Iarnród Éireann
Irish Rail

Rosslare ORE Hub

EIAR Technical Appendices

Technical Appendix 7:

Soils, Geology, Hydrogeology and Contamination

Appendix C: Causeway Factual Report

venterra | GDG GAVIN & DOHERTY GEOSOLUTIONS | NICHOLAS O'DWYER an RSK company | Co-funded by the European Union

Rosslare Europort Offshore Renewable Energy Hub – Marine Site Investigation

Client:	Iarnród Éireann (Irish Rail)
Client's Representative:	Gavin and Doherty Geosolutions Ltd
Report No.:	23-0585
Date:	5th August 2024
Status:	Final for issue

Causeway Geotech Ltd
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

Registered in Northern Ireland. Company Number: NI610766
Approved: ISO 9001 • ISO 14001 • OHSAS 18001

CONTENTS

Document Control Sheet

Note on: Methods of describing soils and rocks & abbreviations used on exploratory hole logs

1 AUTHORITY 5

2 SCOPE 5

3 DESCRIPTION OF SITE 5

4 SITE OPERATIONS 6
4.1 Summary of site works 6
4.2 Marine Plant 6
4.3 Simultaneous Operations 7
4.4 Boreholes 7
4.4.1 Sonic drilled boreholes 7
4.4.2 Sonic drilled boreholes with rotary follow-on drilling 8
4.5 Standpipe installations 8
4.6 Cone penetrometer tests 9
4.6.1 Cone Penetration Tests with sonic/rotary follow-on drilling 9
4.6.2 Cone Penetration Tests with sonic drill outs 9
4.7 Vibro-cores 10
4.8 Grab Samples 10
4.9 Groundwater and ground gas monitoring 10
4.10 Towed geophysical surveying 10
4.11 Surveying 11

5 LABORATORY WORK 11
5.1 Geotechnical laboratory testing of soils 11
5.2 Geotechnical laboratory testing of rock 12
5.3 Environmental Laboratory Testing of Soil 12
5.4 Marine Sediment Analysis – Pre-Disposal Dredge Sampling 13

6 GROUND CONDITIONS 14
6.1 General geology of the area 14
6.2 Ground types encountered during investigation of the site 14
6.3 Groundwater 15

7 REFERENCES 15

APPENDICES

Appendix A	Site and exploratory hole location plans
Appendix B	Borehole logs
Appendix C	Core photographs
Appendix D	Cone penetration test logs
Appendix E	Vibrocore logs
Appendix F	Grab sample logs
Appendix G	Geotechnical laboratory test results
Appendix H	Environmental laboratory test results
Appendix I	Marine sediment laboratory test results
Appendix J	Cone penetrometer test report
Appendix K	Towed geophysics survey report
Appendix L	Calibration certificates

Document Control Sheet

Report No.:		23-0585			
Project Title:		Rosslare Europort Offshore Renewable Energy Hub – Marine Site Investigation			
Client:		Iarnród Éireann (Irish Rail)			
Client's Representative:		Gavin and Doherty Geosolutions Ltd			
Revision:	A02	**Status:**	Final for issue	**Issue Date:**	5th August 2024
Prepared by:		**Reviewed by:**		**Approved by:**	
Neil Patton BSc		Neil Haggan BSc (Hons) MSc FGS		Darren O'Mahony BSc MSc MIEI EurGeol PGeo	

The works were conducted in accordance with:

UK Specification for Ground Investigation 3rd Edition, published by ICE Publishing (2022)

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

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

Laboratory testing was conducted in accordance with:

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

METHODS OF DESCRIBING SOILS AND ROCKS

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

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
SB	Sonic 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 Nx5=Cu is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	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.

Rosslare Europort Offshore Renewable Energy Hub

1 AUTHORITY

On the instructions of Gavin and Doherty Geosolutions Ltd Consulting Engineers, ("the Client's Representative"), acting on the behalf of Iarnród Éireann (Irish Rail) ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed new offshore renewable energy hub development within the boundary of Rosslare Europort.

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

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

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

2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, Cone Penetration Tests (CPT's), vibrocores, grab samples, towed geophysical survey, soil and rock core sampling, in-situ and laboratory testing, and the preparation of a factual report on the findings.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted in the operational port of Rosslare and the surrounding nearshore waters. The land-based boreholes were completed in an area adjacent to the port at the top of the rock armour. Some land locations fell within an active construction site being operated by John Paul Construction.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 19th September and 21st May 2024, comprised:

- Towed geophysical surveys in advance of the intrusive works (note Boomer survey was post works)
  - Multibeam Echosounder (MBES)
  - Side Scan Sonar (SSS)
  - Towed Magnetometer (MAG)
  - Sub Bottom Profiler including Boomer (SBP)
- Thirty overwater boreholes
  - Five boreholes by sonic drilling methods
  - Twenty-five boreholes by sonic drilling methods extended by rotary follow-on drilling
- Twelve Cone Penetration Tests (CPTs) with sonic/rotary core follow-on.
- Eighteen Cone Penetration Tests (CPTs)
- Four Cone Penetration Tests (CPTs) with drill outs
- Three land-based boreholes by sonic drilling methods extended by rotary follow-on drilling
- a standpipe installation in one borehole
- Fifty-nine vibrocores
- Five grab samples

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

4.2 Marine Plant

The Causeway Giant 2 (CG2) jack-up barge was deployed for all overwater testing locations. The CG2 is a Ravestein RCP250 modular jack-up barge in a fifteen-pontoon configuration joined and secured by a simple pinning system; deck size for CG2 on this project was 17m x 24m. The CG2 sits on four 36m legs with associated hydraulic rams and operated in jack-up mode only.

The overwater boreholes/CPTs were sunk through an integral moonpool through one of the pontoons which make up the main deck of the jack-up barge.

Atlantic Towage and Marine Ltd provided the marine support vessels (Ocean Battler and Ocean Supporter) for all barge moves and supply/equipment transfers, and provided CTVs (Ocean Clipper and Ocean Quest) to assist with all crew transfers.

Grab samples and vibrocores were carried out using the Hi-Ab deck crane on board the Ocean Supporter multi-cat vessel.

4.3 Simultaneous Operations

A number of the proposed locations lay within the active shipping areas and their various approaches. In order to safely complete the works in these areas, close cooperation was required with port operations to enable suitable working windows in the shipping schedules to be utilised.

Unfortunately, not all locations could be completed to their scheduled depths due to the time constraints of getting the marine plant on and off each location before the next scheduled vessel arrival/departure. In total there were seven borehole and four CPT locations which were terminated shy of their target depths. Details of these are included in the relevant sections below.

4.4 Boreholes

A total of thirty-three boreholes were put down in a minimum diameter of 150mm through soils and rock strata to their completion depths using both Fraste CRS-XL140 Duo and Fraste CRS-XL170 Duo rotosonic rubber-tracked drilling rigs. The borehole logs state the methodology and plant used for each location, as well as the appropriate depth ranges.

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

4.4.1 Sonic drilled boreholes

Five boreholes (M-BH21, M-BH31, M-BH32, M-BH35, and M-CPT32) were put to their completion by sonic drilling techniques only. The boreholes were completed using Fraste CRS XL Duo rubber-tracked sonic drilling rigs.

Fully cased sonic drilling techniques were employed to advance the boreholes of nominal 180mm diameter to a specific depth. Four of these boreholes were terminated early due to their location within the shipping area and subsequent insufficient working window (M-BH21, M-BH31, M-BH32, and M-BH35).

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

The disturbed sonic samples were placed in a rigid core liner in single channel core boxes. They were then photographed and examined by a qualified and experienced Engineering Geologist, enabling the production of an engineering log in accordance with BS 5930: 2015: Code of practice for ground investigations.

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

4.4.2 Sonic drilled boreholes with rotary follow-on drilling

Twenty-eight boreholes (L-BH01, L-BH03, L-BH04, M-BH02, M-BH06, M-BH07, M-BH08, M-BH11 – M-BH22, M-BH25, M-BH27 – M-BH30, M-BH32, M-BH34, M-BH36, M-BH37, M-BH39A, M-BH40, and M-CPT32) were put to their completion by sonic drilling techniques with rotary follow-on in suitable overburden strata and rockhead. The boreholes were completed using both Fraste CRS-XL140 Duo and Fraste CRS-XL170 Duo rubber-tracked roto-sonic drilling rigs.

Four of these boreholes were terminated early due to their location within the shipping area and subsequent insufficient working window (M-BH34, M-BH37, and M-BH40).

For the three land-based boreholes inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions. Fully cased sonic drilling techniques were employed to advance the boreholes of nominal 180mm diameter to a specific depth after which Geobore-S coring was undertaken with core recovery in overburden strata and rockhead.

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

The disturbed sonic samples were placed in a rigid core liner in single channel core boxes. Where coring was carried out within overburden and bedrock strata, Geobore S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel core boxes. The core boxes (both sonic and rotary core runs) were then photographed and examined by a qualified and experienced Engineering Geologist, enabling the production of an engineering log in accordance with *BS 5930: 2015+A1:2020: Code of practice for ground investigations*.

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

4.5 Standpipe installations

A groundwater monitoring standpipe was installed in borehole L-BH01.

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

4.6 Cone penetrometer tests

Eighteen cone penetration tests (M-CPT06 – M-CPT08, M-CPT13, M-CPT14, M-CPT16 – M-CPT20, M-CPT22, M-CPT25A, M-CPT27, M-CPT35, M-CPT37, M-CPT40, M-CPT21_BH, and M-CPT39_BH) were carried out using the Eijkelkamp Drill'n CPT module in conjunction with the Fraste CRS-XL170 Duo rubber-tracked sonic drilling rig.

Four of these cone penetration tests were terminated early due to their location within the shipping area and subsequent insufficient working window (M-CPT06, M-CPT25A, M-CPT40, and M-CPT21_BH).

A 15cm^2 digital subtraction cone from Hottinger Baldwin Messtechnik GmbH was used throughout all CPT operations on this project. These eighteen CPT-only locations were pushed to refusal, at which point the test was terminated and the rods recovered to deck.

The processed CPT plots for the relevant sections of these exploratory holes are presented within the CPT Report in Appendix J. The cone penetration logs are presented in Appendix D

4.6.1 Cone Penetration Tests with sonic/rotary follow-on drilling

Twelve CPTs (M-BH01, M-BH03, M-BH04, M-BH05, M-BH09, M-BH10, M-BH23, M-BH24, M-BH26, M-BH33, M-BH38, and M-BH41) were completed using the Eijkelkamp Drill'n CPT module in conjunction with the Fraste CRS XL170 Duo rubber-tracked sonic drilling rig. Following CPT refusal, the locations were advanced to scheduled depths by a combination of sonic drilling with rotary follow-on coring in suitable overburden material.

The processed CPT plots for the relevant sections of these exploratory holes are presented within the CPT Report in Appendix J. The follow-on borehole logs are presented in Appendix B with associated core photographs in Appendix C.

4.6.2 Cone Penetration Tests with sonic drill outs

Four CPTs (M-CPT02, M-CPT11, M-CPT12, and M-CPT31) were completed using the Eijkelkamp Drill'n CPT module in conjunction with the Fraste CRS XL170 Duo rubber-tracked sonic drilling rig. Following CPT refusal, the locations were advanced to either allow the CPT push to be advanced beyond an obstruction, or else to confirm the CPT refusal material.

The processed CPT plots for the relevant sections of these exploratory holes are presented within the CPT Report in Appendix J. The cone penetration logs are presented in Appendix D with associated drill out material photographs in Appendix C.

4.7 Vibro-cores

Fifty-nine Vibrocore samples (M-VC01 to M-VC 24 and M-VC26 to M-VC60) were carried out in Rosslare Harbour. Fourteen vibrocores refused on three attempts at the surface, thirty-one vibrocores met refusal on soft to stiff clay from depths of 0.35m (M-VC46) to 3.10m (M-VC09), eight vibrocores refused on sand from depths of 1.10m (M-VC59) to 2.10m (M-VC34), six vibrocores met refusal on gravel from depths of 0.50m (M-VC19) to 1.50m (M-VC37).

The vibrocore sampling was completed using a Geocorer 6000 system deployed from the deck of the Ocean Supporter. Each Vibrocore sample tube was driven into the sediment by the vibrahead and subsequently recovered and examined by a qualified and experienced Engineering Geologist, enabling the production of an engineering log in accordance with BS 5930: 2015: Code for practice of ground investigations.

Appendix E presents the Vibrocore logs.

4.8 Grab Samples

Five grab samples (GS01 to GS05) using Van Veen grab sampler were carried out in the Small Boat Harbour to the west of Rosslare Europort to provide additional material for Marine Institute testing.

Appendix F presents the grab sample logs.

4.9 Groundwater and ground gas monitoring

Following completion of site works, groundwater monitoring was conducted over two monitoring rounds. Ground water monitoring was carried out using a water interface probe.

4.10 Towed geophysical surveying

Hydromaster Limited were contracted to carry out over water geophysical surveys in advance of the intrusive works programme. The surveys consisted of multi beam echosounder (MBES), side scan sonar (SSS), towed magnetometer (MAG), and sub bottom profiler (SBP). The surveys were required across the marine works areas as advised by the Client's Representative.

The preliminary aim of the surveys was to allow ADCO to clear the proposed intrusive works locations for shallow archaeology in advance of the jack-up barge arriving.

The towed surveys were completed over two visits, the first from 19th – 24th September 2023, the second on the 21st May 2024.

The survey report is presented for review in Appendix K with all electronic files transferred to the Client as required.

4.11 Surveying

The as-built exploratory hole positions were surveyed throughout the marine works programme by Site Engineers from Causeway Geotech Limited. Surveying was carried out using a Trimble R10 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (IRENET95) and ground elevation (Rosslare Chart Datum, 0.00mCD = -1.69mOD Malin Head) at each location are recorded on the individual exploratory hole logs. The exploratory hole location plan presented in Appendix A shows these as-built positions, all coordinates and levels are noted on the exploratory hole logs.

5 LABORATORY WORK

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

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests, density by linear measurement, particle density by gas jar, and particle size distribution analysis.
- **compressibility:** one dimensional consolidation (oedometer)
- **shear strength** (total stress): laboratory vane tests, unconsolidated undrained triaxial tests
- **shear strength** (effective stress): consolidated undrained triaxial tests (single and multi-stage)
- **direct shear:** small shear box tests
- **compaction related:** dry density/moisture content relationship (4.5kg and vibrating rammers), Moisture Condition Value (MCV), MCV at natural moisture content, California bearing ratio tests (recompacted disturbed sample)
- **soil chemistry:** pH, water-soluble sulphate content, water-soluble chloride content, organic matter content.

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

The test results are presented in Appendix G.

5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- saturation water content of rock
- point load index
- uniaxial compressive strength (UCS) tests
- Schmidt rebound hardness test

Table 1: Summary of rock testing and testing standards

Test	Test carried out in accordance with
Saturation water content of rock	BS1377-2 :2022
Point load index	ISRM (2007)
Uniaxial compression strength tests	ASTM D7012 - 23
Schmidt rebound hardness test	BS 1881-202

Due to the nature of the bedrock across the site (poor quality, low strength, weathered, fractured) it was not suitable for a lot of the proposed rock testing scheduled by the Client's Representative. There were many Uniaxial Compressive Strength (UCS) tests and some point load tests for which a suitable test specimen could not be obtained; the core would break up during attempted subsampling or the subsequent sample preparation. In some cases where the weathered mudstone was behaving more as a cohesive soil, alternate testing in the form of Schmidt rebound testing was explored to obtain a corresponding UCS value.

The test results are presented in Appendix G. All test restrictions are included in Appendix G at the end of the relevant lab test report.

5.3 Environmental Laboratory Testing of Soil

Environmental testing, as specified by the Client's Representative, was conducted on selected environmental soil samples by Derwentside Environmental Testing Services in Consett, Durham.
This included testing for a range of determinants, including:

- Metals (Sb, As, Be, B, Cd, Cr [III], Cr [VI], Cu, Pb, Hg, Mo, Ni, Se, V, Zn)
- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)

- BTEX and MTBE compounds
- Phenol (monohydric)
- Organic matter
- Cyanides (total, free)
- Thiocyanate
- Asbestos screen
- Sulphate as SO_4, Sulphide, Chloride,
- Orthophosphate as P
- Ammoniacal Nitrogen as NH_3, Nitrate as NO_3, Nitrite as NO_2
- pH, acid/alkali reserve

Results of environmental laboratory testing are presented in Appendix H.

5.4 Marine Sediment Analysis – Pre-Disposal Dredge Sampling

In addition to geotechnical testing conducted on soils, marine sediment samples were selected at specified vibrocore and borehole locations for chemical testing relating to disposal at sea parameters.

Samples were recovered at each location at previously advised depths for testing of:

- Moisture Content and Total Solids
- Particle Size Analysis (PSA)
- Particle Density/Specific Gravity
- Organic Matter (TOC)
- Carbonate
- Metals (Al, As, Cd, Cr, Cu, Hg, Li, Ni, Pb, Zn)
- Dibutyltin (DBT) and Tributyltin (TBT)
- Polycyclic Aromatic Hydrocarbons (EPA16)
- Total Hydrocarbon Content (THC)
- Polychlorinated Biphenyls (PCB – ICES7)
- Organochlorine Pesticides

Further testing was requested to cover EPA radiological testing. This was completed on five selected composite samples at SOCOTEC's Didcot nuclear laboratory for the following advised determinands:

- Gamma Spectrometry
- Extended Gamma Suite to include K-40, I-131, C-134, C-137, Am-241, Ra-226, Ra-228

Table 2 on the following page indicates the chosen locations for the composite samples as advised by the Client's Representative.

Table 2: Details of locations for the composite radiological testing samples

Composite Sample no.	Exploratory Hole Locations
RAD 1 (ES101)	M-VC01, M-VC02, M-VC05, M-VC09
RAD 2 (ES102)	M-VC03, M-VC04, M-VC08, M-VC11
RAD 3 (ES103)	M-VC34, M-VC35, M-VC42, M-VC48, M-VC56
RAD 4 (ES104)	M-VC28, M-VC30, M-VC31, M-VC32, M-VC33
RAD 5 (ES105)	M-VC37, M-VC39, M-VC40, M-VC45

The dredge analysis and radiological test results are included in Appendix I.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise alluvium and glacial till. These deposits are underlain by slate, siltstones and sandstones of the Ballybro Formation, mudstones and siltstones of the Milltown Formation, conglomerates and sandstones of the Grahormack Formation, and finally amphibolites and minor schists of the Greenore Point Group.

6.2 Ground types encountered during investigation of the site

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

- **Made Ground (fill):** reworked/imported sandy gravel and cobble fill was encountered in the land-based boreholes; extending to a maximum depth of with fragments of concrete and brick extending to a depth of 7.50m below bed (-2.71mCD) in L-BH03.

- **Alluvium deposits:** typically, very soft to soft silts and clays, often sandy, also encountered as very loose to loose silty/clayey sands and occasional gravels.

- **Glacial Till:** typically, sandy gravelly clays, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth. Interbeds of granular material are also encountered consisting of medium dense gravelly sands and sandy gravels with fines content and occasional cobbles.

- **Bedrock (Mudstone, Sandstone, Mylonite, Schist, Amphibolite, Gneiss and Dolerite):** Rockhead was encountered at depths ranging from 0.20m below bed (-4.00mCD) in M-BH09 to 11.50m below bed (-16.40mCD) in borehole M-BH01.

6.3 Groundwater

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

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

Subsequent monitoring of the standpipe installation in L-BH01 recorded water levels as shown in Table 3 below.

Table 3: Groundwater monitoring

Date	Time	L-BH01	L-BH01
		Water level mbgl (base of install)	Water level mCD (base of install)
05/03/2024	15:40	4.50m (10.50m)	+1.60mCD (-4.40mCD)
21/03/2024	12:50	4.30m (10.50m)	+1.80mCD (-4.40mCD)

Continued monitoring of the installed standpipe will give an indication of the seasonal variation in groundwater level which should be factored into design considerations.

7 REFERENCES

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

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

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

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

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

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

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

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

CAUSEWAY GEOTECH

APPENDIX A

SITE AND EXPLORATORY HOLE LOCATION PLANS

Legend Key

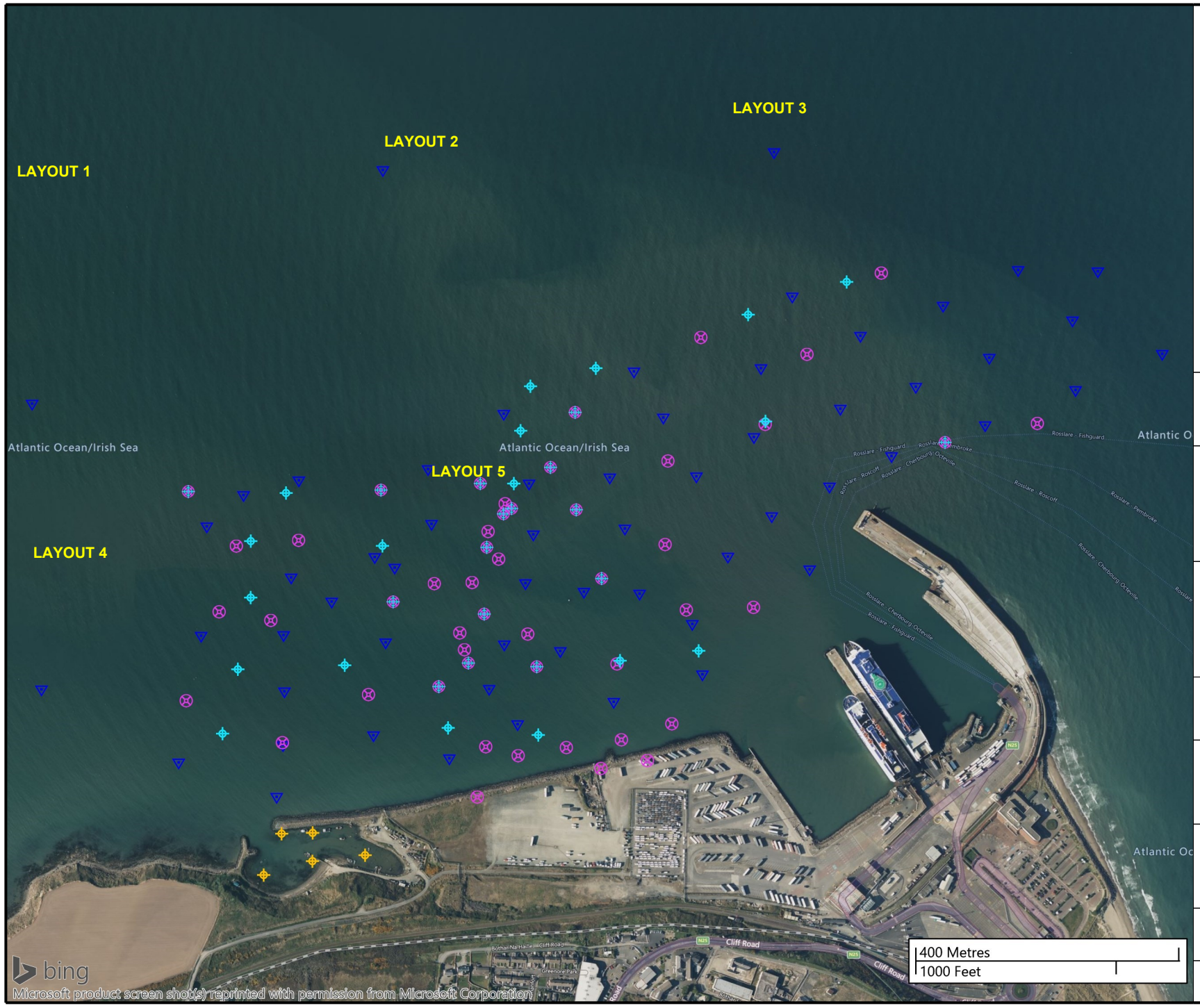
Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Site Location Plan

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:75000



Legend Key

- Locations By Type - CPT
- Locations By Type - CPT+SNC
- Locations By Type - GS
- Locations By Type - SNC
- Locations By Type - VC

Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Exploratory Hole Layout Overview

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:8000

Legend Key

- Cone Penetration Test - CPT
- CPT/Sonic/Rotary - CPT+SNC
- Grab Samples - GS
- Sonic/Rotary Drilling - SNC
- Vibrocores - VC

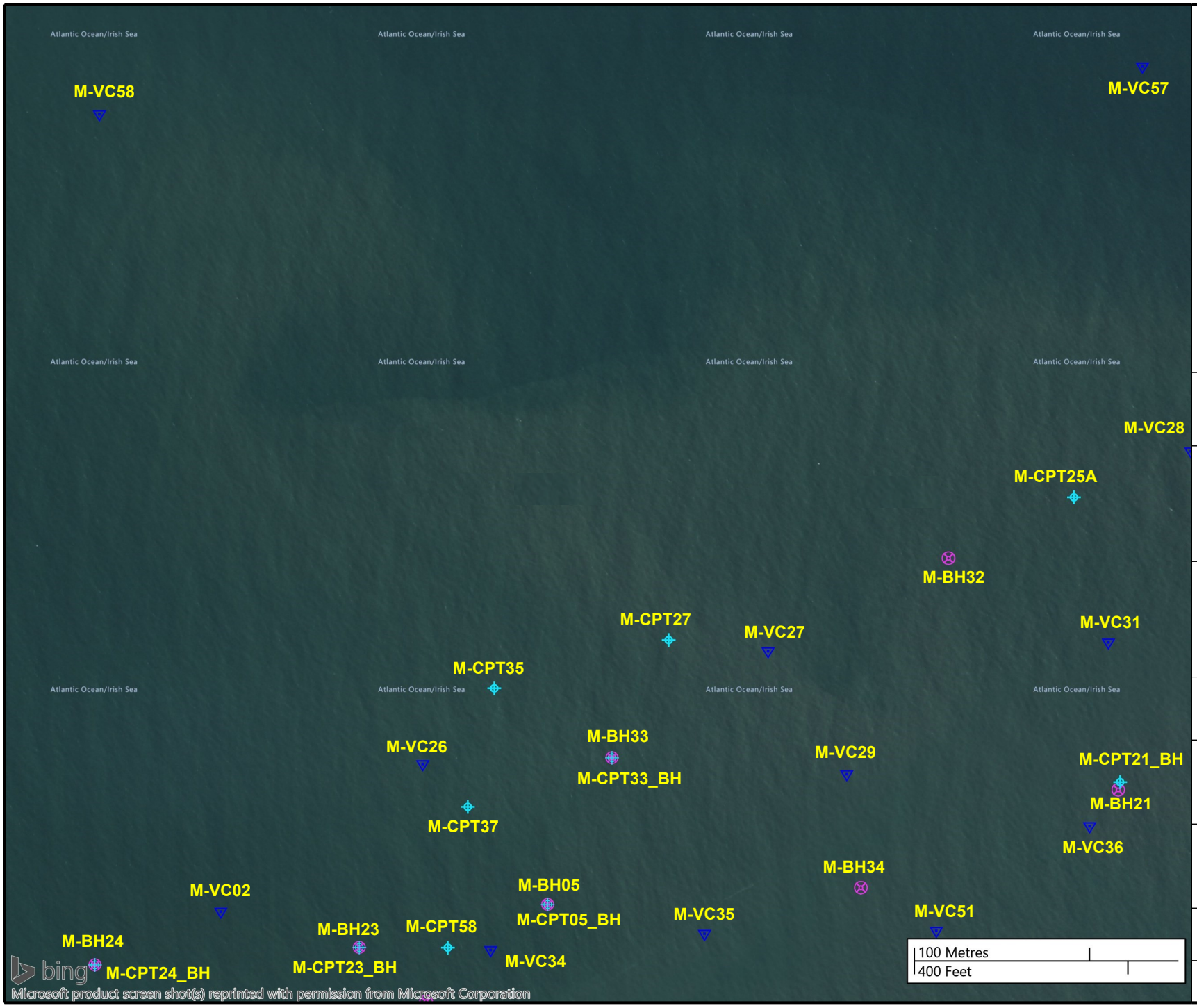
Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Exploratory Hole Location Plan 1

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:3000



Legend Key

- Cone Penetration Test - CPT
- CPT/Sonic/Rotary - CPT+SNC
- Grab Samples - GS
- Sonic/Rotary Drilling - SNC
- Vibrocores - VC

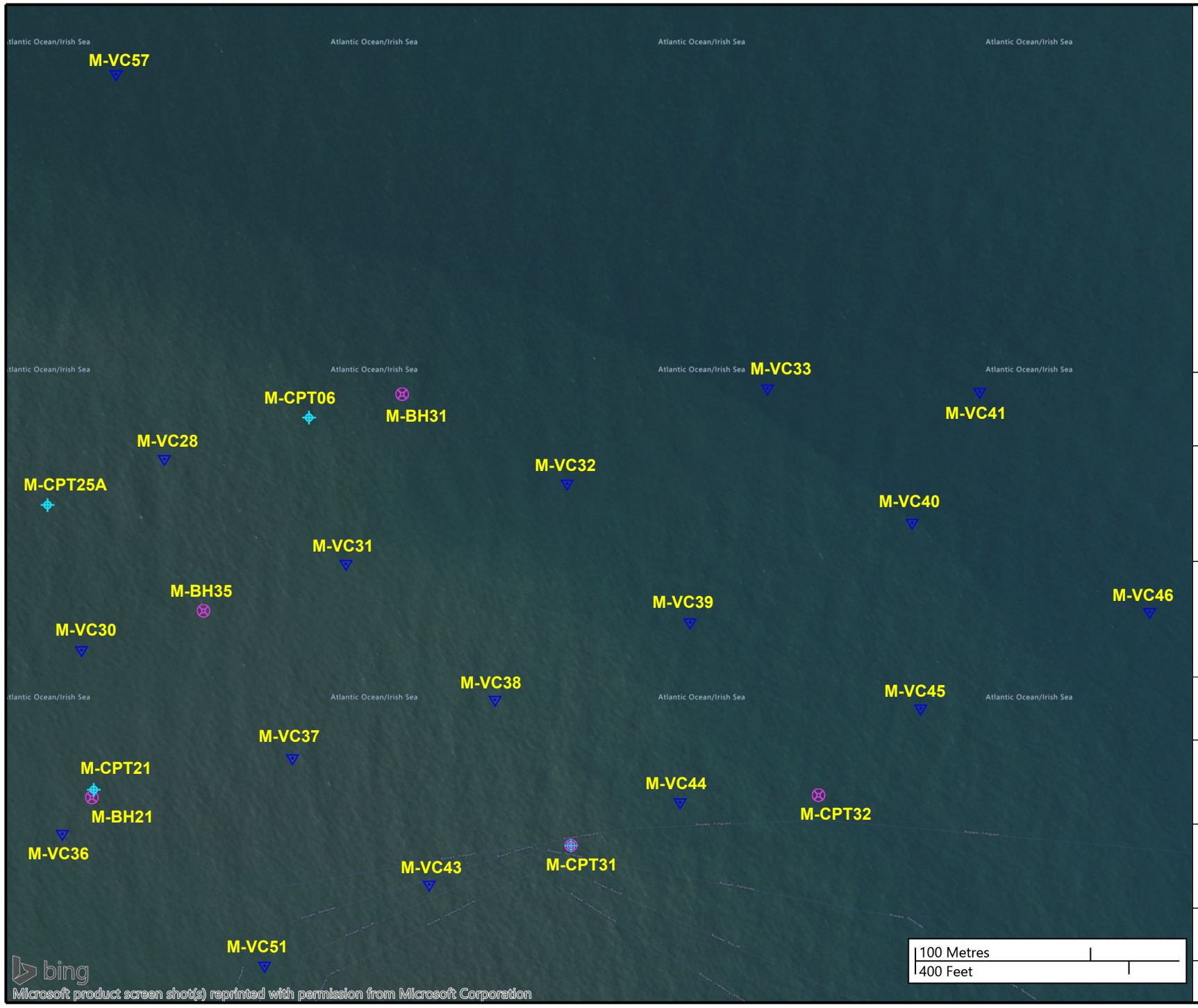
Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Exploratory Hole Location Plan 2

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:3000



Legend Key

- Cone Penetration Test - CPT
- CPT/Sonic/Rotary - CPT+SNC
- Grab Samples - GS
- Sonic/Rotary Drilling - SNC
- Vibrocores - VC

Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Exploratory Hole Location Plan 3

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:3000

Legend Key

- Cone Penetration Test - CPT
- CPT/Sonic/Rotary - CPT+SNC
- Grab Samples - GS
- Sonic/Rotary Drilling - SNC
- Vibrocores - VC

Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Exploratory Hole Location Plan 4

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:3000

Legend Key

- Cone Penetration Test - CPT
- CPT/Sonic/Rotary - CPT+SNC
- Grab Samples - GS
- Sonic/Rotary Drilling - SNC
- Vibrocores - VC

Project No.	23-0585
Client	Iarnród Éireann
Client's Rep	GDG

Exploratory Hole Location Plan 5

Rosslare Europort Offshore Renewable Energy Hub SI

CAUSEWAY GEOTECH

Last Revision	18/04/2024
Scale	1:3000

CAUSEWAY GEOTECH

APPENDIX B

BOREHOLE LOGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID L-BH01
		Client: Iarnród Éireann	
		Client's Rep: GDG	

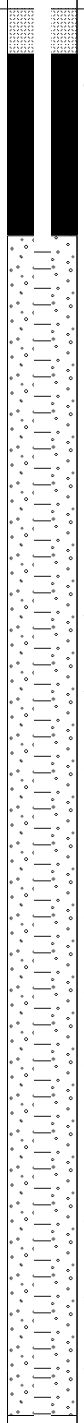
Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	9.00	712887.58 E
Rotary Coring	Fraste CRS-XL140 Duo	9.00	11.50	612572.39 N

Final Depth: 11.50 m	Start Date: 02/03/2024	Driller: MJ/DJ	Sheet 1 of 2
Elevation: 6.10 mCD	End Date: 03/03/2024	Logger: MS	Scale: 1:50
			FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Description
0.00 - 1.20	B1						MADE GROUND: Medium dense light brown sandy slightly silty angular to subangular fine to coarse GRAVEL of various lithologies with medium cobble content. Sand is fine to coarse. Cobbles are angular to subangular of various lithologies.
0.30 - 0.75	SPT (C)	N=23 (4,5/6,6,5,6) Hammer SN = 1353	0.30	Dry			
1.20 - 1.50	B2				4.90	1.20	MADE GROUND: Dark brown slightly sandy slightly silty angular to subrounded fine to coarse GRAVEL of various lithologies with medium cobble content. Sand is fine to coarse. Cobbles are angular to subangular of various lithologies.
1.50 - 3.30	B3				4.60	1.50	MADE GROUND: Very dense light greenish grey very sandy silty angular to subangular fine to coarse GRAVEL of various lithologies with medium cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of various lithologies.
2.50 - 2.56	SPT (C)	100 (25 for 50mm/100 for 10mm) Hammer SN = 1353	2.50	Dry			
3.30 - 4.00	B4				2.80	3.30	Very dense light brown and brown slightly sandy slightly clayey subangular to subrounded fine to medium GRAVEL of various lithologies. Sand is fine to coarse.
3.50 - 3.75	SPT (C)	100 (25 for 145mm/100 for 105mm) Hammer SN = 1353	3.50	Dry			
					2.10	4.00	Very dense dark greenish grey slightly sandy angular to subangular fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse. Cobbles are angular to subangular of amphibolite. *4.00-4.50m: AZCL*
4.50 - 5.20	B5		4.50	Dry			
4.50 - 4.74	SPT (C)	100 (5,7/100 for 95mm) Hammer SN = 1353					
					0.90	5.20	Medium dense to dense dark grey sandy slightly clayey angular to subangular fine to coarse GRAVEL of amphibolite with bands of brown slightly sandy slightly gravelly clay. Sand is fine to coarse. *5.20-6.00m: AZCL*
5.50 - 5.95	SPT (C)	N=21 (4,4/5,5,5,6) Hammer SN = 1353	5.50	4.90			
6.00 - 7.50	B6						
6.50 - 6.95	SPT (C)	N=32 (2,4/7,8,8,9) Hammer SN = 1353	6.50	5.00			
7.50 - 9.00	B7		7.50	5.00	-1.40	7.50	Medium dense light brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.
7.50 - 7.95	SPT (C)	N=29 (6,6/6,8,7,8) Hammer SN = 1353					
9.00 - 9.10	C3						
9.20 - 9.35	C1				-2.90	9.00	Very weak dark greenish grey fresh speckled yellow and white, highly

TCR	SCR	RQD	FI

Legend | Water | Backfill



Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
9.00	177
11.50	150

Water Added

From (m)	To (m)

Remarks

Land borehole
All elevations and reduced levels are given in local Chart Datum

Standpipe installation

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID L-BH01
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	9.00	712887.58 E
Rotary Coring	Fraste CRS-XL140 Duo	9.00	11.50	612572.39 N

Final Depth: 11.50 m	Start Date: 02/03/2024	Driller: MJ/DJ	Sheet 2 of 2
			Scale: 1:50
Elevation: 6.10 mCD	End Date: 03/03/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		100	81	47	>20						fractured AMPHIBOLITE. Discontinuities: 1) 45-75° degree joints, very closely spaced, undulating, rough, open with yellowish green to brown mineralisation on joint surfaces. 2) 20-45° joints, closely spaced, undulating, rough, open with green and brown staining on joint surfaces.		
10.50								-4.40	10.50		Strong (locally weak) dark greenish grey speckled white fresh AMPHIBOLITE. Discontinuities: 1) 20-40° joints, medium spaced, planar, rough, open and clean.		
10.50 - 10.60	C6	100	100	100	1								
10.60 - 10.70	C5												
10.70 - 11.00	C4												
11.00													
11.15	C2	100	100	100									
11.50								-5.40	11.50		End of Borehole at 11.50m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Casing Details	
To (m)	Diam (mm)
9.00	177
11.50	150

Water Added	
From (m)	To (m)

Remarks

Land borehole
All elevations and reduced levels are given in local Chart Datum

Standpipe installation

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID L-BH03

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 13.00 m	Start Date: 29/02/2024	Driller: MJ/DJ	Sheet 1 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	7.50	713076.16 E				
Rotary Coring	Fraste CRS-XL140 Duo	7.50	13.00	612620.40 N	Elevation: 5.44 mCD	End Date: 01/03/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.20	B1							MADE GROUND: Light brown sandy slightly silty angular to subangular fine to coarse GRAVEL of various lithologies with medium cobble content. Sand is fine to coarse. Cobbles are angular to subangular of various lithologies.		
1.20 - 1.50	B2		1.20	Dry	4.24	1.20		MADE GROUND: Medium dense brown and greyish brown very sandy silty angular to subangular fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse. Cobbles are angular to subangular of various lithologies.		
1.20 - 1.65	SPT (C)	N=28 (5,7/7,6,7,8) Hammer SN = 1353								
1.50 - 2.50	B3									
2.20	D9									
2.50 - 3.50	B4		2.50	Dry						
2.50 - 2.95	SPT (C)	N=30 (7,8/7,8,8,7) Hammer SN = 1353								
3.20	D10									
3.50 - 4.50	B5		3.50	Dry						
3.50 - 3.95	SPT (C)	N=22 (4,5/6,6,5,5) Hammer SN = 1353								
4.20	D11									
4.50 - 5.50	B6		4.50	4.40	0.94	4.50		Medium dense dark brown very sandy clayey subangular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse. [slight organic odour]		
4.50 - 4.95	SPT (C)	N=23 (4,6/5,6,6,6) Hammer SN = 1353								
5.20	D12									
5.50 - 6.50	B7		5.50	4.80						
5.50 - 5.95	SPT (C)	N=15 (3,3/4,3,4,4) Hammer SN = 1353								
6.20	D13									
6.50 - 7.50	B8									
					-1.56	7.00		Weak to moderately weak greyish green moderately weathered AMPHIBOLITE. Highly fractured, no discernable fracture sets.		
7.20	D14									
7.50 - 7.66	SPT (C)	100 (25 for 80mm/100 for 85mm) Hammer SN = 1353	7.50	5.10	-2.06	7.50		Moderately weak (locally medium strong) greyish green fresh AMPHIBOLITE. Highly fractured, no discernable fracture sets, with iron oxide staining on fracture surfaces.		
		NI						*8.00-9.90m: AZCL*		
		35 0 0								
		AZCL								
9.00										
		TCR SCR RQD FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
7.50	177		
13.00	150		

Remarks

Land borehole

All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID L-BH03
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	7.50	713076.16 E
Rotary Coring	Fraste CRS-XL140 Duo	7.50	13.00	612620.40 N

Final Depth: 13.00 m	Start Date: 29/02/2024	Driller: MJ/DJ	Sheet 2 of 2
			Scale: 1:50
Elevation: 5.44 mCD	End Date: 01/03/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		40	16	7	NI			-4.46	9.90		Moderately weak (locally medium strong) greyish green fresh AMPHIBOLITE. Highly fractured, no discernable fracture sets.		
10.50		70	26	0	AZCL / >20			-5.36	10.80		10.50-10.80m: AZCL Moderately weak (locally medium strong) greenish grey fresh AMPHIBOLITE. Highly fractured, no discernable fracture sets.		
11.50								-6.06	11.50		Very weak (locally weak to moderately weak) greyish green, locally greenish pink AMPHIBOLITE with quartz and calcite veining. Discontinuities: 1) 40-50° joints, closely spaced, planar, rough, open with orange staining on fracture surfaces and some localized quartz mineralization. 2) 60-75° joints, very closely to closely spaced, planar, rough, open to moderately wide with green and orange staining on fracture surfaces and some localized quarts and calcite mineralisation.		
11.50	C1												
12.00 - 12.15	C5												
12.05 - 12.20	C2												
12.15 - 12.30	C4	100	87	75	10								
12.60 - 12.70	C6												
12.75 - 13.00	C3												
13.00								-7.56	13.00		End of Borehole at 13.00m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
7.50	177
13.00	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Land borehole
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID L-BH04

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.60 m	Start Date: 03/03/2024	Driller: MJ/DJ	Sheet 1 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	9.00	713147.12 E				
Rotary Coring	Fraste CRS-XL140 Duo	9.00	11.60	612634.20 N	Elevation: 4.79 mCD	End Date: 04/03/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.20	B1							MADE GROUND: Dark brown sandy slightly silty angular to subangular fine to coarse GRAVEL of various lithologies with medium cobble content. Sand is fine to coarse. Cobbles are angular to subangular of various lithologies.		
1.20 - 1.50	B2				3.59	1.20		MADE GROUND: Greenish grey sandy slightly silty angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
1.50 - 2.20	B3		1.50	Dry	3.29	1.50		MADE GROUND: Medium dense to very dense greenish grey and dark grey angular to subangular fine to coarse GRAVEL of metamorphic origin with low cobble content. Cobbles are subangular of metamorphic origin.		
1.50 - 1.95	SPT (C)	N=24 (3,5/5,6,7,6) Hammer SN = 1353						2.20-4.00m: AZCL		
2.50 - 2.80	SPT (C)	100 (8,17/100 for 145mm) Hammer SN = 1353	2.50	Dry						
3.50 - 3.52	SPT (C)	100 (25 for 10mm/100 for 5mm) Hammer SN = 1353	3.50	Dry						
4.00 - 4.50	B4				0.79	4.00		MADE GROUND: Very dense greenish grey slightly sandy gravelly COBBLES of amphibolite. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of various lithologies. [Rock armour]		
4.50 - 4.61	SPT (C)	100 (25 for 80mm/100 for 30mm) Hammer SN = 1353	4.50	Dry				4.50-4.70m: AZCL - inbetween rock armour		
4.70 - 5.70	B5									
5.50 - 5.52	SPT (C)	100 (25 for 10mm/100 for 10mm) Hammer SN = 1353	5.50	5.20						
								6.00-7.30m: AZCL - inbetween rock armour		
7.50	D9		7.50	5.40	-2.71	7.50		Dark brown slightly gravelly slightly silty fine to coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies.		
7.50 - 7.90	B6									
7.50 - 7.58	SPT (C)	100 (25 for 80mm/100 for 5mm) Hammer SN = 1353			-3.11	7.90		Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of amphibolite.		
7.90 - 8.10	B7				-3.31	8.10		Extremely weak to very weak greenish grey highly weathered AMPHIBOLITE. Highly fractured, with no discernable fracture sets.		
8.10 - 9.00	B8									
8.50	D10									
9.10 - 9.20	C4				-4.21	9.00		Medium strong (locally very strong) dark greenish grey speckled		
9.20 - 9.30	C3									
9.30 - 9.40	C5									

TCR	SCR	RQD	FI
			AZCL

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
9.00	177
11.60	150

Water Added

From (m)	To (m)

Remarks

Land borehole
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID L-BH04

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.60 m	Start Date: 03/03/2024	Driller: MJ/DJ	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	9.00	713147.12 E				
Rotary Coring	Fraste CRS-XL140 Duo	9.00	11.60	612634.20 N	Elevation: 4.79 mCD	End Date: 04/03/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.40 - 9.50	C6	87	48	32	9						white, fresh AMPHIBOLITE. Discontinuities: 1) 40-60° joints, very closely to closely spaced, undulating, rough, open to moderately wide with brown staining on fracture surfaces. 2) 60-90° joints, closely spaced, planar, rough, open with brown and green staining on fracture surfaces.		
10.20 - 10.30	C8												
10.35 - 10.50	C7												
10.50								-5.71	10.50		Medium strong dark greenish grey, fresh AMPHIBOLITE with rare steeply dipping quartz and calcite veining.		
10.50 - 10.65	C2	100	100	100	0								
10.75	C1												
11.00 - 11.10	C9												
11.10		100	100	100									
11.60								-6.81	11.60		End of Borehole at 11.60m		
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
9.00	177		
11.60	150		

Remarks

Land borehole
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH01
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170	0.00	11.00	712929.97 E
Cone Penetration	Drill N'CPT	1.50	10.03	613014.48 N
Rotary Coring	Fraste CRS-XL170	11.00	18.00	

Final Depth: 18.00 m	Start Date: 01/12/2023	Driller: MMcK/MJ	Sheet 1 of 2 Scale: 1:50
Elevation: -4.90 mCD	End Date: 02/12/2023	Logger: OG+MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.50	SB1				-5.10	0.20		Dark brown clayey fine to coarse SAND with rare shell fragments.		
								Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine of various lithologies.		
1.50 - 2.50	SB2				-6.40	1.50		Dark greyish brown clayey fine to coarse SAND with rare shell fragments.		
2.50	SB3				-7.40	2.50		Firm to stiff dark brown slightly sandy CLAY. Sand is fine to coarse.		
4.00 - 5.50	SB4									
5.50 - 7.00	SB5									
7.00	SB6									
8.50 - 10.00	SB7									

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

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.00	177
18.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.60m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.50m casing flushed, pushed to 10.03m below bed before refusal (total load reached)
Dissipation Test completed at 7.91m
See "M-CPT01_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on recovery of 7.00m rock	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH01
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 18.00 m	Start Date: 01/12/2023	Driller: MMcK/MJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170	0.00	11.00					Scale: 1:50
Cone Penetration	Drill N'CPT	1.50	10.03	712929.97 E				
Rotary Coring	Fraste CRS-XL170	11.00	18.00	613014.48 N	Elevation: -4.90 mCD	End Date: 02/12/2023	Logger: OG+MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
									-14.30	9.40		Very stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of mudstone.		
10.00 - 11.00	SB8													
11.00 - 11.34	SPT (C)	100 (25 for 140mm/100 for 200mm) Hammer SN = 1501				NI	11.0	0.00						
			90	35	20				-16.40	11.50		Weak to medium strong dark grey DOLERITE. Slightly weathered: closer fracture spacing, with occasional brown discolouration and rare grey clay on fracture surfaces. Discontinuities: 1. 0-20 degree joints, medium spaced (90/230/600), planar, smooth with brown staining on some joint surfaces. 2. 55-65 degree joints at 12.60-12.70m,12.90-13.10m and 13.10-13.20m, planar, rough with faint brown staining on joint surfaces. 3. 85-90 degree joint at 13.30-13.80m, planar, rough, with patchy grey clay on joint surface.		
11.75 - 12.00	C1													
12.00						4								
12.00 - 12.10	C2													
12.10 - 12.20	C3													
			100	100	27									
						8								
13.40 - 13.50	C4													
13.50														
			100	66	0				-18.70	13.80		Weak greenish grey DOLERITE. Slightly weathered: slightly reduced strength, closer fracture spacing, with localised greenish grey silt infill. Discontinuities: 1. 0-20 degree joints, closely spaced (20/160/250), undulating, rough, with localised greenish grey silt infill, up to 5mm on some joint surfaces. 2. 80-85 degree joints at 13.80-14.10m, 14.50-14.70m, 14.50-14.80m and 15.50-15.90m, undulating, rough with localised greenish grey silt infill, up to 3mm on some fracture surfaces.		
						8								
15.00														
15.20 - 15.40	C5													
			100	27	0									
						17			-20.80	15.90		Very weak to weak dark grey DOLERITE. Slightly weathered: slightly closer fracture spacing, with faint brown discolouration. Discontinuities: 1. 0-15 degree joints, closely spaced (100/190/500), planar, smooth, with faint brown staining on some joint surfaces. 2. 50-60 degree joints at 15.90-16.50m, closely spaced (0/100/130), planar, smooth, with faint brown staining on some joint surfaces. 3. 80-85 degree joints at 16.90-17.30m and 17.30-18.00m, undulating, rough, with faint brown staining on joint surfaces.		
16.50														
16.60 - 16.70	C6													
16.70 - 16.80	C7													
			100	87	17	7								
18.00							18.0	0.00	-22.90	18.00		End of Borehole at 18.00m		
18.00 - 18.00	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501													

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.00	177
18.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.60m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.50m casing flushed, pushed to 10.03m below bed before refusal (total load reached)
Dissipation Test completed at 7.91m
See "M-CPT01_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on recovery of 7.00m rock	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH02
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.40	712911.97 E
Rotary Coring	Fraste CRS-XL170 Duo	4.40	17.90	612936.66 N

Final Depth: 17.90 m	Start Date: 14/12/2023	Driller: MMcK/MJ +MMCK/MJ	Sheet 1 of 2 Scale: 1:50
Elevation: -4.65 mCD	End Date: 15/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material washed away by drilling process; probably soft to firm slightly sandy silty CLAY.		
0.90	D4		0.90	0.00	-5.55	0.90		Soft to firm dark brown slightly sandy CLAY. Sand is fine coarse.		
0.90 - 1.90	SB1									
0.90 - 1.35	SPT (S)	N=7 (1,2/1,1,2,3) Hammer SN = 1501								
1.90 - 2.35	UT6	Ublow=78 100% Recovery	1.90	0.00						
1.90 - 2.90	SB2									
					-7.35	2.70		Dark brown and grey slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies.		
2.90	D5		2.90	0.00	-7.55	2.90		Very stiff light brownish grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular fine to medium of mudstone.		
2.90 - 3.90	SB3									
2.90 - 3.35	SPT (S)	N=42 (6,8/8,9,13,12) Hammer SN = 1501								
3.90 - 4.28	SPT (C)	N=75 (25 for 82mm/12,18,21,24) Hammer SN = 1501	3.90	0.00	-8.55	3.90		NO RECOVERY: Clean out casing and switch to geobore; establishing seal.		
					-9.05	4.40		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone.		
					-9.25	4.60		NO RECOVERY: Assumed weathered rockhead washed out by drilling processes.		
5.90					-10.55	5.90		Extremely weak indistinctly thinly laminated dark grey highly weathered MUDSTONE with rare white calcite veins, up to 10mm. No discernible discontinuity sets		
7.40										
8.90					-13.55	8.90		Very weak thinly laminated blackish grey highly fractured MUDSTONE with rare white calcite mineralisation. No discernible discontinuity sets.		

TCR	SCR	RQD	FI
			NI
10	0	0	AZCL
80	0	0	AZCL
77	0	0	20

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.40	177
17.90	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH02
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.40	712911.97 E
Rotary Coring	Fraste CRS-XL170 Duo	4.40	17.90	612936.66 N

Final Depth: 17.90 m	Start Date: 14/12/2023	Driller: MMcK/MJ +MMCK/MJ	Sheet 2 of 2 Scale: 1:50
Elevation: -4.65 mCD	End Date: 15/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		77	0	0									
10.40					>20								
		90	0	0									
								-16.05	11.40		Extremely weak indistinctly thinly laminated grey weathered MUDSTONE with rare white calcite mineralisation. No discernible discontinuity sets.		
					20								
11.90													
11.90 - 12.00	C2												
		67	27	13									
					20								
12.80 - 12.90	C3												
12.90 - 13.00	C4							-17.65	13.00		Weak thinly laminated grey MUDSTONE with rare white calcite mineralisation. Slightly weathered: reduced strength, closer fracture spacing. Discontinuities: 1. 0-10 degree joints, closely spaced (40/135/200), undulating, smooth, clean. 2. 65-70 degree joint at 13.20-13.35m, undulating, rough, clean.		
					10								
13.40						13.4	0.00	-18.05	13.40				
13.40 - 13.67	SPT(C) N=100 (25 for 70mm/100 for 200mm) Hammer SN = 1501				AZCL								
13.40 - 13.50	C5	77	77	77	5						Very weak indistinctly thinly laminated dark grey highly fractured MUDSTONE with occasional white calcite veins, up to 10mm. Slightly weathered: reduced strength, closer fracture spacing, clean. Incipient fracture at various angles.		
14.90								-19.55	14.90		Weak thinly laminated dark grey highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing. Discontinuities: 1. 0-10 degree joints, medium spaced (190/375/800), undulating, rough, clean. 2. 30-50 degree joints, very closely to closely spaced (20/165/600), undulating, rough clean. 3. 65-70 degree joint at 15.50-15.70m, undulating, rough. 4. 85-90 degree joint at 16.20-16.40m, undulating, rough, clean.		
		100	48	0	9								
16.40													
		80	10	0	>20								
					AZCL								
17.90								-22.55	17.90		End of Borehole at 17.90m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Casing Details	
To (m)	Diam (mm)
4.40	177
17.90	150

Water Added	
From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH03
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170	0.00	8.50	712892.46 E
Cone Penetration	Drill N'CPT	0.40	7.68	612852.30 N
Rotary Coring	Fraste CRS-XL170	8.50	13.00	

Final Depth: 13.00 m	Start Date: 15/12/2023	Driller: MJ/ MMcK	Sheet 1 of 2 Scale: 1:50
Elevation: -4.71 mCD	End Date: 16/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably soft to firm slightly sandy silty CLAY.		
0.40 - 1.50	SB1				-5.11	0.40				
					-5.21	0.50		Grey slightly gravelly fine to coarse SAND with frequent shell fragments. Gravel is subangular fine to coarse of various lithologies. Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine of various lithologies.		
1.50 - 3.00	SB2				-6.11	1.40		Firm brown slightly sandy slightly gravelly CLAY with occasional lenses of grey medium to coarse sand (300-500mm). Sand is fine to coarse. Gravel is angular to subangular fine to medium of various lithologies.		
3.00 - 4.50	SB3									
4.50 - 6.00	SB4									
					-9.71	5.00		Firm to stiff grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular fine to medium of mudstone.		
6.00 - 7.00	SB5									
7.00 - 8.50	SB6				-11.71	7.00		Extremely weak indistinctly laminated dark grey weathered MUDSTONE. No discernible discontinuity sets.		
8.50 - 8.55	C1		8.50	0.00	-13.21	8.50		Extremely weak to very wek indistinctly thinly laminated dark grey MUDSTONE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing.		
8.55 - 8.60	C2									
8.50 - 8.57	SPT (C)	100 (25 for 40mm/100 for 35mm) Hammer SN = 1501								
9.00 - 9.05	C3									
		TCR / SCR / RQD / FI								

Depth scale: 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

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.50	177
13.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 7.68m below bed before refusal (total load reached)
Dissipation Test completed at 4.58m
See "M-CPT03_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH03
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170	0.00	8.50	712892.46 E
Cone Penetration	Drill N'CPT	0.40	7.68	612852.30 N
Rotary Coring	Fraste CRS-XL170	8.50	13.00	

Final Depth: 13.00 m	Start Date: 15/12/2023	Driller: MJ/ MMcK	Sheet 2 of 2 Scale: 1:50
Elevation: -4.71 mCD	End Date: 16/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		100	59	0	6						Discontinuities: 1. 0-10 degree joints, medium spaced (90/375/500), undulating, smooth, clean. 2. 70-80 degree joints, probably closely to medium spaced, planar, clean.		
10.00						10.0	0.00	-14.71	10.00		Extremely weak thinly laminated blackish grey MUDSTONE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 0-20 degree joints, medium spaced (120/500/620), undulating, smooth, clean. 2. 45 degree joints at 12.40-12.50m and 12.60-12.70m, planar, smooth, clean. 3. 60 degree joint at 10.60-10.75m, planar, smooth, clean. 4. 75-85 degree joints at 10.20-10.50m, very closely spaced, undulating, smooth, clean. 5. 90 degree joint at 11.10-12.40m, undulating, smooth, clean.		
10.00 - 10.07	SPT(C) 100 (25 for 60mm/100 for 15mm) Hammer SN = 1501				10								
10.00 - 10.05	C4	87	53	12									
					5								
11.50						11.5	0.00						
11.50 - 11.56	SPT(C) 100 (25 for 20mm/100 for 40mm) Hammer SN = 1501												
		90	60	0	5								
13.00						13.0	0.00	-17.71	13.00		End of Borehole at 13.00m		
13.00 - 13.02	SPT(C) 100 (25 for 10mm/100 for 15mm) Hammer SN = 1501												
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
8.50	177		
13.00	150		

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 7.68m below bed before refusal (total load reached)
Dissipation Test completed at 4.58m
See "M-CPT03_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH04
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.00 m	Start Date: 02/12/2023	Driller: MMcK/MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170	0.00	4.00	712869.32 E				Scale: 1:50
Cone Penetration	Drill N'CPT	1.50	1.95					
Rotary Coring	Fraste CRS-XL170	4.00	10.00	612776.87 N	Elevation: -3.87 mCD	End Date: 03/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.50	SB1				-4.47	0.60		Dark grey slightly gravelly silty fine to coarse SAND with occasional shell fragments. Gravel is subangular to subrounded fine to coarse of various lithologies.		
					-5.27	1.40		Firm dark grey sandy CLAY. Sand is fine to medium.		
1.70 - 2.50	SB2							Medium dense brown very gravelly silty clayey fine to coarse SAND. Gravel is angular to subangular fine to medium of various lithologies.		
2.50 - 3.50	SB3		2.50	0.00						
2.50 - 2.95	SPT (C)	N=22 (3,6/4,5,7,6) Hammer SN = 1501								
3.50 - 4.00	SB4				-7.57	3.70		WEATHERED AMPHIBOLITE recovered as grey slightly gravelly clay. Gravel is angular fine to coarse of amphibolite.		
					-7.87	4.00		Medium strong dark grey AMPHIBOLITE with numerous white calcite veins, up to 45mm. Slightly weathered: reduced strength, closer fracture spacing, with greenish brown discolouration on joint surfaces.		
		TCR 100, SCR 87, RQD 20, FI 8			-8.67	4.80		Discontinuities: 1. 0-10 degree joints, medium spaced (120/200/250), undulating, rough, with brownish green staining on joint surfaces. 2. 70-75 degree joints at 4.50-4.70m and 4.60-4.80m, planar, rough, with brownish green staining on joint surfaces. 3. 85-90 degree joint at 4.00-4.15m, undulating, rough, with brownish green staining on joint surface.		
		FI 6								
5.50		TCR 100, SCR 100, RQD 73, FI 4						Strong grey AMPHIBOLITE with numerous white calcite veins, up to 20mm. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with orangish brown discolouration on fracture surfaces. Discontinuities: 1. 0-20 degree joints, widely spaced (200/740/900), undulating, rough, with orangish brown staining on joint surfaces. 2. 40-50 degree joints, widely spaced (100/1230/1900), undulating, rough, with orangish brown staining on some joint surfaces. 3. 60-65 degree joints at 8.10-8.25m and 8.30-8.50m, planar, rough, with orangish brown staining on joint surfaces.		
7.00		TCR 100, SCR 91, RQD 57						Strong grey AMPHIBOLITE with numerous white calcite veins, up to 30mm. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with faint brown discolouration on fracture surfaces.		
8.50					-12.37	8.50		Discontinuities: 1. 25-35 degree joints, medium spaced (320/500/830), undulating, rough, with faint brown staining on some joint surfaces. 2. 70-75 degree joints at 8.60-8.75m and 9.20-9.40m, planar, rough, with faint brown staining on joint surfaces.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.00	177
10.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.90m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.50m casing flushed, pushed to 1.95m below bed before refusal (maximum tip load)
Dissipation Test completed at 1.54m
See "M-CPT04_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH04
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170	0.00	4.00	712869.32 E
Cone Penetration	Drill N'CPT	1.50	1.95	612776.87 N
Rotary Coring	Fraste CRS-XL170	4.00	10.00	

Final Depth:	10.00 m	Start Date:	02/12/2023	Driller:	MMcK/ MJ	Sheet 2 of 2 Scale: 1:50
Elevation:	-3.87 mCD	End Date:	03/12/2023	Logger:	MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		100	90	47	4								
10.00								-13.87	10.00		End of Borehole at 10.00m		

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
4.00	177		
10.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.90m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.50m casing flushed, pushed to 1.95m below bed before refusal (maximum tip load)
Dissipation Test completed at 1.54m
See "M-CPT04_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH05
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS XL-170	0.00	8.00	712988.94 E
Cone Penetration	Drill N'CPT	0.50	0.94	613078.71 N
Cone Penetration	Drill N'CPT	2.50	9.29	
Rotary Coring	Fraste CRS XL-170	8.00	20.00	

Final Depth: 20.00 m	Start Date: 03/01/2024	Driller: MJ/MMcK +MMcK	Sheet 1 of 3
Elevation: -5.75 mCD	End Date: 04/01/2024	Logger: MS	Scale: 1:50
			FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably loose silty gravelly fine to coarse SAND.		
0.50 - 2.00	SB1				-6.25	0.50		Brownish grey slightly gravelly very silty fine to coarse SAND with rare shell fragments. Gravel is angular to subangular fine to medium of various lithologies.		
					-6.75	1.00		Light brown slightly gravelly clayey fine to coarse SAND with lenses of clay. Gravel is subangular to subrounded fine to medium of various lithologies.		
2.50	SB2									
3.50 - 5.00	SB3									
					-10.25	4.50		Firm to stiff light brown slightly sandy CLAY with lenses of fine to medium sand. Sand is fine to medium.		
5.00 - 6.50	SB4									
6.50 - 8.00	SB5									
					-13.05	7.30		WEATHERED MUDSTONE recovered as, dark brownish grey slightly gravelly CLAY. Gravel is angular fine to medium.		
8.00	C1	TCR: 65, SCR: 13, RQD: 0, FI: AZCL / >20			-13.75	8.00		Very weak dark grey highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing, with grey clay infill. No discernible fracture sets.		

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
8.00	177		
20.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 0.50m casing flushed, pushed to 0.94m below bed before refusal (maximum tip load) Sonic drill out completed to 2.00m, material suitable so second CPT push attempted
CPT push 2 at this location; 0.50m casing flushed to 2.50m, pushed to 9.29m below bed before refusal (tip load)
Dissipation Tests completed at 3.25m and 5.47m; both tests <5mins in total
See "M-CPT05_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	20/06/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH05
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS XL-170	0.00	8.00	712988.94 E
Cone Penetration	Drill N'CPT	0.50	0.94	613078.71 N
Cone Penetration	Drill N'CPT	2.50	9.29	
Rotary Coring	Fraste CRS XL-170	8.00	20.00	

Final Depth:	20.00 m	Start Date:	03/01/2024	Driller:	MJ/MMcK +MMcK	Sheet 2 of 3 Scale: 1:50
Elevation:	-5.75 mCD	End Date:	04/01/2024	Logger:	MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								-15.05	9.30		Weak dark grey thinly laminated MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing. Discontinuities: 1. 20-45 degree joints, widely spaced (200/640/1000), undulating, smooth, clean. 2. 60-80 degree joints, probably closely to medium spaced, planar, smooth, clean.		
9.50					10	9.50	0.00						
9.50 - 9.86	SPT(C) 100 (11,13/100 for 211mm) Hammer SN = 1501	100	40	7	>20								
10.50 - 10.55	C2				9								
11.00						11.0	0.00						
11.00 - 11.15	SPT(C) 100 (25 for 80mm/100 for 67mm) Hammer SN = 1501	93	53	0	AZCL 8								
12.50						12.5	0.00	-18.25	12.50		Weak to medium strong dark grey thinly laminated MUDSTONE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 20-45 degree joints, medium spaced (200/530/1600), planar, smooth, clean. 2. 60-80 degree joints, probably medium spaced, planar, smooth, clean.		
12.50 - 12.61	SPT(C) 100 (25 for 75mm/100 for 38mm) Hammer SN = 1501												
13.00 - 13.20	C3	100	80	0									
14.00					7	14.0	0.00						
14.00 - 14.04	SPT(C) 100 (25 for 15mm/100 for 28mm) Hammer SN = 1501	100	83	0									
15.50						15.5	0.00						
15.50 - 15.51	SPT(C) 100 (25 for 5mm/100 for 5mm) Hammer SN = 1501												
15.50 - 15.60	C4												
15.60 - 15.70	C5	100	95	20									
15.80 - 16.00	C6												
17.00					5	17.0	0.00						
17.00 - 17.02	SPT(C) 100 (25 for 5mm/100 for 15mm) Hammer SN = 1501	100	100	28									
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
8.00	177		
20.00	150		

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 0.50m casing flushed, pushed to 0.94m below bed before refusal (maximum tip load)
Sonic drill out completed to 2.00m, material suitable so second CPT push attempted
CPT push 2 at this location; 0.50m casing flushed to 2.50m, pushed to 9.29m below bed before refusal (tip load)
Dissipation Tests completed at 3.25m and 5.47m; both tests <5mins in total
See "M-CPT05_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	20/06/2024

AGS

CAUSEWAY GEOTECH	Project No.	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID
	23-0585	Client: Iarnród Éireann	M-BH05
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 20.00 m	Start Date: 03/01/2024	Driller: MJ/MMcK +MMcK	Sheet 3 of 3
Sonic Drilling	Fraste CRS XL-170	0.00	8.00	712988.94 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.50	0.94	613078.71 N	Elevation: -5.75 mCD	End Date: 04/01/2024	Logger: MS	FINAL
Cone Penetration	Drill N'CPT	2.50	9.29					
Rotary Coring	Fraste CRS XL-170	8.00	20.00					

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
18.50 18.50 - 18.50	SPT(C) 100 (25 for 0mm/100 for 5mm) Hammer SN = 1501	97	97	0		18.5	0.00						
20.00 20.00 - 20.00	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501					20.0	0.00	-25.75	20.00		End of Borehole at 20.00m		
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
8.00	177		
20.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 0.50m casing flushed, pushed to 0.94m below bed before refusal (maximum tip load)
Sonic drill out completed to 2.00m, material suitable so second CPT push attempted
CPT push 2 at this location; 0.50m casing flushed to 2.50m, pushed to 9.29m below bed before refusal (tip load)
Dissipation Tests completed at 3.25m and 5.47m; both tests <5mins in total
See "M-CPT05_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	20/06/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH06
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	10.50	712895.18 E
Rotary Coring	Fraste CRS-XL170 Duo	10.50	15.00	612978.41 N

Final Depth: 15.00 m	Start Date: 28/11/2023	Driller: MMcK/ MJ+MJ	Sheet 1 of 2 Scale: 1:50
Elevation: -4.56 mCD	End Date: 29/11/2023	Logger: MS	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 - 1.50 0.00 - 0.45	D8 SB1 SPT (S)	N=0 (1,0/0,0,0,0) Hammer SN = 1501	0.00		-5.00	0.45		NO RECOVERY: Material washed away by drilling process; probably soft to firm slightly sandy silty CLAY.		
1.50 - 1.95 1.50 - 3.00	UT12 SB2	Ublow=76 100% Recovery	1.50					Firm to stiff greyish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine of various lithologies.		
3.00 3.00 - 4.50 3.00 - 3.45	D9 SB3 SPT (S)	N=38 (4,7/7,8,10,13) Hammer SN = 1501	3.00		-7.56	3.00		Very stiff grey and brown sandy CLAY. Sand is fine to coarse.		
4.50 - 4.95 4.50 - 6.00	U13 SB4	Ublow=87 100% Recovery	4.50		-9.06	4.50		Stiff to very stiff dark brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
6.00 6.00 - 7.50 6.00 - 6.45	D10 SB5 SPT (S)	N=32 (4,6/9,7,8,8) Hammer SN = 1501	6.00							
					-11.56	7.00		Very stiff dark brown sandy CLAY. Sand is fine to coarse.		
7.50 7.50 - 9.00 7.50 - 7.95	D11 SB6 SPT (S)	N=30 (8,12/11,7,6,6) Hammer SN = 1501	7.50							
					-13.36	8.80		Extremely weak indistinctly thinly laminated dark grey weathered MUDSTONE recovered as, angular fine to coarse gravel.		
9.00 - 10.50 9.00 - 9.09	SB7 SPT (S)	50 (25 for 80mm/50 for 7mm) Hammer SN = 1501	9.00							

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
10.50	177
15.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH06
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 15.00 m	Start Date: 28/11/2023	Driller: MMcK/MJ+MJ	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	10.50	712895.18 E				
Rotary Coring	Fraste CRS-XL170 Duo	10.50	15.00	612978.41 N	Elevation: -4.56 mCD	End Date: 29/11/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records				Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
10.50	C1							-15.06	10.50		Extremely weak indistinctly thinly laminated blackish grey weathered MUDSTONE. Slightly weathered: highly reduced strength, much closer fracture spacing. No discernible discontinuity sets.		
		100	0	0	>20								
								-16.20	11.65		Weak thinly laminated blackish grey highly fractured MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing. Discontinuities: 1. 0-10 degree joints, probably very closely to closely spaced, planar, smooth. 2. 70-90 degree joints, probably closely spaced, undulating, smooth. *12.70-13.35m: Incipient sub-vertical joint.* *13.00m: sub-horiztonal joint.* *13.80-14.00m: 70 degree joint.* *14.50-14.70m: 70 degree joint.*		
12.00					>20								
		100	27	0									
					6								
13.50													
		100	23	0	>20								
					9								
15.00								-19.56	15.00		End of Borehole at 15.00m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
10.50	177
15.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH07
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 14.05 m	Start Date: 17/12/2023	Driller: MJ +MMcK	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.80	712873.01 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	4.80	14.05	612899.97 N	Elevation: -4.58 mCD	End Date: 18/12/2023	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
												NO RECOVERY: Material washed away by drilling process; probably soft to firm slightly sandy silty CLAY.		
0.80 0.80 - 1.80 0.80 - 1.25	D5 SB1 SPT (S)	N=13 (3,2/3,3,4,3) Hammer SN = 1501					0.80	0.00	-5.38	0.80		Firm to stiff light brown slightly sandy CLAY. Sand is fine to coarse.		
1.80 - 2.25 1.80 - 2.80	UT7 SB2	Ublow=73 100% Recovery					1.80	0.00	-6.58	2.00		Stiff to very stiff light brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular fine to medium of mudstone.		
2.80 2.80 - 3.80 2.80 - 3.06	D6 SB3 SPT (S)	50 (25 for 110mm/50 for 150mm) Hammer SN = 1501					2.80	0.00						
3.80 - 3.90 3.80 - 4.80	UT8 SB4	Ublow=100 25% Recovery					3.80	0.00						
4.80 4.80 - 4.87 5.00 - 5.10	C1 SPT (C) C2	100 (25 for 10mm/100 for 61mm) Hammer SN = 1501	100	61	0	NI 5	4.80	0.00	-9.68	5.10		Extremely weak indistinctly thinly laminated blackish grey MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing, with occasional grey clay infill on fracture surfaces. Discontinuities: 1. 5-25 degree joints, medium spaced (90/230/740), undulating, rough, with occasional grey clay infill (2-20mm) between joint surfaces. 2. 45 degree joint at 5.45-5.55m, planar, rough, with mudstone gravel infill on joint surface (up to 50mm).		
6.30 6.30 - 6.61	SPT(C) 100 (7,15/100 for 160mm) Hammer SN = 1501		60	22	22	>20	6.30	0.00	-11.28	6.70		Weak probably thinly laminated dark grey highly fractured MUDSTONE with occasional white calcite veins and crystallisation. Slightly weathered: slightly reduced strength, much closer fracture spacing. Discontinuities: 1. 40-60 degree joints, probably closely spaced, planar, smooth, clean. 2. 70-90 degree joints, probably closely spaced, planar, smooth, clean.		
7.80 7.80 - 8.10	SPT(C) 100 (9,14/100 for 150mm) Hammer SN = 1501		53	0	0	AZCL >20	7.80	0.00						
9.30							9.30	0.00						

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.80	177
14.05	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.20m
All elevations and reduced levels are given in local Chart Datum

CPT could not be completed due to sea state pushing the riser casing off vertical

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH07
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.80	712873.01 E
Rotary Coring	Fraste CRS-XL170 Duo	4.80	14.05	612899.97 N

Final Depth: 14.05 m	Start Date: 17/12/2023	Driller: MJ +MMcK	Sheet 2 of 2 Scale: 1:50
Elevation: -4.58 mCD	End Date: 18/12/2023	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.30 - 9.61	SPT(C) 100 (8,16/100 for 160mm) Hammer SN = 1501	80	0	0	AZCL / >20								
10.05		80	37	14	AZCL / >20 / 9			-15.38	10.80		Extremely weak thinly laminated dark grey MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing. Discontinuities: 1. 0-10 degree joints at 10.80-11.00m, very closely spaced (20/50/80), undulating, smooth, clean. 2. 50-65 degree joints, medium spaced (200/250/290), planar, smooth, clean.		
11.55 11.55 - 11.77	SPT(C) 100 (25 for 85mm/100 for 135mm) Hammer SN = 1501	100	0	0	>20	11.6	0.00	-16.13	11.55		Weak probably thinly laminated dark grey highly fractured MUDSTONE with rare white calcite crystallisation. Slightly weathered: slightly reduced strength, much closer fracture spacing. No discernible discontinuity sets.		
13.05 13.05 - 13.25	SPT(C) 100 (25 for 85mm/100 for 115mm) Hammer SN = 1501	100	32	0	11	13.1	0.00	-17.93	13.35		Weak thinly laminated blackish grey MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing, with occasional white calcite crystallisation. Discontinuities: 1. 0-10 degree joints, closely spaced (50/100/120), planar, smooth, clean. 2. 80-90 degree joint at 13.35-14.05m, undulating, smooth, clean.		
14.05 14.05 - 14.22	SPT(C) 100 (25 for 75mm/100 for 95mm) Hammer SN = 1501					14.1	0.00	-18.63	14.05		End of Borehole at 14.05m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
4.80	177
14.05	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.20m
All elevations and reduced levels are given in local Chart Datum

CPT could not be completed due to sea state pushing the riser casing off vertical

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH08
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	5.50	712855.54 E
Rotary Coring	Fraste CRS-XL170 Duo	5.50	17.00	612822.55 N

Final Depth: 17.00 m	Start Date: 01/12/2023	Driller: MMcK	Sheet 1 of 2 Scale: 1:50
Elevation: -4.69 mCD	End Date: 01/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material washed away by drilling process; probably soft to firm slightly sandy silty CLAY. *0.00-1.00m: AZCL*		
1.00 1.00 - 2.00 1.00 - 1.45	D5 SB1 SPT (S)	N=9 (2,1/2,2,2,3) Hammer SN = 1501	1.00	0.00	-5.69	1.00		Firm to stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine of mudstone.		
2.00 - 2.45 2.00 - 3.00	UT8 SB2	Ublow=77 100% Recovery	2.00							
3.00 3.00 - 4.00 3.00 - 4.00	D6 P9 SB3	0% Recovery	3.00							
4.00 4.00 - 5.50 4.00 - 4.45	D7 SB4 SPT (S)	N=28 (3,5/5,8,7,8) Hammer SN = 1501	4.00	0.00	-8.69	4.00		Very stiff dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of mudstone.		
5.50 - 5.69	SPT (C)	100 (25 for 87mm/100 for 100mm) Hammer SN = 1501	5.50	0.00						
		TCR 70, SCR 0, RQD 0, FI NI			-10.69	6.00		Extremely weak indistinctly thinly laminated dark grey weathered MUDSTONE. Slightly weathered: highly reduced strength, much closer fracture spacing, with grey clay infill on fracture surfaces. Discontinuities: 1. 0-10 degree bedding fractures, probably very closely spaced, planar, smooth with grey clay infill on fracture surfaces.		
6.50 6.50	C1	TCR 100, SCR 30, RQD 30, FI >20								
8.00		TCR 100, SCR 93, RQD 87								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
5.50	177
17.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.60m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Water	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH08
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 17.00 m	Start Date: 01/12/2023	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	5.50	712855.54 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	5.50	17.00	612822.55 N	Elevation: -4.69 mCD	End Date: 01/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50								-14.19	9.50		Weak dark grey thinly laminated MUDSTONE recovered as, angular medium to coarse gravel of mudstone.		
		66	33	27	20			-14.59	9.90		Weak dark grey indistinctly thinly laminated highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing, with grey sandy gravelly clay infill. Discontinuities: 1. 0-20 degree bedding fractures, probably closely spaced, planar, smooth with grey sandy gravelly clay infill on some fracture surfaces. 2. 75-85 degree joints at 12.70-12.95m and 12.80-13.00m, planar, smooth with grey sandy gravelly clay infill on fracture surfaces.		
11.00					AZCL						10.50-11.60m: AZCL		
		60	45	40									
12.50					>20								
		73	43	43									
					AZCL						13.60-14.00m: AZCL		
14.00						14.0	0.00	-18.69	14.00				
14.00 - 14.30	SPT(C) 100 (9,11/100 for 145mm) Hammer SN = 1501										Very weak to weak dark grey indistinctly thinly laminated dark grey MUDSTONE with occasional white quartz veins. Slightly weathered: reduced strength, closer fracture spacing. No discernable discontinuities.		
		93	86	86	>20								
15.50								-20.19	15.50		Weak dark grey MUDSTONE, recovered as, angular to subangular medium to coarse gravel of mudstone.		
					>20			-20.59	15.90		Weak dark grey indistinctly thinly laminated MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing. Discontinuities: 1. 0-10 degree bedding fractures at 16.00m, 16.25m and 16.40m, planar, smooth, clean. 2. 45 degree joint at 16.10-16.15m, planar, smooth, clean.		
		66	26	26	6								
					AZCL						16.50-17.00m: AZCL		
17.00						17.0	0.00	-21.69	17.00		End of Borehole at 17.00m		
17.00 - 17.24	SPT(C) 100 (25 for 143mm/100 for 94mm) Hammer SN = 1501												
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
5.50	177
17.00	150

Water Added

From (m)	To (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.60m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Water	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No.	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID
	23-0585	Client: Iarnród Éireann	M-BH09
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.70 m	Start Date: 15/12/2023	Driller: MMcK	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170	0.00	1.70					Scale: 1:50
Cone Penetration	Drill N'CPT	0.20	0.34	712825.48 E				
Rotary Coring	Fraste CRS-XL170	1.70	10.70	612739.91 N	Elevation: -3.80 mCD	End Date: 15/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.40	SB1						0.00	0.00				NO RECOVERY: Material flushed to prepare for CPT test; probably soft to firm slightly sandy silty CLAY.		
0.00 - 0.45	SPT (C)	N=27 (10,7/6,6,6,9) Hammer SN = 1501							-4.00	0.20		WEATHERED MUDSTONE recovered as, brown slightly sandy clayey angular to subangular fine to coarse GRAVEL of mudstone. Sand is fine to coarse.		
1.40 - 1.70	SB2						1.40	0.00						
1.40 - 1.54	SPT (C)	100 (25 for 135mm/100 for 5mm) Hammer SN = 1501							-5.50	1.70		Medium strong grey and white GNEISS. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with orangish brown discolouration on fracture surfaces. Discontinuities: 1. 5-25 degree joints, medium spaced (150/315/390), undulating, rough with orangish brown staining on joint surfaces. 2. 85-90 degree joint at 2.55-2.85m, undulating, rough with orangish brown staining on joint surfaces.		
			93	70	32	4								
									-6.75	2.95		Weak grey and white GNEISS. Slightly weathered: slightly reduced strength, closer fracture spacing. Discontinuities: 1. 10-30 degree joints, medium spaced (165/540/1200), undulating, rough, clean.		
3.20														
3.90	C1		100	96	82									
4.30 - 4.40	C2													
4.70						2								
			96	96	85									
6.20									-10.00	6.20		Medium strong grey and white GNEISS. Slightly weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 50-60 degree joints, widely spaced (700/900/1100), planar, rough, clean. 2. 75-80 degree joint at 8.25-8.60m, undulating, smooth, clean. 3. 85-90 degree joint at 6.40-6.65m, undulating, rough, clean.		
6.20 - 6.30	C3													
			100	100	47									
7.70						3								
			100	100	30									
9.20									-13.00	9.20				

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
1.70	177		
10.70	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.20m casing flushed, pushed to 0.34m below bed before refusal (total load reached)
No Dissipation Test
See "M-CPT09_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH09
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.70 m	Start Date: 15/12/2023	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170	0.00	1.70	712825.48 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.20	0.34	612739.91 N	Elevation: -3.80 mCD	End Date: 15/12/2023	Logger: MS	FINAL
Rotary Coring	Fraste CRS-XL170	1.70	10.70					

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		47	47	17	4						Strong grey and white GNEISS. Slightly weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 5-20 degree joints, medium spaced (90/265/700), undulating, rough, clean.		
					AZCL								
10.70 10.70 - 10.70	SPT(C) 100 (25 for 5mm/100 for 0mm) Hammer SN = 1501					10.7	0.00	-14.50	10.70		End of Borehole at 10.70m		
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
1.70	177		
10.70	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.20m casing flushed, pushed to 0.34m below bed before refusal (total load reached)
No Dissipation Test
See "M-CPT09_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH10
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170	0.00	10.20	713029.97 E
Cone Penetration	Drill N'CPT	1.84	9.47	613014.81 N
Rotary Coring	Fraste CRS-XL170	10.20	25.20	

Final Depth: 25.20 m	Start Date: 14/01/2024	Driller: MMcK/MJ	Sheet 1 of 3 Scale: 1:50
Elevation: -5.39 mCD	End Date: 15/01/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably soft to firm slightly sandy silty CLAY.		
1.50	D7				-6.89	1.50				
1.50 - 2.70	SB1				-6.99	1.60		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to medium of various lithologies.		
								Light brown very clayey fine to medium SAND.		
2.50	D8									
2.70 - 4.20	SB2				-8.09	2.70		Light brown slightly sandy CLAY. Sand is fine to coarse.		
3.50	D9									
4.20 - 5.70	SB3									
4.50	D10									
					-10.19	4.80		Firm to stiff brown slightly sandy silty CLAY. Sand is fine to medium.		
5.50	D11									
5.70 - 7.20	SB4									
					-11.79	6.40		Light brown clayey fine to medium SAND.		
6.50	D12									
7.20 - 8.70	SB5									
7.50	D13									
					-13.09	7.70		Stiff brown and brownish grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of various lithologies..		
8.50	D14									
8.70 - 10.20	SB6									

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
10.20	177
25.20	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.30m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 1.00m casing flushed, pushed to 1.01m below bed before refusal (maximum tip load) Sonic drill out completed to 1.84m, material suitable so second CPT push attempted
CPT push 2 at this location; 1.84m casing flushed, pushed to 9.47m below bed before refusal (maximum tip load)
Dissipation Test completed at 3.13m
See "M-CPT10_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	20/06/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH10
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 25.20 m	Start Date: 14/01/2024	Driller: MMcK/MJ	Sheet 2 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	10.20	713029.97 E				Scale: 1:50
Cone Penetration	Drill N'CPT	1.84	9.47	613014.81 N	Elevation: -5.39 mCD	End Date: 15/01/2024	Logger: MS	FINAL
Rotary Coring	Fraste CRS-XL170	10.20	25.20					

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
									-14.64	9.25		Indistinctly thinly laminated grey weathered MUDSTONE recovered as, slightly gravelly sandy clay. Sand is fine to coarse. Gravel is angular to subangular fine to medium of mudstone.		
10.20 - 10.36	SPT (C)	100 (25 for 65mm/100 for 95mm) Hammer SN = 1501					10.2	0.00	-15.59	10.20		Weak thinly laminated blackish grey highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing. Discontinuities: 1. Probable 0-20 degree joints, probably very closely spaced, undulating, smooth. 2. 80-90 degree joint at 10.20-11.20m, undulating, smooth.		
11.00	C1		100	13	0	>20								
11.70							11.7	0.00						
11.70 - 11.96	SPT(C) 100 (25 for 87mm/100 for 168mm) Hammer SN = 1501		100	27	20				-17.89	12.50		Weak light grey thinly laminated MUDSTONE. Slightly weathered: locally reduced strength, closer fracture spacing. Discontinuities: 1. 70-85 degree joints at 13.05-13.45m and 14.50-14.80m, planar, smooth.		
13.00 - 13.05	C2													
13.20							13.2	0.00						
13.20 - 13.47	SPT(C) 100 (25 for 124mm/100 for 150mm) Hammer SN = 1501													
13.20 - 14.70	C3		100	100	62	2								
14.70							14.7	0.00						
14.70 - 14.75	SPT(C) 100 (25 for 30mm/100 for 17mm) Hammer SN = 1501													
14.70 - 14.75	C5		100	91	60									
14.80	C4													
16.20							16.2	0.00	-21.59	16.20		LOW RECOVERY: Weak blackish grey highly fractured MUDSTONE. Probably slightly weathered. Discontinuities probably extremely closely to very closely spaced at various angles. *16.20-17.70m: No recovery, core washed out during drilling*		
16.20 - 16.27	SPT(C) 100 (25 for 39mm/100 for 29mm) Hammer SN = 1501		0	0	0	NR								
17.70							17.7	0.00						
17.70 - 17.80	SPT(C) 100 (25 for 75mm/100 for 20mm) Hammer SN = 1501					>20						*18.30-19.20m: AZCL*		

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
10.20	177		
25.20	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.30m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 1.00m casing flushed, pushed to 1.01m below bed before refusal (maximum tip load) Sonic drill out completed to 1.84m, material suitable so second CPT push attempted
CPT push 2 at this location; 1.84m casing flushed, pushed to 9.47m below bed before refusal (maximum tip load)
Dissipation Test completed at 3.13m
See "M-CPT10_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	20/06/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH10
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 25.20 m	Start Date: 14/01/2024	Driller: MMcK/MJ	Sheet 3 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	10.20					Scale: 1:50
Cone Penetration	Drill N'CPT	1.84	9.47	713029.97 E				
Rotary Coring	Fraste CRS-XL170	10.20	25.20	613014.81 N	Elevation: -5.39 mCD	End Date: 15/01/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		40	0	0	AZCL								
19.20 19.20 - 19.39	SPT(C) 100 (25 for 85mm/100 for 105mm) Hammer SN = 1501				>20	19.2	0.00				19.35-20.70m: AZCL		
		10	0	0	AZCL								
20.70 20.70 - 20.90	SPT(C) 100 (25 for 110mm/100 for 90mm) Hammer SN = 1501				>20	20.7	0.00						
		47	0	0	AZCL						21.40-22.20m: AZCL		
22.20 22.20 - 22.32	SPT(C) 100 (25 for 75mm/100 for 50mm) Hammer SN = 1501					22.2	0.00	-27.59	22.20		Very weak thinly laminated grey MUDSTONE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with grey clay and gravel infill. Discontinuities: 1. 20-40 degree joints, widely spaced (100/750/1400), planar, smooth. 2. 60 degree joint at 24.35-24.50m, planar, smooth, with grey gravel infill, up to 45mm on joint surface. 3. 75-90 degree joints at 22.20-22.55m, 23.70-23.90m and 24.10-24.25m, planar, smooth, with occasional grey clay smearing on joint surfaces.		
22.20 23.00 - 23.10	C6 C7	100	77	26									
23.70 23.70 - 23.73	SPT(C) 100 (25 for 10mm/100 for 22mm) Hammer SN = 1501				3	23.7	0.00						
		100	74	14									
25.20 25.20 - 25.24	SPT(C) 100 (25 for 28mm/100 for 15mm) Hammer SN = 1501					25.2	0.00	-30.59	25.20		End of Borehole at 25.20m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
10.20	177
25.20	150

Water Added

From (m)	To (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.30m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 1.00m casing flushed, pushed to 1.01m below bed before refusal (maximum tip load)
Sonic drill out completed to 1.84m, material suitable so second CPT push attempted
CPT push 2 at this location; 1.84m casing flushed, pushed to 9.47m below bed before refusal (maximum tip load)
Dissipation Test completed at 3.13m
See "M-CPT10_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	20/06/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH11

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 12.80 m	Start Date: 19/12/2023	Driller: MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	6.00	712960.03 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	6.00	12.80	612823.14 N	Elevation: -4.27 mCD	End Date: 19/12/2023	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.50 - 1.50 0.50 - 2.00 1.00	P6 SB1 D8	0% Recovery	0.50		-4.87	0.60		NO RECOVERY: Material washed away by drilling process; probably soft very sandy SILT.		
2.00 2.00 - 2.45 2.00 - 3.50 3.00	D9 UT7 SB2 D10	Ublow=22 100% Recovery	2.00	0.00	-5.92	1.65		Soft dark grey very sandy CLAY with occasional shell fragments. Sand is fine to coarse. (Organic Odour)		
3.50 - 5.00 3.50 - 3.95 4.00	SB3 SPT (C) D11	N=23 (5,4/6,6,5,6) Hammer SN = 1501	3.50	0.00	-7.57	3.30		Soft brown slightly sandy CLAY. Sand is fine to coarse.		
5.00 5.00 - 6.00 5.00 - 5.45	D12 SB5 SPT (C)	N=24 (6,7/7,6,6,5) Hammer SN = 1501	5.00	0.00	-8.17	3.90		Medium dense dark brown gravelly slightly clayey fine to coarse SAND. Gravel is angular fine of various lithologies.		
					-9.52	5.25		Firm to stiff light brown slightly sandy gravelly SILT/CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
					-9.82	5.55		Dark grey angular fine to coarse GRAVEL of metamorphic lithologies.		
					-10.02	5.75		Stiff light brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies.		
					-10.27	6.00		WEATHERED AMPHIBOLITE recovered as, light grey angular fine to coarse gravel.		
6.80 8.15 - 8.30 8.30	C1	TCR 85, SCR 64, RQD 0, FI 8 TCR 100, SCR 100, RQD 79, FI 5 TCR 100, SCR 100, RQD 82						Medium strong greenish grey AMPHIBOLITE with numerous discontinuous white quartz veins, up to 50mm. Slightly weathered: localised slightly reduced strength, slightly closer fracture spacing, with brown and green staining on fracture surfaces. Discontinuities: 1. 0-25 degree joints, medium spaced (90/390/1200), undulating, rough, with brown and greenish grey staining on joint surfaces. 2. 60-65 degree joint at 7.85-8.00m, undulating, rough, with brown staining on joint surface. 3. 75 degree joint at 10.80-11.05m, undulating, rough, clean. 4. 85-90 degree joint at 6.20-6.40m, undulating, rough, with brown staining on joint surface.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
6.00	177
12.80	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.30m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH11
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	6.00	712960.03 E
Rotary Coring	Fraste CRS-XL170 Duo	6.00	12.80	612823.14 N

Final Depth: 12.80 m	Start Date: 19/12/2023	Driller: MJ	Sheet 2 of 2
			Scale: 1:50
Elevation: -4.27 mCD	End Date: 19/12/2023	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.80													
9.80 - 9.90	C3				1								
10.60	C2	100	100	76									
								-15.32	11.05		Strong light grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, closer fracture spacing, with reddish brown discolouration and clay infill on fracture surfaces. Discontinuities: 1. 0-15 degree joints, medium spaced (410/585/1100), undulating, rough, with red clay infill, up to 3mm on some joint surfaces. 2. 70-80 degree joints at 11.30-11.65m and 11.70-12.05m, planar, rough, with red clay infill, up to 30mm on joint surfaces.		
11.30					3								
		100	100	20									
12.80								-17.07	12.80		End of Borehole at 12.80m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
6.00	177
12.80	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.30m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH12
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 12/12/2023	Driller: MJ/ MMcK	Sheet 1 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	6.50	713182.69 E				
Rotary Coring	Fraste CRS-XL170 Duo	6.50	11.00	612691.14 N	Elevation: -2.95 mCD	End Date: 12/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	SB1	Low Recovery						Very soft dark grey and brown very sandy slightly clayey SILT. Sand is fine to coarse.		
0.50	D6		0.50	0.00						
0.50 - 1.50	SB2									
0.50 - 0.95	SPT (S)	N=0 (0,0/0,0,0,0) Hammer SN = 1501								
1.50	D7		1.50	0.00				*1.50 - 3.50m: AZCL, material washed away by drilling process; probably very soft very sandy slightly clayey silt.*		
1.50 - 1.95	SPT (S)	N=0 (0,0/0,0,0,0) Hammer SN = 1501								
2.50	D8		2.50	0.00						
2.50 - 2.95	SPT (S)	N=0 (1,0/0,0,0,0) Hammer SN = 1501								
3.50	D9		3.50	0.00	-6.45	3.50		Very soft grey slightly sandy silty CLAY. Sand is fine to coarse.		
3.50 - 4.50	SB3									
3.50 - 3.95	SPT (S)	N=2 (1,0/1,1,0,0) Hammer SN = 1501								
4.50	D10		4.50	0.00						
4.50 - 5.50	SB4									
4.50 - 4.95	SPT (S)	N=3 (1,1/1,0,1,1) Hammer SN = 1501								
5.50	D11		5.50	0.00	-8.45	5.50		Very loose light brownish grey sandy subangular fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse.		
5.50 - 6.50	SB5									
5.50 - 5.95	SPT (S)	N=2 (0,1/0,1,1,0) Hammer SN = 1501								
6.50 - 6.60	C1		6.50	0.00	-9.45	6.50		Moderately weak (locally strong) grey and pink GNEISS with rare white quartz veins, up to 6mm. Slightly weathered: slightly reduced strength, probable closer fracture spacing with brownish green discolouration on some fracture surfaces. Discontinuities: 1. 0-15 degree joints, probably medium spaced. undulating, rough with brownish green staining on some joint surfaces. 2. 40-50 degree joints, probably medium spaced, planar, smooth, with brownish green staining on some joint surfaces.		
6.50 - 6.60	C3									
6.80 - 6.90	SPT (C)	100 (25 for 90mm/100 for 192mm) Hammer SN = 1501								
		TCR 100, SCR 0, RQD 0, FI 9								
8.00					-10.95	8.00		Medium strong dark grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing with greenish brown discolouration.		
8.10	C2									
		TCR 95, SCR 95, RQD 45, FI 7								
8.70 - 8.80	C6				-11.55	8.60		Discontinuities: 1. 0-10 degree joints, closely spaced (150/190/210), undulating, rough, with greenish brown staining on joint surfaces. 2. 85-90 degree joint at 8.00-8.20m, undulating, rough, with patchy		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
6.50	177
11.00	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.50m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH12
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 12/12/2023	Driller: MJ/ MMcK	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	6.50	713182.69 E				
Rotary Coring	Fraste CRS-XL170 Duo	6.50	11.00	612691.14 N	Elevation: -2.95 mCD	End Date: 12/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.40 - 9.50	C7										greenish brown staining on joint surface.		
9.50											Medium strong (locally strong) grey and pink GNEISS. Slightly weathered: slightly closer fracture spacing, with brown discolouration on some fracture surfaces. Discontinuities: 1. 0-20 degree joints, medium spaced (60/300/900). undulating, rough, with brown staining on some joint surfaces. 2. 70-75 degree joint at 10.00-10.25m, undulating, rough, with brown staining on joint surface.		
9.50 - 9.90	C5	100	100	68	4								
11.00						11.0	0.00	-13.95	11.00		End of Borehole at 11.00m		
11.00 - 11.00	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501												
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
6.50	177
11.00	177

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.50m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH13
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 12/12/2023	Driller: MMcK	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.00	713106.47 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.00	11.00	612664.96 N	Elevation: -2.72 mCD	End Date: 12/12/2023	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.50 0.50 - 1.50 0.50 - 0.95	D3 SB1 SPT (S)	N=22 (3,4/4,5,6,7) Hammer SN = 1501	0.50	0.00				Medium dense brown very sandy slightly clayey angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
1.50 - 2.00 1.50 - 1.72	SB2 SPT (C)	100 (11,13/100 for 75mm) Hammer SN = 1501	1.50	0.00	-4.22	1.50		WEATHERED BEDROCK recovered as, light greyish brown sandy slightly clayey GRAVEL and COBBLES. Sand is fine to coarse. Gravel is angular fine to coarse of amphibolite. Cobbles are subangular of amphibolite.		
					-4.72	2.00		Medium strong greenish grey speckled white fractured AMPHIBOLITE. Slightly weathered: closer to much closer fracture spacing, with brown discolouration on fracture surfaces. Discontinuities: 1. 0-15 degree joints, closely spaced (60/160/200), undulating, rough, with brown staining on some of the joint surfaces. 2. 55-60 degree joints, medium spaced (30/315/460), planar, rough, with brown staining on joint surfaces.		
3.50					-6.62	3.90		Medium strong greenish grey speckled white AMPHIBOLITE and occasional green chlorite veins, up to 10mm. Slightly weathered: slightly closer fracture spacing, with faint dark brown discolouration on fracture surfaces. Discontinuities: 1. 0-25 degree joints, medium spaced (20/340/800), planar, smooth, with brown staining on some joint surfaces. 2. 50-65 degree joints, widely spaced (400/1420/1900), planar, rough, with brown staining on some joint surfaces.		
5.00										
6.50 6.50 - 6.70 6.70 - 7.00	C1 C4									
7.60 - 7.70 7.75 - 8.00	C3 C2									
8.00										

TCR	SCR	RQD	FI
100	60	7	11
89	89	39	
93	79	50	5
100	100	85	
100	100	68	3

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.00	177
11.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.50m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH13

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 12/12/2023	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.00	713106.47 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.00	11.00	612664.96 N	Elevation: -2.72 mCD	End Date: 12/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50		100	100	79									
11.00 11.00 - 11.00	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501					11.0	0.00	-13.72	11.00		End of Borehole at 11.00m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.50m
All elevations and reduced levels are given in local Chart Datum

Casing Details

To (m)	Diam (mm)
2.00	177
11.00	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH14

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 9.80 m	Start Date: 11/12/2023	Driller: MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.00	713022.01 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	3.00	9.80	612651.11 N	Elevation: -2.94 mCD	End Date: 12/12/2023	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.50 - 1.50 0.50 - 0.58	SB1 SPT (C)	100 (25 for 77mm/100 for 0mm) Hammer SN = 1501	0.50	0.00				Very dense brown sandy silty clayey angular to subangular fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse. Cobbles are angular to subangular of various lithologies.		
1.50 - 2.00	SB2									
2.00 - 3.00	SB3				-4.94	2.00		Grey very gravelly very silty clayey fine to coarse SAND. Gravel is angular to subangular fine to medium of various lithologies.		
2.50 - 2.56	SPT (C)	100 (25 for 50mm/100 for 10mm) Hammer SN = 1501	2.50	0.00	-5.44	2.50		WEATHERED BEDROCK recovered as, light greyish brown slightly sandy clayey angular fine to coarse GRAVEL and occasional subangular COBBLES of amphibolite.		
3.80		TCR 100, SCR 0, RQD 0, FI 7 TCR 100, SCR 20, RQD 0, FI 12			-5.94	3.00		Medium strong (locally weak) dark grey fractured AMPHIBOLITE. Slightly weathered: reduced strength, much closer fracture spacing, with faint greenish brown discolouration. Discontinuities: 1. 0-20 degree joints, closely spaced (20/180/220), undulating, rough, with faint greenish brown staining on joint surfaces. 2. 45-55 degree joints, widely spaced (300/635/700), undulating, rough, with faint greenish brown staining on joint surfaces.		
5.30 5.40 - 5.50 5.50 - 5.60 6.00 - 6.20 6.20 - 6.35 6.30 - 6.40 6.40 6.80 6.80 - 7.25 7.25 - 7.35 7.80 - 8.00 8.15 - 8.30 8.30	C4 C5 C6 C7 C2 C1 C8 C9 C10 C3	TCR 100, SCR 100, RQD 43, FI 6 TCR 100, SCR 100, RQD 42, FI 6 TCR 100, SCR 78, RQD 34, FI 15			-7.74	4.80		Medium strong (locally weak to moderately weak) greenish grey AMPHIBOLITE. Slightly weathered: closer fracture spacing, with faint green discolouration. Discontinuities: 1. 0-25 degree joints, medium spaced (65/240/450), planar and undulating, rough, with faint green staining on some joint surfaces. 2. 60-75 degree joints, medium spaced (60/415/800), planar, rough, with green staining on some joint surfaces.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
9.80	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH14

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 9.80 m	Start Date: 11/12/2023	Driller: MJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.00	713022.01 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	3.00	9.80	612651.11 N	Elevation: -2.94 mCD	End Date: 12/12/2023	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
					4								
9.80								-12.74	9.80		End of Borehole at 9.80m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
3.00	177
9.80	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH15
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.00	712948.95 E
Rotary Coring	Fraste CRS-XL170 Duo	3.00	10.50	612637.04 N

Final Depth: 10.50 m	Start Date: 11/12/2023	Driller: MMcK	Sheet 1 of 2
Elevation: -2.55 mCD	End Date: 11/12/2023	Logger: MS	Scale: 1:50
			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 - 1.00 0.00 - 0.45	D4 SB1 SPT (S)	N=10 (2,2/3,2,3,2) Hammer SN = 1501	0.00	0.00	-3.35	0.80		Loose to medium dense brown and yellowish brown gravelly slightly clayey fine to medium SAND. Gravel is subrounded to rounded fine of various lithologies.		
1.00 - 2.00 1.00 - 1.08	SB2 SPT (C)	100 (25 for 61mm/100 for 17mm) Hammer SN = 1501	1.00	0.00	-4.35	1.80		WEATHERED BEDROCK recovered as yellowish brown sandy silty clayey angular to subangular fine to coarse gravel of mudstone with low cobble content. Sand is fine to coarse. Cobbles are angular of mudstone.		
2.00 - 3.00 2.00 - 2.04	SB3 SPT (C)	100 (25 for 40mm/100 for 0mm) Hammer SN = 1501	2.00	0.00	-5.55	3.00		WEATHERED BEDROCK recovered as greenish brown mottled yellowish brown very sandy silty clayey angular to subangular fine to coarse gravel of mudstone with low cobble content. Sand is fine to coarse. Cobbles are subangular of mudstone.		
4.50 4.70 - 4.90 4.90 - 5.15 5.00 5.70 - 6.00 6.00 6.40 - 6.70 6.70 - 6.90 6.90 - 7.10 7.40 - 7.50 7.50 9.00	C4 C5 C1 C3 C6 C7 C8 C2				-7.25	4.70		Medium strong grey GNEISS. Slightly weathered: closer fracture spacing, with brown discolouration. Discontinuities: 1. 0-10 degree joints, medium spaced (50/215/300), undulating, rough, with brown staining on joint surfaces. 2. 90 degree joint, undulating, rough, with brown staining on joint surface. Medium strong to strong grey and pink GNEISS with occasional quartz and feldspar veins at various angles. Slightly weathered: slightly closer fracture spacing, with brown discolouration on fracture surfaces and localised light brown silt infill. Discontinuities: 1. 0-20 degree joints, medium spaced (20/290/800), undulating, rough, with brown staining on joint surfaces. 2. 45 degree joint at 6.20-6.30m, planar, smooth, with brown staining on joint surface. 3. 70-90 degree joints at 5.30-5.60m, 5.70-6.20m, 7.35-7.80m, 8.00-8.15m, 9.60-9.85m and 10.30-10.50m, undulating, rough, with brown staining on joint surfaces and rare brown silt infill up to 5mm on joint surfaces.		

TCR	SCR	RQD	FI
53	0	0	AZCL
			10
100	71	45	
100	60	43	6
100	89	53	

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 9.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH15

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.50 m	Start Date: 11/12/2023	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.00	712948.95 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	3.00	10.50	612637.04 N	Elevation: -2.55 mCD	End Date: 11/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		96	96	64	5								
10.50 10.50 - 10.50	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501					10.5	0.00	-13.05	10.50		End of Borehole at 10.50m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
3.00	177
10.50	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 9.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH16

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 13/12/2023	Driller: MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.50	712898.73 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.50	11.00	612649.56 N	Elevation: -2.29 mCD	End Date: 13/12/2023	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	SB1				-2.59	0.30		NO RECOVERY: Material washed away by drilling process; probably soft to firm slightly sandy silty CLAY.		
0.50 - 1.50	SB2		0.50	0.00				Dense brown very gravelly clayey fine to coarse SAND with occasional shell fragments. Gravel is angular to subangular fine to coarse of various lithologies.		
0.50 - 0.95	SPT (C)	N=31 (4,7/7,8,8,8) Hammer SN = 1501			-3.19	0.90		Firm to stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of various lithologies.		
					-3.59	1.30		Brown mottled grey sandy angular to subangular fine to coarse GRAVEL of metamorphic origin. Sand is fine to coarse.		
1.50 - 2.50	SB3		1.50	0.00	-3.79	1.50		Very stiff grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of metamorphic origin.		
1.50 - 1.78	SPT (C)	100 (10,15/100 for 125mm) Hammer SN = 1501			-3.99	1.70		WEATHERED AMPHIBOLITE recovered as light grey sandy angular to subangular fine to coarse GRAVEL. Sand is fine to medium.		
2.50 - 2.57	SPT (C)	100 (25 for 50mm/100 for 20mm) Hammer SN = 1501	250	0.00	-4.99	2.70		Moderately weak dark greenish grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, closer fracture spacing, with brownish green discolouration.		
3.50					-6.19	3.90		Discontinuities: 1. 10-25 degree joints, medium spaced (150/240/290), undulating, rough with brownish green staining on joint surfaces. 2. 55-60 degree joint at 2.90-3.05m, planar, rough with brownish green staining on joint surface. 3. 90 degree joint at 3.00-3.50m, undulating, rough with brownish green staining on joint surface.		
5.00					-6.99	4.70		Moderately weak to medium strong indistinctly narrowly foliated dark greenish grey and white GNEISS. Slightly weathered: slightly reduced strength, closer fracture spacing, with brownish green discolouration.		
					-7.69	5.40		Discontinuities: 1. 0-15 degree joints, medium spaced (130/270/310), undulating, rough with brownish green staining on joint surfaces. 2. 45 degree joint at 4.25-4.35m, planar, rough with brownish green staining on joint surface. 3. 85-90 degree joint at 3.90-4.50m, undulating, rough with brownish green staining on joint surface.		
6.50					-8.79	6.50		Moderately weak dark grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, closer fracture spacing with brownish green and orangish brown discolouration on fracture surfaces,		
6.50 - 6.60	C1							Discontinuities: 1. 0-10 degree joints, closely spaced (60/175/400), undulating, rough with orangish brown staining on joint surfaces. 2. 45 degree joint at 4.80-4.90m, planar, rough with brownish green staining on joint surface. 3. 60 degree joint at 4.90-5.05m, undulating, rough with brownish green and orangish brown staining on joint surface.		
6.60 - 6.70	C2									
6.70 - 6.80	C3									
7.70 - 7.80	C4									
8.00								Moderately weak to medium strong narrowly foliated grey and greenish grey GNEISS. Slightly weathered: slightly reduced strength, slightly closer fracture spacing with brownish green discolouration.		
8.40 - 8.50	C7				-10.69	8.40		Discontinuities: 1. 0-10 degree joints, closely spaced (20/185/590), planar, rough with brownish green staining on joint surfaces. 2. 40-50 degree joints, medium spaced (90/365/620), planar, rough with brownish green staining on joint surfaces.		
8.80 - 8.95	C6									
9.10 - 9.50	C5				-11.29	9.00				

Depth (m)	TCR	SCR	RQD	FI
3.50	100	35	0	>20
5.00	100	87	0	6
6.50	100	73	10	6
7.70	100	64	0	9
8.40	100	69	26	8
9.50				6
11.00				7
				8

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.50	177
11.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.60m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH16
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 13/12/2023	Driller: MJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.50	712898.73 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.50	11.00	612649.56 N	Elevation: -2.29 mCD	End Date: 13/12/2023	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50		100	100	77	6			-13.29	11.00		Medium strong (locally very weak) dark grey and greenish grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing with greenish grey discolouration. Discontinuities: 1. 5-20 degree joints, medium spaced (140/215/380), planar, rough with greenish grey staining on joint surfaces. 2. 70-90 degree joints at 6.75-7.10m and 7.75-8.40m, undulating, rough with greenish grey staining on joint surfaces.		
11.00											Very weak to weak grey and greenish grey mottled pinkish white AMPHIBOLITE. Slightly weathered: slightly reduced strength, closer fracture spacing with greenish grey discolouration. Discontinuities: 1. 45-50 degree joint at 8.60-8.70m, planar, rough with brownish green staining on joint surface. 2. 50-60 degree joints, closely spaced (50/150/220), undulating, rough with greenish grey staining on joint surfaces.		
											Medium strong grey AMPHIBOLITE white rare white calcite veins, up to 20mm. Slightly weathered: slightly closer fracture spacing and localised greenish grey discolouration on fracture surfaces. Discontinuities: 1. 5-20 degree joints, medium spaced (25/200/380), undulating, rough with greenish grey staining on some joint surfaces. 2. 75 degree joint at 10.85-11.00m, planar, rough with patchy greenish grey staining on joint surface,		
											End of Borehole at 11.00m		
		TCR	SCR	RQD	FI								

Depth scale: 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0, 13.5, 14.0, 14.5, 15.0, 15.5, 16.0, 16.5, 17.0, 17.5, 18.0, 18.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.50	177
11.00	150

Water Added

From (m)	To (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.60m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH17
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.50	712565.24 E
Rotary Coring	Fraste CRS-XL170 Duo	4.50	10.50	612835.10 N

Final Depth: 10.50 m	Start Date: 19/01/2024	Driller: MMcK	Sheet 1 of 2
Elevation: -4.36 mCD	End Date: 19/01/2024	Logger: OG	Scale: 1:50
			FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00	D4						0.00	0.00	-4.51	0.15		Soft to firm dark greyish brown sandy CLAY with rare shell fragments. Sand is fine to coarse.		
0.00 - 1.50	SB1											Firm to stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine of various lithologies.		
0.00 - 0.45	SPT (S)	N=11 (2,2/3,2,3,3) Hammer SN = 1501												
1.50	D5						1.50	0.00						
1.50 - 3.00	SB2													
1.50 - 1.95	SPT (S)	N=14 (2,3/3,4,4,3) Hammer SN = 1501												
3.00	D6						3.00	0.00						
3.00 - 4.50	SB3													
3.00 - 3.32	SPT (C)	100 (25 for 135mm/100 for 190mm) Hammer SN = 1501							-7.71	3.35		Indistinctly thinly laminated light and dark grey weathered MUDSTONE recovered as, slightly gravelly sandy clay. Sand is fine to coarse. Gravel is angular to subangular fine of mudstone.		
4.00	D7													
4.50	C1						4.50	0.00	-8.96	4.60		Extremely weak to very weak indistinctly thinly laminated dark grey highly fractured weathered MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing.		
4.50 - 4.63	SPT (C)	100 (25 for 71mm/100 for 59mm) Hammer SN = 1501												
			100	16	0	>20						Discontinuities are extremely closely to very closely spaced at various angles.		
6.00							6.00	0.00						
6.00 - 6.18	SPT(C)	100 (25 for 68mm/100 for 115mm) Hammer SN = 1501				5						6.45-6.60m: 50-55 degree joint, planar, smooth		
6.20 - 6.30	C2		87	53	18							6.70-6.85m: 55 degree joint, planar, smooth		
7.50							7.50	0.00						
7.50 - 7.71	SPT(C)	100 (25 for 90mm/100 for 123mm) Hammer SN = 1501				>20								
7.60 - 7.65	C4		100	67	0									
9.00							9.00	0.00						

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.50	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH17

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.50 m	Start Date: 19/01/2024	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.50	712565.24 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	4.50	10.50	612835.10 N	Elevation: -4.36 mCD	End Date: 19/01/2024	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.00 - 9.14	SPT(C) 100 (25 for 60mm/100 for 85mm) Hammer SN = 1501	100	0	0									
10.50						10.5	0.00	-14.86	10.50		End of Borehole at 10.50m		
10.50 - 10.59	SPT(C) 100 (25 for 40mm/100 for 49mm) Hammer SN = 1501												
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Casing Details

To (m)	Diam (mm)
4.50	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH18
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	8.00	712605.81 E
Rotary Coring	Fraste CRS-XL170 Duo	8.00	16.00	612958.36 N

Final Depth: 16.00 m	Start Date: 07/01/2024	Driller: MMcK/MJ	Sheet 1 of 2
Elevation: -4.97 mCD	End Date: 12/01/2024	Logger: MS	Scale: 1:50
			FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material washed away by drilling process; probably soft to firm sandy silty CLAY.		
0.50 0.50 - 1.50 0.50 - 0.95	D8 SB1 SPT (S)	N=13 (3,4/3,3,4,3) Hammer SN = 1501	0.50	0.00	-5.47	0.50		Firm to stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
1.50 1.50 - 1.95 1.50 - 2.50	D9 UT16 SB2	Ublow=74 100% Recovery	1.50	0.00						
2.50 2.50 - 3.50 2.50 - 2.95	D10 SB3 SPT (S)	N=15 (3,3/4,3,4,4) Hammer SN = 1501	2.50	0.00						
3.50 3.50 - 3.95 3.50 - 4.50	D11 UT17 SB4	Ublow=81 100% Recovery	3.50	0.00						
4.50 4.50 - 5.00 4.50 - 4.95	D12 SB5 SPT (S)	N=27 (9,7/7,7,6,7) Hammer SN = 1501	4.50	0.00	-9.47	4.50		Medium dense very gravelly clayey fine to coarse SAND. Gravel is subangular fine to medium of various lithologies.		
5.00 - 6.50	SB6				-9.97	5.00		Brown very clayey fine to coarse SAND.		
5.50	D13									
6.50 6.50 - 8.00 6.50 - 6.95	D14 SB7 SPT (S)	N=43 (7,10/10,9,11,13) Hammer SN = 1501	6.50	0.00	-11.47	6.50		Dense brown gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to medium of various lithologies.		
7.50	D15				-12.57	7.60		Very weak indistinctly thinly laminated brownish grey weathered MUDSTONE. No discernible discontinuities.		
8.00 - 8.16	SPT (C)	100 (25 for 91mm/100 for 70mm) Hammer SN = 1501	8.00	0.00	-12.97	8.00		LOW RECOVERY: Probable very weak indistinctly thinly laminated dark grey MUDSTONE with extremely closely to very closely spaced discontinuities at various angles.		
8.50										

TCR	SCR	RQD	FI
44	0	0	AZCL
			>20
20	0	0	AZCL

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.00	177
16.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH18
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 16.00 m	Start Date: 07/01/2024	Driller: MMcK/MJ	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	8.00	712605.81 E				
Rotary Coring	Fraste CRS-XL170 Duo	8.00	16.00	612958.36 N	Elevation: -4.97 mCD	End Date: 12/01/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
10.00 10.00 - 10.45 10.00	SPT(C) N=46 (9,12/10,11,13,12) Hammer SN = 1501 C1	100	0	0	>20	10.0	0.00						
								-16.17	11.20		Very weak thinly laminated dark grey MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing, with occasional grey clay infill. Discontinuities: 1. 0-15 degree joints, medium spaced (90/255/320), undulating, smooth. 2. 75-90 degree joints at 11.50-11.70m, 11.90-12.05m, 12.10-12.20m, 12.30-12.45m, 12.80-13.30m and 13.30-13.50m, undulating, smooth, with grey clay infill on joint surfaces.		
11.50 11.50 - 11.78	SPT(C) 100 (25 for 125mm/100 for 160mm) Hammer SN = 1501	100	53	0	10	11.5	0.00						
13.00 13.00 - 13.18 13.00 - 13.05	SPT(C) 100 (25 for 85mm/100 for 95mm) Hammer SN = 1501 C2	83	41	41	AZCL 20 2	13.0	0.00				13.00-13.20m: AZCL - SPT disturbance		
								-18.47	13.50		Weak indistinctly thinly laminated dark grey MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing. Discontinuities: 1. 0-20 degree joints, medium spaced (70/415/660), undulating, smooth. 2. 65-80 degree joints at 15.00-15.30m, 15.20-15.35m, 15.55-15.70m, 15.70-15.90 and 15.80-16.00m, planar, smooth.		
14.50 14.50 - 14.66	SPT(C) 100 (25 for 70mm/100 for 85mm) Hammer SN = 1501	78	25	0	AZCL 11	14.5	0.00				14.50-14.70m: AZCL - SPT disturbance		
16.00 16.00 - 16.19	SPT(C) 100 (25 for 87mm/100 for 102mm) Hammer SN = 1501					16.0	0.00	-20.97	16.00		End of Borehole at 16.00m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
8.00	177
16.00	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH19
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 14.90 m	Start Date: 16/01/2024	Driller: MMcK/MJ	Sheet 1 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.90	712485.96 E				
Rotary Coring	Fraste CRS-XL170 Duo	2.90	14.90	612846.37 N	Elevation: -4.58 mCD	End Date: 18/01/2024	Logger: MS/OG	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00	D3						0.00	0.00						
0.00 - 1.40	SB1								-4.78	0.20		Very loose dark greyish brown slightly sandy silty CLAY with rare shell fragments. Sand is fine to medium.		
0.00 - 0.45	SPT (S)	N=1 (1,0/0,0,1,0) Hammer SN = 1501										Firm brown slightly sandy slightly gravelly CLAY . Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
1.40	D4						1.40	0.00						
1.40 - 2.90	SB2													
1.40 - 1.85	SPT (S)	N=10 (3,2/2,3,2,3) Hammer SN = 1501												
2.40	D5													
2.90 - 3.03	SPT (C)	100 (34 for 82mm/100 for 45mm) Hammer SN = 1501					2.90	0.00	-7.48	2.90		Very stiff brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies.		
3.40	D6		100	0	0	NI								
4.40							4.40	0.00						
4.40 - 4.74	SPT(C)	100 (25 for 75mm/100 for 265mm) Hammer SN = 1501							-9.18	4.60		Extremely weak indistinctly thinly laminated dark grey highly fractured weathered MUDSTONE. Slightly weathered: highly reduced strength, closer fracture spacing, with grey sandy clay infill.		
4.40	D7		100	65	0							Fractures and probably very closely to closely spaced at various angles.		
4.50 - 4.60	C2													
4.80 - 4.90	C1													
5.40	D8													
5.90							5.90	0.00						
5.90 - 6.01	SPT(C)	100 (25 for 70mm/100 for 38mm) Hammer SN = 1501												
6.10 - 6.20	C4		93	37	0	>20								
7.40							7.40	0.00						
7.40 - 7.54	SPT(C)	100 (25 for 75mm/100 for 70mm) Hammer SN = 1501												
			100	33	27									
8.90							8.90	0.00				8.90-9.10m: AZCL - SPT disturbance		
						AZCL								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
2.90	177		
149.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.10m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH19
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.90	712485.96 E
Rotary Coring	Fraste CRS-XL170 Duo	2.90	14.90	612846.37 N

Final Depth: 14.90 m	Start Date: 16/01/2024	Driller: MMcK/MJ	Sheet 2 of 2 Scale: 1:50
Elevation: -4.58 mCD	End Date: 18/01/2024	Logger: MS/OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
8.90 - 9.02	SPT(C) 100 (25 for 75mm/100 for 40mm) Hammer SN = 1501	87	47	47	>20								
10.30 - 10.45	C5					10.4	0.00				10.40-10.70m: AZCL - SPT disturbance		
10.40 - 10.53	SPT(C) 100 (25 for 70mm/100 for 60mm) Hammer SN = 1501	80	40	40	AZCL								
11.90 - 12.08	SPT(C) 100 (25 for 75mm/100 for 105mm) Hammer SN = 1501	100	13	0	>20	11.9	0.00						
13.40 - 13.58	SPT(C) 100 (23 for 85mm/100 for 95mm) Hammer SN = 1501	92	20	0		13.4	0.00						
14.90 - 15.06	SPT(C) 100 (25 for 75mm/100 for 80mm) Hammer SN = 1501					14.9	0.00	-19.48	14.90		End of Borehole at 14.90m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Casing Details

To (m)	Diam (mm)
2.90	177
149.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.10m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH20
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.30	713201.52 E
Rotary Coring	Fraste CRS-XL170 Duo	2.30	12.50	612865.53 N

Final Depth: 12.80 m	Start Date: 13/01/2024	Driller: MMcK/MJ	Sheet 1 of 2 Scale: 1:50
Elevation: -6.24 mCD	End Date: 13/01/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
												NO RECOVERY: Material washed away by drilling process; probably very soft sandy silty CLAY.		
0.80	D2						0.80	0.00	-7.04	0.80				
0.80 - 2.30	SB1											Very soft dark brown and black very sandy CLAY with rare shell fragments. Sand is fine to coarse. (Organic Odour)		
0.80 - 1.25	SPT (S)	N=0 (0,0/0,0,0,0) Hammer SN = 1501												
1.80	D3													
2.30 - 2.42	SPT (S)	100 (25 for 95mm/100 for 30mm) Hammer SN = 1501					2.30	0.00	-8.54	2.30		Weak greenish grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with orangish brown discolouration and silty clay infill on joint surfaces.		
2.70 - 2.80	C1		97	60	27	4						Discontinuities: 1. 20-40 degree joints, medium spaced (90/430/500), undulating, rough, orangish brown staining on joint surfaces and light brown silty clay infill.		
									-9.84	3.60		2. 55 degree joint at 2.90-3.00m, planar, rough, with orangish brown staining on joint surface and brown silty clay infill up to 15mm on joint surface. 3. 70-75 degree joints at 2.45-2.70m and 3.10-3.40m, planar, rough, with orangish brown staining on joint surfaces.		
3.80												Medium strong greenish grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, locally closer fracture spacing, with brown discolouration.		
4.30	C2		100	93	48	2						Discontinuities: 1. 10-20 degree joints, widely spaced (90/615/920), planar, rough, with brown staining and localised silty clay infill on joint surfaces. 2. 45-60 degree joints at 4.80-4.95m, 4.10-4.20m, 6.35-6.45m and 6.45-6.55m, planar, rough, with brown staining on joint surfaces. 3. 75-90 degree joints at 5.80-6.35m, 6.60-7.15m and 7.60-7.80m, undulating, rough, with brown staining on joint surfaces.		
5.30			100	72	27									
6.80			100	92	9	4								
						8			-14.14	7.90		Medium strong to strong grey and white GNEISS. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with occasional orangish brown discolouration on fracture surfaces.		
8.30			100	100	56							Discontinuities: 1. 10-30 degree joints, medium spaced (80/445/800), planar, rough, with occasional orangish brown staining on joint surfaces. 2. 55-70 degree joints at 8.60-8.80m, 11.80-11.95m, 12.00-12.15m and 12.20-12.80m, planar, rough and smooth.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.30	177
12.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 11.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH20

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 12.80 m	Start Date: 13/01/2024	Driller: MMcK/MJ	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.30	713201.52 E				
Rotary Coring	Fraste CRS-XL170 Duo	2.30	12.50	612865.53 N	Elevation: -6.24 mCD	End Date: 13/01/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.80		97	97	92	2								
11.30		87	69	35	4								
					AZCL								
12.80								-19.04	12.80		End of Borehole at 12.80m		

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
2.30	177		
12.50	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 11.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH21

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 8.10 m	Start Date: 01/02/2024	Driller: KW	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	8.10	713315.45 E 613151.82 N	Elevation: -10.53 mCD	End Date: 01/02/2024	Logger: LW	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.60	SB1							Firm to stiff light greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
0.60	D12		0.60	0.00						
0.60 - 1.60	SB2									
0.60 - 1.05	SPT (S)	N=18 (3,4/5,5,4,4) Hammer SN = 1353								
1.60	UT11	Ublow=62 60% Recovery	1.60					*1.60-1.70m: Bed of greyish brown very gravelly clayey fine to coarse sand.*		
1.60 - 2.60	SB3									
					-12.83	2.30		Light greyish brown very gravelly clayey fine to coarse SAND Gravel is angular fine to coarse of various lithologies.		
2.60	D13		2.60	0.00	-13.13	2.60		Very stiff light greyish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies.		
2.60 - 3.60	SB4									
2.60 - 3.05	SPT (S)	N=34 (3,4/7,7,10,10) Hammer SN = 1353								
					-13.83	3.30		Dense greyish brown very gravelly very silty fine to coarse SAND. Gravel is angular fine to medium of various lithologies.		
3.60	D10		3.60	0.00						
3.60 - 4.60	SB5									
3.60 - 4.05	SPT (S)	N=36 (3,5/7,9,10,10) Hammer SN = 1353								
					-14.93	4.40		Brown very sandy subangular to subrounded GRAVEL of various lithologies. Sand is fine to coarse.		
4.60	D9		4.60	0.00	-15.13	4.60		Very stiff brownish grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium of mudstone.		
4.60 - 5.60	SB6									
4.60 - 5.01	SPT (S)	50 (4,6/50 for 265mm) Hammer SN = 1353								
					-15.63	5.10		Weathered grey MUDSTONE recovered as, grey sandy silty angular fine to medium gravel. Sand is fine to coarse.		
5.60 - 6.60	SB7		5.60	0.00	-16.13	5.60		Weathered grey MUDSTONE recovered as, grey sandy silty angular fine to coarse gravel with low cobble content. Sand is fine to coarse. Cobbles are subangular.		
5.60 - 5.78	SPT (C)	50 (25 for 105mm/50 for 75mm) Hammer SN = 1353								
6.60 - 8.10	SB8		6.60	0.00	-17.13	6.60		Weathered grey MUDSTONE recovered as, sandy clayey angular to subangular fine to coarse gravel. Sand is fine to coarse.		
6.60 - 6.76	SPT (C)	100 (25 for 80mm/100 for 85mm) Hammer SN = 1353								
					-18.63	8.10		End of Borehole at 8.10m		

Depth scale: 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

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.10	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 15.40m
All elevations and reduced levels are given in local Chart Datum

Not enough time in working window between sailings to progress this location any deeper
Sonic drilling was advanced to prove mudstone bedrock rather than switching to Geobore-S

Core Barrel	Flush Type	Termination Reason	Last Updated
		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH22
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	11.20	712920.57 E
Rotary Coring	Fraste CRS-XL140 Duo	11.20	16.20	613021.45 N

Final Depth: 16.20 m	Start Date: 12/02/2024	Driller: MJ	Sheet 1 of 2 Scale: 1:50
Elevation: -4.63 mCD	End Date: 13/02/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY; probably very soft to soft slightly sandy SILT.		
0.50	D17		0.50	0.00	-5.13	0.50		Very soft dark grey CLAY with frequent shell fragments. [organic odour]		
0.50 - 1.20	B1									
0.50 - 0.95	SPT (S)	N=0 (0,0/0,0,0,0) Hammer SN = 1353								
1.20	D18		1.20	0.00						
1.20 - 1.70	B2									
1.20 - 1.65	SPT (S)	N=1 (0,1/0,0,1,0) Hammer SN = 1353								
			1.70	0.00	-6.33	1.70		Stiff brown slightly sandy CLAY. Sand is fine to coars.		
1.70	D19									
1.70 - 2.70	B3									
1.70 - 2.15	SPT (S)	N=25 (3,7/6,7,7,5) Hammer SN = 1353								
2.20	D20									
2.70 - 3.15	UT30	Ublow=63 100% Recovery	2.70	0.00						
2.70 - 3.65	B4									
3.20	D21									
3.65 - 4.20	B5				-8.28	3.65		Brown slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
4.20	D22		4.20	0.00	-8.83	4.20		Medium dense brown silty fine to medium SAND.		
4.20 - 5.70	B6									
4.20 - 4.65	SPT (S)	N=25 (6,6/5,7,6,7) Hammer SN = 1353								
5.70	D23		5.70	0.00						
5.70 - 6.00	B7									
5.70 - 6.15	SPT (S)	N=28 (7,8/7,6,7,8) Hammer SN = 1353			-10.63	6.00		Stiff to very stiff brown slightly sandy CLAY. Sand is fine to medium.		
6.00 - 7.20	B8									
6.20	D24									
7.20	D25		7.20	0.00						
7.20 - 7.80	B9									
7.20 - 7.65	SPT (C)	N=40 (9,12/10,11,10,9) Hammer SN = 1353								
7.80 - 8.05	B10				-12.43	7.80		Stiff dark grey mottled black thinly laminated sandy CLAY. Sand is fine to medium.		
8.00	D26				-12.68	8.05		Very soft brown silty CLAY.		
8.05 - 8.40	B11									
8.40 - 8.70	B12				-13.03	8.40		Brown silty fine to medium SAND.		
8.70	D27		8.70	0.00	-13.33	8.70		Stiff to very stiff grey mottled brown sandy gravelly CLAY with occasional lenses of sand. Sand is fine t coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies.		
8.70 - 10.00	B13									
8.70 - 9.15	SPT (S)	N=28 (6,8/7,6,8,7) Hammer SN = 1353								
9.00	D28									

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.20	177
16.20	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH22
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 16.20 m	Start Date: 12/02/2024	Driller: MJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	11.20	712920.57 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL140 Duo	11.20	16.20	613021.45 N	Elevation: -4.63 mCD	End Date: 13/02/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
10.00	D29						10.2	0.00						
10.00 - 10.50	B14													
10.20 - 10.65	SPT (C)	N=48 (7,12/11,13,12,12) Hammer SN = 1353												
10.50 - 10.85	B15								-15.13	10.50		Very stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular medium to medium of mudstone.		
10.85 - 11.20	B16								-15.48	10.85		Medium strong light grey medium to coarse grained SANDSTONE, interbedded with thick beds of moderately weak dark grey MUDSTONE, locally highly fractured. Discontinuities: 1) 10-30° joints, very close to closely spaced, undulating, rough, clean 2) 60-70° joints, medium spaced, undulating, rough, clean		
11.20	C1		80	0	0	>20								
11.70						NI	11.7	0.00						
11.70 - 11.88	SPT(C) 100 (25 for 95mm/100 for 85mm) Hammer SN = 1353		93	27	7	12								
12.60 - 12.75	C2													
13.20														
13.70	C3		100	80	33	4								
						NI								
14.50	C4					4								
14.70						NI								
						4								
						NI								
			100	87	20	10								
16.20									-20.83	16.20		End of Borehole at 16.20m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.20	177
16.20	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH23
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 25.00 m	Start Date: 04/01/2024	Driller: MJ/ MMcK	Sheet 1 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	11.00	712881.55 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.80	10.56					
Rotary Coring	Fraste CRS-XL170	11.00	25.00	613051.61 N	Elevation: -4.83 mCD	End Date: 05/01/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably very loose to loose gravelly silty SAND.		
0.80 - 2.00	SB1				-5.63	0.80		Dark grey gravelly silty fine to coarse SAND with frequent shell fragments. Gravel is subangular to subrounded fine to medium of various lithologies.		
1.20	D8				-6.03	1.20		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
2.00 - 3.50	SB2				-6.83	2.00		Brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
3.30	D9				-8.13	3.30		Firm brown slightly sandy CLAY.		
3.50 - 5.00	SB3									
					-9.53	4.70		Brown slightly clayey fine to medium SAND.		
5.00	D10				-9.83	5.00		Firm brown slightly sandy CLAY. Sand is fine to coarse.		
5.00 - 6.50	SB4									
6.00	D11									
					-11.03	6.20		Dark grey mottled black sandy angular to subangular fine GRAVEL of various lithologies. Sand is fine to coarse.		
6.40	D12				-11.23	6.40		Firm brown slightly sandy sightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
6.50 - 8.00	SB5									
					-12.13	7.30		Firm brown mottled black slightly sandy gravelly CLAY with organic odour. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
7.40	D13									
8.00	SB6									

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.00	177
25.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.80m casing flushed, pushed to 10.56m below bed before refusal (maximum tip load)
Dissipation Tests completed at 6.18m, 6.42m and 7.49m
See "M-CPT23_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH23
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 25.00 m	Start Date: 04/01/2024	Driller: MJ/ MMcK	Sheet 2 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	11.00					Scale: 1:50
Cone Penetration	Drill N'CPT	0.80	10.56	712881.55 E				
Rotary Coring	Fraste CRS-XL170	11.00	25.00	613051.61 N	Elevation: -4.83 mCD	End Date: 05/01/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records					Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50 - 11.00	SB7													
									-14.93	10.10		Weak indistinctly thinly laminated dark grey weathered MUDSTONE. No discernible fracture sets.		
		100	40	0	>20				-15.83	11.00		Very weak thinly laminated dark grey highly fractured MUDSTONE. Slightly weathered: slightly reduced strength, much closer fracture spacing. Discontinuities: 1. 65-80 degree joints, probably very closely to closely spaced, planar, rough, clean.		
12.50							12.5	0.00						
12.50 - 12.69	SPT(C) 100 (25 for 95mm/100 for 95mm) Hammer SN = 1501													
12.50 - 12.55	C3	80	40	0										
13.50 - 13.55	C1								-18.18	13.35		Very weak thinly laminated grey MUDSTONE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with grey clay smearing.		
13.55 - 13.60	C2				8									
14.00							14.0	0.00	-18.83	14.00		Discontinuities: 1. 55-70 degree joints, probably closely spaced, undulating, rough, with grey clay smearing on joint surfaces.		
14.00 - 14.02	SPT(C) 100 (25 for 7mm/100 for 12mm) Hammer SN = 1501											Weak indistinctly thinly laminated dark grey highly fractured MUDSTONE. Slightly weathered: slightly reduced strength, much closer fracture spacing, with grey clay infill.		
14.00	C4	100	0	0								Discontinuities: 1. Probable 60-75 degree joints, probably very closely to closely spaced, undulating, rough, with grey clay smearing on joint surfaces.		
15.50							15.5	0.00						
15.50 - 15.53	SPT(C) 100 (25 for 10mm/100 for 20mm) Hammer SN = 1501	100	0	0	>20									
17.00							17.0	0.00						
17.00 - 17.04	SPT(C) 100 (25 for 17mm/100 for 27mm) Hammer SN = 1501								-22.33	17.50		Weak thinly laminated dark grey MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing. Discontinuities: 1. 85-90 degree joint 17.70-18.00m, undulating, rough, with grey clay smearing on joint surface.		
		100	20	0	8									
		TCR	SCR	RQD	FI									

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
11.00	177		
25.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.80m casing flushed, pushed to 10.56m below bed before refusal (maximum tip load)
Dissipation Tests completed at 6.18m, 6.42m and 7.49m
See "M-CPT23_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH23
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 25.00 m	Start Date: 04/01/2024	Driller: MJ/ MMcK	Sheet 3 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	11.00	712881.55 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.80	10.56	613051.61 N	Elevation: -4.83 mCD	End Date: 05/01/2024	Logger: OG	FINAL
Rotary Coring	Fraste CRS-XL170	11.00	25.00					

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
18.50						18.5	0.00						
18.50 - 18.58	SPT(C) 100 (25 for 50mm/100 for 31mm) Hammer SN = 1501				>20								
		100	32	0	13			-23.83	19.00		Medium strong thinly laminated dark grey MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing. Discontinuities: 1. 40-50 degree joints, closely spaced (40/100/140), planar, smooth, clean. 2. 80-85 degree joints at 19.00-19.25m and 19.30-19.60m, planar, smooth, clean.		
					20			-24.43	19.60				
20.00						20.0	0.00						
20.00 - 20.07	SPT(C) 100 (25 for 30mm/100 for 40mm) Hammer SN = 1501										Weak indistinctly thinly laminated dark grey MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing, with occasional grey clay smearing. Discontinuities: 1. Probable 10-25 degree joints, probably closely spaced. 2. 70-90 degree joints, probably closely spaced, undulating, rough, with grey clay smearing on joint surfaces.		
		85	22	0	9								
21.50						21.5	0.00						
21.50 - 21.53	SPT(C) 100 (25 for 15mm/100 for 17mm) Hammer SN = 1501				>20								
		100	0	0				-27.13	22.30		Weak indistinctly thinly laminated grey MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing, with clayey gravel infill, up to 60mm. Discontinuities: 1. 50-70 degree joints, probably closely spaced, undulating, rough, clean.		
23.00						23.0	0.00						
23.00 - 23.03	SPT(C) 100 (25 for 9mm/100 for 23mm) Hammer SN = 1501				14								
		87	0	0									
24.50						24.5	0.00						
24.50 - 24.54	SPT(C) 100 (25 for 15mm/100 for 20mm) Hammer SN = 1501	100	24	0									
25.00								-29.83	25.00		End of Borehole at 25.00m		
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
11.00	177		
25.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.80m casing flushed, pushed to 10.56m below bed before refusal (maximum tip load)
Dissipation Tests completed at 6.18m, 6.42m and 7.49m
See "M-CPT23_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH24
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.50 m	Start Date: 31/01/2024	Driller: MJ/KW	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL140	0.00	11.50	712730.03 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.90	0.90	613038.13 N	Elevation: -5.38 mCD	End Date: 01/02/2024	Logger: LW	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.00	SB1				-5.73	0.35		Grey slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine of various lithologies.		
								Firm light brown and grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine of various lithologies.		
1.00 - 2.50	SB2									
2.50 - 4.00	SB3									
4.00 - 5.50	SB4									
5.50 - 7.00	SB5									
7.00 - 8.50	SB6									
					-13.58	8.20		Stiff brownish black CLAY.		
8.50 - 10.00	SB7				-13.88	8.50		Brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine to medium of various lithologies.		
					-14.28	8.90		Stiff brownish grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium of mudstone.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.50	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.90m casing flushed, pushed to target depth 10.90m below bed
Dissipation Test completed at 3.49m
See "M-CPT24_BH" plots for all CPT data
Borehole continued via sonic techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH24

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.50 m	Start Date: 31/01/2024	Driller: MJ/KW	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL140	0.00	11.50	712730.03 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.90	0.90	613038.13 N	Elevation: -5.38 mCD	End Date: 01/02/2024	Logger: LW	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
					-14.73	9.35		Weathered brownish black MUDSTONE. No discernible discontinuity sets.		
					-15.08	9.70		Weathered grey MUDSTONE recovered as, angular to subangular fine to coarse gravel with medium cobble content. Cobbles are subangular.		
10.00 - 11.50	SB8				-15.38	10.00		Weathered grey MUDSTONE recovered as, angular to subangular fine to coarse gravel with frequent pockets of clay.		
					-16.28	10.90		Weathered grey MUDSTONE recovered as, angular to subangular fine to coarse gravel.		
					-16.88	11.50		End of Borehole at 11.50m		

9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0, 13.5, 14.0, 14.5, 15.0, 15.5, 16.0, 16.5, 17.0, 17.5, 18.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.50	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.90m casing flushed, pushed to target depth 10.90m below bed
Dissipation Test completed at 3.49m
See "M-CPT24_BH" plots for all CPT data
Borehole continued via sonic techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH25
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	6.70	712815.17 E
Rotary Coring	Fraste CRS-XL170 Duo	6.70	13.20	612896.92 N

Final Depth:	13.20 m	Start Date:	18/12/2023	Driller:	MMcK/ MJ	Sheet 1 of 2
Elevation:	-4.17 mCD	End Date:	19/12/2023	Logger:	MS	Scale: 1:50
						FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material washed away by drilling process; probably soft to firm slightly sandy silty CLAY.		
0.70	D6	SPT sample	0.70	0.00	-4.87	0.70				
0.70 - 1.70	SB1							Firm to stiff brown slightly sandy CLAY. Sand is fine to coarse.		
0.70 - 1.15	SPT (S)	N=9 (1,2/2,2,2,3) Hammer SN = 1501								
1.00	D7									
1.70 - 2.15	UT12	Ublow=62 100% Recovery	1.70	0.00						
1.70 - 2.70	SB2									
2.00	D8									
2.70 - 3.70	SB3		2.70	0.00	-6.87	2.70		Very stiff brown becoming grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
2.70 - 3.15	SPT (C)	N=38 (10,11/9,9,10,10) Hammer SN = 1501								
3.00	D9									
3.70 - 5.20	SB4		3.70	0.00						
3.70 - 4.14	SPT (C)	N=76 (25 for 145mm/19,23,17,17) Hammer SN = 1501								
4.00	D10									
5.00	D11									
5.20 - 6.70	SB5		5.20	0.00						
5.20 - 5.55	SPT (C)	100 (25 for 76mm/100 for 270mm) Hammer SN = 1501								
					-10.57	6.40		Extremely weak indistinctly laminated dark grey highly weathered MUDSTONE. Slightly weathered: highly reduced strength, much closer fracture spacing. No discernible discontinuity sets.		
6.70 - 7.02	SPT (C)	100 (25 for 75mm/100 for 245mm) Hammer SN = 1501	6.70	0.00						
7.20					-11.37	7.20		Very weak thinly laminated blackish grey highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing. No discernible discontinuity sets.		
					-12.67	8.50		Extremely weak indistinctly thinly laminated grey MUDSTONE recovered as, firm very gravelly clay. Gravel is angular fine to medium.		
8.70			8.70	0.00	-12.87	8.70		Weak thinly laminated blackish grey highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing. No discernible discontinuity sets.		
8.70 - 9.02	SPT(C) 100 (25 for 85mm/100 for 235mm) Hammer SN = 1501									

TCR	SCR	RQD	FI
70	0	0	AZCL
			>20
73	0	0	AZCL
			>20
			NI
			AZCL

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
6.70	177
13.20	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.80m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH25
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	6.70	712815.17 E
Rotary Coring	Fraste CRS-XL170 Duo	6.70	13.20	612896.92 N

Final Depth: 13.20 m	Start Date: 18/12/2023	Driller: MMcK/MJ	Sheet 2 of 2 Scale: 1:50
Elevation: -4.17 mCD	End Date: 19/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
10.20		37	0	0	>20	10.2	0.00						
10.20 - 10.62	SPT(C) N=80 (25 for 115mm/14,18,25,23) Hammer SN = 1501	81	0	0	AZCL >20			-14.97	10.80		Extremely weak to weak thinly laminated blackish grey highly fractured MUDSTONE. Slightly weathered: reduced strength, much closer fracture spacing. Discontinuities: 1. 0-20 degree joints, probably very closely spaced, undulating, smooth. 2. 70-90 degree joints, probably very closely spaced, undulating, smooth.		
11.70						11.7	0.00						
11.70 - 12.01	SPT(C) 100 (25 for 75mm/100 for 235mm) Hammer SN = 1501	89	0	0	>20								
13.20								-17.37	13.20		End of Borehole at 13.20m		

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Casing Details	
To (m)	Diam (mm)
6.70	177
13.20	150

Water Added	
From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.80m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH26
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 20.50 m	Start Date: 05/01/2024	Driller: MJ/ MMcK	Sheet 1 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	6.50	712435.00 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.60	0.87	613029.14 N	Elevation: -4.56 mCD	End Date: 06/01/2024	Logger: MS	FINAL
Rotary Coring	Fraste CRS-XL170	6.50	20.50					

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably firm to stiff slightly sandy gravelly CLAY.		
0.60	D6				-5.16	0.60				
0.60 - 2.00	SB1							Firm to stiff greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse of various lithologies.		
					-5.46	0.90		Very stiff brown mottled dark brown and yellow slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
1.60	D7									
2.00	D8		2.00	0.00	-6.56	2.00				
2.00 - 3.00	SB2							Very stiff orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to medium of various lithologies.		
2.00 - 2.44	SPT (S)	50 (7,12/50 for 290mm) Hammer SN = 1501								
2.60	D9									
					-7.36	2.80		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse of various lithologies.		
3.00	D10		3.00	0.00						
3.00 - 4.00	SB3									
3.00 - 3.32	SPT (S)	50 (3,12/50 for 165mm) Hammer SN = 1501								
3.60	D11									
4.00	D12		4.00	0.00						
4.00 - 5.00	SB4									
4.00 - 4.13	SPT (S)	50 (25 for 95mm/50 for 32mm) Hammer SN = 1501								
					-9.06	4.50		Very stiff light brown and yellow slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to medium of various lithologies.		
4.60	D13									
5.00	D14		5.00	0.00						
5.00 - 6.50	SB5									
5.00 - 5.25	SPT (C)	100 (25 for 38mm/100 for 209mm) Hammer SN = 1501								
5.60	D15									
					-10.46	5.90		WEATHERED MUDSTONE, recovered as light greyish brown sandy slightly silty angular fine to coarse gravel.		
6.50 - 6.66	SPT (C)	100 (25 for 88mm/100 for 75mm) Hammer SN = 1501	6.50	0.00						
7.00					-11.56	7.00		Weak thinly laminated grey fractured MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing, with orangish brown staining. Discontinuities: 1. 20-40 degree joints, medium spaced (200/450/700), planar, rough, with orangish brown staining on joint surfaces. 2. 70-80 degree joints at 7.25-7.50m, 8.00-8.25m, 8.10-8.40m, planar, rough, with orangish brown staining on joint surfaces,		
8.50			8.50	0.00				Weak thinly laminated light grey MUDSTONE. Slightly weathered: closer fracture spacing, localised oragnish brown discolouration.		
8.50 - 8.64	SPT(C)	100 (25 for 92mm/100 for 51mm) Hammer SN = 1501			-13.36	8.80		Discontinuities: 1. 35-45 degree joints, closely spaced (30/180/500), planar, rough,		

Field Records	TCR	SCR	RQD	FI
0.60 - 6.66	0	0	0	AZCL
7.00 - 8.50	100	27	0	4

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
6.50	177
20.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.60m casing flushed, pushed to 0.87m below bed before refusal (cone inclination)
No Dissipation Test carried out to shallow refusal
See "M-CPT26_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH26
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 20.50 m	Start Date: 05/01/2024	Driller: MJ/ MMcK	Sheet 2 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	6.50	712435.00 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.60	0.87					
Rotary Coring	Fraste CRS-XL170	6.50	20.50	613029.14 N	Elevation: -4.56 mCD	End Date: 06/01/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		93	73	0	4						with localised orangish brown staining and calcite mineralisation on joint surfaces. 2. 60-75 degree joints at 9.00-9.30m and 10.20-10.40m, planar, smooth, with patchy orangish brown staining from 9.00-9.30m. 3. 85-90 degree joint at 12.50-13.00m, undulating, rough, with calcite mineralisation on joint surface.		
10.00						10.0	0.00						
10.00 - 10.02	SPT(C) 100 (25 for 16mm/100 for 5mm) Hammer SN = 1501												
10.00 - 10.20	C5	100	100	0									
11.00 - 11.10	C3												
11.10 - 11.20	C4				9								
11.50						11.5	0.00						
11.50 - 11.53	SPT(C) 100 (25 for 10mm/100 for 18mm) Hammer SN = 1501	95	80	0									
13.00						13.0	0.00	-17.56	13.00				
13.00 - 13.00	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501	100	100	0							Medium strong thinly laminated grey MUDSTONE. Slightly weathered: closer fracture spacing. Discontinuities: 1. 10-20 degree joints, widely spaced (200/900/1300), planar, smooth, clean. 2. 45-55 degree joints, widely spaced (120/900/1750), planar, rough, clean. 3. 65-80 degree joints at 13.35-13.55m, 14.80-15.00m, 15.20-15.40m, 15.55-15.80m, 16.00-16.20m, 16.25-16.40m and 16.85-17.25m, planar, rough, clean. 4. 90 degree joint at 15.30-15.55m, undulating, rough, clean.		
					4								
14.50						14.5	0.00						
14.50 - 14.52	SPT(C) 100 (25 for 15mm/100 for 7mm) Hammer SN = 1501												
14.50	C6	100	87	0									
14.80 - 14.90	C7				8								
16.00						16.0	0.00						
16.00 - 16.00	SPT(C) 100 (25 for 5mm/100 for 0mm) Hammer SN = 1501	100	95	0	4								
17.50						17.5	0.00	-22.06	17.50		Moderately weak thinly laminated grey MUDSTONE. Slightly weathered: closer to slightly closer fracture spacing. Discontinuities: 1. 10-30 degree joints, medium spaced (40/275/1500), planar, smooth, clean. 2. 60-70 degree joints at 17.50-17.65m, 19.75-19.95m, 19.80-20.00m and 20.10-20.40m, planar, smooth, with localised calcite mineralisation on joint surfaces.		
17.50 - 17.52	SPT(C) 100 (25 for 17mm/100 for 0mm) Hammer SN = 1501	100	97	9	9								
18.30 - 18.40	C8												
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
6.50	177		
20.50	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.60m casing flushed, pushed to 0.87m below bed before refusal (cone inclination)
No Dissipation Test carried out to shallow refusal
See "M-CPT26_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH26
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 20.50 m	Start Date: 05/01/2024	Driller: MJ/ MMcK	Sheet 3 of 3
Sonic Drilling	Fraste CRS-XL170	0.00	6.50	712435.00 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.60	0.87	613029.14 N	Elevation: -4.56 mCD	End Date: 06/01/2024	Logger: MS	FINAL
Rotary Coring	Fraste CRS-XL170	6.50	20.50					

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
19.00						19.0	0.00						
19.00 - 19.03	SPT(C) 100 (25 for 20mm/100 for 12mm) Hammer SN = 1501												
19.20	C9	100	100	30	2								
20.50						20.5	0.00	-25.06	20.50		End of Borehole at 20.50m		
20.50 - 20.50	SPT(C) 100 (25 for 0mm/100 for 0mm) Hammer SN = 1501												
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
6.50	177		
20.50	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.60m casing flushed, pushed to 0.87m below bed before refusal (cone inclination)
No Dissipation Test carried out to shallow refusal
See "M-CPT26_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH27
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.80 m	Start Date: 19/01/2024	Driller: MMcK/MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.30	712438.64 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	3.30	10.80	612709.40 N	Elevation: -3.45 mCD	End Date: 24/01/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.30	D4						0.30	0.00	-3.75	0.30		NO RECOVERY: Material washed away by drilling process; probably very soft slightly sandy CLAY.		
0.30 - 1.30	SB1											Very soft dark greyish brown slightly sandy CLAY. Sand is fine to medium.		
0.30 - 0.75	SPT (S)	N=0 (0,0/0,0,0,0) Hammer SN = 1501							-4.20	0.75				
									-4.55	1.10		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies.		
1.30	D5						1.30	0.00				Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
1.30 - 2.30	SB2													
1.30 - 1.75	SPT (S)	N=36 (3,6/7,9,8,12) Hammer SN = 1501												
2.30	D6						2.30	0.00						
2.30 - 3.30	SB3													
2.30 - 2.75	SPT (S)	N=79 (8,11/16,21,21,21) Hammer SN = 1501												
3.30	C1						3.30	0.00	-6.65	3.20		Very stiff brown CLAY.		
3.30 - 3.50	C2								-6.75	3.30		Very dense dark brownish grey very clayey subangular to subrounded fine to coarse GRAVEL of various lithologies.		
3.30 - 3.75	SPT (S)	N=82 (25 for 147mm/20,18,20,24) Hammer SN = 1501				AZCL						3.30-3.75m: AZCL (possibly due to SPT disturbance)		
3.70 - 3.75	C3					NI								
			67	0	0	>20			-7.50	4.05		Extremely weak indistinctly thinly laminated dark grey weathered MUDSTONE. Slightly weathered: highly reduced strength, much closer fracture spacing. No discerible discontinuity sets.		
4.80							4.80	0.00	-8.25	4.80				
4.80 - 5.04	SPT(C) 100 (25 for 105mm/100 for 135mm) Hammer SN = 1501		100	24	0	>20						Very weak thinly laminated grey MUDSTONE. Slightly weathered: highly reduced strength, much closer fracture spacing, with grey clay infill.		
							5.30	0.00						
4.90 - 5.00	C4					AZCL						Discontinuities probably very closely spaced at various angles. 5.30-5.70m: AZCL (possibly due to SPT disturbance)		
5.30														
5.30 - 5.61	SPT(C) 100 (25 for 132mm/100 for 175mm) Hammer SN = 1501		60	0	0	>20								
6.30							6.30	0.00	-9.75	6.30				
6.30 - 6.50	SPT(C) 100 (25 for 100mm/100 for 100mm) Hammer SN = 1501											Very weak thinly laminated dark grey MUDSTONE. Slightly weathered: highly reduced strength, closer fracture spacing, with grey clay infill.		
6.40 - 6.45	C5		86	47	20	8						Discontinuities: 1. 5-30 degree joints, probably very closely to closely spaced, planar, smooth, with grey clay smearing on some joint surfaces. 2. 60-70 degree joint at 6.95-7.10m, undulating, smooth.		
7.80							7.80	0.00						
7.80 - 8.03	SPT(C) 100 (25 for 103mm/100 for 125mm) Hammer SN = 1501		29	11	11	AZCL						7.80-8.85m: AZCL (possibly due to SPT disturbance)		
						>20								
9.30							9.30	0.00						

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.30	177
10.80	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH27

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.80 m	Start Date: 19/01/2024	Driller: MMcK/MJ	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.30	712438.64 E				
Rotary Coring	Fraste CRS-XL170 Duo	3.30	10.80	612709.40 N	Elevation: -3.45 mCD	End Date: 24/01/2024	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.30 - 9.49	SPT(C) 100 (25 for 85mm/100 for 109mm) Hammer SN = 1501	63	0	0	AZCL >20						*9.30-9.85m: AZCL (possibly due to SPT disturbance)*		
10.80 10.80 - 11.01	SPT(C) 100 (25 for 75mm/100 for 135mm) Hammer SN = 1501					10.8	0.00	-14.25	10.80		End of Borehole at 10.80m		

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
3.30	177		
10.80	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH28
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.50 m	Start Date: 26/01/2024	Driller: MMcK/RC	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.50	712718.08 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.50	10.50	612725.10 N	Elevation: -3.17 mCD	End Date: 27/01/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00	D3						0.00	0.00				Stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subrounded to rounded fine to medium of various lithologies.		
0.00 - 1.00	SB1								-3.47	0.30		Very soft to soft dark brown slightly gravelly sandy CLAY/SILT. Sand is fine to coarse. Gravel is subrounded to rounded fine to medium of various lithologies.		
0.00 - 0.45	SPT (S)	N=17 (3,6/6,4,4,3) Hammer SN = 1501												
1.00	D4						1.00	0.00						
1.00 - 2.50	SB2													
1.00 - 1.45	SPT (S)	N=3 (1,1/1,0,1,1) Hammer SN = 1501												
2.00	D5													
									-5.47	2.30		Weathered grey AMPHIBOLITE, recovered as sandy angular to subangular fine to coarse gravel. Sand is fine to coarse.		
2.50 - 2.81	SPT (C)	100 (25 for 92mm/100 for 218mm) Hammer SN = 1501	0	0	0	NR	2.50	0.00	-5.67	2.50		NO RECOVERY: Core washed away during drilling process; possibly due to SPT disturbance.		
3.00			100	33	12	3			-6.17	3.00		Very weak becoming weak greenish grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing, with orangish brown discolouration on fracture surfaces. Discontinuities: 1. 10-25 degree joints, medium spaced (60/500/1000), undulating, rough, with orangish brown staining on joint surfaces. 2. 75-90 degree joint at 3.60-4.20m, undulating, rough, with orangish brown staining on joint surface.		
4.00 - 4.10	C3													
4.30 - 4.40	C1													
4.40 - 4.50	C2								-7.67	4.50		Moderately weak greenish grey AMPHIBOLITE. Slightly weathered: slightly reduced strength, closer fracture spacing, with yellowish brown and green discolouration. Discontinuities: 1. 10-20 degree joints, medium to widely spaced (200/600/1700), planar, rough, with yellowish brown staining on joint surfaces. 2. 50-65 degree joints, widely spaced (600/1200/1900), planar, rough, with yellowish brown and green staining on joint surfaces. 3. 70-85 degree joints at 4.40-4.60m, 4.60-4.80m, 6.90-7.05m, 7.40-7.65m, 7.65-7.85m, 8.40-8.85m and 9.70-10.00m, undulating, rough, with yellowish brown and green staining on joint surfaces.		
4.50														
4.60 - 4.70	C5													
5.00	C4		100	73	24									
6.00														
6.00 - 6.10	C6		100	86	43	4								
7.50			93	88	29									
9.00														

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.50	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH28

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.50 m	Start Date: 26/01/2024	Driller: MMcK/RC	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.50	712718.08 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.50	10.50	612725.10 N	Elevation: -3.17 mCD	End Date: 27/01/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		100	86	64									
10.50								-13.67	10.50		End of Borehole at 10.50m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.50	177
10.50	150

Water Added

From (m)	To (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.00m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH29

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 06/01/2024	Driller: MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	8.00	712510.49 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	8.00	11.00	612947.44 N	Elevation: -4.78 mCD	End Date: 06/01/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material washed away by drilling process; probably soft to firm sandy silty CLAY.		
0.60 0.60 - 2.10 0.60 - 1.05 1.00	D6 SB1 SPT (S) D7	N=9 (1,1/2,2,2,3) Hammer SN = 1501	0.60	0.00	-5.38	0.60		Firm to stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
2.00 2.10 - 2.55 2.10 - 3.60	D8 UT15 SB2	Ublow=64 100% Recovery	2.10	0.00						
3.00	D9									
3.60 3.60 - 4.60 3.60 - 4.05 4.00	D10 SB3 SPT (S) D11	N=17 (3,4/3,5,4,5) Hammer SN = 1501	3.60	0.00						
4.60 - 5.05 4.80	UT16 D12	Ublow=75 100% Recovery	4.60	0.00				*4.60-5.00m: Material recovered as UT sample*		
5.00 - 6.50	SB4				-9.78	5.00		Brown very silty clayey fine to coarse SAND.		
6.00	D13									
6.50 - 8.00 6.50 - 6.95 7.00	SB5 SPT (C) D14	N=38 (3,6/7,10,9,12) Hammer SN = 1501	6.50	0.00	-11.18	6.40		Very stiff brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of mudstone.		
8.00 8.00 - 8.33	C1 SPT (C)	100 (8,16/100 for 180mm) Hammer SN = 1501 TCR: 100 SCR: 27 RQD: 0 FI:	8.00	0.00	-12.78	8.00		Very weak thinly laminated grey fractured MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing, with occasional calcite veining, up to 40mm. Discontinuities: 1. Probable 5-25 degree joints, probably very closely to closely spaced. 2. 45-65 degree joints, probably closely spaced, planar, rough, clean.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.00	177
11.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.40m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH29

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 06/01/2024	Driller: MJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	8.00	712510.49 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	8.00	11.00	612947.44 N	Elevation: -4.78 mCD	End Date: 06/01/2024	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50						9.50	0.00						
9.50 - 9.69	SPT(C) 100 (25 for 85mm/100 for 105mm) Hammer SN = 1501	100	17	0	>20								
10.80 - 10.85	C2												
11.00								-15.78	11.00		End of Borehole at 11.00m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.00	177
11.00	150

Water Added

From (m)	To (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.40m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH30
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.40	712587.15 E
Rotary Coring	Fraste CRS-XL170 Duo	3.40	11.30	612648.71 N

Final Depth: 11.30 m	Start Date: 25/01/2024	Driller: MMcK/RC	Sheet 1 of 2 Scale: 1:50
Elevation: -3.07 mCD	End Date: 26/01/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material washed away by drilling process; probably soft to firm sandy clay.		
0.40	D4		0.40	0.00	-3.47	0.40				
0.40 - 1.40	SB1				-3.67	0.60		Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. *0.55-0.60m: Bed of sandy subangular fine to coarse gravel.*		
0.40 - 0.85	SPT (S)	N=17 (4,5/4,4,4,5) Hammer SN = 1501						Stiff to very stiff light brown slightly gravelly sandy CLAY/SILT with occasional pockets (<5mm) of fine to coarse sand. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
1.40	D5		1.40	0.00						
1.40 - 1.85	UT7	Ublow=72 100% Recovery								
1.40 - 2.40	SB2									
2.40	D6		2.40	0.00						
2.40 - 3.40	SB3									
2.40 - 2.85	SPT (S)	N=41 (8,8/10,10,10,11) Hammer SN = 1501			-5.97	2.90		Weathered AMPHIBOLITE recovered as, grey sandy angular to subangular gravel. Sand is fine to coarse.		
3.40 - 3.65	SPT (C)	100 (15,33/100 for 100mm) Hammer SN = 1501	3.40	0.00	-6.47	3.40		NO RECOVERY: Core washed away during drilling process; possibly due to SPT disturbance.		
3.80					-6.87	3.80		Very weak to weak greenish grey AMPHIBOLITE. Slightly weathered: reduced strength, closer fracture spacing, with orangish brown discolouration.		
4.00 - 4.05	C1							Discontinuities: 1. 20-45 degree joints, medium spaced (30/330/430), undulating, rough with pervasive orangish brown staining on joint surfaces. 2. 55-75 degree joints, probably closely to medium spaced, undulating, rough, with pervasive orangish brown staining on joint surfaces.		
5.30										
5.30 - 5.50	C2							*5.60-6.50m: Recovered non-intact*		
6.80								*6.50-6.80m: AZCL*		
					-10.47	7.40		Medium strong to strong greenish grey AMPHIBOLITE. Slightly weathered: reduced strength, closer fracture spacing, with orangish brown discolouration.		
8.30								Discontinuities: 1. 0-20 degree joints, medium spaced (50/280/900), undulating, rough, with orangish brown staining on joint surfaces. 2. 50 degree joint at 7.50-7.60m, undulating, rough, with orangish brown staining on joint surface. 3. 75-90 degree joint at 8.10-10.40m and 10.50-11.30m, undulating, rough, with orangish brown staining on joint surfaces. *9.20-9.90m: AZCL; core washed away due to sub-vertical fracture*		

TCR	SCR	RQD	FI
0	0	0	
93	16	0	7
73	20	9	>20
			AZCL
			10
90	43	13	
			9
70	0	0	

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.40	177
11.30	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH30

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.30 m	Start Date: 25/01/2024	Driller: MMcK/RC	Sheet 2 of 2 Scale: 1:50
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	3.40	712587.15 E				
Rotary Coring	Fraste CRS-XL170 Duo	3.40	11.30	612648.71 N	Elevation: -3.07 mCD	End Date: 26/01/2024	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.80					AZCL						9.80-10.40m: AZCL; core washed away due to sub-vertical fracture		
		73	27	0	8								
11.30								-14.37	11.30		End of Borehole at 11.30m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
3.40	177
11.30	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.70m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH31

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 8.00 m	Start Date: 18/02/2024	Driller: MJ	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	8.00	713488.08 E 613386.94 N	Elevation: -9.73 mCD	End Date: 19/02/2024	Logger: OG	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY; probably silty SAND.		
0.40 - 0.50	B1				-10.13	0.40				
0.50 - 1.50	B2		0.50	0.00				Medium dense brown fine to coarse SAND with occasional lenses of very soft brown clay.		
0.50 - 0.95	SPT (S)	N=15 (1,3/3,4,4,4) Hammer SN = 1353								
1.00	D11									
1.50 - 2.50	B3		1.50	0.00				*1.50-1.60m: rare subrounded coarse GRAVEL of quartz*		
1.50 - 1.95	SPT (C)	N=22 (3,4/5,5,6,6) Hammer SN = 1353								
2.00	D12									
2.50 - 3.50	B4		2.50	0.00						
2.50 - 2.95	SPT (C)	N=20 (5,5/5,4,5,6) Hammer SN = 1353								
3.00	D13									
3.50 - 4.50	B5		3.50	0.00						
3.50 - 3.95	SPT (C)	N=22 (4,5/6,6,5,5) Hammer SN = 1353								
4.00	D14									
4.50 - 5.00	B6		4.50	0.00						
4.50 - 4.95	SPT (C)	N=25 (5,6/6,7,6,6) Hammer SN = 1353								
5.00	D15				-14.73	5.00		Dense brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to medium of various lithologies.		
5.00 - 5.90	B7									
5.50 - 5.95	SPT (C)	N=31 (6,8/8,7,8,8) Hammer SN = 1353	5.50	0.00						
5.90 - 6.20	B8				-15.63	5.90		Very stiff brown sandy gravelly CLAY. Sand is fine. Gavel is subangular to subrounded fine to medium of various lithologies.		
6.00	D16									
6.20 - 6.50	B9				-15.93	6.20		Brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to medium of various lithologies.		
6.50 - 8.00	B10		6.50	0.00	-16.23	6.50		Very stiff light brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to medium of various lithologies.		
6.50 - 6.95	SPT (C)	N=35 (8,8/9,9,8,9) Hammer SN = 1353								
7.00	D17									
8.00 - 8.44	SPT (C)	50 (10,12/50 for 295mm) Hammer SN = 1353	8.00	0.00	-17.73	8.00		End of Borehole at 8.00m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.00	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 15.90m
All elevations and reduced levels are given in local Chart Datum

Not enough time in working window between sailings to progress this location any deeper

Core Barrel	Flush Type	Termination Reason	Last Updated
		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH32

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 8.00 m	Start Date: 15/02/2024	Driller: MJ	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	8.00	713214.70 E 613282.26 N	Elevation: -9.00 mCD	End Date: 15/02/2024	Logger: OG	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.20 - 0.50	B1				-9.20	0.20		NO RECOVERY; probably sandy SILT/CLAY.		
0.50	D11		0.50	0.00				Firm to stiff brown slightly sandy slightly gravelly CLAY with rare lenses of fine sand. Sand is fine to medium. Gravel is subrounded fine to medium of various lithologies.		
0.50 - 1.50	B2									
0.50 - 0.95	SPT (S)	N=28 (4,7/6,7,8,7) Hammer SN = 1353								
1.00	D12									
1.50 - 1.95	UT18	Ublow=67 100% Recovery	1.50	0.00						
1.50 - 2.50	B3									
2.00	D13									
2.50 - 3.50	B4									
3.00	D14		3.00	0.00						
3.00 - 3.45	SPT (S)	N=30 (6,8/8,7,8,7) Hammer SN = 1353								
3.50 - 4.50	B5									
4.00	D15		4.00	0.00						
4.00 - 4.45	UT19	Ublow=70 100% Recovery								
4.50 - 5.50	B6									
5.00	D16									
5.50 - 6.50	B7				-14.50	5.50		Medium dense light yellowish brown slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to medium of various lithologies.		
6.00	D17									
6.50 - 7.10	B8		6.50	0.00						
6.50 - 6.95	SPT (C)	N=30 (4,6/7,9,7,7) Hammer SN = 1353								
7.10 - 7.50	B9				-16.10	7.10		Firm to stiff brownish red CLAY. [Possible weathered rockhead]		
7.50 - 8.00	B10				-16.50	7.50		WEATHERED ROCKHEAD; recovered as red angular to subangular fine to coarse GRAVEL of gneiss.		
					-17.00	8.00		End of Borehole at 8.00m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.00	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 16.30m
All elevations and reduced levels are given in local Chart Datum

Not enough time in working window between sailings to progress this location any deeper

Core Barrel	Flush Type	Termination Reason	Last Updated
		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH33
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 13.50 m	Start Date: 11/02/2024	Driller: MJ/SJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL140	0.00	7.50	713024.22 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.40	7.79					
Rotary Coring	Fraste CRS-XL140	7.50	13.50	613163.55 N	Elevation: -6.53 mCD	End Date: 12/02/2024	Logger: OG+MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably gravelly SILT/CLAY.		
0.40 - 0.70	B1				-6.93	0.40		Very soft grey gravelly silty CLAY with frequent shell fragments. Gravel is angular to subrounded fine to coarse of various lithologies.		
0.70 - 1.50	B2				-7.23	0.70		Soft brown slightly sandy CLAY with rare subangular to subrounded fine to medium gravel of various lithologies. Sand is fine to coarse.		
1.00	D12									
1.50 - 2.50	B3									
2.00	D13									
2.50 - 2.90	B4				-9.03	2.50		Brown silty fine to coarse SAND.		
2.90 - 3.50	B5				-9.43	2.90		Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of various lithologies.		
3.00	D14									
3.50 - 4.50	B6									
4.00	D15									
4.50 - 4.80	B7				-11.03	4.50		Light brown fine to coarse SAND.		
4.80 - 5.00	B8				-11.33	4.80		Very stiff brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of various lithologies.		
5.00 - 6.00	B9				-11.53	5.00		Brown clayey fine to coarse SAND.		
6.00 - 6.70	B10				-12.53	6.00		Very stiff brown slightly gravelly very sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of various lithologies.		
6.10	D16									
6.70 - 7.50	B11				-13.23	6.70		Very stiff reddish brown CLAY with occasional bands of subangular to subrounded medium to coarse gravel of various lithologies.		
					-14.03	7.50		Grey gravelly angular to subangular cobbles of amphibolite. Gravel is angular to subangular fine to coarse of amphibolite.		
		100 0 0 NI >20			-14.38	7.85		Very stiff reddish brown sandy very gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of various lithologies.		
8.00		100 0 0 NI >20			-14.73	8.20		WEATHERED BEDROCK; recovered as reddish brown angular fine to coarse GRAVEL of moderately weak dolerite.		
8.50		100 100 60 2			-15.03	8.50		Weak to moderately weak reddish brown and grey DOLERITE with rare white inclusions of plagioclase feldspar.		
9.00										
9.00 - 9.10	C1	NI								
		TCR SCR RQD FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
7.50	177		
13.50	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 7.79m below bed before refusal (maximum tip load)
Dissipation Tests carried out at 1.53m and 3.27m
See "M-CPT33_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH33
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 13.50 m	Start Date: 11/02/2024	Driller: MJ/SJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL140	0.00	7.50	713024.22 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.40	7.79					
Rotary Coring	Fraste CRS-XL140	7.50	13.50	613163.55 N	Elevation: -6.53 mCD	End Date: 12/02/2024	Logger: OG+MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.15 - 9.20	C2										Discontinuities:		
9.50 - 9.60	C3										1) 45-60° joints, very closely to closely spaced, undulating, planar, rough, open, clean		
		100	87	0	10						2) 70-90° joints, very closely to closely spaced, undulating, planar, rough, open, clean		
10.50													
10.70 - 10.80	C4												
		97	93	13	16								
12.00													
		97	93	50	8								
13.50								-20.03	13.50		End of Borehole at 13.50m		
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
7.50	177		
13.50	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 7.79m below bed before refusal (maximum tip load)
Dissipation Tests carried out at 1.53m and 3.27m
See "M-CPT33_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH34
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	4.20	713168.63 E
Rotary Coring	Fraste CRS-XL170 Duo	4.20	7.70	613092.41 N

Final Depth: 7.70 m	Start Date: 15/01/2024	Driller: MMcK	Sheet 1 of 1 Scale: 1:50
Elevation: -10.07 mCD	End Date: 15/01/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00	D4						0.00	0.00				Firm brown slightly sandy CLAY. Sand is fine to coarse.		
0.00 - 1.20	SB1													
0.00 - 0.45	SPT (S)	N=9 (1,2/2,2,2,3) Hammer SN = 1501												
									-11.07	1.00		Firm to stiff light brown sandy silty CLAY. Sand is fine to coarse.		
1.20	D5						1.20	0.00						
1.20 - 2.70	SB2													
1.20 - 1.65	SPT (S)	N=10 (1,3/2,3,3,2) Hammer SN = 1501												
2.70	D6						2.70	0.00						
2.70 - 4.20	SB3													
2.70 - 3.15	SPT (S)	N=15 (4,3/4,3,4,4) Hammer SN = 1501												
									-13.27	3.20		Stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of various lithologies,		
3.70	D7													
4.20 - 4.58	SPT (C)	100 (25 for 140mm/100 for 238mm) Hammer SN = 1501	0	0	0	NR	4.20	0.00	-14.27	4.20		NO RECOVERY: Core washed out during drilling, due to SPT disturbance.		
4.70									-14.77	4.70				
4.70	D8											Extremely weak dark grey highly fractured MUDSTONE. Slightly weathered: reduced strength, closer fracture spacing, with grey clay smearing.		
4.80 - 5.00	C1		100	7	0	>20						Discontinuities are probably very closely spaced at various angles.		
5.70	D9													
6.20							6.20	0.00	-16.27	6.20				
6.20 - 6.25	SPT(C)	100 (25 for 12mm/100 for 35mm) Hammer SN = 1501				>20						Very weak thinly laminated dark grey highly fractured MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing, with grey clay infill.		
			100	25	0	14						Discontinuities: 1. 10-20 degree joints, probably very closely to closely spaced, undulating, rough, with grey clay infill, up to 10mm on joint surfaces.. 2. 50-65 degree joints at 6.70-6.85m, 6.90-7.00m, 7.00-7.15m, 7.05-7.15m and 7.30-7.45m, planar, rough, with grey clay infill, up to 15mm on joint surfaces.		
						>20			-17.57	7.50				
7.70							7.70	0.00	-17.77	7.70		Very weak indistinctly thinly laminated grey highly weathered MUDSTONE. Slightly weathered: reduced strength, probably much closer fracture spacing.		
7.70 - 7.73	SPT(C)	100 (25 for 9mm/100 for 20mm) Hammer SN = 1501										No discernible discontinuity sets.		
												End of Borehole at 7.70m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.20	177
7.70	200

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 13.80m
All elevations and reduced levels are given in local Chart Datum

Not enough time in working window between sailings to progress this location any deeper

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH35

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 8.30 m	Start Date: 18/02/2024	Driller: SJ	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	8.30	713377.15 E 613260.24 N	Elevation: -7.57 mCD	End Date: 18/02/2024	Logger: MS	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.70	B1							Dense dark grey sandy subangular to subrounded fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse. Cobbles are subangular of mudstone.		
0.50	D10		0.50	0.00						
0.50 - 0.95	SPT (S)	N=33 (6,8/6,7,13,7) Hammer SN = 1353			-8.27	0.70				
0.70 - 1.50	B2							Loose brown and light brown gravelly slightly silty fine to coarse SAND. Gravel is subrounded to rounded fine to medium of various lithologies.		
1.00	D11									
1.50	D12		1.50	0.00						
1.50 - 2.50	B3									
1.50 - 1.95	SPT (S)	N=4 (0,1/1,0,1,2) Hammer SN = 1353								
2.00	D13									
2.50	D14		2.50	0.00	-10.07	2.50		Loose to medium dense brown and light brown very sandy slightly silty subrounded to rounded fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of mudstone.		
2.50 - 3.50	B4									
2.50 - 2.95	SPT (S)	N=5 (1,1/0,2,1,2) Hammer SN = 1353								
3.00	D15									
3.50	D16		3.50	0.00						
3.50 - 4.50	B5									
3.50 - 3.95	SPT (S)	N=7 (0,1/1,1,2,3) Hammer SN = 1353								
4.00	D17									
4.50 - 5.50	B6		4.50	0.00						
4.50 - 4.95	SPT (C)	N=8 (1,2/2,1,2,3) Hammer SN = 1353								
5.00	D18									
5.50 - 6.50	B7		5.50	0.00						
5.50 - 5.95	SPT (C)	N=10 (2,2/3,2,2,3) Hammer SN = 1353								
6.00	D19									
6.50 - 7.20	B8		6.50	0.00						
6.50 - 6.95	SPT (C)	N=12 (3,2/2,3,3,4) Hammer SN = 1353								
7.00	D20									
7.20 - 8.30	B9				-14.77	7.20		Very dense brown and light brown sandy slightly silty subangular to subrounded fine to coarse GRAVEL of mudstone and quartz with medium cobble content. Sand is fine to coarse. Cobbles are subangular of mudstone.		
8.00	D21		8.00	0.00						
8.00 - 8.18	SPT (C)	50 (4,5/50 for 35mm) Hammer SN = 1353			-15.87	8.30		End of Borehole at 8.30m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
8.30	177

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 12.80m
All elevations and reduced levels are given in local Chart Datum

Not enough time in working window between sailings to progress this location any deeper

Core Barrel	Flush Type	Termination Reason	Last Updated
		Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH36

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 13/02/2024	Driller: SJ/MJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	5.00	712862.54 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL140 Duo	5.00	11.00	612797.04 N	Elevation: -3.96 mCD	End Date: 14/02/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY; probably sandy SILT/CLAY.		
0.50 0.50 - 0.95	D5 SPT (S)	N=4 (0,0/1,0,1,2) Hammer SN = 1353	0.50	0.00						
1.50 - 2.00	B1				-5.46	1.50		Soft brown slightly sandy CLAY with occasional angular to subrounded fine to coarse gravel of various lithologies. Sand is fine to coarse.		
2.00 - 2.45 2.00 - 2.85	UT7 B2	Ublow=77 100% Recovery	2.00	0.00	-5.96	2.00		Brown silty fine to coarse SAND.		
2.85 - 4.30	B3				-6.81	2.85		Dense brown very sandy slightly silty angular fine to medium GRAVEL of various lithologies. Sand is fine to coarse.		
3.50 - 3.95 3.90	SPT (C) D6	N=33 (4,4/7,7,9,10) Hammer SN = 1353	3.50	0.00						
4.30 - 4.80	B4				-8.26	4.30		Very stiff brown gravelly CLAY. Gravel is angular fine to coarse of amphibolite.		
					-8.76	4.80		WEATHERED BEDROCK; recovered as reddish brown slightly sandy angular to subangular fine to coarse GRAVEL of amphibolite.		
5.00 - 5.07	SPT (C)	100 (25 for 30mm/100 for 40mm) Hammer SN = 1353	5.00	0.00	-8.96	5.00		Strong to very strong light greenish grey AMPHIBOLITE with frequent veining of plagioclase feldspar. Discontinuities: 1) 40-45° joints, closely spaced, rough, undulating, open with patchy brown discolouration on joint surfaces.		
6.50										
8.00					-11.26	7.30		Very strong light greenish grey AMPHIBOLITE with occasional veining of plagioclase feldspar. Discontinuities: 1) 20-30° joints, medium to widely spaced, rough , undulating, open with patchy light brown discolouration on joint surfaces.		

TCR	SCR	RQD	FI
100	100	13	11
100	100	60	6
100	100	93	3
			1

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
5.00	177
11.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.60m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH36

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.00 m	Start Date: 13/02/2024	Driller: SJ/MJ	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	5.00	712862.54 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL140 Duo	5.00	11.00	612797.04 N	Elevation: -3.96 mCD	End Date: 14/02/2024	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50		100	100	97	2								
11.00								-14.96	11.00		End of Borehole at 11.00m		

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
5.00	177		
11.00	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 11.60m
All elevations and reduced levels are given in local Chart Datum

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH37

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 8.00 m	Start Date: 13/01/2024	Driller: MMcK	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL170 Duo	0.00	2.00	713166.23 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL170 Duo	2.00	8.00	612964.74 N	Elevation: -8.80 mCD	End Date: 13/01/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
												NO RECOVERY: Material washed away by drilling process; probably loose to medium dense sandy gravel.		
0.50	D2						0.50		-9.30	0.50		Dense grey sandy angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
0.50 - 2.00	SB1													
0.50 - 0.95	SPT (S)	N=44 (5,6/9,13,12,10) Hammer SN = 1501							-9.55	0.75		Firm to stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of various lithologies.		
1.50	D3											Very weak thinly laminated dark grey highly fractured weathered MUDSTONE. Slightly weathered: locally highly reduced strength, closer fracture spacing, with grey clay infill. Discontinuities: 1. Probable 0-20 degree joints, probably extremely closely to very closely spaced, planar, smooth. 2. 50-65 degree joints at 2.80-2.90m and 3.10-3.25m, planar, smooth, with grey clay smearing on joint surfaces. *2.00-2.75m: Weathered mudstone with grey clay infill.*		
2.00 - 2.15	SPT (C)	100 (25 for 15mm/100 for 136mm) Hammer SN = 1501				>20	2.00		-10.70	1.90				
2.50 - 2.55	C1		73	22	0	10								
3.50							3.50		-12.40	3.60				
3.50 - 3.83	SPT(C) 100 (12,11/100 for 179mm) Hammer SN = 1501											Very weak thinly laminated blackish grey MUDSTONE. Slightly weathered: slightly reduced strength, closer fracture spacing. Discontinuities: 1. 40-60 degree joints, closely spaced (50/130/300), planar, smooth.		
4.00 - 4.10	C2		94	72	0	8								
5.00							5.00		-13.80	5.00				
5.00 - 5.18	SPT(C) 100 (25 for 115mm/100 for 60mm) Hammer SN = 1501		50	0	0	AZCL						Weak indistinctly thinly laminated blackish grey highly fractured MUDSTONE. Slightly weathered: slightly reduced strength. Discontinuities are probably very closely spaced at various angles. *5.00-5.75m: AZCL*		
						>20								
6.50							6.50		-15.30	6.50				
6.50 - 6.72	SPT(C) 100 (25 for 80mm/100 for 140mm) Hammer SN = 1501		95	84	32	2						Weak thinly laminated blackish grey MUDSTONE. Slightly weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 60-80 degree joints at 7.00-7.20m, 7.30-7.60m and 7.60-7.75m, planar, smooth.		
8.00							8.00		-16.80	8.00		End of Borehole at 8.00m		
8.00 - 8.14	SPT(C) 100 (25 for 69mm/100 for 75mm) Hammer SN = 1501													

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.00	177
8.00	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 12.80m
All elevations and reduced levels are given in local Chart Datum

Location had to be stopped before target depth due to increasing weather/sea state
Taken to 8.00m before drilling was halted and barge moved clear of the shipping area

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH38
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.30 m	Start Date: 19/12/2023	Driller: MMcK	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL170	0.00	6.30	713071.21 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.30	5.75	612910.67 N	Elevation: -4.91 mCD	End Date: 19/12/2023	Logger: MS	FINAL
Rotary Coring	Fraste CRS-XL170	6.30	11.30					

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably very soft to soft slightly sandy silty CLAY.		
0.80 - 1.80	SB1				-5.70	0.80		Very soft to soft dark brown and black slightly sandy SILT/CLAY. Sand is fine to coarse.		
1.00	D5									
1.80 - 3.30	SB2									
2.00	D6									
3.00	D7									
3.30 - 4.80	SB3									
					-8.51	3.60		Firm to stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to medium of various lithologies.		
4.00	D8									
4.80 - 6.30	SB4									
5.00	D9									
					-10.10	5.20		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of various lithologies.		
					-11.00	6.10		WEATHERED AMPHIBOLITE recovered as, angular to subangular fine to coarse gravel.		
6.30 - 6.58	SPT (C)	100 (25 for 88mm/100 for 189mm) Hammer SN = 1501	6.30	0.00	-11.20	6.30		NO RECOVERY: AZCL due to disturbance caused by SPT(C) test; probably weathered amphibolite as gravel.		
		100 71 30 12			-11.70	6.80		Medium strong grey AMPHIBOLITE with white numerous discontinuous white quartz veins, up to 25mm. Slightly weathered: reduced strength, closer fracture spacing, localised pervasive reddish brown discolouration and orangish brown discolouration on fracture surfaces. Discontinuities: 1. 0-20 degree joints, closely spaced (50/140/210), undulating, rough, with orangish brown staining on some fracture surfaces. 2. 75-90 degree joint at 7.05-7.60m, planar, rough, with orangish brown staining on fracture surface. *8.30-8.80m: Pervasive reddish brown staining.*		
		7								
8.30		100 33 7 8			-13.70	8.80		Extremely weak very narrowly foliated reddish brown weathered MYLONITE. Slightly weathered: highly reduced strength, closer fracture spacing, with pervasive reddish brown discolouration and clay infill.		
		TCR SCR RQD FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
6.30	177		
11.30	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.20m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.30m casing flushed, pushed to 5.75m below bed before refusal (maximum tip load)
Dissipation Test completed at 4.62m
See "M-CPT38_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH38
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 11.30 m	Start Date: 19/12/2023	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS-XL170	0.00	6.30					Scale: 1:50
Cone Penetration	Drill N'CPT	0.30	5.75	713071.21 E				
Rotary Coring	Fraste CRS-XL170	6.30	11.30	612910.67 N	Elevation: -4.91 mCD	End Date: 19/12/2023	Logger: MS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
					6						Discontinuities: 1. 30-40 degree joints, closely spaced (90/195/260), planar, smooth, with reddish brown clay smear on fracture surfaces.		
9.80						9.80	0.00	-14.70	9.80		(Possible fault gouge)		
9.80 - 9.92	SPT(C) 100 (25 for 50mm/100 for 72mm) Hammer SN = 1501				>20						Very weak very narrowly foliated light grey highly fractured MYLONITE. Slightly weathered: highly reduced strength, much closer fracture spacing, with grey clay infill.		
		90	57	0				-15.30	10.40		Discontinuities: 1. 60-65 degree foliation fractures, probably very closely spaced, planar, smooth, with light grey clay smear on fracture surfaces.		
					6						(Possible fault gouge)		
11.30								-16.20	11.30		Medium strong narrowly foliated grey SCHIST. Slightly weathered: slightly reduced strength, closer fracture spacing, with grey silt infill on fracture surfaces. Discontinuities: 1. 0-5 degree joints, medium spaced (290/340/450), undulating, rough, with grey silt smear on joint surfaces,. 2. 50-55 degree joint at 10.80-10.90m, undulating, rough, with grey silt infill, up to 3mm on joint surface. 3. 70-75 degree foliation fracture at 10.85-11.20m, planar, smooth, with grey silt infill, up to 4mm on fracture surface.		
											End of Borehole at 11.30m		
		TCR	SCR	RQD	FI								

Depth scale: 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0, 13.5, 14.0, 14.5, 15.0, 15.5, 16.0, 16.5, 17.0, 17.5, 18.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
6.30	177
11.30	150

Water Added

From (m)	To (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 13.20m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.30m casing flushed, pushed to 5.75m below bed before refusal (maximum tip load)
Dissipation Test completed at 4.62m
See "M-CPT38_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH39A

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 12.70 m	Start Date: 02/01/2024	Driller: MMcK	Sheet 1 of 2
Sonic Drilling	Fraste CRS XL-170 Duo	0.00	2.80	713097.00 E				Scale: 1:50
Rotary Coring	Fraste CRS XL-170 Duo	2.80	12.70	612780.69 N	Elevation: -3.87 mCD	End Date: 03/01/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.20 - 1.70	SB1				-4.07	0.20		NO RECOVERY: Material washed away by drilling process; probably silty SAND. Dense light brown very sandy very clayey angular fine to medium GRAVEL of various lithologies. Sand is fine to coarse.		
1.70 - 2.80	SB2		1.70	0.00						
1.70 - 1.98	SPT (C)	50 (8,15/50 for 135mm) Hammer SN = 1501								
2.50 - 2.50	SPT (C)	50 (25 for 5mm/50 for 0mm) Hammer SN = 1501	2.50	0.00	-6.27	2.40		WEATHERED BEDROCK recovered as light grey clayey angular fine to coarse GRAVEL of amphibolite.		
					-6.67	2.80		Weak to moderately weak dark greenish grey AMPHIBOLITE. Slightly weathered: reduced strength, closer fracture spacing, with orangish brown discolouration on fracture surfaces. Discontinuities: 1. 20-25 degree joints at 2.95-3.00m, 3.20-3.25m and 4.65-4.70m, planar, rough, with orangish brown staining on joint surfaces. 2. 60-70 degree joints at 3.40-3.50m and 3.80-3.90m, planar, rough, with orangish brown staining on joint surfaces. *2.80-3.10m: Incipient sub-vertical joint.*		
3.60 - 3.70	C1	100 67 27								
3.70 - 3.85	C2	93 93 13		3						
					-8.57	4.70		Moderately weak to medium strong dark greenish grey AMPHIBOLITE with pinkish grey feldspar mineralisation. Slightly weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 10-30 degree joints, widely spaced (300/670/910), undulating, rough, clean. 2. 50-60 degree joints at 10.30-10.45m, 10.95-11.10m and 11.20-11.35m, planar and undulating, rough, clean. 3. 75-90 degree joints at 5.80-6.20m, 6.80-7.20m, 7.25-7.70m and 7.80-8.50m, undulating, rough, clean.		
5.20 - 5.20	C3	100 100 43								
6.60 - 6.70	C4	93 93 0		2						
8.20		86 73 47								
		TCR SCR RQD FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
2.80	177		
12.70	150		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.80m
All elevations and reduced levels are given in local Chart Datum

Drilling element for M-BH39 location which was stopped early following CPT refusal to move barge to safe haven

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH39A

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 12.70 m	Start Date: 02/01/2024	Driller: MMcK	Sheet 2 of 2
Sonic Drilling	Fraste CRS XL-170 Duo	0.00	2.80	713097.00 E				Scale: 1:50
Rotary Coring	Fraste CRS XL-170 Duo	2.80	12.70	612780.69 N	Elevation: -3.87 mCD	End Date: 03/01/2024	Logger: OG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.70													
		100	100	9									
11.20													
		100	84	49									
12.70								-16.57	12.70		End of Borehole at 12.70m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
2.80	177
12.70	150

Water Added	
From (m)	To (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 10.80m
All elevations and reduced levels are given in local Chart Datum

Drilling element for M-BH39 location which was stopped early following CPT refusal to move barge to safe haven

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated on instruction of Client	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-BH40

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 8.90 m	Start Date: 09/02/2024	Driller: MJ	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	1.40	713304.34 E				Scale: 1:50
Rotary Coring	Fraste CRS-XL140 Duo	1.40	8.90	612871.88 N	Elevation: -8.99 mCD	End Date: 10/02/2024	Logger: OG	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	B1											Dark grey angular to subangular fine to coarse GRAVEL of amphibolite, quartz and dolerite with rare subrounded cobbles.		
0.30 - 0.80	B2								-9.29	0.30		Soft brownish grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of amphibolite.		
0.50	D5													
0.80 - 1.00	B3						0.80	0.00	-9.79	0.80		Very dense dark grey angular to subangular fine to coarse GRAVEL of amphibolite.		
0.80 - 1.08	SPT (C)	100 (7,18/100 for 125mm) Hammer SN = 1353							-9.99	1.00		Grey very gravelly slightly clayey fine to coarse SAND with pockets of grey clay. Gravel is angular to subangular fine to medium of amphibolite.		
1.00 - 1.40	B4													
1.40 - 1.63	SPT (C)	100 (25 for 115mm/100 for 115mm) Hammer SN = 1353					1.40	0.00						
						AZCL								
			53	47	0	NI			-10.99	2.00		Moderately weak greenish grey AMPHIBOLITE. Moderately weathered. Discontinuities: 1) 70-80° joints, extremely close to very closely spaced, undulating, rough with patchy light brown staining on joint surfaces and occasional light brown silty clay infill (<2mm).		
						>20								
2.90														
			100	87	27	6			-12.59	3.60		Moderately weak becoming medium strong to strong greenish grey AMPHIBOLITE with occasional veining of plagioclase feldspar, localised fracturing and distinct areas of foliation. Discontinuities: 1) 30-45° joints, medium spaced, undulating, rough with reddish brown staining on joint surfaces.		
3.90	C1													
4.40														
			100	73	50	2								
						NI						5.30-5.60m: localized fracturing		
						1								
5.90														
			100	87	53	4						6.10-6.30m: foliation present		
												7.10-7.0m: foliation present		
7.40												7.40-7.90m: localized fracturing		
						NI								
			100	67	54	3								
8.90									-17.89	8.90		End of Borehole at 8.90m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
1.40	177
8.90	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 14.60m
All elevations and reduced levels are given in local Chart Datum

Not enough time in working window between sailings to progress this location any deeper

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH41
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 17.50 m	Start Date: 17/02/2024	Driller: MJ/SJ	Sheet 1 of 2
Sonic Drilling	Fraste CRS-XL140	0.00	11.50	712918.05 E				Scale: 1:50
Cone Penetration	Drill N'CPT	0.40	10.03					
Rotary Coring	Fraste CRS-XL140	11.50	17.50	613005.92 N	Elevation: -4.85 mCD	End Date: 18/02/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								NO RECOVERY: Material flushed to prepare for CPT test; probably sandy CLAY.		
1.00 - 1.70	B1				-5.85	1.00		Firm brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to rounded fine to coarse of various lithologies. Cobbles are subrounded to rounded of various lithologies.		
1.50	D13									
1.70 - 2.00	B2				-6.55	1.70		Firm brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subrounded to rounded fine to medium of various lithologies.		
2.00 - 3.00	B3									
2.50	D14									
3.00 - 4.00	B4									
3.50	D15									
4.00 - 5.00	B5				-8.85	4.00		Firm to stiff silty CLAY with low cobble content. Cobbles are subrounded to rounded of various lithologies.		
4.50	D16									
5.00 - 6.00	B6				-9.85	5.00		Stiff brown slightly sandy silty CLAY with occasional pockets of rounded fine gravel of various lithologies.		
5.50	D17									
6.00 - 6.95	B7									
6.50	D18									
6.95 - 7.50	B8				-11.80	6.95		Dense dark brown sandy slightly clayey subangular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
7.50	D19				-12.35	7.50		Firm to stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
7.50 - 8.80	B9									
8.50	D20									
8.80 - 9.50	B10				-13.65	8.80		Dense to very dense brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of mudstone. Sand is fine to coarse.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.50	177
17.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.20m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 10.03m below bed before refusal (maximum tip load)
Dissipation Tests completed at 1.53m, 5.70m, 7.55m, and 9.78m
See "M-CPT41_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI	Borehole ID M-BH41
		Client: Iarnród Éireann	
		Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL140	0.00	11.50	712918.05 E
Cone Penetration	Drill N'CPT	0.40	10.03	613005.92 N
Rotary Coring	Fraste CRS-XL140	11.50	17.50	

Final Depth: 17.50 m	Start Date: 17/02/2024	Driller: MJ/SJ	Sheet 2 of 2
			Scale: 1:50
Elevation: -4.85 mCD	End Date: 18/02/2024	Logger: MS	FINAL

Depth (m)	Sample / Tests	Field Records				Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50	D21												
9.50 - 10.60	B11												
10.60 - 11.50	B12							-15.45	10.60		Extremely weak light greenish grey weathered MUDSTONE, no discernable fracture sets.		
		100	100	100	>20			-17.05	12.20		Weak light grey partially weathered MUDSTONE. Discontinuities: 1) 10-15° joints, medium spaced, undulating, rough, tight or open, with grey clay infill (1-3mm) and occasional calcite crystals. 2) 25-30° joints, very closely spaced, incipient, blocky.		
13.00						13.0	0.00						
13.00 - 13.20	SPT(C) 50 (25 for 105mm/50 for 95mm) Hammer SN = 1353												
13.00 - 14.50	C2Whole core box shipped	100	97	87	4								
14.00 - 14.05	C3												
14.30 - 14.40	C1												
14.50													
		100	80	27	>20								
					NI								
16.00													
16.00 - 17.50	C4												
		100	93	53	>20								
					4			-21.45	16.60		Moderately weak light grey fine to medium grained SANDSTONE. Fractures are subhorizontal, medium spaced, undulating, rough.		
					15			-22.05	17.20		Moderately weak light grey MUDSTONE. Discontinuities: 1) 25-30° joints, very closely spaced, incipient, blocky.		
17.50								-22.35	17.50		End of Borehole at 17.50m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
11.50	177
17.50	150

Water Added

From (m)	To (m)

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Deck to bed = 12.20m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 10.03m below bed before refusal (maximum tip load)
Dissipation Tests completed at 1.53m, 5.70m, 7.55m, and 9.78m
See "M-CPT41_BH" plots for all CPT data
Borehole continued via sonic and rotary coring techniques to termination depth

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH	Project No. 23-0585	Project Name: Rosslare Europort Offshore Renewable Energy Hub SI Client: Iarnród Éireann Client's Rep: GDG	Borehole ID M-CPT32

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 1.50 m	Start Date: 19/02/2024	Driller: MJ/DJ	Sheet 1 of 1
Sonic Drilling	Fraste CRS-XL140 Duo	0.00	1.50	713732.78 E 613162.74 N	Elevation: -8.03 mCD	End Date: 19/02/2024	Logger: MS	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00	D2		0.00	0.00				Very stiff light brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone.		
0.00 - 0.31	SPT (S)	44 (6,8/44 for 163mm) Hammer SN = 1353								
					-8.73	0.70		Brown and grey slight sandy slightly silty angular to subangular fine to coarse GRAVEL of mudstone. Sand is fine to coarse.		
1.00 - 1.50	SB1									
					-9.23	1.20		Weak to moderately weak light and dark grey MUDSTONE; slightly weathered, appears highly fractured, no discernable fracture sets.		
					-9.53	1.50		End of Borehole at 1.50m		

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
1.50	177		

Remarks

Overwater borehole drilled off Causeway Giant 2 jack-up barge
Originally proposed as CPT location but hard material present at surface when lowering casing
Deck to bed = 15.00m
All elevations and reduced levels are given in local Chart Datum

Sonic run completed to 1.50m to confirm material (weathered rockhead at 1.20m)

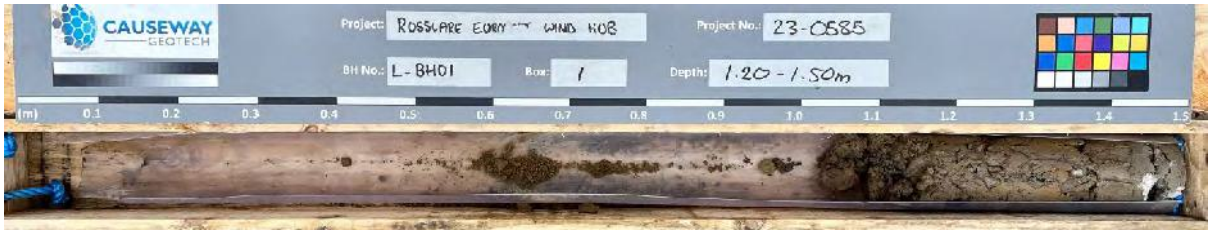
Core Barrel	Flush Type	Termination Reason	Last Updated
		Drill out terminated on suspected rockhead	04/07/2024

AGS

CAUSEWAY GEOTECH

APPENDIX C

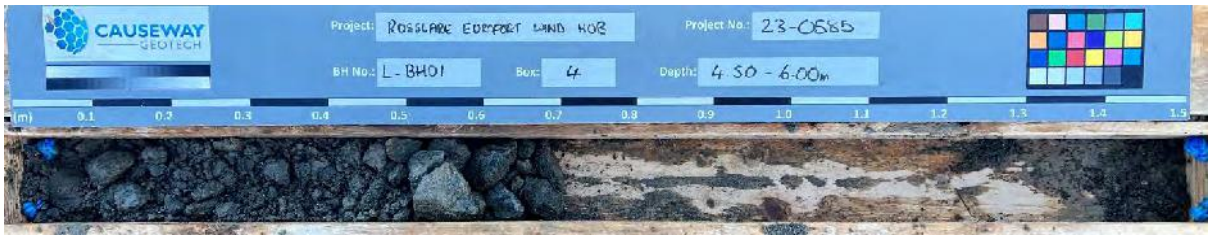
CORE PHOTOGRAPHS



L-BH01 – Box 1 (1.20-1.50m)

L-BH01 – Box 2 (1.50-3.00m)

L-BH01 – Box 3 (3.00-4.50m)



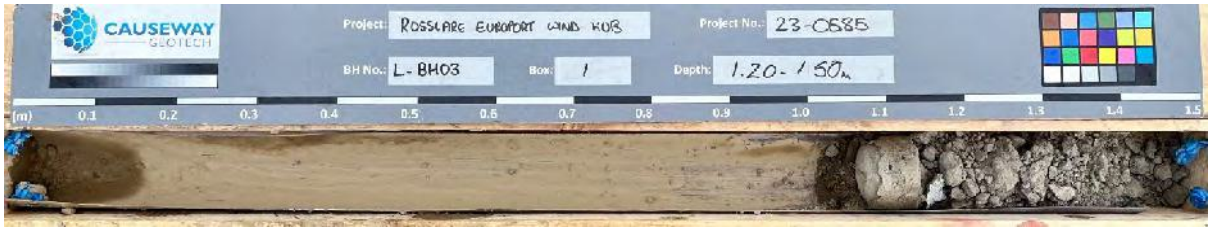
L-BH01 – Box 4 (4.50-6.00m)

L-BH01 – Box 5 (6.00-7.50m)

L-BH01 – Box 6 (7.50-9.00m)

L-BH01 – Box 7 (9.00-10.50m)

L-BH01 – Box 8 (10.50-11.50m)



L-BH03 – Box 1 (1.20-1.50m)

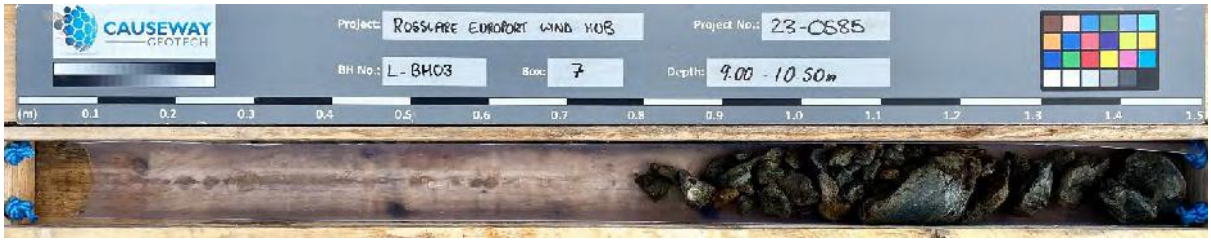
L-BH03 – Box 2 (1.50-3.00m)

L-BH03 – Box 3 (3.00-4.50m)

L-BH03 – Box 4 (4.50-6.00m)

L-BH03 – Box 5 (6.00-7.50m)

L-BH03 – Box 6 (7.50-9.00m)



L-BH03 – Box 7 (9.00-10.50m)

L-BH03 – Box 8 (10.50-11.50m)

L-BH03 – Box 9 (11.50-13.00m)

L-BH04 – Box 1 (1.20-1.50m)

L-BH04 – Box 2 (1.50-2.50m)

L-BH04 – Box 3 (3.50-4.50m)

L-BH04 – Box 4 (4.50-6.00m)

L-BH04 – Box 5 (6.00-7.50m)

L-BH04 – Box 6 (7.50-9.00m)

L-BH04 – Box 7 (9.00-10.50m)

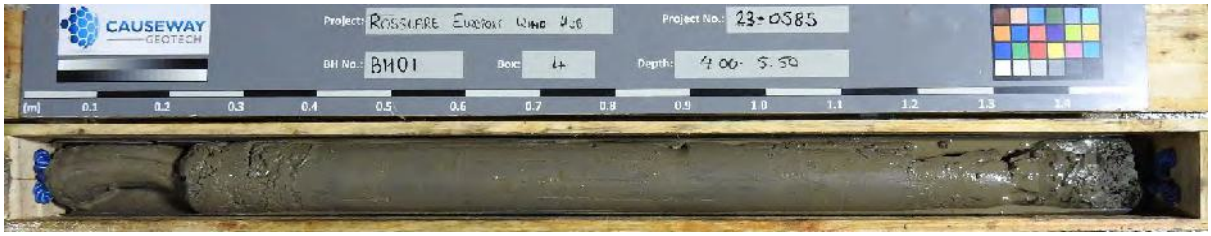
L-BH04 – Box 8 (10.50-11.10m)

L-BH04 – Box 9 (11.10-11.60m)

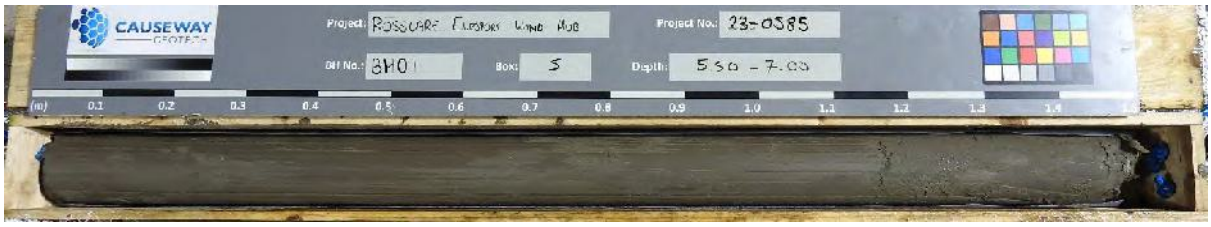
M-BH01 – Box 1 (0.00-1.50m)

M-BH01 Box 2 (1.50-2.50m)

M-BH01 – Box 3 (2.50-4.00m)

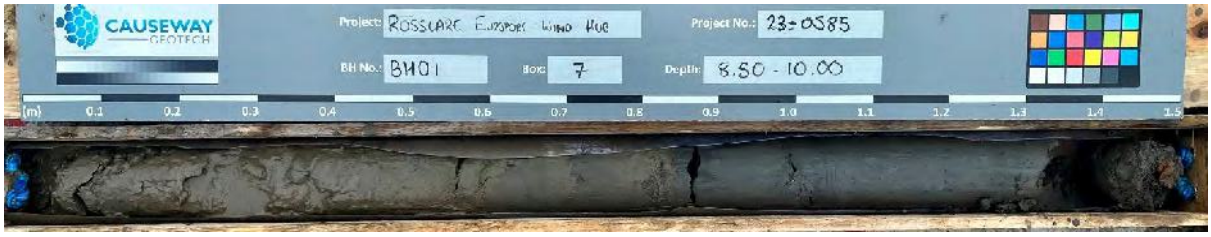


M-BH01 – Box 4 (4.00-5.50m)



M-BH01 – Box 5 (5.50-7.00m)

M-BH01 – Box 6 (7.00-8.50m)



M-BH01 – Box 7 (8.50-10.00m)

M-BH01 – Box 8 (10.00-11.00m)

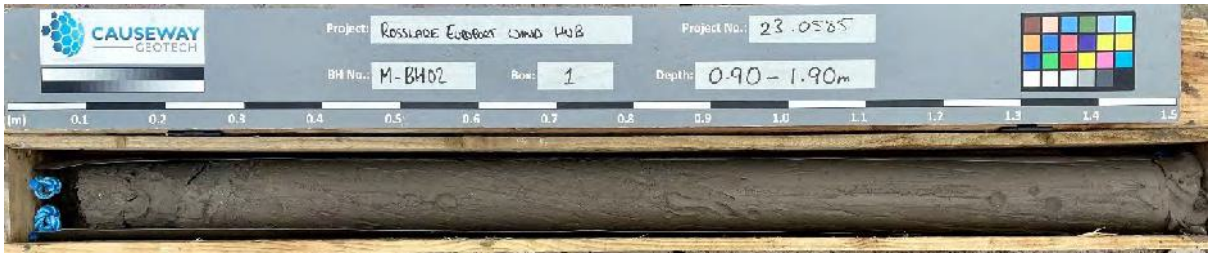
M-BH01 – Box 9 (11.00-12.00m)

M-BH01 – Box 10 (12.00-13.50m)

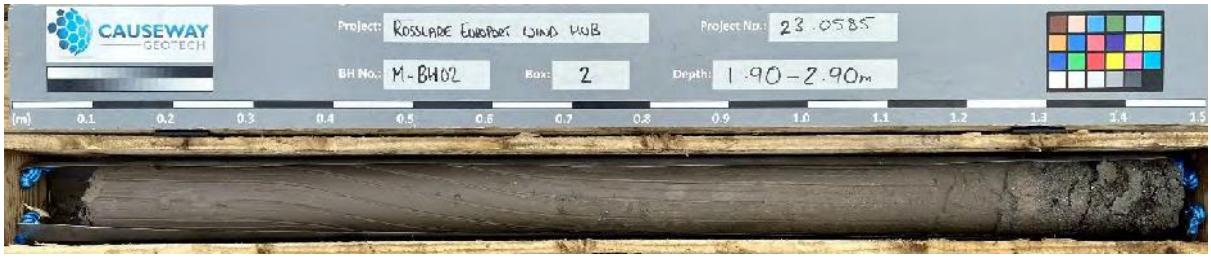
M-BH01 – Box 11 (13.50-15.00m)

M-BH01 – Box 12 (15.00-16.50m)

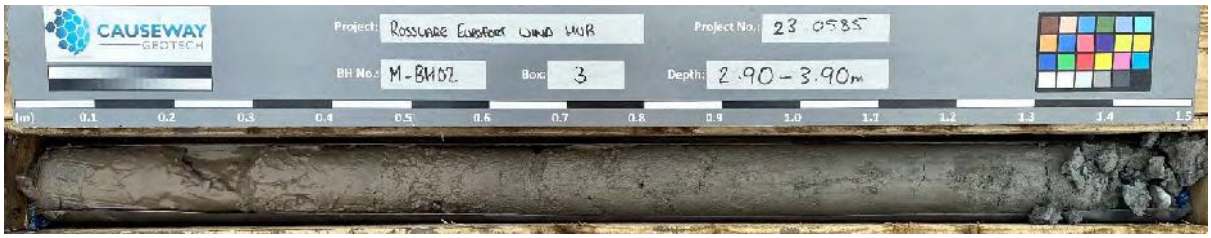
M-BH01 – Box 13 (16.50-18.00m)



M-BH02 – Box 1 (0.90-1.90m)



M-BH02 - Box 2 (1.90-2.90m)



M-BH02 - Box 3 (2.90-3.90m)

NO RECOVERY FROM 3.90-4.40m

M-BH02 - Box 4 (4.40-5.90m)

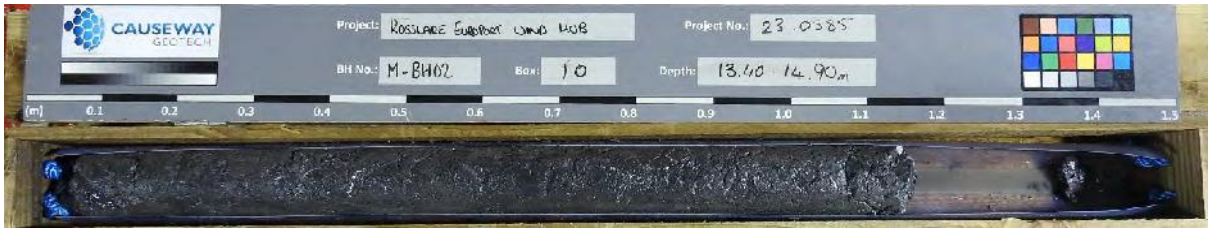
M-BH02 – Box 5 (5.90-7.40m)

M-BH02 – Box 6 (7.40-8.90m)

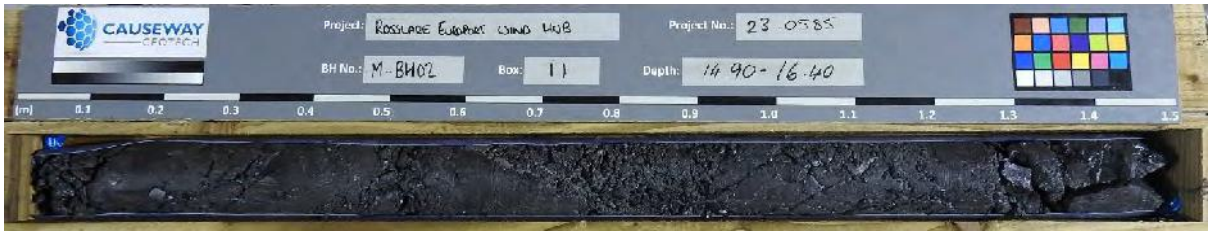
M-BH02 - Box 7 (8.90-10.40m)

M-BH02 - Box 8 (10.40-11.90m)

M-BH02 – Box 9 (11.90-13.40m)



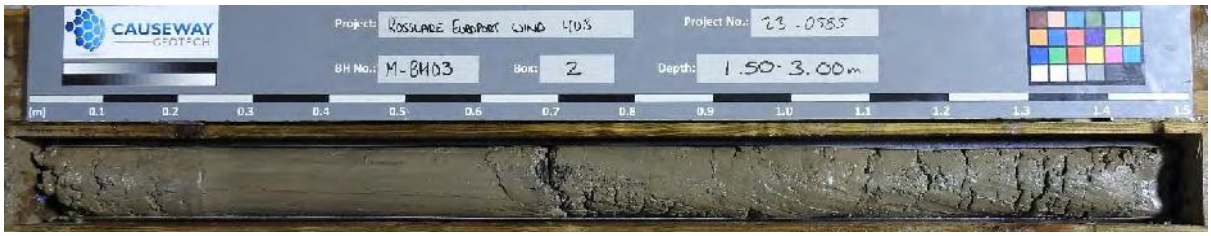
M-BH02 - Box 10 (13.40-14.90m)



M-BH02 – Box 11 (14.90-16.40m)

M-BH02 – Box 12 (16.40-17.90m)

M-BH03 – Box 1 (0.40-1.50m)

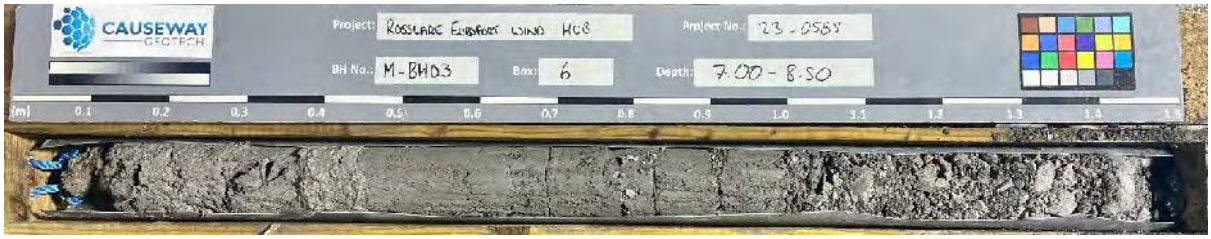


M-BH03 - Box 2 (1.50-3.00m)

M-BH03 - Box 3 (3.00-4.50m)

M-BH03 - Box 4 (4.50-6.00m)

M-BH03 - Box 5 (6.00-7.00m)

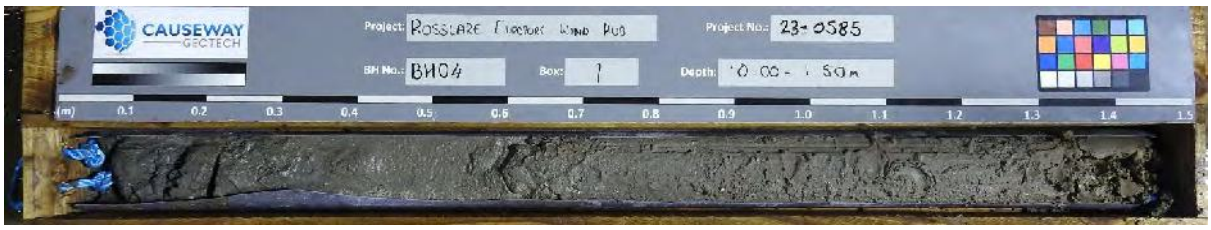


M-BH03 – Box 6 (7.00-8.50m)

M-BH03 - Box 7 (8.50-10.00m)

M-BH03 - Box 8 (10.00-11.50m)

M-BH03 – Box 9 (11.50-13.00m)



M-BH04 – Box 1 (0.00-1.50m)

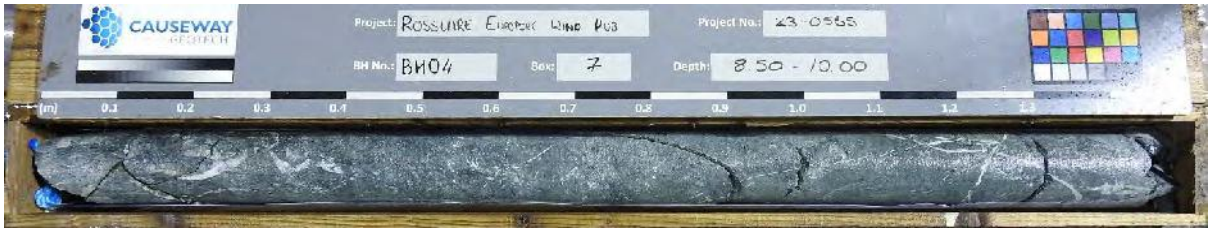
M-BH04 – Box 2 (1.70-2.50m)

M-BH04 – Box 3 (2.50-4.00m)

M-BH04 – Box 4 (4.00-5.50m)

M-BH04 – Box 5 (5.50-7.00m)

M-BH04 – Box 6 (7.00-8.50m)



M-BH04 – Box 7 (8.50-10.00m)

M-BH05 – Box 1 (0.50-2.00m)

M-BH05 – Box 2 (2.00-3.50m)

M-BH05 – Box 3 (3.50-5.00m)

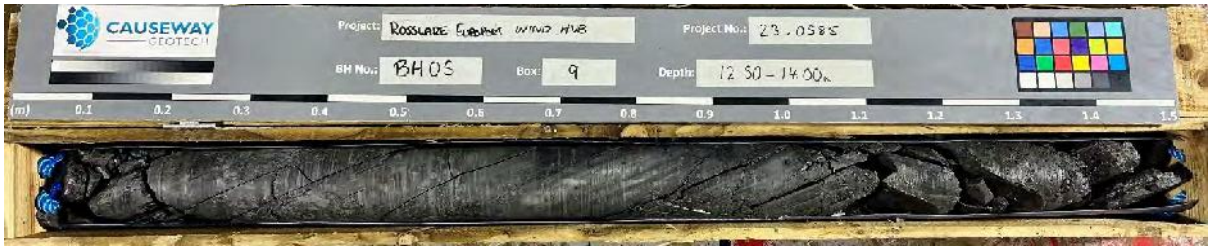
M-BH05 – Box 4 (5.00-6.50m)

M-BH05 – Box 5 (6.50-8.00m)

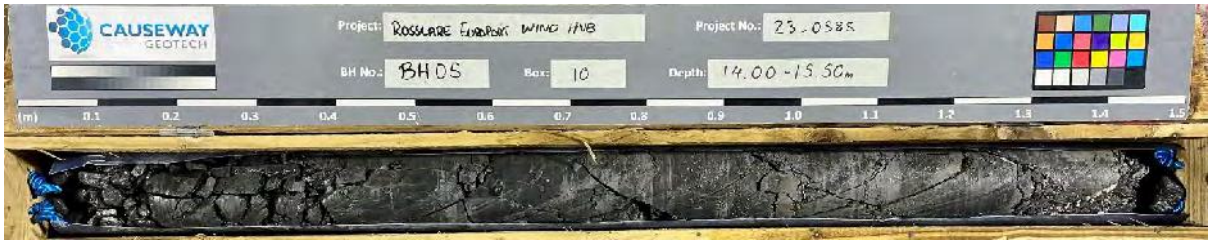
M-BH05 – Box 6 (8.00-9.50m)

M-BH05 – Box 7 (9.50-11.00m)

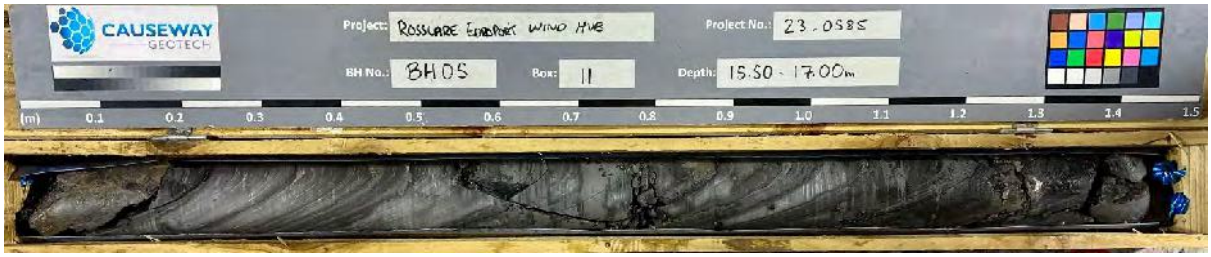
M-BH05 – Box 8 (11.00-12.50m)



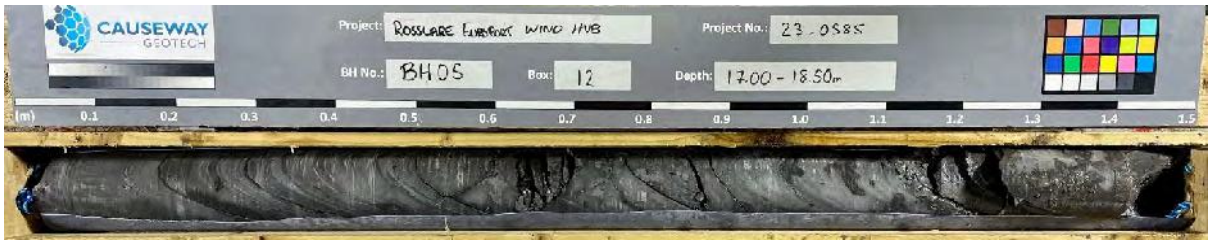
M-BH05 – Box 9 (12.50-14.00m)



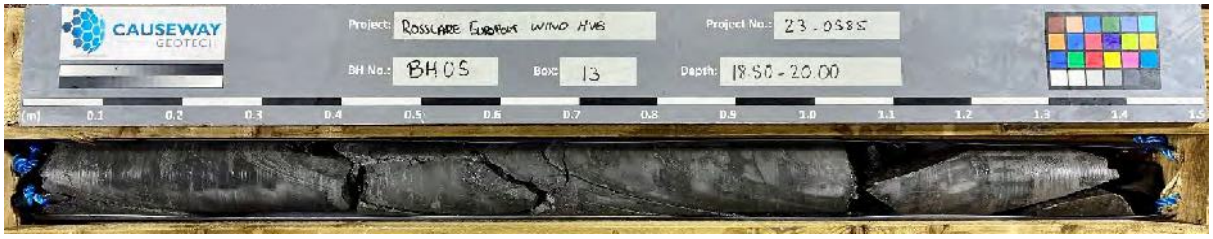
M-BH05 – Box 10 (14.00-15.50m)



M-BH05 – Box 11 (15.50-17.00m)

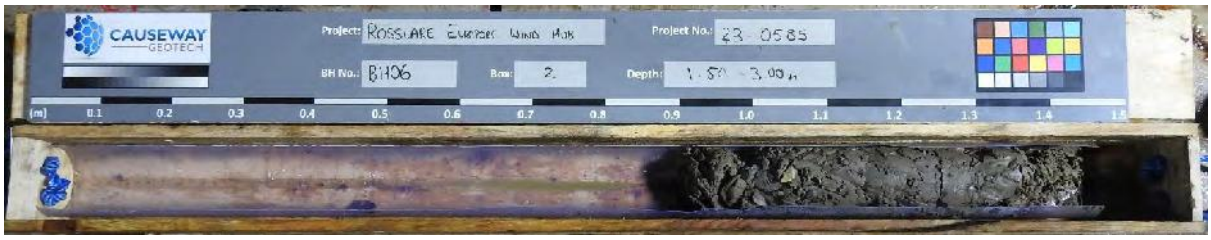


M-BH05 – Box 12 (17.00-18.50m)



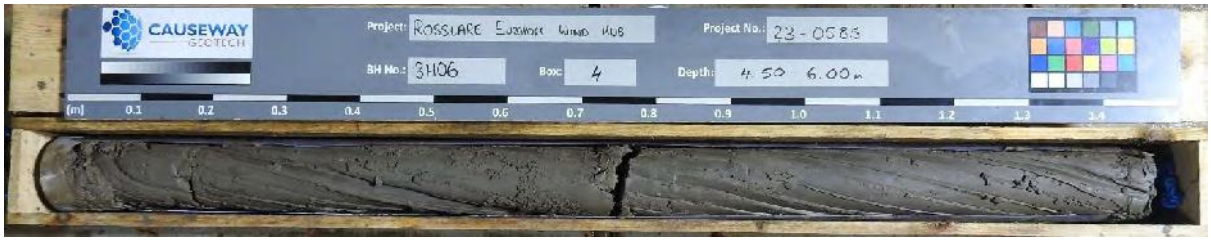
M-BH05 – Box 13 (18.50-20.00m)

M-BH06 – Box 1 (0.00-1.50m)



M-BH06 – Box 2 (1.50-3.00m)

M-BH06 – Box 3 (3.00-4.50m)

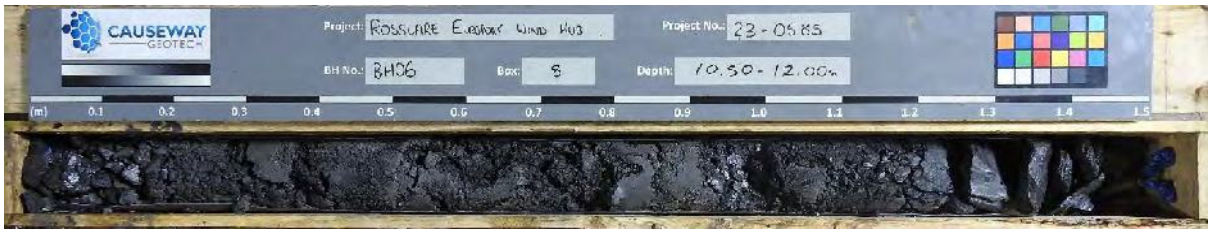


M-BH06 – Box 4 (4.50-6.00m)

M-BH06 – Box 5 (6.00-7.50m)

M-BH06 – Box 6 (7.50-9.00m)

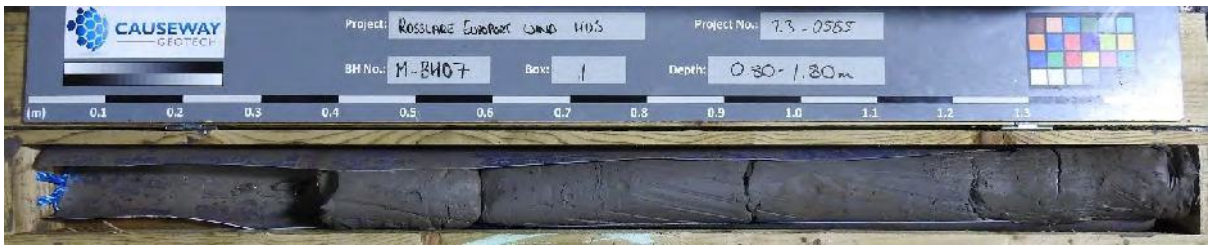
M-BH06 – Box 7 (9.00-10.50m)



M-BH06 – Box 8 (10.50-12.00m)

M-BH06 – Box 9 (12.00-13.50m)

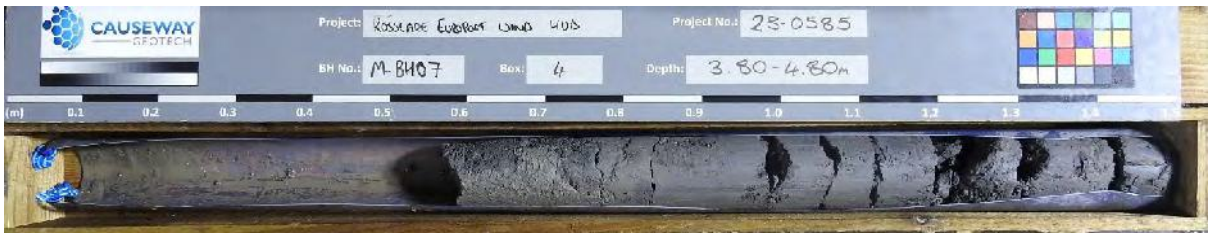
M-BH06 – Box 10 (13.50-15.00m)



M-BH07 – Box 1 (0.80-1.80m)

M-BH07 – Box 2 (1.80-2.80m)

M-BH07 – Box 3 (2.80-3.80m)



M-BH07 – Box 4 (3.80-4.80m)

M-BH07 – Box 5 (4.80-6.30m)

M-BH07 – Box 6 (6.30-7.80m)

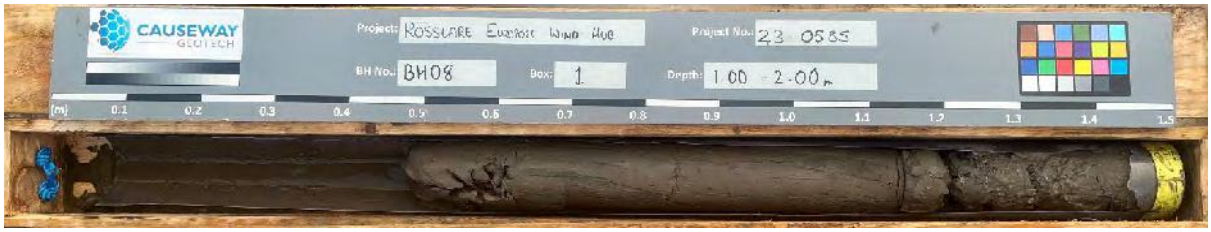
M-BH07 – Box 7 (7.80-9.30m)

M-BH07 – Box 8 (9.30-10.05m)

M-BH07 – Box 9 (10.05-11.55m)

M-BH07 – Box 10 (11.55-13.05m)

M-BH07 – Box 11 (13.05-14.05m)

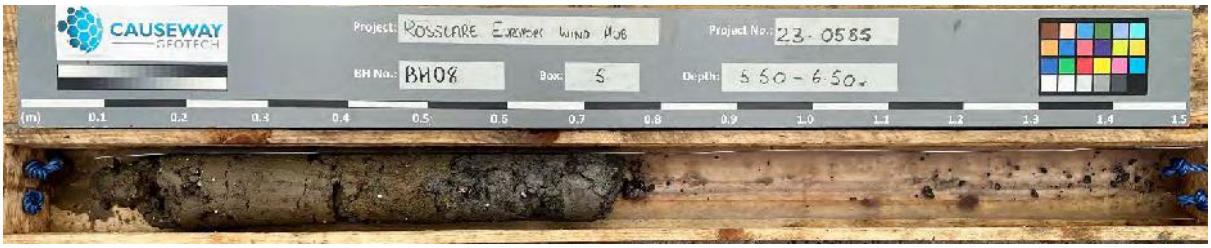


M-BH08 – Box 1 (1.00-2.00m)

M-BH08 – Box 2 (2.00-3.00m)

M-BH08 – Box 3 (3.00-4.00m)

M-BH08 – Box 4 (4.00-5.50m)



M-BH08 – Box 5 (5.50-6.50m)

M-BH08 – Box 6 (6.50-8.00m)

M-BH08 – Box 7 (8.00-9.50m)

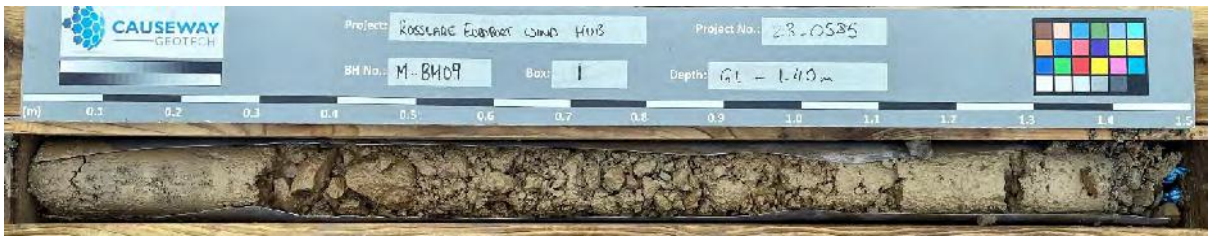
M-BH08 – Box 8 (9.50-11.00m)

M-BH08 – Box 9 (11.00-12.50m)

M-BH08 – Box 10 (12.50-14.00m)

M-BH08 – Box 11 (14.00-15.50m)

M-BH08 – Box 12 (15.50-17.00m)



M-BH09 – Box 1 (0.00-1.40m)

M-BH09 - Box 2 (1.40-2.70m)

M-BH09 - Box 3 (1.70-3.20m)

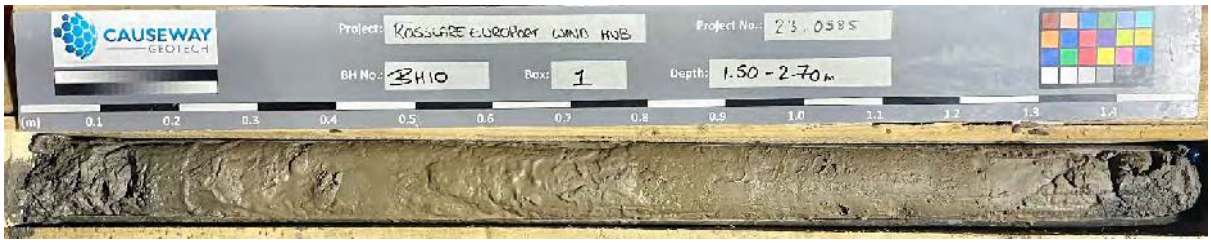
M-BH09 - Box 4 (3.70-4.70m)

M-BH09 - Box 5 (4.70-6.20m)

M-BH09 – Box 6 (6.20-7.70m)

M-BH09 - Box 7 (7.70-9.20m)

M-BH09 – Box 8 (9.20-10.70m)



M-BH10 – Box 1 (1.50-2.70m)

M-BH10 - Box 2 (2.70-4.20m)

M-BH10 - Box 3 (4.20-5.70m)

M-BH10 - Box 4 (5.70-7.20m)

M-BH10 - Box 5 (7.20-8.70m)

M-BH10 – Box 6 (8.70-10.20m)

M-BH10 - Box 7 (10.20-11.70m)

M-BH10 - Box 8 (11.70-13.20m)

M-BH10 - Box 9 (13.20-14.70m)

M-BH10 - Box 10 (14.70-16.20m)

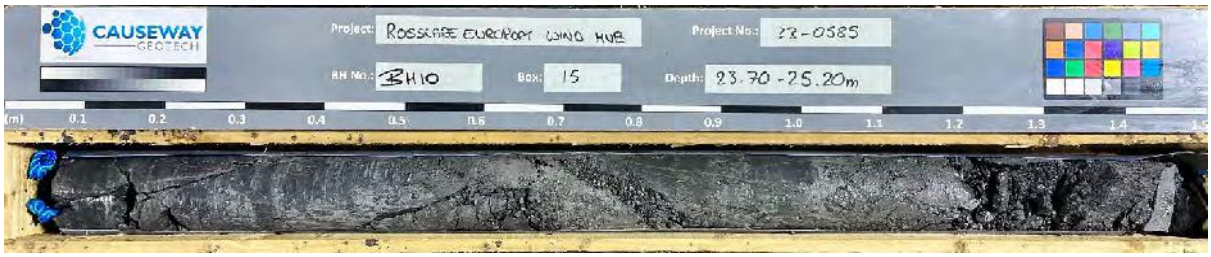
NO RECOVERY – 16.20-17.70m

M-BH10 – Box 11 (17.70-19.20m)

M-BH10 - Box 12 (19.20-20.70m)

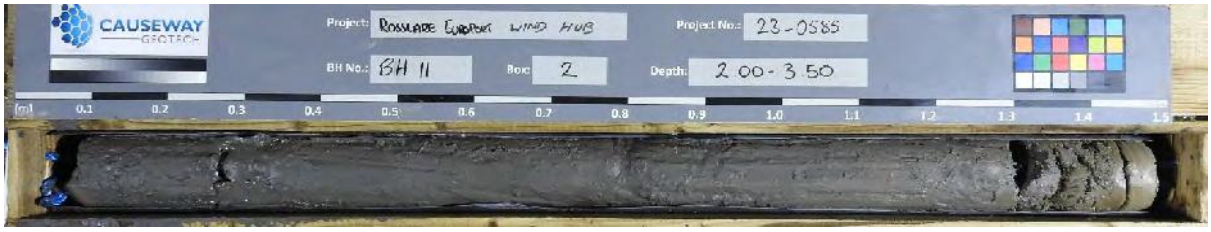
M-BH10 - Box 13 (20.70-22.20m)

M-BH10 - Box 14 (22.20-23.70m)

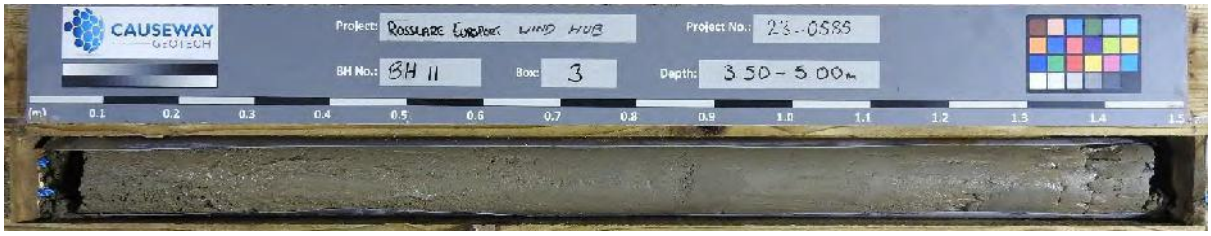


M-BH10 – Box 15 (23.70-25.20m)

M-BH11 – Box 1 (0.50-2.00m)



M-BH11 - Box 2 (2.00-3.50m)

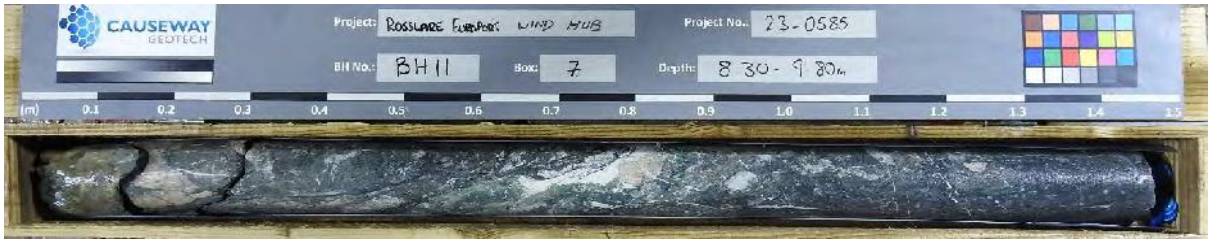


M-BH11 - Box 3 (3.50-5.00m)

M-BH11 - Box 4 (5.00-6.00m)

M-BH11 - Box 5 (6.00-6.80m)

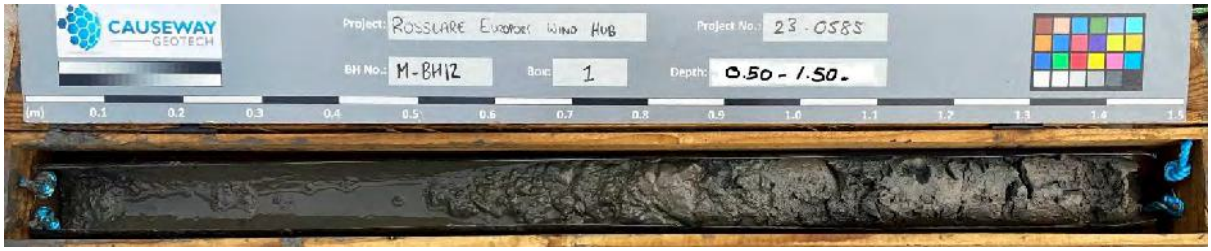
M-BH11 – Box 6 (6.80-8.30m)



M-BH11 - Box 7 (8.30-9.80m)

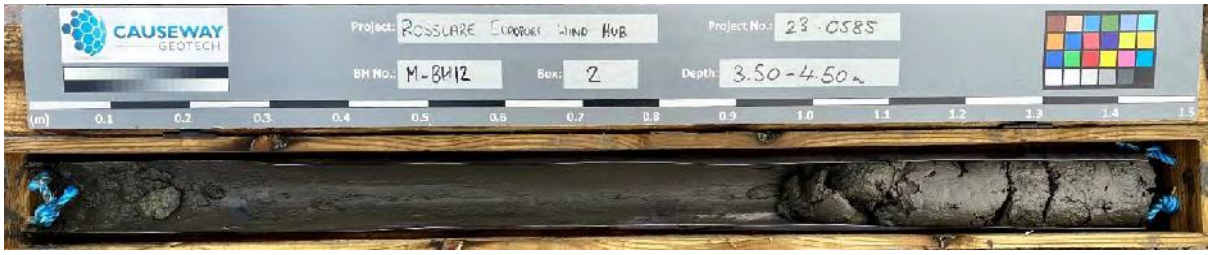
M-BH11 - Box 8 (9.80-11.30m)

M-BH11 – Box 9 (11.30-12.80m)



M-BH12 – Box1 (0.50-1.50m)

NO RECOVERY – 1.50-3.50m



M-BH12 – Box 2 (3.50-4.50m)

M-BH12 – Box 3 (4.50-5.50m)

M-BH12 – Box 4 (5.50-6.50m)

M-BH12 – Box 5 (6.50-8.00m)

M-BH12 – Box 6 (8.00-9.50m)

M-BH12 – Box 7 (9.50-11.00m)

M-BH13 – Box 1 (0.50-1.50m)

M-BH13 – Box 2 (1.50-2.00m)

M-BH13 – Box 3 (2.00-3.50m)

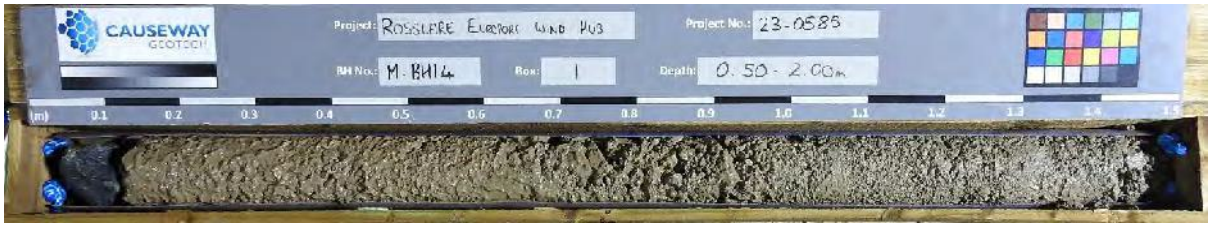
M-BH13 – Box 4 (3.50-5.00m)

M-BH13 – Box 5 (5.00-6.50m)

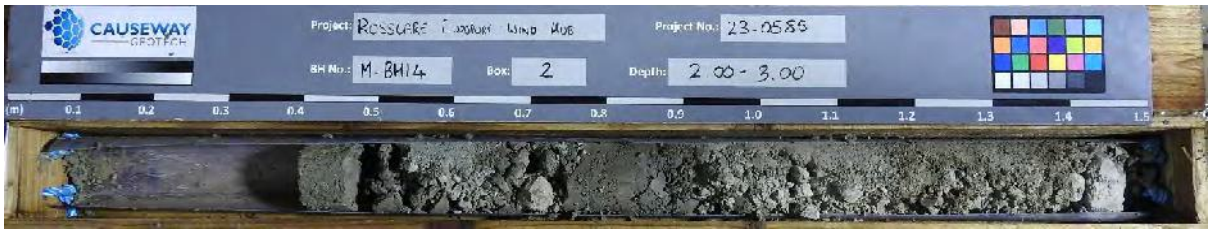
M-BH13 – Box 6 (6.50-8.00m)

M-BH13 – Box 7 (8.00-9.50m)

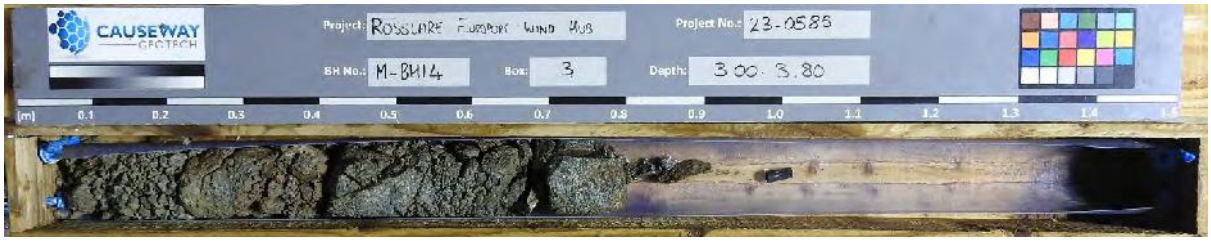
M-BH13 – Box 8 (9.50-11.00m)



M-BH14 – Box 1 (0.50-2.00m)

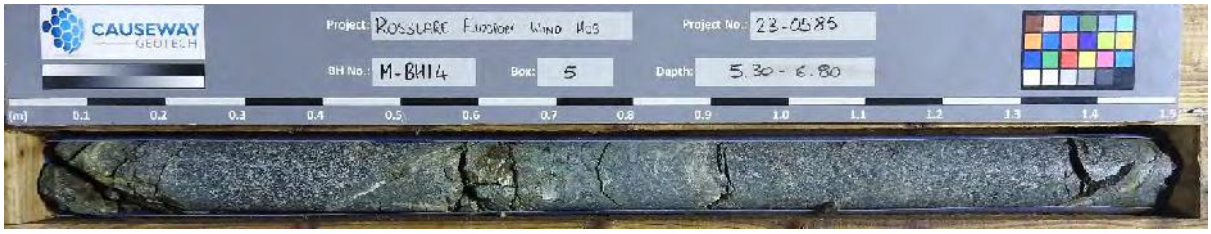


M-BH14 – Box 2 (2.00-3.00m)



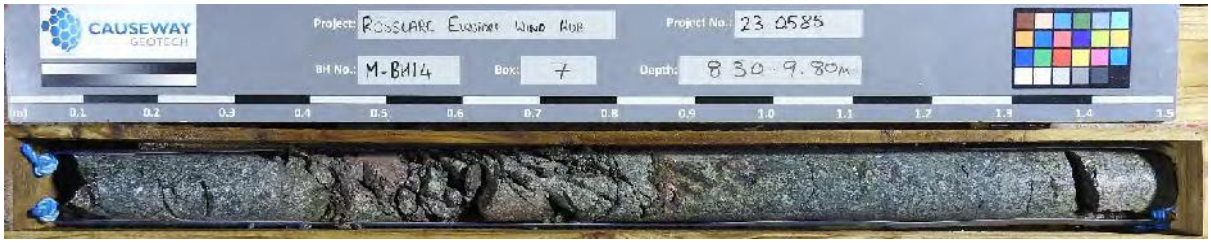
M-BH14 – Box 3 (3.00-3.80m)

M-BH14 – Box 4 (3.80-5.30m)

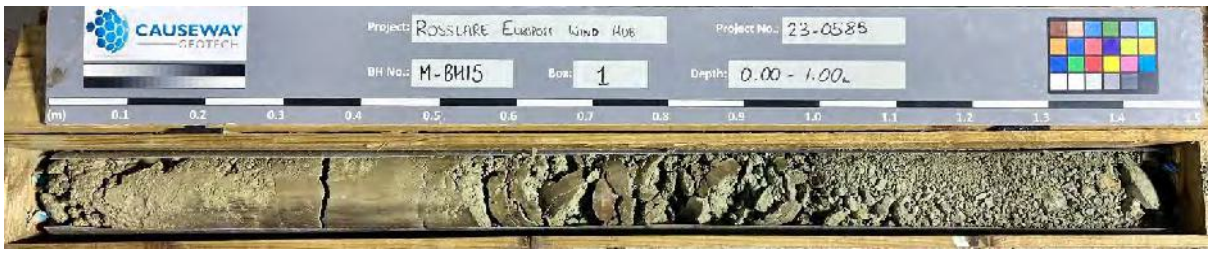


M-BH14 – Box 5 (5.30-6.80m)

M-BH14 – Box 6 (6.80-8.30m)



M-BH14 – Box 7 (8.30-9.80m)



M-BH15 – Box 1 (0.00-1.00m)

M-BH15 – Box 2 (1.00-2.00m)

M-BH15 – Box 3 (2.00-3.00m)

M-BH15 – Box 4 (3.00-4.50m)

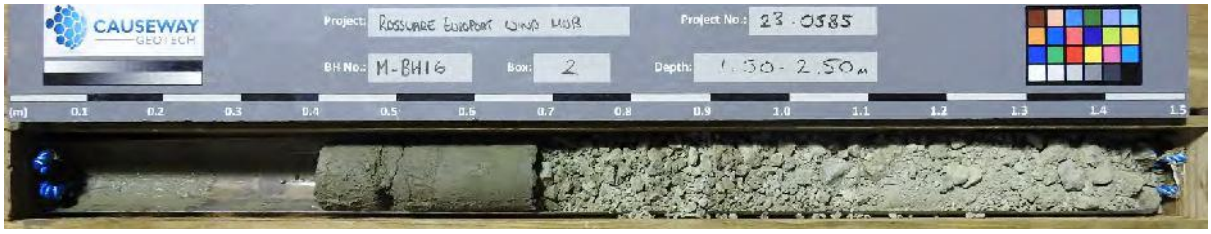
M-BH15 – Box 5 (4.50-6.00m)

M-BH15 – Box 6 (6.00-7.50m)

M-BH15 – Box 7 (7.50-9.00m)

M-BH15 – Box 8 (9.00-10.50m)

M-BH16 – Box 1 (0.00-1.50m)



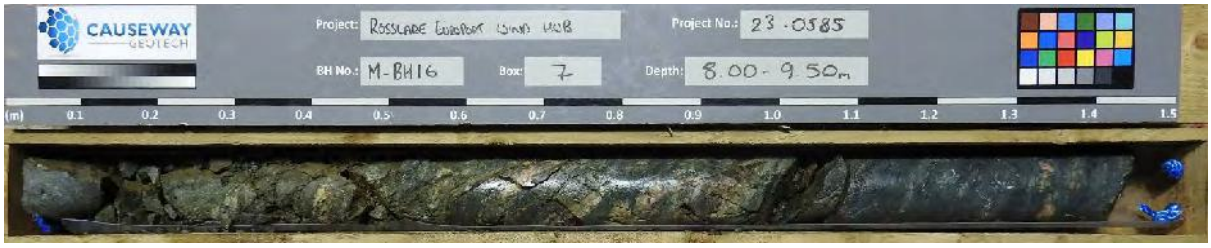
M-BH16 – Box 2 (1.50-2.50m)

M-BH16 – Box 3 (2.50-3.50m)

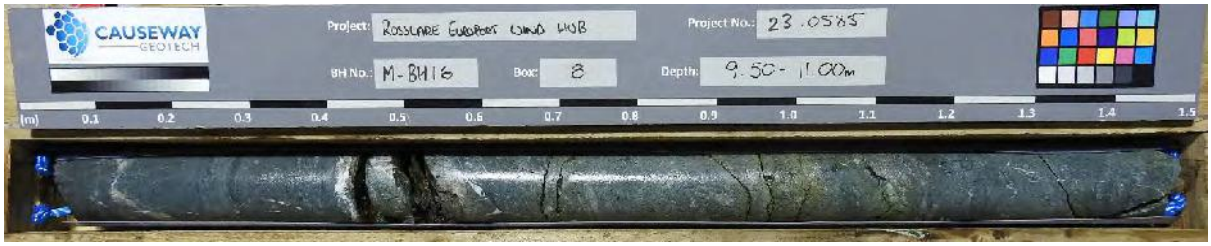
M-BH16 – Box 4 (3.50-5.00m)

M-BH16 – Box 5 (5.00-6.50m)

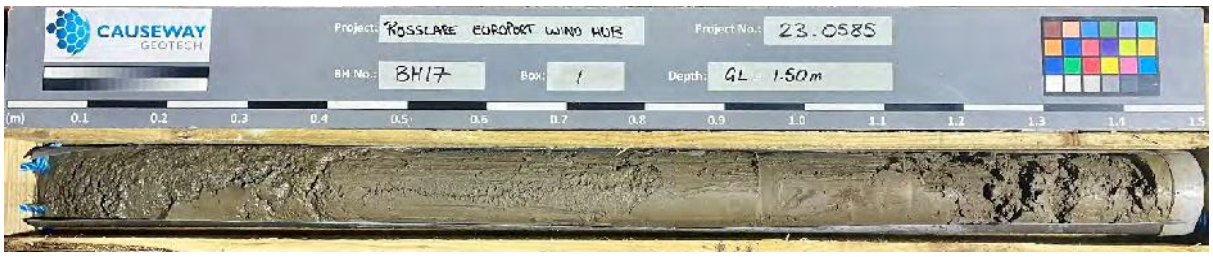
M-BH16 – Box 6 (6.50-8.00m)



M-BH16 – Box 7 (8.00-9.50m)



M-BH16 – Box 8 (9.50-11.00m)



M-BH17 – Box 1 (0.00-1.50m)

M-BH17 – Box 2 (1.50-3.00m)

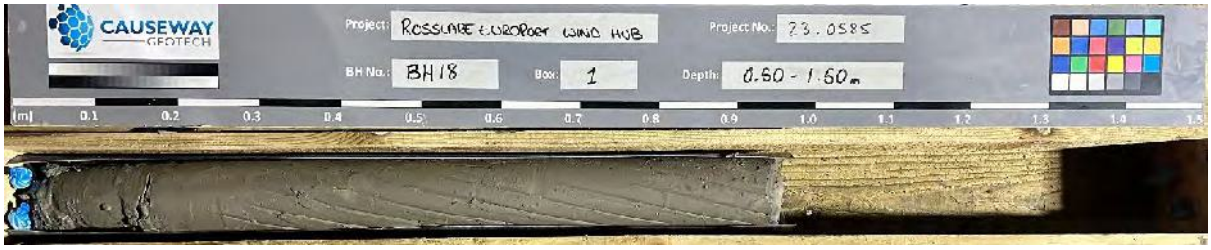
M-BH17 – Box 3 (3.00-4.50m)

M-BH17 – Box 4 (4.50-6.00m)

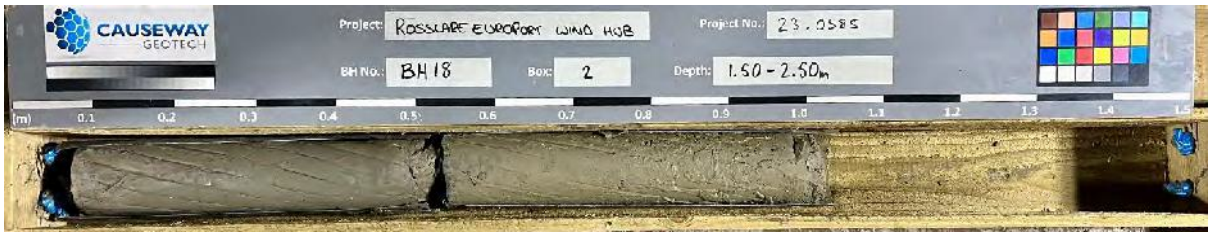
M-BH17 – Box 5 (6.00-7.50m)

M-BH17 – Box 6 (7.50-9.00m)

M-BH17 – Box 7 (9.00-10.50m)



M-BH18 – Box 1 (0.50-1.50m)



M-BH18 – Box 2 (1.50-2.50m)

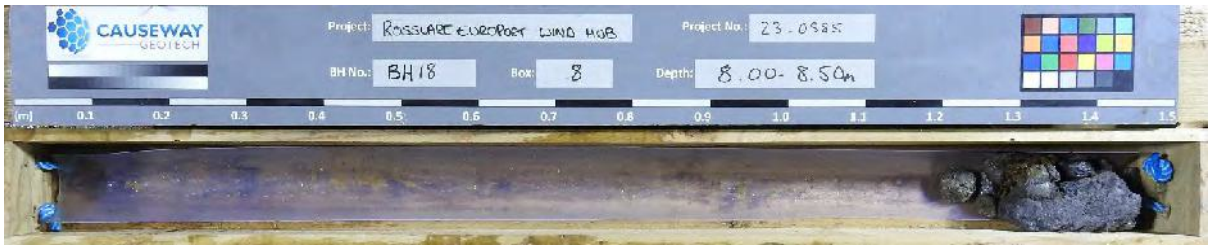
M-BH18 – Box 3 (2.50-3.50m)

M-BH18 – Box 4 (3.50-4.50m)

M-BH18 – Box 5 (4.50-5.00m)

M-BH18 – Box 6 (5.00-6.50m)

M-BH18 – Box 7 (6.50-8.00m)



M-BH18 – Box 8 (8.00-8.50m)

M-BH18 – Box 9 (8.50-10.00m)

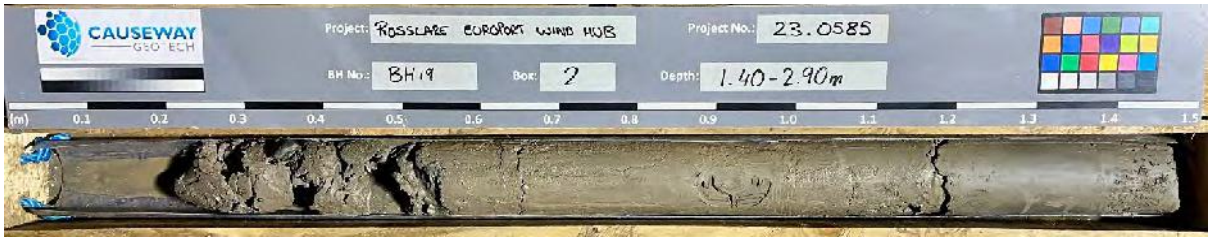
M-BH18 – Box 10 (10.00-11.50m)

M-BH18 – Box 11 (11.50-13.00m)

M-BH18 – Box 12 (13.00-14.50m)

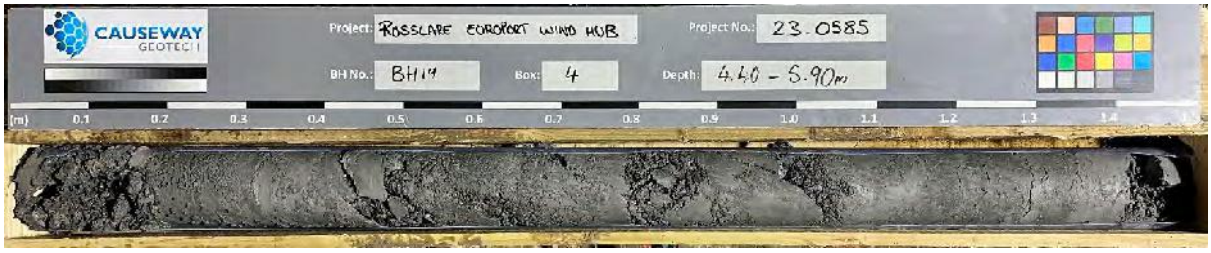
M-BH18 – Box 13 (14.50-16.00m)

M-BH19 – Box 1 (0.00-1.40m)

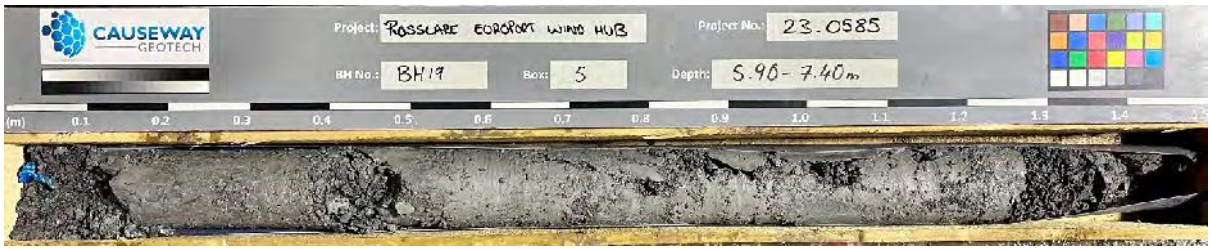


M-BH19 – Box 2 (1.40-2.90m)

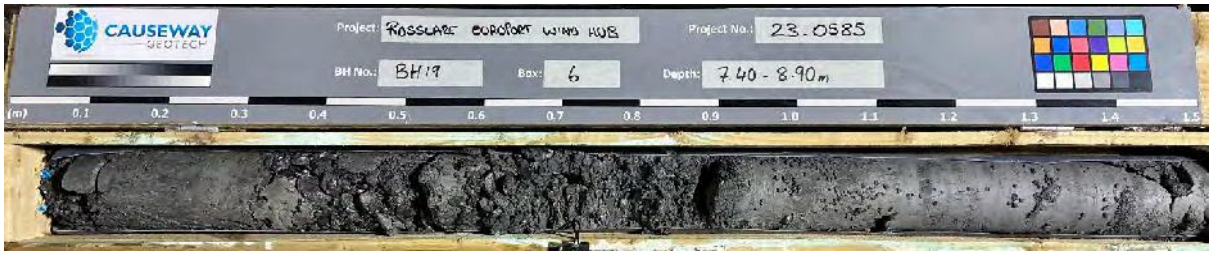
M-BH19 – Box 3 (2.90-4.40m)



M-BH19 – Box 4 (4.40-5.90m)



M-BH19 – Box 5 (5.90-7.40m)



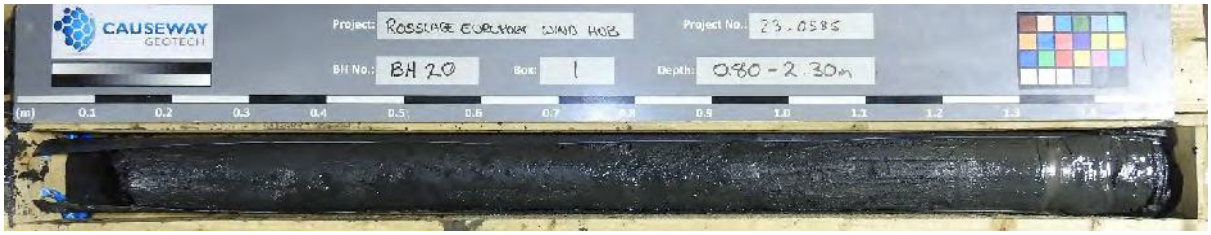
M-BH19 – Box 6 (7.40-8.90m)

M-BH19 – Box 7 (8.90-10.40m)

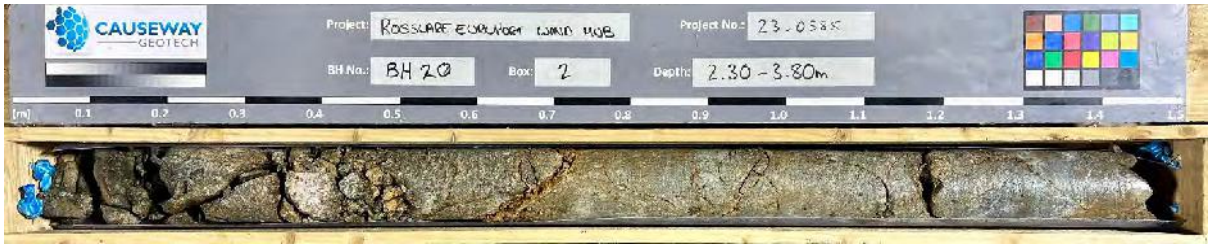
M-BH19 – Box 8 (10.40-11.90m)

M-BH19 – Box 9 (11.90-13.40m)

M-BH19 – Box 10 (13.40-14.90m)



M-BH20 – Box 1 (0.80-2.30m)



M-BH20 – Box 2 (2.30-3.80m)

M-BH20 – Box 3 (3.80-5.30m)

M-BH20 – Box 4 (5.30-6.80m)

M-BH20 – Box 6 (8.30-9.80m)

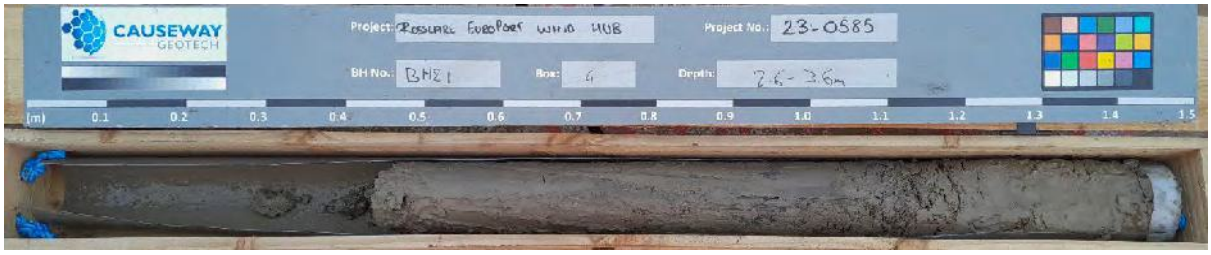
M-BH20 – Box 7 (9.80-11.30m)

M-BH20 – Box 8 (11.30-12.80m)

M-BH21 – Box 1 (0.00-0.60m)

M-BH21 - Box 2 (0.60-1.60m)

M-BH21 - Box 3 (1.60-2.60m)



M-BH21 - Box 4 (2.60-3.60m)

M-BH21 - Box 5 (3.60-4.60m)

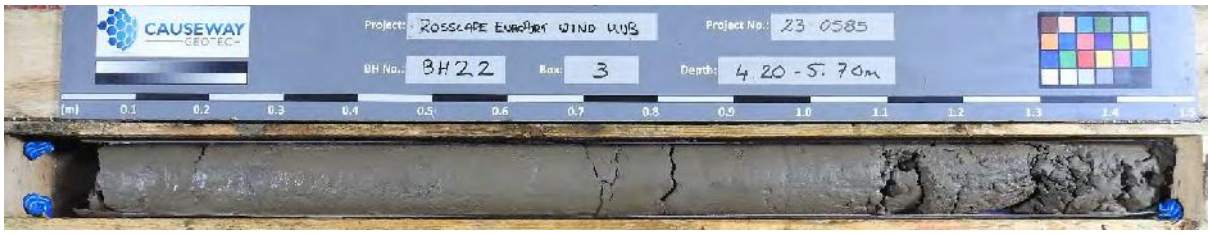
M-BH21 - Box 6 (4.60-5.60m)

M-BH21 - Box 7 (5.60-6.60m)

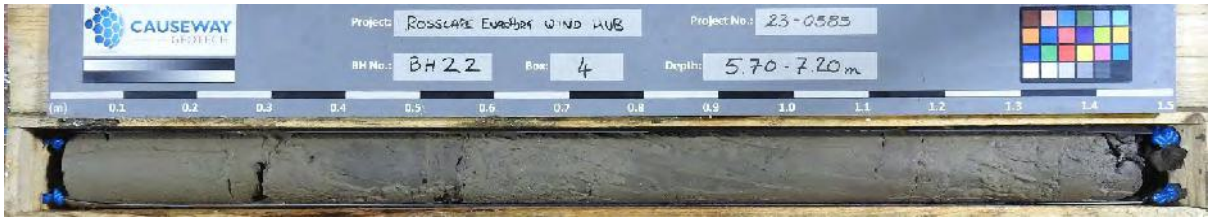
M-BH21 – Box 8 (6.60-8.10m)

M-BH22 - Box 1 (1.20-2.70m)

M-BH22 - Box 2 (2.70-4.20m)



M-BH22 - Box 3 (4.20-5.70m)

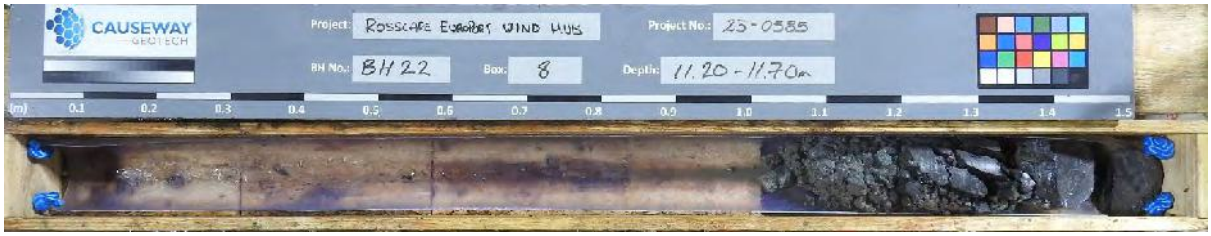


M-BH22 - Box 4 (5.70-7.20m)

M-BH22 - Box 5 (7.20-8.70m)

M-BH22 - Box 6 (8.70-10.20m)

M-BH22 - Box 7 (10.20-11.20m)



M-BH22 - Box 8 (11.20-11.70m)

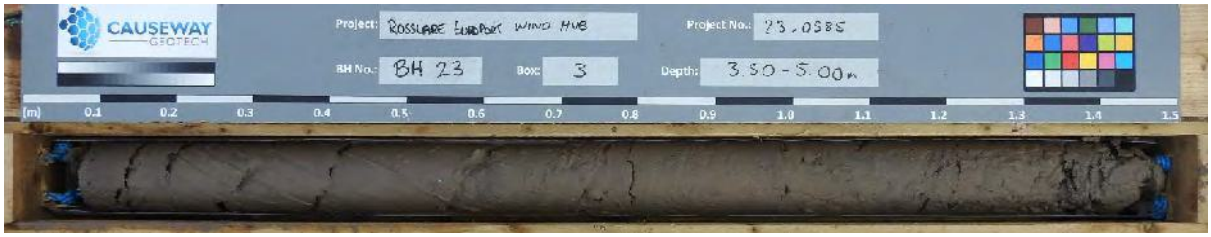
M-BH22 - Box 9 (11.70-13.20m)

M-BH22 - Box 10 (13.20-14.70m)

M-BH22 – Box 11 (14.70-16.20m)

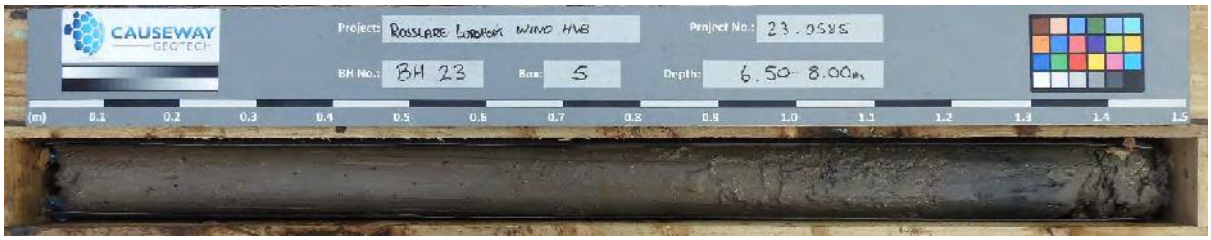
M-BH23 - Box 1 (0.80-2.00m)

M-BH23 - Box 2 (2.00-3.50m)

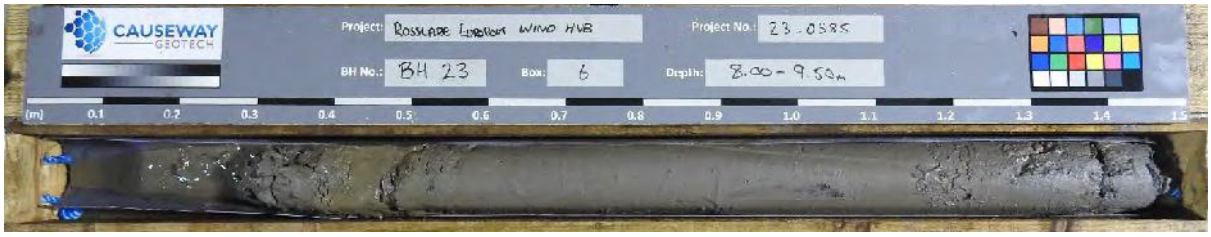


M-BH23 - Box 3 (3.50-5.00m)

M-BH23 - Box 4 (5.00-6.50m)

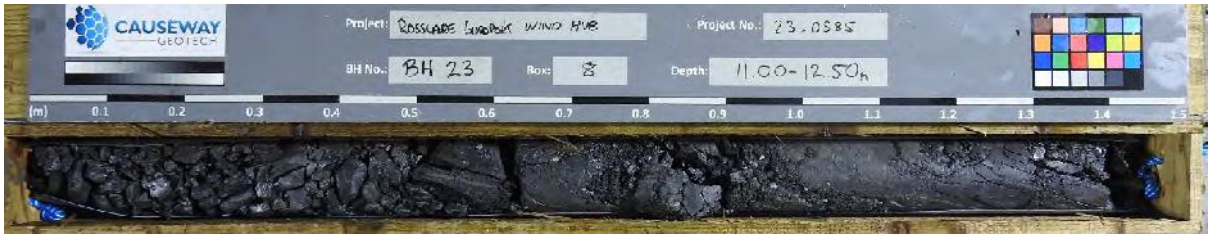


M-BH23 - Box 5 (6.50-8.00m)



M-BH23 - Box 6 (8.00-9.50m)

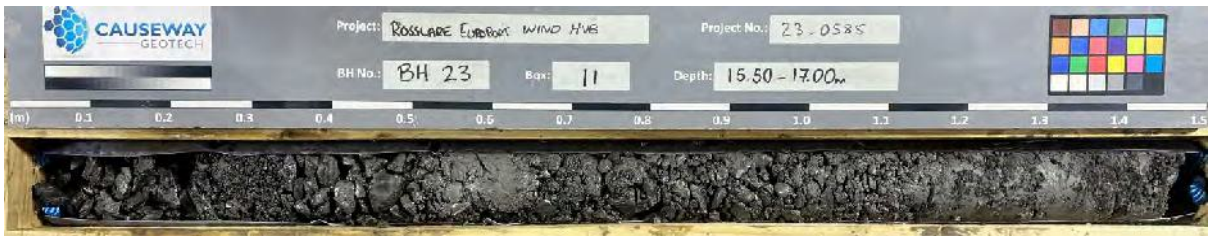
M-BH23 - Box 7 (9.50-11.00m)



M-BH23 - Box 8 (11.00-12.50m)

M-BH23 - Box 9 (12.50-14.00m)

M-BH23 - Box 10 (14.00-15.50m)

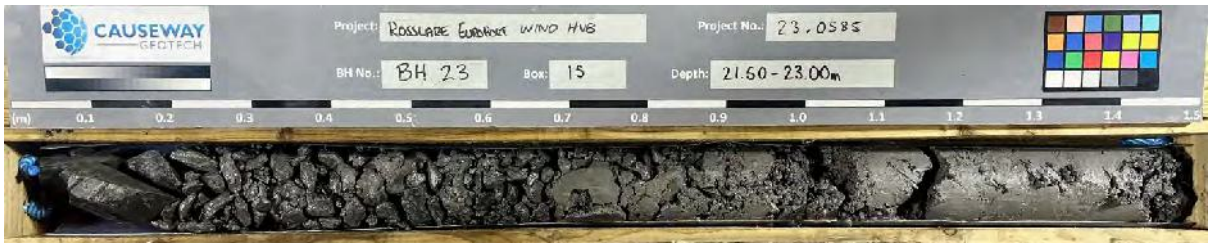


M-BH23 - Box 11 (15.50-17.00m)

M-BH23 - Box 12 (17.00-18.50m)

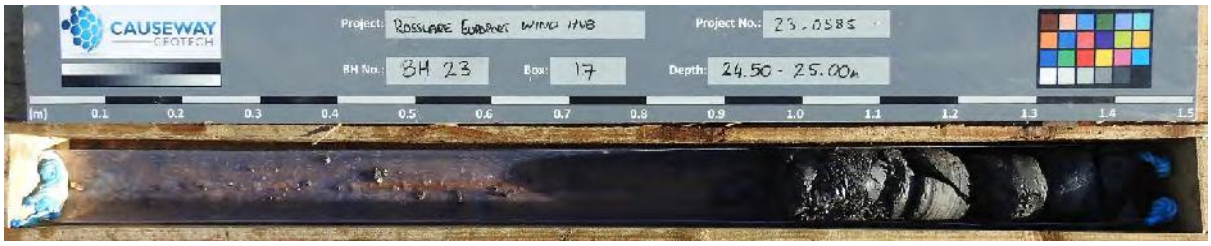
M-BH23 - Box 13 (18.50-20.00m)

M-BH23 - Box 14 (20.00-21.50m)



M-BH23 - Box 15 (21.50-23.00m)

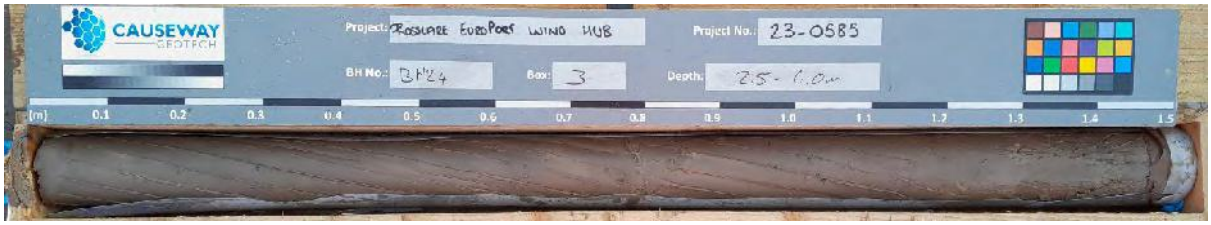
M-BH23 - Box 16 (23.00-24.50m)



M-BH23 – Box 17 (24.50-25.00m)

M-BH24 - Box 1 (0.00-1.00m)

M-BH24 - Box 2 (1.00-2.50m)



M-BH24 - Box 3 (2.50-4.00m)

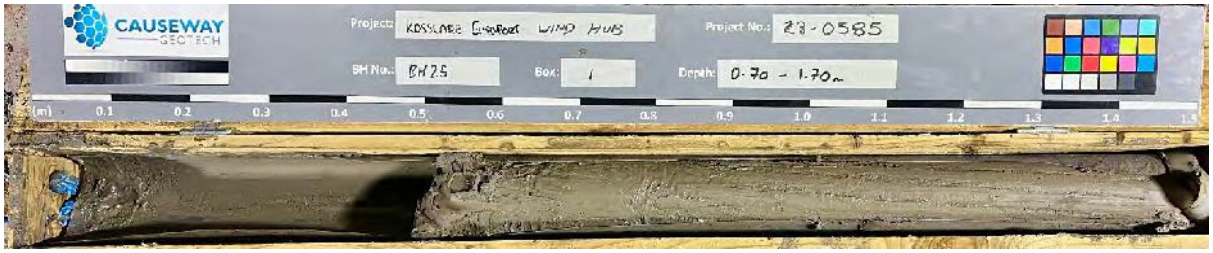
M-BH24 - Box 4 (4.00-5.50m)

M-BH24 - Box 5 (5.50-7.00m)

M-BH24 - Box 6 (7.00-8.50m)

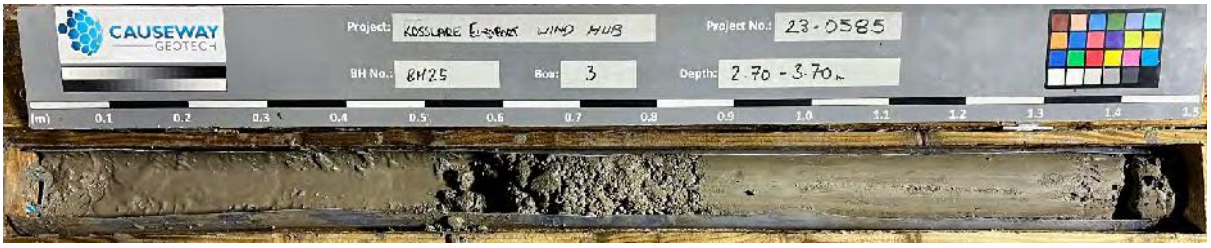
M-BH24 - Box 7 (8.50-10.00m)

M-BH24 – Box 8 (10.00-11.50m)



M-BH25 - Box 1 (0.70-1.70m)

M-BH25 - Box 2 (1.70-2.70m)

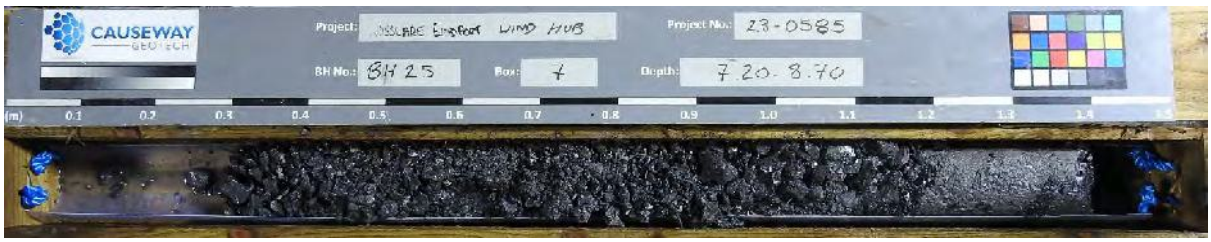


M-BH25 - Box 3 (2.70-3.70m)

M-BH25 - Box 4 (3.70-5.20m)

M-BH25 - Box 5 (5.70-6.70m)

M-BH25 - Box 6 (6.70-7.20m)

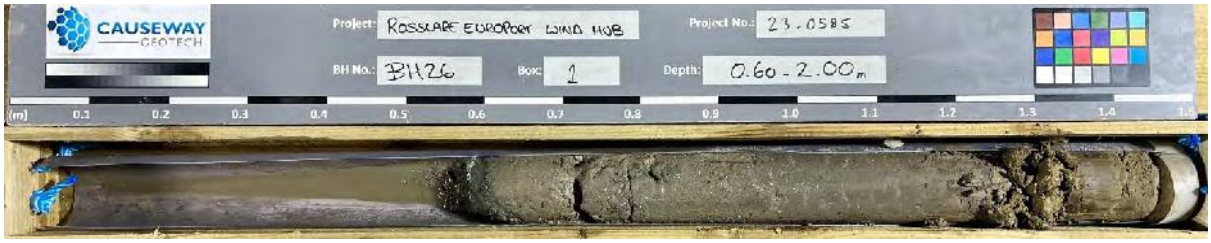


M-BH25 - Box 7 (7.20-8.70m)

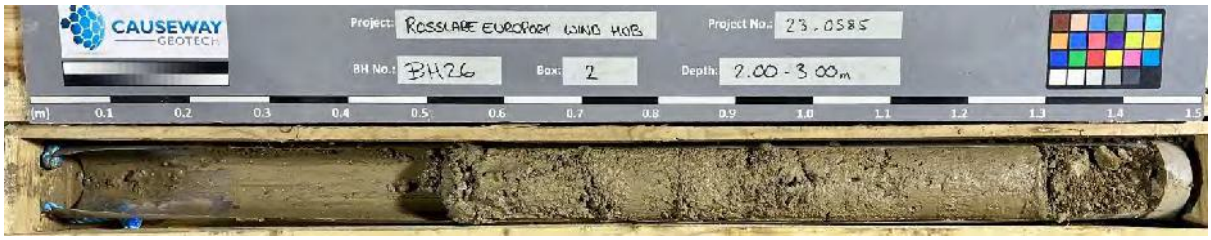
M-BH25 - Box 8 (8.70-10.20m)

M-BH25 - Box 8 (10.20-11.70m)

M-BH25 – Box 10 (11.70-13.20m)

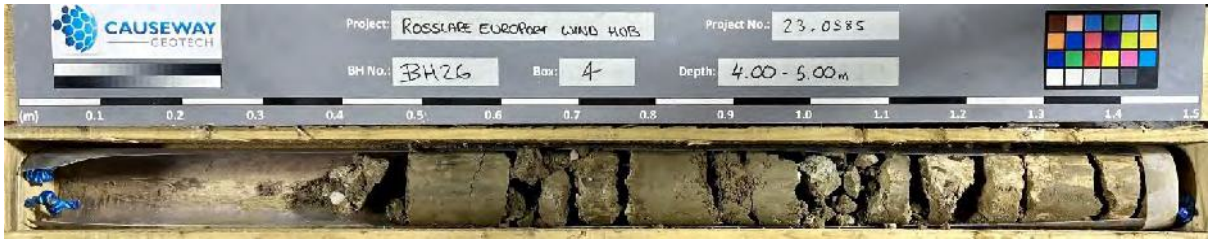


M-BH26 – Box 1 (0.60-2.00m)

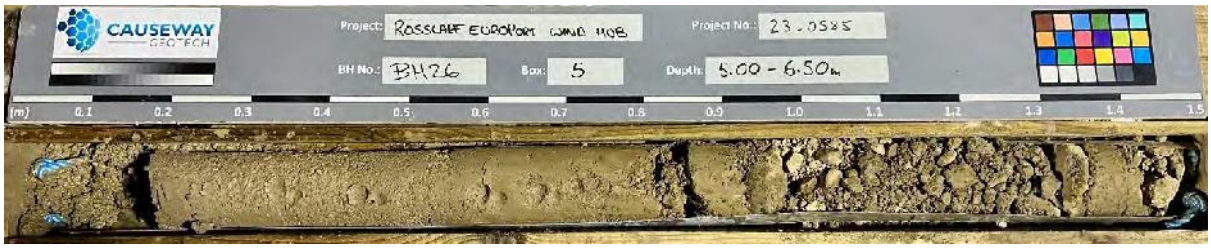


M-BH26 – Box 2 (2.00-3.00m)

M-BH26 – Box 3 (3.00-4.00m)



M-BH26 – Box 4 (4.00-5.00m)



M-BH26 – Box 5 (5.00-6.50m)

NO RECOVERY - 6.50-7.00m

M-BH26 – Box 6 (7.00-8.50m)

M-BH26 – Box 7 (8.50-10.00m)

M-BH26 – Box 8 (10.00-11.50m)

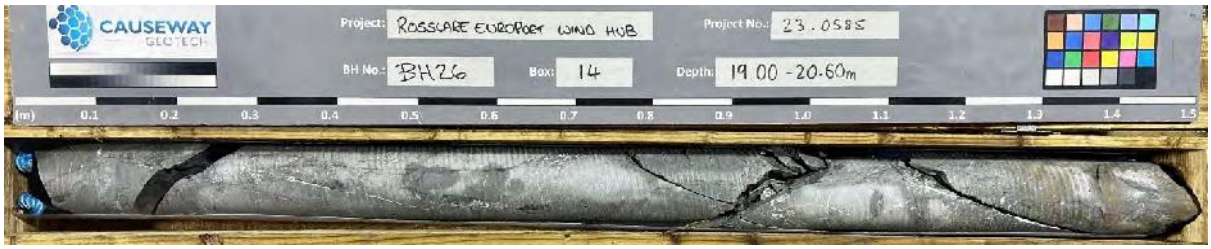
M-BH26 – Box 9 (11.50-13.00m)

M-BH26 – Box 10 (13.00-14.50m)

M-BH26 – Box 11 (14.50-16.00m)

M-BH26 – Box 12 (16.00-17.50m)

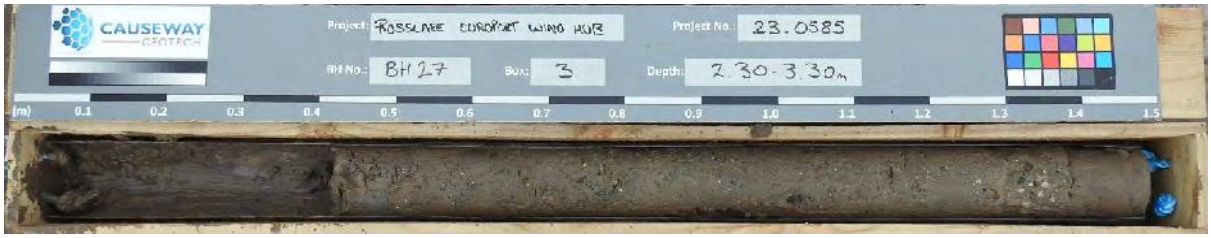
M-BH26 – Box 13 (17.50-19.00m)



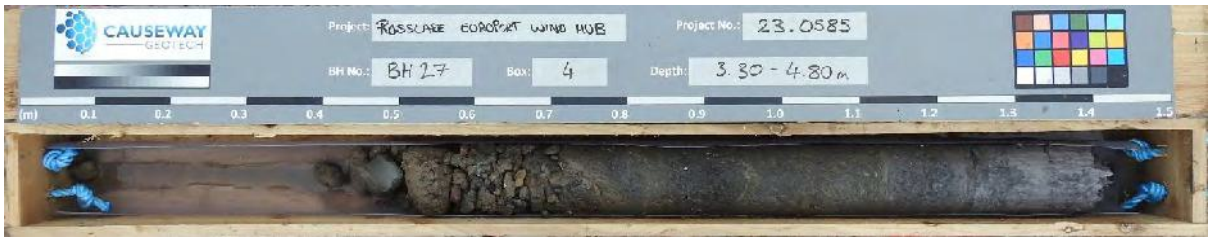
M-BH26 – Box 14 (19.00-20.50m)

M-BH27 – Box 1 (0.30-1.30m)

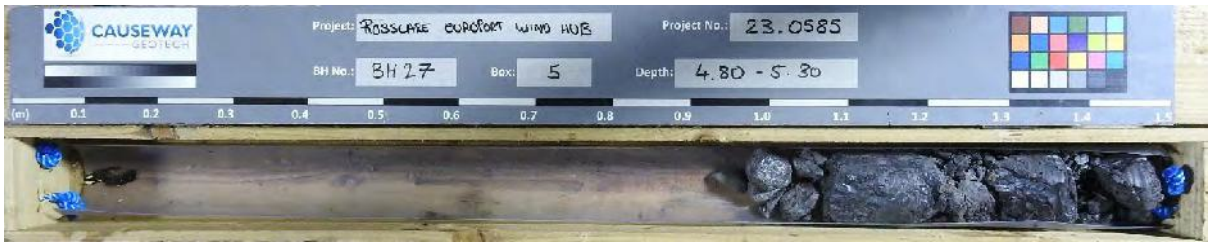
M-BH27 – Box 2 (1.30-2.30m)



M-BH27 – Box 3 (2.30-3.30m)



M-BH27 – Box 4 (3.30-4.80m)



M-BH27 – Box 5 (4.80-5.30m)

M-BH27 – Box 6 (5.30-6.30m)

M-BH27 – Box 7 (6.30-7.80m)

M-BH27 – Box 8 (7.80-9.30m)

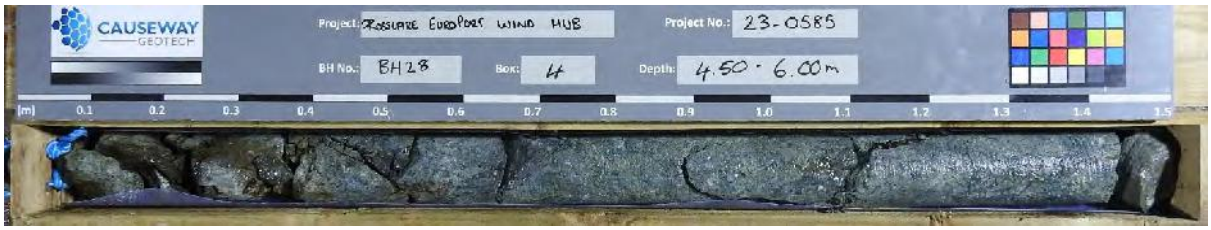
M-BH27 – Box 9 (9.30-10.80m)

M-BH28 – Box 1 (0.00-1.00m)

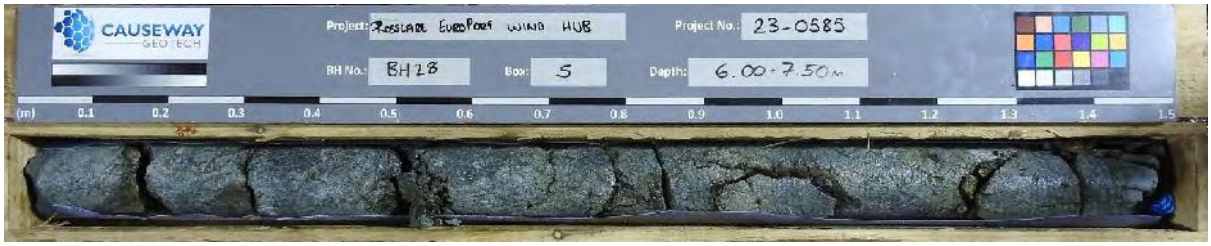
M-BH28 – Box 2 (1.00-2.50m)

NO RECOVERY – 2.50-3.00m

M-BH28 – Box 3 (3.00-4.50m)



M-BH28 – Box 4 (4.50-6.00m)

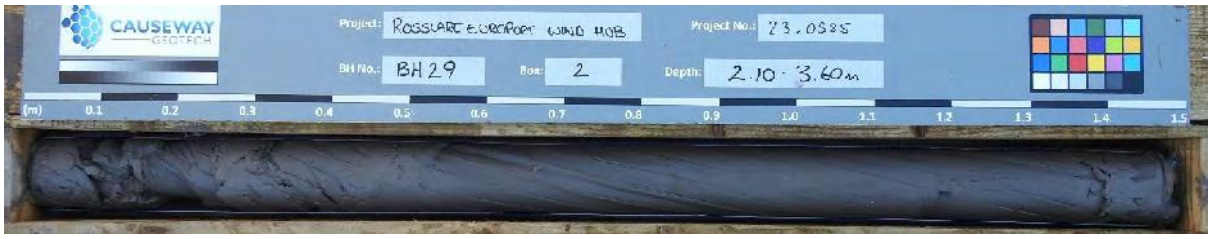


M-BH28 – Box 5 (6.00-7.50m)

M-BH28 – Box 6 (7.50-9.00m)

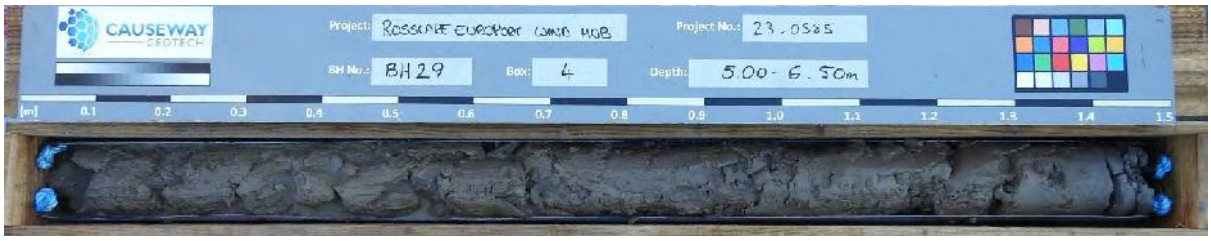
M-BH28 – Box 7 (9.00-10.50m)

M-BH29 – Box 1 (0.60-2.00m)



M-BH29 – Box 2 (2.10-3.60m)

M-BH29 – Box 3 (3.60-5.00m)



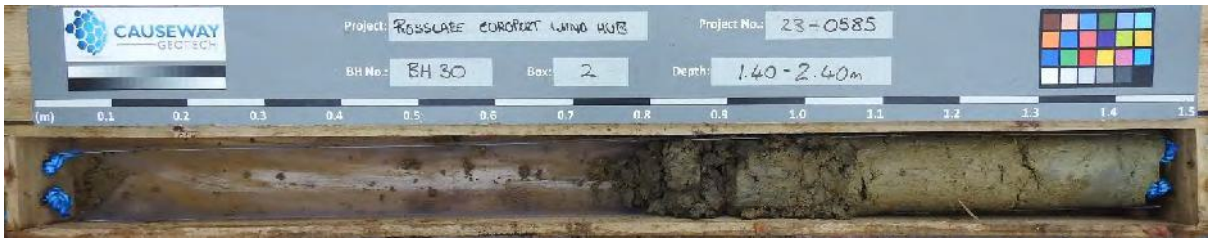
M-BH29 – Box 4 (5.00-6.50m)

M-BH29 – Box 5 (6.50-8.00m)

M-BH29 – Box 6 (8.00-9.50m)

M-BH29 – Box 7 (9.50-11.00m)

M-BH30 – Box 1 (0.40-1.40m)



M-BH30 – Box 2 (1.40-2.40m)

M-BH30 – Box 3 (2.40-3.40m)

NO RECOVERY – 3.40-3.80m

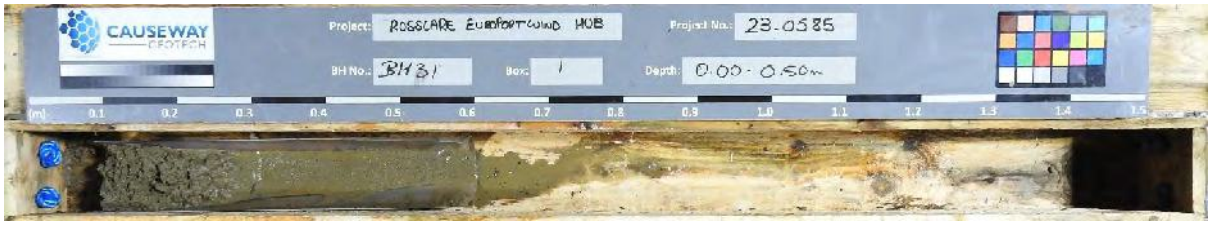
M-BH30 – Box 4 (3.80-5.30m)

M-BH30 – Box 5 (5.80-6.80m)

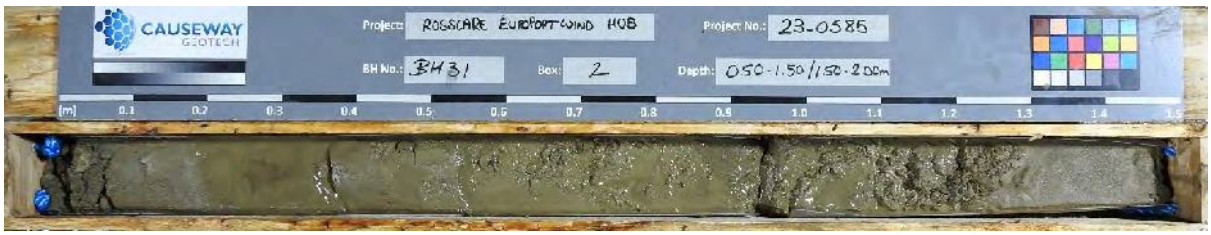
M-BH30 – Box 6 (6.80-8.30m)

M-BH30 – Box 7 (8.30-9.80m)

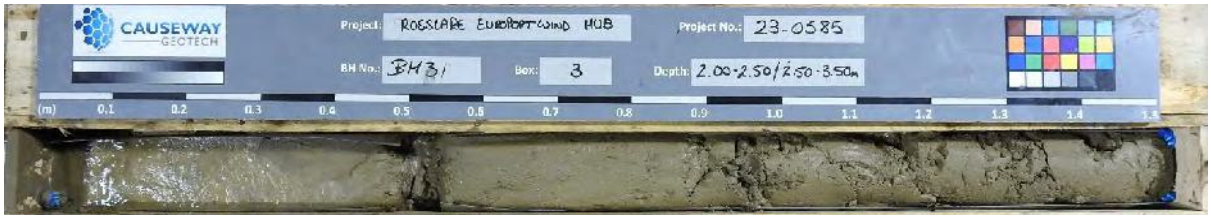
M-BH30 – Box 8 (9.80-11.30m)



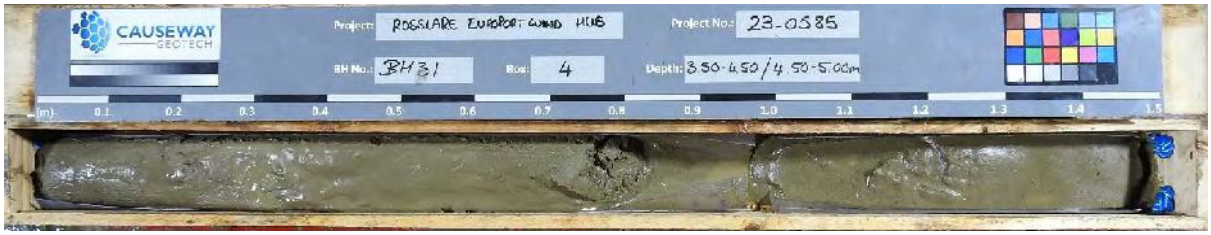
M-BH31 – Box 1 (0.00-0.50m)



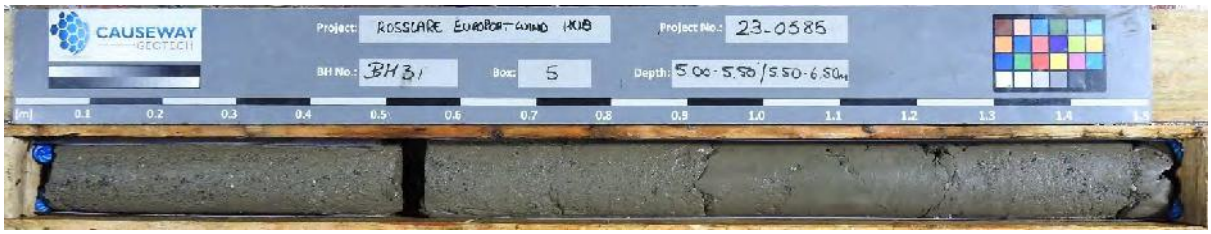
M-BH31 – Box 2 (0.50-2.00m)



M-BH31 – Box 3 (2.00-3.50m)

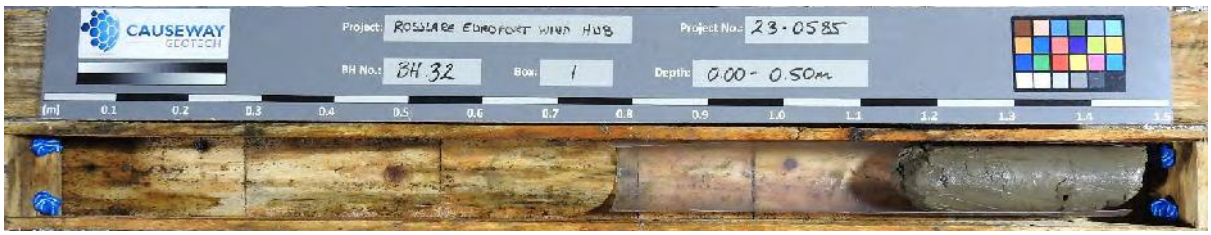


M-BH31 – Box 4 (3.50-5.00m)



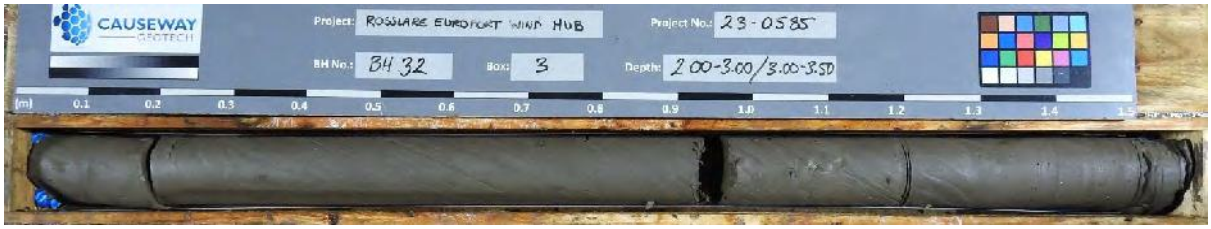
M-BH31 – Box 5 (5.00-6.50m)

M-BH31 – Box 6 (6.50-8.00m)



M-BH32 – Box 1 (0.00-0.50m)

M-BH32 – Box 2 (0.50-1.50m)

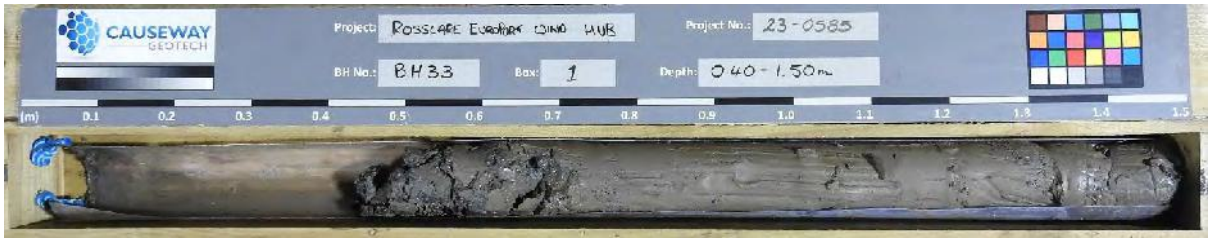


M-BH32 – Box 3 (1.50-3.00m)

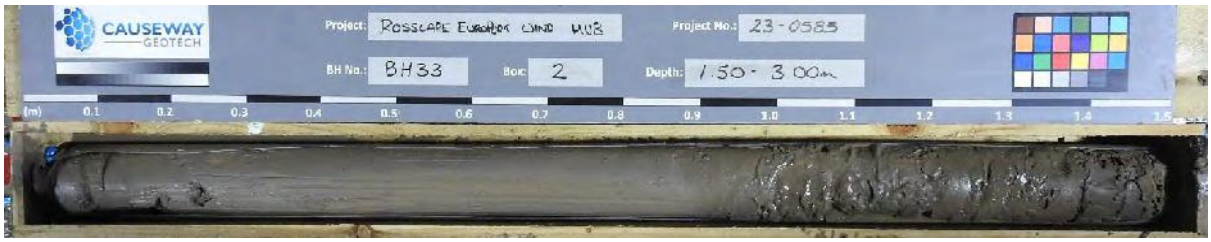
M-BH32 – Box 4 (3.50-5.00m)

M-BH32 – Box 5 (5.00-6.50m)

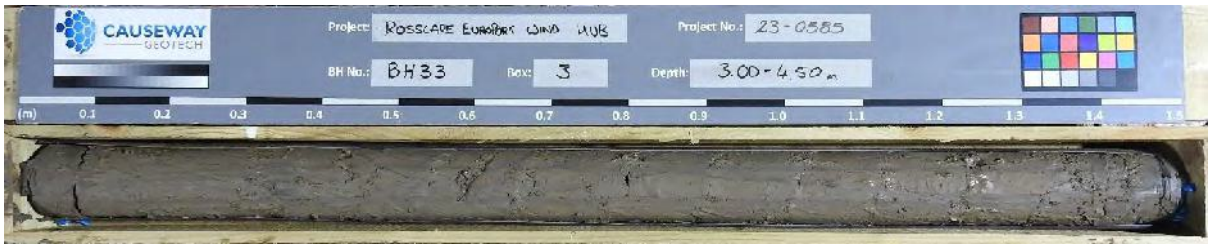
M-BH32 – Box 6 (6.50-8.00m)



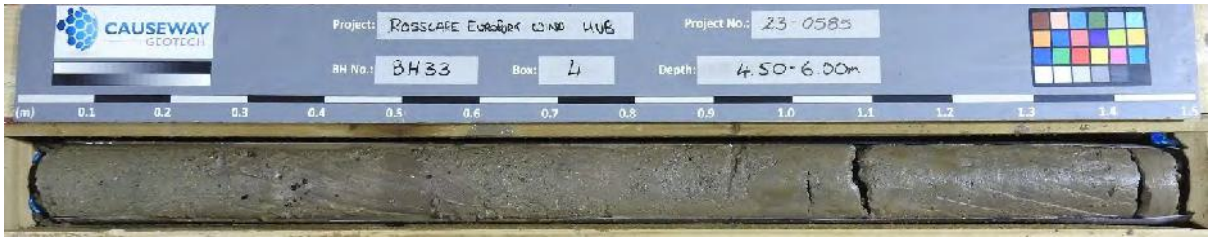
M-BH33 – Box 1 (0.40-1.50m)



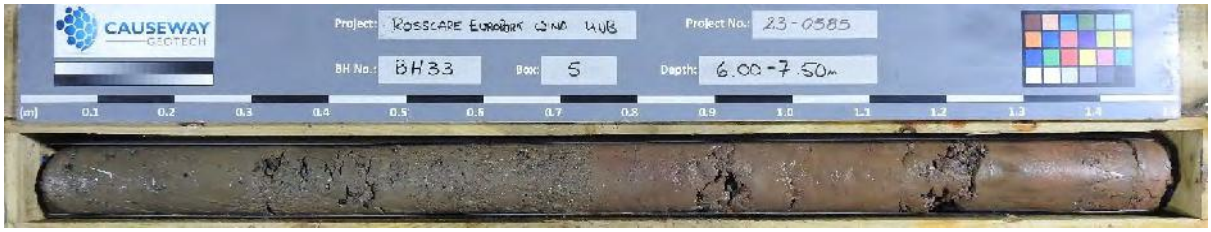
M-BH33 – Box 2 (1.50-3.00m)



M-BH33 – Box 3 (3.00-4.50m)



M-BH33 – Box 4 (4.50-6.00m)



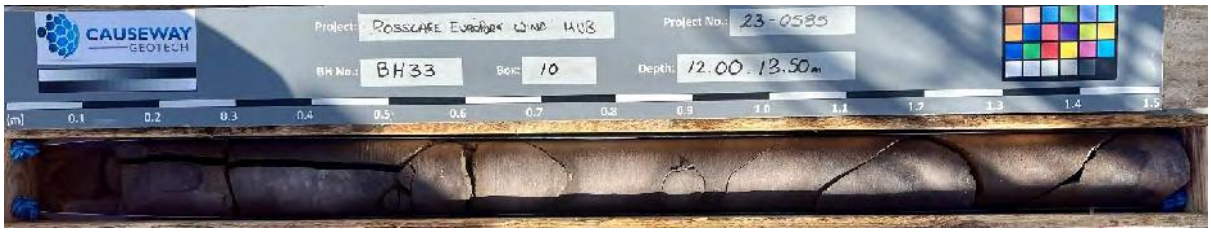
M-BH33 – Box 5 (6.00-7.50m)

M-BH33 – Box 6 (7.50-8.50m)

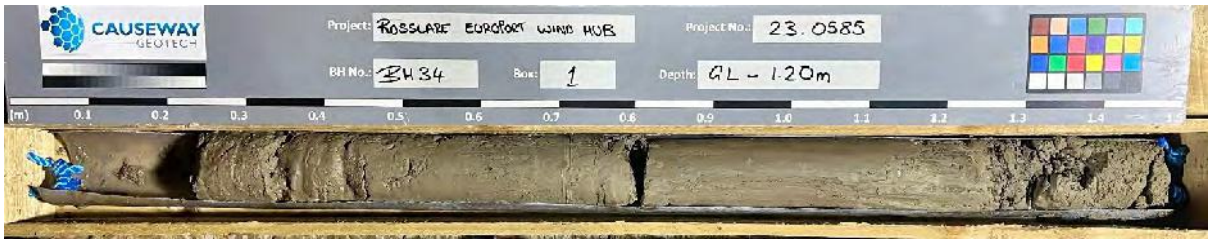
M-BH33 – Box 7 (8.50-9.00m)

M-BH33 – Box 8 (9.00-10.50m)

M-BH33 – Box 9 (10.50-12.00m)

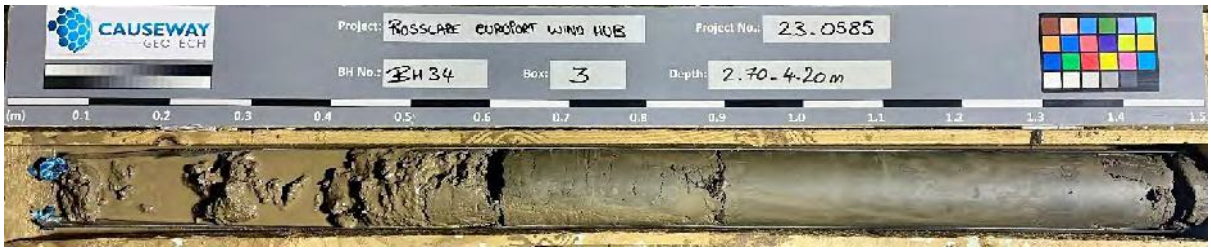


M-BH33 – Box 10 (12.00-13.50m)



M-BH34 – Box 1 (0.00-1.20m)

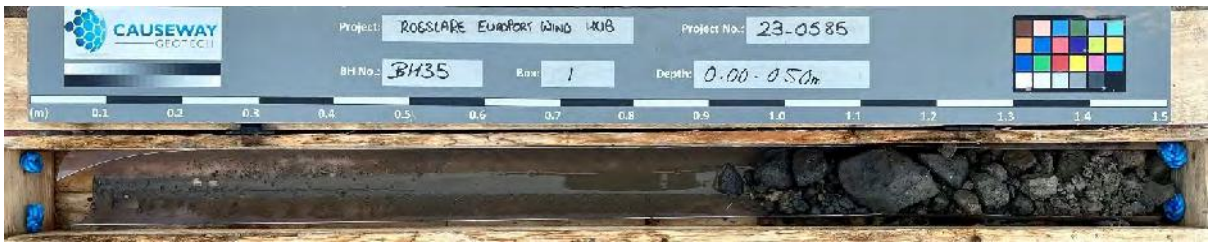
M-BH33 – Box 2 (1.20-2.70m)



M-BH34 – Box 3 (2.70-4.20m)

M-BH34 – Box 4 (4.70-6.20m)

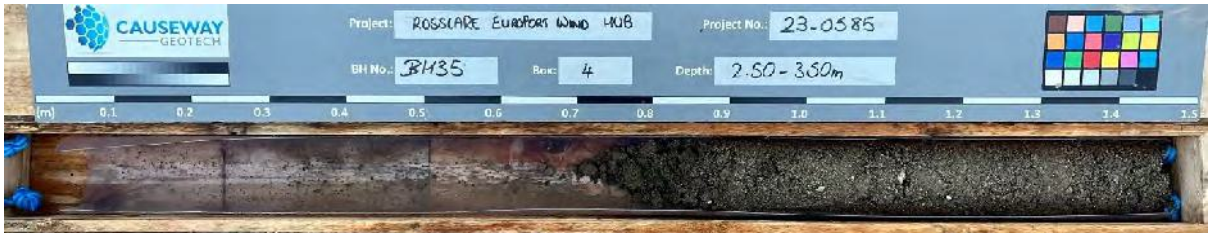
M-BH34 – Box 5 (6.20-7.70m)



M-BH35 – Box 1 (0.00-0.50m)

M-BH35 – Box 2 (0.50-1.50m)

M-BH35 – Box 3 (1.50-2.50m)



M-BH35 – Box 4 (2.50-3.50m)

M-BH35 – Box 5 (3.50-4.50m)

M-BH35 – Box 6 (4.50-5.50m)

M-BH35 – Box 7 (5.50-6.50m)

M-BH35 – Box 8 (6.50-8.00m)

M-BH35 – Box 9 (8.00-8.80m)

M-BH36 – Box 1 (0.50-2.00m)

M-BH36 – Box 2 (2.00-3.50m)

M-BH36 – Box 3 (3.50-5.00m)

M-BH36 – Box 4 (5.00-6.50m)

M-BH36 – Box 5 (6.50-8.00m)

M-BH36 – Box 6 (8.00-9.50m)

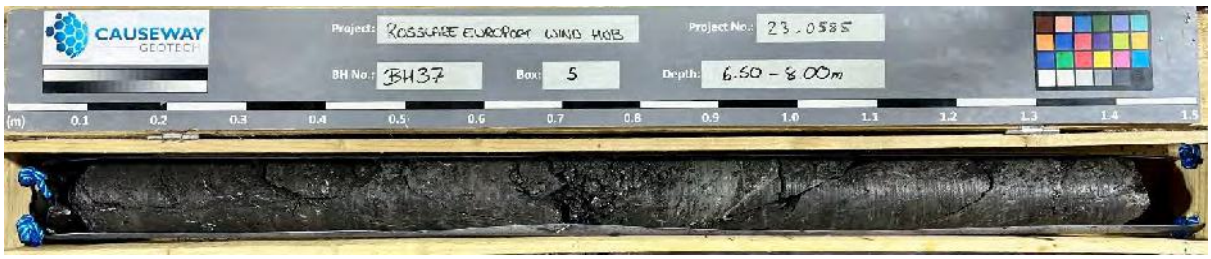
M-BH36 – Box 7 (9.50-11.00m)

M-BH37 – Box 1 (0.50-2.00m)

M-BH37 – Box 2 (2.00-3.50m)

M-BH37 – Box 3 (3.50-5.00m)

M-BH37 – Box 4 (5.00-6.50m)



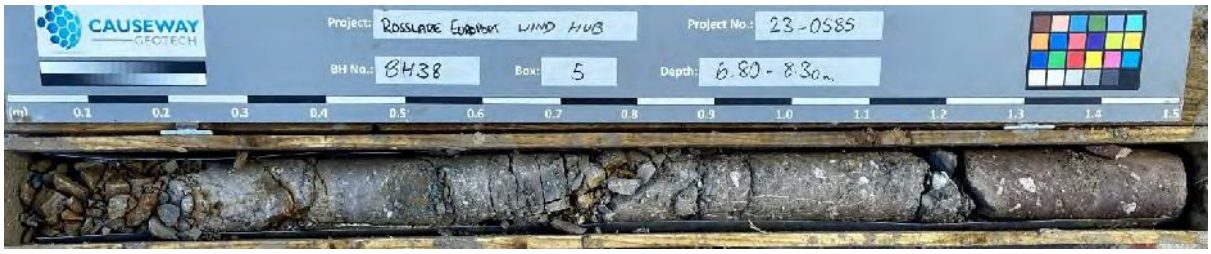
M-BH37 – Box 5 (6.50-8.00m)

M-BH38 – Box 1 (0.80-1.80m)

M-BH38 – Box 2 (1.80-3.30m)

M-BH38 – Box 3 (3.30-4.80m)

M-BH38 – Box 4 (4.80-6.30m)

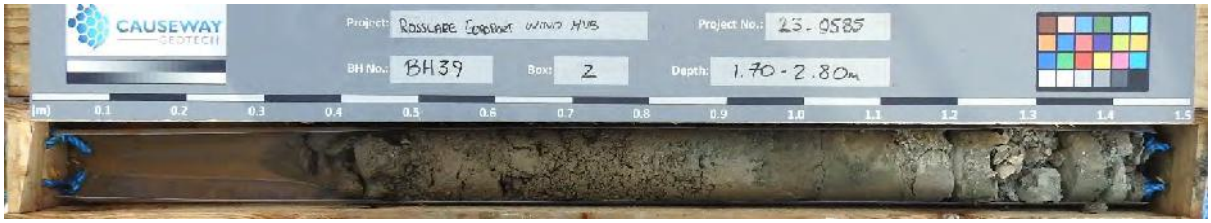


M-BH38 – Box 5 (6.80-8.30m)

M-BH38 – Box 6 (8.30-9.80m)

M-BH38 – Box 7 (9.80-11.30m)

M-BH39A – Box 1 (0.20-1.70m)



M-BH39A – Box 2 (1.70-2.80m)

M-BH39A – Box 3 (2.80-3.70m)

M-BH39A – Box 4 (3.70-5.20m)

M-BH39A – Box 5 (5.20-6.70m)

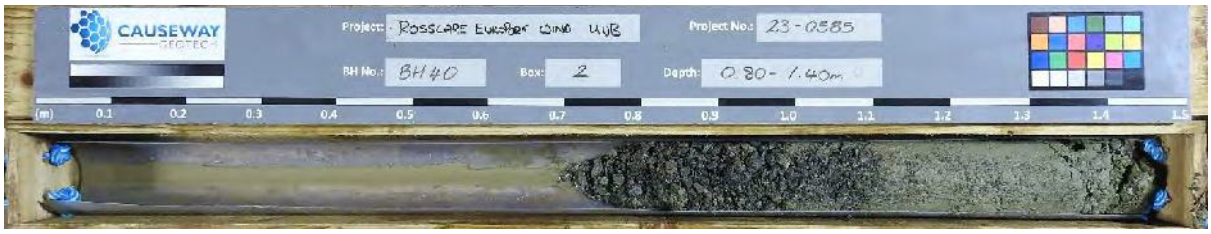
M-BH39A – Box 6 (6.70-8.20m)

M-BH39A – Box 7 (8.20-9.70m)

M-BH39A – Box 8 (9.70-11.20m)

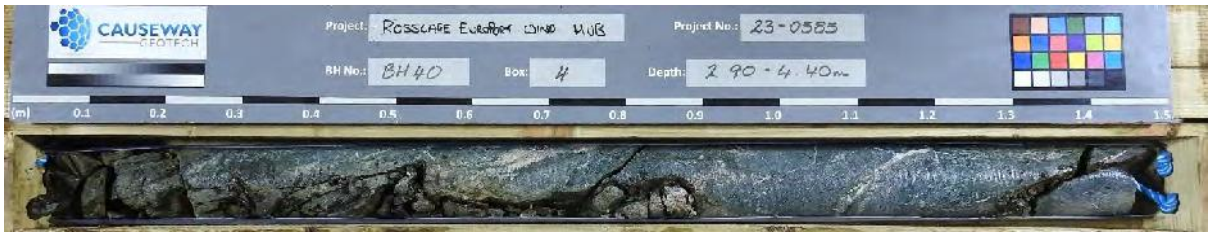
M-BH39A – Box 9 (11.20-12.70m)

M-BH40 – Box 1 (0.00-0.80m)



M-BH40 – Box 2 (0.80-1.40m)

M-BH40 – Box 3 (1.40-2.90m)

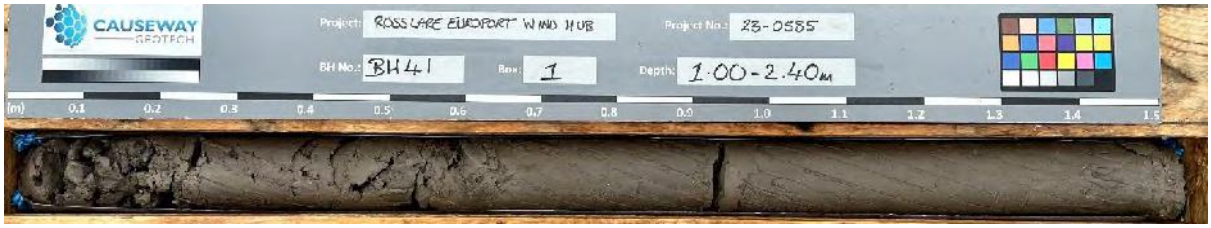


M-BH40 – Box 4 (2.90-4.40m)

M-BH40 – Box 5 (4.40-5.90m)

M-BH40 – Box 6 (5.90-7.40m)

M-BH40 – Box 7 (7.40-8.90m)



M-BH41 – Box 1 (1.00-2.50m)

M-BH41 – Box 2 (2.50-4.00m)

M-BH41 – Box 3 (4.00-5.50m)

M-BH41 – Box 4 (5.50-7.00m)

M-BH41 – Box 5 (7.00-8.50m)

M-BH41 – Box 6 (8.50-10.00m)

M-BH41 – Box 7 (10.00-11.50m)

M-BH41 – Box 8 (11.50-13.00m)

M-BH41 – Box 9 (13.00-14.50m)

M-BH41 – Box 10 (14.50-16.00m)

M-BH41 – Box 11 (16.00-17.50m)

M-CPT02 – Box 1 (1.50-3.00m)

M-CPT02 – Box 2 (3.00-4.50m)

M-CPT02 – Box 3 (4.50-6.00m)

M-CPT02 – Box 4 (6.00-7.50m)

M-CPT11 – Box 1 (1.10-2.80m)

M-CPT12 – Box 1 (1.50-2.70m)

M-CPT12 – Box 2 (2.70-4.20m)

M-CPT31 – Box 1 (0.70-2.00m)