN/s	1.1
TEST DURATION	min.sec	3.48
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	229.6
UNCONFINED COMPRESSIVE STRENGTH	MPa	28.5
WATER CONTENT (ISRM Suggested Methods)	%	0.6
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.62
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.61



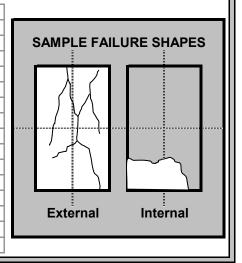
BOREHOLE			
SAMPLE			
DEPTH	m	SAMPLE FAIL	URE SHAPES
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%	External	Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

BOREHOLE			
SAMPLE			
DEPTH	m	SAMPLE FAIL	URE SHAPES
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%	External	Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

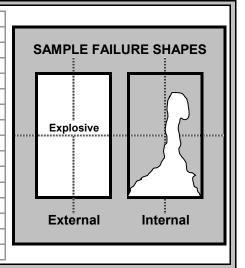
Tested in accordance with ASTM D7012 - 14



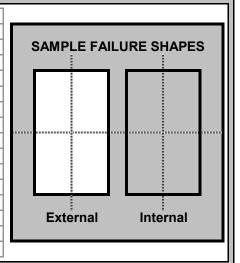
BOREHOLE		WP03_BH11
SAMPLE		C7
DEPTH	m	10.50-10.85
SAMPLE DIAMETER	mm	101.53
SAMPLE HEIGHT	mm	202.70
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.6
TEST DURATION	min.sec	5.49
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	182.8
UNCONFINED COMPRESSIVE STRENGTH	MPa	22.6
WATER CONTENT (ISRM Suggested Methods)	%	1.1
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.58
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.55



BOREHOLE		WP03_BH11
SAMPLE		C9
DEPTH	m	16.50-17.00
SAMPLE DIAMETER	mm	101.71
SAMPLE HEIGHT	mm	202.51
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.6
TEST DURATION	min.sec	13.19
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	506.3
UNCONFINED COMPRESSIVE STRENGTH	MPa	62.3
WATER CONTENT (ISRM Suggested Methods)	%	0.4
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.63
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.62



ш			
	BOREHOLE		
	SAMPLE		
	DEPTH	m	
	SAMPLE DIAMETER	mm	
	SAMPLE HEIGHT	mm	
	TEST CONDITION		
	RATE OF LOADING	kN/s	
	TEST DURATION	min.sec	
	DATE OF TESTING		
	LOAD FRAME USED		
	LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
	FAILURE LOAD	kN	
	UNCONFINED COMPRESSIVE STRENGTH	MPa	
	WATER CONTENT (ISRM Suggested Methods)	%	
	BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	
	DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	
П			



Tested in accordance with ASTM D7012 - 14

#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH01

Sample Ref.: Depth (m):

8.30-8.45

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Slightly to

moderately weathered

Sample details

Maximum grain size (mm) 2

Condition as tested

As received

Equipment used

Cerchar apparatus Type 2 (West): In this apparatus the sample moves under a stationary stylus

with a specific speed.

High abrasiveness

Planes of weakness

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

	1	2	3	4	5
mm	0.35	0.34	0.35	0.35	0.34
mm	0.37	0.36	0.37	0.37	0.36
mm	0.35	0.35	0.35	0.35	0.35
mm	0.37	0.35	0.37	0.37	0.35
mm	0.37	0.35	0.37	0.37	0.35
mm	0.36	0.35	0.36	0.36	0.35
mm					0.36
CERCHAR-Abrasivity-Index (CAI)					
of CAI					0.05
	mm mm mm mm mm mm mm itty-Index	mm 0.37 mm 0.35 mm 0.37 mm 0.37 mm 0.36 mm 0.36	mm       0.35       0.34         mm       0.37       0.36         mm       0.35       0.35         mm       0.37       0.35         mm       0.36       0.35         mm       0.36       0.35         mm       0.31       0.35	mm         0.35         0.34         0.35           mm         0.37         0.36         0.37           mm         0.35         0.35         0.35           mm         0.37         0.35         0.37           mm         0.36         0.35         0.36           mm         0.36         0.35         0.36           mm         0.10         0.10         0.10           rity-Index (CAI)         0.10         0.25	mm         0.35         0.34         0.35         0.35           mm         0.37         0.36         0.37         0.37           mm         0.35         0.35         0.35         0.35           mm         0.37         0.35         0.37         0.37           mm         0.36         0.35         0.36         0.36           mm         0.36         0.35         0.36         0.36           mm         o.36         o.35         o.36         o.36

Classification	of CAI
<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Date tested: 21 December 2023

\*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Classification of CAI

Not required

Checked and Approved by

IT

Project Name:

Project Number:

GEO / 39521

DUBLIN ARRAY 23/1262-2

Tabios (Head of Department)

Date: 04/01/2024



#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH02

Sample Ref.:

Depth (m): 6.65-6.80 Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly

In this apparatus the sample moves under a stationary stylus

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

weathered

**Equipment used** 

with a specific speed.

Cerchar apparatus Type 2 (West):

Sample details

Maximum grain size (mm) 2

Condition as tested Planes of weakness

Direction of stylus

As received

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.		1	2	3	4	5	
Measurement d <sub>1</sub>	mm	0.38	0.38	0.39	0.39	0.38	
Measurement d <sub>2</sub>	mm	0.39	0.39	0.40	0.40	0.39	
Measurement d <sub>3</sub>	mm	0.39	0.39	0.40	0.40	0.39	
Measurement d <sub>4</sub>	mm	0.40	0.40	0.41	0.41	0.40	
Measurement d <sub>5</sub>	mm	0.38	0.38	0.40	0.40	0.38	
Mean reading d <sub>M</sub>	mm	0.39	0.39	0.40	0.40	0.39	
Mean pin wear	mm					0.39	
CERCHAR-Abrasivity-Index (CAI)							
Standard deviation of <b>CAI</b>							
Classification of CA	41				High	abrasiveness	

Date tested: 21 December 2023

Classification of CAI

Extremely low

Very low

Medium

Extreme

Quartzitic

Low

High

< 0.30

0.30-0.50

0.50-1.00

1.00-2.00

2.00-4.00

4.00-6.00

6.00-7.00

#### Photograph

#### Not required

Checked and Approved by

Tabios (Head of Department)

04/01/2024 Date:

Project Number:

Project Name:

GEO / 39521



<sup>\*</sup>Measurements done under >50x magnification calibrated microscope. Using top and side view

#### **CERCHAR ABRASIVITY**

Borehole Ref.:

Sample Ref.:

WP03-BH11

Depth (m): 12.80-12.90

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly

weathered

**Equipment used** 

with a specific speed.

Cerchar apparatus Type 2 (West):

Sample details

Maximum grain size (mm) 2

Condition as tested

Planes of weakness

As received

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

In this apparatus the sample moves under a stationary stylus

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.		1	2	3	4	5			
Measurement d <sub>1</sub>	mm	0.39	0.39	0.40	0.39	0.39			
Measurement d <sub>2</sub>	mm	0.40	0.40	0.41	0.40	0.39			
Measurement d <sub>3</sub>	mm	0.40	0.40	0.41	0.40	0.39			
Measurement d <sub>4</sub>	mm	0.41	0.41	0.42	0.41	0.40			
Measurement d <sub>5</sub>	mm	0.39	0.39	0.41	0.39	0.40			
Mean reading d <sub>M</sub>	mm	0.40	0.40	0.41	0.40	0.39			
Mean pin wear	mm					0.40			
CERCHAR-Abrasivity-Index (CAI)									
Standard deviation of CAI									

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Classification of CAI

Classification of CAI High abrasiveness

\*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Date tested: 21 December 2023

#### Not required

Checked and Approved by

1

Project Number:

GEO / 39521

I Tabios (Head of Department)

Date: 04/01/2024

Project Name:





#### HEAD OFFICE Causeway Geotech Ltd

8 Drumahiskey Road Ballymoney Co. Antrim, N. Ireland, BT53 7QL **NI**: +44 (0)28 276 66640

> Registered in Northern Ireland. Company Number: NI610766

#### REGIONAL OFFICE Causeway Geotech (IRL) Ltd

Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI**: +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

## SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

4 January 2024

Project Name:	Dublin Array Onshore Cable Route					
Project No.:	23-0343					
Client:	Dublin Array					
Engineer:	GDG					

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 05/12/2023 and 04/01/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Rock Schedule 5

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	4

#### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited (UKAS 2643)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	1
ROCK – subcontracted to GEOLABS (UKAS 2643)	Cerchar Abrasivity Index	ASTM D7625 - 10	2

CAUSEWAY GEOTECH			Point Load Strength Index Tests Summary of Results															
Project No.	2 0242			Proje	ect Nam	е		р.	ıblin ^	\rrov C	)ncha-	o Cobi	Do::t-					
	23-0343					1		DI	JOIIN <i>F</i>	Array C	Jnsnore	e Cable	Route	<del> </del>	1	1		
Borehole	Sa	ample		Spe	ecimen	Rock Type		Test Type see ISRM			Dime	ensions		Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including
No.	Depth m	Ref.	Туре	Ref.	Depth m	Rook Type	Type (D, A, I, B)	Direction (L, P or U)	Failure Valid (Y/N)	Lne	W	Dps mm	Dps'	kN	a Equiva	Is MPa	Is(5 0) <sub>MPa</sub>	water content if measured)
WP03_BH10A	14.10	1	С	2	14.10	GRANITE	А	U	YES		101.6		76.0	9.3	99.2	0.9	1.3	
WP03_BH10A	15.00	2	С	2	15.00	GRANITE	D	U	YES	91.1	101.6	101.6	99.0	17.3	100.3	1.7	2.4	
WP03_BH10A	15.10	3	С	2	15.10	GRANITE	А	U	YES		101.7	77.0	74.0	5.6	97.9	0.6	0.8	
WP03_BH10A	18.70	4	С	2	18.70	GRANITE	D	U	YES	77.3	101.7	101.8	99.0	16.2	100.3	1.6	2.2	
							-											
							_								_			
Test Type D - Diametral, A - Direction L - parallel to plan P - perpendicular U - unknown or ra Dimensions Dps - Distance be Dps' - at failure (s Lne - Length from W - Width of sho	nes of weaking to planes of andom etween plates see ISRM not platens to its plate	ness f weakr ens ( pla ote 6) neares	ness aten se t free e	eparatio	D <sub>ps</sub>	ametral P	D <sub>ps</sub>	Axial	P		ne 🖈	Bloo			D <sub>ps</sub>	Irregul	ar lump	D <sub>ps</sub>
						ods : 1985, unless not	ed othe	rwise				Printed		Appro	ved B	у	mim	
Detailed legend for Size factor, F = (I				ased o	n ISRM, i	s shown above.					12/05	5/2023	00:00				ַּ	JKAS TESTING
						L	AB 17	R - V	ersio	n 5				Stepl	nen V	√atson		10122



#### LABORATORY TEST CERTIFICATE

Certificate No : 23/1262 - 01-2

To: Stephen Watson

Client : Causeway Geotech Limited

8 Drumahiskey Road

Ballymoney Co. Antrim BT53 7QL 10 Queenslie Point Queenslie Industrial Estate 120 Stepps Road Glasgow

Tel: 0141 774 4032

G33 3NQ

email: info@mattest.org Website: www.mattest.org

#### LABORATORY TESTING OF ROCK

#### Introduction

We refer to samples taken from Dublin Array and delivered to our laboratory on 22nd November 2023.

#### **Material & Source**

Sample Reference : See Report Plates

Sampled By : Client

Sampling Certificate : Not Supplied

Location : See Report Plates

Description : Rock Cores

Date Sampled : Not Supplied

Date Tested : 22nd November 2023 Onwards

Source : 23-0343 - Dublin Array

#### **Test Results**

As Detailed On Page 2

#### Comments

The results contained in this report relate to the sample(s) as received Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

#### Remarks

Approved for Issue

T McLelland (Director)

Date

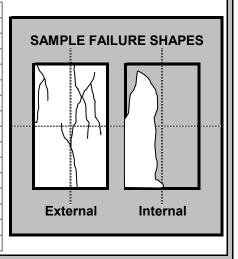
11/12/2023



Issue No. 01 Page 1 of 2



BOREHOLE		WP03_BH10A
SAMPLE		C5
DEPTH	m	20.00-20.30
SAMPLE DIAMETER	mm	101.89
SAMPLE HEIGHT	mm	207.07
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.5
TEST DURATION	min.sec	6.51
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	209.0
UNCONFINED COMPRESSIVE STRENGTH	MPa	25.6
WATER CONTENT (ISRM Suggested Methods)	%	0.5
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.63
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.62



BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	<b>External</b> Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	

Tested in accordance with ASTM D7012 - 14

#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH10A

Sample Ref.: Depth (m):

10.60-10.75

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Slightly to

moderately weathered

Sample details

Maximum grain size (mm) 2

Condition as tested

As received

Cerchar apparatus Type 2 (West):

In this apparatus the sample moves under a stationary stylus

with a specific speed.

High abrasiveness

**Equipment used** 

Planes of weakness

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.		1	2	3	4	5		
Measurement d <sub>1</sub>	mm	0.35	0.35	0.35	0.35	0.35		
Measurement d <sub>2</sub>	mm	0.36	0.36	0.36	0.36	0.36		
Measurement d <sub>3</sub>	mm	0.36	0.36	0.36	0.36	0.36		
Measurement d <sub>4</sub>	mm	0.37	0.37	0.37	0.37	0.37		
Measurement d <sub>5</sub>	mm	0.35	0.35	0.35	0.35	0.35		
Mean reading d <sub>M</sub>	mm	0.36	0.36	0.36	0.36	0.36		
Mean pin wear	mm					0.36		
CERCHAR-Abrasivity-Index (CAI)								
Standard deviation of CAI								

Classification of CAI					
<0.30	Extremely low				
0.30-0.50	Very low				
0.50-1.00	Low				
1.00-2.00	Medium				
2.00-4.00	High				
4.00-6.00	Extreme				

Date tested: 21 December 2023

Quartzitic

6.00-7.00

\*Measurements done under >50x magnification calibrated microscope. Using top and side view

#### Photograph

Classification of CAI

#### Not required

Checked and Approved by

Tabios (Head of Department)

04/01/2024 Date:

Project Number:

Project Name:

GEO / 39521



#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH10A

Sample Ref.: Depth (m):

15.80-16.10

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Slightly to

moderately weathered

Sample details

Maximum grain size (mm) 2

Condition as tested

As received

Cerchar apparatus Type 2 (West):

In this apparatus the sample moves under a stationary stylus

with a specific speed.

High abrasiveness

**Equipment used** 

Planes of weakness

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.		1	2	3	4	5			
Measurement d <sub>1</sub>	mm	0.36	0.36	0.36	0.36	0.36			
Measurement d <sub>2</sub>	mm	0.37	0.36	0.37	0.37	0.36			
Measurement d <sub>3</sub>	mm	0.37	0.36	0.37	0.37	0.36			
Measurement d <sub>4</sub>	mm	0.38	0.37	0.38	0.38	0.37			
Measurement d <sub>5</sub>	mm	0.36	0.37	0.36	0.36	0.37			
Mean reading d <sub>M</sub>	mm	0.37	0.36	0.37	0.37	0.36			
Mean pin wear	mm					0.37			
CERCHAR-Abrasivity-Index (CAI)									
Standard deviation of CAI									

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High

Extreme

Quartzitic

Classification of CAI

4.00-6.00

6.00-7.00

Date tested: 21 December 2023

#### Photograph

Classification of CAI

#### Not required

Checked and Approved by

IT

Tabios (Head of Department)

Date:

04/01/2024

Project Number:

Project Name:

GEO / 39521



<sup>\*</sup>Measurements done under >50x magnification calibrated microscope. Using top and side view



#### HEAD OFFICE Causeway Geotech Ltd

8 Drumahiskey Road Ballymoney Co. Antrim, N. Ireland, BT53 7QL NI: +44 (0)28 276 66640

> Registered in Northern Ireland. Company Number: NI610766

#### REGIONAL OFFICE Causeway Geotech (IRL) Ltd

Unit 1 Fingal House Stephenstown Industrial Estate Balbriggan, Co Dublin, Ireland, K32 VR66 **ROI:** +353 (0)1 526 7465

> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

## SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

12 January 2024

<b>Project Name:</b>	Dublin Array Onshore Cable Route					
Project No.:	23-0343					
Client:	Dublin Array					
Engineer:	GDG					

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 05/12/2023 and 04/01/2023.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd











**Project Name:** Dublin Array Onshore Cable Route

**Report Reference:** Rock Schedule 7

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	4

#### **SUB-CONTRACTED TESTS**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited (UKAS 2643)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	2
ROCK – subcontracted to GEOLABS (UKAS 2643)	Cerchar Abrasivity Index	ASTM D7625 - 10	3

CAUSEWAY GEOTECH				Point Load Strength Index Tests Summary of Results														
Project No.	23-0343			Proje	ect Nam	е		יח	ublin A	Array (	Onshore	e Cable	e Route	·				
		ample		Spe	ecimen			Type ISRM		linay c	Dimensions			Force	Equivalent diameter, De	Point Load Strength Index		Romano
Borehole No.	Depth	Ref.	Туре	Ref.	Depth	Rock Type	Type (D, A, I, B)	Direction (L, P or U)	Failure Valid (Y/N)	Lne	W	Dps	Dps'	P kN	a Equivaler	Is MPa	Is(5 0) MPa	(including water content if measured)
WP03_BH06	21.60		С	2	21.60	GRANITE	А	U	YES	mm	mm 99.6	mm 60.0	mm 57.0	2.3	85.0	0.3	0.4	
WP03_BH13	6.80		С	2	6.80	GRANITE	D	U	YES	94.3	101.6	101.6	98.0	6.9	99.8	0.7	0.9	
WP03_BH13	10.80		С	2	10.80	GRANITE	А	U	YES		101.5	94.0	90.0	6.1	107.8	0.5	0.7	
WP03_BH13	16.80		С	2	16.80	GRANITE	D	U	YES	80.0	101.8	101.8	98.0	5.1	99.9	0.5	0.7	
							_											
							_											
							<u> </u>											
Test Type D - Diametral, A - Direction L - parallel to plar P - perpendicular U - unknown or ra Dimensions Dps - Distance be Dps' - at failure (s Lne - Length from W - Width of sho	nes of weaking to planes of andom etween plates see ISRM not platens to a platens to a	ness f weakr ens ( pla ote 6) neares	ness aten se t free e	eparation	D <sub>ps</sub>	ametral P	D <sub>ps</sub>	Axial	P	L <sub>r</sub>	ne 🖈	Bloc			D <sub>ps</sub>	4	ar lump	P D <sub>ps</sub>
	accordance	e with I	SRM S	Sugges	ted Metho	ods : 1985, unless not s shown above.	ed othe	rwise				Printed 2/2024	00:00	Appro	ved B		Imminum	JKAS TESTING
, (			,			L	AB 17	R - V	ersio	n 5				Stepl	nen V	√atson		10122



#### LABORATORY TEST CERTIFICATE

Certificate No : 23/1262 - 03-1

To: Stephen Watson

Client : Causeway Geotech Limited

8 Drumahiskey Road

Ballymoney Co. Antrim BT53 7QL 10 Queenslie Point Queenslie Industrial Estate 120 Stepps Road Glasgow

Tel: 0141 774 4032

G33 3NQ

email: info@mattest.org Website: www.mattest.org

#### LABORATORY TESTING OF ROCK

#### Introduction

We refer to samples taken from Dublin Array and delivered to our laboratory on 08th January 2024.

#### **Material & Source**

Sample Reference : See Report Plate

Sampled By : Client

Sampling Certificate : Not Supplied

Location : See Report Plate

Description : Rock Cores

Date Sampled : Not Supplied

Date Tested : 08th January 2024 Onwards

Source : 23-0343 - Dublin Array

#### **Test Results**

As Detailed On Page 2

#### Comments

The results contained in this report relate to the sample(s) as received Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

#### Remarks

Approved for Issue

T McLelland (Director)

Date

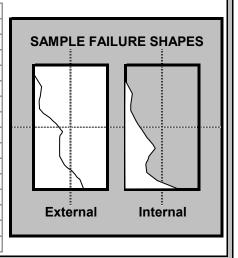
12/01/2024



Issue No. 01 Page 1 of 2

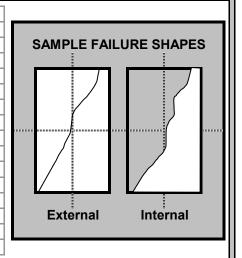


BOREHOLE		WP03_BH13
SAMPLE		С
DEPTH	m	14.30-14.50
SAMPLE DIAMETER	mm	101.51
SAMPLE HEIGHT	mm	160.26
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.5
TEST DURATION	min.sec	5.30
DATE OF TESTING		12/01/2024
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	163.5
UNCONFINED COMPRESSIVE STRENGTH	MPa	20.2
WATER CONTENT (ISRM Suggested Methods)	%	0.8
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.57
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.55



Test specimen does not meet specified length / diameter ratio requirements

BOREHOLE		WP03_BH13
SAMPLE		С
DEPTH	m	18.80-19.10
SAMPLE DIAMETER	mm	101.40
SAMPLE HEIGHT	mm	184.36
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.4
TEST DURATION	min.sec	3.20
DATE OF TESTING		12/01/2024
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	83.9
UNCONFINED COMPRESSIVE STRENGTH	MPa	10.4
WATER CONTENT (ISRM Suggested Methods)	%	1.7
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.70
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.65



Test specimen does not meet specified length / diameter ratio requirements

BOREHOLE			
SAMPLE			
DEPTH	m	SAMPLE FAIL	URE SHAPES
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%	External	Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

Tested in accordance with ASTM D7012 - 14

#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH06

Sample Ref.: Depth (m):

21.70-21.80

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly

weathered

Sample details

Maximum grain size (mm) 2

Condition as tested

As received

Cerchar apparatus Type 2 (West):

In this apparatus the sample moves under a stationary stylus

with a specific speed.

**Equipment used** 

Planes of weakness

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.		1	2	3	4	5
Measurement d <sub>1</sub>	mm	0.40	0.40	0.40	0.40	0.38
Measurement d <sub>2</sub>	mm	0.40	0.40	0.41	0.40	0.40
Measurement d <sub>3</sub>	mm	0.40	0.40	0.41	0.40	0.38
Measurement d <sub>4</sub>	mm	0.41	0.41	0.42	0.41	0.40
Measurement d <sub>5</sub>	mm	0.41	0.41	0.40	0.41	0.40
Mean reading d <sub>M</sub>	mm	0.40	0.40	0.41	0.40	0.39
Mean pin wear	mm					0.40
CERCHAR-Abrasi		4.00				
Standard deviation		0.07				
Classification of Ca	Al				High	abrasiveness

Classification of CAI							
<0.30	Extremely low						
0.30-0.50	Very low						
0.50-1.00	Low						
1.00-2.00	Medium						
2.00-4.00	High						
4.00-6.00	Extreme						
6.00-7.00	Quartzitic						

Date tested: 21 December 2023

\*Measurements done under >50x magnification calibrated microscope. Using top and side view

#### Photograph

#### Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

Project Name:

GEO / 39521



#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH13

Sample Ref.:

Depth (m): 9.50-9.80

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly

In this apparatus the sample moves under a stationary stylus

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

weathered

**Equipment used** 

with a specific speed.

Cerchar apparatus Type 2 (West):

Sample details

Maximum grain size (mm) 2

Condition as tested

As received

As rece

Planes of weakness

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.	•	1	2	3	4	5
Measurement d <sub>1</sub>	mm	0.41	0.38	0.41	0.41	0.38
Measurement d <sub>2</sub>	mm	0.41	0.40	0.41	0.41	0.40
Measurement d <sub>3</sub>	mm	0.41	0.39	0.41	0.41	0.39
Measurement d <sub>4</sub>	mm	0.42	0.39	0.42	0.42	0.39
Measurement d <sub>5</sub>	mm	0.42	0.39	0.42	0.42	0.39
Mean reading d <sub>M</sub>	mm	0.41	0.39	0.41	0.41	0.39
Mean pin wear	mm					0.40
CERCHAR-Abrasiv		4.02				
Standard deviation		0.11				
Classification of CAI						abrasiveness

Extreme abrasiveness Date tested: 21 December 2023

Classification of CAI

Extremely low

Very low

Medium

Extreme

Quartzitic

Low

High

< 0.30

0.30-0.50

0.50-1.00

1.00-2.00

2.00-4.00

4.00-6.00

6.00-7.00

#### Photograph

#### Not required

Checked and Approved by

17

Tabios (Head of Department)

Date: 04/01/2024

Project Number:

Project Name:

GEO / 39521



<sup>\*</sup>Measurements done under >50x magnification calibrated microscope. Using top and side view

#### **CERCHAR ABRASIVITY**

Borehole Ref.:

WP03-BH13

Sample Ref.: Depth (m):

18.65-18.80

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly

weathered

Sample details

Maximum grain size (mm) 2

Condition as tested

As received

Cerchar apparatus Type 2 (West):

In this apparatus the sample moves under a stationary stylus

with a specific speed.

**Equipment used** 

Planes of weakness

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Direction of stylus

No weakness

Surface condition (correction)

Rough Sample (no correction needed)

Test No.		1	2	3	4	5	
Measurement d <sub>1</sub>	mm	0.42	0.39	0.40	0.40	0.39	
Measurement d <sub>2</sub>	mm	0.42	0.41	0.42	0.42	0.41	
Measurement d <sub>3</sub>	mm	0.42	0.40	0.40	0.40	0.40	
Measurement d <sub>4</sub>	mm	0.43	0.40	0.42	0.42	0.40	
Measurement d <sub>5</sub>	mm	0.43	0.40	0.42	0.42	0.40	
Mean reading d <sub>M</sub>	mm	0.42	0.40	0.41	0.41	0.40	
Mean pin wear	mm					0.41	
CERCHAR-Abrasivity-Index (CAI)							
Standard deviation of CAI							

Classification of CAI				
<0.30	Extremely low			
0.30-0.50	Very low			
0.50-1.00	Low			
1.00-2.00	Medium			
2.00-4.00	High			
4.00-6.00	Extreme			
6.00-7.00	Quartzitic			

Classification of CAI

Extreme abrasiveness

Date tested: 21 December 2023

#### Photograph

#### Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

Project Name:

GEO / 39521



 $<sup>^{\</sup>star}\text{Measurements}$  done under >50x magnification calibrated microscope. Using top and side view



# APPENDIX G ENVIRONMENTAL LABORATORY TEST RESULTS





### Certificate of Analysis

Certificate Number 23-22937

Issued:

19-Oct-23

Client Causeway Geotech

Unit 1 Fingal House

Stephenstown Industrial Estate

Balbriggan Co. Dublin K32 VR66

Our Reference 23-22937

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE Dublin Array GPR Survey

Description 4 Soil samples, 4 Leachate samples.

Date Received 26-Sep-23

Date Started 26-Sep-23

Date Completed 19-Oct-23

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood General Manager







## **Summary of Chemical Analysis Soil Samples**

Our Ref 23-22937 Client Ref 23-0343

Lab No	2239173	2239174	2239175	2239176
.Sample ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Depth	0.50	0.50	0.50	1.50
Other ID	1	1	1	1
Sample Type	ES	ES	ES	ES
Sampling Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units	11/3	11/3	11/3	11/3
Preparation	Wiethou	100	Offics				
Moisture Content	DETSC 1004	0.1	%	8.8	7.7	11	4.1
Metals	DL13C 1004	0.1	70	0.0	7.7	11	4.1
	DETSC 2301*	1	ma/ka	1.8	1.3	1.2	< 1.0
Antimony Arsenic		0.2	mg/kg mg/kg	1.8	1.3	13	4.4
	DETSC 2301#			75			
Barium	DETSC 2301#	1.5	mg/kg		55	63	120
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	0.6	0.6	0.4
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.4	< 0.2	0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	1.9	1.0	1.6	< 0.1
Chromium	DETSC 2301#	0.15	mg/kg	18	16	12	38
Chromium III	DETSC 2301*	0.15	mg/kg	18	16	12	38
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	35	25	22	21
Lead	DETSC 2301#	0.3	mg/kg	68	30	19	5.1
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.17	0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	3.0	1.6	1.6	< 0.4
Nickel	DETSC 2301#	1	mg/kg	31	26	25	26
Selenium	DETSC 2301#	0.5	mg/kg	1.6	1.2	1.0	< 0.5
Zinc	DETSC 2301#	1	mg/kg	100	69	71	33
Inorganics							
рН	DETSC 2008#		рН	8.2	8.5	8.7	7.9
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	1.6	0.6	1.1	< 0.5
Organic matter	DETSC 2002#	0.1	%	0.5	0.6	1.2	0.2
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.3	2.7	4.1	8.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons				•		•	
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35: EH CU 1D AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS 1D AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16: EH CU 1D AR	DETSC 3072#	0.5	mg/kg	+	< 0.5	< 0.5	< 0.5



## **Summary of Chemical Analysis Soil Samples**

Our Ref 23-22937 Client Ref 23-0343

Contract Title RWE Dublin Array G	rk Survey						
			Lab No		2239174		2239176
		.Sa	_	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
			Depth	0.50	0.50	0.50	1.50
			Other ID	1	1	1	1
			ple Type		ES	ES	ES
		_	_	11/09/2023	11/09/2023	11/09/2023	12/09/2023
		-	ing Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units			1	
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg		< 0.6	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg		< 1.4	< 1.4	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg		< 1.4	< 1.4	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg		< 10	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg		< 10	< 10	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg		< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	0.08	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	0.07	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.04	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03	0.06	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.04	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10	0.34	< 0.10
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3



## **Summary of Chemical Analysis Leachate Samples**

Our Ref 23-22937 Client Ref 23-0343

Lab No	2239177	2239178	2239179	2239180
.Sample ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Depth	0.50	0.50	0.50	1.50
Other ID	1	1	1	1
Sample Type	ES	ES	ES	ES
Sampling Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Preparation							
NRA Leachate Preparation	DETSC 1009*			Υ	Υ	Υ	Υ
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.3	1.3	0.74	11
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	18	9.6	11	13
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.39	< 0.25	< 0.25	18
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	9.1
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.4	0.9	1.3	1.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.24	0.12	0.19	0.15
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.4	0.48	0.58	4.7
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	0.7	< 0.6	1.1
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics					·	•	
рН	DETSC 2008		рН	8.0	8.8	8.7	9.0
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Dissolved Organic Carbon	DETSC 2085	2	mg/l	2.6	2.2	2.7	2.4
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	49.9	25.8	29.9	33.5
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.15	0.088	0.025	0.031
Chloride	DETSC 2055	0.1	mg/l	9.1	6.5	1.5	3.0
Sulphate as SO4	DETSC 2055	0.1	mg/l	16	3.7	3.6	12
Sulphide	DETSC 2208	10	ug/l	14	14	16	10
Petroleum Hydrocarbons					·	•	
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0



### **Summary of Chemical Analysis Leachate Samples**

Our Ref 23-22937 Client Ref 23-0343

Part   Part	Contract litle RWE Dublin Array Gi	rk Survey						
Part								
Mathematic			.Sa	mple ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Sampling Date   Sampling Da				Depth	0.50	0.50	0.50	1.50
Sampling Time         (109/2023)         11/09/2023         11/09/2			(	Other ID	1	1	1	1
Test         Method         LOD         Units           Aromatic C35-C40: EH_CU_1D_AR         DETSC 3072*         1         ug/l         <1.0			Samı	ole Type	ES	ES	ES	ES
Test			Sampl	ing Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Aromatic C35-C40: EH_CU_1D_AR         DETSC 3072*         1         ug/l         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         <			Sampli	ng Time	n/s	n/s	n/s	n/s
Aromatic C5-C40: EH_CU+HS_1D_AR         DETSC 3072*         10         ug/l         < 10         < 10         < 10           TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total         DETSC 3072*         10         ug/l         < 10	Test	Method	LOD	Units				
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total         DETSC 3072*         10         ug/l         < 10         < 10         < 10         < 10           Benzene         DETSC 3322         1         ug/l         < 1.0	Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Benzene   DETSC 3322   1   ug/l   < 1.0   < 1.0   < 1.0   < 1.0	Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Toluene DETSC 3322 1 ug/l < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 Ethylbenzene DETSC 3322 1 ug/l < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1	TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Ethylbenzene         DETSC 3322         1         ug/l         < 1.0         < 1.0         < 1.0           Xylene         DETSC 3322         1         ug/l         < 1.0	Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Xylene         DETSC 3322         1         ug/l         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0         < 1.0 <t< td=""><td>Toluene</td><td>DETSC 3322</td><td>1</td><td>ug/l</td><td>&lt; 1.0</td><td>&lt; 1.0</td><td>&lt; 1.0</td><td>&lt; 1.0</td></t<>	Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
MTBE         DETSC 3322         1         ug/l         < 1.0         < 1.0         < 1.0         < 1.0           PAHs           Naphthalene         DETSC 3304         0.05         ug/l         0.05         < 0.05	Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
PAHs           Naphthalene         DETSC 3304         0.05         ug/l         0.05         < 0.05	Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene         DETSC 3304         0.05         ug/l         0.05         < 0.05         < 0.05         0.12           Acenaphthylene         DETSC 3304         0.01         ug/l         < 0.01	MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Acenaphthylene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         < 0.01           Acenaphthene         DETSC 3304         0.01         ug/l         < 0.01	PAHs							
Acenaphthene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         < 0.01         0.02           Fluorene         DETSC 3304         0.01         ug/l         < 0.01	Naphthalene	DETSC 3304	0.05	ug/l	0.05	< 0.05	< 0.05	0.12
Fluorene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         < 0.01         0.04           Phenanthrene         DETSC 3304         0.01         ug/l         0.02         < 0.01	Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene         DETSC 3304         0.01         ug/l         0.02         < 0.01         0.01         0.16           Anthracene         DETSC 3304         0.01         ug/l         < 0.01	Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02
Anthracene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         < 0.01         0.03           Fluoranthene         DETSC 3304         0.01         ug/l         0.02         0.01         0.03         0.08           Pyrene         DETSC 3304         0.01         ug/l         0.02         0.01         0.03         0.07           Benzo(a)anthracene         DETSC 3304*         0.01         ug/l         < 0.01	Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.04
Fluoranthene         DETSC 3304         0.01         ug/l         0.02         0.01         0.03         0.08           Pyrene         DETSC 3304         0.01         ug/l         0.02         0.01         0.03         0.07           Benzo(a)anthracene         DETSC 3304*         0.01         ug/l         < 0.01	Phenanthrene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.01	0.16
Pyrene         DETSC 3304         0.01         ug/l         0.02         0.01         0.03         0.07           Benzo(a)anthracene         DETSC 3304*         0.01         ug/l         < 0.01	Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.03
Benzo(a)anthracene         DETSC 3304*         0.01         ug/l         < 0.01         < 0.01         0.02         0.02           Chrysene         DETSC 3304         0.01         ug/l         < 0.01	Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.01	0.03	0.08
Chrysene         DETSC 3304         0.01         ug/l         < 0.01         0.01         0.02         0.02           Benzo(b)fluoranthene         DETSC 3304         0.01         ug/l         < 0.01	Pyrene	DETSC 3304	0.01	ug/l	0.02	0.01	0.03	0.07
Benzo(b)fluoranthene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         0.03         0.03           Benzo(k)fluoranthene         DETSC 3304         0.01         ug/l         < 0.01	Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	0.02	0.02
Benzo(k)fluoranthene         DETSC 3304         0.01         ug/l         < 0.01         0.01         0.02           Benzo(a)pyrene         DETSC 3304         0.01         ug/l         < 0.01	Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.01	0.02	0.02
Benzo(a)pyrene         DETSC 3304         0.01         ug/l         < 0.01         0.01         0.02         0.03           Indeno(1,2,3-c,d)pyrene         DETSC 3304         0.01         ug/l         < 0.01	Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.03	0.03
Indeno(1,2,3-c,d)pyrene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         0.02         0.03           Dibenzo(a,h)anthracene         DETSC 3304         0.01         ug/l         < 0.01	Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	0.02
Dibenzo(a,h)anthracene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.01         < 0.02         0.04           PAH Total         DETSC 3304         0.2         ug/l         < 0.20	Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.01	0.02	0.03
Benzo(g,h,i)perylene         DETSC 3304         0.01         ug/l         < 0.01         < 0.01         0.02         0.04           PAH Total         DETSC 3304         0.2         ug/l         < 0.20	Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.03
PAH Total DETSC 3304 0.2 ug/l < 0.20 < 0.20 0.20 0.70 Phenols	Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Phenols	Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.04
	PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	0.20	0.70
Phenol - Monohydric         DETSC 2130         100         ug/l         < 100         < 100         < 100         < 100	Phenols							
	Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100	< 100



## **Summary of Asbestos Analysis Soil Samples**

Our Ref 23-22937 Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2239173	WP03 TP05 1 0.50	SOIL	NAD	none	Barry Kelly
2239174	WP03 TP07 1 0.50	SOIL	NAD	none	Barry Kelly
2239175	WP03 TP08 1 0.50	SOIL	NAD	none	Barry Kelly
2239176	WP03 TP02 1 1.50	SOIL	NAD	none	Barry Kelly

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: \* - not included in laboratory scope of accreditation.



#### Information in Support of the Analytical Results

Our Ref 23-22937 Client Ref 23-0343

Contract RWE Dublin Array GPR Survey

#### **Containers Received & Deviating Samples**

Date Inappropriate container for

Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests
2239173	WP03 TP05 0.50 SOIL	11/09/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2239174	WP03 TP07 0.50 SOIL	11/09/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2239175	WP03 TP08 0.50 SOIL	11/09/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2239176	WP03 TP02 1.50 SOIL	12/09/23	GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2239177	WP03 TP05 0.50 LEACHATE	11/09/23	GJ 250ml, GJ 60ml, PT 1L		
2239178	WP03 TP07 0.50 LEACHATE	11/09/23	GJ 250ml, GJ 60ml, PT 1L		
2239179	WP03 TP08 0.50 LEACHATE	11/09/23	GJ 250ml, GJ 60ml, PT 1L		
2239180	WP03 TP02 1.50 LEACHATE	12/09/23	GJ 250ml, GJ 60ml, PT 1L x2		
					1

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

#### **Soil Analysis Notes**

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

#### Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



### **Information in Support of the Analytical Results**

#### **List of HWOL Acronyms and Operators**

	<b>,</b>
Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Acronym
HS_1D_AL
HS_1D_AL
HS_1D_AL
EH_CU_1D_AL
EH_CU+HS_1D_AL
HS_1D_AR
HS_1D_AR
HS_1D_AR
EH_CU_1D_AR
EH_CU+HS_1D_AR
EH_CU+HS_1D_Total
EH_1D_Total

**End of Report** 



Issued:

Certificate Number 23-25553-0

Client Causeway Geotech

Unit 1 Fingal House

Stephenstown Industrial Estate

Balbriggan Co. Dublin K32 VR66

Our Reference 23-25553-0

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Description One Soil sample.

Date Received 30-Oct-23

Date Started 30-Oct-23

Date Completed 13-Nov-23

Test Procedures Identified by prefix DETSn (details on request).

#### Notes This report supersedes 23-25553, amendments made

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood General Manager





13-Nov-23



## **Summary of Chemical Analysis Soil Samples**

Our Ref 23-25553-0
Client Ref 23-0343
Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2254866
	WP03_TP04
.Sample ID	Α
Depth	1.40
Other ID	1
Sample Type	SOIL
<b>Sampling Date</b>	10/10/2023
<b>Sampling Time</b>	n/s

Test	Method	LOD	Units	
Preparation				
Moisture Content	DETSC 1004	0.1	%	12
Metals				
Antimony	DETSC 2301*	1	mg/kg	1.2
Arsenic	DETSC 2301#	0.2	mg/kg	17
Barium	DETSC 2301#	1.5	mg/kg	54
Beryllium	DETSC 2301#	0.2	mg/kg	0.6
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.6
Cadmium	DETSC 2301#	0.1	mg/kg	1.2
Chromium	DETSC 2301#	0.15	mg/kg	13
Chromium III	DETSC 2301*	0.15	mg/kg	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21
Lead	DETSC 2301#	0.3	mg/kg	18
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.9
Nickel	DETSC 2301#	1	mg/kg	27
Selenium	DETSC 2301#	0.5	mg/kg	1.0
Zinc	DETSC 2301#	1	mg/kg	74
Inorganics			•	
рН	DETSC 2008#		рН	8.1
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1
Total Organic Carbon	DETSC 2084#	0.5	%	0.8
Organic matter	DETSC 2002#	0.1	%	1.1
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.9
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10
Petroleum Hydrocarbons		•	•	
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12: EH CU 1D AL	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16: EH CU 1D AL	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35: EH CU 1D AL	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C35-C40: EH CU 1D AL	DETSC 3072*	3.4	mg/kg	< 3.4
Aliphatic C5-C40: EH CU+HS 1D AL	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01		< 0.01
Aromatic C7-C8: HS 1D AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12: EH CU 1D AR	DETSC 3072#	0.9	mg/kg	< 0.9



## **Summary of Chemical Analysis Soil Samples**

Our Ref 23-25553-0
Client Ref 23-0343
Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2254866
	WP03_TP04
.Sample ID	Α
Depth	1.40
Other ID	1
Sample Type	SOIL
<b>Sampling Date</b>	10/10/2023
<b>Sampling Time</b>	n/s

Test	Method	LOD	Units	
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10
Phenois				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3



## **Summary of Asbestos Analysis Soil Samples**

Our Ref 23-25553-0 Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2254866	WP03_TP04A 1 1.40	SOIL	NAD	none	Ben Barsby

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: \* not included in laboratory scope of accreditation.



Inappropriate

### Information in Support of the Analytical Results

Our Ref 23-25553-0 Client Ref 23-0343

Contract RWE DUBLIN ARRAY GPR SURVEY

#### **Containers Received & Deviating Samples**

		Date			container for
Lab No	Sample ID	Sampled	<b>Containers Received</b>	Holding time exceeded for tests	tests
2254866	WP03_TP04A 1.40 SOIL	10/10/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

#### **Soil Analysis Notes**

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

#### Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



### **Information in Support of the Analytical Results**

#### **List of HWOL Acronyms and Operators**

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
EPH (C10-C40)	EH_1D_Total

**End of Report** 



### Certificate of Analysis

Certificate Number 23-25931

Issued:

15-Nov-23

Client Causeway Geotech

Unit 1 Fingal House

Stephenstown Industrial Estate

Balbriggan Co. Dublin K32 VR66

Our Reference 23-25931

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Description 2 Soil samples, 2 Leachate samples.

Date Received 02-Nov-23

Date Started 02-Nov-23

Date Completed 15-Nov-23

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood General Manager







Our Ref 23-25931
Client Ref 23-0343
Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257364	2257365	
	WP03-BH07	WP03-BH07	
.Sample ID			
Depth	1.00	5.50	
Other ID	2	7	
Sample Type	ES	ES	
<b>Sampling Date</b>	18/10/2023	19/10/2023	
<b>Sampling Time</b>	n/s	n/s	

Test	Method	LOD	Units		
Preparation					
Moisture Content	DETSC 1004	0.1	%	15	11
Metals					
Antimony	DETSC 2301*	1	mg/kg	1.1	1.2
Arsenic	DETSC 2301#	0.2	mg/kg	13	16
Barium	DETSC 2301#	1.5	mg/kg	50	11
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.4
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.9	0.2
Chromium	DETSC 2301#	0.15	mg/kg	18	20
Chromium III	DETSC 2301*	0.15	mg/kg	18	20
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	33
Lead	DETSC 2301#	0.3	mg/kg	16	11
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.3	< 0.4
Nickel	DETSC 2301#	1	mg/kg	26	24
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	66	71
Inorganics					
рН	DETSC 2008#		рН	8.2	8.6
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	0.6	< 0.5
Organic matter	DETSC 2002#	0.1	%	0.5	0.8
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.8	5.4
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10	< 10
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	0.02	0.02
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	0.66	0.67
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12: EH CU 1D AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9



Our Ref 23-25931
Client Ref 23-0343
Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257364	2257365	
	WP03-BH07	WP03-BH07	
.Sample ID			
Depth	1.00	5.50	
Other ID	2	7	
Sample Type	ES	ES	
Sampling Date	18/10/2023	19/10/2023	
Sampling Time	n/s	n/s	

Test	Method	LOD	Units		
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	48	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3



Our Ref 23-25931
Client Ref 23-0343
Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257366	2257367
	WP03-BH07	WP03-BH07
.Sample ID		
Depth	1.00	5.50
Other ID	2	7
Sample Type	ES	ES
<b>Sampling Date</b>	18/10/2023	19/10/2023
<b>Sampling Time</b>	n/s	n/s

Test	Method	LOD	Units		
Preparation					
NRA Leachate Preparation	DETSC 1009*			Υ	Υ
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.87	1.5
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	11	6.6
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.9	0.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	0.45
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	1.8
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	0.8	0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	1.6
Inorganics			-		
pH	DETSC 2008		рН	7.5	6.8
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Dissolved Organic Carbon	DETSC 2085	2	mg/l	2.2	< 2.0
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	29.8	18.5
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	< 0.015	< 0.015
Chloride	DETSC 2055	0.1	mg/l	1.4	0.70
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.9	3.4
Sulphide	DETSC 2208	10	ug/l	24	24
Petroleum Hydrocarbons	<u>.</u>		-	·	
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0



Our Ref 23-25931 Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257366	2257367	
	WP03-BH07	WP03-BH07	
.Sample ID			
Depth	1.00	5.50	
Other ID	2	7	
Sample Type	ES	ES	
Sampling Date	18/10/2023	19/10/2023	
Sampling Time	n/s	n/s	

Test	Method	LOD	Units	•	
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	ug/l	< 10	< 10
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0
PAHs					
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.01	0.03
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.01	0.32
Pyrene	DETSC 3304	0.01	ug/l	0.01	0.27
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	0.11
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.12
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.13
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.05
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.11
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.08
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	0.09
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	1.4
Phenols					
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100



### **Summary of Asbestos Analysis Soil Samples**

Our Ref 23-25931 Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2257364	WP03-BH07 2 1.00	SOIL	NAD	none	Ben Rose
2257365	WP03-BH07 7 5.50	SOIL	NAD	none	Ben Rose

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: \* not included in laboratory scope of accreditation.



Inappropriate

### Information in Support of the Analytical Results

Our Ref 23-25931 Client Ref 23-0343

Contract RWE DUBLIN ARRAY GPR SURVEY

#### **Containers Received & Deviating Samples**

#### Date container for Lab No Sample ID Sampled Containers Received Holding time exceeded for tests tests 2257364 WP03-BH07 1.00 SOIL 18/10/23 | GJ 250ml, GJ 60ml, PT 1L x2 Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days) 2257365 WP03-BH07 5.50 SOIL 19/10/23 GJ 250ml, GJ 60ml, PT 1L x2 pH + Conductivity (7 days) 2257366 WP03-BH07 1.00 LEACHATE 18/10/23 GJ 250ml, GJ 60ml, PT 1L x2 2257367 WP03-BH07 5.50 LEACHATE 19/10/23 GJ 250ml, GJ 60ml, PT 1L x2

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

#### **Soil Analysis Notes**

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

#### **Disposal**

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



### **Information in Support of the Analytical Results**

#### **List of HWOL Acronyms and Operators**

	<b>,</b>
Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Acronym
HS_1D_AL
HS_1D_AL
HS_1D_AL
EH_CU_1D_AL
EH_CU+HS_1D_AL
HS_1D_AR
HS_1D_AR
HS_1D_AR
EH_CU_1D_AR
EH_CU+HS_1D_AR
EH_CU+HS_1D_Total
EH_1D_Total

**End of Report** 



### Certificate of Analysis

Issued:

06-Dec-23

Certificate Number 23-27489

Client Causeway Geotech

Unit 1 Fingal House

Stephenstown Industrial Estate

Balbriggan Co. Dublin K32 VR66

Our Reference 23-27489

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE Dublin Array GPR Survey

Description 2 Soil samples, 2 Leachate prepared by DETS samples.

Date Received 22-Nov-23

Date Started 22-Nov-23

Date Completed 06-Dec-23

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood General Manager







Our Ref 23-27489
Client Ref 23-0343
Contract Title RWE Dublin Array GPR Survey

Lab No	2266116	2266117
	WP03-BH07	WP03-BH07
.Sample ID		
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
<b>Sampling Date</b>	10/11/2023	10/11/2023
<b>Sampling Time</b>	n/s	n/s

		Jailipi	ing rime	n/s	n/s
Test	Method	LOD	Units		
Preparation					
Moisture Content	DETSC 1004	0.1	%	24	7.1
Metals					
Antimony	DETSC 2301*	1	mg/kg	1.2	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	19	19
Barium	DETSC 2301#	1.5	mg/kg	99	44
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	0.3
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.6	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	1.4	0.2
Chromium	DETSC 2301#	0.15	mg/kg	19	22
Chromium III	DETSC 2301*	0.15	mg/kg	19	22
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	24	18
Lead	DETSC 2301#	0.3	mg/kg	51	18
Mercury	DETSC 2325#	0.05	mg/kg	0.08	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.4	0.4
Nickel	DETSC 2301#	1	mg/kg	24	19
Selenium	DETSC 2301#	0.5	mg/kg	0.7	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110	56
Inorganics					
рН	DETSC 2008#		рН	7.9	11.1
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	1.9	0.7
Organic matter	DETSC 2002#	0.1	%	3.0	1.6
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.8	12
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10	< 10
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9



Our Ref 23-27489
Client Ref 23-0343
Contract Title RWE Dublin Array GPR Survey

Lab No	2266116	2266117
	WP03-BH07	WP03-BH07
.Sample ID		
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
Sampling Date	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units	·	
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3



Our Ref 23-27489
Client Ref 23-0343
Contract Title RWE Dublin Array GPR Survey

Lab No	2266118	2266119
	WP03-BH07	WP03-BH07
.Sample ID		
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
<b>Sampling Date</b>	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
NRA Leachate Preparation	DETSC 1009*			Υ	Υ
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.2	1.3
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	10	7.7
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	0.8
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.84	0.19
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.7	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	1.5
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	1.3	0.9
Zinc, Dissolved	DETSC 2306	1.3	ug/l	1.4	< 1.3
Inorganics					
рН	DETSC 2008		рН	7.8	7.6
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Dissolved Organic Carbon	DETSC 2085	2	mg/l	2.7	< 2.0
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	28.0	20.9
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.063	< 0.015
Chloride	DETSC 2055	0.1	mg/l	1.8	0.62
Sulphate as SO4	DETSC 2055	0.1	mg/l	4.5	6.5
Sulphide	DETSC 2208	10	ug/l	< 10	18
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0



Our Ref 23-27489 Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2266118	2266119
	WP03-BH07	WP03-BH07
.Sample ID		
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
Sampling Date	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	ug/l	< 10	< 10
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0
PAHs			•		
Naphthalene	DETSC 3304	0.05	ug/l	0.21	0.09
Acenaphthylene	DETSC 3304	0.01	ug/l	0.07	0.04
Acenaphthene	DETSC 3304	0.01	ug/l	0.23	0.03
Fluorene	DETSC 3304	0.01	ug/l	0.10	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	0.13	0.07
Anthracene	DETSC 3304	0.01	ug/l	0.05	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.24	0.13
Pyrene	DETSC 3304	0.01	ug/l	0.19	0.12
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	0.10	0.07
Chrysene	DETSC 3304	0.01	ug/l	0.12	0.08
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.13	0.10
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.05	0.04
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.10	0.08
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.11	0.09
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.02	0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.10	0.09
PAH Total	DETSC 3304	0.2	ug/l	2.0	1.1
Phenols					
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100



## **Summary of Asbestos Analysis Soil Samples**

Our Ref 23-27489 Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2266116	WP03-BH07 3 2.00	SOIL	NAD	none	Josh Best
2266117	WP03-BH07 5 4.00	SOIL	NAD	none	Josh Best

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: \* not included in laboratory scope of accreditation.



Inappropriate

### Information in Support of the Analytical Results

Our Ref 23-27489 Client Ref 23-0343

Contract RWE Dublin Array GPR Survey

#### **Containers Received & Deviating Samples**

#### Date container for Lab No Sample ID Sampled Containers Received Holding time exceeded for tests tests 2266116 WP03-BH07 2.00 SOIL 10/11/23 GJ 250ml, GJ 60ml, PT 1L pH + Conductivity (7 days) 2266117 WP03-BH07 4.00 SOIL GJ 250ml, GJ 60ml, PT 1L pH + Conductivity (7 days) 10/11/23 2266118 WP03-BH07 2.00 LEACHATE 10/11/23 GJ 250ml, GJ 60ml, PT 1L 2266119 GJ 250ml, GJ 60ml, PT 1L WP03-BH07 4.00 LEACHATE 10/11/23

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

#### **Soil Analysis Notes**

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of  $28^{\circ}\text{C}$  +/- $2^{\circ}\text{C}$ .

#### Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



### **Information in Support of the Analytical Results**

#### **List of HWOL Acronyms and Operators**

	<b>,</b>
Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
EPH (C10-C40)	EH_1D_Total

**End of Report** 



# APPENDIX H SPT HAMMER ENERGY MEASUREMENT REPORT



### **SPT Hammer Energy Test Report**

in accordance with BSEN ISO 22476-3:2005

**Southern Testing** 

Unit 11

Charlwoods Road East Grinstead West Sussex RH19 2HU SPT Hammer Ref: 1411.

Hammer Rei: 1411.

Test Date:

18/02/2023

Report Date:

20/02/2023

File Name:

1411..spt

Test Operator:

**RWS** 

#### **Instrumented Rod Data**

Diameter d<sub>r</sub> (mm):

54

Wall Thickness  $t_r$  (mm):

6.7

Assumed Modulus Ea (GPa): 208

Accelerometer No.1:

64786

Accelerometer No.2:

64789

#### **SPT Hammer Information**

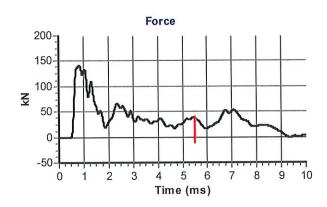
Hammer Mass m (kg): 63.5

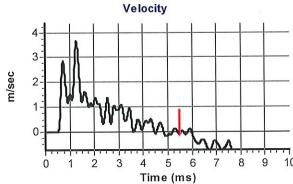
Falling Height h (mm): 760

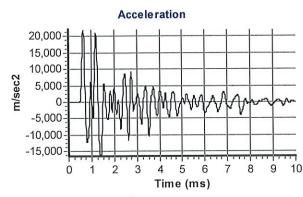
SPT String Length L (m): 10.0

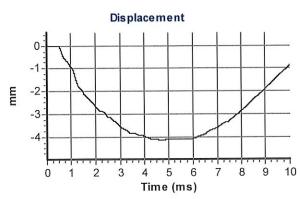
#### **Comments / Location**

**CAUSEWAY** 









#### **Calculations**

Area of Rod A (mm2):

996

Theoretical Energy  $E_{theor}$  (J):

473

303

64

(3). 4/3

Measured Energy  $E_{meas}$  (J):

Signed: Bob Stewart

Energy Ratio E<sub>r</sub> (%):

Title:

Technician

The recommended calibration interval is 12 months

### **SPT Hammer Energy Test Report**

in accordance with BSEN ISO 22476-3:2005

**Southern Testing** 

Unit 11

**Charlwoods Road East Grinstead West Sussex RH19 2HU** 

SPT Hammer Ref:

0208.

Test Date:

18/02/2023

Report Date:

20/02/2023

File Name:

0208..spt

Test Operator:

**RWS** 

#### **Instrumented Rod Data**

Diameter  $d_r$  (mm):

54

Wall Thickness  $t_r$  (mm):

6.7

Assumed Modulus Ea (GPa): 208

Accelerometer No.1:

64786

Accelerometer No.2:

64789

#### **SPT Hammer Information**

Hammer Mass m (kg): 63.5

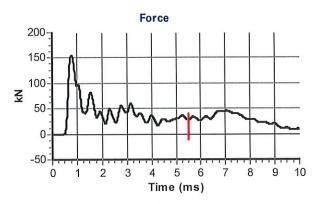
Falling Height h (mm):

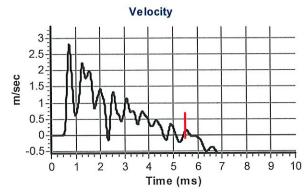
760

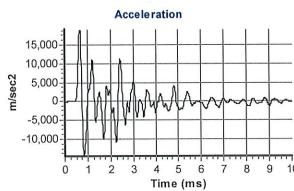
SPT String Length L (m): 10.0

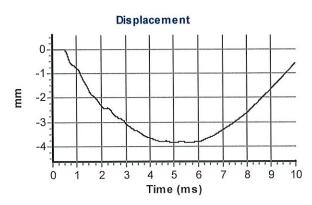
#### **Comments / Location**

**CAUSEWAY** 









#### **Calculations**

Area of Rod A (mm2):

996

Theoretical Energy  $E_{theor}$  (J):

473

Measured Energy E<sub>meas</sub>

244 (J):

Energy Ratio  $E_r$  (%):

**52** 

Signed: **Bob Stewart** 

Title:

Technician

The recommended calibration interval is 12 months



Registered office: Unit 5, Desart House, Lower New Street, Kilkenny

www.RWE.com