



CAUSEWAY
— GEOTECH

Sampling and Chemical Analysis for Dredging at Port Pier, Inver, Co. Donegal

FACTUAL REPORT

Client: Donegal County Council

Client's Representative: Ayesa

Report No.: 23-2011

Date: 13th March 2024

Status: Final for Issue

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Document Control Sheet

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Document Control Sheet

Report No.:		23-2011			
Project Title:		Sampling and Chemical Analysis for Dredging at Port Pier, Inver, Co. Donegal			
Client:		Donegal County Council			
Client's Representative:		Ayesa			
Revision:	A01	Status:	Final for Issue	Issue Date:	13 th March 2024
Prepared by:		Reviewed by:		Approved by:	
 Neil Patton BSc (Hons)		 Neil Haggan BSc (Hons) MSc FGS		 Darren O'Mahony BSc MSc MIEI EurGeol PGeo	

The works were conducted in accordance with:

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

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2.

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, Code of Practice.

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.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
D	Small disturbed sample.
C	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 $N \times 5 = C_u$ 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.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to 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.

Sampling and Chemical Analysis for Dredging at Port Pier, Inver

1 AUTHORITY

On the instructions of Ayesa Consulting Engineers, (“the Client’s Representative”), acting on the behalf of Donegal County Council (“the Client”), sediment sampling works were undertaken at the above location to provide environmental information for dredging of approaches at Port Pier, Inver, County Donegal

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

All information given in this report is based upon the ground conditions encountered during the sampling works, and on the results of the marine sediment laboratory 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. 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 sampling works, as instructed by the Client’s Representative, included grab samples, environmental sampling, marine sediment sampling, environmental lab testing, specialist marine sediment 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 on foot at low tide in the area of Port Pier, Inver, County Donegal. Port Pier is a small harbour with slipway situated 13km due west of Donegal town and 8.5km due east of Killybegs harbour, in County Donegal on the west coast of Ireland.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted on 29th January 2024, comprised:

- Four grab samples
- subsampling for environmental testing
- subsampling for marine sediment analysis

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

4.2 Grab Samples

The grab samples were taken by a two-man team operating on foot at low tide. The crew had full waders and sampling was performed with a Van Veen grab sampler. The recovered material was then subsampled to be sent to the respective testing houses for the environmental and marine institute analyses.

Prior to subsampling, the material was examined by a qualified and experienced Engineering Geologist, thus enabling the production of a log in accordance with *BS 5930: 2015*.

4.3 Surveying

The as-built exploratory hole positions were surveyed during the sampling operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish Grid) and ground elevation (mCD, Chart Datum) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

5 LABORATORY WORK

5.1 Waste Acceptance Criteria (WAC) testing

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 for Waste Acceptance Criteria (WAC)

Results of environmental laboratory testing are presented in Appendix C.

5.2 Marine Institute Testing

The Grab samples were taken at surface in locations as specified by the Client's Representative for Marine Institute testing.

Table 1 below shows details of samples that were recovered during the siteworks, and the subsequent Marine Institute analytical testing suites applied to each sample.

Table 1: Marine sediment analysis samples and associated Marine Institute testing suites.

Sample Ref.	Marine Institute Analysis Suites										
	Visual Inspection	Total Moisture/Total Solids	Particle Size Distribution (PSD)	Total Organic Carbon (TOC)	Carbonate (%CO ₃)	Metals Suite (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn, Al, Li)	Organochlorines (OP)	Polychlorinated Biphenyls (ICES 7)	Total Hydrocarbon Content (THC)	Organotins (DBT & TBT)	Polycyclic Aromatic Hydrocarbons (PAH)
GS01 (0.00-0.15m)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GS02 (0.00-0.15m)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GS03 (0.00-0.15m)	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-
GS04 (0.00-0.15m)	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-

The complete set of marine sediment analysis test results are presented in Appendix d.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicates superficial deposits at the site comprise marine beach deposits.

6.2 Ground types encountered during sediment sampling works

A summary of the ground types encountered in the exploratory holes is listed below:

- **marine beach deposits:** typically, silty occasionally gravelly sands with sandy gravels closer to shore

7 REFERENCES

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 British Standards Institution.

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

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

BS EN ISO 14688-2:2018: 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.



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APPENDIX A
SITE AND EXPLORATORY HOLE LOCATION PLANS



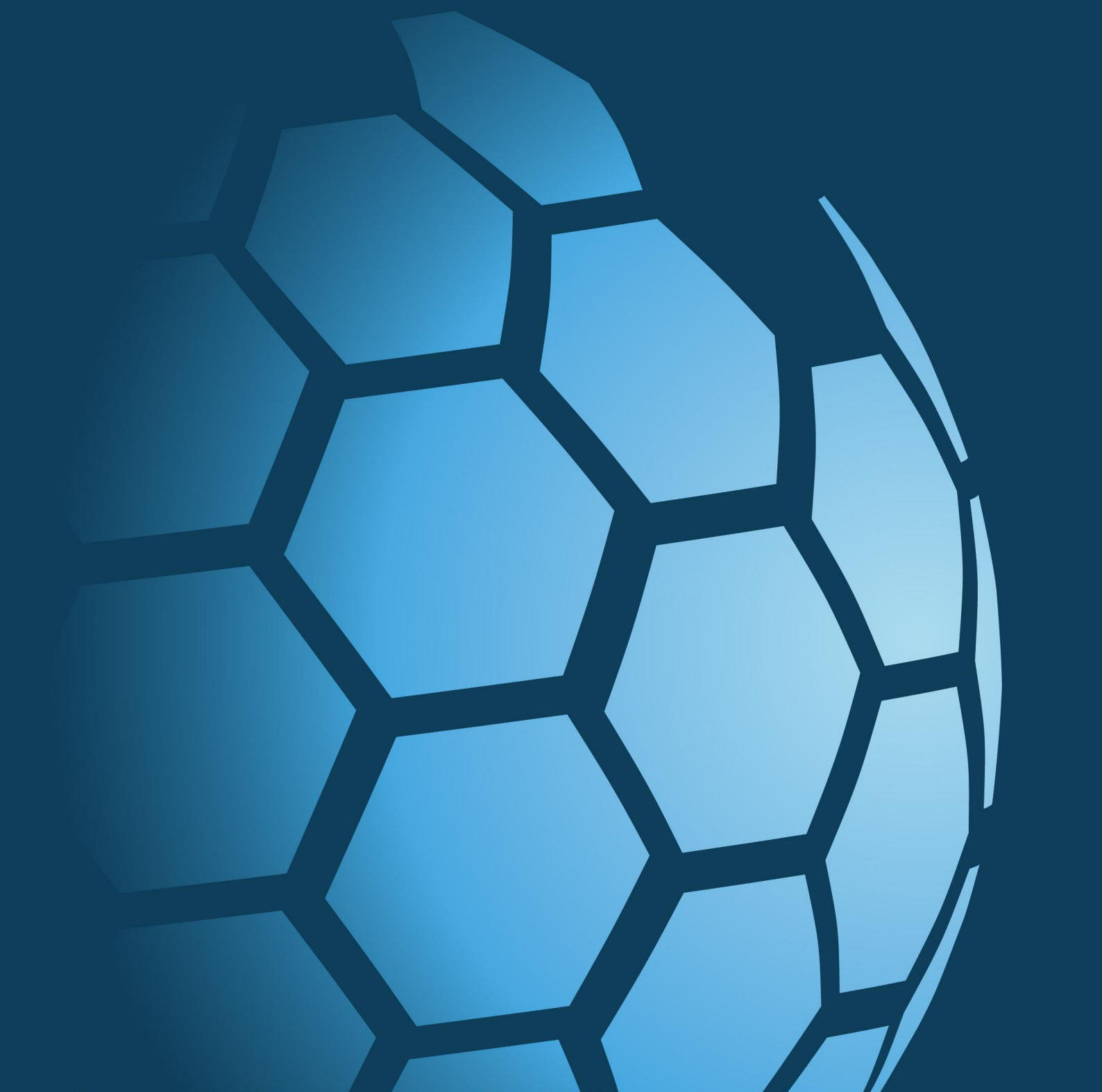


Legend Key  Locations By Type - SL	
Project No.	23-2011
Client	Donegal County Council
Client's Rep	Ayesa
Exploratory Hole Location Plan	
Port Pier Inver Sediment Sampling	
	
Last Revision	05/03/2024
Scale	1:500

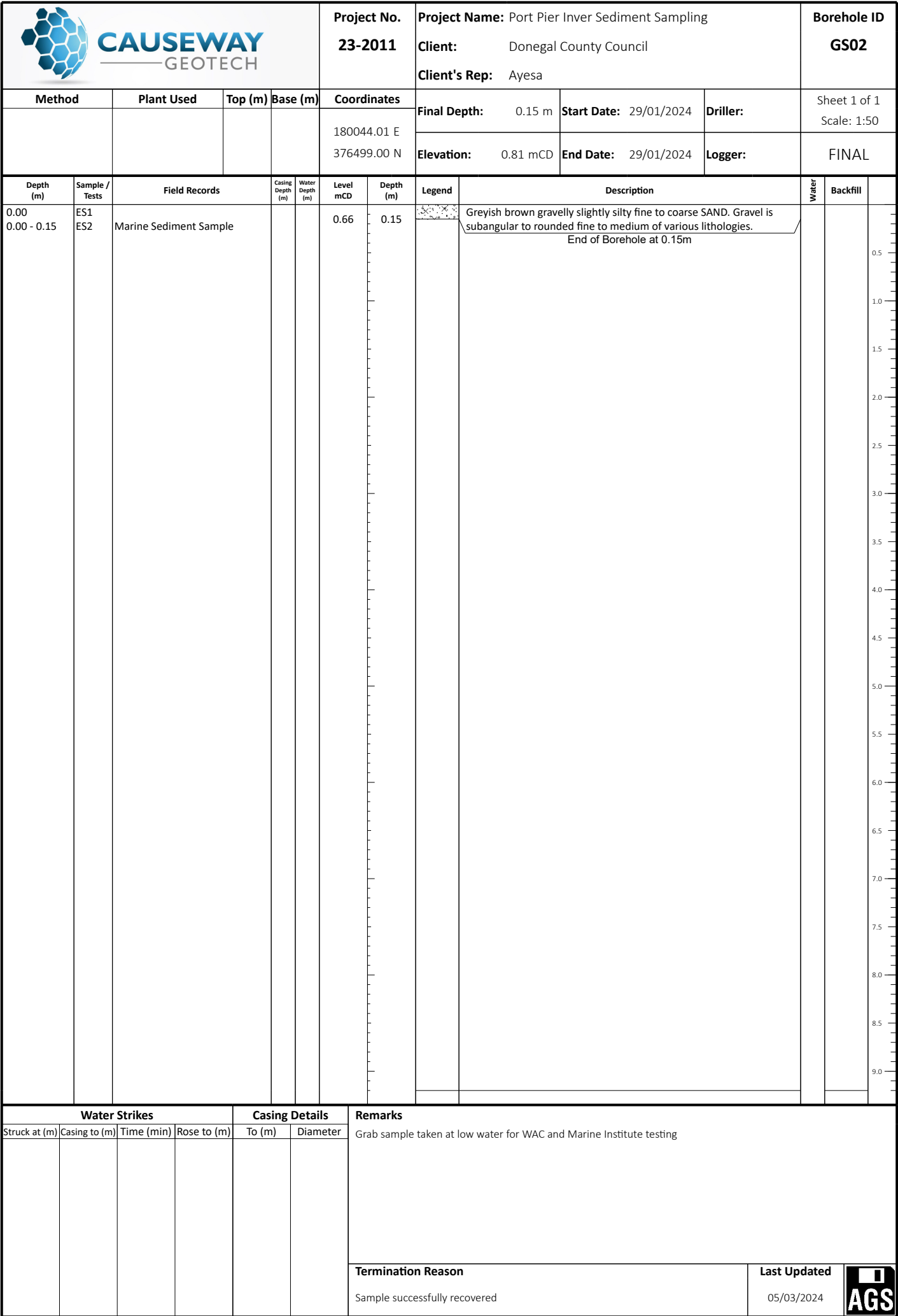


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APPENDIX B
GRAB SAMPLE LOGS



 CAUSEWAY GEOTECH					Project No. 23-2011		Project Name: Port Pier Inver Sediment Sampling Client: Donegal County Council Client's Rep: Ayesa				Borehole ID GS01					
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 0.15 m		Start Date: 29/01/2024		Driller:		Sheet 1 of 1 Scale: 1:50		
						180051.01 E 376525.96 N		Elevation: 2.26 mCD		End Date: 29/01/2024		Logger:		FINAL		
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description				Water	Backfill	
0.00 0.00 - 0.15	ES1 ES2	Marine Sediment Sample					2.11	0.15		Brownish grey very sandy slightly silty subangular to rounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse. End of Borehole at 0.15m						
																0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0
Water Strikes				Casing Details			Remarks									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	Grab sample taken at low water for WAC and Marine Institute testing										
							Termination Reason						Last Updated			
							Sample successfully recovered						05/03/2024			



 CAUSEWAY GEOTECH					Project No. 23-2011		Project Name: Port Pier Inver Sediment Sampling Client: Donegal County Council Client's Rep: Ayesa				Borehole ID GS03					
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 0.15 m		Start Date: 29/01/2024		Driller:		Sheet 1 of 1 Scale: 1:50		
						180082.49 E 376501.76 N		Elevation: -0.13 mCD		End Date: 29/01/2024		Logger:		FINAL		
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description				Water	Backfill	
0.00 0.00 - 0.15	ES1 ES2	Marine Sediment Sample					-0.28	0.15		Brown slightly silty fine to coarse SAND. End of Borehole at 0.15m						
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0																
Water Strikes				Casing Details			Remarks									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	Grab sample taken at low water for WAC and Marine Institute testing										
Termination Reason												Last Updated				
Sample successfully recovered												05/03/2024				



Client's Rep: Ayesa

Borehole ID
GS04

Sheet 1 of 1
Scale: 1:50

FINAL

	Backfil
--	---------

End of Borehole at 0.15m

Grab sample taken at low water for WAC and Marine Institute testing

Sample successfully recovered

05/03/2024





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APPENDIX C
ENVIRONMENTAL LABORATORY TEST RESULTS





Certificate of Analysis

Certificate Number 24-02509

Issued: 12-Feb-24

Client Causeway Geotech
8 Drumahiskey Road
Ballymoney
County Antrim
BT53 7QL

Our Reference 24-02509

Client Reference 23-2011

Order No (not supplied)

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Description 4 Soil samples, 8 Leachate prepared by DETS samples.

Date Received 06-Feb-24

Date Started 06-Feb-24

Date Completed 12-Feb-24

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

A handwritten signature in black ink, appearing to read "K. Bridgewood", written over a light blue horizontal line.

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Lab No	2296312	2296313	2296314	2296315
Sample ID	GS01	GS02	GS03	GS04
Depth				
Other ID	01	01	01	01
Sample Type	ES	ES	ES	ES
Sampling Date	29/01/2024	29/01/2024	29/01/2024	29/01/2024
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	14	3.7	3.2	3.1
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	2.2	3.0	2.4	2.9
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	DETSC 2301#	0.15	mg/kg	33	5.1	4.2	3.9
Copper	DETSC 2301#	0.2	mg/kg	40	5.1	8.4	7.2
Lead	DETSC 2301#	0.3	mg/kg	6.3	4.1	1.8	2.2
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	20	2.6	2.7	2.0
Zinc	DETSC 2301#	1	mg/kg	47	22	18	17
Inorganics							
pH	DETSC 2008#		pH	9.6	8.5	8.4	8.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	1.4	0.4	< 0.1	0.4
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	130	360	310	430
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.05
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	0.03	0.11	0.10	0.20
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	0.06	0.06	0.03	0.13
Aliphatic >EC10-EC12: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC12-EC16: EH_2D_AL	DETSC 3521#	1.2	mg/kg	< 1.20	< 1.20	< 1.20	< 1.20
Aliphatic >EC16-EC21: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC21-EC35: EH_2D_AL	DETSC 3521#	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC35-EC40: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic C5-C44: EH_2D+HS_1D_AL	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00
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 >EC10-EC12: EH_2D_AR	DETSC 3521#	0.9	mg/kg	< 0.90	< 0.90	< 0.90	< 0.90
Aromatic >EC12-EC16: EH_2D_AR	DETSC 3521#	0.5	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50
Aromatic >EC16-EC21: EH_2D_AR	DETSC 3521#	0.6	mg/kg	< 0.60	< 0.60	< 0.60	< 0.60
Aromatic >EC21-EC35: EH_2D_AR	DETSC 3521#	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC35-EC40: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC40-EC44: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic C5-C44: EH_2D+HS_1D_AR	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00
TPH Ali/Aro C5-C44: EH_2D+HS_1D_Total	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00
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

Summary of Chemical Analysis Soil Samples

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Lab No	2296312	2296313	2296314	2296315
Sample ID	GS01	GS02	GS03	GS04
Depth				
Other ID	01	01	01	01
Sample Type	ES	ES	ES	ES
Sampling Date	29/01/2024	29/01/2024	29/01/2024	29/01/2024
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
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	< 0.03	< 0.03	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 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	< 0.03	< 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	< 0.10	< 0.10
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	< 0.3	< 0.3	< 0.3

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Sample Id GS01 01

Sample Numbers 2296312 2296316 2296317

Date Analysed 12/02/2024

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETSC 2084# Total Organic Carbon	%	< 0.5
DETSC 2003# Loss On Ignition	%	0.83
DETSC 3321# BTEX	mg/kg	< 0.04
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10
DETSC 3301 PAHs	mg/kg	< 1.6
DETSC 2008# pH	pH Units	9.6
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETSC 2306 Arsenic as As	3.7	0.51	0.007	0.011
DETSC 2306 Barium as Ba	11	4.2	0.02	< 0.1
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02
DETSC 2306 Chromium as Cr	0.31	< 0.25	< 0.02	< 0.1
DETSC 2306 Copper as Cu	2.4	0.89	0.005	< 0.02
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002
DETSC 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1
DETSC 2306 Lead as Pb	0.24	0.099	< 0.01	< 0.05
DETSC 2306 Antimony as Sb	< 0.17	< 0.17	< 0.01	< 0.05
DETSC 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03
DETSC 2306 Zinc as Zn	2.6	< 1.3	0.005	< 0.01
DETSC 2055 Chloride as Cl	140000	3800	280	278.4
DETSC 2055* Fluoride as F	260	< 100	0.52	0.46
DETSC 2055 Sulphate as SO4	39000	2600	78	< 100
DETSC 2009* Total Dissolved Solids	430000	24000	860	956.6
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETSC 2085 Dissolved Organic Carbon	3900	< 2000	< 10	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information		
DETSC 2008 pH	8.0	8.0
DETSC 2009 Conductivity uS/cm	610.0	34.6
* Temperature*	16.0	16.0

Mass of Sample Kg*	0.130
Mass of dry Sample Kg*	0.125

Stage 1	
Volume of Leachant L2*	0.244
Volume of Eluate VE1*	0.22

Stage 2	
Volume of Leachant L8*	0.997
Volume of Eluate VE2*	0.95

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

* DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Sample Id GS02 01

Sample Numbers 2296313 2296318 2296319

Date Analysed 12/02/2024

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETSC 2084# Total Organic Carbon	%	1.4
DETSC 2003# Loss On Ignition	%	4.5
DETSC 3321# BTEX	mg/kg	< 0.04
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10
DETSC 3301 PAHs	mg/kg	< 1.6
DETSC 2008# pH	pH Units	8.5
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETSC 2306 Arsenic as As	2.7	0.55	0.005	< 0.01
DETSC 2306 Barium as Ba	10	8.1	0.02	< 0.1
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02
DETSC 2306 Chromium as Cr	< 0.25	< 0.25	< 0.02	< 0.1
DETSC 2306 Copper as Cu	2.2	1.1	0.004	< 0.02
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002
DETSC 2306 Molybdenum as Mo	1.2	< 1.1	< 0.02	< 0.1
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1
DETSC 2306 Lead as Pb	< 0.090	0.093	< 0.01	< 0.05
DETSC 2306 Antimony as Sb	< 0.17	< 0.17	< 0.01	< 0.05
DETSC 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03
DETSC 2306 Zinc as Zn	2.8	< 1.3	0.006	< 0.01
DETSC 2055 Chloride as Cl	1200000	36000	2400	2127.2
DETSC 2055* Fluoride as F	< 100	< 100	< 0.02	< 0.1
DETSC 2055 Sulphate as SO4	230000	8500	460	421.3
DETSC 2009* Total Dissolved Solids	3200000	120000	6400	5876.2
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETSC 2085 Dissolved Organic Carbon	2500	< 2000	< 10	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information		
DETSC 2008 pH	7.3	7.6
DETSC 2009 Conductivity uS/cm	4530.0	173.0
* Temperature*	16.0	16.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.112

Stage 1	
Volume of Leachant L2*	0.196
Volume of Eluate VE1*	0.17

Stage 2	
Volume of Leachant L8*	0.896
Volume of Eluate VE2*	0.84

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

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WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Sample Id GS03 01

Sample Numbers 2296314 2296320 2296321

Date Analysed 12/02/2024

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETSC 2084# Total Organic Carbon	%	1.5
DETSC 2003# Loss On Ignition	%	1.7
DETSC 3321# BTEX	mg/kg	< 0.04
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10
DETSC 3301 PAHs	mg/kg	< 1.6
DETSC 2008# pH	pH Units	8.4
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETSC 2306 Arsenic as As	2.6	0.71	0.005	< 0.01
DETSC 2306 Barium as Ba	17	18	0.03	0.18
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02
DETSC 2306 Chromium as Cr	0.48	< 0.25	< 0.02	< 0.1
DETSC 2306 Copper as Cu	3	1.1	0.006	< 0.02
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002
DETSC 2306 Molybdenum as Mo	2	< 1.1	< 0.02	< 0.1
DETSC 2306 Nickel as Ni	0.83	< 0.50	< 0.02	< 0.1
DETSC 2306 Lead as Pb	0.29	0.14	< 0.01	< 0.05
DETSC 2306 Antimony as Sb	< 0.17	< 0.17	< 0.01	< 0.05
DETSC 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03
DETSC 2306 Zinc as Zn	6.8	1.8	0.014	0.025
DETSC 2055 Chloride as Cl	2100000	160000	4200	4425.5
DETSC 2055* Fluoride as F	< 100	< 100	< 0.02	< 0.1
DETSC 2055 Sulphate as SO4	440000	29000	880	888.6
DETSC 2009* Total Dissolved Solids	7100000	450000	14200	14185.3
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETSC 2085 Dissolved Organic Carbon	2600	< 2000	< 10	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information

DETSC 2008 pH	7.4	7.6
DETSC 2009 Conductivity uS/cm	10100.0	638.0
* Temperature*	16.0	16.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.110

Stage 1

Volume of Leachant L2*	0.19
Volume of Eluate VE1*	0.16

Stage 2

Volume of Leachant L8*	0.879
Volume of Eluate VE2*	0.82

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions.
Values are correct at time of issue.

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WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Sample Id GS04 01

Sample Numbers 2296315 2296322 2296323

Date Analysed 12/02/2024

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETSC 2084# Total Organic Carbon	%	2.1
DETSC 2003# Loss On Ignition	%	4.0
DETSC 3321# BTEX	mg/kg	< 0.04
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10
DETSC 3301 PAHs	mg/kg	< 1.6
DETSC 2008# pH	pH Units	8.3
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETSC 2306 Arsenic as As	3.1	0.48	0.006	< 0.01
DETSC 2306 Barium as Ba	17	20	0.03	0.2
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02
DETSC 2306 Chromium as Cr	< 0.25	< 0.25	< 0.02	< 0.1
DETSC 2306 Copper as Cu	2.8	1.1	0.006	< 0.02
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002
DETSC 2306 Molybdenum as Mo	1.6	< 1.1	< 0.02	< 0.1
DETSC 2306 Nickel as Ni	0.54	< 0.50	< 0.02	< 0.1
DETSC 2306 Lead as Pb	0.44	0.097	< 0.01	< 0.05
DETSC 2306 Antimony as Sb	< 0.17	< 0.17	< 0.01	< 0.05
DETSC 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03
DETSC 2306 Zinc as Zn	3.4	< 1.3	0.007	< 0.01
DETSC 2055 Chloride as Cl	2300000	120000	4600	4548.9
DETSC 2055* Fluoride as F	< 100	< 100	< 0.02	< 0.1
DETSC 2055 Sulphate as SO4	420000	28000	840	882.2
DETSC 2009* Total Dissolved Solids	5800000	320000	11600	11618.3
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETSC 2085 Dissolved Organic Carbon	2900	< 2000	< 10	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information		
DETSC 2008 pH	7.4	7.6
DETSC 2009 Conductivity uS/cm	8320.0	458.0
* Temperature*	16.0	16.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.111

Stage 1	
Volume of Leachant L2*	0.192
Volume of Eluate VE1*	0.17

Stage 2	
Volume of Leachant L8*	0.885
Volume of Eluate VE2*	0.83

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

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Summary of Asbestos Analysis Soil Samples

Our Ref 24-02509

Client Ref 23-2011

Contract Title PORT PIER, INVER, SEDIMENT SAMPLING

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2296312	GS01 01	SOIL	NAD	none	Robertas Ciparis
2296313	GS02 01	SOIL	NAD	none	Robertas Ciparis
2296314	GS03 01	SOIL	NAD	none	Robertas Ciparis
2296315	GS04 01	SOIL	NAD	none	Robertas Ciparis

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 24-02509
 Client Ref 23-2011
 Contract PORT PIER, INVER, SEDIMENT SAMPLING

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled				
2296312	GS01 SOIL	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2296313	GS02 SOIL	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2296314	GS03 SOIL	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2296315	GS04 SOIL	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2296316	GS01 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296317	GS01 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296318	GS02 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296319	GS02 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296320	GS03 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296321	GS03 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296322	GS04 LEACHATE	29/01/24		GJ 250ml, GJ 60ml, PT 1L x2		
2296323	GS04 LEACHATE	29/01/24		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

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 >EC10-EC12	EH_2D_AL
Aliphatic >EC12-EC16	EH_2D_AL
Aliphatic >EC16-EC21	EH_2D_AL
Aliphatic >EC21-EC35	EH_2D_AL
Aliphatic >EC35-EC40	EH_2D_AL
Aliphatic >EC40-EC44	EH_2D_AL
Aliphatic C5-C44	EH_2D+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic >EC10-EC12	EH_2D_AR
Aromatic >EC12-EC16	EH_2D_AR
Aromatic >EC16-EC21	EH_2D_AR
Aromatic >EC21-EC35	EH_2D_AR
Aromatic >EC35-EC40	EH_2D_AR
Aromatic >EC40-EC44	EH_2D_AR
Aromatic C5-C44	EH_2D+HS_1D_AR
TPH Ali/Aro C5-C44	EH_2D+HS_1D_Total
TPH (C10-C40)	EH_1D_Total

End of Report



CAUSEWAY
— GEOTECH

APPENDIX D

MARINE SEDIMENT LABORATORY TEST RESULTS



Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02197

Issue Version: 1

Customer: Causeway Geotech Ltd, 8 Drumahiskey Rd, Bendooragh, Balnamore, Ballymoney, BT53 7QL

Customer Reference: Ballymoney - Marine Institute Analysis

Date Sampled: 29-Jan-24

Date Samples Received: 01-Feb-24

Test Report Date: 29-Feb-24

Condition of samples: Cold Satisfactory

Opinions and Interpretations expressed herein are outside the scope of our UKAS accreditation
The results reported relate only to the sample tested
The results apply to the sample as received

JM Colbourne

Authorised by: Jane Colbourne

Position: Customer Service Specialist



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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02197
Issue Version 1
Customer Reference Ballymoney - Marine Institute Analysis

		Method No	SUB_02*
Client Reference:	SOCOTEC Ref:	Matrix	Visual Description
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	Gravelly Sand
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	Sandy Gravel
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	Sand
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	Sand with Shell Fragments and Organic Matter

* See Report Notes

MAR02197

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02197
Issue Version 1
Customer Reference Ballymoney - Marine Institute Analysis

		Units	%	%	%	%	%	Mg/m3
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N
Client Reference:	SOCOTEC Ref:	Matrix	Total Moisture @ 120°C	Total Solids	Gravel (>2mm)	Sand (63-2000 µm)	Silt (<63 µm)	Particle Density
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	10.0	90.0	77.45	21.41	1.150	2.68
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	28.9	71.1	11.70	84.46	3.850	2.71
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	27.6	72.4	0.000	97.77	2.230	2.73
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	29.4	70.6	0.000	97.62	2.380	2.64
Reference Material (% Recovery)			NA	NA	NA	NA	NA	NA
QC Blank			NA	NA	NA	NA	NA	NA

* See Report Notes

MAR02197

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02197
Issue Version 1
Customer Reference Ballymoney - Marine Institute Analysis

		Units	% m/m	%m/m
		Method No	WSLM59*	ANC*
		Limit of Detection	0.02	0.12
		Accreditation	UKAS	No
Client Reference:	SOCOTEC Ref:	Matrix	TOC	Carbonate Equivalent (%CO3)
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	0.22	9.84
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	0.24	16.3
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	0.25	13.4
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	0.32	17.5
Reference Material (% Recovery)			94	100
QC Blank			<0.02	NA

* See Report Notes

MAR02197

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Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02197
Issue Version 1
Customer Reference Ballymoney - Marine Institute Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*
		Limit of Detection	0.14	0.03	1	0.7	0.6	0.01	0.4
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	SOCOTEC Ref:	Matrix	Arsenic as As	Cadmium as Cd	Chromium as Cr	Copper as Cu	Lead as Pb	Mercury as Hg	Nickel as Ni
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	9.2	0.09	41.8	23.6	11.8	<0.01	20.0
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	3.8	0.06	28.3	4.3	8.3	<0.01	6.9
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	4.6	0.13	58.3	5.8	10.5	<0.01	10.7
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	4.0	0.05	25.6	4.0	7.7	<0.01	7.6
Certified Reference Material 2702 (Measured Value)			39.95	0.796	288	105.2	107.8	0.590	61.18
Certified Reference Material 2702 (Certified Value)			45.3	0.817	352	117.7	132.8	0.447	75.4
Certified Reference Material 2702 (% Recovery)			85	78	88	91	83	127	88
QC Blank			<0.14	<0.03	<1	<0.7	<0.6	<0.01	<0.4

* See Report Notes

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Test Report ID MAR02197
Issue Version 1
Customer Reference Ballymoney - Marine Institute Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ICPMS-MWSED*	ICPOES-MWSED*	ICPOES-MWSED*
		Limit of Detection	3.5	1750	2
		Accreditation	UKAS	UKAS	N
Client Reference:	SOCOTEC Ref:	Matrix	Zinc as Zn	Aluminium as Al	Lithium as Li
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	51.8	47300	31.0
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	25.9	24800	10.8
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	51.3	34400	14.0
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	22.8	25000	12.0
Certified Reference Material 2702 (Measured Value)			431.3	87104	83.7
Certified Reference Material 2702 (Certified Value)			485.3	84000	78.2
Certified Reference Material 2702 (% Recovery)			89	94	85
QC Blank			<3.5	<1750	<2

* See Report Notes

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		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	SOCOTEC Ref:	Matrix	Dibutyltin (DBT)	Tributyltin (TBT)
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	<1	<1
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	<1	<1
Certified Reference Material BCR-646 (Measured Value)			606	330
Certified Reference Material BCR-646 (Certified Value)			770	480
Certified Reference Material BCR-646 (% Recovery)			79	69
QC Blank			<1	<1

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		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	SOCOTEC Ref:	Matrix	ACENAPTH	ACENAPHY	ANTHRACN	BAA	BAP	BBF
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	2.98	3.32	<1	<1	<1	3.38
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	1.85	1.87	<1	<1	<1	2.26
Certified Reference Material QPH118MS (Measured Value)			10.3	7.59	22.1	92.5	98.5	147
Certified Reference Material QPH118MS (Certified Value)			10.7	6.96	25.7	125	136	170
Certified Reference Material QPH118MS (% Recovery)			96	109	86	74	72	86
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
 ~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.
 As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.
 * See Report Notes

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		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	N*
Client Reference:	SOCOTEC Ref:	Matrix	BENZGHIP	BKF*	CHRYSENE*	DBENZAH	FLUORANT	FLUORENE
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	1.64	<1	5.73	<1	1.35	8.09
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	<1	<1	3.47	<1	<1	5.16
Certified Reference Material QPH118MS (Measured Value)			119	104	116	27.9	193	11.0
Certified Reference Material QPH118MS (Certified Value)			127	112	121	28.9	255	14.4
Certified Reference Material QPH118MS (% Recovery)			94	93	96	96	76	76
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	SOCOTEC Ref:	Matrix	INDPYR	NAPTH	PHENANT	PYRENE	THC
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	<1	8.27	19.9	2.10	9770
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	<1	4.08	11.3	1.84	7430
Certified Reference Material QPH118MS (Measured Value)			114	25.0	112	171	1456
Certified Reference Material QPH118MS (Certified Value)			132	33.6	143	214	1400
Certified Reference Material QPH118MS (% Recovery)			86	74	78	80	104~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries

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		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	SOCOTEC Ref:	Matrix	PCB28	PCB52	PCB101	PCB118	PCB138	PCB153	PCB180
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material Nist 1941b (Measured Value)			3.46	5.57	4.84	4.83	3.51	5.54	3.07
Certified Reference Material Nist 1941b (Certified Value)			4.52	5.24	5.11	4.23	3.60	5.47	3.24
Certified Reference Material Nist 1941b (% Recovery)			77	106	95	114	98	101	95
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries
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		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	N*	UKAS
Client Reference:	SOCOTEC Ref:	Matrix	AHCH	BHCH	GHCH	DIELDRIN	HCB	DDE	DDT	DDD
GS01 - ES02 (0.00-0.15m)	MAR02197.001	Sediment	<0.1	<0.1	<0.1	0.21	<0.1	<0.1	0.04	<0.1
GS02 - ES02 (0.00-0.15m)	MAR02197.002	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
GS03 - ES02 (0.00-0.15m)	MAR02197.003	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.03	<0.1
GS04 - ES02 (0.00-0.15m)	MAR02197.004	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.21	<0.1
Certified Reference Material Nist 1941b (Measured Value)			36.2	26.7	26.1	37.7	6.47	3.12	1.86	4.99
Certified Reference Material Nist 1941b (Certified Value)			40.0	40.0	40.0	40.0	5.83	3.22	1.12	4.66
Certified Reference Material Nist 1941b (% Recovery)			91~	67~	65~	94~	111	97	166	107
QC Blank			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

For full analyte name see method summaries
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REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR02197.001-004	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ANC*	MAR02197.001-004	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMS-MWSED*	MAR02197.001-004	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPOES-MWSED*	MAR02197.001-004	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR02197.001-004	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR02197.001-004	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/302	MAR02197.001-002	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected. However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (DDT) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02197.001-002	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected. However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (FLUORENE) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02197.001-002	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene). This should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

Deviation Code	Deviation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Sample Contaminated through Damaged Packaging	N/A	N/A
D3	Sample Contaminated through Sampling	N/A	N/A
D4	Inappropriate Container/Packaging	N/A	N/A
D5	Damaged in Transit	N/A	N/A
D6	Insufficient Quantity of Sample	N/A	N/A
D7	Inappropriate Headspace	N/A	N/A
D8	Retained at Incorrect Temperature	N/A	N/A
D9	Lack of Date & Time of Sampling	N/A	N/A
D10	Insufficient Sample Details	N/A	N/A
D11	Sample integrity compromised or not suitable for analysis	N/A	N/A

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Method	Sample and Fraction Size	Method Summary
Total Solids	Wet Sediment	Calculation (100%-Moisture Content). Moisture content determined by drying a portion of the sample at 120°C to constant weight.
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air dried and sieved to <2mm	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Carbonate	Air dried and sieved to <2mm	Quantitative digestion with Hydrochloric Acid back titration with 1M Sodium Hydroxide to pH 7
Metals	Air dried and sieved to <2mm	Microwave assisted HF/Boric extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Solvent extraction and clean up followed by GC-FID analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

Analyte Definitions					
Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorocyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorocyclohexane
BAA	Benzo[a]anthracene	DBENZA	Dibenzo[ah]anthracene	GHCH	gamma-Hexachlorocyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HC	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	DDD	p,p'-Dichlorodiphenyldichloroethane
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	DDE	p,p'-Dichlorodiphenyldichloroethylene
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	DDT	p,p'-Dichlorodiphenyltrichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		

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