

# APPENDIX H GEOTECHNICAL LABORATORY TEST RESULTS





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

8 June 2022

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 28/03/2022 and 08/06/2022.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd











BRITISH

DRILLING ASSOCIATION Project Name: North Irish Sea Array

**Report Reference:** Rock Schedule 1

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 subcontracting 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

	AUSEW	AY		Point Load Strength Index Tests Summary of Results														
Dreis et Ne	GEOTE	СН		Draia	at Nam	-		ç	Sum	mai	ry of	Res	ults					
Project No.	21-1619			Proje	CT Nam	e			N	lorth li	rish Se	a Array	,					
Borehole	Sa	ample	_	Spe	≥cimen	Book Type	Test see	Type ISRM	alid (Y/N)		Dime	limensions		Force P	ent diameter, De	Point Strengtl	Load h Index	Remarks (including
No.	Depth	Ref.	Туре	Ref.	Depth	Rock Type	Type (D, A, I, B)	Direction (L, P or U)	Failure V	Lne	W	Dps	Dps'	1.51	Equival	Is	Is(5 0)	water content if measured)
BH08	8.90		с	1	m 8.90	LIMESTONE	А	U	YES		100.7	102.0	101.0	6.7	113.8	0.5	0.7	
BH08	9.40		с	1	9.40	LIMESTONE	D	U	YES	42.4	100.3	100.3	99.0	10.6	99.6	1.1	1.5	
BH08	13.27		с	1	13.27	LIMESTONE	A	U	YES		100.4	76.0	72.0	27.9	95.9	3.0	4.1	
BH08	13.83		с	1	13.83	LIMESTONE	D	U	NO	57.3	100.3	100.3	99.0	20.9	99.6	2.1	2.9	
	ļ																	
Toot Turne																		
Test Type D - Diametral, A - Axial, I - Irregular Lump, B - Block Direction L - parallel to planes of weakness V - unknown or random Dimensions Dps - Distance between platens (platen separation) Dps' - at failure ( see ISRM note 6) Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load. P													P D <sub>ps</sub>					
Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise Detailed legend for test and dimensions, based on ISRM, is shown above. Size factor, F = (De/50)0.45 for all tests.																		
						L	AB 17	R - V	ersio	n 5				Step	hen.W	/atson		10122

# LABORATORY TEST CERTIFICATE

Certificate No :

To :

Client :

Stephen Watson

22/524 - 04

**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 North Irish Sea Array (NISA) and delivered to our laboratory on 09th May 2022.

## **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	:	09th May 2022 Onwards
Source	:	21-1619 - North Irish Sea Array (NISA)

## 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

- TILL

T McLelland (Director)



08/06/2022









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

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

#### Page 2 of 2



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

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## SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

22 June 2022

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 14/05/2022 and 22/06/2022.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd











BRITISH

DRILLING ASSOCIATION Project Name: North Irish Sea Array

**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	40

## **SUB-CONTRACTED TESTS**

In agreement with Client, the following tests were conducted by an approved sub-contractor. All subcontracting 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	15

c.	AUSEW GEOTE	AY CH		Point Load Strength Index Tests Summary of Results														
Project No.				Proje	ect Nam	e					<u>,</u>							
2	21-1619									lorth Ir	ish Sea	a Array			Ļ,			
Borehole	Sa	ample		Spe	ecimen	Pock Turo	Test see	Type ISRM	alid (Y/N)		Dimensions			Force P	ent diamete De	Point Load Strength Index		Remarks (including
No.	Depth	Ref.	Туре	Ref.	Depth	коск туре	Type (D, A, I, B)	Direction (L, P or U)	Failure V	Lne	W	Dps	Dps'		Equival	Is	Is(5 0)	water content if measured)
BH01	3.25		с	1	3.25	ANDESITE	D	U	NO	132.1	100.9	100.9	99.0	24.0	99.9	2.4	3.3	
BH01	6.20		с	1	6.20	ANDESITE	А	U	YES		101.2	31.0	28.0	10.7	60.1	3.0	3.2	
BH01	7.85		с	1	7.85	ANDESITE	D	U	YES	133.7	101.1	101.1	100.0	9.3	100.5	0.9	1.3	
BH01	10.50		с	1	10.50	ANDESITE	А	U	YES		101.0	83.0	80.0	32.1	101.4	3.1	4.3	
BH01	12.70		с	1	12.70	ANDESITE	А	U	NO		101.0	82.0	78.0	22.1	100.2	2.2	3.0	
BH01	14.90		с	1	14.90	ANDESITE	D	U	NO	90.5	101.2	101.2	99.0	16.5	100.1	1.6	2.3	
BH01	16.20		с	1	16.20	ANDESITE	A	U	YES		101.0	67.0	64.0	16.2	90.7	2.0	2.6	
BH01	18.70		с	1	18.70	ANDESITE	А	U	YES		101.1	83.0	81.0	31.8	102.1	3.0	4.2	
BH01	19.40		с	1	19.40	ANDESITE	D	U	YES	65.4	100.9	100.9	100.0	3.5	100.4	0.3	0.5	
BH01	24.20		с	1	24.20	ANDESITE	A	U	YES		101.0	88.0	83.0	9.5	103.3	0.9	1.2	
BH01	24.40		с	1	24.40	ANDESITE	D	U	YES	56.4	101.2	101.2	98.0	16.0	99.6	1.6	2.2	
BH01	24.80		с	1	24.80	ANDESITE	A	U	YES		100.9	91.0	90.0	1.1	107.5	0.1	0.1	
BH01	28.55		с	1	28.50	ANDESITE	D	U	NO	138.4	85.8	85.8	83.0	22.4	84.4	3.1	4.0	
BH02	6.20		с	1	6.20	GREYWACKE	D	U	YES	43.2	100.2	100.2	99.0	0.6	99.6	0.1	0.1	
BH02	10.80		С	1	10.80	GREYWACKE	D	U	YES	120.5	100.3	100.3	99.0	9.2	99.6	0.9	1.3	
BH02	12.30		с	1	12.30	ANDESITE	A	U	YES		100.2	107.0	105.0	8.8	115.7	0.7	1.0	
BH02	13.70		С	1	13.70	ANDESITE	D	U	NO	123.0	100.4	100.4	97.0	28.4	98.7	2.9	4.0	
BH02	13.95		С	1	13.95	ANDESITE	A	U	YES		101.0	102.0	97.0	26.7	111.7	2.1	3.1	
Test Type D - Diametral, A - Axial, I - Irregular Lump, B - Block Direction L - parallel to planes of weakness P - perpendicular to planes of weakness U - unknown or random Dimensions Dps - Distance between platens (platen separation) Dps' - at failure (see ISRM note 6) Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load. P												Bloc	k		D <sub>ps</sub>		ar lump	P Dps
Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise       Date Printed       Approved B         Detailed legend for test and dimensions, based on ISRM, is shown above.       06/02/2022 00:00       Size factor, F = (De/50)0.45 for all tests.       Stophon												ved By	y Vatson					

c.	AUSEW GEOTE	АҮ СН		Point Load Strength Index Tests Summary of Results														
Project No.				Proje	ect Nam	e					<u> </u>							
2	21-1619					[	1		N	lorth Ir	ish Se	a Array						
Borehole	Sa	Imple		Spe	ecimen	Pack Type	Test see	Type ISRM	alid (Y/N)		Dimensions			Force P	ent diameter De	Point Strengtl	Load n Index	Remarks (including
No.	Depth	Ref.	Туре	Ref.	Depth	коск туре	Type (D, A, I, B)	Direction (L, P or U)	Failure V	Lne	W	Dps	Dps'	۲N	B Equival	Is MPa	Is(5 0)	water content if measured)
BH02	15.60		с	1	15.60	ANDESITE	А	U	YES		101.0	89.0	86.0	19.3	105.2	1.7	2.4	
BH02	16.65		с	1	16.65	ANDESITE	D	U	YES	77.9	101.1	101.1	99.0	10.0	100.0	1.0	1.4	
BH02	19.00		с	1	19.00	ANDESITE	A	U	NO		100.9	93.0	89.0	25.2	106.9	2.2	3.1	
BH02	19.30		с	1	19.30	ANDESITE	D	U	NO	137.7	100.5	100.5	96.0	22.7	98.2	2.4	3.2	
BH02	24.00		с	1	24.00	ANDESITE	D	U	NO	117.7	101.2	101.2	100.0	33.3	100.6	3.3	4.5	
BH02	25.35		с	1	25.35	ANDESITE	А	U	NO		100.9	94.0	92.0	26.5	108.7	2.2	3.2	
BH02	25.80		с	1	25.80	ANDESITE	D	U	NO	95.8	100.9	100.9	99.0	23.0	99.9	2.3	3.1	
BH09	6.65		С	1	6.65	LIMESTONE	A	U	YES		101.0	88.0	83.0	5.5	103.3	0.5	0.7	
BH09	7.75		с	1	7.75	LIMESTONE	D	U	YES	56.2	100.9	100.9	100.0	3.2	100.4	0.3	0.4	
BH09	10.10		с	1	10.10	LIMESTONE	А	U	YES		101.3	69.0	57.0	16.9	85.7	2.3	2.9	
BH09	10.75		с	1	10.75	LIMESTONE	D	U	YES	56.2	100.8	100.8	99.0	9.9	99.9	1.0	1.4	
BH09	11.70		с	1	11.70	LIMESTONE	A	U	YES		101.3	59.0	54.0	25.1	83.5	3.6	4.5	
BH09	13.00		с	1	13.00	LIMESTONE	D	U	NO	67.2	100.5	100.5	99.0	21.9	99.7	2.2	3.0	
BH09	14.20		с	1	14.20	LIMESTONE	A	U	YES		100.8	74.0	71.0	10.0	95.5	1.1	1.5	
BH09	15.75		с	1	15.75	LIMESTONE	A	U	YES		101.1	51.0	48.0	19.6	78.6	3.2	3.9	
BH09	18.55		с	1	18.55	LIMESTONE	D	U	YES	83.2	101.3	101.3	100.0	5.1	100.6	0.5	0.7	
BH09	19.20		с	1	19.20	LIMESTONE	A	U	NO		101.1	84.0	82.0	16.8	102.7	1.6	2.2	
BH15	9.10		с	1	9.10	SILTSTONE	I	U	YES	103.2	77.7	45.0	42.0	0.5	64.5	0.1	0.1	
Test Type D - Diametral, A - Axial, I - Irregular Lump, B - Block Direction L - parallel to planes of weakness P - perpendicular to planes of weakness U - unknown or random Dimensions Dps - Distance between platens ( platen separation ) Dps' - at failure ( see ISRM note 6) Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P													D <sub>ps</sub>		ar lump	P Dps		
Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise       Date Printed       Approved By         Detailed legend for test and dimensions, based on ISRM, is shown above.       06/02/2022 00:00       Size factor, F = (De/50)0.45 for all tests.         LAB 17R - Version 5       Stephers W/stepher																		

	AUSEW			Point Load Strength Index Tests Summary of Results																	
Drojost No	GEOTE	СН	Project Name									ry of Results									
Project No.	21-1619			Proje	CT Nam	e			N	lorth l	rish Se	a Array	,	-		-					
Borehole	Sa	ample		Spe	cimen	Pool Turo	Test see	Type ISRM	alid (Y/N)		Dime	ensions		Force P	ent diameter, De	Point Strengtl	Load h Index	Remarks (including			
No.	Depth	Ref.	Туре	Ref.	Depth	Rock Type	Type (D, A, I, B)	Direction (L, P or U)	Failure V	Lne	w	Dps	Dps'		Equival	Is	Is(5 0)	water content if measured)			
BH15	12 10		C	1	m 12 10	SILTSTONE			YES	mm 94 7	mm 80.9	mm 67.0	mm	KN 3.6	mm	мРа 0.6	мРа 0 7				
BH16	11 75		C C		11 75	MUDSTONE	+		VES	65.1	74.3	40.0	38.0	1.6	60.0	0.4	0.5				
BH16	12.40		C C		12.40	SILTSTONE		о П	YES	122.5	100.1	100.1	97.0	3.0	98.5	0.4	0.0				
BH16	14.85				14.85	SILTSTONE			VES	122.0	100.1	99.0	94.0	5.0	109.7	0.0	0.4				
	14.85				14.05			0	163		100.0	99.0	94.0	5.0	109.7	0.4	0.0				
				-																	
							<u> </u>														
					/		<u> </u>														
						$\square$															
Test Type D - Diametral, A - Axial, I - Irregular Lump, B - Block Direction L - parallel to planes of weakness P - perpendicular to planes of weakness U - unknown or random Dimensions Dps - Distance between platens (platen separation) Dps' - at failure (see ISRM note 6) Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load P													P D <sub>ps</sub>								
Test performed in	n accordance	e with I	SRM S	uggest	ed Metho	ods : 2007, unless note	ed othe	rwise			Date F	Printed	00.00	Appro	ved B	y					
Size factor, $F = 0$	(De/50)0.45	for all t	ests.			L/	AB 17	'R - V	ersio	n 5	50,02		50.00	Stepl	nen.V	√atson		JKAS TESTING 10122			

# LABORATORY TEST CERTIFICATE

Certificate No :

To :

Client :

Stephen Watson

22/524 - 05

**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 North Irish Sea Array (NISA) and delivered to our laboratory on 23rd May 2022.

#### **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	:	23rd May 2022 Onwards
Source	:	21-1619 - North Irish Sea Array (NISA)

## Test Results

As Detailed On Page 2 to Page 7 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

- All

T McLelland (Director)



22/06/2022



DEPTH







Tested in accordance with ASTM D7012 - 14

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

#### Page 2 of 7

MATtest Limited







BOREHOLE		BH01	
SAMPLE		C16	
DEPTH	m	23.20-23.60	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.49	
SAMPLE HEIGHT	mm	198.26	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.0	
TEST DURATION	min.sec	2.30	
DATE OF TESTING		20/06/2022	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	135.4	
UNCONFINED COMPRESSIVE STRENGTH	MPa	16.7	
WATER CONTENT (ISRM Suggested Methods)	%	0.3	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.59	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.58	

Tested in accordance with ASTM D7012 - 14

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH



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>		

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

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

#### Page 4 of 7





		BHUDD	1
		DRVZ	
SAMPLE		C3	
DEPTH	m	11.20-11.50	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.02	
SAMPLE HEIGHT	mm	213.78	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.1	
TEST DURATION	min.sec	7.06	
DATE OF TESTING		20/06/2022	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	458.8	
UNCONFINED COMPRESSIVE STRENGTH	MPa	57.2	
WATER CONTENT (ISRM Suggested Methods)	%	0.3	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.72	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.71	





Tested in accordance with ASTM D7012 - 14

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

#### Page 5 of 7



BOREHOLE		BH02	]
SAMPLE		C12	
DEPTH	m	19.10-19.30	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.38	
SAMPLE HEIGHT	mm	205.61	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.1	
TEST DURATION	min.sec	8.42	
DATE OF TESTING		20/06/2022	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	563.9	
UNCONFINED COMPRESSIVE STRENGTH	MPa	69.9	
WATER CONTENT (ISRM Suggested Methods)	%	0.2	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.84	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.84	



BOREHOLE		BH02	]
SAMPLE		C17	
DEPTH	m	25.55-25.80	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.39	
SAMPLE HEIGHT	mm	206.63	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.3	
TEST DURATION	min.sec	10.50	
DATE OF TESTING		20/06/2022	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	812.1	
UNCONFINED COMPRESSIVE STRENGTH	MPa	100.6	
WATER CONTENT (ISRM Suggested Methods)	%	0.1	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.75	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.75	]

Tested in accordance with ASTM D7012 - 14

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

#### Page 6 of 7



BOREHOLE		BH09	]
SAMPLE		C8	
DEPTH	m	16.00-16.50	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.53	
SAMPLE HEIGHT	mm	203.28	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.0	
TEST DURATION	min.sec	3.10	
DATE OF TESTING		20/06/2022	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	177.1	
UNCONFINED COMPRESSIVE STRENGTH	MPa	21.9	
WATER CONTENT (ISRM Suggested Methods)	%	0.6	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.69	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	2.68	]



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

#### SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

#### Page 7 of 7



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

24 March 2022

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 04/03/2022 and 24/03/2022.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd













Project Name: North Irish Sea Array

**Report Reference:** Schedule 1

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	2
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	1

GEOTECH				Summary of Classification Test Results													
Project N	lo.			Project	Name	1											
	21-16	619					N	North Irish Sea Array									
			Sar	mple	1		Dens	ity	w	Passing	LL	PL	PI	Particle	Casagrande		
Hole N	NO.	Ref	Тор	Base	Туре	Soil Description	DUIK	ary	%	425µm	%	%	%	density	Classification		
							wg/n	13	70	70	70	70	70	Ng/110			
BH08	3	3	0.20	1.20	В	Greyish brown sandy slightly gravelly silty CLAY.			24.0								
BH08	3	5	2.00	3.00	в	Greyish brown sandy slightly gravelly silty CLAY.			12.0	49	23 -1pt	16	7		CL		
BH08	3	7	4.30	5.00	в	Greyish brown slightly gravelly silty fine to coarse SAND.			20.0								
All tests p	perforr	ned i	n accord	lance wit	h BS1	377:1990 unless specified	otherwis	e		-				LAE	01R Version 4		
Key D Li	est easurei er displa	ment unles acement	s :	Liquid I 4pt cor cas - C	_imit Partic le unless : sp - s asagrande method gj - ge	Date Printed Approved By mall pyknometer 24/03/2022				By							
wi - immersion in water					1pt - si	ngle point test						Step	hen.	Watson	10122		





Approved

Stephen.Watson

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#### **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

## 28 April 2022

#### SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 18/03/2022 and 28/04/2022.

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



**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	14		
SOIL	Liquid and Plastic Limits of soil-4 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	8		
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	8		
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	8		
SOIL	Moisture Condition Value at natural moisture content	BS 1377-4: 1990: Cl 5.4	5		
SOIL	Moisture Condition Value / Moisture Content Relationship	BS 1377-4: 1990: Cl 5.5	2		
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	2		

# SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All subcontracting 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 Resistivity		5
SOIL – Subcontracted to Eurofins Chemtest Ltd (UKAS 2183)	BRE Test - Suite B		5

	<b>NAY</b> TECH	Summary of Classification Test Results												
Project No.			Project	Name	•									
21-	1619					Ν	lorth I	rish Se	a Array					
		Sa	mple			Dens	ity	w	Passing	LL	PL	ΡI	Particle	Casagrande
Hole No.	Ref	Тор	Base	Туре	Soil Description	bulk	dry		425µm				density	Classification
						Mg/m	13	%	%	%	%	%	Mg/m3	
TP16	3	1.00		В	Brown sandy slightly gravelly silty CLAY.			18.0	74	41	25	16		CI
TP16	4	2.50		в	Brown sandy slightly gravelly silty CLAY.			11.0	70	33	18	15		CL
TP17	3	1.00		в	Brown sandy slightly gravelly silty CLAY.			37.0						
TP17	4	1.60		в	Brown sandy slightly gravelly silty CLAY.			20.0	83	29	16	13		CL
TP17	5	2.70		В	Brown sandy slightly gravelly silty CLAY.			14.0						
TP18	3	0.80		в	Brown sandy slightly gravelly silty CLAY.			24.0						
TP18	4	1.50		в	Brown sandy slightly gravelly silty CLAY.			25.0	80	38	20	18		СІ
TP18	5	2.60		в	Brown sandy slightly gravelly silty CLAY.			8.5	67	38	20	18		СІ
TP22	3	0.80		в	Brown sandy slightly gravelly silty CLAY.			18.0	85	41	24	17		CI
TP22	4	1.50		в	Brown sandy slightly gravelly silty CLAY.			15.0						
TP22	5	2.80		в	Brown sandy slightly gravelly silty CLAY.			11.0						
TP23	3	0.50		в	Brown sandy slightly gravelly silty CLAY.			16.0	79	29	16	13		CL
All tests perfo	All tests performed in accordance with BS1377:1990 unless specified otherwise LAB 01R Version 5													
Key Densit Linear wd - wa	/ test measure ater displ	ment unles acement	55 :	Liquid 4pt cor cas - C	Limit Particl ne unless : sp - sn asagrande method gj - ga	e density nall pyknom s jar	eter	Date F	Printed	22	Appr	roved	Ву	
wi-im	mersion	in water		1pt - si	ngle point test						Step	hen.	Watson	10122

CAUSEWAY GEOTECH				Summary of Classification Test Results												
Project	No.			Project	Project Name											
	21-1	619					Ν	lorth	lrish Se	ea Array						
Hole	No.	Ref	Sar Top	nple Base	Туре	Soil Description	Dens bulk	ity dry	w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification	
							Mg/n	n3	%	%	%	%	%	Mg/m3		
TP	23	4	1.50		в	Brown sandy slightly gravelly silty CLAY.			11.0							
TP	23	5	2.20		в	Brown sandy slightly gravelly silty CLAY.			12.0	70	33	19	14		CL	
All tests	s perfor	med i	n accord	lance wit	th BS1	377:1990 unless specified	otherwis	e						LAE	3 01R Version 5	
Key Density test Linear measurement unless : wd - water displacement					Liquid 4pt cor cas - C	Limit Partic le unless : sp - si asagrande method gj - ga	le density mall pyknom	neter	Date F	Printed	22	Appr	oved	By		
wi - immersion in water					1pt - si	ngle point test						Step	hen.	Watson	10122	













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	JSEN GEOT	AY ECH		Moisture Condition Value at Natural Moisture Content Summary of Results										
Project No.			Project I	Name	me									
21-	1619			North Irish Sea Array										
Hole No.	Ref	Sar Top	mple Base	Туре	Soil Description	Retained on 20mm sieve %	Moisture Content <20mm	Moisture Condition Value	Method of Interpretation	Remarks				
TP16	4	2.50		в	Brown sandy slightly gravelly silty CLAY.	0	11	12.8	Best fit line					
TP17	3	1.00		в	Brown sandy slightly gravelly silty CLAY.	1	39	11.3	Best fit line					
TP18	3	0.80		в	Brown sandy slightly gravelly silty CLAY.	0	23	4.7	Best fit line					
TP22	5	2.80		в	Brown sandy slightly gravelly silty CLAY.	0	10	13.2	Best fit line					
TP23	4	1.50		в	Brown sandy slightly gravelly silty CLAY.	4	11	3.1	Best fit line					
		-		-	-	-		-	LA	B 10R - Version 6				
Key Test pe annotat	erformec ed othe	l in accord rwise	ance with	BS137	7:Part4:1990, clause 5.4 unless	Date Printed	/2022	Approved By Stephe	n.Watson					

CAUSEWAY	Moisture Con	dition Value /	Moisture Cont	Job Ref	21-1619	
GEOTECH		Relationsh	ip	Borehole/Pit No.	TP16	
Site Name	North Irish Sea Array			Sample No.	3	
Soil Description	Brown sandy slightly gr	avelly silty CLAY.		Depth	1	
Specimen Reference	8	Specimen Depth	1	Sample Type	В	
Specimen Description	Brown sandy slightly gr	avelly silty CLAY.			KeyLAB ID	Caus2022031519
Test Method	BS1377:Part4:1990:cla	use 5.5			Date started	
Sample preparation	Amount of	material larger tha	an 20mm sieve reme	oved	8	%
	Natural Mo	sture Content of s	sample	15.4	%	
	Initial Moist	ure Content of tes	st sample below 20r	16.9	%	
	Separate s	pecimens tested				

#### General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	17	16	14	20	
Moisture Condition Value	8.9	11.3	14.6	4.9	
MCV report	8.9	11.3	14.6	4.9	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					



CAUSEWAY	Moisture Con	dition Value /	Moisture Conte	Job Ref	21-1619	
GEOTECH		Relationsh	ip	Borehole/Pit No.	TP23	
Site Name	North Irish Sea Array			Sample No.	3	
Soil Description	Brown sandy slightly gr	avelly silty CLAY.	Depth	0.5		
Specimen Reference	8	Specimen Depth	0.5	Sample Type	В	
Specimen Description	Brown sandy slightly gr	avelly silty CLAY.			KeyLAB ID	Caus2022031530
Test Method	BS1377:Part4:1990:cla	use 5.5			Date started	
Sample preparation	Amount of	material larger tha	an 20mm sieve remov	/ed	2	%
	Natural Moisture Content of sample				14.2	%
	Initial Moist	ure Content of tes	st sample below 20m	11.4	%	
	Separate s	pecimens tested				

#### General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	15	14	17	15	
Moisture Condition Value	11.4	13.0	4.6	9.3	
MCV report	11.4	13	4.6	9.3	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					







# LABORATORY REPORT



4043

### Contract Number: PSL22/2353

Report Date: 27 April 2022

Client's Reference: 21-1619

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

### For the attention of: Stephen Watson

Contract Title: North Irish Sea Array

Date Received:	31/3/2022
Date Commenced:	31/3/2022
Date Completed:	27/4/2022

### 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 (Director) R Berriman (Quality Manager)

Ste

S Royle (Laboratory Manager)

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

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster DN4 0AR tel: +44 (0)844 815 6641 fax: +44 (0)844 815 6642 e-mail: rberriman@prosoils.co.uk awatkins@prosoils.co.uk Page 1 of

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
<b>TP16</b>	3	В	1.00		Brown gravelly sandy CLAY.
<b>TP17</b>	3	В	1.00		Brown CLAY.
<b>TP18</b>	3	В	0.80		Brown slightly gravelly slightly sandy CLAY.
<b>TP22</b>	3	В	0.80		Brown gravelly sandy CLAY.
<b>TP23</b>	3	В	0.50		Brown gravelly sandy CLAY.



# SUMMARY OF THERMAL PROPERTY TESTS

### In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal	
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	Durandar
Number	Number	Туре	Depth	Depth	%	Mg/m <sup>3</sup>	Mg/m <sup>3</sup>			Remarks
			m	m				W/m K	C.cm/W	
<b>TP16</b>	3	В	1.00		20	2.04	1.69	1.803	55.5	
<b>TP17</b>	3	В	1.00		39	1.76	1.27	1.340	74.6	
<b>TP18</b>	3	В	0.80		23	1.95	1.59	1.817	55.1	
<b>TP22</b>	3	В	0.80		18	2.07	1.76	2.150	46.5	
<b>TP23</b>	3	В	0.50		14	2.14	1.88	2.022	49.5	



# 🔅 eurofins

### Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Report No.:	22-12438-1		
Initial Date of Issue:	11-Apr-2022		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan Joe Gervin John Cameron Lucy Newland Martin Gardiner Matthew Gilbert Neil Haggan Paul Dunlop Sean Ross Stephen Franey Stephen Watson Stuart Abraham Thomas McAllister		
Project	21-1619 North Irish Sea Array		
Quotation No.:		Date Received:	01-Apr-2022
Order No.:		Date Instructed:	01-Apr-2022
No. of Samples:	5		
Turnaround (Wkdays):	7	Results Due:	11-Apr-2022
Date Approved:	11-Apr-2022		
Approved By:			
Sont			

**Details:** 

Stuart Henderson, Technical Manager



# 🔅 eurofins

### Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

## <u> Results - Soil</u>

#### Project: 21-1619 North Irish Sea Array

Client: Causeway Geotech Ltd		Chei	ntest Jo	ob No.:	22-12438	22-12438	22-12438	22-12438	22-12438
Quotation No.:	0	Chemte	st Sam	ple ID.:	1403834	1403835	1403836	1403837	1403838
Order No.:		Clie	nt Samp	le Ref.:	3	5	4	5	4
		Sa	ample Lo	ocation:	TP16	TP17	TP18	TP22	TP23
			Sample	e Type:	SOIL	SOIL	SOIL	SOIL	SOIL
			Тор Dep	oth (m):	1.0	2.7	1.5	2.8	1.5
			Date Sa	ampled:	31-Mar-2022	31-Mar-2022	31-Mar-2022	31-Mar-2022	31-Mar-2022
Determinand	Accred.	SOP	Units	LOD					
Moisture	Ν	2030	%	0.020	16	7.6	9.9	9.8	9.9
рН	U	2010		4.0	8.6	7.9	8.2	8.4	8.8
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.010	0.048	0.18	0.012
Total Sulphur	U	2175	%	0.010	0.024	0.069	0.032	0.23	0.069
Sulphate (Acid Soluble)	U	2430	%	0.010	0.038	0.016	0.017	0.032	0.030

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	рН	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

### **Report Information**

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
Т	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis All Asbestos testing is performed at the indicated laboratory Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

#### **Sample Deviation Codes**

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt All water samples will be retained for 14 days from the date of receipt Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: customerservices@chemtest.com



HEAD OFFICE Causeway Geotech Ltd 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

### 28 April 2022

### SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 18/03/2022 and 28/04/2022.

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:	North Irish Sea Array
---------------	-----------------------

**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	8
SOIL	Liquid and Plastic Limits of soil-4 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	4
SOIL	Moisture Condition Value at natural moisture content	BS 1377-4: 1990: Cl 5.4	3
SOIL	Moisture Condition Value / Moisture Content Relationship	BS 1377-4: 1990: Cl 5.5	1
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	1

### SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All subcontracting 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 Resistivity		2
SOIL – Subcontracted to Eurofins Chemtest Ltd (UKAS 2183)	BRE Test - Suite B		3

	CAU	SEV GEO	<b>VAY</b> TECH	Summary of Classification Test Results											
Project No	D.		Project Name												
	21-16	19				North Irish Sea Array									
Hole Nr	_		Sar	mple		Soil Description	Dens bulk	ity drv	W	Passing 425µm	LL	PL	ΡI	Particle density	Casagrande
	0.	Ref	Тор	Base	Туре	Soli Description	Mg/m	13	%	%	%	%	%	Mg/m3	Classification
TP19		3	1.00		В	Dark grey sandy slightly gravelly silty CLAY.			21.0	93	37	16	21		CI
TP19		4	2.00		В	Dark grey slightly gravelly clayey fine to coarse SAND.			8.8	39	37	16	21		CI
TP19		5	3.00		В	Dark grey slightly gravelly clayey fine to coarse SAND.			10.0						
TP24		3	1.00		В	Brownish grey sandy slightly gravelly silty CLAY.			20.0	63	31	20	11		CL
TP24		4	2.00		В	Brownish grey sandy slightly gravelly silty CLAY.			13.0	62	31	19	12		CL
TP25		3	1.00		в	Brownish grey sandy slightly gravelly silty CLAY.			25.0	82	27	18	9		CL
TP25		4	2.00		В	Brown slightly gravelly clayey fine to coarse SAND.			8.8						
TP25		5	2.80		в	Dark brown sandy slightly gravelly silty CLAY.			21.0	88	27	14	13		CL
All tests p	erform	ned ir	accord	lance wit	h BS1	377:1990 unless specified	otherwis	e						LAE	01R Version 5
Key De Lir	ensity te near me d - water	st asurer	nent unles acement	s :	Liquid I 4pt con cas - C	Limit Particle ne unless : sp - Sn asagrande method oi - cra:	e density nall pyknom s jar	ieter	Date F 04/1	Printed 2/2022 (	00:00	Appr	oved	By	
wi	wd - water displacement cas - Casagrande method gj - gas jar   wi - immersion in water 1pt - single point test							TESTING 10122			10122				













	Moisture Condition Value at Natural Moisture Content GEOTECH Summary of Results								ent					
Project No.			Project I	Project Name										
21-	1619			North Irish Sea Array										
Hole No.	Ref	Sai Top	nple Base Type		nple Base Type		Soil Description	Retained on 20mm sieve	Moisture Content <20mm	Moisture Condition Value	Method of Interpretation	Remarks		
						%	%							
TP19	3	1.00		в	Dark grey sandy slightly gravelly silty CLAY.	66	21	7.3	Best fit line					
TP24	3	1.00		в	Brownish grey sandy slightly gravelly silty CLAY.	32	19	3.2	Best fit line					
TP25	3	1.00		в	Brownish grey sandy slightly gravelly silty CLAY.	0	27	too wet	Best fit line					
		•	•						LA	B 10R - Version 6				
Key Test pe annota	erformed ted othe	l in accord rwise	ance with	BS137	7:Part4:1990, clause 5.4 unless	Date Printed 04/12/20	22 00:00	Approved By Stephe	n.Watson					

CALISEWAY	Moisture Co	ndition Value	Job Ref	21-1619		
GEOTECH		Relationsh	nip		Borehole/Pit No.	TP24
Site Name	North Irish Sea Array		Sample No.	3		
Soil Description	Brownish grey sandy	slightly gravelly silt	Depth	1		
Specimen Reference	10	Specimen Depth	Sample Type	В		
Specimen Description	Brownish grey sandy	slightly gravelly silt	y CLAY.		KeyLAB ID	Caus2022031536
Test Method	BS1377:Part4:1990:cl	ause 5.5			Date started	31/03/2022
Sample preparation	Amount of	f material larger that	an 20mm sieve rem	32	%	
	Natural M	oisture Content of	sample		12.1	%
	Initial Mois	sture Content of te	18.9	%		
	Separate	specimens tested				

#### General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	19	16	10	14	
Moisture Condition Value	3.2	7.2	14.0	9.1	
MCV report	3.2	7.2	14	9.1	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					



×

invalid points --- extended regression

----- linear regression

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# LABORATORY REPORT



4043

### Contract Number: PSL22/2279

Report Date: 27 April 2022

Client's Reference: 21-1619

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

### For the attention of: Stephen Watson

Contract Title: North Irish Sea Array

Date Received:	28/3/2022
Date Commenced:	28/3/2022
Date Completed:	27/4/2022

### 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 (Director) R Berriman (Quality Manager)

Ste

S Royle (Laboratory Manager)

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

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster DN4 0AR tel: +44 (0)844 815 6641 fax: +44 (0)844 815 6642 e-mail: rberriman@prosoils.co.uk awatkins@prosoils.co.uk Page 1 of

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
<b>TP19</b>	3	В	1.00		Brown gravelly sandy CLAY.
<b>TP25</b>	3	В	1.00		Grey sandy slightly clayey GRAVEL.



# SUMMARY OF THERMAL PROPERTY TESTS

### In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal	
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	
Number	Number	Туре	Depth	Depth	%	Mg/m <sup>3</sup>	Mg/m <sup>3</sup>			Kemarks
			m	m				W/m K	C.cm/W	
<b>TP19</b>	3	В	1.00		15	2.18	1.90	2.098	47.7	
TP25	3	В	1.00		8.4	2.33	2.15	1.506	66.4	



# 🔅 eurofins

### Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Final Report			Email: info@chemtest.cor
Report No.:	22-11183-1		
Initial Date of Issue:	31-Mar-2022		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan Joe Gervin John Cameron Lucy Newland Martin Gardiner Matthew Gilbert Neil Haggan Paul Dunlop Sean Ross Stephen Franey Stephen Watson Stuart Abraham Thomas McAllister		
Project	21-1618 North Irish Sea Array		
Quotation No.:		Date Received:	24-Mar-2022
Order No.:		Date Instructed:	24-Mar-2022
No. of Samples:	3		
Turnaround (Wkdays):	7	Results Due:	01-Apr-2022
Date Approved:	31-Mar-2022		
Approved By:			
and			

**Details:** 

201

2183

Stuart Henderson, Technical Manager

# 🔅 eurofins

### Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

## <u> Results - Soil</u>

#### Project: 21-1618 North Irish Sea Array

Client: Causeway Geotech Ltd		Che	mtest Jo	ob No.:	22-11183	22-11183	22-11183
Quotation No.:	Chemtest Sample ID.:		1398048	1398049	1398050		
Order No.:		Client Sample Ref.:		4	4	4	
		Sample Location:		TP19	TP24	TP25	
		Sample Type:		SOIL	SOIL	SOIL	
	Top Depth (m):		2.0	2.0	2.0		
			Date Sa	ampled:	23-Mar-2022	23-Mar-2022	23-Mar-2022
Determinand	Accred.	SOP	Units	LOD			
Moisture	Ν	2030	%	0.020	12	13	10
рН	U	2010		4.0	8.8	8.8	8.8
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.16	0.013	0.16
Sulphate (Total)	U	2430	%	0.010	0.60	0.055	0.94
Sulphate (Acid Soluble)	U	2430	%	0.010	0.036	< 0.010	0.022

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	рН	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

### **Report Information**

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
Т	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis All Asbestos testing is performed at the indicated laboratory Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

#### **Sample Deviation Codes**

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt All water samples will be retained for 14 days from the date of receipt Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: customerservices@chemtest.com



### LABORATORY RESTRICTION REPORT

Project Reference	21-1619			То	Colm Hurley
Project Name	North Irish Sea Array			Position	Project Manager
North hish oca Allay		From	Stephen Watson		
TP reference	21 1610	1	2	1 Iom	
TR Telefence	21-1019		5	Position	Laboratory 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 Sample Test		Test				
Number	Number	Depth (m)	Туре	Туре	Reason for Restriction	Required Action
TP24	3	1	В	Thermal Resistivity	Insufficient material	CANCEL
For electronic reporting a form of electronic signature or printed name is		Laboratory Signature Stephen Watson	Project Manager Signature Colm Hurley			
acceptable		Date 16 April 2022	Date			



HEAD OFFICE Causeway Geotech Ltd 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

### 28 April 2022

### SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 18/03/2022 and 28/04/2022.

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:	North Irish Sea Array
---------------	-----------------------

**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-4 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	11
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	11
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	11
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	1
SOIL	Moisture Condition Value at natural moisture content	BS 1377-4: 1990: Cl 5.4	5
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	2
### SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All subcontracting 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 <i>(UKAS 4043)</i>	Thermal Resistivity		6

	USE GEO	<b>NAY</b> TECH		Summary of Classification Test Results											
Project No.	1010		Project	Name											
21-	1619	<u>Sa</u>			[		Iorth I	Irish Se	a Array						
Hole No.	Ref	Тор	Base	Туре	Soil Description	Dens bulk Mg/m	ity dry 13	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification	
BH03	2	0.80	1.00	в	Brown sandy slightly gravelly silty CLAY.			23.0	83	42	21	21		СІ	
BH03	3	1.80	2.00	В	Brown sandy slightly gravelly silty CLAY.			14.0							
BH03	4	2.80	3.00	в	Brown sandy slightly gravelly silty CLAY.			13.0							
BH03	5	3.80	4.00	в	Brown sandy slightly gravelly silty CLAY.			13.0	65	30	16	14		CL	
BH03	14	5.00	5.45	U	Brown sandy slightly gravelly silty CLAY.			13.0							
BH03	10	5.50		D	Brown sandy slightly gravelly silty CLAY.			11.0	60	25	14	11		CL	
BH03	12	7.50		D	Brown sandy slightly gravelly silty CLAY.			22.0							
TP01	3	1.00		в	Greyish brown sandy slightly gravelly silty CLAY.			17.0	92	45	22	23		CI	
TP02	3	1.00		в	Greyish brown sandy slightly gravelly silty CLAY.			14.0	67	30	19	11		CL	
TP07	4	1.00		в	Greyish brown sandy slightly gravelly silty CLAY.			16.0	65	30	19	11		CL	
TP07	6	2.00		в	Greyish brown sandy slightly gravelly silty CLAY.			14.0	67	40	16	24		CI	
TP09	4	1.20		в	Greyish brown silty CLAY.			23.0	98	41	22	19		CI	
All tests perfo	rmed i	n accord	lance wit	h BS1	377:1990 unless specified	otherwis	e						LAE	01R Version 5	
Key Densit Linear wd - w wi - irr	v test measure ater displ mersion	ment unles acement in water	s :	Liquid Limit Particle density 4pt cone unless : sp - small pyknometer cas - Casagrande method gj - gas jar					Date Printed 04/11/2022 00:00			oved	By	UKAS TESTING 10122	

•	CAL	JSE GEO	<b>VAY</b> TECH	Summary of Classification Test Results											
Project	No.			Project	Name										
	21-1	619					-	North	lrish Se	ea Array		ī	T		
	No		Saı	mple	r –	Coll Departmention	Dens	sity	w	Passing 425um	LL	PL	ΡI	Particle	Casagrande
Hole	INO.	Ref	Тор	Base	Туре	Soli Description	Ma/r	n3	%	%	%	%	%	Mg/m3	Classification
TP	20	3	1.00		в	Greyish brown sandy slightly gravelly silty CLAY.		-	32.0	89	53	26	27		СН
TP	20	4	1.20		в	Greyish brown clayey fine to coarse SAND.			37.0	93	40	22	18		CI
TP	21	3	1.00		в	Greyish brown sandy slightly gravelly clayey SILT with occasional shell fragments.			58.0	96	53	35	18		МН
All tests	perfor	med ii	n accord	lance wi	th BS1	377:1990 unless specified	lotherwis	se						LAE	3 01R Version 5
, Density test Linear measurement unless : wd - water displacement wi - immersion in water				s :	Liquid 4pt cor cas - C 1pt - si	d Limit Particle density one unless : sp - small pyknometer Casagrande method gj - gas jar single point test				Date Printed 04/11/2022 00:00			oved	By Watson	UKAS TESTING 10122





Stephen.Watson



LAB 05R - Version 5

Stephen.Watson







Stephen.Watson





Stephen.Watson







CAL		Moisture Condition Value at Natural Moisture Content												
CAC	-GEOT	ECH				Summary of Results								
Project No.			Project I	Name										
21-	1619					North I	rish Sea Arra	y						
Hole No.	Def	Sar	nple	Tures	Soil Description	Retained on 20mm sieve	Moisture Content <20mm	Moisture Condition Value	Method of Interpretation	Remarks				
	Rei	төр	Dase	Type		%	%							
TP01	3	1.00		в	Greyish brown sandy slightly gravelly silty CLAY.	0	20	13.0	Best fit line					
TP02	3	1.00		В	Greyish brown sandy slightly gravelly silty CLAY.	12	96	8.8	Best fit line					
TP07	4	1.00		В	Greyish brown sandy slightly gravelly sitty CLAY.	14	16	8.7	Best fit line					
TP09	4	1.20		в	Greyish brown sandy slightly gravelly silty CLAY.	0	23	13.9	Best fit line					
TP21	3	1.00		в	Greyish brown slightly sandy silty CLAY with occasional shell fragments.	4	69	7.8	Best fit line					
					1				LA	B 10R - Version 6				
Key Test pe annotat	rformed ed othe	l in accord rwise	ance with I	BS1377	7:Part4:1990, clause 5.4 unless	Date Printed 04/11/20								









## LABORATORY REPORT



4043

### Contract Number: PSL22/2280

Report Date: 27 April 2022

Client's Reference: 21-1619

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

### For the attention of: Stephen Watson

Contract Title: North Irish Sea Array

Date Received:	28/3/2022
Date Commenced:	28/3/2022
Date Completed:	27/4/2022

### 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 (Director) R Berriman (Quality Manager)

Ste

S Royle (Laboratory Manager)

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

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster DN4 0AR tel: +44 (0)844 815 6641 fax: +44 (0)844 815 6642 e-mail: rberriman@prosoils.co.uk awatkins@prosoils.co.uk Page 1 of

## SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP01	4	В	1.20		Dark brown slightly gravelly sandy CLAY.
<b>TP02</b>	4	В	1.20		Brown gravelly sandy CLAY.
<b>TP07</b>	5	В	1.20		Brown gravelly sandy CLAY.
<b>TP09</b>	4	В	1.20		Dark brown slightly sandy CLAY.
TP20	3	В	1.00		Brown slightly gravelly slightly sandy CLAY.
TP21	3	В	1.00		Dark brown sandy CLAY with some organic material.



## SUMMARY OF THERMAL PROPERTY TESTS

### In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal	
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	
Number	Number	Туре	Depth	Depth	%	Mg/m <sup>3</sup>	Mg/m <sup>3</sup>			Remarks
			m	m				W/m K	C.cm/W	
<b>TP01</b>	4	В	1.20		19	2.01	1.68	1.893	52.8	
<b>TP02</b>	4	В	1.20		14	2.18	1.91	2.171	46.1	
<b>TP07</b>	5	В	1.20		16	2.14	1.84	2.095	47.7	
<b>TP09</b>	4	В	1.20		21	1.99	1.65	1.662	60.2	
<b>TP20</b>	3	В	1.00		31	1.86	1.42	1.657	60.4	
<b>TP21</b>	3	В	1.00		55	1.60	1.03	1.153	86.8	





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 ROI: +3533 (0)1 526 7465 Company Number 633786

www.causewaygeotech.com

### 20 April 2022

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 28/03/2022 and 20/04/2022.

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: North Irish Sea Array

### **Report Reference:** Schedule 8

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	14
SOIL	Liquid and Plastic Limits of soil-4 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	8
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	6
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	5
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	2

### SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All subcontracting 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 Eurofins Chemtest Ltd (UKAS 2183)	BRE Test - Suite B		2

	JSE GEO	<b>VAY</b> TECH	Summary of Classification Test Results											
Project No.			Project	Name	1									
21-1	619	0.5			[	N 1	lorth	lrish Se	ea Array			1		_
Hole No.	Ref	Тор	Base	Туре	Soil Description	Dens bulk Mg/m	ity dry n3	W %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
BH09	3	0.30	0.50	в	Brown sandy slightly gravelly silty CLAY.			22.0	81	30	18	12		CL
BH09	5	1.80	2.00	в	Brown sandy slightly gravelly silty CLAY.			14.0	77	25	15	10		CL
BH09	10	3.00		D	Brown sandy slightly gravelly silty CLAY.			8.0						
BH09	6	3.80	4.00	в	Brown sandy gravelly silty CLAY.			11.0	58	25	14	11		CL
BH09	7	4.80	5.00	в	Brown sandy slightly gravelly silty CLAY.			12.0						
BH09	8	5.80	6.00	в	Brown sandy clayey subangular fine to coarse GRAVEL.			6.2	53	24	13	11		CL
BH15	4	0.80	1.00	в	Brown sandy slightly gravelly silty CLAY.			16.0	69	33	18	15		CL
BH15	5	1.80	2.00	в	Greyish brown sandy slightly gravelly silty CLAY.			14.0						
BH15	6	2.80	3.00	в	Greyish brown sandy slightly gravelly silty CLAY.			14.0	70	28	16	12		CL
BH15	7	3.80	4.00	в	Greyish brown sandy slightly gravelly silty CLAY.			16.0						
BH15	8	4.80	5.00	в	Greyish brown sandy slightly gravelly silty CLAY.			15.0	70	27	14	13		CL
BH15	9	5.80	6.00	в	Greyish brown sandy slightly gravelly silty CLAY.			15.0						
All tests perfor	med i	n accord	lance wi	th BS1	377:1990 unless specified	otherwis	е						LAE	3 01R Version 5
Key Density test Linear measurement unless : wd - water displacement					iquid Limit Particle density pt cone unless : sp - small pyknometer as - Casagrande method gj - gas jar				Date Printed 20/04/2022			oved	Ву	
wi-imr	nersion	in water		1pt - si	ngle point test				Step	hen.	Watson	10122		

•	CAL	JSE GEO	<b>VAY</b> TECH	Summary of Classification Test Results												
Project	No.			Project	Name	•										
	21-1	619				I		N	lorth	rish Se	ea Array		1	-		
Hole	No.		Sai	mple	1	Soil Description		Dens bulk	ity dry	W	Passing 425µm	LL	PL	PI	Particle density	Casagrande
		Ref	Тор	Base	Туре			Mg/m	13	%	%	%	%	%	Mg/m3	Classification
В⊦	115	18	6.00	6.45	U	Greyish brown sandy slightly gravelly silty CLAY.	/			14.0	65	28	14	14		CL
BH	115	16	8.00		D Greyish brown sandy slightly gravelly silty CLAY.				15.0							
All tests	s perfor	med i	n accord	lance wit	th BS1	377:1990 unless spec	cified	otherwise	е	_	_	_	_	_	LAE	3 01R Version 5
Key Density test Linear measurement unless :			Liquid 4pt cor	uid Limit Particle density cone unless : sp - small pyknometer			Date Printed 20/04/2022			Appr	oved	By				
wd - water displacement wi - immersion in water					cas - Casagrande method gj - gas jar 1pt - single point test						Stephen Watson					











Stephen.Watson







## 🔅 eurofins

### Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Report No.:	22-12437-1		
Initial Date of Issue:	07-Apr-2022		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan Joe Gervin John Cameron Lucy Newland Martin Gardiner Matthew Gilbert Neil Haggan Paul Dunlop Sean Ross Stephen Franey Stephen Watson Stuart Abraham Thomas McAllister		
Project	21-1619 North Irish Sea Array		
Quotation No.:		Date Received:	01-Apr-2022
Order No.:		Date Instructed:	01-Apr-2022
No. of Samples:	2		
Turnaround (Wkdays):	7	Results Due:	11-Apr-2022
Date Approved:	07-Apr-2022		
Approved By:			
Sont			

**Details:** 

Stuart Henderson, Technical Manager



## 🔅 eurofins

### Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

#### Project: 21-1619 North Irish Sea Array

Client: Causeway Geotech Ltd	Chemtest Job No.:				22-12437	22-12437
Quotation No.:	Chemtest Sample ID.:				1403832	1403833
Order No.:	Client Sample Ref.:				6	17
	Sample Location:				BH09	BH15
	Sample Type:				SOIL	SOIL
	Top Depth (m):				3.8	1.2
		Date Sampled:		31-Mar-2022	31-Mar-2022	
Determinand	Accred.	SOP	Units	LOD		
Moisture	N	2030	%	0.020	13	15
рН	U	2010		4.0	8.8	8.7
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.089	0.023
Sulphate (Total)	U	2430	%	0.010	0.15	0.28
Sulphate (Acid Soluble)	U	2430	%	0.010	0.11	0.013
# Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	рН	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
Т	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis All Asbestos testing is performed at the indicated laboratory Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

#### **Sample Deviation Codes**

- A Date of sampling not supplied
- B Sample age exceeds stability time (sampling to extraction)
- C Sample not received in appropriate containers
- D Broken Container
- E Insufficient Sample (Applies to LOI in Trommel Fines Only)

#### Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt All water samples will be retained for 14 days from the date of receipt Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: customerservices@chemtest.com



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

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### SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

16 September 2022

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 24/08/2022 and 16/09/2022.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd













Project Name: North Irish Sea Array

**Report Reference:** Schedule 12 - 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	13
SOIL	Liquid and Plastic Limits of soil-4 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	13
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	13
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 subcontracting 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 <i>(UKAS 4043)</i>	Thermal Resistivity		0 (7 x ongoing)

	JSE' GEC	WAY DTECH	Summary of Classification Test Results											
Project No.			Project Name											
21-1	619			North Irish Sea Array										
Hole No.		Sai	mple		Specimen Description	Density		W	Passing 425µm	LL	PL	ΡI	Particle density	Casagrande
	Ref	Тор	Base	Туре		Mg/m	13	%	%	%	%	%	Mg/m3	Classification
ST02	4	1.00		в	Brownish grey sandy gravelly silty CLAY.			12.0	65	33	19	14		CL
ST03	3	0.50		в	Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL with cobbles.			9.5	35	36	22	14		CI
ST03	5	1.30		в	Brown sandy slightly gravelly silty CLAY.			17.0	79	36	19	17		CI
ST06	4	1.00		в	Brown sandy gravelly silty CLAY.			11.0	66	33	17	16		CL
ST23	3	0.50		В	Grey slightly sandy slightly silty subangular fine to coarse GRAVEL.			8.0	37	25	16	9		CL
ST23	4	1.00		В	Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL.			8.9	50	36	22	14		СІ
ST24	3	0.50		в	Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL.			6.2	41	27	17	10		CL
ST24	4	1.00		в	Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL.			10.0	37	32	22	10		CL
ST27	5	1.00		в	Brownish grey sandy slightly gravelly silty CLAY.			12.0	64	35	18	17		CL/CI
ST29	3	0.50		В	Grey gravelly clayey fine to coarse SAND.			7.1	33	27	19	8		CL
ST29	5	1.20		В	Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL.			7.5	44	26	19	7		CL
ST31	3	0.50		в	Grey gravelly slightly silty fine to coarse SAND.			4.0	31	33	21	12		CL
All tests perfor	med i	n accord	lance wit	th BS1	377:1990 unless specified	otherwis	e		I			-	LAE	3 01R Version 6
Key Density test Li			Liquid I	uid Limit Particle density			Date Printed			Approved By			¥)€	
Linear measurement unless : wd - water displacement wi - immersion in water				4pt con cas - C 1pt - sin	e unless : sp - sn asagrande method gj - gas ngle point test	nall pyknom s jar	ieter	16/09/2022			Sten	hen	Watson	UKAS TESTING 10122

	WAY DTECH	Summary of Classification Test Results												
Project No.			Project	Name										
21-1	619 I	Sor			[	N   _	lorth	lrish Se	ea Array					
Hole No.	Ref	Тор	Base	Туре	Specimen Description	Dens bulk Mg/m	ity dry 13	W %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
ST31	5	1.20		В	Brown sandy gravelly silty CLAY.			11.0	76	26	14	12		CL
All tests perfo	med i	n accord	lance wit	h BS1	377:1990 unless specified	otherwis	e						LAE	01R Version 6
Key Density test Linear measurement unless : 4 wd - water displacement c			Liquid I 4pt con cas - C	I Limit Particle density one unless : sp - small pyknom Casagrande method gj - gas jar			Date Printed 16/09/2022			Appr	oved	Ву		
wi - im	nersion	in water		1pt - sir	ngle point test						Step	hen.	Watson	10122





LAB 05R - Version 6

Approved

45

38

0.15

0.063

Stephen.Watson





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



Approved

75

72

67

62

52

Mg/m3

2.65

0.425

0.3

0.212

0.15

0.063

Stephen.Watson





LAB 05R - Version 6

Stephen.Watson

Approved













Stephen.Watson

Approved

49

40

0.15

0.063











Approved

Stephen.Watson



# LABORATORY REPORT



4043

### Contract Number: PSL22/5887

Report Date: 26 September 2022

Client's Reference: 21-1619

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

#### For the attention of: Stephen Watson

Date Received:9/9/2022Date Commenced:9/9/2022Date Completed:26/9/2022	Contract Title:	North Irish Sea Array
	Date Received: Date Commenced: Date Completed:	9/9/2022 9/9/2022 26/9/2022

### 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 (Director) R Berriman (Quality Manager) S Royle (Laboratory Manager)

EKT

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

Page 1 of

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster DN4 0AR tel: +44 (0)844 815 6641 fax: +44 (0)844 815 6642 e-mail: rgunson@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
ST03	5	В	1.20		Brown slightly gravelly sandy CLAY.
ST06	5	В	1.20		Brown slightly gravelly very sandy CLAY.
ST23	5	В	1.20		Brown gravelly very sandy CLAY.
ST24	5	В	1.20		Brown slightly gravelly very sandy CLAY.
ST29	5	В	1.20		Brown slightly gravelly very sandy CLAY.
ST31	5	В	1.20		Brown slightly gravelly very sandy CLAY.
ST27		В	1.20		Brown slightly gravelly very sandy CLAY.



# SUMMARY OF THERMAL PROPERTY TESTS

#### In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal	
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	Demoster
Number	Number	Туре	Depth	Depth	%	Mg/m <sup>3</sup>	Mg/m <sup>3</sup>			Remarks
			m	m				W/m K	C.cm/W	
ST03	5	В	1.20		17	2.08	1.78	2.145	46.6	
ST06	5	В	1.20		13	2.11	1.87	2.675	37.4	
ST23	5	В	1.20		15	2.11	1.84	2.506	39.9	
ST24	5	В	1.20		11	2.19	1.99	1.890	52.9	
ST29	5	В	1.20		10	2.20	2.00	3.739	26.7	
ST31	5	В	1.20		12	2.19	1.96	2.402	41.6	
ST27		В	1.20		12	2.02	1.81	2.745	36.4	





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> Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

26 September 2022

Project Name:	North Irish Sea Array
Project No.:	21-1619
Client:	Statkraft
Engineer:	ARUP

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 08/09/2022 and 26/09/2022.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd













Project Name: North Irish Sea Array

**Report Reference:** Schedule 13

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-4 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	2
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 subcontracting 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 <i>(UKAS 4043)</i>	Thermal Resistivity		1

• CA	USE	WAY DTECH	Summary of Classification Test Results											
Project No. 21-	1619		Project Name North Irish Sea Array											
		Sar	nple			Dons	ity	147						
Hole No.	Ref	Тор	Base	Туре	Specimen Description	bulk Mg/m	dry 13	%	425µm	%	%	%	density Mg/m3	Casagrande Classification
SLT02	1	0.70		в	Brown slightly sandy clayey subangular fine to coarse GRAVEL.			7.5	63	35	18	17		CL/CI
SLT02	3	1.40		В	Brown gravelly sandy CLAY.			10.0	49	25	16	9		CL
All tests performed in accordance with BS1377:1990 unless specified otherwise LAB 01R Version 6														
Key Density test Linear measurement unless :			s :	Liquid Limit Particle density 4pt cone unless : sp - small pyknometer			eter	Date Printed 26/09/2022			Appr	Approved By		
wd - water displacement wi - immersion in water				cas - Casagrande method gj - gas jar 1pt - single point test							Step	TESTING 10122		





Stephen.Watson

LAB 05R - Version 6

10122



# LABORATORY REPORT



4043

### Contract Number: PSL22/5888

Report Date: 26 September 2022

Client's Reference: 21-1619

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

#### For the attention of: Stephen Watson

Date Received:9/9/2022Date Commenced:9/9/2022Date Completed:26/9/2022	Contract Title:	North Irish Sea Array
Date Completed. 20/0/2022	Date Received: Date Commenced: Date Completed:	9/9/2022 9/9/2022 26/9/2022

### 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 (Director) R Berriman (Quality Manager) S Royle (Laboratory Manager)

£##

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

Page 1 of

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster DN4 0AR tel: +44 (0)844 815 6641 fax: +44 (0)844 815 6642 e-mail: rgunson@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
SLT02	2	В	1.20		Brown gravelly sandy CLAY.



# **SUMMARY OF THERMAL PROPERTY TESTS**

#### In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal	
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	
Number	Number	Туре	Depth	Depth	%	Mg/m <sup>3</sup>	Mg/m <sup>3</sup>			Remarks
			m	m				W/m K	C.cm/W	
SLT02	2	В	1.20		17	2.09	1.79	1.990	50.3	

