CAUSEWAY GEOTECH

APPENDIX D

CONE PENETRATION TEST LOGS



CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT02

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS-XL140	0.00	7.50	
Cone Penetration	Drill N'CPT	1.00	6.68	712894.35 E
				612954.27 N

Final Depth: 7.50 m **Start Date:** 01/02/2024 **Driller:** MJ

Elevation: -4.53 mCD **End Date:** 01/02/2024 **Logger:** MS

Sheet 1 of 1
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 very soft to soft slightly sandy silty CLAY.		
1.00 - 1.50	SB1				-5.53	1.00		Very soft to soft slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
1.50 - 3.00	SB2				-6.03	1.50		Firm dark brown and grey sandy silty CLAY. Sand is fine to medium.		
					-6.23	1.70		Firm dark brown slightly sandy silty CLAY. Sand is fine to medium.		
3.00 - 4.50	SB3									
4.50 - 6.00	SB4				-9.03	4.50		Stiff dark brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone.		
6.00 - 7.50	SB5									
					-11.13	6.60		Dark brown and grey slightly sandy slightly silty subangular to subrounded fine to medium GRAVEL of mudstone. Sand is fine to coarse.		
					-11.33	6.80		Weathered grey MUDSTONE recovered as, slightly sandy clayey angular to subangular fine to coarse gravel.		
					-11.73	7.20		Weathered dark grey MUDSTONE recovered as, slightly clayey angular to subangular fine to coarse gravel.		
					-12.03	7.50		End of Borehole at 7.50m		

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)
7.50	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 9.50m
All elevations and reduced levels are given in local Chart Datum

CPT push 1 at this location; 1,00m casing flushed, pushed to 6.68m below bed before refusal (maximum tip load)
Dissipation Test completed at 3.41m
See "M-CPT02" plots for all CPT data
Drill out completed to 7.50m to confirm refusal material (mudstone @ 6.70m)

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT06
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	7.76	713435.10 E 613372.32 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
7.76 m	27/02/2024	SJ/SW	Scale: 1:50
Elevation: -9.47 mCD	**End Date:** 27/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 7.760m. See CPT log		
								End of Borehole at 7.76m		

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		Water Added	
To (m)	Diam (mm)	From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 14.90m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.90m casing flushed, pushed to 7.76m below bed before refusal (maximum tip load)
No Dissipation Test completed
See "M-CPT06" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT07
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	9.37	712932.38 E 613052.65 N

Final Depth:	9.37 m	Start Date:	16/01/2024	Driller:	MJ	Sheet 1 of 2 Scale: 1:50
Elevation:	-4.82 mCD	End Date:	16/01/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 9.380m. See CPT log		

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)
0.90	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 11.45m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.90m casing flushed, pushed to 9.37m below bed before refusal (maximum tip load)
Dissipation Tests completed at 1.65m and 4.56m (cut short due to window in berthing schedule)
See "M-CPT07" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT07
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	9.37	712932.38 E 613052.65 N

Final Depth:	9.37 m	Start Date:	16/01/2024	Driller:	MJ	Sheet 2 of 2 Scale: 1:50
Elevation:	-4.82 mCD	End Date:	16/01/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								End of Borehole at 9.37m		

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)
0.90	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 11.45m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.90m casing flushed, pushed to 9.37m below bed before refusal (maximum tip load)
Dissipation Tests completed at 1.65m and 4.56m (cut short due to window in berthing schedule)
See "M-CPT07" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT08
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	10.29	712733.76 E 612952.91 N

Final Depth:	10.29 m	Start Date:	03/02/2024	Driller:	KW	Sheet 1 of 2 Scale: 1:50
Elevation:	-4.72 mCD	End Date:	03/02/2024	Logger:	LW	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 10.290m. See CPT log		

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)
0.80	177

Water Added

From (m)	To (m)

Remarks

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

CPT push at this location; 0.80m casing flushed, pushed to 10.29m below bed before refusal (total load reached)
Dissipation Test completed at 3.35m
See "M-CPT08" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to total load reached	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT08
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	10.29	712733.76 E 612952.91 N

Final Depth:	10.29 m	Start Date:	03/02/2024	Driller:	KW	Sheet 2 of 2 Scale: 1:50
Elevation:	-4.72 mCD	End Date:	03/02/2024	Logger:	LW	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								End of Borehole at 10.29m		

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)
0.80	177

Water Added

From (m)	To (m)

Remarks

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

CPT push at this location; 0.80m casing flushed, pushed to 10.29m below bed before refusal (total load reached)
Dissipation Test completed at 3.35m
See "M-CPT08" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to total load reached	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT11

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)
Sonic Drilling	Fraste CRS-XL140	0.00	2.80
Cone Penetration	Drill N'CPT	1.10	1.40
Cone Penetration	Drill N'CPT	3.10	6.84

Coordinates: 712752.04 E, 612867.82 N

Final Depth: 6.84 m | **Start Date:** 10/02/2024 | **Driller:** SJ/RW

Elevation: -4.40 mCD | **End Date:** 10/02/2024 | **Logger:** MS

Sheet 1 of 1 | 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 sandy CLAY.		
1.10 - 2.80	SB1				-5.50	1.10		Very stiff brown gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of various lithologies.		
2.80 2.80 - 3.25	D2 SPT (S)	N=28 (2,5/6,6,7,9) Hammer SN = 1353	2.80	0.00	-7.20	2.80		CPT push to refusal following drill out		
					-11.24	6.84		End of Borehole at 6.84m		

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)
2.80	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed 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 1 at this location; 1.10m casing flushed, pushed to 1.40m below bed before refusal (maximum tip load)
Drill out completed to 2.80m to confirm refusal material (gravelly clay)
CPT push 2 at this location; 3.10m casing flushed, pushed to 6.84m below bed before refusal (tip load)
Dissipation Test completed at 3.24m
See "M-CPT11" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT12
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)
Sonic Drilling	Fraste CRS-XL170	0.00	1.50
Cone Penetration	Drill N'CPT	0.50	0.88
Cone Penetration	Drill N'CPT	1.65	3.37
Sonic Drilling	Fraste CRS-XL170	3.37	4.20

Coordinates
712974.59 E
612773.71 N

Final Depth: 4.20 m | **Start Date:** 27/01/2024 | **Driller:** RC

Elevation: -3.55 mCD | **End Date:** 27/01/2024 | **Logger:** OG

Sheet 1 of 1
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 very soft to soft slightly sandy silty CLAY.		
1.20 - 1.65	SPT (S)	N=8 (8,6/3,1,2,2) Hammer SN = 1501	1.20	0.00						
1.50 - 2.70	SB1				-5.04	1.50		Soft to firm brownish grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. (Drillers description)		
2.70 - 4.20	SB2							*3.25-3.40m: Brownish grey sandy clayey subangular fine to coarse gravel.*		
					-6.94	3.40		Weathered AMPHIBOLITE recovered as, silty sandy angular to subangular fine to coarse gravel.		
					-7.74	4.20		End of Borehole at 4.20m		

Water Strikes

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

Casing Details

To (m)	Diam (mm)
4.20	177

Water Added

From (m)	To (m)

Remarks

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

CPT push 1 at this location; 0.50m casing flushed, pushed to 0.88m below bed before refusal (maximum tip load)
SPT carried out at 1.50m; material suitable so second CPT push attempted
CPT push 2 at this location; 1.65m casing flushed, pushed to 3.37m below bed before refusal (tip load)
No Dissipation Test
See "M-CPT12" plots for all CPT data
Drill out completed to 4.20m to confirm refusal material (weathered amphibolite at 3.40m)

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT13
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	2.34	712679.86 E 612769.16 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.34 m	05/02/2024	MJ	Scale: 1:50
Elevation: -4.22 mCD	**End Date:** 05/02/2024	**Logger:** NP	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 2.340m. See CPT log		
								End of Borehole at 2.34m		

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)
1.00	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed 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; 1.00m casing flushed, pushed to 2.36m below bed before refusal (cone inclination)
No Dissipation Tests completed
See "M-CPT13" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT14
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	0.83	712841.31 E 612677.19 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.83 m	21/02/2024	MK/SW	Scale: 1:50
Elevation: -7.91 mCD	**End Date:** 21/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 0.830m. See CPT log		
								End of Borehole at 0.83m		

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		Water Added	
To (m)	Diam (mm)	From (m)	To (m)

Remarks

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

CPT push at this location; 0.20m casing flushed, pushed to 0.83m below bed before refusal (cone inclination)
No Dissipation Tests completed
See "M-CPT14" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

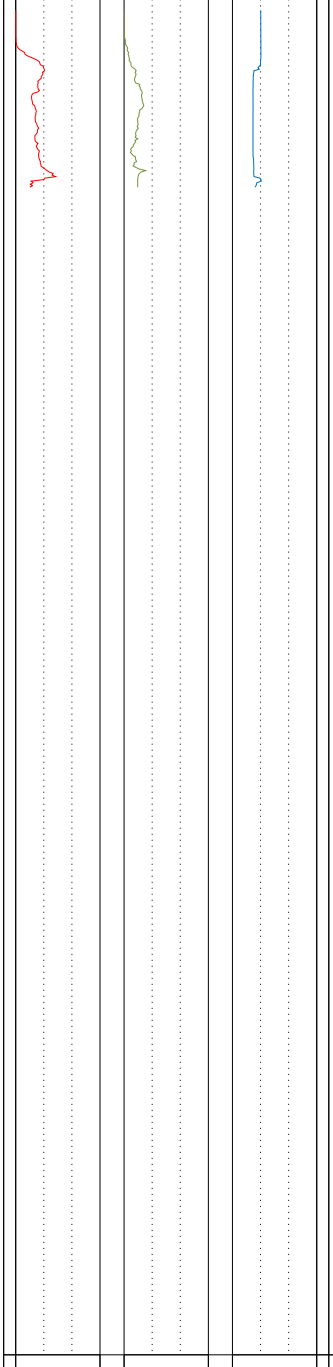
AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT16
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	1.48	712978.74 E 612669.45 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.48 m	13/01/2024	MJ	Scale: 1:50
Elevation: -2.37 mCD	**End Date:** 13/01/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 1.480m. See CPT log End of Borehole at 1.48m		

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)
0.30	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 6.20m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.30m casing flushed, pushed to 1.48m below bed before refusal (cone inclination)
See "M-CPT16" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT17
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	9.67	712584.51 E 613030.26 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
9.67 m	15/02/2024	SJ	Scale: 1:50
Elevation: -5.02 mCD	**End Date:** 15/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 9.670m. See CPT log		

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)
0.50	177

Water Added

From (m)	To (m)

Remarks

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

CPT push at this location; 0.50m casing flushed, pushed to 9.67m below bed before refusal (cone inclination)
Dissipation Tests completed at 4.10m and 5.10m
See "M-CPT17" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT17
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	9.67	712584.51 E 613030.26 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
9.67 m	15/02/2024	SJ	Scale: 1:50
Elevation: -5.02 mCD	**End Date:** 15/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								End of Borehole at 9.67m		

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)
0.50	177

Water Added

From (m)	To (m)

Remarks

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

CPT push at this location; 0.50m casing flushed, pushed to 9.67m below bed before refusal (cone inclination)
Dissipation Tests completed at 4.10m and 5.10m
See "M-CPT17" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT18
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	9.50	712531.80 E 612955.54 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
9.50 m	03/02/2024	MJ	Scale: 1:50
Elevation: -4.59 mCD	**End Date:** 04/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 9.500m. See CPT log		

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)
0.40	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 12.35m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 9.50m below bed before refusal (cone inclination)
Dissipation Test completed at 0.44m
See "M-CPT18" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT18
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	9.50	712531.80 E 612955.54 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
9.50 m	03/02/2024	MJ	Scale: 1:50
Elevation: -4.59 mCD	**End Date:** 04/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								End of Borehole at 9.50m		

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)
0.40	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 12.35m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 9.50m below bed before refusal (cone inclination)
Dissipation Test completed at 0.44m
See "M-CPT18" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT19
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	7.87	712533.97 E 612869.28 N

Final Depth:	7.87 m	Start Date:	04/02/2024	Driller:	KW	Sheet 1 of 1 Scale: 1:50
Elevation:	-4.18 mCD	End Date:	04/02/2024	Logger:	LW	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 7.870m. See CPT log		
								End of Borehole at 7.87m		

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)
0.40	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 12.40m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.40m casing flushed, pushed to 7.87m below bed before refusal (cone inclination)
Dissipation Tests completed at 3.43m and 5.51m
See "M-CPT19" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT20
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	7.00	712516.54 E 612759.30 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
7.00 m	04/02/2024	MJ	Scale: 1:50
Elevation: -3.62 mCD	**End Date:** 05/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 7.000m. See CPT log		
								End of Borehole at 7.00m		

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)
0.50	177

Water Added

From (m)	To (m)

Remarks

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

CPT push at this location; 0.50m casing flushed, pushed to 7.00m below bed before refusal (cone inclination)
Dissipation Tests completed at 2.79m and 4.46m
See "M-CPT20" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT21_BH
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS XL-170 Duo	0.00	0.25	713316.31 E
Cone Penetration	Drill N'CPT	0.25	1.75	613156.31 N

Final Depth:	1.75 m	**Start Date:**	16/01/2024	**Driller:**	MJ	Sheet 1 of 1
Elevation:	-10.40 mCD	**End Date:**	16/01/2024	**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
					-10.65	0.25		NO RECOVERY: Material flushed to prepare for CPT test; probably very soft to soft slightly sandy silty CLAY. Firm brownish grey very gravelly sandy CLAY. (Drillers Description)		
					-12.15	1.75		End of Borehole at 1.75m		

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)
0.25	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 15.60m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.25m casing flushed, pushed to 1.75m below bed before refusal (maximum tip load)
See "M-CPT21_BH" plots for all CPT data
Location abandoned before follow-on drilling could be completed due to seals present in area and reduced time due to berthing schedule

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT22
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	1.72	712495.91 E 612660.54 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.72 m	18/02/2024	SJ	Scale: 1:50
Elevation: -3.32 mCD	**End Date:** 18/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 1.720m. See CPT log		
								End of Borehole at 1.72m		

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)
1.00	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 8.20m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.00m casing flushed, pushed to 1.72m below bed before refusal (maximum tip load)
Dissipation Test completed at 1.11m
See "M-CPT22" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT25A
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	0.92	713285.97 E 613318.82 N

Final Depth:	0.92 m	**Start Date:**	27/02/2024	**Driller:**	SJ/SW	Sheet 1 of 1	
Elevation:	-7.91 mCD	**End Date:**	27/02/2024	**Logger:**	MS	Scale: 1:50	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 0.920m. See CPT log		
								End of Borehole at 0.92m		

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)

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 12.30m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.75m casing flushed, pushed to 0.92m below bed before refusal (maximum tip load)
No Dissipation Test completed
See "M-CPT25A" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT27

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	7.45	713055.00 E 613231.76 N

Final Depth:	7.45 m	**Start Date:**	14/02/2024	**Driller:**	MJ	Sheet 1 of 1	
Elevation:	-6.47 mCD	**End Date:**	15/02/2024	**Logger:**	OG	Scale: 1:50	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 7.450m. See CPT log		
								End of Borehole at 7.45m		

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)
0.85	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 14.10m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.85m casing flushed, pushed to 7.45m below bed before refusal (maximum tip load)
Dissipation Tests completed at 1.73m, 3.07m, and 7.37m
See "M-CPT27" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to maximum tip resistance	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT31
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration	Drill N'CPT	0.70	1.15	
Sonic Drilling	Fraste CRS-XL140	1.15	2.00	713591.25 E
				613130.63 N

Final Depth:	2.00 m	Start Date:	19/02/2024	Driller:	MJ/DJ	Sheet 1 of 1
Elevation:	-8.17 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
								NO RECOVERY: Material flushed to prepare for CPT test; probably sandy CLAY.		
0.70 - 2.00	SB1				-8.86	0.70		Soft light brown slightly sandy CLAY. Sand is fine to coarse.		
					-9.16	1.00		Brown slightly gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is angular to subangular fine to coarse of mudstone. Cobbles are angular to subangular of mudstone.		
					-9.36	1.20		Brown and grey slight sandy slightly silty angular to subangular fine to coarse GRAVEL of mudstone. Sand is fine to coarse.		
					-9.76	1.60		Weak to moderately weak light and dark grey MUDSTONE; slightly weathered, appears highly fractured, no discernable fracture sets.		
2.00 - 2.38	SPT (C)	100 (25 for 103mm/100 for 276mm)	2.00	0.00	-10.16	2.00		End of Borehole at 2.00m		

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)
2.00	177		

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 14.50m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.70m casing flushed, pushed to 1.15m below bed before refusal (maximum tip load)
No Dissipation Test
See "M-CPT31" plots for all CPT data
Drill out completed to 2.00m to confirm refusal material (weathered rockhead at 1.60m)

Core Barrel	Flush Type	Termination Reason	Last Updated
		Drill out terminated on suspected rockhead	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT35
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	8.49	712955.46 E 613201.83 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
8.49 m	19/02/2024	SJ/RW	Scale: 1:50
Elevation: -5.53 mCD	**End Date:** 20/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 8.490m. See CPT log		
								End of Borehole at 8.49m		

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)

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed 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; 1.00m casing flushed, pushed to 8.49m below bed before refusal (cone inclination)
Dissipation Tests completed at 1.29m, and 7.75m
See "M-CPT35" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT37
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	7.94	712942.05 E 613133.56 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
7.94 m	20/02/2024	SJ/RW	Scale: 1:50
Elevation: -5.23 mCD	**End Date:** 21/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 7.940m. See CPT log		
								End of Borehole at 7.94m		

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)

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 12.00m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.00m casing flushed, pushed to 7.94m below bed before refusal (cone inclination)
Dissipation Tests completed at 2.19m, 4.46m, and 6.72m
See "M-CPT37" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT39_BH
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste CRS XL-170	0.00	0.50	
Cone Penetration	Drill N'CPT	0.50	1.32	713101.66 E
				612785.82 N

Final Depth:	1.32 m	Start Date:	20/12/2023	Driller:	MMcK +MMc	Sheet 1 of 1
Elevation:	-4.00 mCD	End Date:	20/12/2023	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 flushed to prepare for CPT test; probably very soft to soft slightly sandy silty CLAY.		
					-4.50	0.50		Light brown sandy slightly clayey angular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse. (Drillers Description)		
					-5.32	1.32		End of Borehole at 1.32m		

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)
0.50	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge
Deck to bed = 11.80m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 0.50m casing flushed, pushed to 1.32m below bed before refusal (total load reached)
See "M-CPT39_BH" plots for all CPT data
Follow-on borehole then abandoned due to encroaching bad weather requiring barge to be moved to safe haven

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to total load reached	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-CPT40
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Cone Penetration Testing	Drill N'CPT	0.00	2.33	713222.22 E 612803.66 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.33 m	14/02/2024	SJ	Scale: 1:50
Elevation: -5.36 mCD	**End Date:** 14/02/2024	**Logger:** SJ	FINAL

Depth (m)	Sample / Tests	Cone Resistance (MPa) 0 20 40 60	Sleeve Friction (MPa) 0 0.5 1.0 1.5	Pore Pressure (MPa) -0.5 0.0 0.5 1.0	Level mCD	Depth (m)	Legend	Description	Water	Backfill
								CPT Push from 0.010m to 2.330m. See CPT log		
								End of Borehole at 2.33m		

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)
1.10	177

Water Added

From (m)	To (m)

Remarks

Overwater CPT completed off Causeway Giant 2 jack-up barge (SHIPPING LOCATION)
Deck to bed = 9.80m
All elevations and reduced levels are given in local Chart Datum

CPT push at this location; 1.10m casing flushed, pushed to 2.33m below bed before refusal (cone inclination)
No Dissipation Test completed
See "M-CPT40" plots for all CPT data

Core Barrel	Flush Type	Termination Reason	Last Updated
		CPT terminated due to inclination	04/07/2024

AGS

CAUSEWAY GEOTECH

APPENDIX E

VIBROCORE LOGS



CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC01
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.30	712956.91 E 613050.89 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.30 m	12/02/2024	SJ	Scale: 1:50
Elevation: -4.64 mCD	**End Date:** 12/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 1.00	ES1 B4	Marine Sediment Sample						Soft dark grey and black sandy silty CLAY with occasional shell fragments. Sand is fine to medium.		
1.00 - 1.40 1.00 - 2.30	ES2 B5	Marine Sediment Sample			-6.04	1.40		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.		
2.00 - 2.30	ES3	Marine Sediment Sample			-6.94	2.30		End of Borehole at 2.30m		



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.90m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC02
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.60	712801.68 E 613069.37 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.60 m	12/02/2024	SJ	Scale: 1:50
Elevation: -5.26 mCD	**End Date:** 12/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Soft brown slightly sandy silty CLAY. Sand is fine to medium.		
0.00 - 1.00	B4									
0.60 - 0.90	ES2	Marine Sediment Sample			-5.86	0.60		Dark grey and greyish brown slightly gravelly slightly silty fine to coarse SAND with frequent shell fragments. Gravel is angular to subangular fine to coarse of various lithologies.		
1.00 - 1.60	B5									
1.20 - 1.60	ES3	Marine Sediment Sample								
					-6.86	1.60		End of Borehole at 1.60m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.60m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC03

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.95	712603.32 E 613047.68 N

Final Depth: 0.95 m **Start Date:** 12/02/2024 **Driller:** SJ

Elevation: -4.97 mCD **End Date:** 12/02/2024 **Logger:** MS

Sheet 1 of 1
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 - 0.50 0.00 - 0.95	ES1 B3	Marine Sediment Sample						Firm light brown sandy CLAY with rare shell fragments. Sand is fine to medium.		
0.50 - 0.95	ES2	Marine Sediment Sample								
					-5.92	0.95		End of Borehole at 0.95m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC04
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.00	712519.54 E 613023.32 N

Final Depth:	1.00 m	Start Date:	12/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-4.97 mCD	End Date:	12/02/2024	Logger:	OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 1.00	ES1 B3	Marine Sediment Sample						Firm light brown slightly sandy CLAY with rare shell fragments. Sand is fine to medium.		
0.60 - 1.00	ES2	Marine Sediment Sample			-5.96	1.00		End of Borehole at 1.00m		

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC05
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.75	712964.34 E 612973.30 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.75 m	21/02/2024	SJ	Scale: 1:50
Elevation: -4.45 mCD	**End Date:** 21/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Light brown silty fine to medium SAND.		
0.00 - 1.00	B4									
1.00 - 2.00	B5									
1.20 - 1.50	ES2	Marine Sediment Sample								
					-5.94	1.50		Firm to stiff brown slightly sandy silty CLAY. Sand is fine to coarse.		
2.00 - 2.75	B6									
2.45 - 2.75	ES3	Marine Sediment Sample								
					-7.20	2.75		End of Borehole at 2.75m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC06
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.90	712808.44 E 612985.85 N

Final Depth:	1.90 m	Start Date:	15/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-4.89 mCD	End Date:	15/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 1.00	ES1 B4	Marine Sediment Sample						Soft dark grey and black sandy SILT with frequent shell fragments. Sand is fine to medium.		
0.70 - 0.95	ES2	Marine Sediment Sample			-5.59	0.70		Light grey slightly gravelly fine to coarse SAND with frequent shell fragments. Gravel is angular to subangular fine to coarse of various lithologies.		
1.00 - 1.90	B5				-6.09	1.20		Soft to firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular of mudstone.		
1.70 - 1.90	ES3	Marine Sediment Sample			-6.79	1.90		End of Borehole at 1.90m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.40m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC07
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.90	712722.82 E 612933.16 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.90 m	15/02/2024	SJ	Scale: 1:50
Elevation: -4.83 mCD	**End Date:** 15/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 1.00	ES1 B4	Marine Sediment Sample			-5.43	0.60		Soft dark grey and black sandy SILT with frequent shell fragments. Sand is fine.		
1.00 - 1.45 1.00 - 2.00	ES2 B5	Marine Sediment Sample			-6.23	1.40		Soft becoming firm light brown slightly sandy CLAY. Sand is fine to medium.		
2.00 - 2.90 2.50 - 2.90	B6 ES3	Marine Sediment Sample			-7.73	2.90		Firm to stiff light brown silty CLAY.		
								End of Borehole at 2.90m		

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.30m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC08
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.10	712464.41 E 612974.21 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.10 m	14/02/2024	SJ	Scale: 1:50
Elevation: -4.56 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
0.00 - 0.50	B3							Light grey slightly gravelly fine to coarse SAND with frequent shell fragments. Gravel is subrounded fine to medium of various lithologies. [Organic odour]		
0.00 - 0.50	ES1	Marine Sediment Sample								
0.60 - 1.10	B4				-5.16	0.60		Soft to firm brown slightly sandy CLAY. Sand is fine to coarse.		
0.70 - 1.10	ES2	Marine Sediment Sample								
					-5.66	1.10		End of Borehole at 1.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.10m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC09
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	3.10	712954.28 E 612898.60 N

Final Depth:	3.10 m	Start Date:	15/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-4.50 mCD	End Date:	15/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Soft dark brown and black clayey SILT with occasional shell fragments.		
0.00 - 1.00	B4				-4.95	0.45		Light brown and grey slightly gravelly clayey fine to coarse SAND with low cobble content. Gravel is angular to subangular fine to medium of various lithologies. Cobbles are subrounded to rounded of mudstone (63x100mm)		
1.00 - 2.00	B5									
1.35 - 1.65	ES2	Marine Sediment Sample								
2.00 - 3.10	B6									
2.80 - 3.10	ES3	Marine Sediment Sample			-7.30	2.80		Firm to stiff light brown CLAY.		
					-7.60	3.10		End of Borehole at 3.10m		

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 8.10m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC10
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.75	712753.99 E 612917.69 N

Final Depth:	1.75 m	Start Date:	15/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-4.69 mCD	End Date:	15/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.40	ES1	Marine Sediment Sample						Light grey slightly gravelly fine to coarse SAND with frequent shell fragments. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 0.60	B4									
0.50 - 0.85	ES2	Marine Sediment Sample			-5.29	0.60		Light brown slightly clayey fine to medium SAND.		
1.00 - 1.75	B5				-5.69	1.00		Soft becoming firm brown slightly sandy CLAY. Sand is fine to medium.		
1.50 - 1.75	ES3	Marine Sediment Sample								
					-6.44	1.75		End of Borehole at 1.75m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.20m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC11
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.85	712595.32 E 612899.05 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.85 m	15/02/2024	SJ	Scale: 1:50
Elevation: -4.59 mCD	**End Date:** 15/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.40	ES1	Marine Sediment Sample						Light grey slightly gravelly silty fine to coarse SAND with abundant shell fragments. Gravel is subangular to rounded fine to coarse. [Organic odour]		
0.00 - 1.00	B4				-4.99	0.40		Soft to firm light brown slightly gravelly slightly sandy CLAY. Gravel is subangular to rounded fine to medium of various lithologies.		
0.50 - 0.90	ES2	Marine Sediment Sample								
1.00 - 1.85	B5									
1.50 - 1.85	ES3	Marine Sediment Sample								
					-6.44	1.85		End of Borehole at 1.85m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.20m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC12
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.62	712658.10 E 612863.65 N

Final Depth:	1.62 m	Start Date:	15/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-4.42 mCD	End Date:	15/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.40	ES1	Marine Sediment Sample						Light grey slightly gravelly slightly silty fine to coarse SAND with frequent shell fragments. Gravel is subangular to rounded fine to medium of various lithologies. [Organic odour]		
0.00 - 0.80	B4				-4.82	0.40		Soft becoming firm light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to medium of various lithologies.		
0.50 - 0.85	ES2	Marine Sediment Sample								
0.80 - 1.62	B5									
1.30 - 1.62	ES3	Marine Sediment Sample								
					-6.04	1.62		End of Borehole at 1.62m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

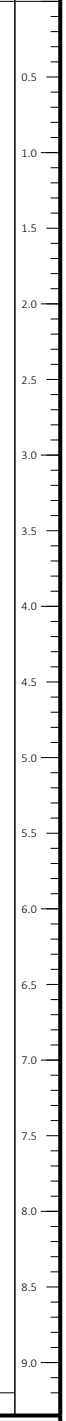
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC13
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	712924.11 E 612804.23 N

Final Depth:	0.00 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	21/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC14

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.10	712741.82 E 612803.26 N

Final Depth: 1.10 m **Start Date:** 14/02/2024 **Driller:** SJ

Elevation: -4.14 mCD **End Date:** 14/02/2024 **Logger:** OG

Sheet 1 of 1
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 - 0.50	ES1	Marine Sediment Sample						Light grey slightly gravelly slightly silty fine to coarse SAND with frequent shell fragments. Gravel is subangular to rounded fine to medium of various lithologies. [Organic odour]		
0.00 - 0.70	B3									
0.70 - 1.10	B4				-4.84	0.70		Firm brown slightly sandy CLAY. Sand is fine to medium.		
0.80 - 1.10	ES2	Marine Sediment Sample								
					-5.24	1.10		End of Borehole at 1.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 8.30m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC15
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
VIbrocoring	Geocorer 6000	0.00	0.00	712585.75 E 612810.85 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.00 m	13/02/2024	SJ	Scale: 1:50
Elevation: mCD	**End Date:** 13/02/2024	**Logger:** N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill

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)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC16
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.40	712459.96 E 612806.88 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.40 m	14/02/2024	SJ	Scale: 1:50
Elevation: -3.84 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
0.00 - 0.50	ES1	Marine Sediment Sample						Light grey slightly silty fine to coarse SAND with frequent shell fragments. [Organic odour]		
0.00 - 0.70	B3									
0.70 - 1.40	B4				-4.54	0.70		Soft to firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies.		
1.00 - 1.40	ES2	Marine Sediment Sample								
					-5.24	1.40		End of Borehole at 1.40m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.60m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC17
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.60	712902.44 E 612735.81 N

Final Depth:	0.60 m	Start Date:	23/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-2.95 mCD	End Date:	23/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	B3									
0.00 - 0.30	ES1	Marine Sediment Sample			-3.25	0.30		Brownish grey sandy angular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
0.30 - 0.60	B4							Firm brown slightly sandy CLAY. Sand is fine.		
0.40 - 0.60	ES2	Marine Sediment Sample			-3.55	0.60		End of Borehole at 0.60m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.40m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC18
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.20	712589.10 E 612724.95 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.20 m	14/02/2024	SJ	Scale: 1:50
Elevation: -3.62 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
0.00 - 0.30	ES1	Marine Sediment Sample						Soft brown slightly sandy CLAY. Sand is fine to medium.		
0.30 - 0.70	B4				-3.92	0.30		Light grey slightly gravelly fine to coarse SAND with frequent shell fragments. Gravel is angular fine to coarse of various lithologies.		
0.40 - 0.70	ES2	Marine Sediment Sample								
0.70 - 1.20	B5				-4.32	0.70		Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
0.80 - 1.20	ES3	Marine Sediment Sample								
					-4.82	1.20		End of Borehole at 1.20m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC19
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.50	712947.33 E 612682.93 N

						Sheet 1 of 1
Final Depth:	0.50 m	Start Date:	15/02/2024	Driller:	SJ	Scale: 1:50
Elevation:	-2.16 mCD	End Date:	15/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 0.50	B2 ES1	Marine Sediment Samples			-2.66	0.50		Light brown and greyish brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of various lithologies with low cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of various lithologies. End of Borehole at 0.50m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.20m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

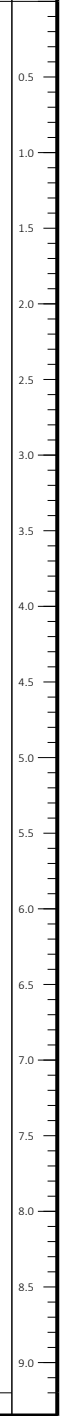
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC20
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	712843.85 E 612628.38 N

Final Depth:	0.00 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	21/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC21
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.60	712726.87 E 612660.94 N

Final Depth:	0.60 m	**Start Date:**	15/02/2024	**Driller:**	SJ	Sheet 1 of 1	Scale: 1:50
Elevation:	-2.19 mCD	**End Date:**	15/02/2024	**Logger:**	MS	FINAL	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 0.60	ES1 B2	Marine Sediment Sample			-2.79	0.60		Firm to stiff slightly sandy gravelly CLAY with abundant shell fragments. Sand is fine to coarse. Gravel is angular to subangular fine to medium. End of Borehole at 0.60m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.20m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC22
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	712589.11 E 612642.73 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.00 m	12/02/2024	SJ	Scale: 1:50
Elevation: mCD	**End Date:** 12/02/2024	**Logger:** N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill

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)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC23
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.00	712429.16 E 612612.59 N

Final Depth:	1.00 m	Start Date:	23/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-2.48 mCD	End Date:	23/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	B3							Soft to firm brown CLAY with rare shell fragments.		
0.00 - 0.50	ES1	Marine Sediment Sample								
0.50 - 1.00	B4				-2.98	0.50		Brown slightly sandy clayey subangular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
0.60 - 1.00	ES2	Marine Sediment Sample			-3.48	1.00		End of Borehole at 1.00m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 5.90m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC24
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.00	712580.14 E 612563.54 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	23/02/2024	SJ	Scale: 1:50
Elevation: -1.92 mCD	**End Date:** 23/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 0.70	B4									
					-2.62	0.70				
0.80 - 1.20	B5							Brownish grey slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of various lithologies.		
0.80 - 1.20	ES2	Marine Sediment Sample								
					-3.22	1.30				
1.50 - 2.00	B6							Soft brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
1.50 - 2.00	ES3	Marine Sediment Sample								
					-3.92	2.00		End of Borehole at 2.00m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 5.40m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC26
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.00	712915.53 E 613156.51 N

Final Depth:	2.00 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-5.16 mCD	End Date:	21/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Very soft black and brown silty CLAY with frequent shells, organic matter, and rare worms. [Strong organic smell]		
0.00 - 1.00	B4									
					-5.76	0.60		Firm brown slightly sandy CLAY. Sand is fine to coarse.		
0.80 - 1.10	ES2	Marine Sediment Sample								
1.00 - 2.00	B5									
1.70 - 2.00	ES3	Marine Sediment Sample			-6.86	1.70		Brown fine to coarse SAND.		
					-7.16	2.00		End of Borehole at 2.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 8.60m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

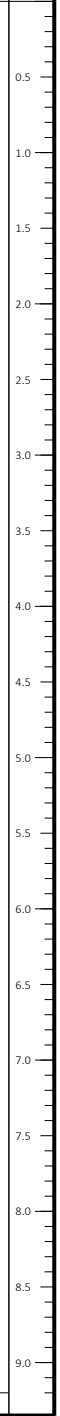
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC27
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713112.54 E 613225.71 N

Final Depth:	0.00 m	Start Date:	13/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	13/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC28
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.75	713352.64 E 613345.78 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1 Scale: 1:50
0.75 m	19/02/2024	SJ	
Elevation: -7.51 mCD	**End Date:** 19/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 0.75	ES1 B2	Marine Sediment Sample			-8.26	0.75		Brown and greyish cream sandy angular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse. End of Borehole at 0.75m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 10.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis
Poor sample return

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

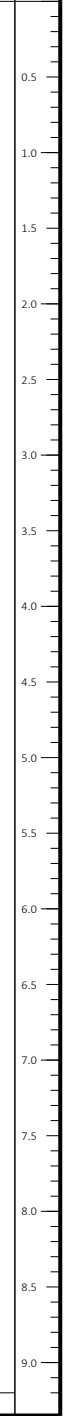
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC29
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713159.19 E 613156.30 N

Final Depth:	0.00 m	Start Date:	13/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	13/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC30
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.70	713307.72 E 613235.22 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.70 m	19/02/2024	SJ	Scale: 1:50
Elevation: -9.07 mCD	**End Date:** 19/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies.		
0.00 - 0.70	B3									
0.70 - 1.70	B4									
1.30 - 1.70	ES2	Marine Sediment Sample								
					-10.77	1.70		End of Borehole at 1.70m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 12.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC31

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.80	713458.22 E 613288.10 N

Final Depth: 1.80 m **Start Date:** 19/02/2024 **Driller:** SJ

Elevation: -8.03 mCD **End Date:** 19/02/2024 **Logger:** OG

Sheet 1 of 1
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 - 0.50	ES1	Marine Sediment Sample						Brown slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 0.90	B3									
0.90 - 1.80	B4									
1.30 - 1.80	ES2	Marine Sediment Sample								
					-9.83	1.80		End of Borehole at 1.80m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 11.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC32
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.60	713584.08 E 613336.98 N

Final Depth:	1.60 m	Start Date:	19/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-9.14 mCD	End Date:	19/02/2024	Logger:	OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Light brown slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to medium of various lithologies.		
0.00 - 0.60	B3									
0.60 - 1.60	B4				-9.74	0.60		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium of various lithologies.		
1.10 - 1.60	ES2	Marine Sediment Sample								
					-10.74	1.60		End of Borehole at 1.60m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 12.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC33
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.10	713698.21 E 613394.14 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.10 m	19/02/2024	SJ	Scale: 1:50
Elevation: -10.50 mCD	**End Date:** 19/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	B4							Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 0.50	ES1	Marine Sediment Sample								
0.50 - 1.80	B5				-11.00	0.50		Brownish grey slightly silty fine to medium SAND.		
0.60 - 1.10	ES2	Marine Sediment Sample								
1.90 - 2.10	ES3	Marine Sediment Sample			-12.30	1.80		Firm brown CLAY with pockets of fine sand.		
					-12.60	2.10		End of Borehole at 2.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 13.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC34
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.10	713079.68 E 613063.03 N

Final Depth:	2.10 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-7.14 mCD	End Date:	21/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Brown gravelly very silty fine to coarse SAND. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 1.00	B4									
0.80 - 1.10	ES2	Marine Sediment Sample			-8.04	0.90				
1.00 - 2.00	B5							Light brown slightly silty fine to coarse SAND.		
1.80 - 2.10	ES3	Marine Sediment Sample								
					-9.24	2.10		End of Borehole at 2.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 12.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC35
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geoborer 6000	0.00	2.00	713212.76 E 613067.72 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	23/02/2024	SJ	Scale: 1:50
Elevation: -9.60 mCD	**End Date:** 23/02/2024	**Logger:** OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Firm brown CLAY.		
0.00 - 0.80	B4									
					-10.40	0.80				
0.90 - 1.40	ES2	Marine Sediment Sample						Light greyish brown slightly gravelly fine to medium SAND. Gravel is angular to subangular fine to medium of various lithologies.		
1.20 - 2.00	B5									
1.50 - 2.00	ES3	Marine Sediment Sample								
					-11.60	2.00		End of Borehole at 2.00m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 13.20m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC36
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.00	713299.15 E 613129.73 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.00 m	21/02/2024	SJ	Scale: 1:50
Elevation: -10.79 mCD	**End Date:** 21/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Soft to firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of various lithologies.		
0.00 - 1.00	B3									
1.00 - 2.00	B4									
1.60 - 2.00	ES2	Marine Sediment Sample								
					-12.59	1.80		Light brown clayey fine to medium SAND.		
					-12.79	2.00		End of Borehole at 2.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 14.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC37
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.50	713430.17 E 613176.06 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.50 m	21/02/2024	SJ	Scale: 1:50
Elevation: -9.19 mCD	**End Date:** 21/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Brown and greyish cream sandy angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
0.00 - 0.80	B4									
0.70 - 1.00	ES2	Marine Sediment Sample								
0.80 - 1.50	B5									
1.30 - 1.50	ES3	Marine Sediment Sample								
					-10.69	1.50		End of Borehole at 1.50m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 12.20m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

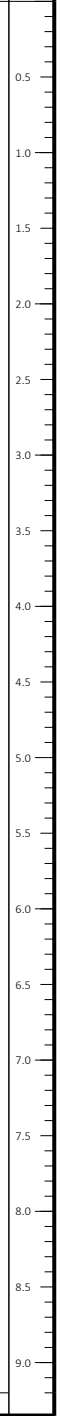
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC38
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713545.55 E 613212.19 N

Final Depth:	0.00 m	Start Date:	19/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	19/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC39
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.80	713656.86 E 613259.15 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1 Scale: 1:50
1.80 m	21/02/2024	SJ	
Elevation: -8.83 mCD	**End Date:** 21/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Firm to stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 1.00	B4									
0.70 - 1.10	ES2	Marine Sediment Sample								
1.00 - 1.80	B5									
1.60 - 1.80	ES3	Marine Sediment Sample								
					-10.63	1.80		End of Borehole at 1.80m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 11.80m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC40
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.10	713782.97 E 613319.13 N

Final Depth:	2.10 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-9.73 mCD	End Date:	21/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Very soft to soft light grey and brown slightly sandy slightly gravelly SILT with frequent shell fragments. Sand is fine to coarse. Gravel is subangular to subrounded fine of various lithologies.		
0.00 - 1.00	B4									
					-10.33	0.60		Brown slightly silty fine to medium SAND.		
0.80 - 1.10	ES2	Marine Sediment Sample								
1.00 - 2.00	B5									
					-10.93	1.20		Stiff brown slightly sandy CLAY. Sand is fine to medium.		
					-11.43	1.70		Brown slightly silty fine to medium SAND.		
1.90 - 2.10	ES3	Marine Sediment Sample			-11.63	1.90		Stiff brown slightly sandy CLAY. Sand is fine to medium.		
					-11.83	2.10		End of Borehole at 2.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 13.70m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

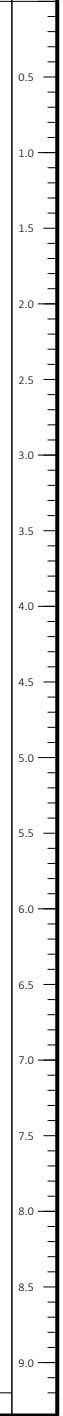
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC41
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713820.14 E 613395.01 N

Final Depth:	0.00 m	Start Date:	13/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	13/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC42
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.10	713104.68 E 612985.47 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
2.10 m	23/02/2024	SJ	Scale: 1:50
Elevation: -8.22 mCD	**End Date:** 23/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample								
0.20 - 1.00	B4				-8.42	0.20		Brownish grey sandy silty angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse. Firm brown CLAY.		
1.20 - 1.60	B5				-9.42	1.20		Firm brownish grey slightly sandy SILT with frequent shell fragments. Sand is fine to coarse.		
1.30 - 1.60	ES2	Marine Sediment sample								
1.60 - 2.10	B6				-9.82	1.60		Firm brown slightly sandy gravelly CLAY with pockets (3-10mm) of fine sand. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of various lithologies.		
1.70 - 2.10	ES3	Marine Sediment Sample								
					-10.32	2.10		End of Borehole at 2.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 11.90m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

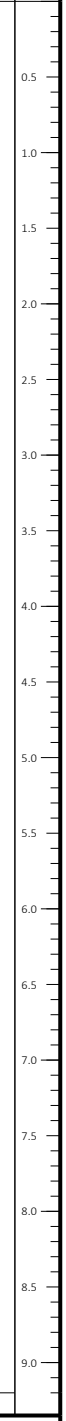
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC43
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713510.20 E 613105.49 N

Final Depth:	0.00 m	Start Date:	19/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	19/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

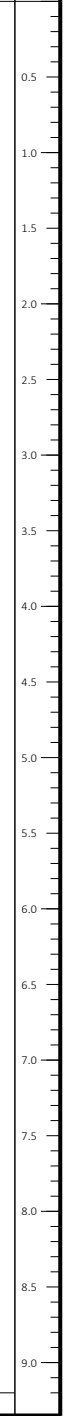
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC44
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713653.25 E 613155.96 N

Final Depth:	0.00 m	Start Date:	19/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	19/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC45
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.00	713790.25 E 613212.86 N

Final Depth:	2.00 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-8.29 mCD	End Date:	21/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.40 0.00 - 1.00	ES1 B4	Marine Sediment Sample			-8.59	0.30		Soft black and brown silty fine to coarse SAND with low cobble content. Cobbles (70x70x50mm) are subangular to subrounded of mudstone. Light brown silty fine to medium SAND.		
1.00 - 1.30 1.00 - 2.00	ES2 B5	Marine Sediment Sample								
1.70 - 2.00	ES3	Marine Sediment Sample								
					-10.29	2.00		End of Borehole at 2.00m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 10.80m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC46
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.35	713920.64 E 613271.18 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.35 m	15/02/2024	SJ	Scale: 1:50
Elevation: -9.64 mCD	**End Date:** 15/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.35	ES1	Marine Sediment Sample			-9.99	0.35		Soft to firm brown slightly sandy slightly gravelly CLAY with rare shell fragments. Sand is fine to coarse. Gravel is rounded fine to medium of mudstone. End of Borehole at 0.35m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 13.70m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC47
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	3.70	713044.26 E 612887.47 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
3.70 m	12/02/2024	SJ	Scale: 1:50
Elevation: -4.27 mCD	**End Date:** 12/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Soft dark grey and black sandy SILT with occasional shell fragments. Sand is fine. [Strong hydrocarbon odour]		
0.00 - 1.00	B4				-4.67	0.40		Very soft to soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine of various lithologies.		
1.00 - 2.00	B5									
1.60 - 1.95	ES2	Marine Sediment Sample								
2.00 - 3.70	B6									
3.40 - 3.70	ES3	Marine Sediment Sample								
					-7.97	3.70		End of Borehole at 3.70m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 6.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC48
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.90	713129.45 E 612886.52 N

Final Depth:	1.90 m	Start Date:	23/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-6.09 mCD	End Date:	23/02/2024	Logger:	OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Firm brown CLAY.		
0.00 - 1.00	B4									
1.00 - 1.40	B5				-7.09	1.00		Firm grey mottled brown slightly sandy SILT with frequent shell fragments. Sand is fine to coarse.		
1.10 - 1.40	ES2	Marine Sediment Sample								
1.40 - 1.90	B6				-7.49	1.40		Firm brown slightly sandy gravelly CLAY with lenses (8-15mm) of fine sand. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of various lithologies.		
1.50 - 1.90	ES3	Marine Sediment Sample								
					-7.99	1.90		End of Borehole at 1.90m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 9.70m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC49
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.00	713262.73 E 612946.25 N

Final Depth:	1.00 m	Start Date:	14/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-8.48 mCD	End Date:	14/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Dark greyish brown slightly gravelly slightly clayey fine to coarse SAND with occasional shell fragments. Gravel is angular to subangular fine to medium of various lithologies.		
0.00 - 1.00	B3									
0.50 - 1.00	ES2	Marine Sediment Sample								
					-9.18	0.70		Brown and greyish cream slightly sandy angular to subangular fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
					-9.48	1.00		End of Borehole at 1.00m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 12.10m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

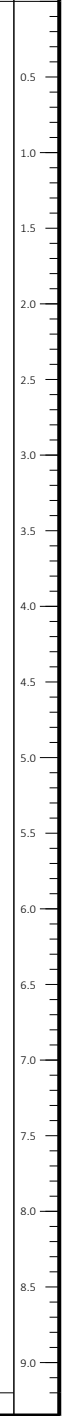
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC50
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713329.11 E 613009.44 N

Final Depth:	0.00 m	Start Date:	19/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	19/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

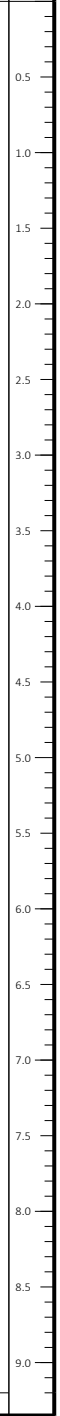
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC51
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713416.77 E 613056.84 N

Final Depth:	0.00 m	Start Date:	19/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	mCD	End Date:	19/02/2024	Logger:	N/A	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC52
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.80	713010.26 E 612796.08 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.80 m	23/02/2024	SJ	Scale: 1:50
Elevation: -3.56 mCD	**End Date:** 23/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Grey mottled brown slightly gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.00 - 1.00	B3									
1.00 - 1.80	B4				-4.56	1.00		Firm brown CLAY.		
1.10 - 1.60	ES2	Marine Sediment Sample								
					-5.36	1.80		End of Borehole at 1.80m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.10m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC53
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.60	713210.58 E 612842.08 N

Final Depth:	1.60 m	Start Date:	22/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-5.40 mCD	End Date:	22/02/2024	Logger:	OG	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 1.60	ES1 B4	Marine Sediment Sample						Very soft grey mottled black silty CLAY with occasional shell fragments.		
0.90 - 1.20	ES2	Marine Sediment Sample								
1.40 - 1.60	ES3	Marine Sediment Sample								
					-7.00	1.60		End of Borehole at 1.60m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 9.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC54
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	0.00	713388.81 E 612929.64 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
0.00 m	19/02/2024	SJ	Scale: 1:50
Elevation:	**End Date:**	**Logger:**	FINAL
mCD	19/02/2024	N/A	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill

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)	Diameter

Remarks

Vibrocore sample location attempted off the Ocean Supporter
No recovery in this location despite multiple attempts - unsuitable material for vibrocoring

Termination Reason

No Recovery - unsuitable material

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC55
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.70	713093.76 E 612720.36 N

Final Depth:	1.70 m	Start Date:	12/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-3.02 mCD	End Date:	12/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50 0.00 - 0.80	ES1 B4	Marine Sediment Sample						Light and dark grey slightly gravelly slightly clayey fine to coarse SAND with frequent shell fragments. Gravel is subangular to subrounded fine to medium of various lithologies.		
0.70 - 1.00 0.80 - 1.70	ES2 B5	Marine Sediment Sample			-3.67	0.65		Soft becoming firm light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to rounded fine to medium of various lithologies.		
1.60 - 1.70	ES3	Marine Sediment Sample			-4.72	1.70		End of Borehole at 1.70m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 5.30m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC56
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	2.65	713228.16 E 612765.51 N

Final Depth:	2.65 m	Start Date:	21/02/2024	Driller:	SJ	Sheet 1 of 1 Scale: 1:50
Elevation:	-5.06 mCD	End Date:	21/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30 0.00 - 1.00	ES1 B4	Marine Sediment Sample						Soft black and brown slightly sandy silty CLAY. Sand is fine to coarse. [Strong hydrocarbon odour]		
1.00 - 1.30 1.00 - 2.65	ES2 B5	Marine Sediment Sample								
2.35 - 2.65	ES3	Marine Sediment Sample								
					-7.71	2.65		End of Borehole at 2.65m		

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

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 8.70m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated on refusal of sampler	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC57
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.40	713319.68 E 613565.56 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.40 m	21/02/2024	SJ	Scale: 1:50
Elevation: -8.48 mCD	**End Date:** 21/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES1	Marine Sediment Sample						Light greyish brown slightly clayey fine to medium SAND.		
0.00 - 1.00	B3									
					-9.08	0.60		Brown and greyish cream slightly sandy subangular to subrounded fine to coarse GRAVEL of various lithologies. Sand is fine to coarse.		
1.00 - 1.40	B4									
1.00 - 1.40	ES2	Marine Sediment Sample								
					-9.88	1.40		End of Borehole at 1.40m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 12.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC58

Client: Iarnród Éireann

Client's Rep: GDG

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.90	712721.47 E 613524.56 N

Final Depth: 1.90 m **Start Date:** 23/02/2024 **Driller:** SJ

Elevation: -5.46 mCD **End Date:** 23/02/2024 **Logger:** MS

Sheet 1 of 1
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 - 0.50 0.00 - 1.00	ES1 B4	Marine Sediment Sample						Light brown slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to medium of various lithologies.		
0.90 - 1.40 1.00 - 1.90	ES2 B5	Marine Sediment Sample								
1.60 - 1.90	ES3	Marine Sediment Sample								
					-7.36	1.90		End of Borehole at 1.90m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 8.90m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC59
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.10	712192.75 E 613155.55 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.10 m	15/02/2024	SJ	Scale: 1:50
Elevation: -4.45 mCD	**End Date:** 15/02/2024	**Logger:** MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	ES1	Marine Sediment Sample						Light grey slightly gravelly slightly clayey fine to coarse SAND with abundant shells. Gravel is angular to subangular fine to medium of various lithologies.		
0.00 - 1.10	B3									
0.80 - 1.10	ES2	Marine Sediment Sample			-5.55	1.10		End of Borehole at 1.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 8.50m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	M-VC60
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Vibrocoring	Geocorer 6000	0.00	1.10	712216.93 E 612719.46 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
1.10 m	14/02/2024	SJ	Scale: 1:50
Elevation: -3.43 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
0.00 - 0.25	ES1	Marine Sediment Sample						Soft dark grey slightly sandy SILT. Sand is fine to medium.		
0.25 - 1.10	B3				-3.68	0.25		Soft to firm slightly sandy CLAY. Sand is fine to coarse.		
0.70 - 1.10	ES2	Marine Sediment Sample								
					-4.53	1.10		End of Borehole at 1.10m		

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)	Diameter

Remarks

Vibrocore sample location completed off the Ocean Supporter
Deck to bed = 7.00m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated on refusal of sampler

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

APPENDIX F

GRAB SAMPLE LOGS



CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	GS01
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Grab Sampling	Van Veen Sampler	0.00	0.15	712589.55 E 612509.71 N

Final Depth:	0.15 m	Start Date:	20/02/2024	Driller:	MS	Sheet 1 of 1 Scale: 1:50
Elevation:	0.82 mCD	End Date:	20/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.15	ES1	Marine Sediment Sample			0.66	0.15		Light brown slightly silty fine to coarse SAND with rare shell fragments. End of Borehole at 0.15m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Overwater grab sample taken from Ocean Quest
Deck to bed = 1.40m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated at scheduled depth

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	GS02
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Grab Sampling	Van Veen Sampler	0.00	0.15	712636.64 E 612512.04 N

Final Depth:	0.15 m	Start Date:	20/02/2024	Driller:	MS	Sheet 1 of 1 Scale: 1:50
Elevation:	-0.37 mCD	End Date:	20/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.15	ES1	Marine Sediment Sample			-0.52	0.15		Light brown slightly silty fine to medium SAND. End of Borehole at 0.15m		

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

Remarks

Overwater grab sample taken from Ocean Quest
Deck to bed = 2.60m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated at scheduled depth	04/07/2024

AGS

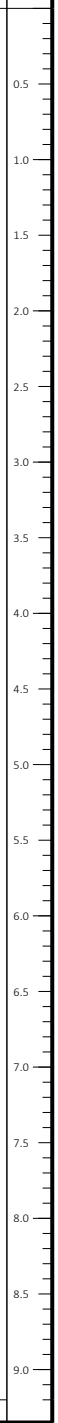
CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	GS03
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Grab Sampling	Van Veen Sampler	0.00	0.15	712563.18 E 612446.00 N

Final Depth:	0.15 m	Start Date:	20/02/2024	Driller:	MS	Sheet 1 of 1 Scale: 1:50
Elevation:	-0.10 mCD	End Date:	20/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.15	ES1	Marine Sediment Sample			-0.25	0.15		Light brown slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine of various lithologies. End of Borehole at 0.15m		



Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Overwater grab sample taken from Ocean Quest
Deck to bed = 2.40m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated at scheduled depth

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	GS04
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Grab Sampling	Van Veen Sampler	0.00	0.15	712638.01 E 612468.86 N

Final Depth:	0.15 m	Start Date:	20/02/2024	Driller:	MS	Sheet 1 of 1 Scale: 1:50
Elevation:	-0.42 mCD	End Date:	20/02/2024	Logger:	MS	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.15	ES1	Marine Sediment Sample			-0.57	0.15		Light brown slightly silty fine to coarse SAND with rare shell fragments and remnants of oil and tar. [Strong hydrocarbon odour] End of Borehole at 0.15m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

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

Remarks

Overwater grab sample taken from Ocean Quest
Deck to bed = 2.70m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason	Last Updated
Terminated at scheduled depth	04/07/2024

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
23-0585	Rosslare Europort Offshore Renewable Energy Hub SI	GS05
	Client: Iarnród Éireann	
	Client's Rep: GDG	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Grab Sampling	Van Veen Sampler	0.00	0.15	712717.97 E 612479.78 N

Final Depth:	0.15 m	**Start Date:**	20/02/2024	**Driller:**	MS	Sheet 1 of 1	
Elevation:	0.93 mCD	**End Date:**	20/02/2024	**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 - 0.15	ES1	Marine Sediment Sample			0.78	0.15		Very soft brown slightly gravelly sandy SILT with some oil deposits. Gravel is angular to subangular fine. [Strong hydrocarbon odour] End of Borehole at 0.15m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

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

Casing Details

To (m)	Diameter

Remarks

Overwater grab sample taken from Ocean Quest
Deck to bed = 1.30m
All elevations and reduced levels are given in local Chart Datum
Samples taken for Marine Sediment Analysis

Termination Reason

Terminated at scheduled depth

Last Updated

04/07/2024

AGS

CAUSEWAY GEOTECH

APPENDIX G

GEOTECHNICAL LABORATORY TEST RESULTS



CAUSEWAY GEOTECH

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Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

1 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 28/01/2024 and 01/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G01

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	BS 1377-2: 1990: Cl 3.2	14
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	8
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	21
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	19
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	3
SOIL	Laboratory Vane Shear Strength (3 determinations) *	BS 1377-7: 1990: Cl 3	1
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	1
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	3
	Extra over days (more than initial 3 days)		6

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	pH Value of Soil		1
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Organic Matter Content		3
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Water soluble chloride content		1
SOIL – subcontracted to Pro Soils Limited *(UKAS 4043)*	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	1
	Extra over days (more than initial 4 days)		4

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk / dry Mg/m3		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
M-BH01	1	0.00	1.50	SB	Grey slightly sandy silty CLAY.			22						
M-BH01	2	1.50	2.50	SB	Grey slightly sandy silty CLAY.			15	83	22 -1pt	14	8		CL
M-BH01	4	4.00	5.50	SB	Grey slightly sandy silty CLAY.			25	97	33 -1pt	16	17		CL
M-BH01	6	7.00	8.50	SB	Grey slightly sandy silty CLAY.			22	97	28 -1pt	17	11		CL
M-BH06	1	0.00	1.50	SB	Greyish brown slightly clayey fine to coarse SAND.			20	97	25 -1pt	18	7		CL
M-BH06	3	3.00	4.50	SB	Greyish brown slightly sandy silty CLAY.			26	96	41 -1pt	18	23		CI
M-BH06	9	3.00		D	Greyish brown slightly sandy silty CLAY.			25	97	40 -1pt	18	22		CI
M-BH06	10	6.00		D	Greyish brown slightly sandy silty CLAY.			21						
M-BH06	11	7.50		D	Greyish brown slightly sandy silty CLAY.			25						
M-BH08	1	1.00	2.00	SB	Brown slightly sandy silty CLAY.			24						
M-BH08	2	2.00	3.00	SB	Brown slightly sandy silty CLAY.			22						
M-BH08	4	4.00	5.50	SB	Brown slightly sandy slightly gravelly silty CLAY.			16						

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

LAB 01R Version 6

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

20/02/2024

Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk / dry Mg/m3		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
M-BH08	7	4.00		D	Brown slightly sandy slightly gravelly silty CLAY.			19	84	44 -1pt	20	24		CI
M-BH12	9	3.50		D	Brown sandy silty CLAY.			87	100	66 -1pt	31	35		CH

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

LAB 01R Version 6

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

20/02/2024

Approved By

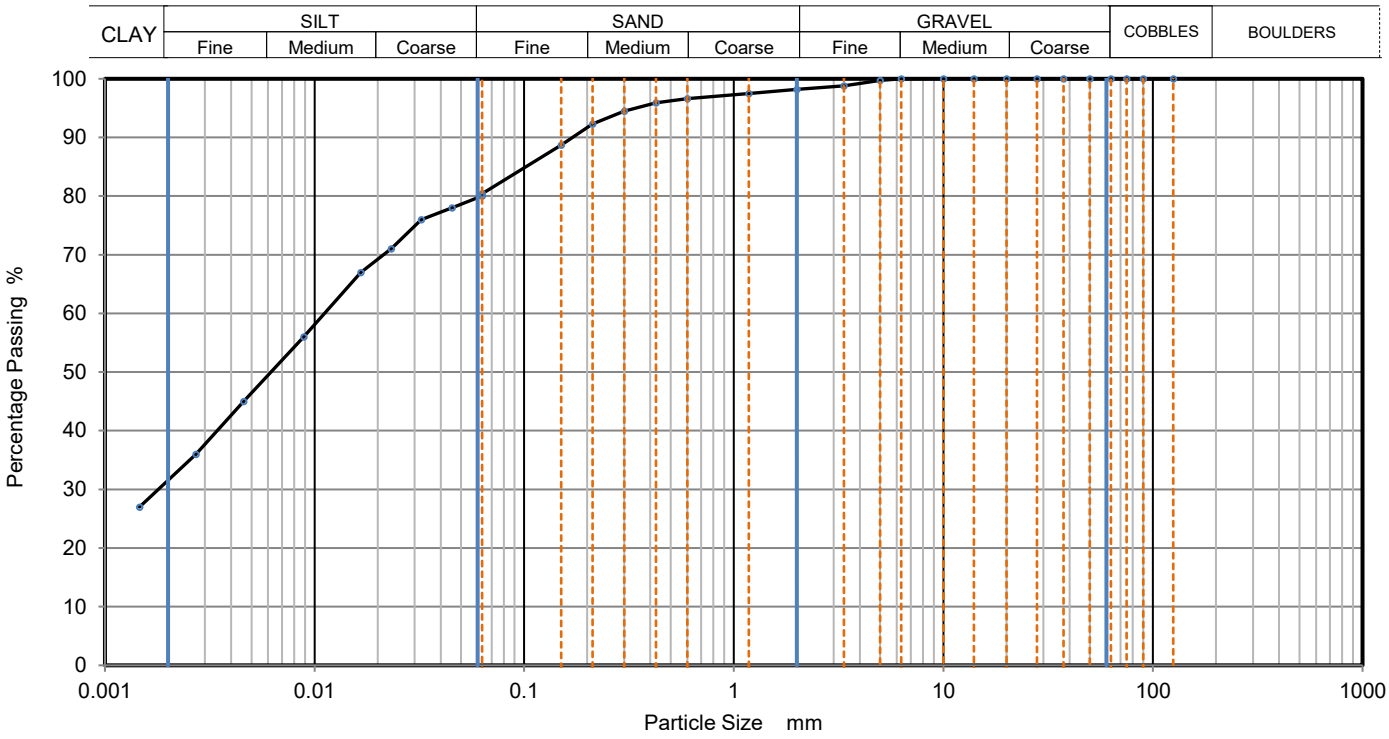
Stephen Watson

UKAS TESTING

10122

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH01
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	0.00
				Base	1.50
Specimen Reference	6	Specimen Depth	0 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401310



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	80
90	100	0.04534	78
75	100	0.03230	76
63	100	0.02318	71
50	100	0.01663	67
37.5	100	0.00889	56
28	100	0.00459	45
20	100	0.00271	36
14	100	0.00146	27
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	95		
0.212	92		
0.15	89		
0.063	80		

Dry Mass of sample, g: 241

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.8
Sand	17.8
Silt	49.1
Clay	31.3

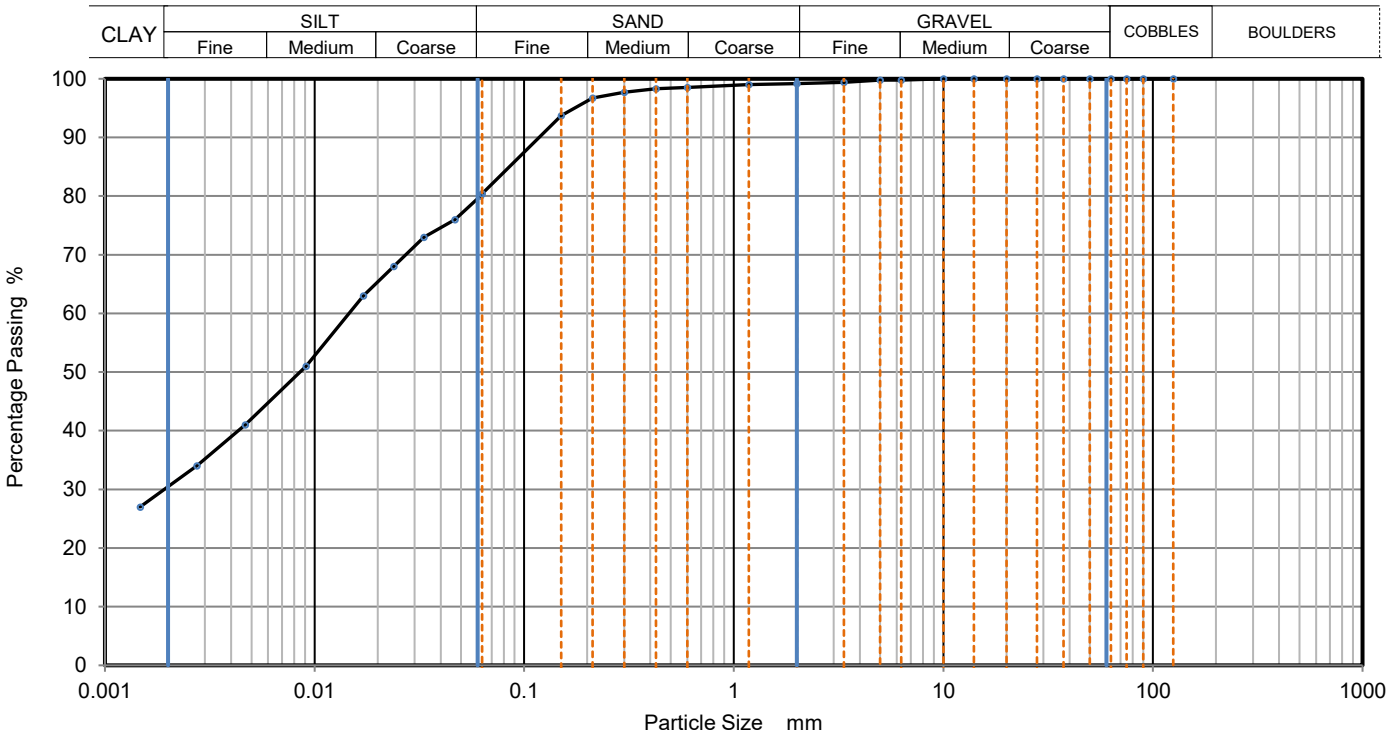
Grading Analysis		
D100	mm	
D60	mm	0.0112
D30	mm	0.00183
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH01
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	2.50
				Base	4.00
Specimen Reference	3	Specimen Depth	2.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401312



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06190	80
90	100	0.04671	76
75	100	0.03326	73
63	100	0.02385	68
50	100	0.01710	63
37.5	100	0.00912	51
28	100	0.00467	41
20	100	0.00275	34
14	100	0.00147	27
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	98		
0.212	97		
0.15	94		
0.063	80		

Dry Mass of sample, g: 338

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.8
Sand	18.8
Silt	50.0
Clay	30.4

Grading Analysis		
D100	mm	
D60	mm	0.0144
D30	mm	0.00193
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

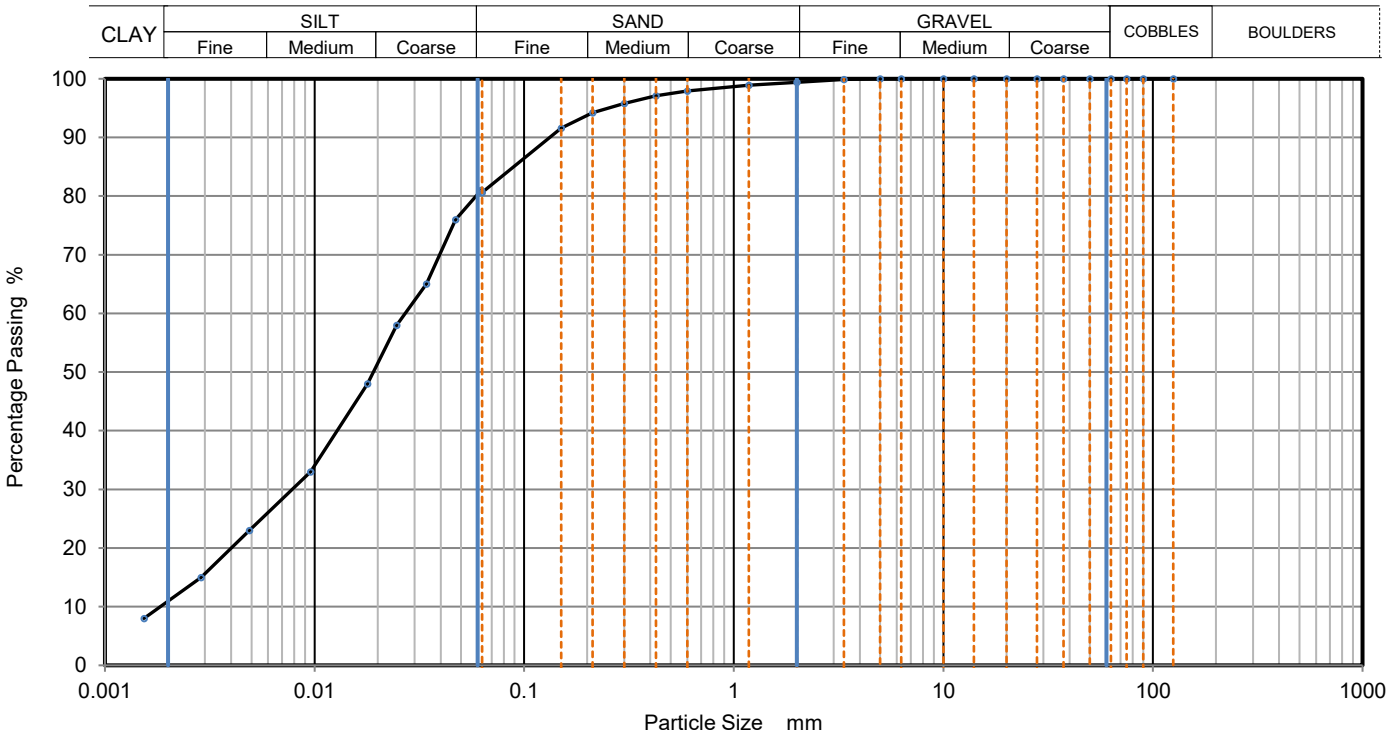
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH01
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	7.00
				Base	8.50
Specimen Reference	8	Specimen Depth	7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401314



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06236	81
90	100	0.04704	76
75	100	0.03420	65
63	100	0.02466	58
50	100	0.01789	48
37.5	100	0.00957	33
28	100	0.00489	23
20	100	0.00287	15
14	100	0.00153	8
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	92		
0.063	81		

Dry Mass of sample, g	243

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.6
Sand	18.8
Silt	69.9
Clay	10.7

Grading Analysis		
D100	mm	
D60	mm	0.027
D30	mm	0.00797
D10	mm	0.00188
Uniformity Coefficient		14
Curvature Coefficient		1.3

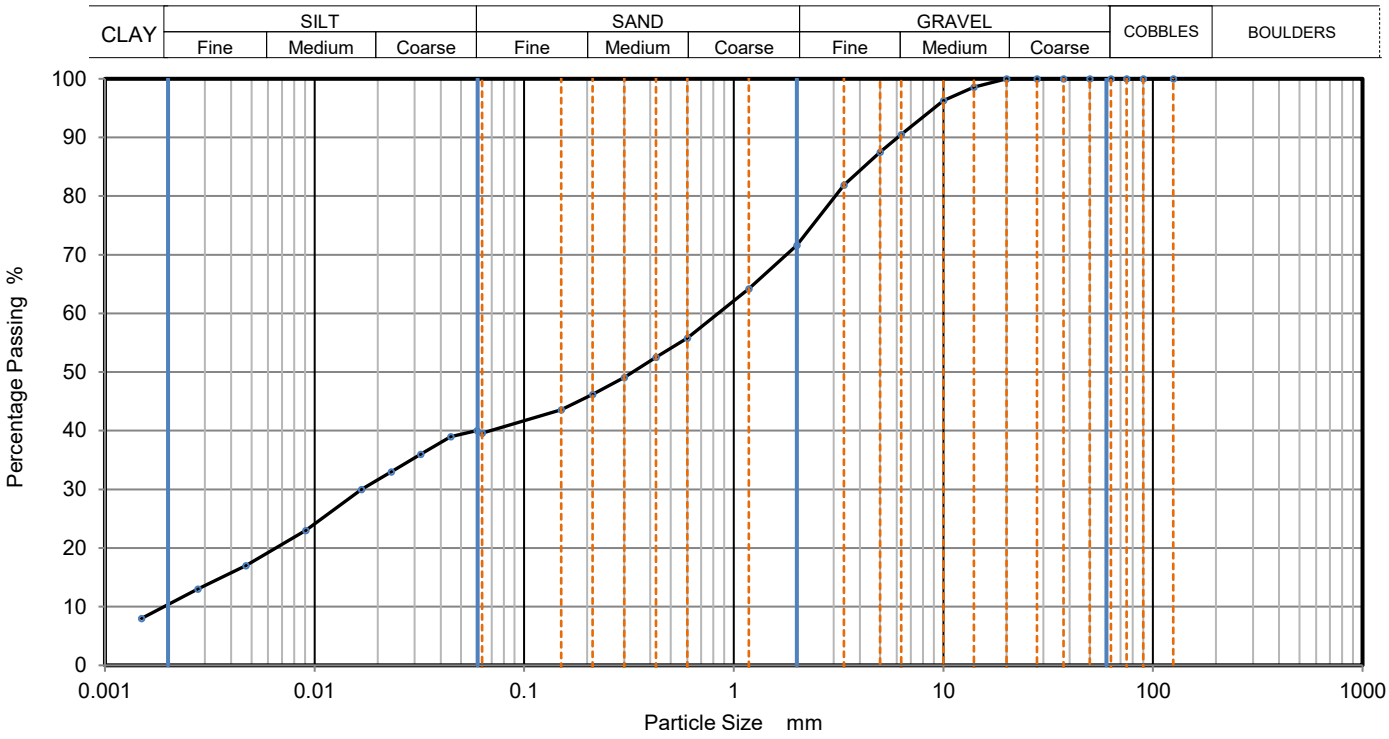
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH01
Site Name	Rosslare OWH - GI			Sample No.	7
Specimen Description	Grey sandy gravelly silty CLAY.			Sample Depth (m) Top	8.50
				Base	10.00
Specimen Reference	3	Specimen Depth	8.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401315



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05956	40
90	100	0.04464	39
75	100	0.03206	36
63	100	0.02318	33
50	100	0.01675	30
37.5	100	0.00906	23
28	100	0.00470	17
20	100	0.00278	13
14	99	0.00149	8
10	96		
6.3	91		
5	88		
3.35	82		
2	72		
1.18	64		
0.6	56	Particle density	(assumed)
0.425	53	2.65	Mg/m3
0.3	49		
0.212	46		
0.15	44		
0.063	40		

Dry Mass of sample, g: 539

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	28.4
Sand	32.0
Silt	29.3
Clay	10.3

Grading Analysis		
D100	mm	
D60	mm	0.843
D30	mm	0.0164
D10	mm	0.00191
Uniformity Coefficient		440
Curvature Coefficient		0.17

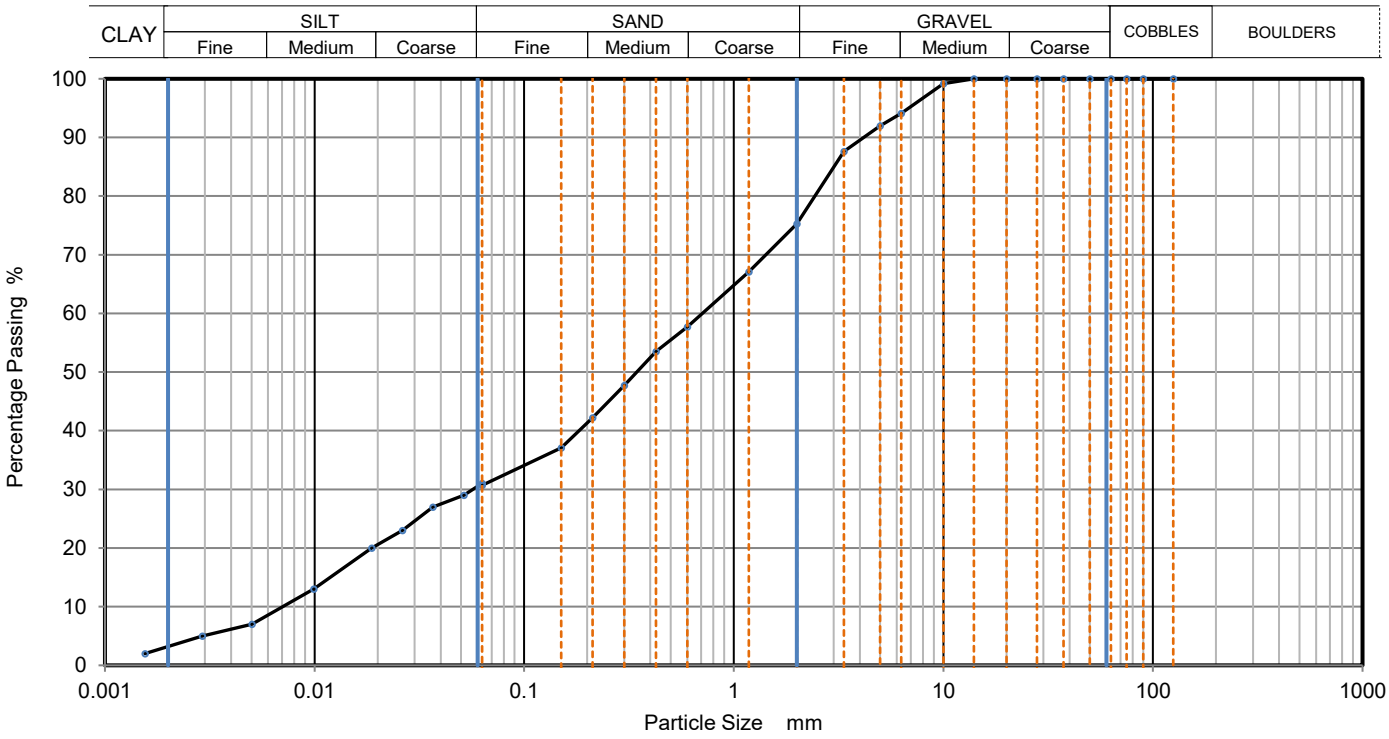
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH04
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy gravelly silty CLAY.			Sample Depth (m) Top	1.70
				Base	2.50
Specimen Reference	3	Specimen Depth	1.7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401316



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	31
90	100	0.05151	29
75	100	0.03664	27
63	100	0.02621	23
50	100	0.01874	20
37.5	100	0.00989	13
28	100	0.00503	7
20	100	0.00292	5
14	100	0.00155	2
10	99		
6.3	94		
5	92		
3.35	88		
2	75		
1.18	67		
0.6	58	Particle density	(assumed)
0.425	54	2.65	Mg/m3
0.3	48		
0.212	42		
0.15	37		
0.063	31		

Dry Mass of sample, g: 330

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	24.7
Sand	44.6
Silt	27.4
Clay	3.3

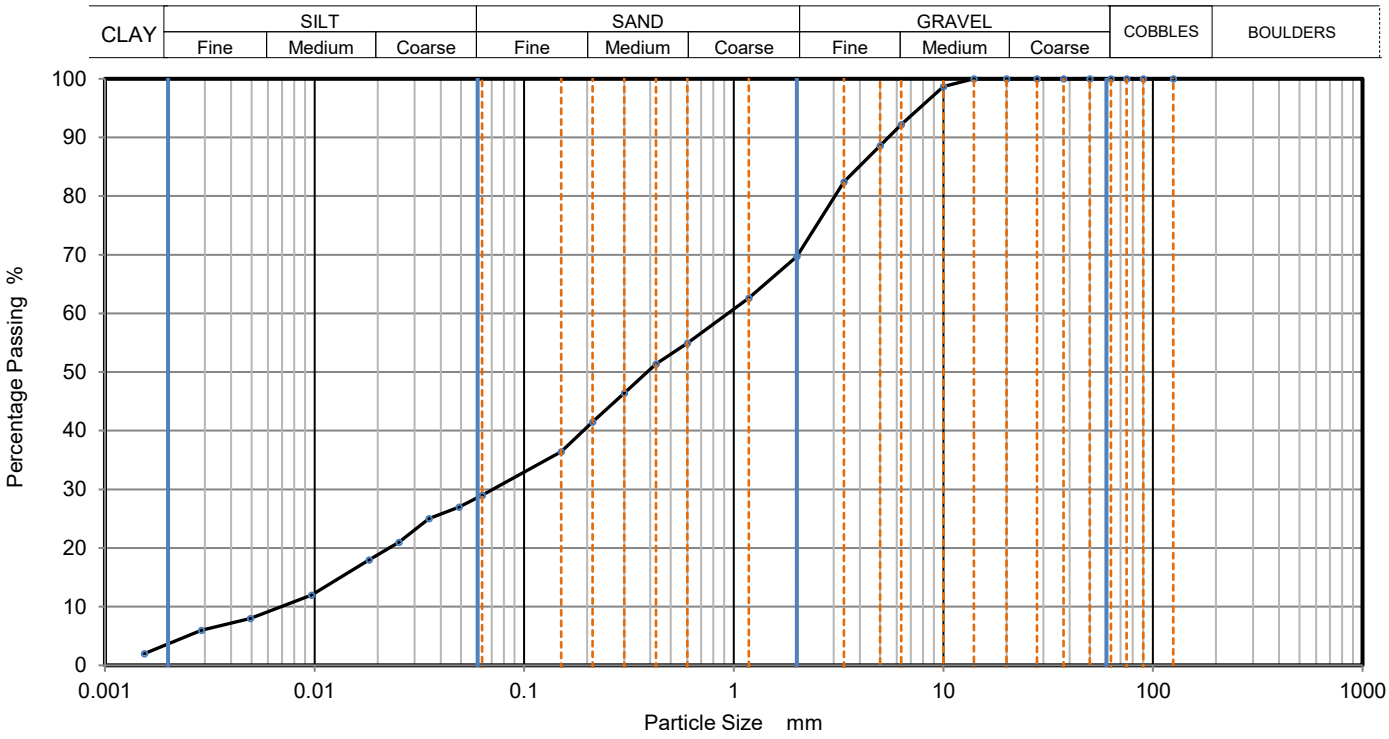
Grading Analysis		
D100	mm	
D60	mm	0.708
D30	mm	0.0584
D10	mm	0.00711
Uniformity Coefficient		100
Curvature Coefficient		0.68

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH04
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly gravelly silty fine to coarse SAND.			Sample Depth (m) Top	2.50
				Base	3.50
Specimen Reference	3	Specimen Depth	2.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401317



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	29
90	100	0.04901	27
75	100	0.03510	25
63	100	0.02529	21
50	100	0.01821	18
37.5	100	0.00968	12
28	100	0.00495	8
20	100	0.00289	6
14	100	0.00154	2
10	99		
6.3	92		
5	89		
3.35	82		
2	70		
1.18	63		
0.6	55	Particle density	(assumed)
0.425	51	2.65	Mg/m3
0.3	46		
0.212	42		
0.15	36		
0.063	29		

Dry Mass of sample, g: 487

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	30.3
Sand	40.7
Silt	25.4
Clay	3.6

Grading Analysis		
D100	mm	
D60	mm	0.939
D30	mm	0.0709
D10	mm	0.00688
Uniformity Coefficient		140
Curvature Coefficient		0.78

Remarks

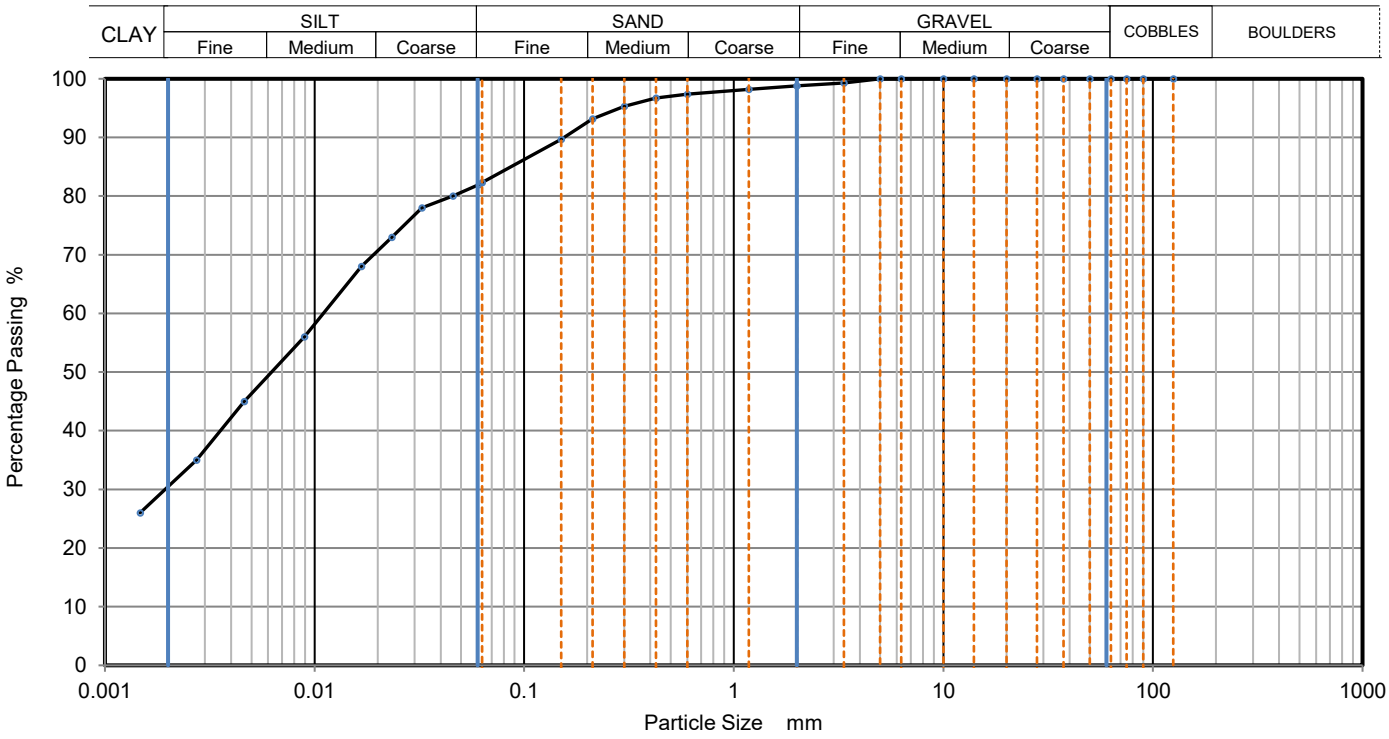
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH06
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Greyish brown slightly clayey fine to coarse SAND.			Sample Depth (m) Top	0.00
				Base	1.50
Specimen Reference	8	Specimen Depth	0 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202401318



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06097	82
90	100	0.04568	80
75	100	0.03255	78
63	100	0.02335	73
50	100	0.01675	68
37.5	100	0.00895	56
28	100	0.00462	45
20	100	0.00273	35
14	100	0.00147	26
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	97	Particle density 2.65	(assumed) Mg/m3
0.425	97		
0.3	95		
0.212	93		
0.15	90		
0.063	82		

Dry Mass of sample, g: 268

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.2
Sand	16.5
Silt	51.8
Clay	30.5

Grading Analysis		
D100	mm	
D60	mm	0.0108
D30	mm	0.00193
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

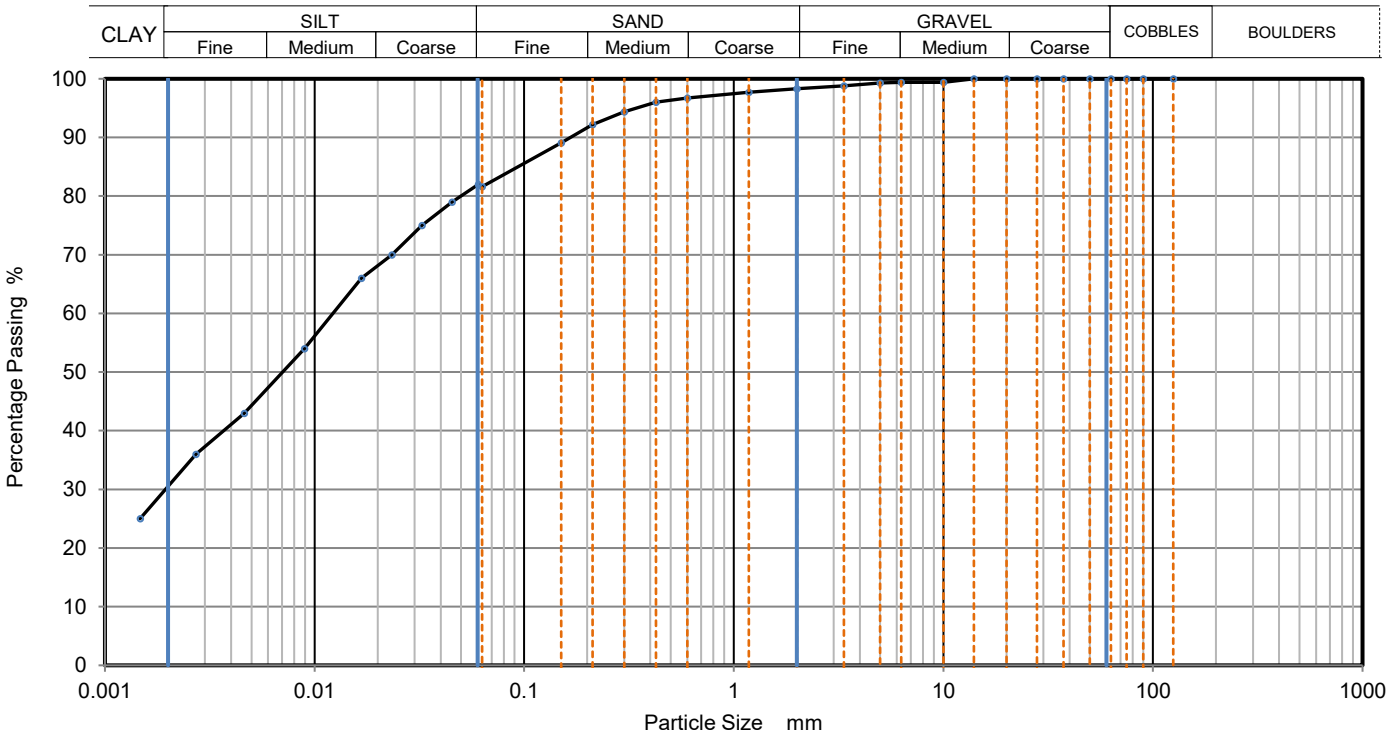
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH06
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.50
				Base	3.00
Specimen Reference	3	Specimen Depth	1.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013110



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06050	82
90	100	0.04534	79
75	100	0.03255	75
63	100	0.02335	70
50	100	0.01675	66
37.5	100	0.00895	54
28	100	0.00462	43
20	100	0.00271	36
14	100	0.00147	25
10	99		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	94		
0.212	92		
0.15	89		
0.063	82		

Dry Mass of sample, g: 273

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.7
Sand	16.6
Silt	51.1
Clay	30.6

Grading Analysis		
D100	mm	
D60	mm	0.0122
D30	mm	0.00193
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

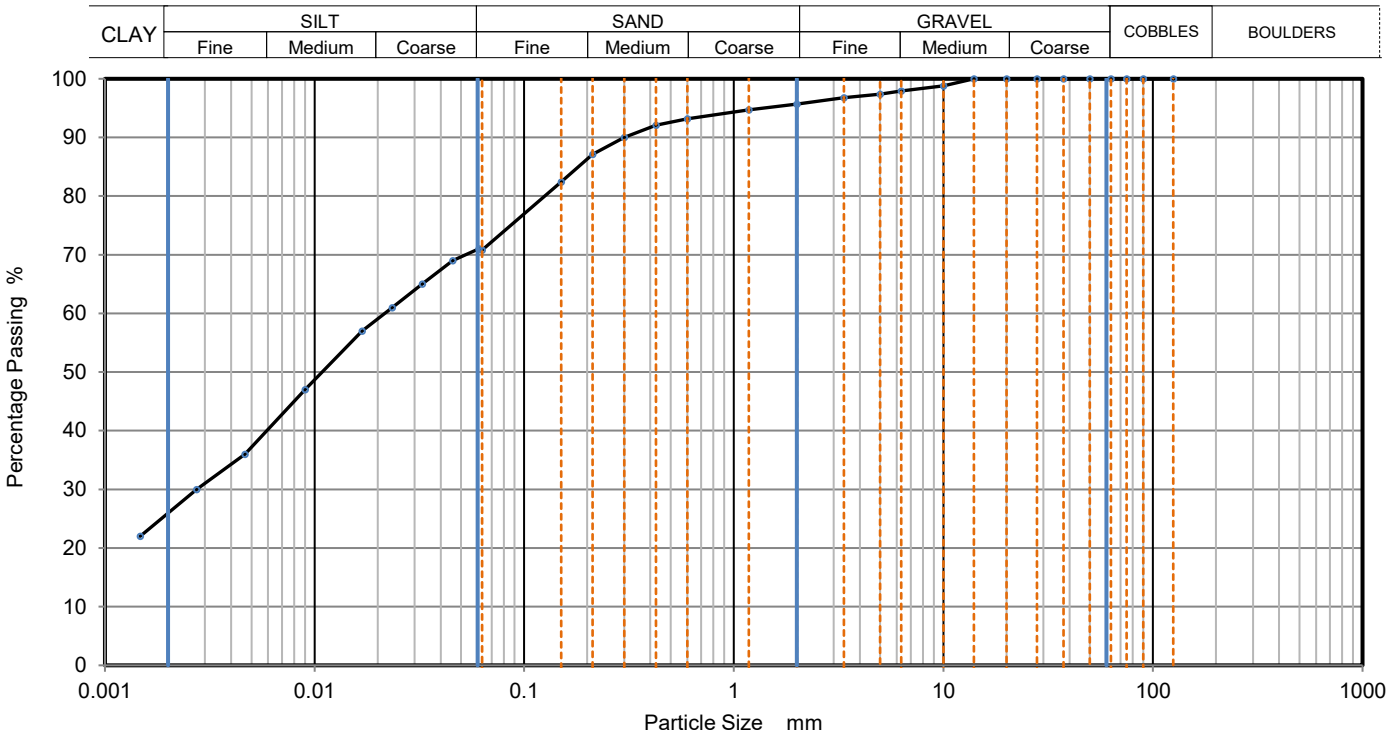
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH06
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Greyish brown sandy silty CLAY.			Sample Depth (m) Top	4.50
				Base	6.00
Specimen Reference	3	Specimen Depth	4.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013113



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06077	71
90	100	0.04554	69
75	100	0.03270	65
63	100	0.02347	61
50	100	0.01684	57
37.5	100	0.00900	47
28	100	0.00465	36
20	100	0.00273	30
14	100	0.00147	22
10	99		
6.3	98		
5	97		
3.35	97		
2	96		
1.18	95		
0.6	93	Particle density	(assumed)
0.425	92	2.65	Mg/m3
0.3	90		
0.212	87		
0.15	82		
0.063	71		

Dry Mass of sample, g: 402

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	4.3
Sand	24.9
Silt	44.5
Clay	26.3

Grading Analysis		
D100	mm	
D60	mm	0.0222
D30	mm	0.00266
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

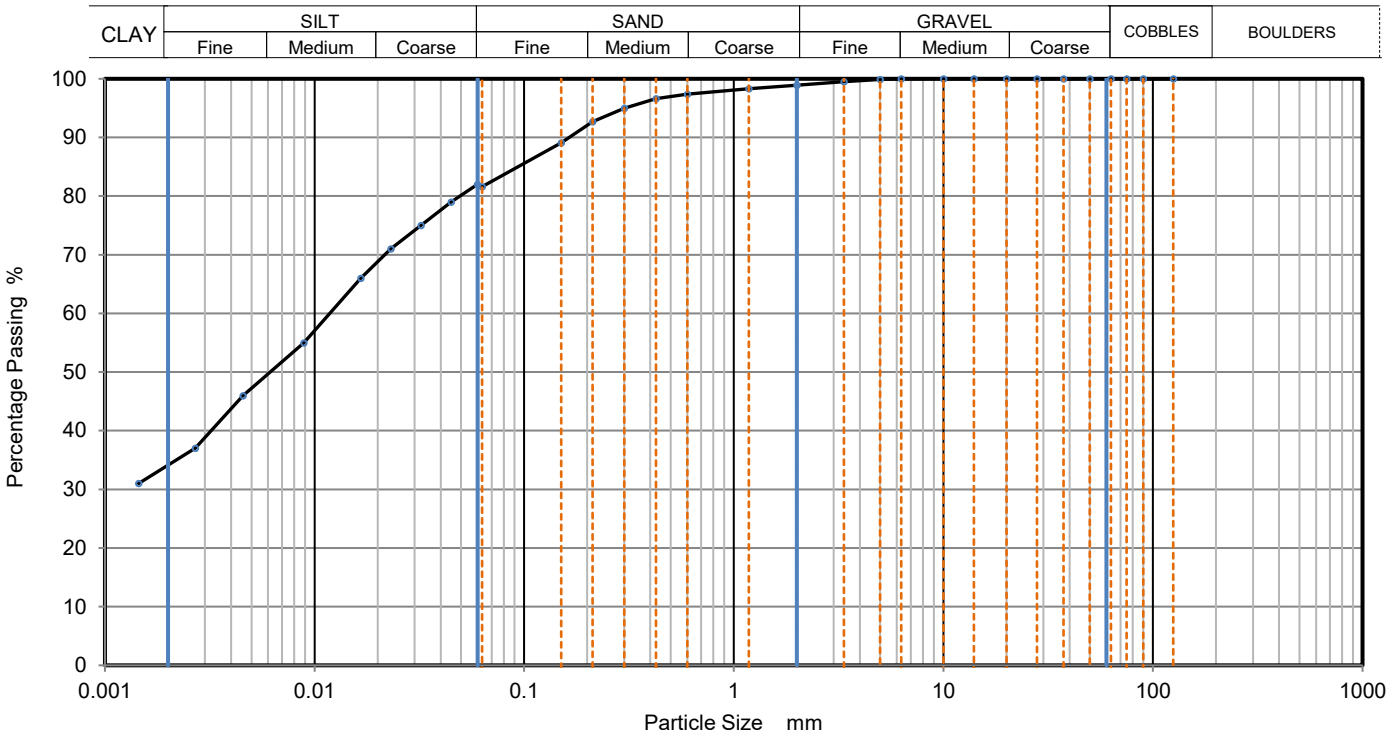
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH08
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.00
				Base	2.00
Specimen Reference	6	Specimen Depth	1 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013118



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05980	82
90	100	0.04482	79
75	100	0.03220	75
63	100	0.02312	71
50	100	0.01659	66
37.5	100	0.00888	55
28	100	0.00456	46
20	100	0.00270	37
14	100	0.00145	31
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	95		
0.212	93		
0.15	89		
0.063	82		

Dry Mass of sample, g: 270

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.1
Sand	17.3
Silt	47.3
Clay	34.3

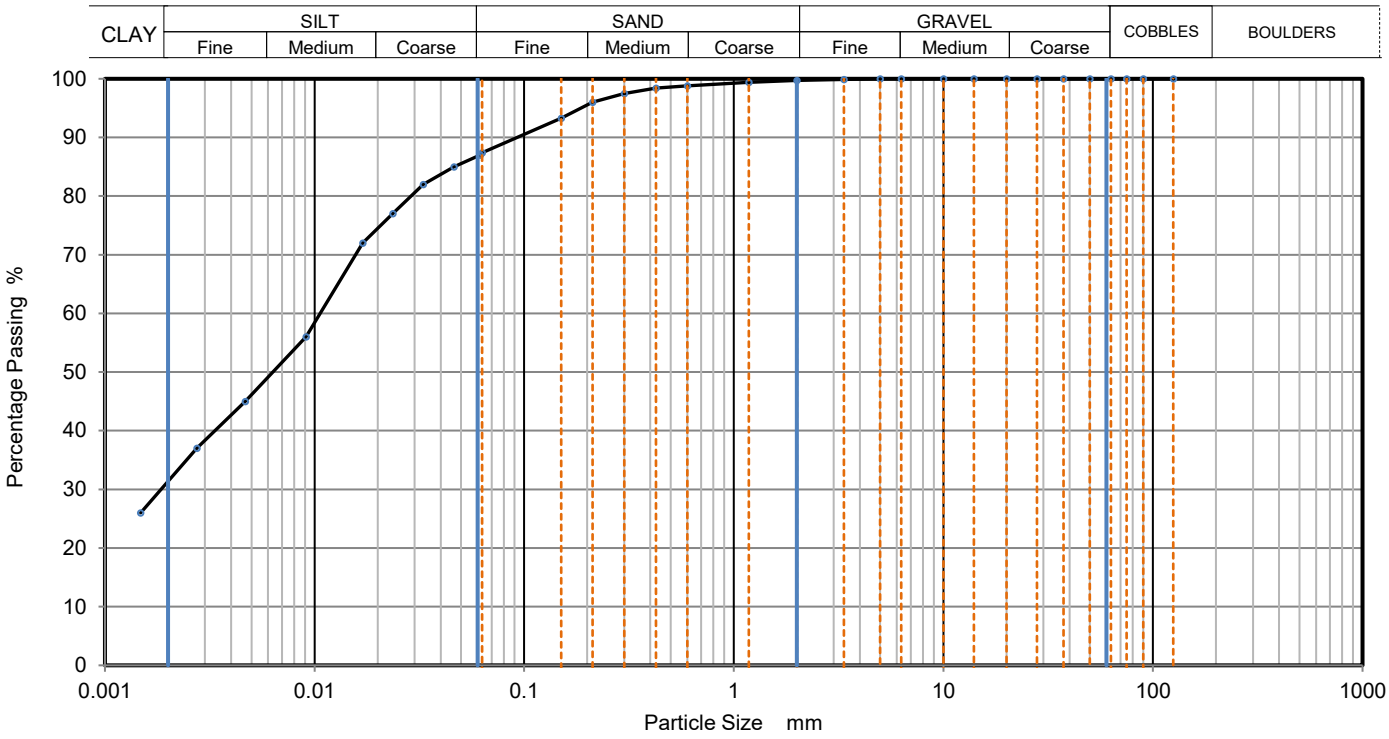
Grading Analysis		
D100	mm	
D60	mm	0.0117
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-BH08
Site Name	Rosslare OWH - GI				Sample No.		2
Specimen Description	Brown slightly sandy silty CLAY.				Sample Depth (m)	Top	2.00
						Base	3.00
Specimen Reference	6	Specimen Depth	2	m	Sample Type		SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus2024013120



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06172	87
90	100	0.04624	85
75	100	0.03295	82
63	100	0.02364	77
50	100	0.01696	72
37.5	100	0.00912	56
28	100	0.00468	45
20	100	0.00275	37
14	100	0.00148	26
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	98		
0.212	96		
0.15	93		
0.063	87		

Dry Mass of sample, g: 264

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.3
Sand	12.3
Silt	55.8
Clay	31.6

Grading Analysis		
D100	mm	
D60	mm	0.0108
D30	mm	0.00182
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

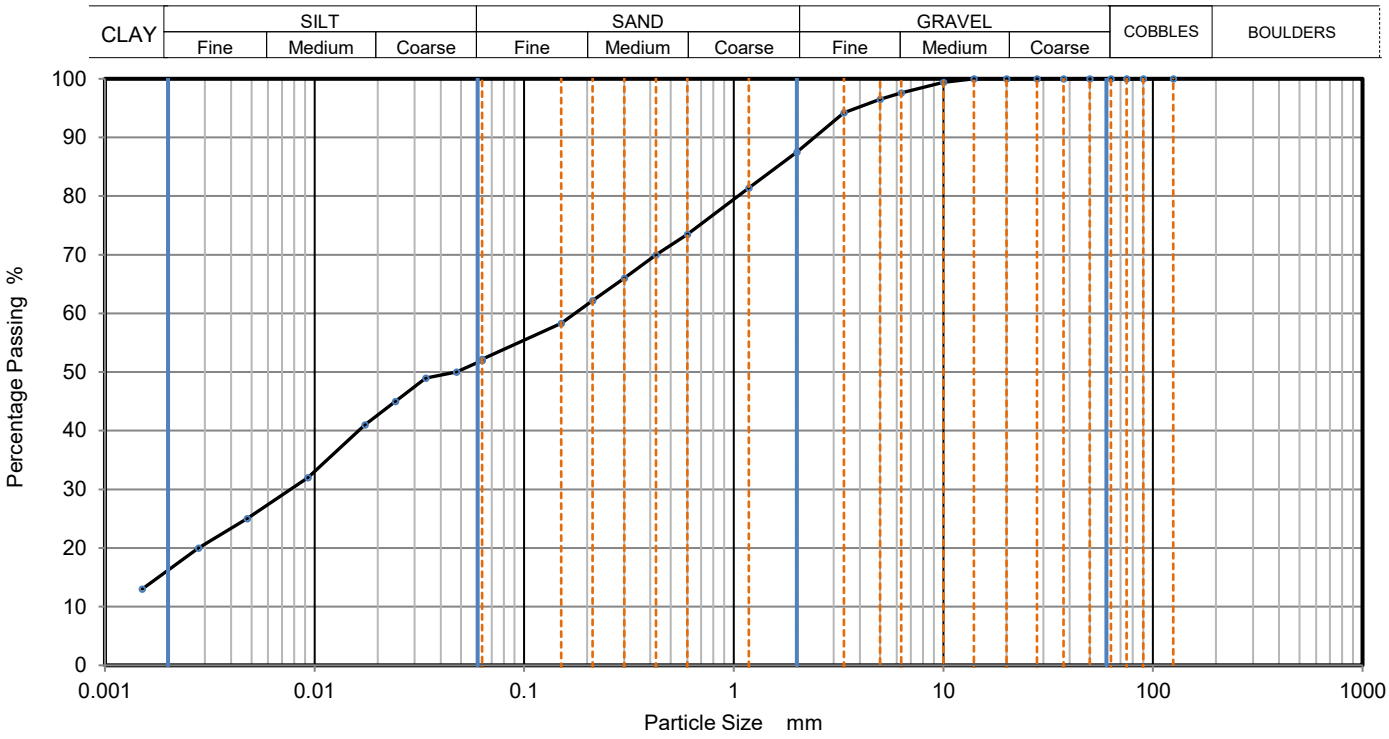
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH08
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown slightly sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	4.00
				Base	5.50
Specimen Reference	6	Specimen Depth	4 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013122



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	52
90	100	0.04762	50
75	100	0.03391	49
63	100	0.02431	45
50	100	0.01743	41
37.5	100	0.00929	32
28	100	0.00476	25
20	100	0.00280	20
14	100	0.00151	13
10	99		
6.3	98		
5	97		
3.35	94		
2	88		
1.18	81		
0.6	74	Particle density	(assumed)
0.425	70	2.65	Mg/m3
0.3	66		
0.212	62		
0.15	58		
0.063	52		

Dry Mass of sample, g: 350

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	12.5
Sand	35.4
Silt	36.2
Clay	15.9

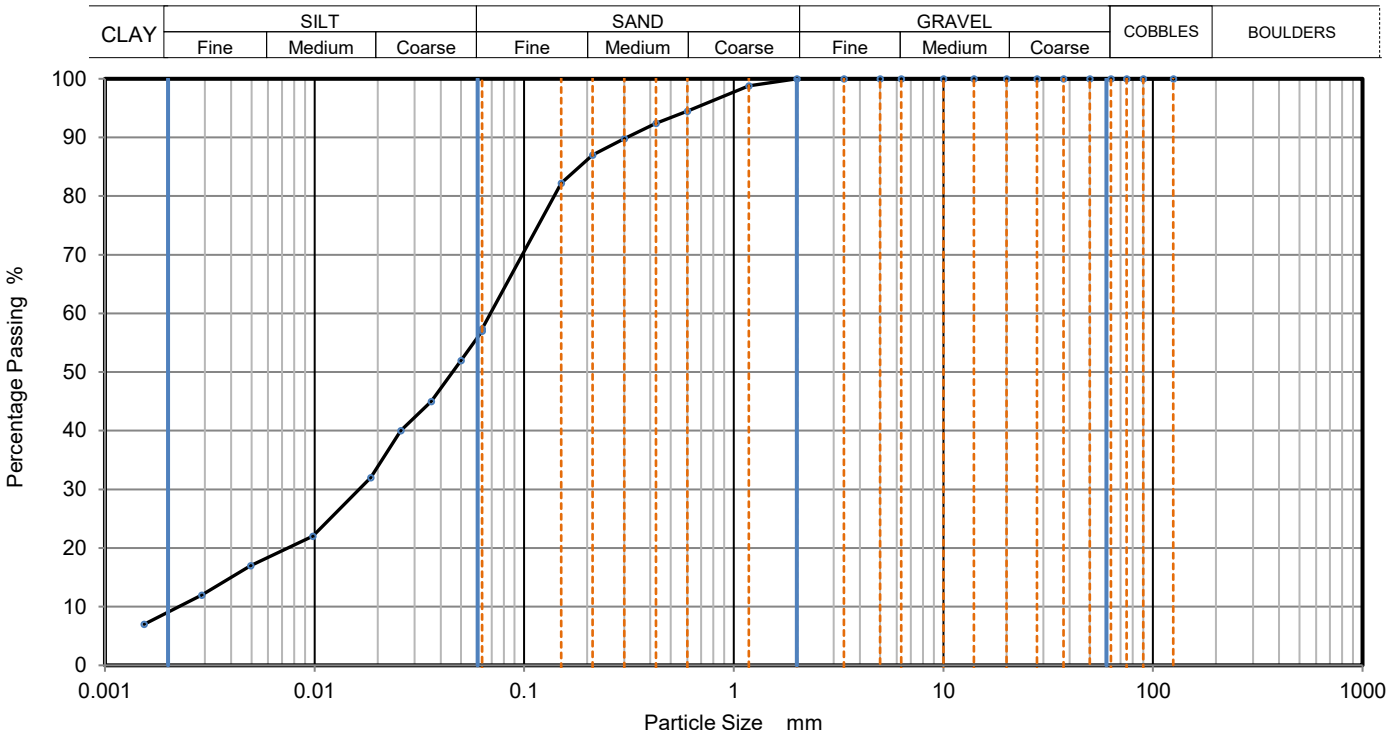
Grading Analysis		
D100	mm	
D60	mm	0.174
D30	mm	0.00744
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH12
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	0.50
				Base	1.50
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013123



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	57
90	100	0.04994	52
75	100	0.03599	45
63	100	0.02577	40
50	100	0.01855	32
37.5	100	0.00980	22
28	100	0.00495	17
20	100	0.00289	12
14	100	0.00154	7
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	95	Particle density	(assumed)
0.425	92	2.65	Mg/m3
0.3	90		
0.212	87		
0.15	82		
0.063	57		

Dry Mass of sample, g: 259

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.0
Sand	42.6
Silt	47.8
Clay	9.6

Grading Analysis		
D100	mm	
D60	mm	0.069
D30	mm	0.0159
D10	mm	0.00211
Uniformity Coefficient		33
Curvature Coefficient		1.7

Remarks

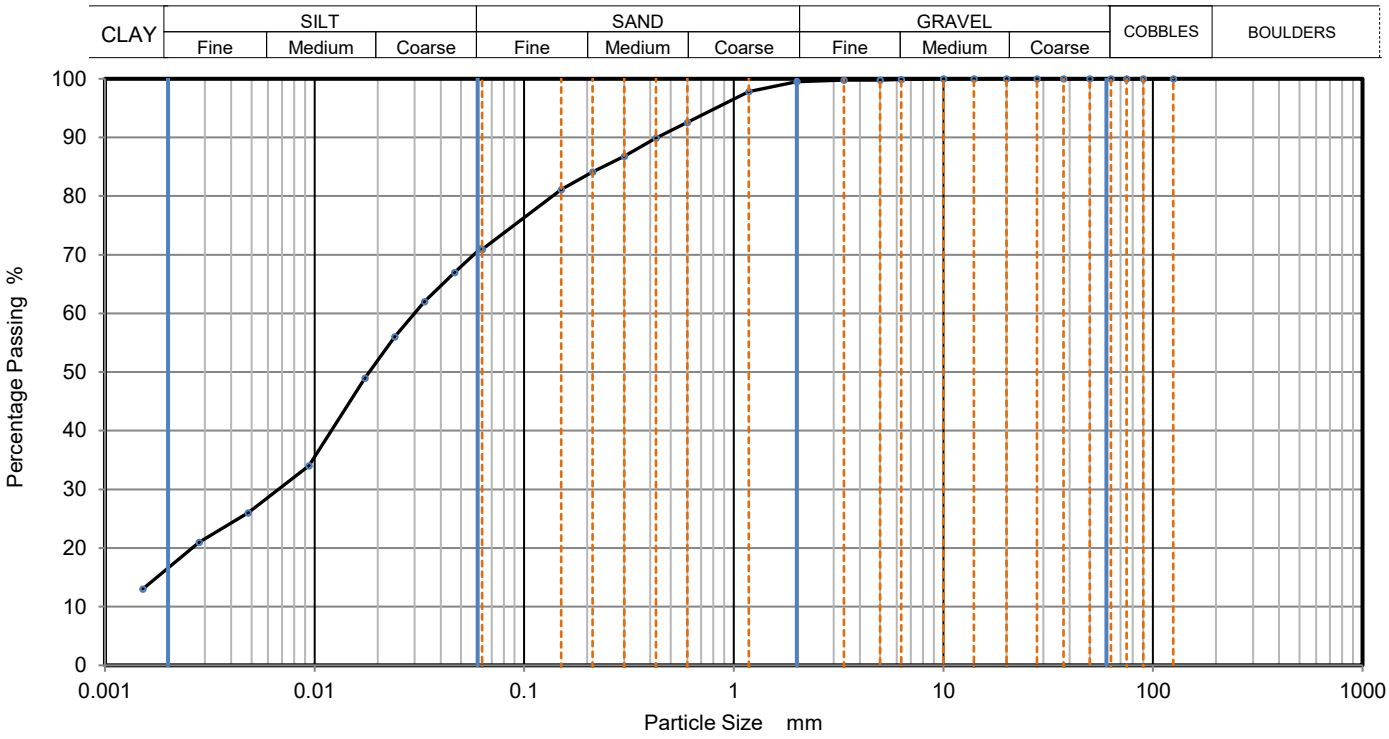
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Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH12
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	3.50
				Base	4.50
Specimen Reference	3	Specimen Depth	3.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013124



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06172	71
90	100	0.04659	67
75	100	0.03343	62
63	100	0.02415	56
50	100	0.01743	49
37.5	100	0.00941	34
28	100	0.00482	26
20	100	0.00281	21
14	100	0.00151	13
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	98		
0.6	93	Particle density	(assumed)
0.425	90	2.65	Mg/m3
0.3	87		
0.212	84		
0.15	81		
0.063	71		

Dry Mass of sample, g: 237

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.5
Sand	28.6
Silt	54.1
Clay	16.8

Grading Analysis		
D100	mm	
D60	mm	0.0298
D30	mm	0.00669
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

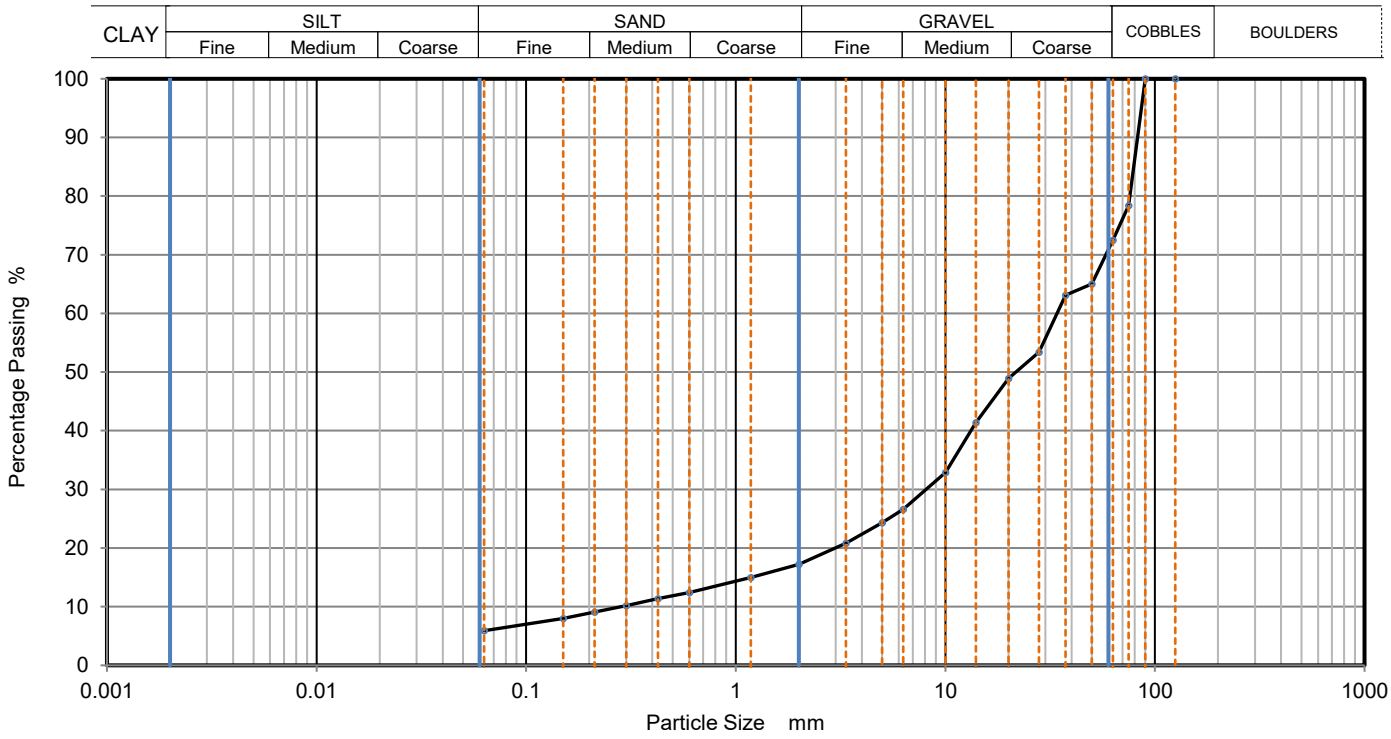
Remarks

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

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Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH12
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Greyish brown slightly sandy slightly clayey subangular fine to coarse GRAVEL with cobbles.			Sample Depth (m) Top	5.50
				Base	6.50
Specimen Reference	3	Specimen Depth	5.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024013127



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	78		
63	73		
50	65		
37.5	63		
28	53		
20	49		
14	41		
10	33		
6.3	27		
5	24		
3.35	21		
2	17		
1.18	15		
0.6	12		
0.425	11		
0.3	10		
0.212	9		
0.15	8		
0.063	6		

Dry Mass of sample, g	6494

Sample Proportions	% dry mass
Cobbles	27.5
Gravel	55.2
Sand	11.3
Fines <0.063mm	6.0

Grading Analysis		
D100	mm	
D60	mm	34.2
D30	mm	8.08
D10	mm	0.281
Uniformity Coefficient		120
Curvature Coefficient		6.8

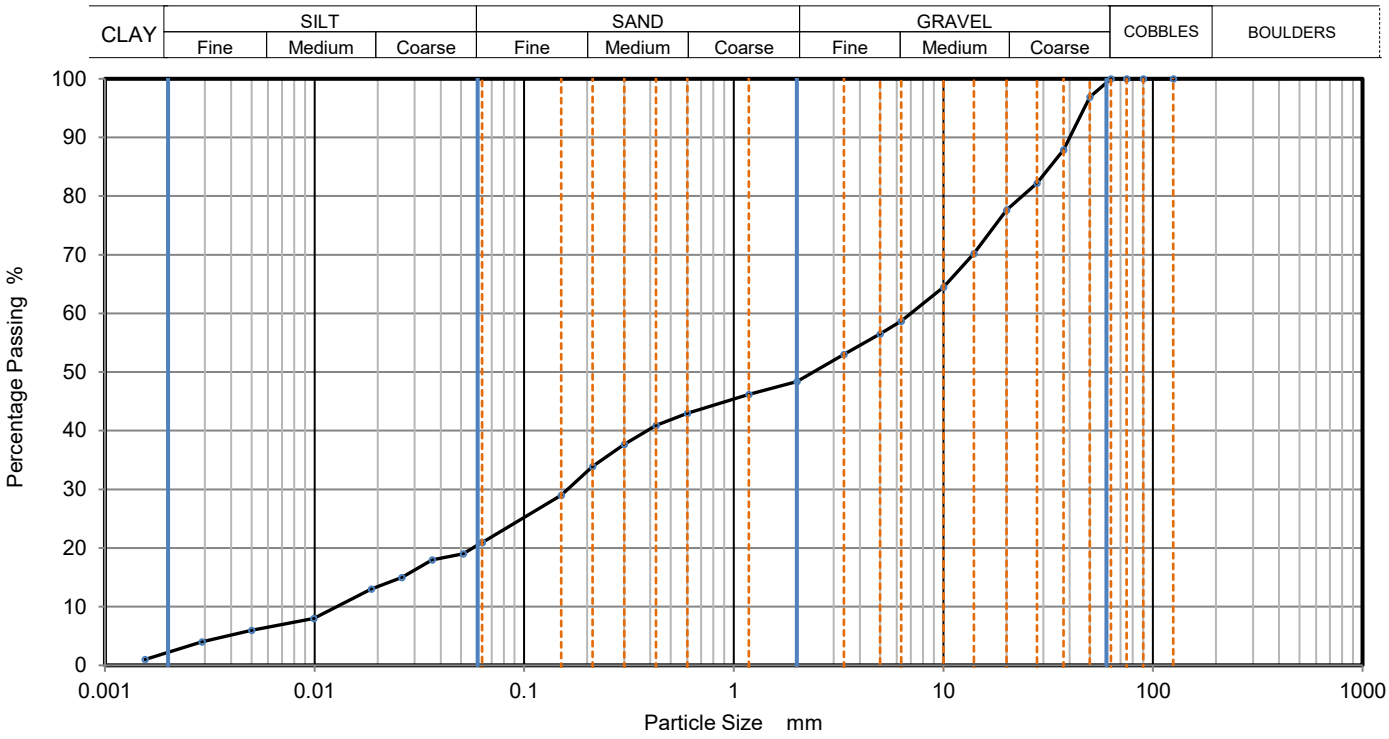
Remarks

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

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Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH13
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown sandy gravelly silty CLAY.			Sample Depth (m) Top	0.50
				Base	1.50
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013128



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	21
90	100	0.05122	19
75	100	0.03644	18
63	100	0.02608	15
50	97	0.01866	13
37.5	88	0.00991	8
28	82	0.00501	6
20	78	0.00291	4
14	70	0.00155	1
10	65		
6.3	59		
5	57		
3.35	53		
2	48		
1.18	46		
0.6	43	Particle density	(assumed)
0.425	41	2.65	Mg/m3
0.3	38		
0.212	34		
0.15	29		
0.063	21		

Dry Mass of sample, g: 7175

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	51.6
Sand	27.5
Silt	18.5
Clay	2.4

Grading Analysis		
D100	mm	
D60	mm	7.01
D30	mm	0.161
D10	mm	0.0129
Uniformity Coefficient		540
Curvature Coefficient		0.29

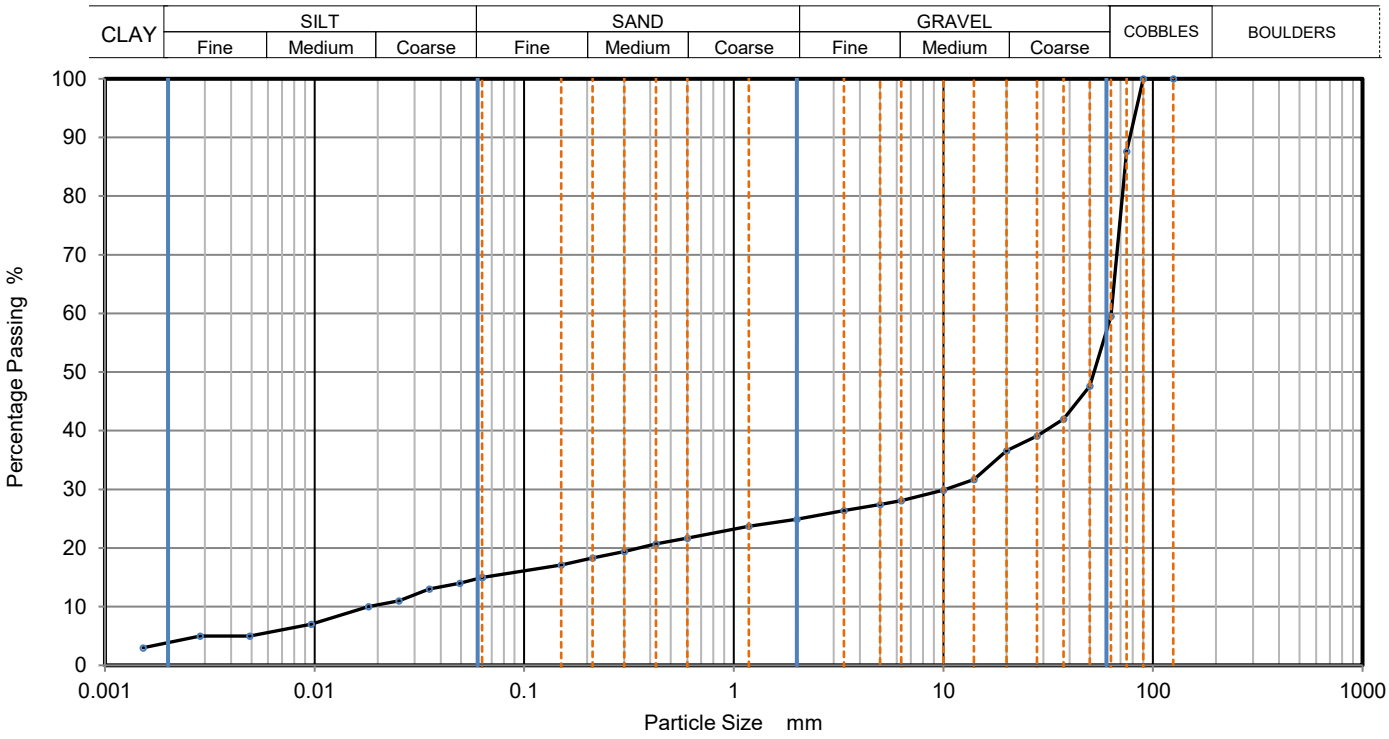
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH13
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy gravelly silty CLAY with cobbles.			Sample Depth (m) Top	1.50
				Base	2.00
Specimen Reference	3	Specimen Depth	1.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013129



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	15
90	100	0.04929	14
75	88	0.03531	13
63	60	0.02529	11
50	48	0.01811	10
37.5	42	0.00963	7
28	39	0.00490	5
20	37	0.00284	5
14	32	0.00152	3
10	30		
6.3	28		
5	27		
3.35	26		
2	25		
1.18	24		
0.6	22	Particle density (assumed)	
0.425	21	2.65 Mg/m3	
0.3	19		
0.212	18		
0.15	17		
0.063	15		

Dry Mass of sample, g: 8486

Sample Proportions	% dry mass
Cobbles	40.5
Gravel	34.6
Sand	9.9
Silt	11.2
Clay	3.8

Grading Analysis		
D100	mm	
D60	mm	63.2
D30	mm	10.3
D10	mm	0.0174
Uniformity Coefficient		3600
Curvature Coefficient		96

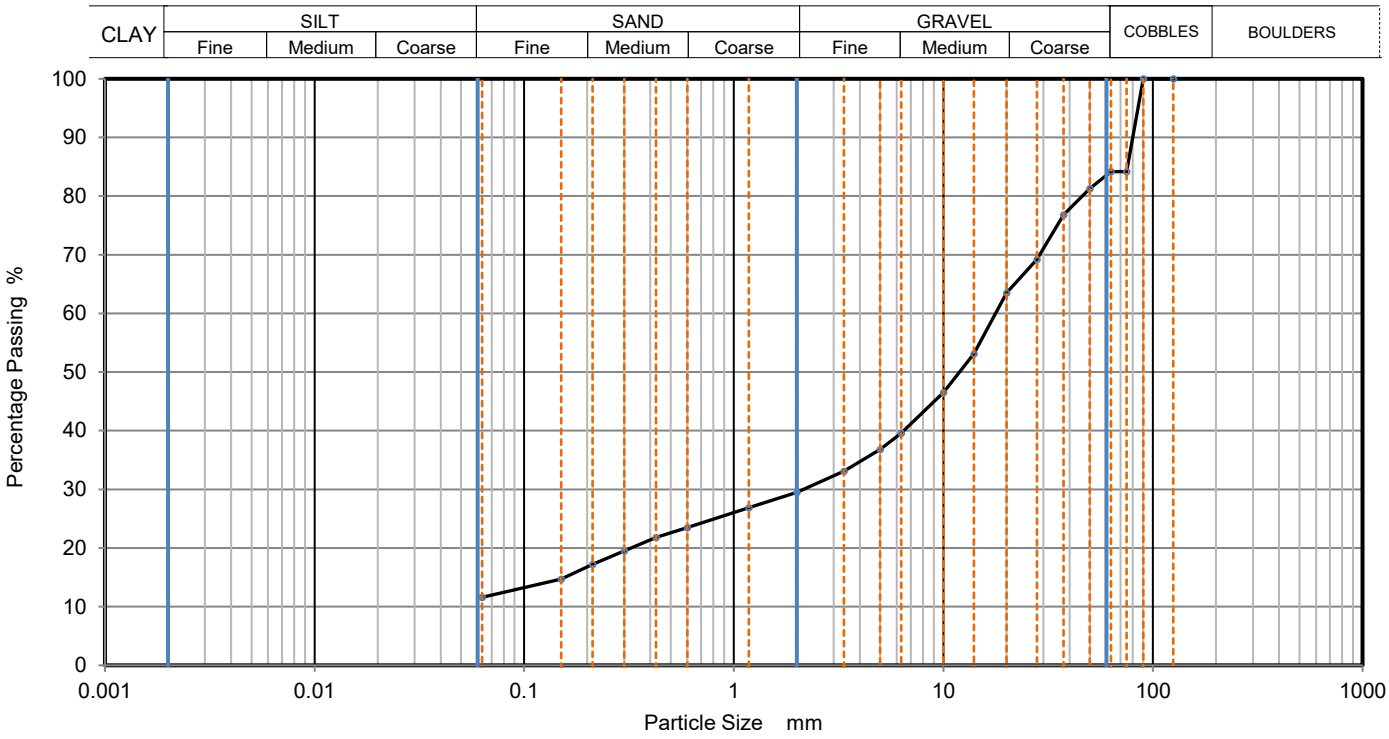
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH14
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown slightly sandy slightly silty subangular fine to coarse GRAVEL.			Sample Depth (m) Top	0.50
				Base	1.50
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024013130



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	84		
63	84		
50	81		
37.5	77		
28	69		
20	64		
14	53		
10	47		
6.3	40		
5	37		
3.35	33		
2	30		
1.18	27		
0.6	24		
0.425	22		
0.3	20		
0.212	17		
0.15	15		
0.063	12		

Dry Mass of sample, g	7487

Sample Proportions	% dry mass
Cobbles	15.8
Gravel	54.7
Sand	18.0
Fines <0.063mm	12.0

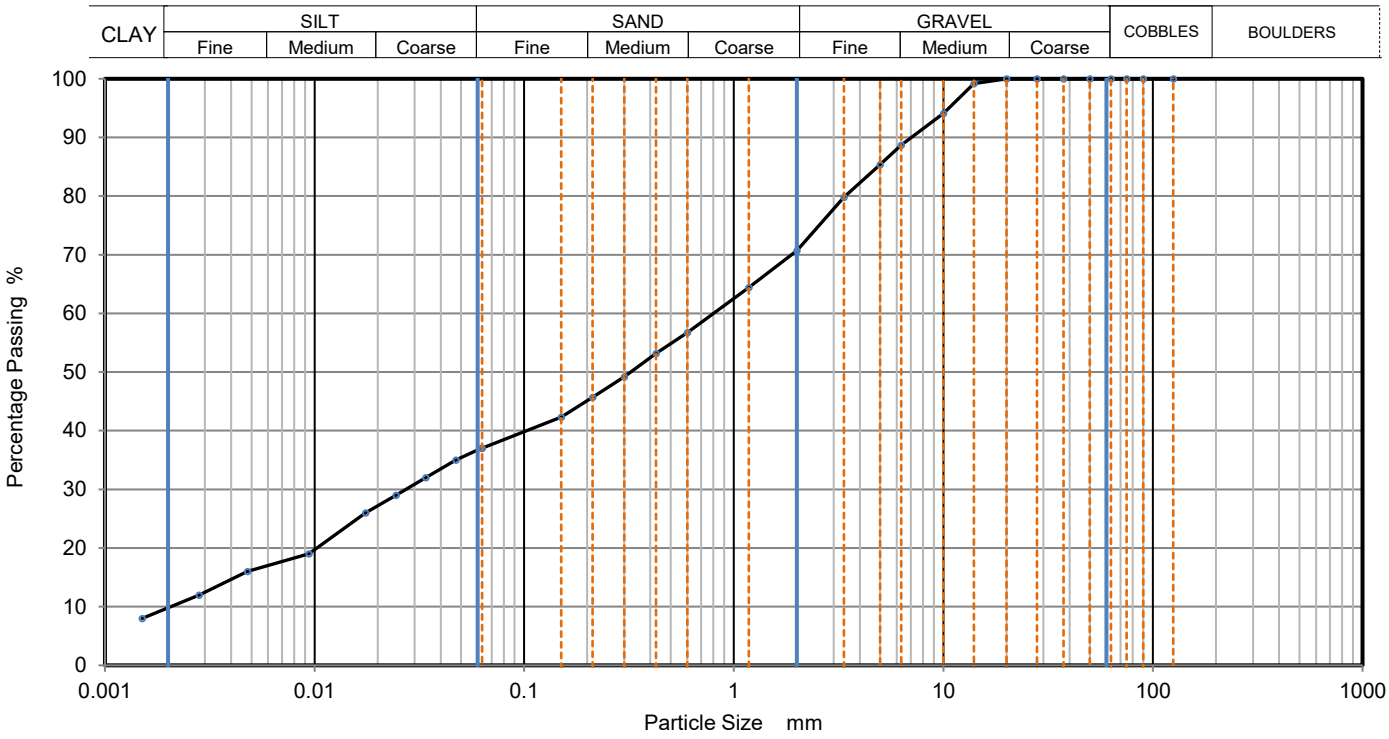
Grading Analysis		
D100	mm	
D60	mm	17.7
D30	mm	2.14
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH14
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Greyish brown slightly gravelly clayey fine to coarse SAND.			Sample Depth (m) Top	2.00
				Base	3.00
Specimen Reference	3	Specimen Depth	2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013132



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06266	37
90	100	0.04728	35
75	100	0.03391	32
63	100	0.02448	29
50	100	0.01754	26
37.5	100	0.00941	19
28	100	0.00479	16
20	100	0.00281	12
14	99	0.00151	8
10	94		
6.3	89		
5	85		
3.35	80		
2	71		
1.18	64		
0.6	57	Particle density	(assumed)
0.425	53	2.65	Mg/m3
0.3	49		
0.212	46		
0.15	42		
0.063	37		

Dry Mass of sample, g: 387

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.3
Sand	33.7
Silt	27.0
Clay	10.0

Grading Analysis		
D100	mm	
D60	mm	0.804
D30	mm	0.0277
D10	mm	0.00201
Uniformity Coefficient		400
Curvature Coefficient		0.48

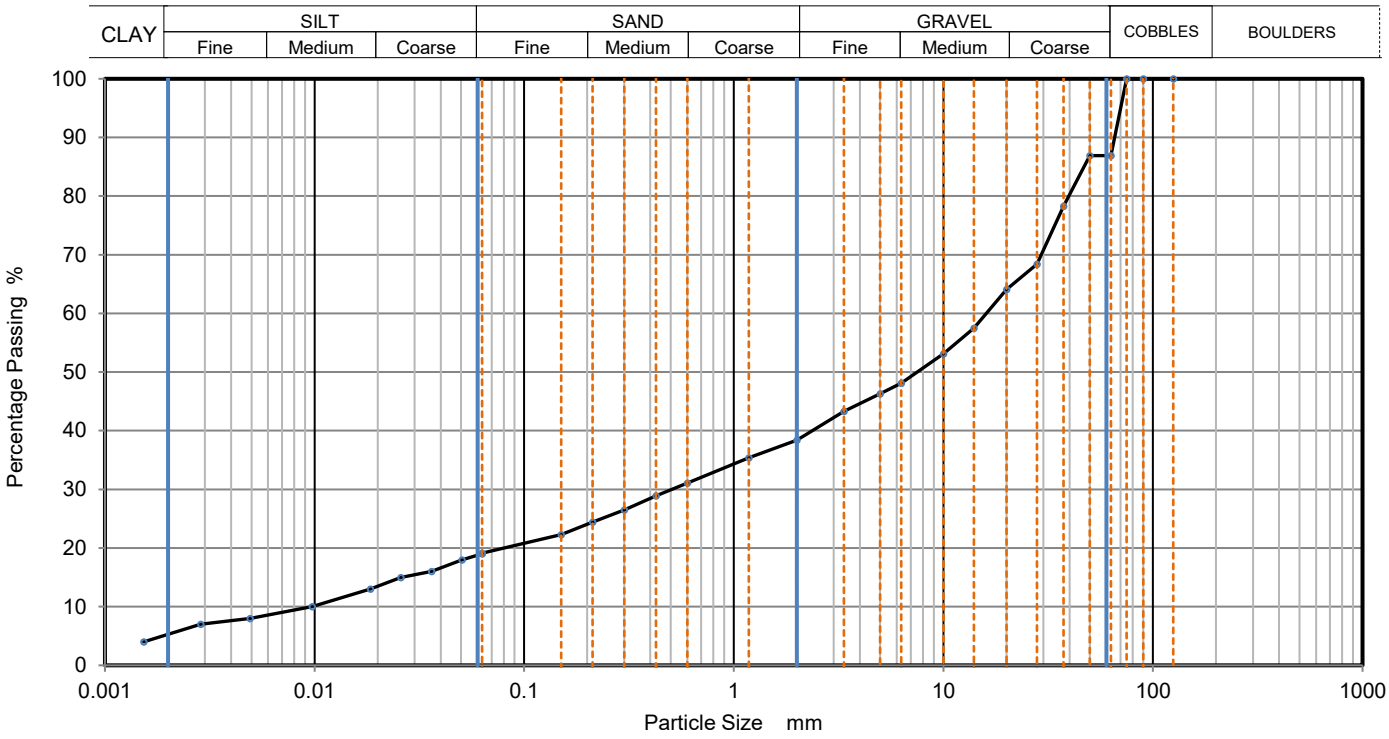
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH15
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Greenish grey sandy gravelly silty CLAY with some cobbles.			Sample Depth (m) Top	1.00
				Base	2.00
Specimen Reference	3	Specimen Depth	1 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013133



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	19
90	100	0.05058	18
75	100	0.03621	16
63	87	0.02577	15
50	87	0.01844	13
37.5	78	0.00975	10
28	68	0.00493	8
20	64	0.00286	7
14	58	0.00153	4
10	53		
6.3	48		
5	46		
3.35	43		
2	38		
1.18	35		
0.6	31	Particle density	(assumed)
0.425	29	2.65	Mg/m3
0.3	27		
0.212	24		
0.15	22		
0.063	19		

Dry Mass of sample, g: 6988

Sample Proportions	% dry mass
Cobbles	13.1
Gravel	48.6
Sand	19.3
Silt	14.0
Clay	5.0

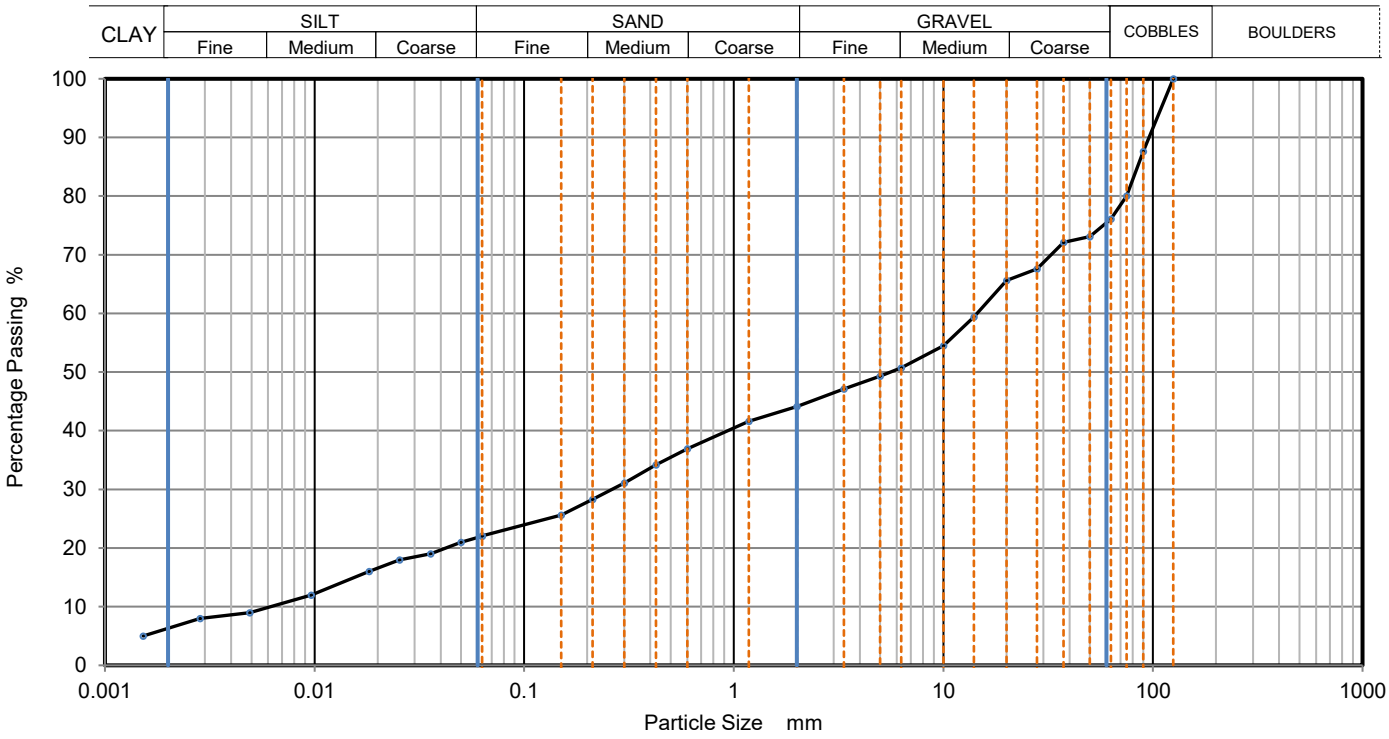
Grading Analysis		
D100	mm	
D60	mm	16
D30	mm	0.504
D10	mm	0.0105
Uniformity Coefficient		1500
Curvature Coefficient		1.5

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH15
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Greenish grey sandy gravelly silty CLAY.			Sample Depth (m) Top	2.00
				Base	3.00
Specimen Reference	3	Specimen Depth	2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013134



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	22
90	88	0.04994	21
75	80	0.03577	19
63	76	0.02545	18
50	73	0.01822	16
37.5	72	0.00963	12
28	68	0.00490	9
20	66	0.00284	8
14	59	0.00152	5
10	55		
6.3	51		
5	49		
3.35	47		
2	44		
1.18	42		
0.6	37	Particle density	(assumed)
0.425	34	2.65	Mg/m3
0.3	31		
0.212	28		
0.15	26		
0.063	22		

Dry Mass of sample, g: 9586

Sample Proportions	% dry mass
Cobbles	23.9
Gravel	32.0
Sand	22.0
Silt	15.8
Clay	6.3

Grading Analysis		
D100	mm	125
D60	mm	14.5
D30	mm	0.261
D10	mm	0.00608
Uniformity Coefficient		2400
Curvature Coefficient		0.77

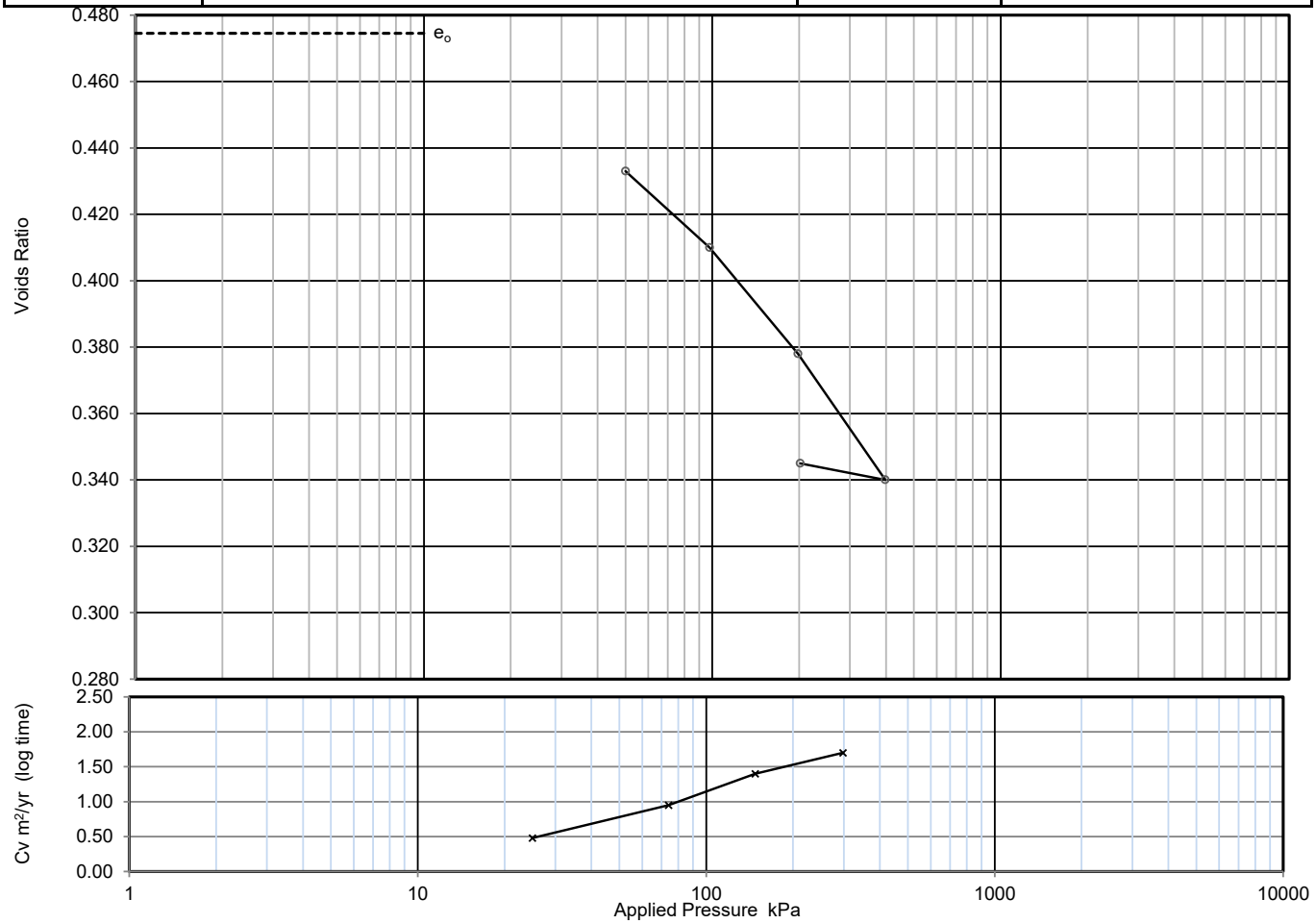
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH06
Site Name	Rosslare OWH - GI				Sample No.		12
Soil Description	Greyish brown slightly sandy silty CLAY.				Sample Depth (m)	Top	1.50
						Bottom	1.95
Specimen Reference	3	Specimen Depth	1.55	m	Sample Type		UT
Specimen Description	Greyish brown slightly sandy silty CLAY.				KeyLAB ID		Caus202401319
Test Method	BS1377:Part 5:1990, clause 3				Date started		30/01/2024



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.475	-	-	-	-
50	0.433	0.56	0.48	0.42	0.002
98	0.410	0.34	0.95	1.4	0.00098
198	0.378	0.23	1.4	7.2	0.0011
398	0.340	0.14	1.7	7.6	0.0013
202	0.345	0.019			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.15	mm
Moisture Content	17.0	21.0	%
Bulk density	2.10	2.38	Mg/m3
Dry density	1.80	1.97	Mg/m3
Voids Ratio	0.475	0.345	
Saturation	95	161	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

Printed :

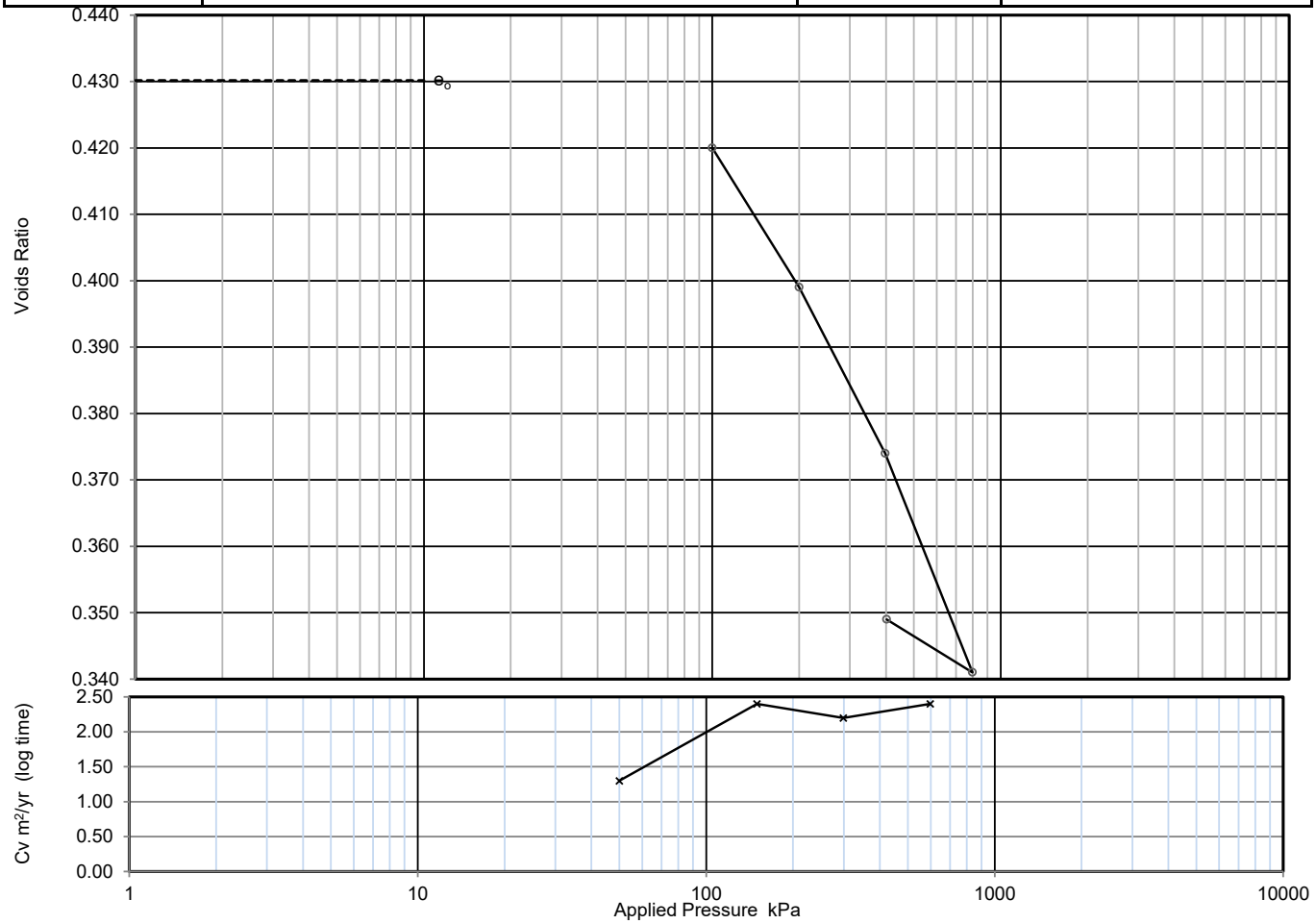
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LAB 13R - Version 6

UKAS TESTING

10122

CAUSEWAY GEOTECH	**ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3**			Job Ref	23-0585
				Borehole/Pit No.	M-BH06
Site Name	Rosslare OWH - GI			Sample No.	13
Soil Description	Greyish brown sandy silty CLAY.			Sample Depth (m) Top	4.50
				Bottom	4.95
Specimen Reference	5	Specimen Depth	4.55 m	Sample Type	U
Specimen Description	Greyish brown sandy silty CLAY.			KeyLAB ID	Caus2024013114
Test Method	BS1377:Part 5:1990, clause 3			Date started	02/02/2024



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.430	-	-	-	-
100	0.420	0.073	1.3	1.5	0.0011
200	0.399	0.15	2.4	7.3	0.00084
398	0.374	0.092	2.2	19	0.0013
798	0.341	0.06	2.4	14	0.0014
402	0.349	0.015			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.77	mm
Moisture Content	18.0	21.0	%
Bulk density	2.18	2.38	Mg/m3
Dry density	1.85	1.96	Mg/m3
Voids Ratio	0.430	0.349	
Saturation	110	160	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

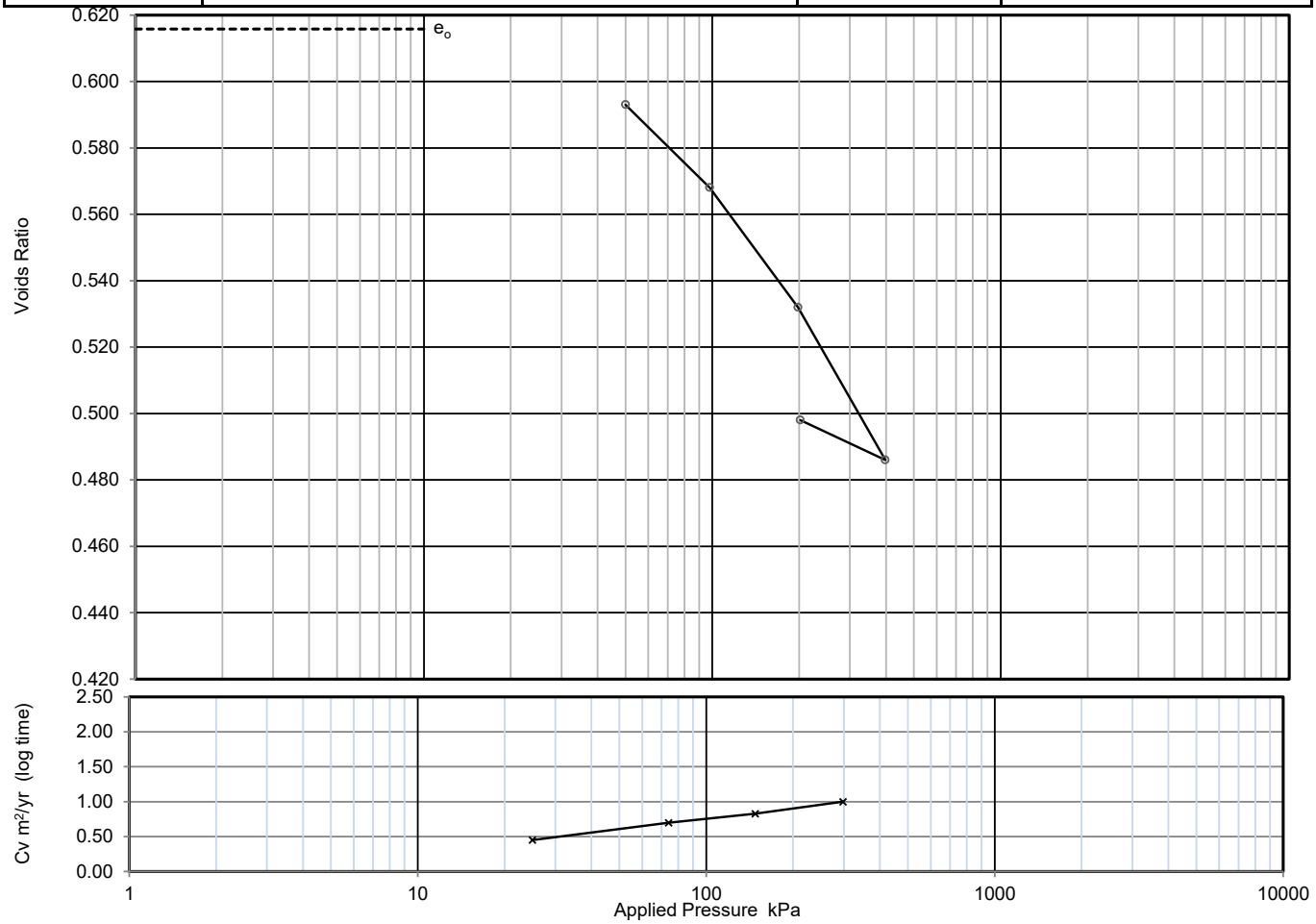
Approved: Stephen Watson

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LAB 13R - Version 6

UKAS TESTING 10122

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH08
Site Name	Rosslare OWH - GI				Sample No.		8
Soil Description	Brown slightly sandy silty CLAY.				Sample Depth (m)	Top	2.00
						Bottom	2.45
Specimen Reference	5	Specimen Depth	2.05	m	Sample Type		UT
Specimen Description	Brown slightly sandy silty CLAY.				KeyLAB ID		Caus2024013119
Test Method	BS1377:Part 5:1990, clause 3				Date started		02/02/2024



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.616	-	-	-	-
50	0.593	0.28	0.45	0.42	0.0013
98	0.568	0.33	0.7	0.85	0.0016
198	0.532	0.23	0.83	1.3	0.0022
398	0.486	0.15	1	1.3	0.0024
202	0.498	0.042			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.45	mm
Moisture Content	24.0	27.0	%
Bulk density	2.03	2.25	Mg/m3
Dry density	1.64	1.77	Mg/m3
Voids Ratio	0.616	0.498	
Saturation	102	144	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

Printed :

20/02/2024 15:04

LAB 13R - Version 6

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10122

Summary of Laboratory Vane Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

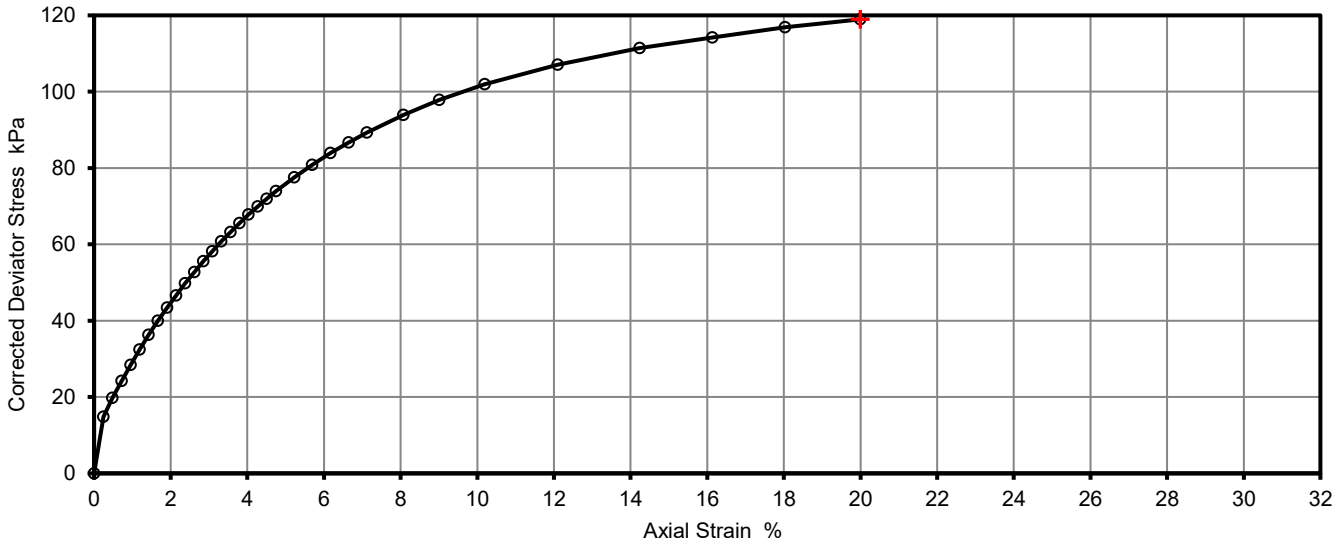
Hole No.	Sample				Specimen Description at test horizon	Moisture Content %	Vane shear strength		Sensitivity	Remarks
	Ref	Top	Base	Type			Undisturbed kPa	Remoulded kPa		
M-BH06	13	4.50	4.95	U	Greyish brown sandy silty CLAY.	20	130			

Notes	Date Printed	Approved By	Table
Tests performed in accordance with BS 1377:Part 7:clause 3 using 19mm x 30mm vane Tests carried out in nominally 100mm diameter tube unless noted otherwise Shear strengths are average of at least 3 tests unless noted otherwise	20/02/2024	Stephen Watson	1 sheet 1

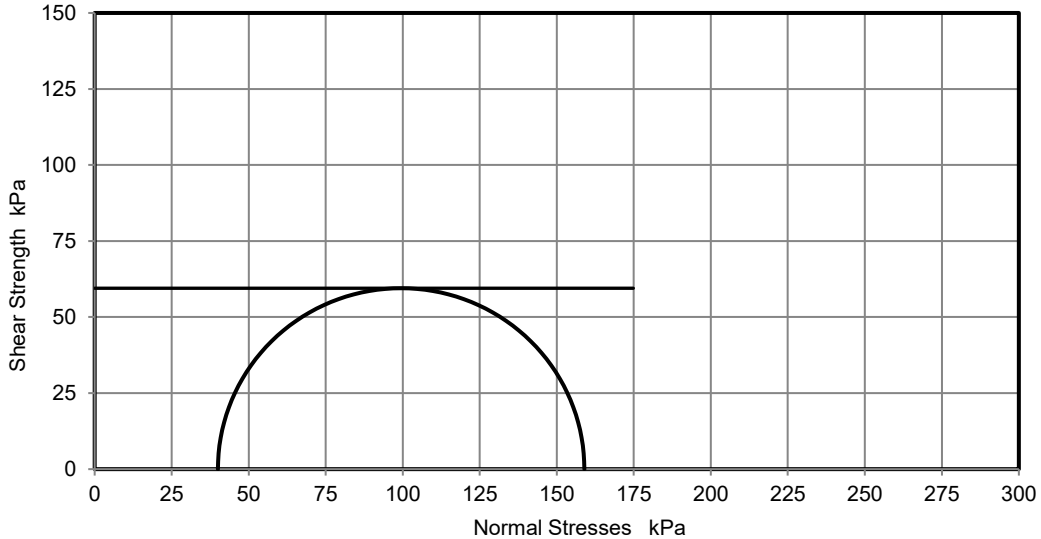
CAUSEWAY GEOTECH	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	23-0585
				Borehole/Pit No.	M-BH08
Site Name	Rosslare OWH - GI			Sample No.	8
Soil Description	Brown slightly sandy silty CLAY.			Depth	2.00
Specimen Reference	6	Specimen Depth	2.05 m	Sample Type	UT
Specimen Description	Firm brown slightly sandy silty CLAY.			KeyLAB ID	Caus2024013119
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	31/01/2024

Sample Condition		UNDISTURBED	
Test Number		1	
Length		210.2	mm
Diameter		105.4	mm
Bulk Density		1.96	Mg/m3
Moisture Content		26	%
Dry Density		1.56	Mg/m3
Rate of Strain		3.0	%/min
Cell Pressure		40	kPa
At failure	Axial Strain	20.0	%
	Deviator Stress, (σ1 - σ3)f	119	kPa
	Undrained Shear Strength, cu	59	kPa ½(σ1 - σ3)f
	Mode of Failure		

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks

No failure defined. Testing terminated at 20% axial strain.

Approved: Stephen Watson

Printed: 20/02/2024 15:05

UKAS TESTING
10122

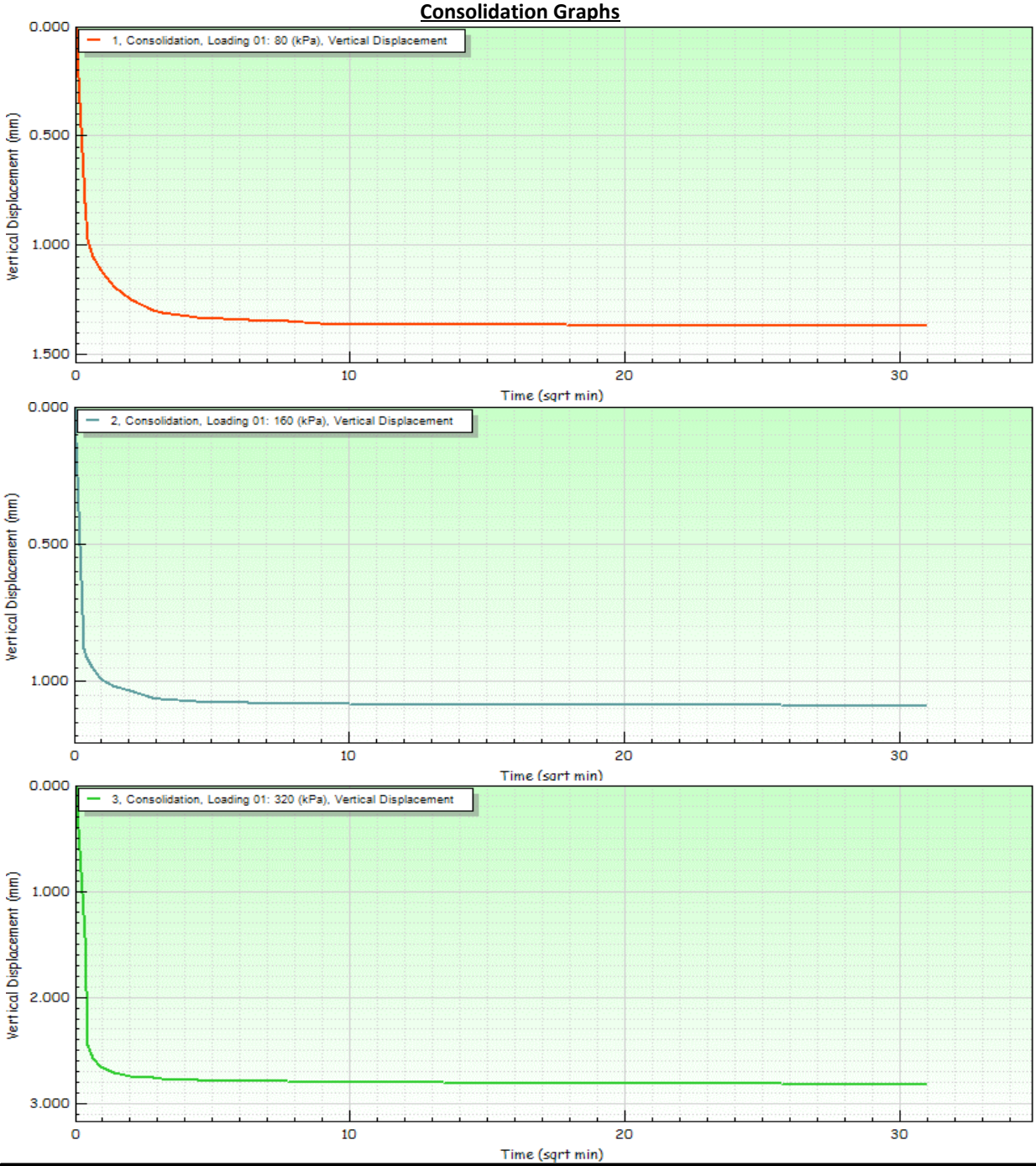
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH06	Sample Reference		7	
Depth (m)	9.00	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	8.8	8.8	8.8
Bulk Density (Mg/m^3)	1.97	1.96	1.95
Dry Density (Mg/m^3)	1.81	1.80	1.80
Voids Ratio	0.463	0.474	0.475
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	1.366	1.090	2.820
Shearing			
Rate of Strain (mm/min)	0.073	0.073	0.073
Peak Shear Stress (kPa)	67.0	109.9	187.6
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	9.543	6.423	4.857
Final Conditions			
Water Content (%)	19.0	18.0	18.0
Dry Density (Mg/m^3)	2.17	2.02	2.53
Voids Ratio	0.311	0.372	0.226

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH06	Sample Reference	7	
Depth (m)	9.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

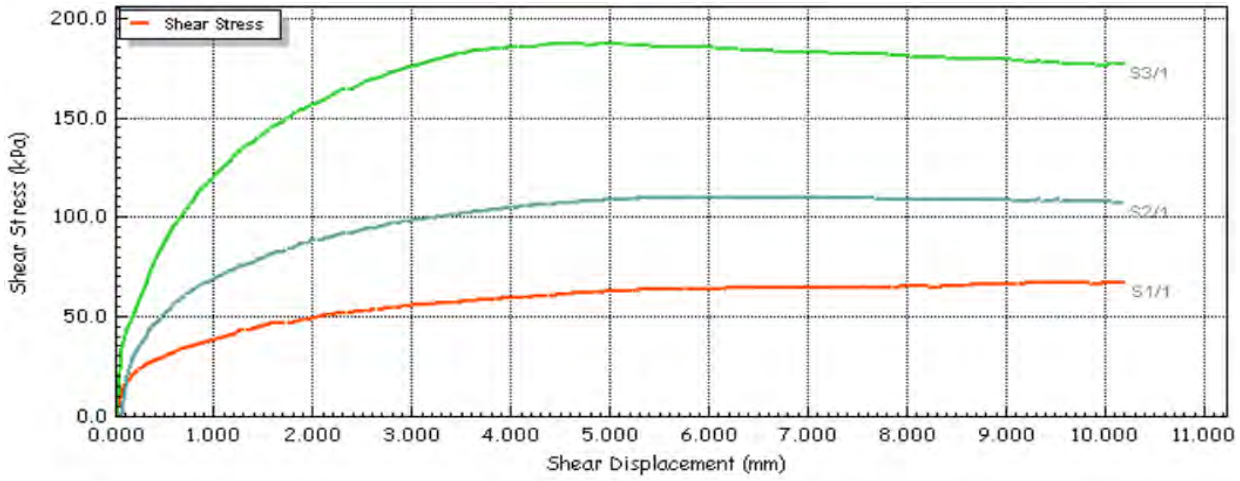


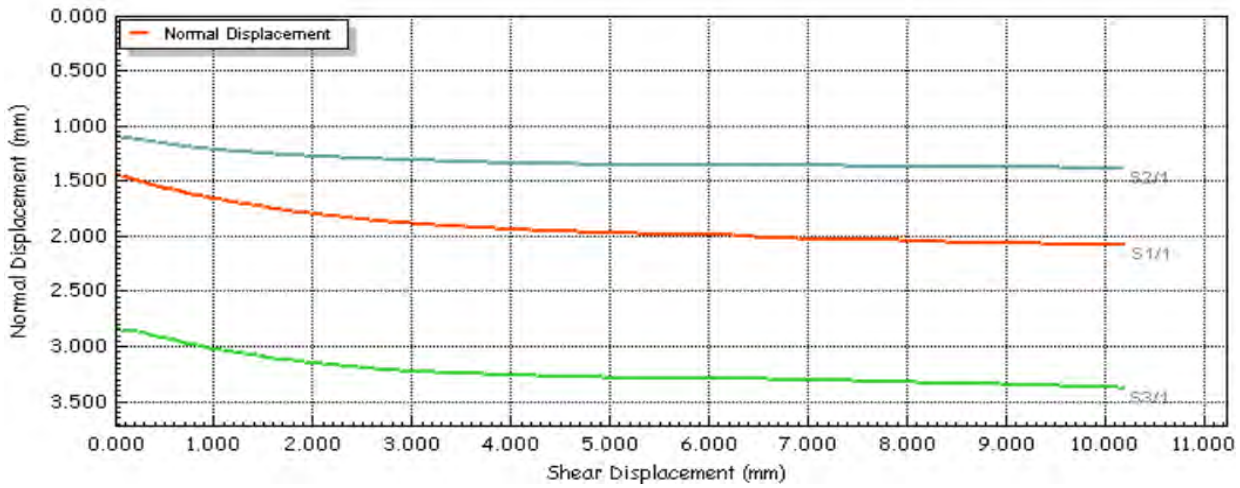
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH06	Sample Reference	7	
Depth (m)	9.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



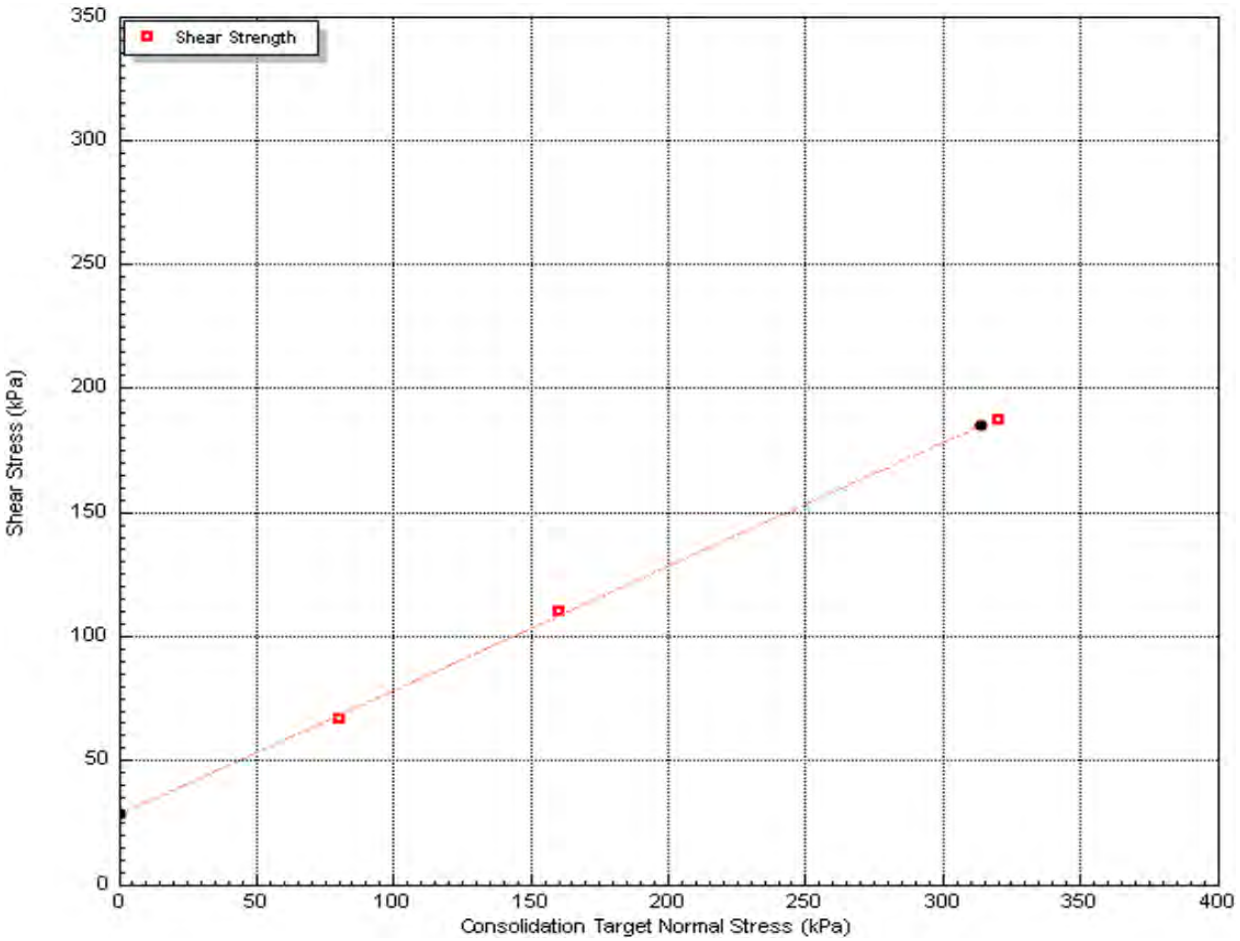


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH06	Sample Reference	7	
Depth (m)	9.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	28		
Angle of Shearing Resistance (°)	26.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH12	Sample Reference		4	
Depth (m)	4.50	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown sandy silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	60.0	60.0	60.0
Bulk Density (Mg/m^3)	1.59	1.59	1.58
Dry Density (Mg/m^3)	1.00	1.00	0.99
Voids Ratio	1.654	1.656	1.686
Consolidation			
Normal Pressure (kPa)	50	100	200
Vertical Displacement (mm)	2.964	4.561	5.372
Shearing			
Rate of Strain (mm/min)	0.056	0.056	0.056
Peak Shear Stress (kPa)	33.2	64.9	125.0
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	7.557	10.161	8.997
Final Conditions			
Water Content (%)	51.0	18.0	44.0
Dry Density (Mg/m^3)	1.41	1.89	2.23
Voids Ratio	1.155	0.947	0.873

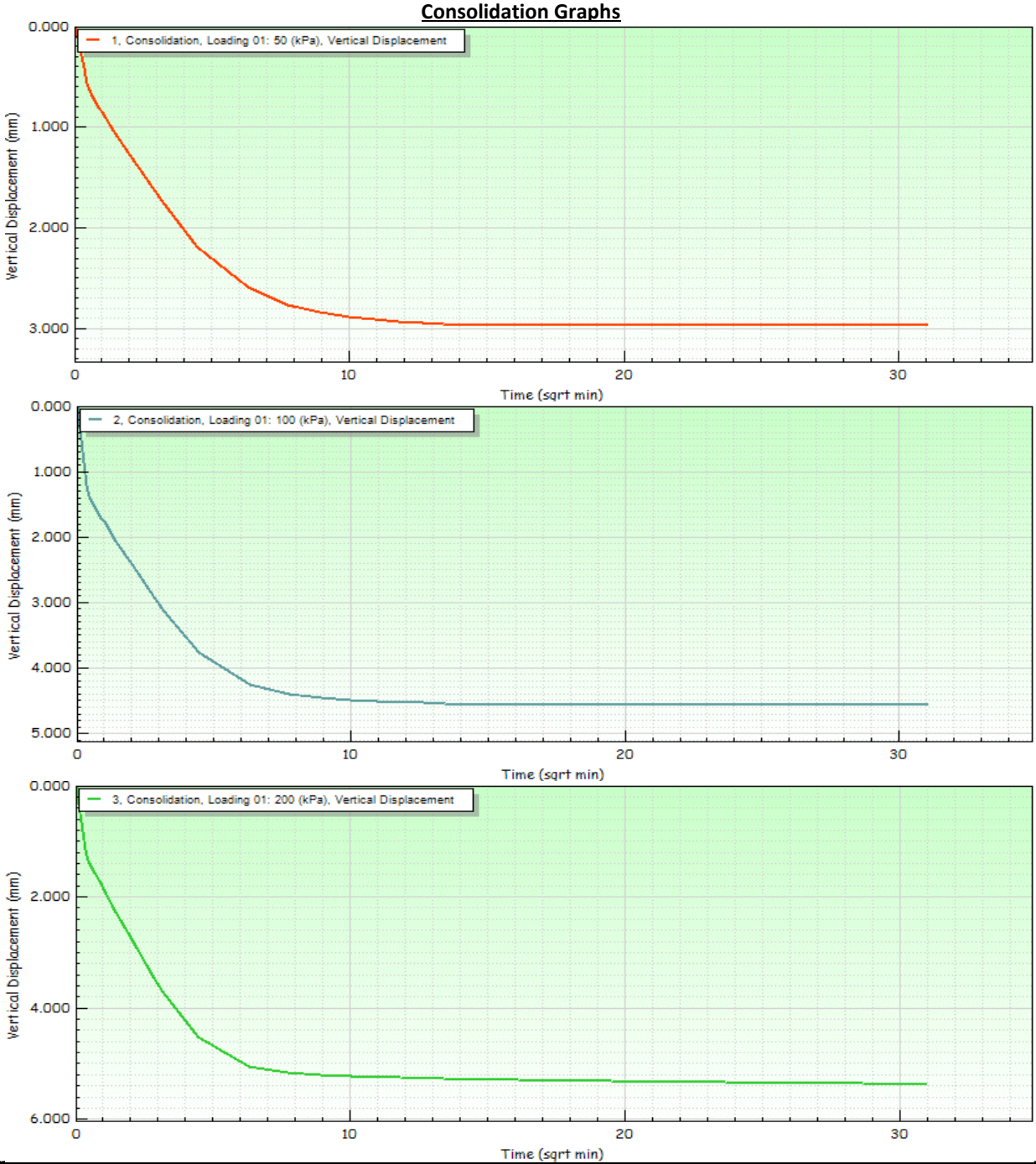
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH12	Sample Reference	4	
Depth (m)	4.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

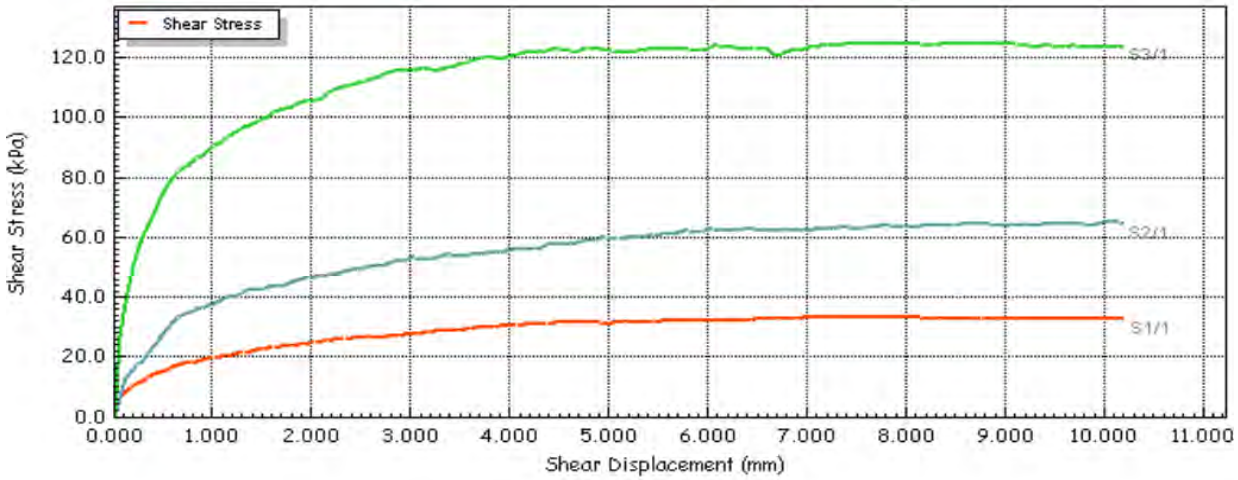


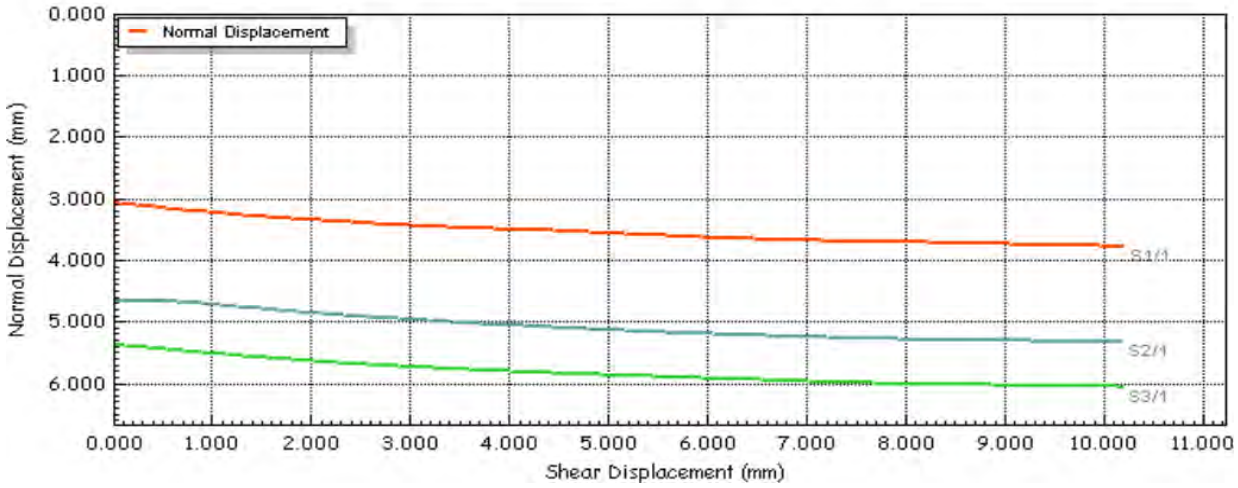
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH12	Sample Reference		4	
Depth (m)	4.50	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



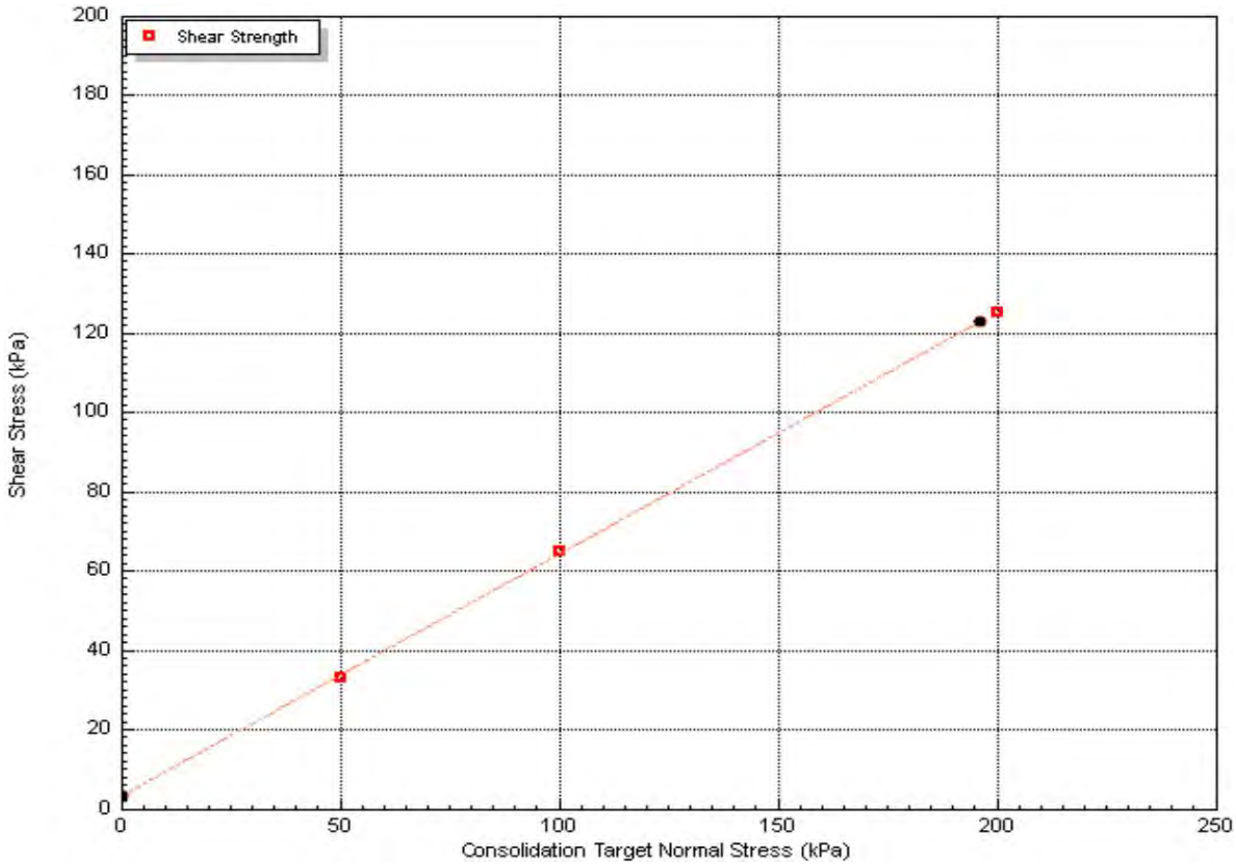


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH12	Sample Reference	4	
Depth (m)	4.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	3		
Angle of Shearing Resistance (°)	31.5		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

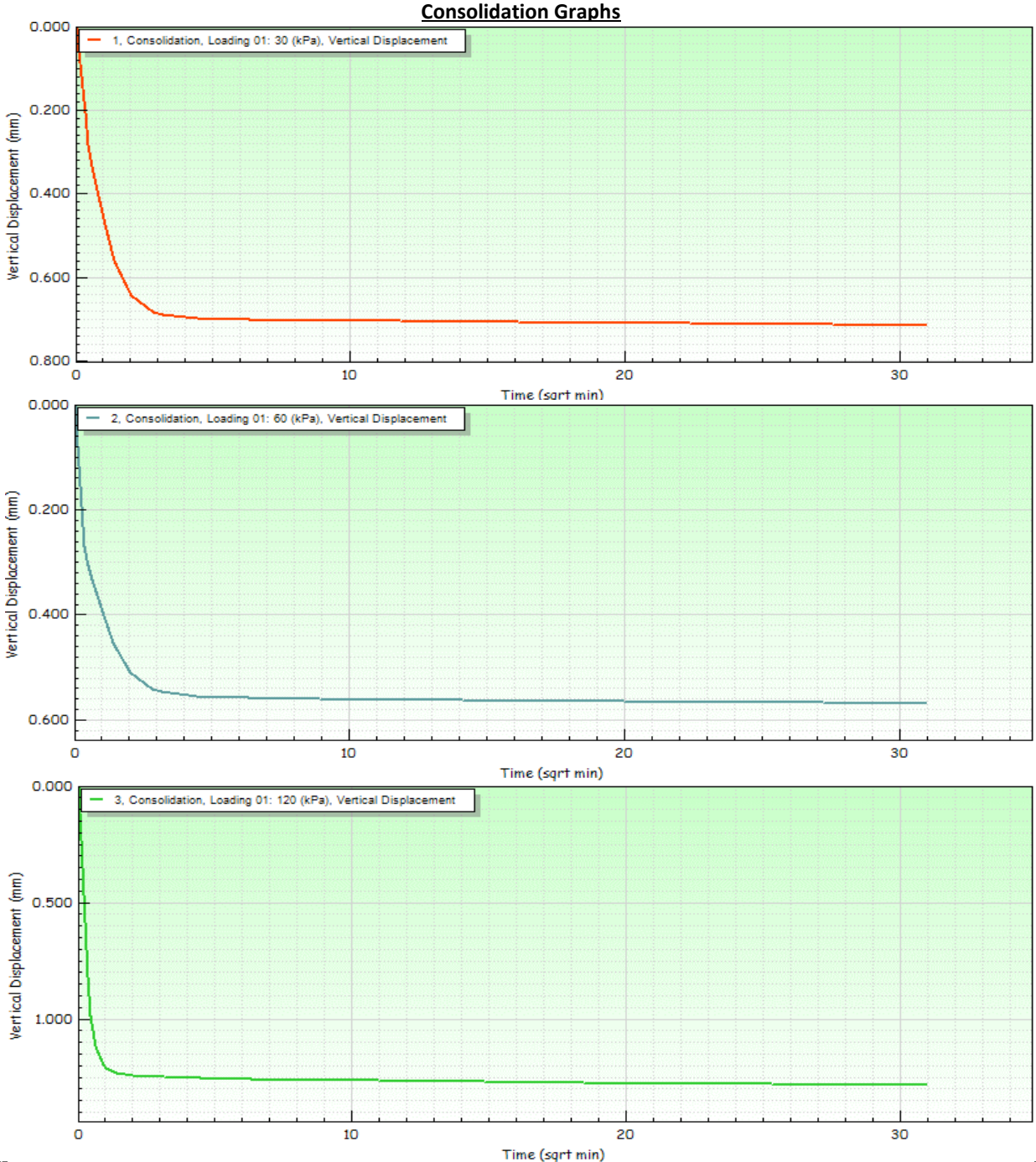
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH14	Sample Reference		2	
Depth (m)	1.50	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown slightly gravelly clayey fine to coarse SAND.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	17.0	17.0	17.0
Bulk Density (Mg/m^3)	2.20	2.19	2.17
Dry Density (Mg/m^3)	1.88	1.88	1.86
Voids Ratio	0.406	0.408	0.424
Consolidation			
Normal Pressure (kPa)	30	60	120
Vertical Displacement (mm)	0.714	0.568	1.282
Shearing			
Rate of Strain (mm/min)	0.062	0.062	0.062
Peak Shear Stress (kPa)	35.3	54.5	84.0
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	9.903	3.663	3.837
Final Conditions			
Water Content (%)	17.0	17.0	18.0
Dry Density (Mg/m^3)	1.99	1.96	2.08
Voids Ratio	0.353	0.363	0.311

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH14	Sample Reference	2	
Depth (m)	1.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

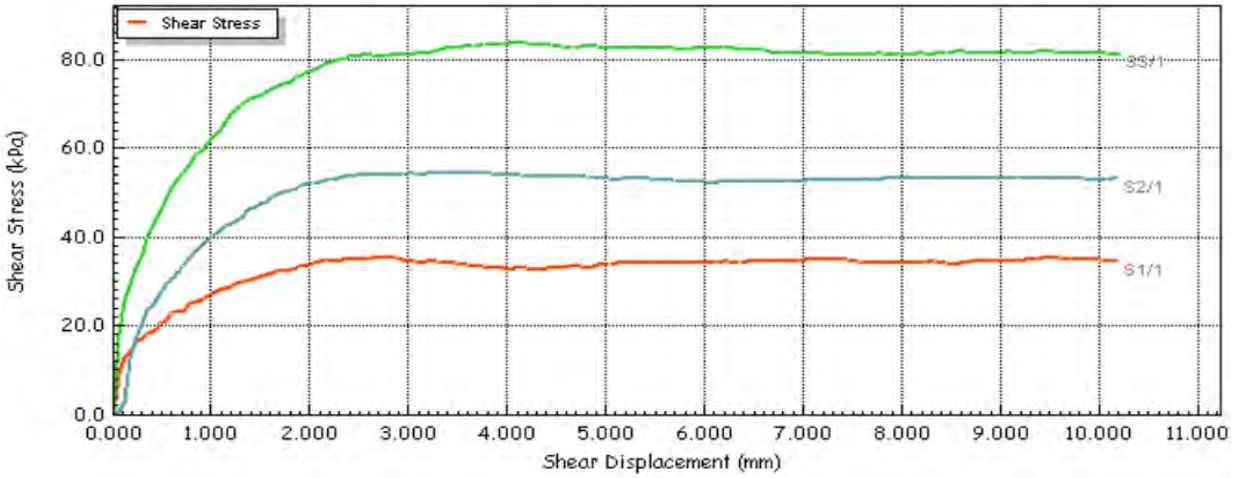


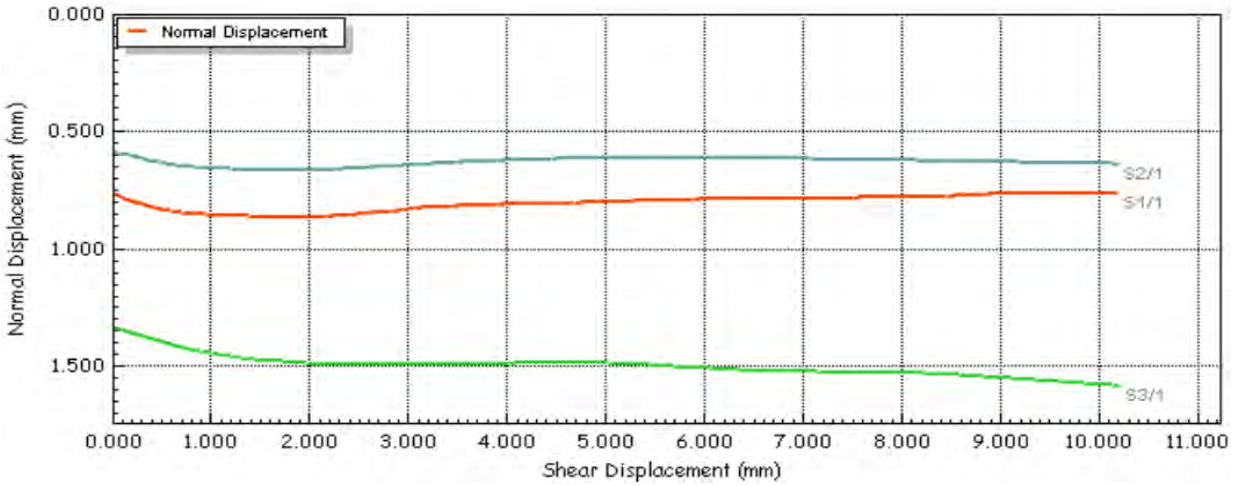
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH14	Sample Reference	2	
Depth (m)	1.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage

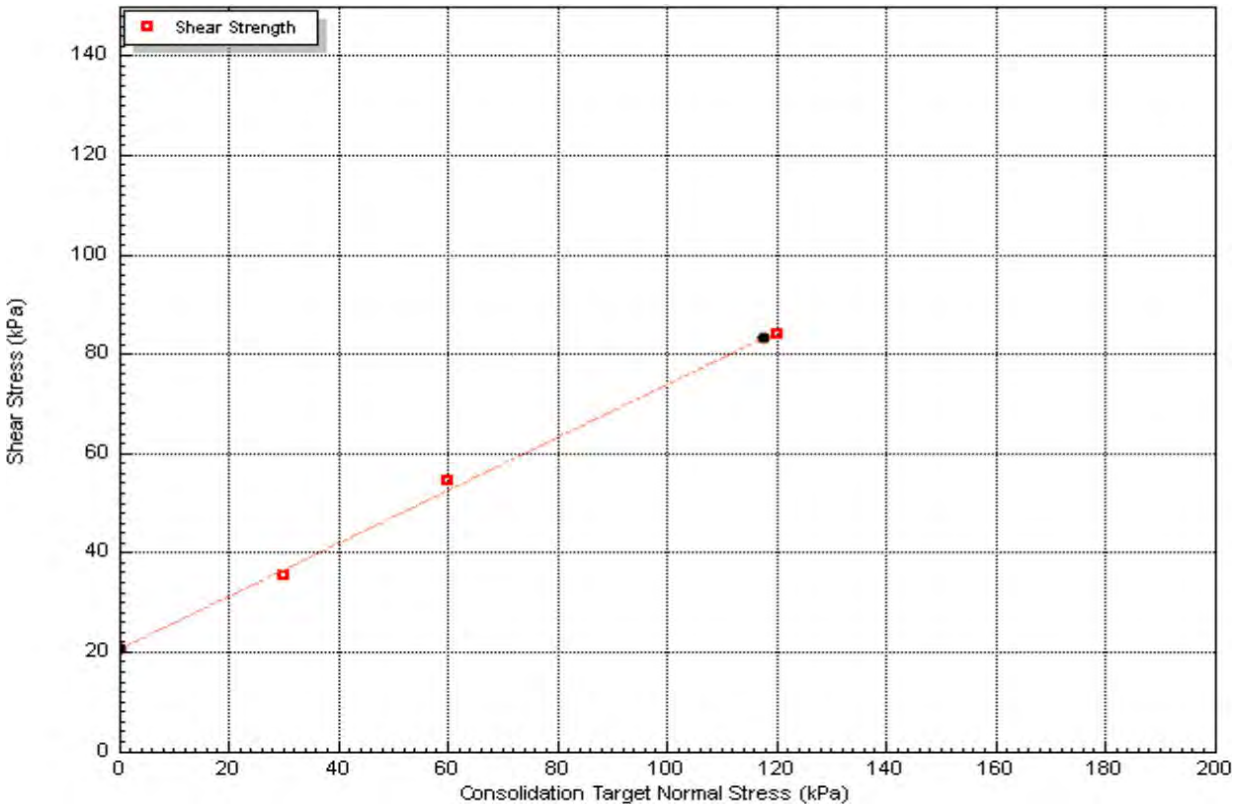




	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH14	Sample Reference	2	
Depth (m)	1.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	21		
Angle of Shearing Resistance (°)	28.0		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	**Aaron Nutt**	**Joseph Nicholl**

Lab Sheet Reference : LAB25R - Version 4

LABORATORY REPORT

Contract Number: PSL24/0789

Report Date: 19 February 2024

Client's Reference: 23-0585

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

For the attention of: Stephen Watson

Contract Title: Rosslare Europort Offshore Renewable Energy Hub SI

Date Received: 31/1/2024
Date Commenced: 31/1/2024
Date Completed: 19/2/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Managing Director)	R Berriman (Associate Director)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	D Burton (Advanced Testing Manager)

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Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details				
	Depth			1.50-1.95m U12
	Description			Brown slightly gravelly slightly sandy CLAY.
	Type			Undisturbed, vertical orientation.
	Initial Sample Length	L_0	(mm)	211.0
	Initial Sample Diameter	D_0	(mm)	105.0
	Initial Sample Weight	W_0	(gr)	3699.0
	Initial Bulk Density	ρ_0	(Mg/m3)	2.02
	Particle Density	ρ_s	(Mg/m3)	2.66

sketch showing specimen location in original sample

Initial Conditions			Stage 1	2	3	4
Initial Cell Pressure	σ_{3i}	(kPa)	330	360	420	
Initial Back Pressure	U_{bi}	(kPa)	300	300	300	
Membrane Thickness	m_b	(mm)	0.600			
Displacement Input	L_{IP}	(mm)	CH 2			
Load Input	N_{IP}	(N)	CH 1			
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 3			
Sample Volume	V	(cc)	CH 2			
Initial Moisture	ω_i	(%)	21			
Initial Dry Density	ρ_{di}	(Mg/m3)	1.67			
Initial Voids Ratio	e_i	.	0.592			
Initial Degree of Saturation	S_i	(%)	95			
B Value	B	.	1.00			

Final Conditions						
Final Moisture	ω_f	(%)	21			
Final Dry Density	ρ_{df}	(Mg/m3)	1.71			
Final Voids Ratio	e_f	.	0.555			
Final Degree of Saturation	S_f	(%)	100.0			
			Stage 1	2	3	4
Failure Criteria		.	Max. Dev.	Max. Dev.	Max. Dev.	
Strain At Failure	ε_f	(%)	2.00	3.55	20.00	
Stress At Failure	$(\sigma_1-\sigma_3)$	(kPa)	75.1	99.8	252.6	
Minor Stress At Failure	σ_3'	(kPa)	12.2	24.2	133.0	
Major Stress At Failure	σ_1'	(kPa)	87.3	124.0	385.6	
Principal Stress Ratio At Failure	σ_1'/σ_3'		7.157	5.125	2.899	
PwP At Failure Criteria	u_f		317.8	335.8	287.0	

Notes



Plastic

Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH06 1.50-1.95m UT12	
			Test Date	02/02/2024	
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH06	
			Sample	1.50-1.95m UT12	
Client	Causeway Geotech		Depth	1.50-1.95m U12	
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

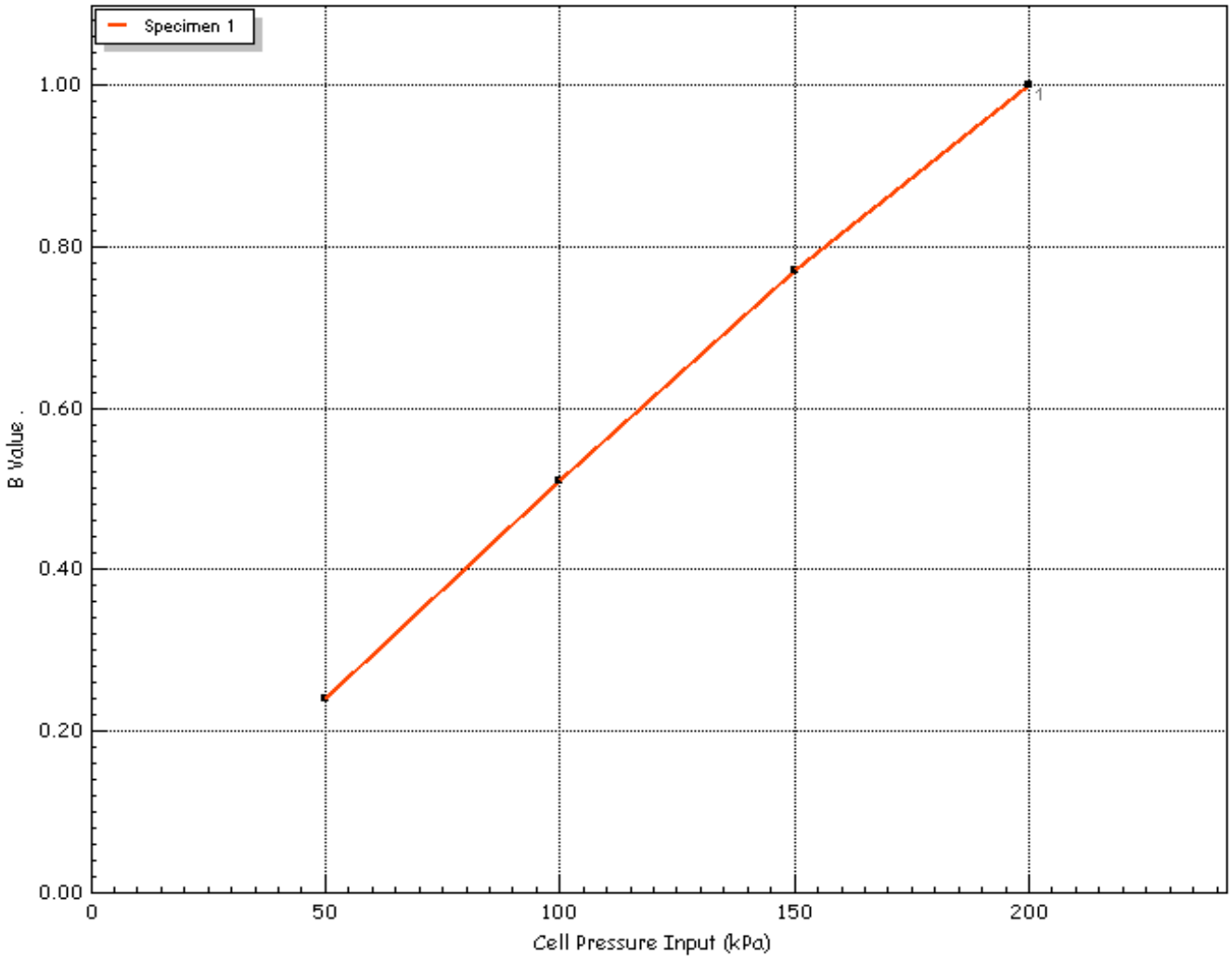
PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	σ	(kPa)	200
Pore Water Pressure Input	u pwp	(kPa)	157
B Value	B	.	1.00



PSL PROFESSIONAL SOILS LABORATORY UKAS TESTING 4043	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH06 1.50-1.95m UT12
				Test Date	02/02/2024
	Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH06
				Sample	1.50-1.95m UT12
	Client	Causeway Geotech		Depth	1.50-1.95m U12
	Operator	David Burton	Checked S.Royle	Approved	S.Royle

PSL Laboratory

Effective Stress Triaxial Compression

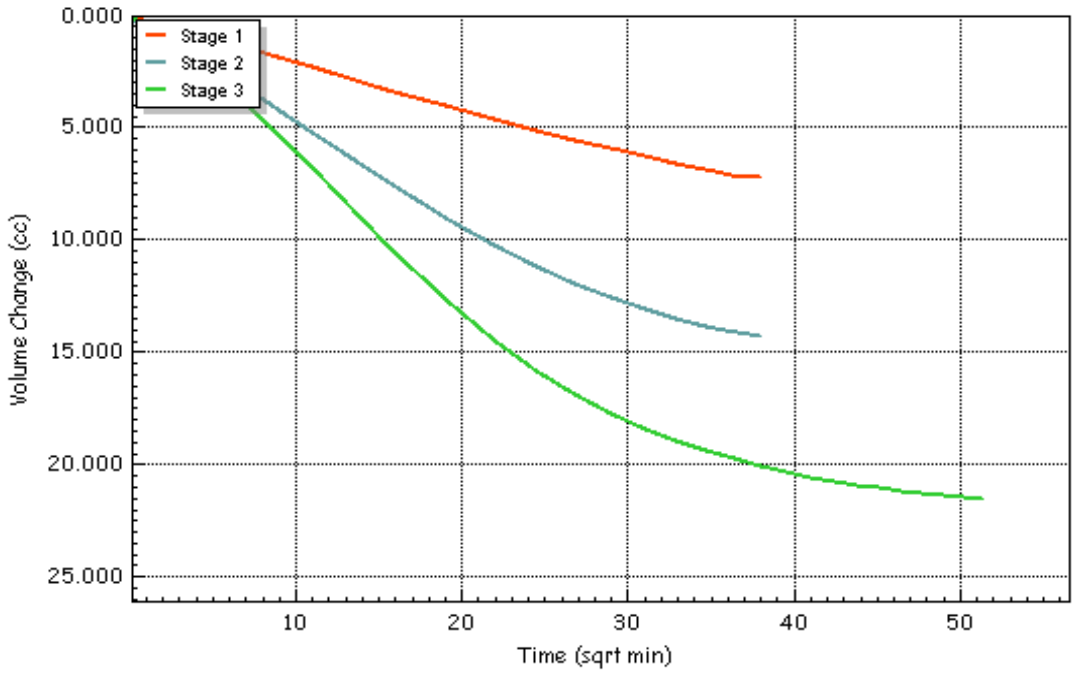
Consolidated Undrained

Consolidation Plots

Initial Conditions			Stage 1	2	3
Initial Cell Pressure	σ_3	(kPa)	330	360	420
Initial Back Pressure	u_{bi}	(kPa)	300	300	300
Pore Water Pressure Input	u_{pwp}	(kPa)	302	331	367
Drainage Method			Radial+One End		

Final Conditions			Stage 1	2	3
PWP Dissipation %	U%	(%)	100.00	100.00	98.07
Volumetric Strain	ε_v%	(%)	0.39	0.78	1.18
Corrected Length	L_C	(mm)	210.7	205.9	200.6
Corrected Area	A_C	(cm2)	86.36	87.71	88.96
Corrected Volume	V_C	(cc)	1819.839	1805.582	1784.050
t100	t_{100}	(min)	298.18	326.45	943.90
Consolidation	c_v	(m2/year)	0.008	0.007	0.002
Compressibility	m_v	(m2/MN)	2.078	0.255	0.179
Test Time	t_F	(h:m:s)	08:56:43	09:47:36	28:19:01
Estimated Strain to Failure	ε%	(%)	5.0	5.0	5.0
Shear Machine Speed	d_r	(mm/min)	0.01963	0.01963	0.01963

Notes



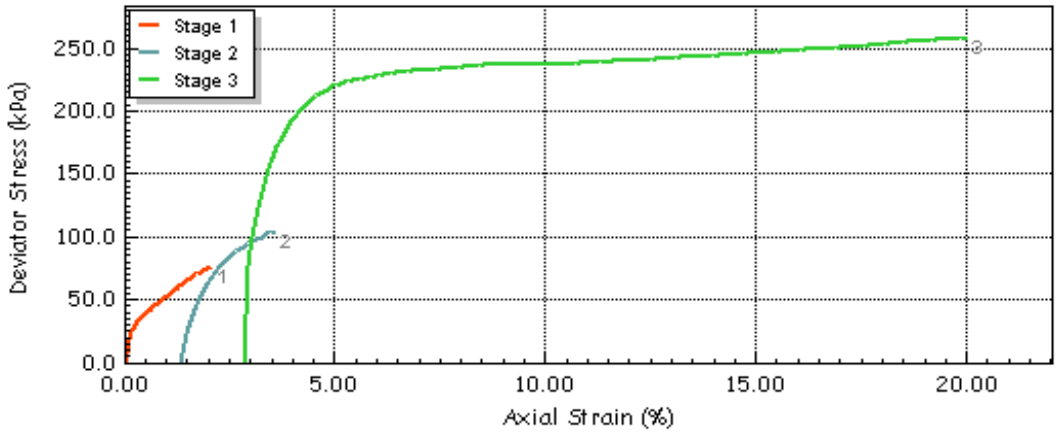
Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH06 1.50-1.95m UT12	
			Test Date	02/02/2024	
	Rosslare Europort Offshore		Borehole	M-BH06	
Jobfile	Renewable Energy HUB SI		Sample	1.50-1.95m UT12	
Client	Causeway Geotech		Depth	1.50-1.95m U12	
Operator	David Burton	Checked S.Royle		Approved	S.Royle

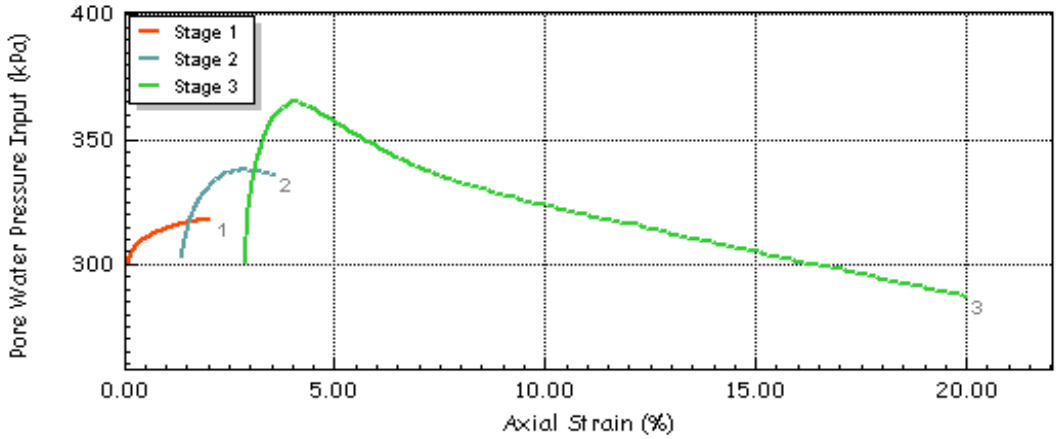
PSL Laboratory

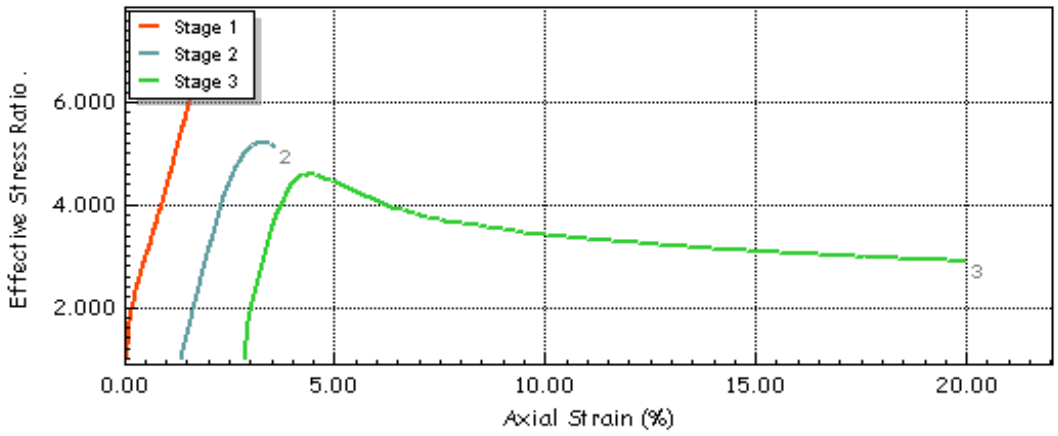
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







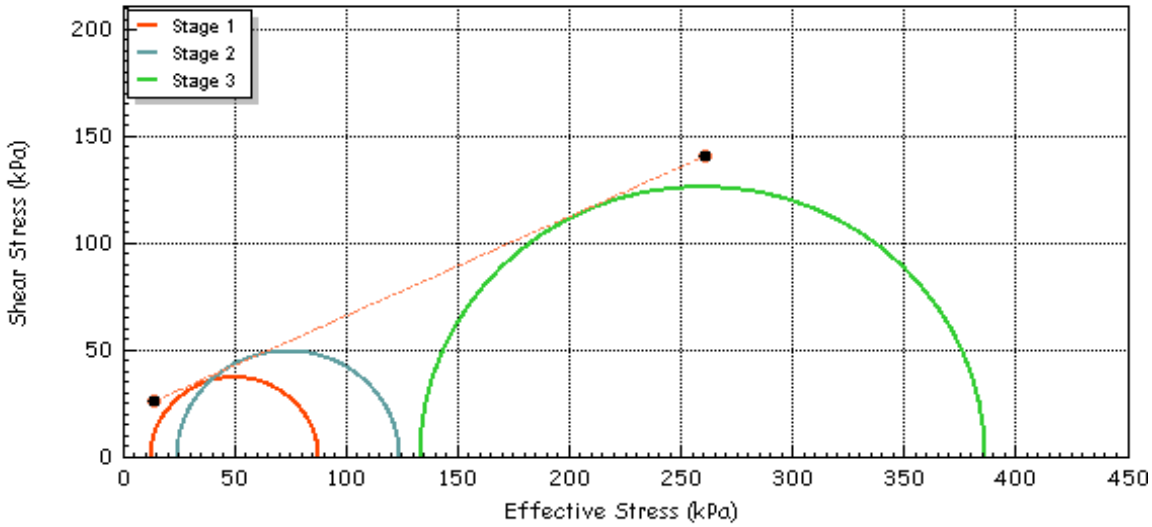
PSL PROFESSIONAL SOILS LABORATORY — UKAS TESTING 4043	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH06 1.50-1.95m UT12
				Test Date	02/02/2024
		Rosslare Europort Offshore		Borehole	M-BH06
	Jobfile	Renewable Energy HUB SI		Sample	1.50-1.95m UT12
	Client	Causeway Geotech		Depth	1.50-1.95m U12
	Operator	David Burton	Checked	S.Royle	Approved S.Royle

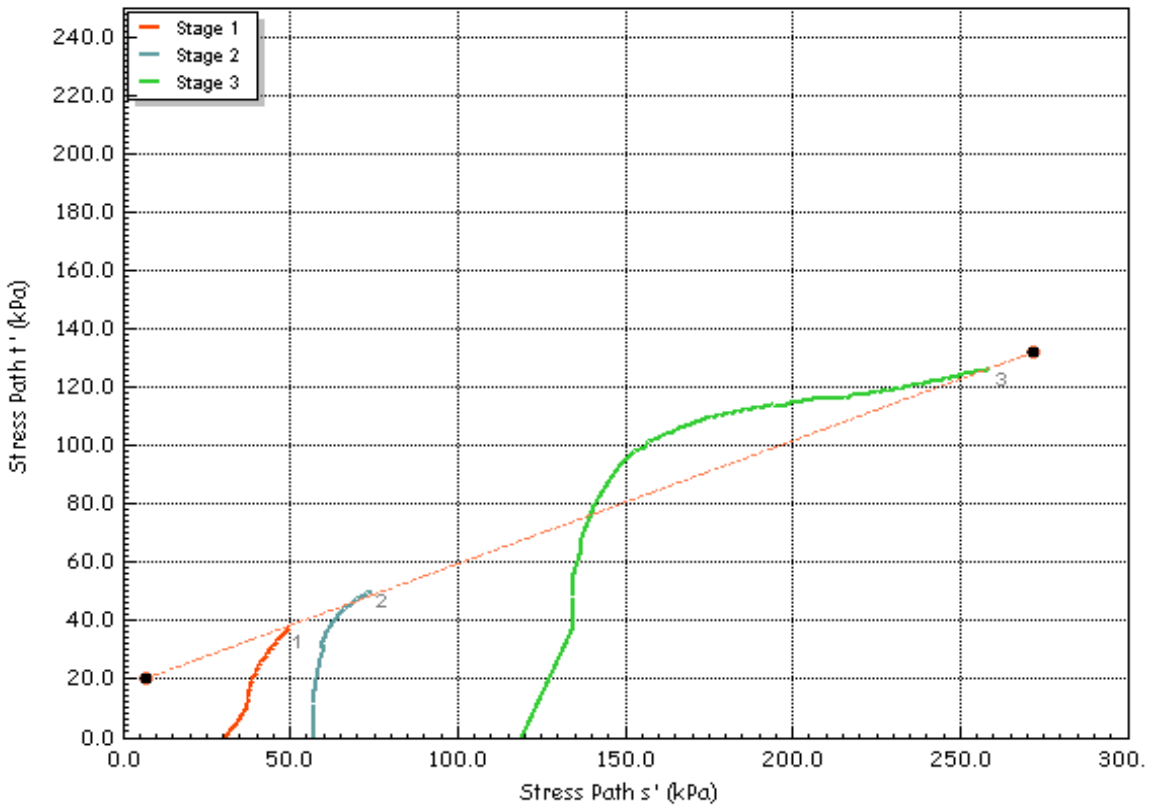
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective	c'	(kPa)	19.45	Effective Cohesion	c'	(kPa)	19.45
Effective Friction	ϕ'	(deg)	24.9	Effective Friction	ϕ'	(deg)	24.9





Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH06 1.50-1.95m UT12	
			Test Date	02/02/2024	
	Rosslare Europort Offshore		Borehole	M-BH06	
Jobfile	Renewable Energy HUB SI		Sample	1.50-1.95m UT12	
Client	Causeway Geotech		Depth	1.50-1.95m U12	
Operator	David Burton	Checked S.Royle		Approved	S.Royle

PSL Laboratory

Certificate of Analysis

Certificate Number 24-02921 *Issued:* 19-Feb-24

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

Our Reference 24-02921

Client Reference 23-0585

Order No (not supplied)

Contract Title ROSSIARE EUROPORT OFFSHORE RENEWABLE ENERGY HUB SI

Description 3 Soil samples.

Date Received 12-Feb-24

Date Started 12-Feb-24

Date Completed 19-Feb-24

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-02921
Client Ref 23-0585
Contract Title ROSSIARE EUROPORT OFFSHORE RENEWABLE ENERGY HUB SI

			Lab No	2298663	2298664	2298665
			.Sample ID	M-BH01	M-BH01	M-BH06
			Depth	2.50	7.00	0.00
			Other ID	3	6	8
			Sample Type	SB	SB	D
			Sampling Date	09/02/2024	09/02/2024	09/02/2024
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
pH	DETSC 2008#		pH			8.8
Organic matter	DETSC 2002#	0.1	%	1.0	1.4	1.0
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l			1500

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 24-02921
Client Ref 23-0585
Contract ROSSIARE EUROPORT OFFSHORE RENEWABLE ENERGY HUB SI

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2298663	M-BH01 2.50 SOIL	09/02/24	PT 500ml		
2298664	M-BH01 7.00 SOIL	09/02/24	PT 500ml		
2298665	M-BH06 0.00 SOIL	09/02/24	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

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

End of Report

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / G01	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH06	7	9.00	SB	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH14	2	1.50	SB	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
06 February 2024	07 February 2024

CAUSEWAY GEOTECH

HEAD OFFICE
Causeway Geotech Ltd
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NI: +44 (0)28 276 66640
Registered in Northern Ireland.
Company Number: NI610766

REGIONAL OFFICE
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Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

1 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 28/01/2024 and 01/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G02

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	BS 1377-2: 1990: Cl 3.2	24
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	13
SOIL	Particle density by Gas jar method	BS 1377-2: 1990: Cl 8.2	3
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	16
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	16
SOIL	Moisture Condition Value at natural moisture content	BS 1377-4: 1990: Cl 5.4	1
SOIL	Moisture Condition Value / Moisture Content Relationship	BS 1377-4: 1990: Cl 5.5	1
SOIL	California Bearing Ratio (CBR)	BS 1377-4: 1990: Cl 7	1
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	4
SOIL	Laboratory Vane Shear Strength (3 determinations) *	BS 1377-7: 1990: Cl 3	3
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	2
	Extra over days (more than initial 3 days)		4

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	pH Value of Soil		2
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Sulphate Content water extract		2
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Organic Matter Content		4
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Water soluble chloride content		2
SOIL – subcontracted to Pro Soils Limited *(UKAS 4043)*	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	2
	Extra over days (more than initial 4 days)		0

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk / dry Mg/m3		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
M-BH02	4	0.90		D	Grey slightly sandy silty CLAY.			19	97	38 -1pt	19	19		CI
M-BH02	6	1.90	2.35	UT	Grey slightly sandy silty CLAY.			20						
M-BH02	5	2.90		D	Grey sandy slightly gravelly silty CLAY.			14						
M-BH03	1	0.40	1.50	SB	Grey slightly sandy silty CLAY.			22						
M-BH03	2	1.50	3.00	SB	Grey slightly sandy silty CLAY.			26						
M-BH03	4	4.50	6.00	SB	Grey sandy slightly gravelly silty CLAY.			11						
M-BH03	5	6.00	7.00	SB	Grey sandy slightly gravelly silty CLAY.			13	75	35 -1pt	19	16		CL/CI
M-BH07	5	0.80		D	Grey sandy silty CLAY.			20	96	38 -1pt	18	20		CI
M-BH07	2	1.80	2.80	SB	Grey sandy slightly gravelly silty CLAY.			14	49	26 -1pt	19	7		CL
M-BH07	7	1.80	2.25	UT	Greyish brown slightly sandy slightly gravelly silty CLAY.			13						
M-BH07	6	2.80		D	Greyish brown slightly sandy slightly gravelly silty CLAY.			11	49	30 -1pt	20	10		CL
M-BH11	8	1.00		D	Greyish brown slightly sandy slightly gravelly silty CLAY.			30	92	40 -1pt	18	22		CI

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

LAB 01R Version 6

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

28/02/2024

Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.: 23-0585

Project Name: Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
M-BH11	10	3.00		D	Greyish brown slightly sandy slightly gravelly silty CLAY.			11	76	26 -1pt	14	12		CL
M-BH11	3	3.50	5.00	SB	Greyish brown slightly sandy slightly gravelly silty CLAY.			11	71	22 -1pt	16	6		ML/CL
M-BH11	12	5.00		D	Greyish brown slightly sandy slightly gravelly silty CLAY.			11	69	25 -1pt	16	9		CL
M-BH16	2	0.50	1.50	SB	Greyish brown sandy slightly gravelly silty CLAY.			10						
M-BH25	1	0.70	1.70	SB	Greyish brown slightly sandy silty CLAY.			25						
M-BH25	7	1.00		D	Greyish brown slightly sandy silty CLAY.			24	99	45 -1pt	21	24		CI
M-BH25	8	2.00		D	Greyish brown slightly sandy silty CLAY.			22						
M-BH25	10	4.00		D	Greyish brown sandy slightly gravelly silty CLAY.			14						
M-BH38	5	1.00		D	Greyish brown slightly gravelly clayey fine to coarse SAND.			34						
M-BH38	7	3.00		D	Greyish brown slightly gravelly clayey fine to coarse SAND.			26	96	31 -1pt	23	8		ML/CL
M-BH38	3	3.30	4.80	SB	Grey sandy slightly gravelly silty CLAY.			40	98	32 -1pt	21	11		CL
M-BH38	9	5.00		D	Grey sandy slightly gravelly silty CLAY.			8.9	45	33 -1pt	18	15		CL

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

LAB 01R Version 6

Key

Density test | Liquid Limit | Particle density

Linear measurement unless : | 4pt cone unless : | sp - small pyknometer

wd - water displacement | cas - Casagrande method | gj - gas jar

wi - immersion in water | 1pt - single point test

Date Printed: 28/02/2024

Approved By: Stephen Watson

UKAS TESTING 10122

Particle Density by Gas Jar Tests - Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description at test horizon	Particle Density Mg/m3	Remarks
	Ref	Top	Base	Type			
M-BH03	3	3.00	4.50	SB	Grey slightly sandy silty CLAY.	2.63	
M-BH07	3	2.80	3.80	SB	Greyish brown slightly sandy slightly gravelly silty CLAY.	2.70	
M-BH11	9	2.00		D	Greyish brown slightly sandy silty CLAY.	2.60	

LAB 04R Version 6

Notes

Gas Jar tests to BS1377-2 :2022 Clause 9.2

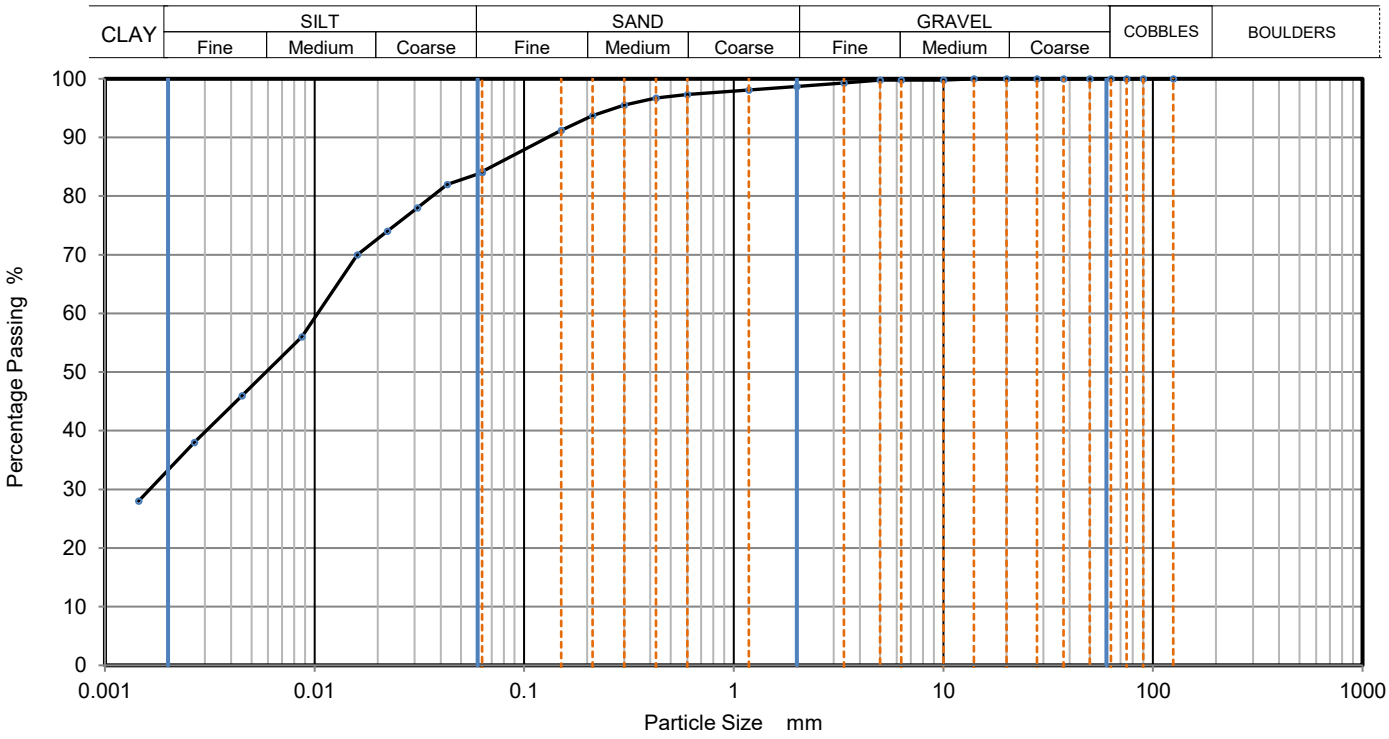
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UKAS TESTING

10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH02
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	0.90
				Base	1.90
Specimen Reference	2	Specimen Depth	0.9 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013136



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	84
90	100	0.04299	82
75	100	0.03092	78
63	100	0.02223	74
50	100	0.01597	70
37.5	100	0.00869	56
28	100	0.00450	46
20	100	0.00267	38
14	100	0.00145	28
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	91		
0.063	84		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.3
Sand	14.4
Silt	50.9
Clay	33.4

Grading Analysis		
D100	mm	
D60	mm	0.0103
D30	mm	0.00163
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

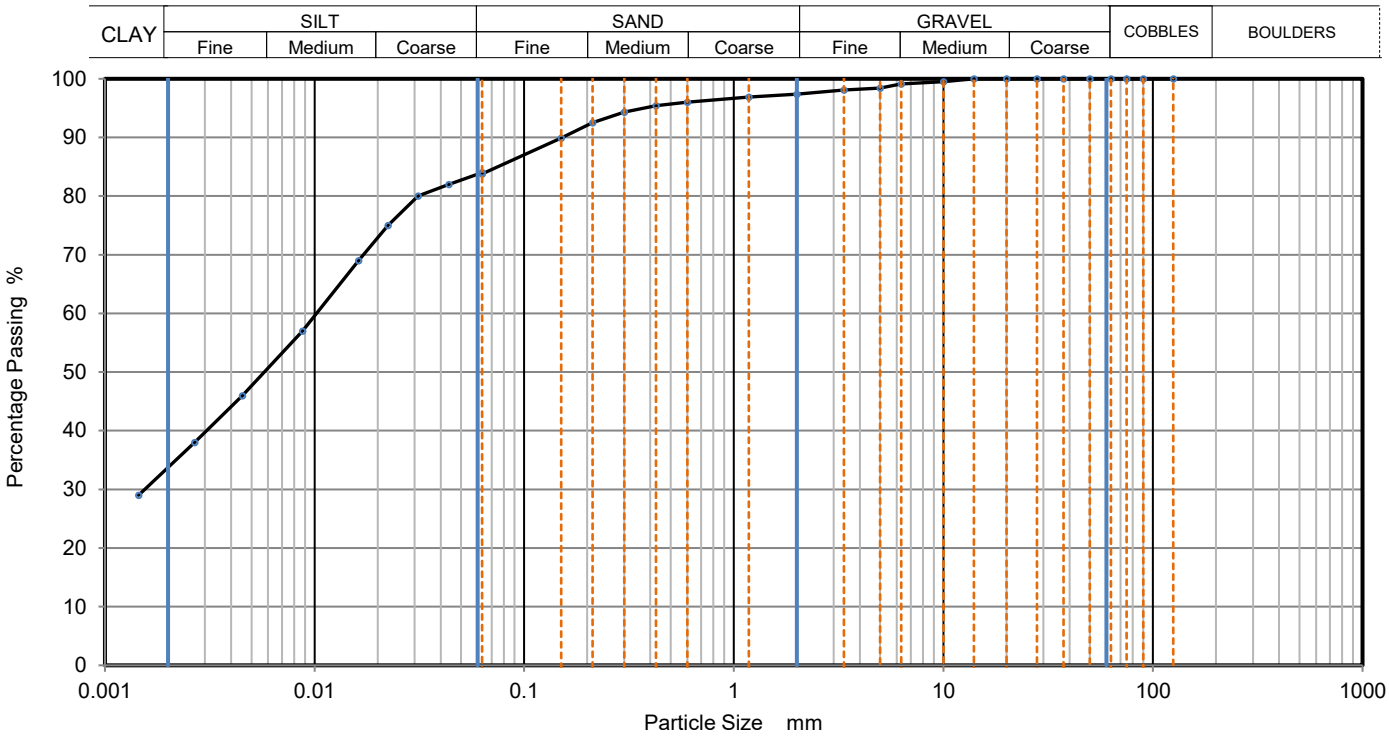
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH02
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	1.90
				Base	2.90
Specimen Reference	3	Specimen Depth	1.9 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013138



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	84
90	100	0.04373	82
75	100	0.03118	80
63	100	0.02241	75
50	100	0.01623	69
37.5	100	0.00876	57
28	100	0.00453	46
20	100	0.00268	38
14	100	0.00145	29
10	100		
6.3	99		
5	98		
3.35	98		
2	97		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	94		
0.212	93		
0.15	90		
0.063	84		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.6
Sand	13.6
Silt	50.1
Clay	33.7

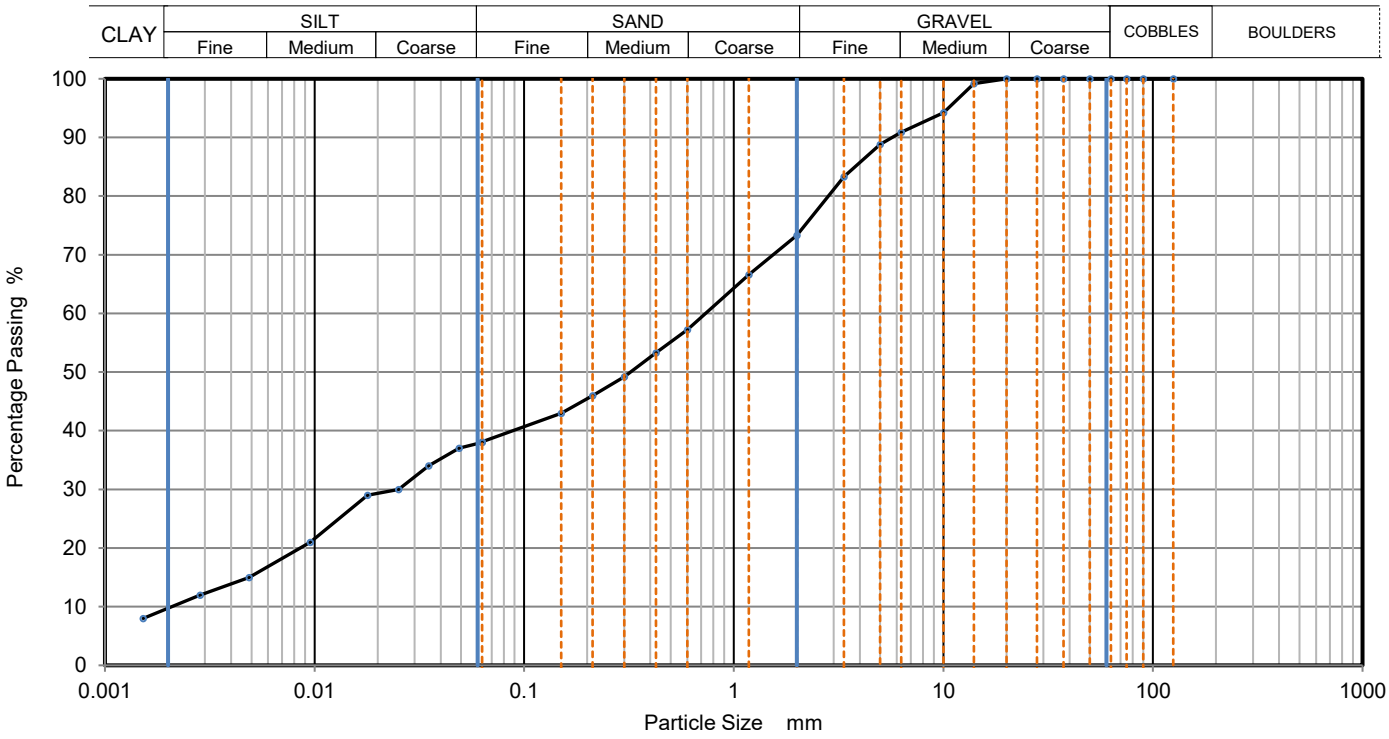
Grading Analysis		
D100	mm	
D60	mm	0.0104
D30	mm	0.00152
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-BH02
Site Name	Rosslare OWH - GI				Sample No.		3
Specimen Description	Grey sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	2.90
						Base	3.90
Specimen Reference	3	Specimen Depth	2.9	m	Sample Type		SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus2024013140



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	38
90	100	0.04896	37
75	100	0.03508	34
63	100	0.02513	30
50	100	0.01788	29
37.5	100	0.00952	21
28	100	0.00487	15
20	100	0.00284	12
14	99	0.00152	8
10	94		
6.3	91		
5	89		
3.35	83		
2	73		
1.18	67		
0.6	57	Particle density	(assumed)
0.425	53	2.65	Mg/m3
0.3	49		
0.212	46		
0.15	43		
0.063	38		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	26.7
Sand	35.1
Silt	28.6
Clay	9.6

Grading Analysis		
D100	mm	
D60	mm	0.733
D30	mm	0.0226
D10	mm	0.00211
Uniformity Coefficient		350
Curvature Coefficient		0.33

Remarks

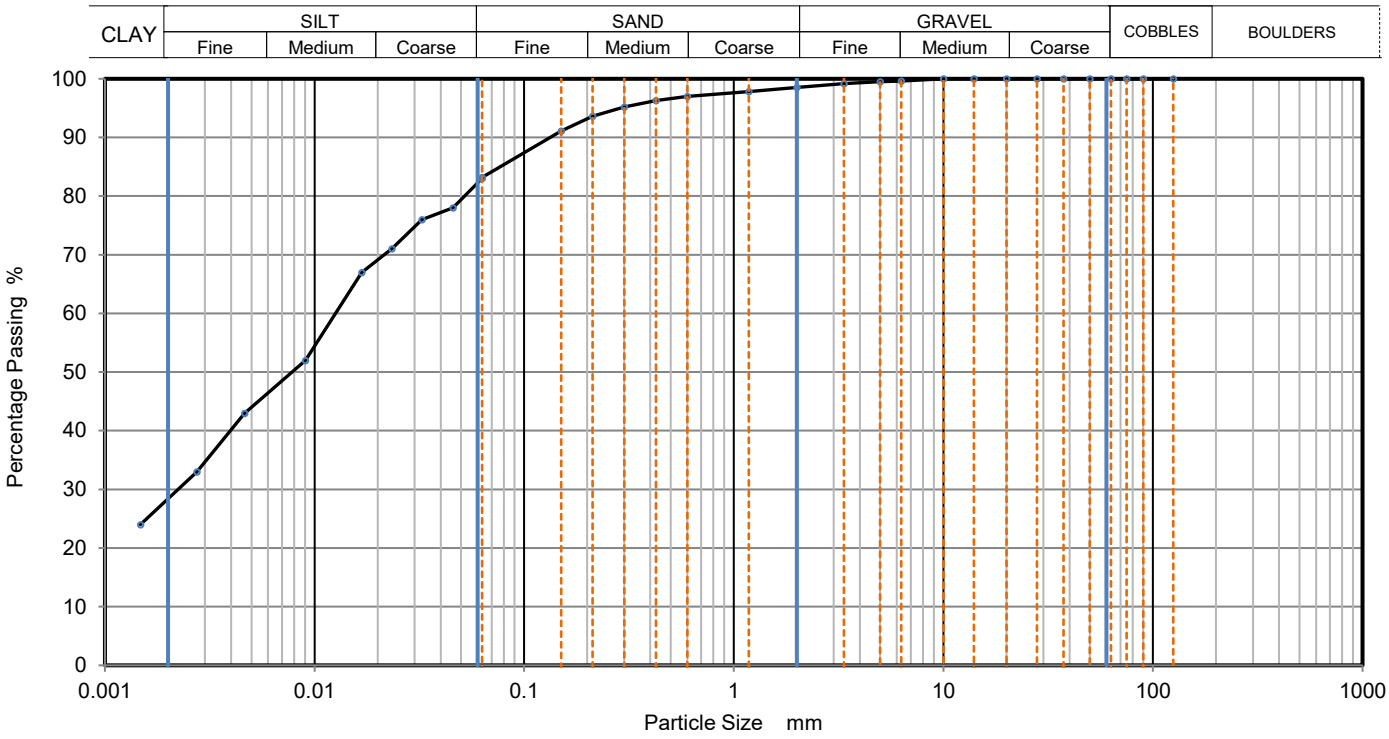
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH03
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	0.40
				Base	1.50
Specimen Reference	6	Specimen Depth	0.4 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013141



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	83
90	100	0.04571	78
75	100	0.03257	76
63	100	0.02338	71
50	100	0.01677	67
37.5	100	0.00903	52
28	100	0.00463	43
20	100	0.00274	33
14	100	0.00148	24
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	95		
0.212	94		
0.15	91		
0.063	83		

Dry Mass of sample, g: 500

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.5
Sand	15.2
Silt	54.9
Clay	28.4

Grading Analysis		
D100	mm	
D60	mm	0.0126
D30	mm	0.00221
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

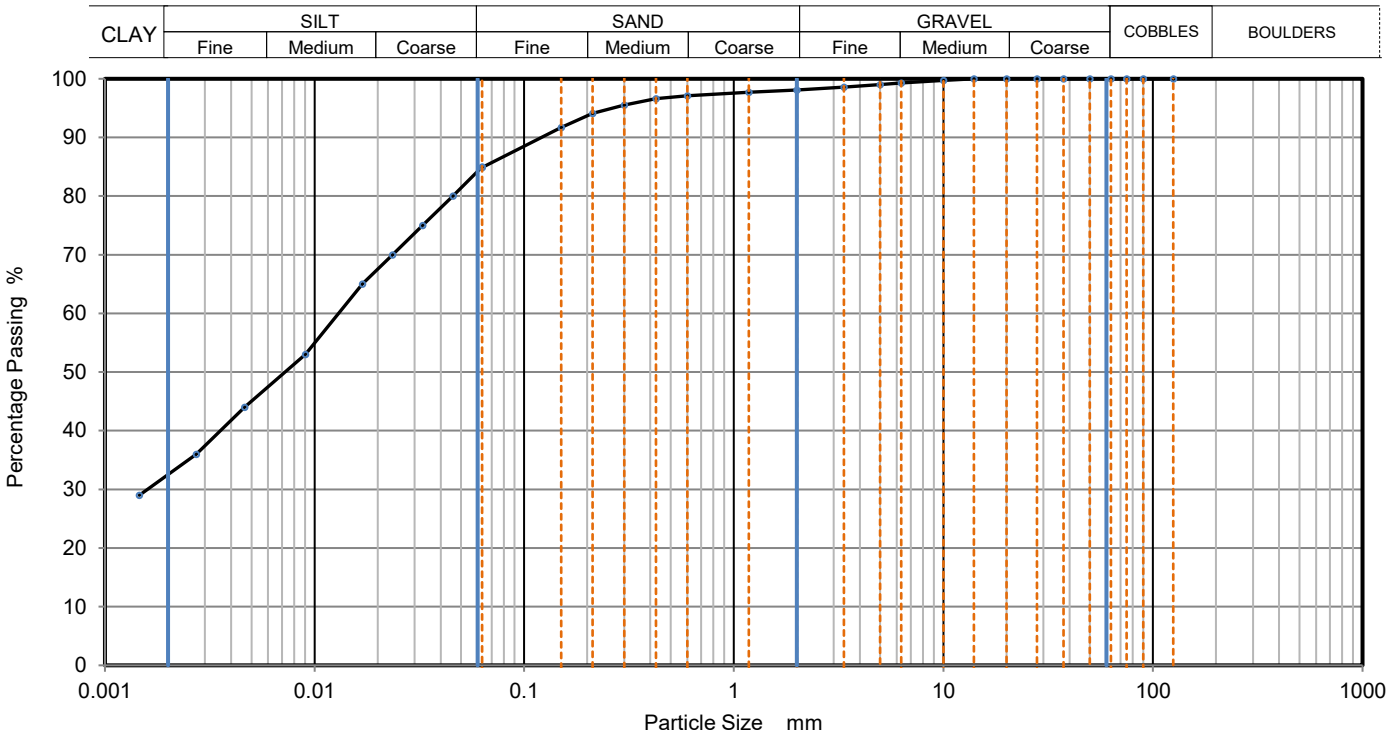
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH03
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	1.50
				Base	3.00
Specimen Reference	6	Specimen Depth	1.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013142



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	85
90	100	0.04571	80
75	100	0.03282	75
63	100	0.02355	70
50	100	0.01689	65
37.5	100	0.00903	53
28	100	0.00463	44
20	100	0.00272	36
14	100	0.00146	29
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	92		
0.063	85		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.9
Sand	13.2
Silt	52.1
Clay	32.8

Grading Analysis		
D100	mm	
D60	mm	0.0127
D30	mm	0.00158
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

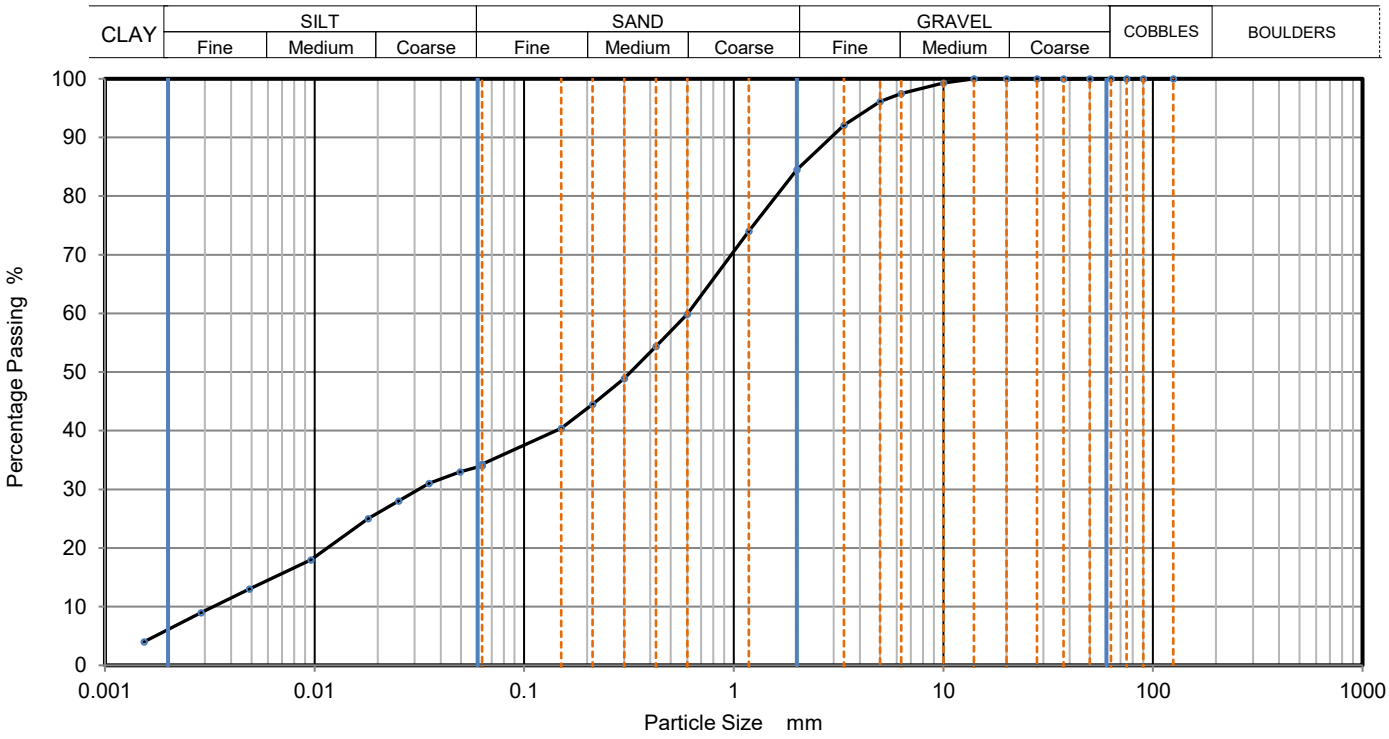
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH03
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	4.50
				Base	6.00
Specimen Reference	6	Specimen Depth	4.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013144



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	34
90	100	0.04945	33
75	100	0.03519	31
63	100	0.02521	28
50	100	0.01805	25
37.5	100	0.00961	18
28	100	0.00489	13
20	100	0.00287	9
14	100	0.00153	4
10	99		
6.3	98		
5	96		
3.35	92		
2	85		
1.18	74		
0.6	60	Particle density	(assumed)
0.425	54	2.65	Mg/m3
0.3	49		
0.212	45		
0.15	40		
0.063	34		

Dry Mass of sample, g: 507

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	15.5
Sand	50.2
Silt	27.9
Clay	6.4

Grading Analysis		
D100	mm	
D60	mm	0.603
D30	mm	0.0304
D10	mm	0.00325
Uniformity Coefficient		190
Curvature Coefficient		0.47

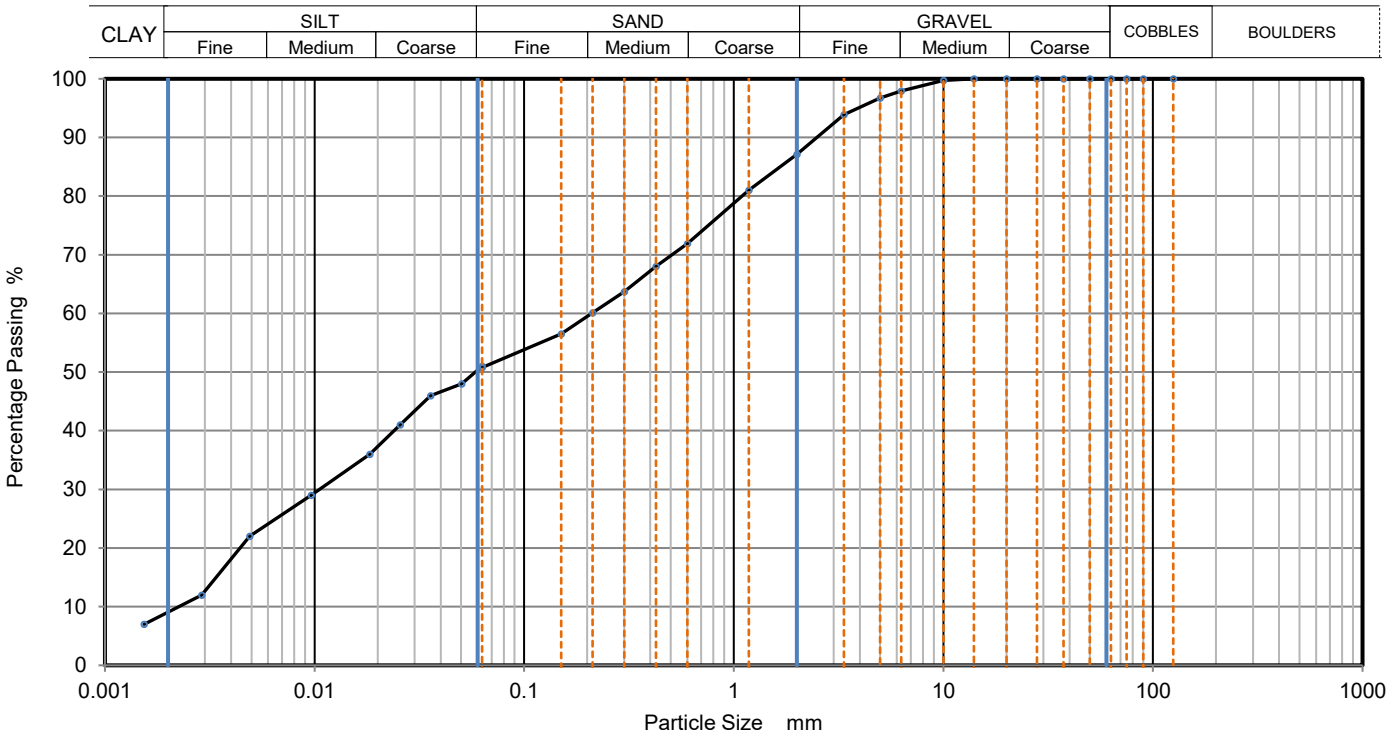
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH03
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	6.00
				Base	7.00
Specimen Reference	9	Specimen Depth	6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013145



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	51
90	100	0.05026	48
75	100	0.03577	46
63	100	0.02561	41
50	100	0.01833	36
37.5	100	0.00963	29
28	100	0.00490	22
20	100	0.00289	12
14	100	0.00154	7
10	100		
6.3	98		
5	97		
3.35	94		
2	87		
1.18	81		
0.6	72	Particle density	(assumed)
0.425	68	2.65	Mg/m3
0.3	64		
0.212	60		
0.15	57		
0.063	51		

Dry Mass of sample, g: 508

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	12.9
Sand	36.2
Silt	41.6
Clay	9.3

Grading Analysis		
D100	mm	
D60	mm	0.211
D30	mm	0.0105
D10	mm	0.0022
Uniformity Coefficient		96
Curvature Coefficient		0.24

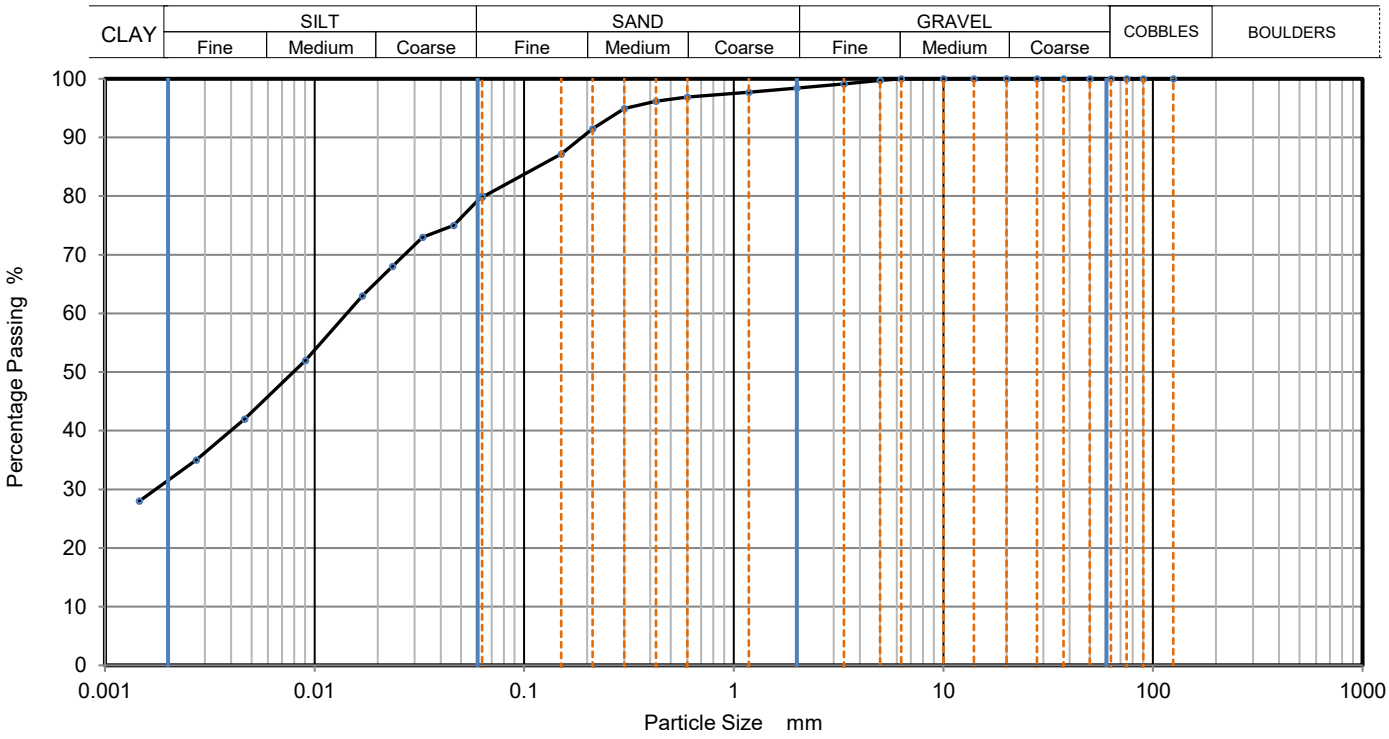
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH07
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Grey slightly sandy silty CLAY.			Sample Depth (m) Top	0.80
				Base	1.80
Specimen Reference	3	Specimen Depth	0.8 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013147



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	80
90	100	0.04606	75
75	100	0.03282	73
63	100	0.02355	68
50	100	0.01689	63
37.5	100	0.00903	52
28	100	0.00463	42
20	100	0.00272	35
14	100	0.00146	28
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	95		
0.212	92		
0.15	87		
0.063	80		

Dry Mass of sample, g: 505

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.6
Sand	18.6
Silt	48.1
Clay	31.7

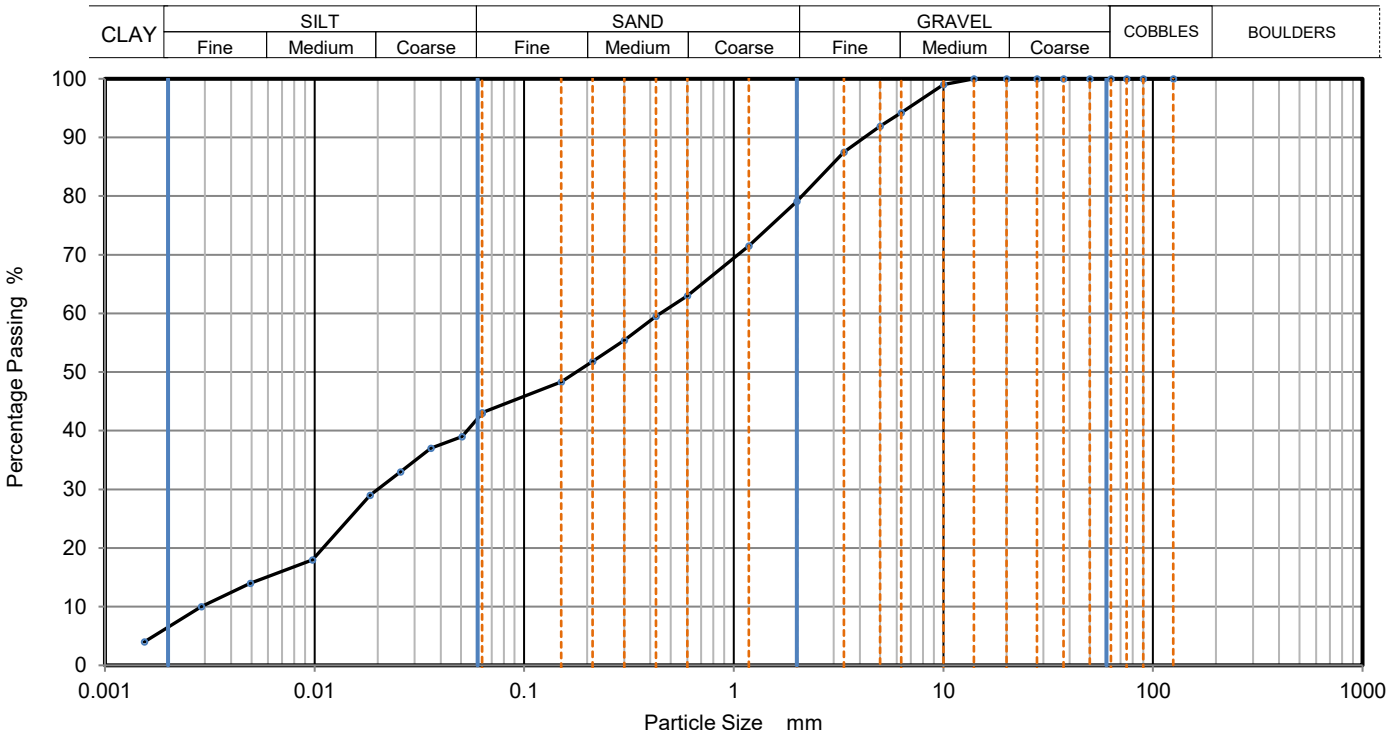
Grading Analysis		
D100	mm	
D60	mm	0.0141
D30	mm	0.00172
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH07
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.80
				Sample Depth (m) Base	2.80
Specimen Reference	7	Specimen Depth	1.8 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013149



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	43
90	100	0.05042	39
75	100	0.03588	37
63	100	0.02568	33
50	100	0.01838	29
37.5	100	0.00977	18
28	100	0.00494	14
20	100	0.00288	10
14	100	0.00154	4
10	99		
6.3	94		
5	92		
3.35	88		
2	79		
1.18	72		
0.6	63	Particle density	(assumed)
0.425	60	2.65	Mg/m3
0.3	55		
0.212	52		
0.15	48		
0.063	43		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	20.9
Sand	36.0
Silt	36.4
Clay	6.7

Grading Analysis		
D100	mm	
D60	mm	0.446
D30	mm	0.0204
D10	mm	0.00281
Uniformity Coefficient		160
Curvature Coefficient		0.33

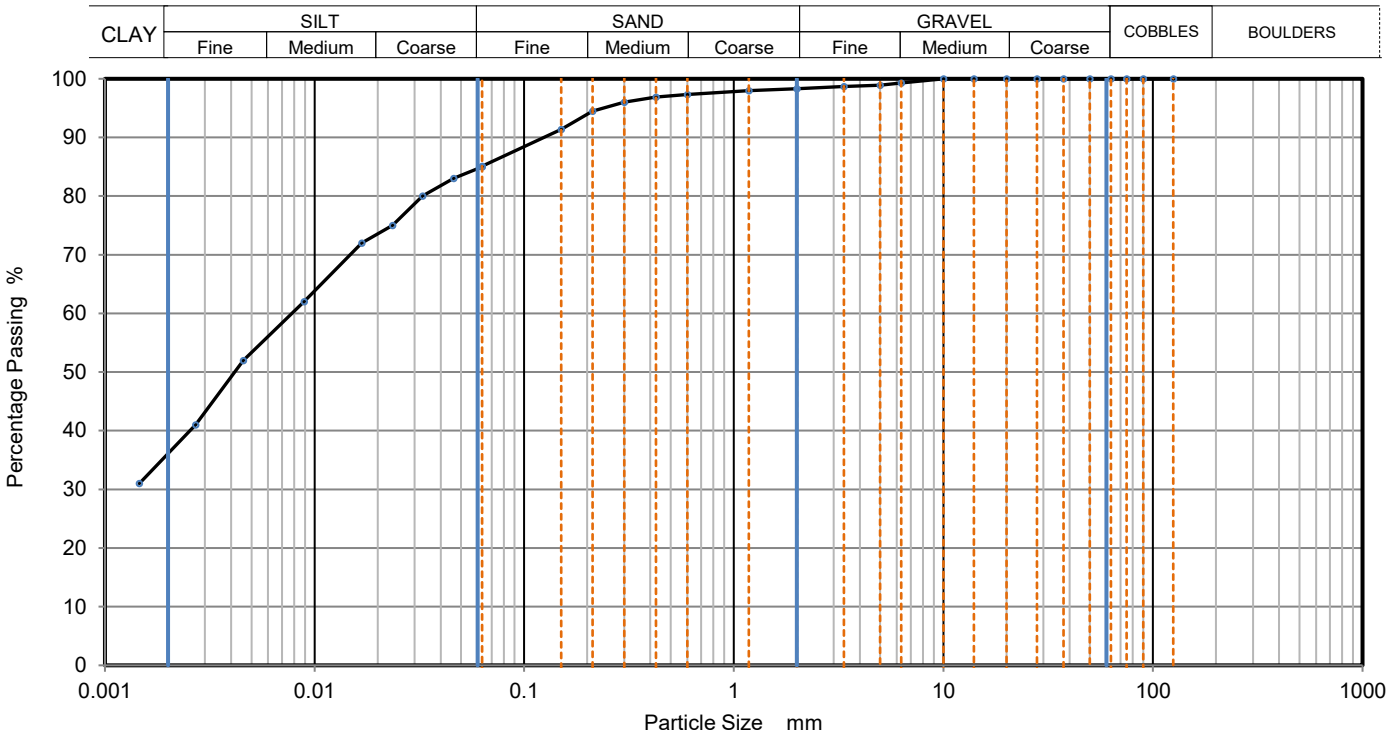
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH11
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	2.00
				Base	3.50
Specimen Reference	5	Specimen Depth	2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013157



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	85
90	100	0.04606	83
75	100	0.03282	80
63	100	0.02355	75
50	100	0.01677	72
37.5	100	0.00891	62
28	100	0.00457	52
20	100	0.00271	41
14	100	0.00146	31
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	95		
0.15	91		
0.063	85		

Dry Mass of sample, g: 500

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.7
Sand	13.3
Silt	48.8
Clay	36.2

Grading Analysis		
D100	mm	
D60	mm	0.00788
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

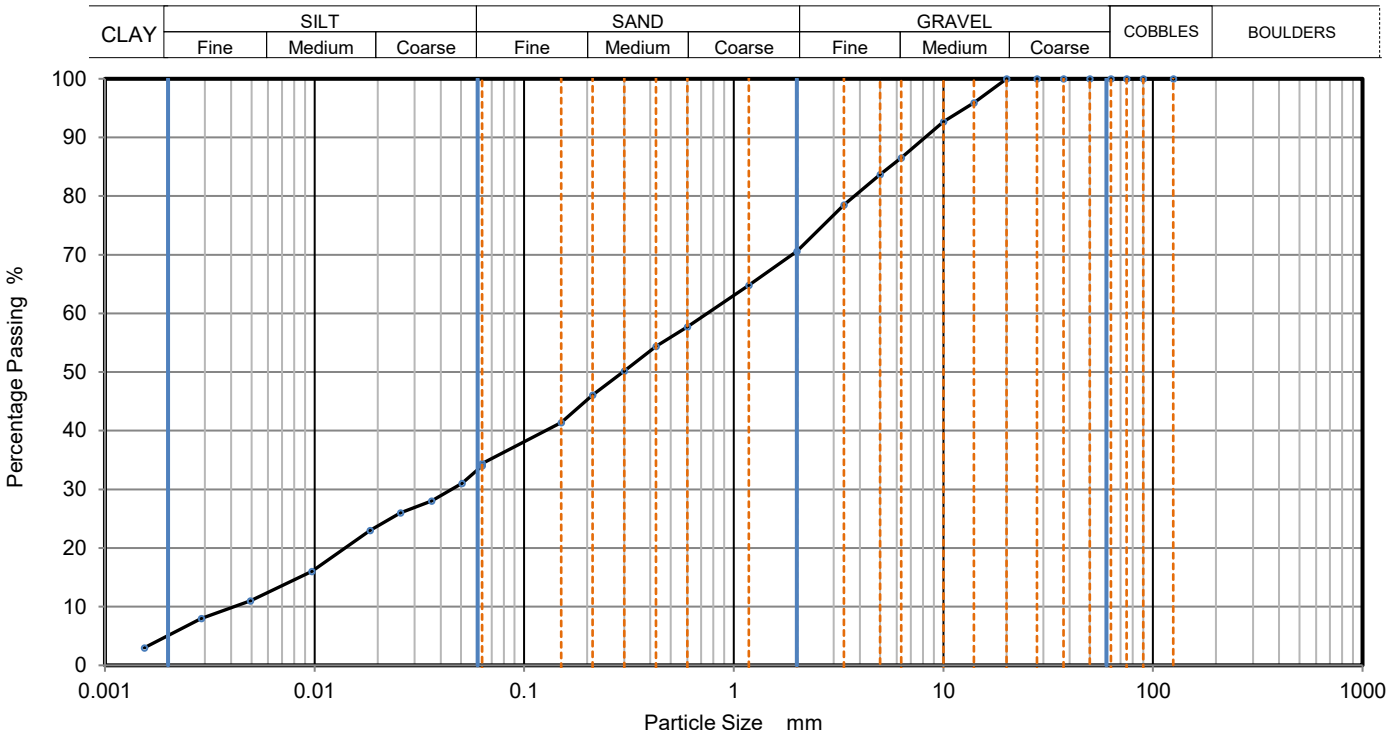
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH16
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.50
				Base	1.50
Specimen Reference	6	Specimen Depth	0.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013161



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	34
90	100	0.05042	31
75	100	0.03610	28
63	100	0.02568	26
50	100	0.01838	23
37.5	100	0.00972	16
28	100	0.00494	11
20	100	0.00288	8
14	96	0.00154	3
10	93		
6.3	87		
5	84		
3.35	79		
2	71		
1.18	65		
0.6	58	Particle density	(assumed)
0.425	54	2.65	Mg/m3
0.3	50		
0.212	46		
0.15	41		
0.063	34		

Dry Mass of sample, g: 506

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.4
Sand	36.2
Silt	29.1
Clay	5.3

Grading Analysis		
D100	mm	
D60	mm	0.745
D30	mm	0.045
D10	mm	0.00388
Uniformity Coefficient		190
Curvature Coefficient		0.7

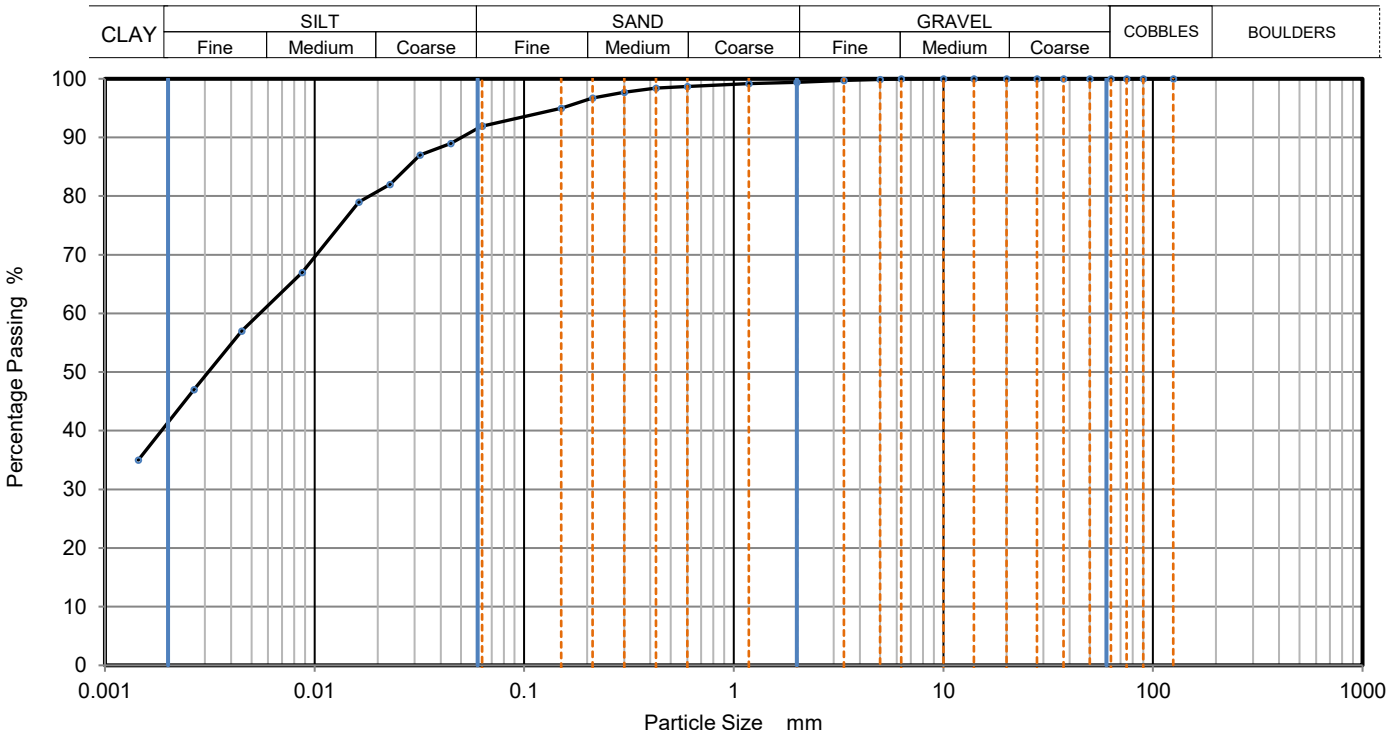
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH25
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.70
				Base	1.70
Specimen Reference	6	Specimen Depth	0.7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013162



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	92
90	100	0.04464	89
75	100	0.03182	87
63	100	0.02286	82
50	100	0.01629	79
37.5	100	0.00872	67
28	100	0.00448	57
20	100	0.00266	47
14	100	0.00144	35
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	98		
0.212	97		
0.15	95		
0.063	92		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.6
Sand	7.6
Silt	50.4
Clay	41.4

Grading Analysis		
D100	mm	
D60	mm	0.00544
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

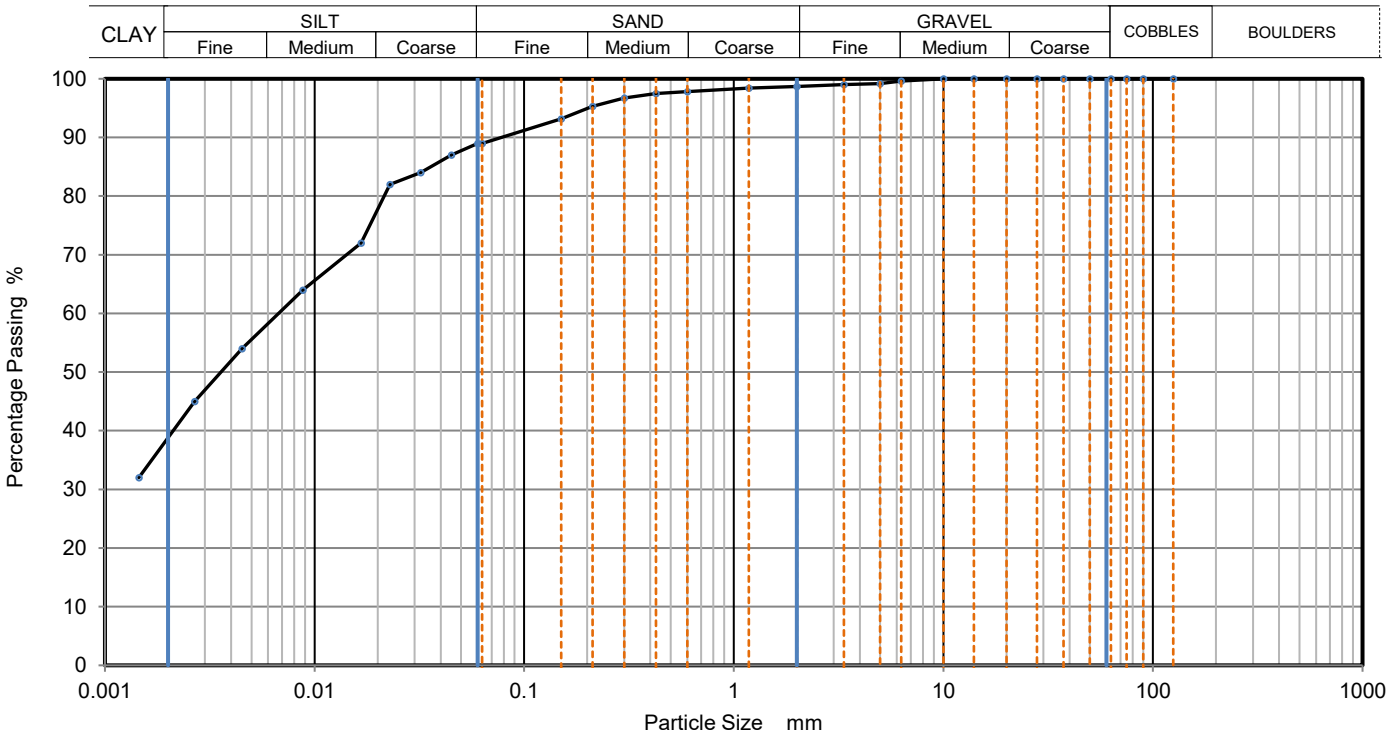
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH25
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.70
				Base	2.70
Specimen Reference	3	Specimen Depth	1.7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013165



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06003	89
90	100	0.04500	87
75	100	0.03207	84
63	100	0.02286	82
50	100	0.01665	72
37.5	100	0.00879	64
28	100	0.00451	54
20	100	0.00267	45
14	100	0.00145	32
10	100		
6.3	100		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	97		
0.212	95		
0.15	93		
0.063	89		

Dry Mass of sample, g: 508

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.3
Sand	9.7
Silt	50.4
Clay	38.6

Grading Analysis		
D100	mm	
D60	mm	0.00659
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

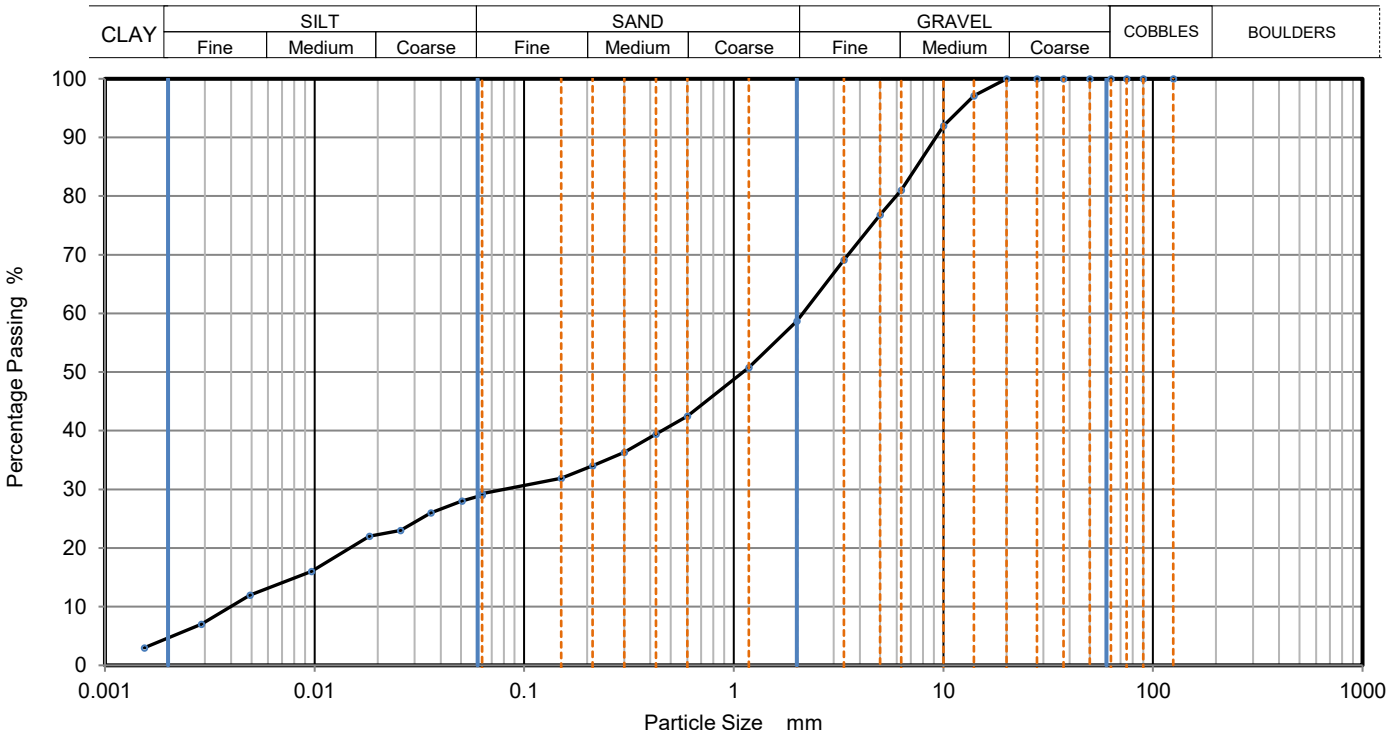
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH25
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	3.70
				Base	5.20
Specimen Reference	3	Specimen Depth	3.7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013167



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	29
90	100	0.05042	28
75	100	0.03588	26
63	100	0.02568	23
50	100	0.01827	22
37.5	100	0.00966	16
28	100	0.00491	12
20	100	0.00288	7
14	97	0.00154	3
10	92		
6.3	81		
5	77		
3.35	69		
2	59		
1.18	51		
0.6	43	Particle density	(assumed)
0.425	39	2.65	Mg/m3
0.3	36		
0.212	34		
0.15	32		
0.063	29		

Dry Mass of sample, g: 503

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	41.3
Sand	29.4
Silt	24.5
Clay	4.8

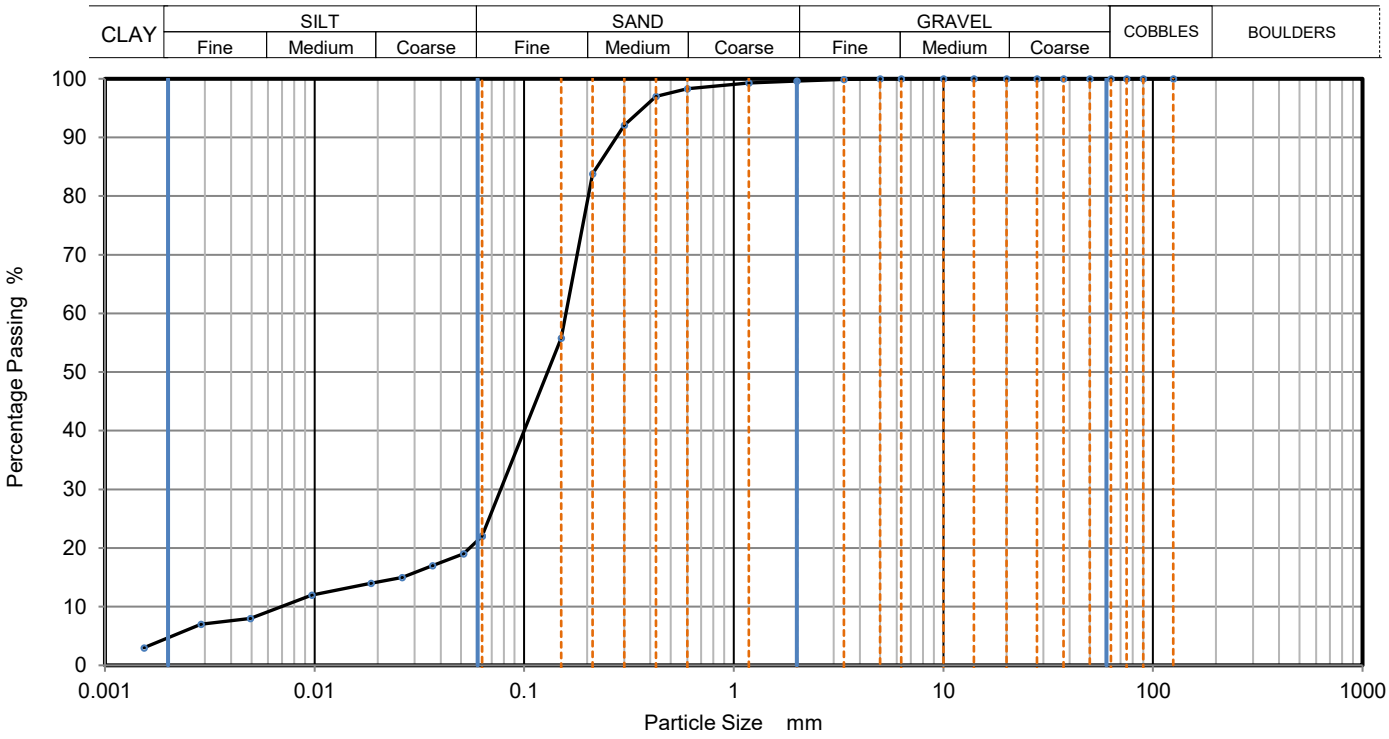
Grading Analysis		
D100	mm	
D60	mm	2.14
D30	mm	0.0798
D10	mm	0.00399
Uniformity Coefficient		540
Curvature Coefficient		0.75

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH38
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Greyish brown clayey fine to coarse SAND.			Sample Depth (m) Top	0.80
				Base	1.80
Specimen Reference	3	Specimen Depth	0.8 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013170



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	22
90	100	0.05137	19
75	100	0.03655	17
63	100	0.02615	15
50	100	0.01860	14
37.5	100	0.00972	12
28	100	0.00494	8
20	100	0.00287	7
14	100	0.00153	3
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	92		
0.212	84		
0.15	56		
0.063	22		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.4
Sand	77.5
Silt	17.1
Clay	5.0

Grading Analysis		
D100	mm	
D60	mm	0.158
D30	mm	0.0772
D10	mm	0.00708
Uniformity Coefficient		22
Curvature Coefficient		5.3

Remarks

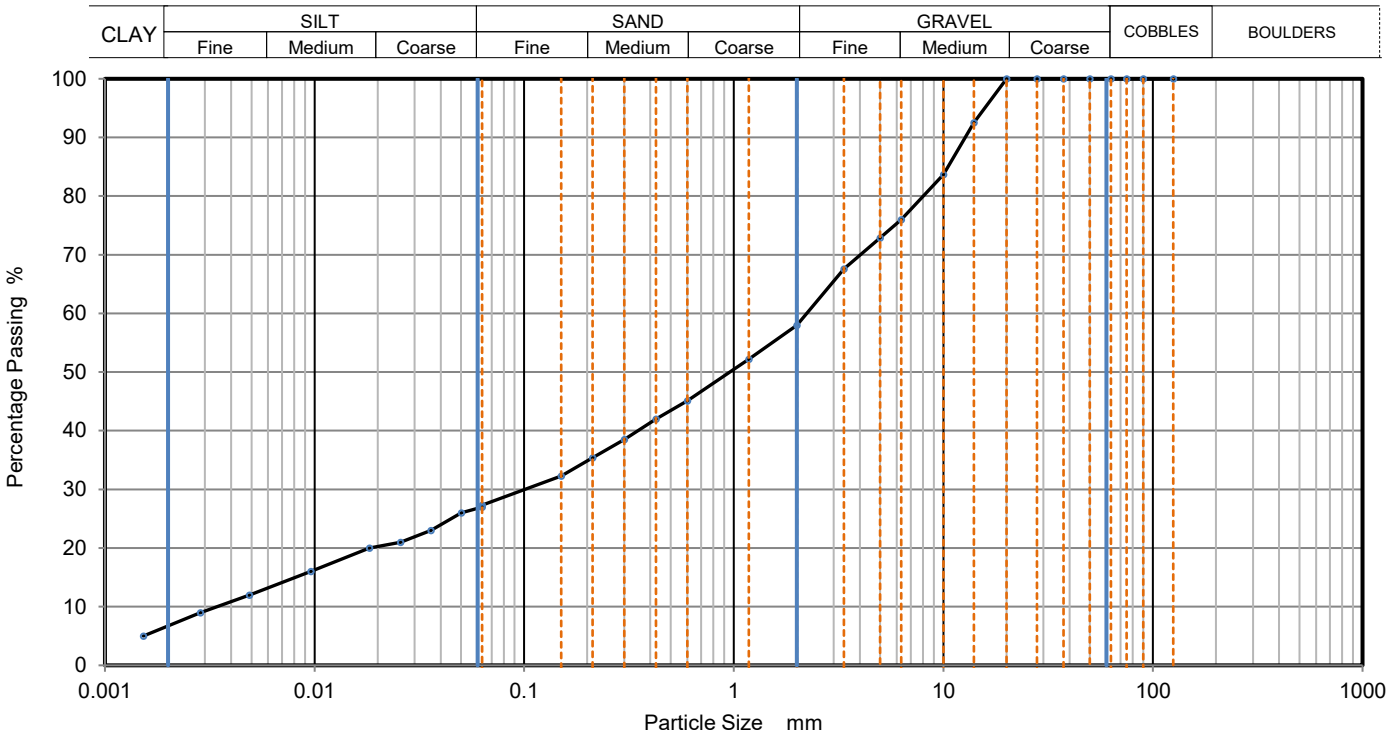
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

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PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH38
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	4.80
				Base	6.30
Specimen Reference	3	Specimen Depth	4.8 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024013174



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	27
90	100	0.05010	26
75	100	0.03588	23
63	100	0.02568	21
50	100	0.01827	20
37.5	100	0.00961	16
28	100	0.00489	12
20	100	0.00285	9
14	93	0.00153	5
10	84		
6.3	76		
5	73		
3.35	68		
2	58		
1.18	52		
0.6	45	Particle density	(assumed)
0.425	42	2.65	Mg/m3
0.3	39		
0.212	35		
0.15	32		
0.063	27		

Dry Mass of sample, g: 507

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	42.0
Sand	30.7
Silt	20.4
Clay	6.9

Grading Analysis		
D100	mm	
D60	mm	2.22
D30	mm	0.101
D10	mm	0.00344
Uniformity Coefficient		650
Curvature Coefficient		1.3

Remarks

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

Approved
Stephen Watson

Moisture Condition Value at Natural Moisture Content
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Retained on 20mm sieve %	Moisture Content <20mm %	Moisture Condition Value	Method of Interpretation	Remarks
	Ref	Top	Base	Type						
M-BH11	2	2.00	3.50	SB	Greyish brown slightly sandy silty CLAY.	0	13.2	11.5	Best fit line	

LAB 10R - Version 7

Key

Test performed in accordance with BS1377:Part4:1990, clause 5.4 unless annotated otherwise

Date Printed

28/02/2024

Approved By

Stephen Watson

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CAUSEWAY GEOTECH	**Moisture Condition Value / Moisture Content Relationship**			Job Ref		23-0585
				Borehole/Pit No.		M-BH03
Site Name	Rosslare OWH - GI			Sample No.		3
Soil Description	Grey slightly sandy silty CLAY.			Sample Depth (m)	Top	3
					Base	4.5
Specimen Reference	6	Specimen Depth	3 m	Sample Type		SB
Specimen Description	Grey slightly sandy silty CLAY.			KeyLAB ID		Caus2024013143
Test Method	BS1377:Part4:1990:clause 5.5			Date started		

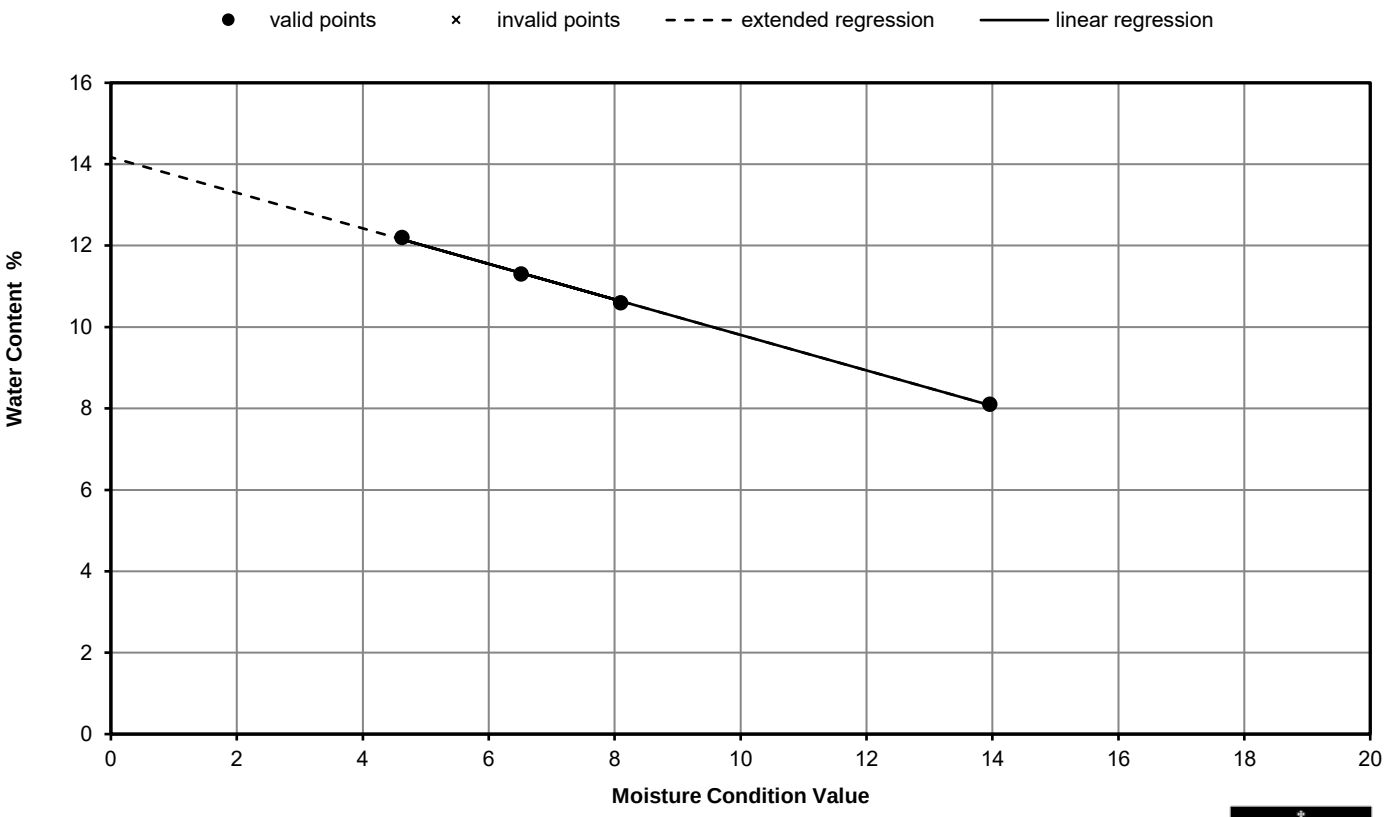
Sample preparation

Amount of material larger than 20mm sieve removed	0	%
Natural Water Content of sample	8.1	%
Initial Water Content of test sample below 20mm	8.1	%
Separate specimens tested		

General remarks

Table of results

MCV Test Number	1	2	3	4	
Water Content, %	8	12	11	11	
Moisture Condition Value	14.0	4.6	8.1	6.5	
MCV report	14	4.6	8.1	6.5	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					



Approved
Stephen Watson

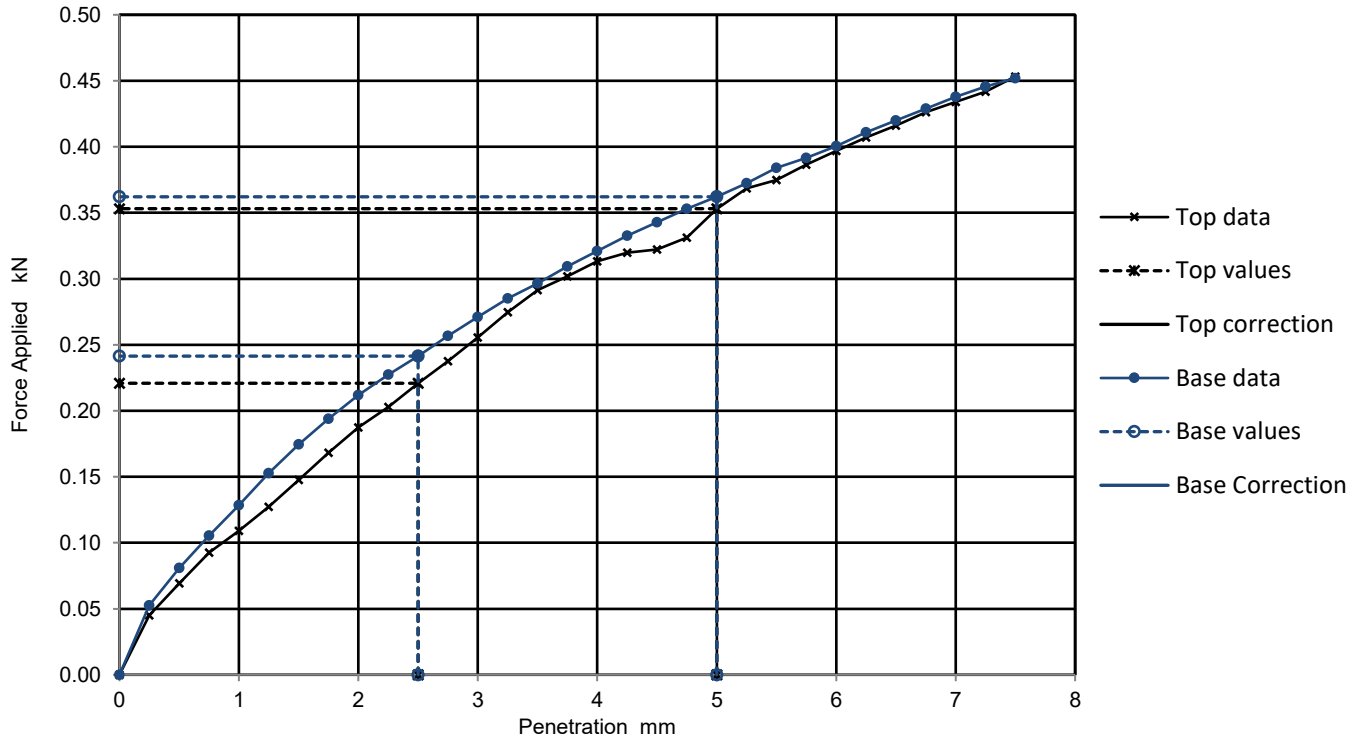
UKAS TESTING
10122

CAUSEWAY GEOTECH	**California Bearing Ratio (CBR)**			Job Ref	23-0585
				Borehole/Pit No.	M-BH07
Site Name	Rosslare OWH - GI			Sample No.	3
Soil Description	Greyish brown slightly sandy slightly gravelly silty CLAY.			Depth m	2.80
Specimen Reference		Specimen Depth	m	Sample Type	SB
Specimen Description	Greyish brown slightly sandy slightly gravelly silty CLAY.			KeyLAB ID	Caus2024013151
Test Method	BS1377 : Part 4 : 1990, clause 7			CBR Test Number	1

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked	
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking		days
				Time to surface		days
				Amount of swell recorded		mm
Material retained on 20mm sieve removed		0	%	Dry density after soaking		Mg/m3
Initial Specimen details	Bulk density	2.25	Mg/m3	Surcharge applied	4.5	kg
	Dry density	2.04	Mg/m3		3	kPa
	Moisture content	10	%			

Force v Penetration Plots



Results

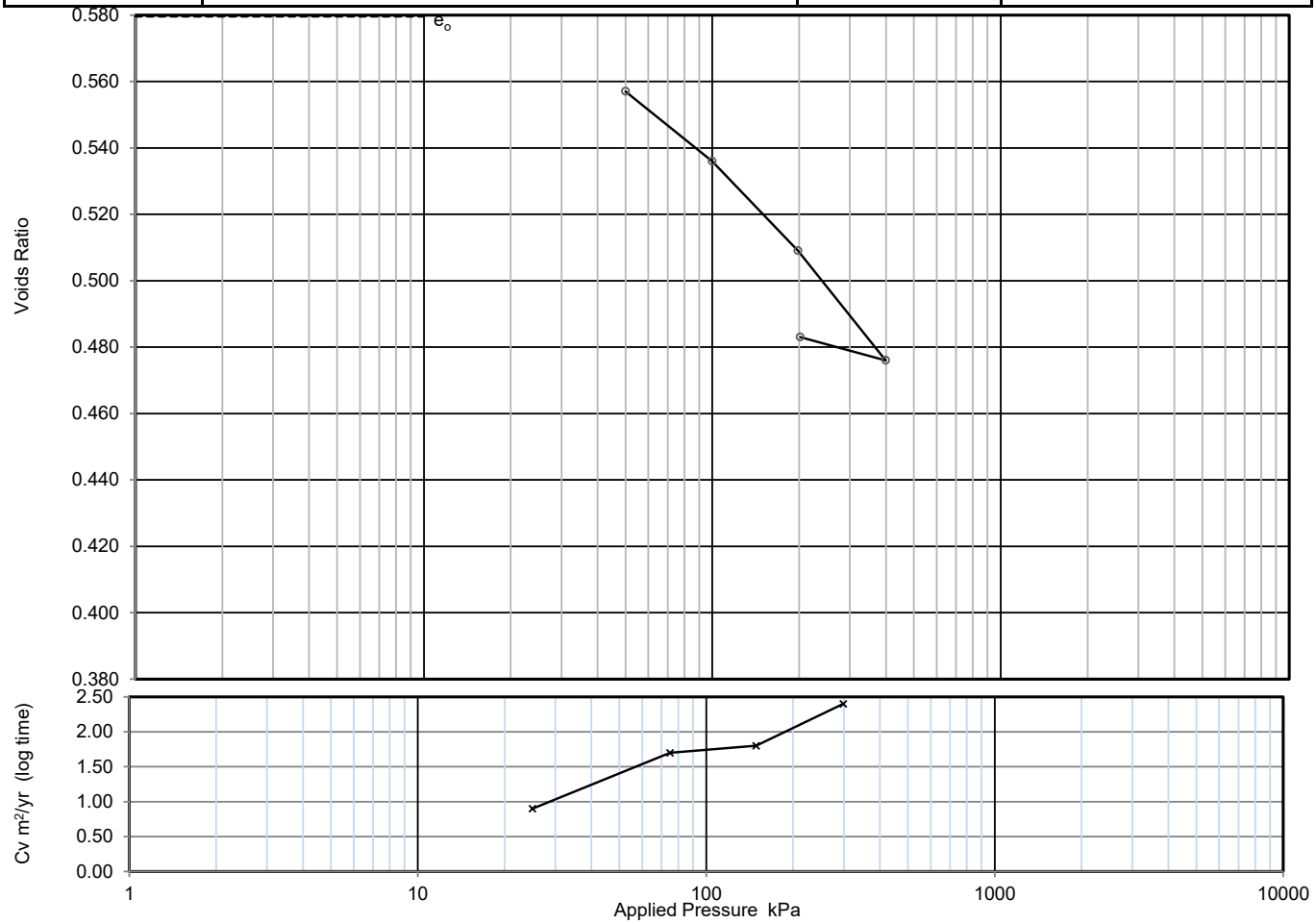
	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	1.7	1.8	1.8	1.8	10
BASE	No	1.8	1.8	1.8		11

General remarks	Test specific remarks	Approved
Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH02
Site Name	Rosslare OWH - GI				Sample No.		6
Soil Description	Grey slightly sandy silty CLAY.				Sample Depth (m)	Top	1.90
						Bottom	2.35
Specimen Reference	6	Specimen Depth	1.95	m	Sample Type		UT
Specimen Description	Grey slightly sandy silty CLAY.				KeyLAB ID		Caus2024013137
Test Method	BS1377:Part 5:1990, clause 3				Date started		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.580	-	-	-	-
50	0.557	0.28	0.9	0.98	0.0014
100	0.536	0.27	1.7	2.9	0.0014
198	0.509	0.18	1.8	3	0.0014
399	0.476	0.11	2.4	4.9	0.0022
202	0.483	0.023			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.68	mm
Moisture Content	27.0	25.0	%
Bulk density	2.13	2.23	Mg/m3
Dry density	1.68	1.79	Mg/m3
Voids Ratio	0.580	0.483	
Saturation	123	137	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

Printed :

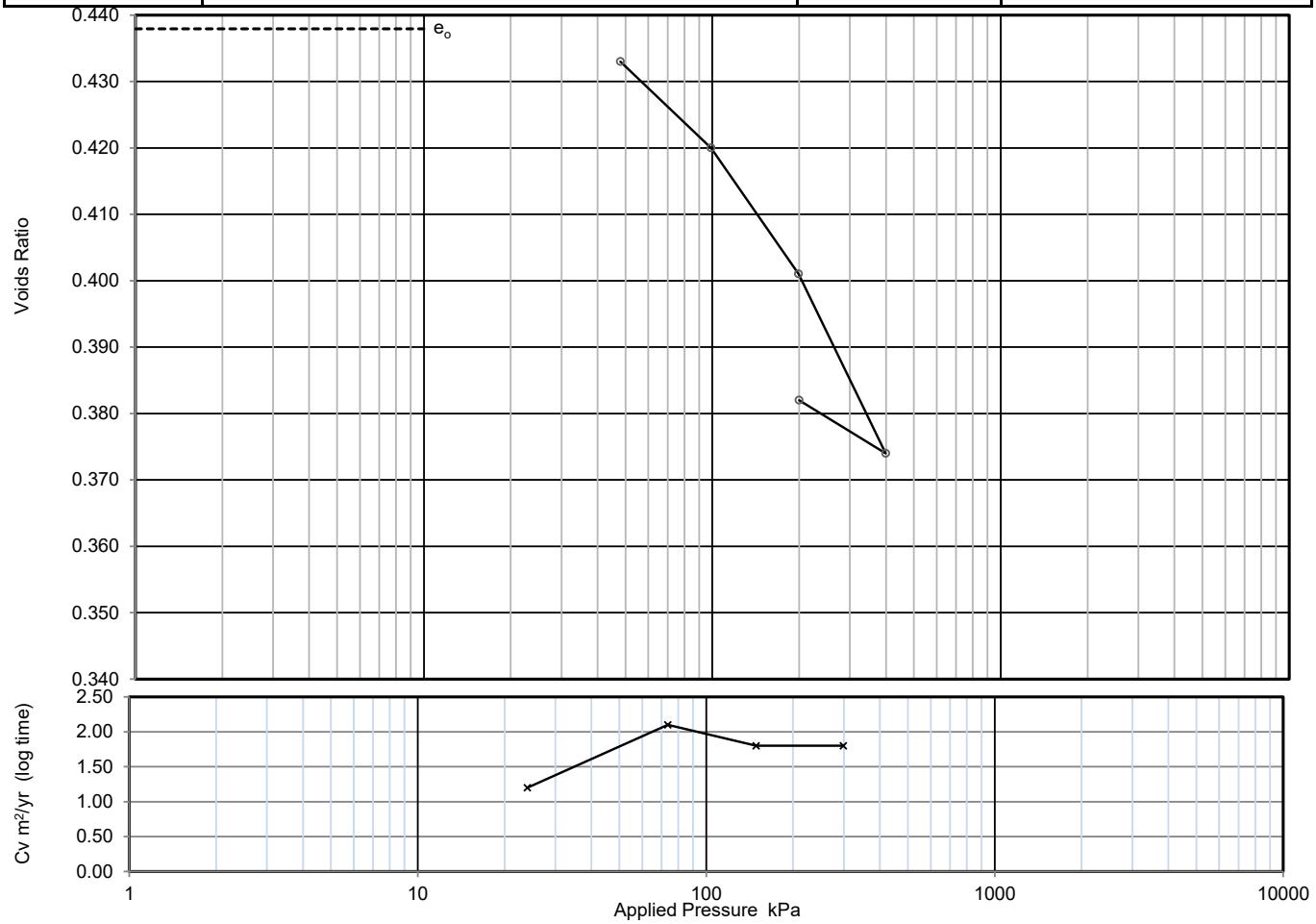
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LAB 13R - Version 6

UKAS TESTING

10122

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH07
Site Name	Rosslare OWH - GI				Sample No.		7
Soil Description	Greyish brown slightly sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	1.80
						Bottom	2.25
Specimen Reference	6	Specimen Depth	1.85	m	Sample Type		UT
Specimen Description	Greyish brown slightly sandy slightly gravelly silty CLAY.				KeyLAB ID		Caus2024013150
Test Method	BS1377:Part 5:1990, clause 3				Date started		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.438	-	-	-	-
48	0.433	0.076	1.2	1.4	0.00084
99	0.420	0.18	2.1	21	0.0011
199	0.401	0.14	1.8	22	0.0012
399	0.374	0.093	1.8	20	0.0017
200	0.382	0.028			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	19.13	mm
Moisture Content	18.0	20.0	%
Bulk density	2.17	2.30	Mg/m3
Dry density	1.84	1.92	Mg/m3
Voids Ratio	0.438	0.382	
Saturation	108	139	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

Printed :

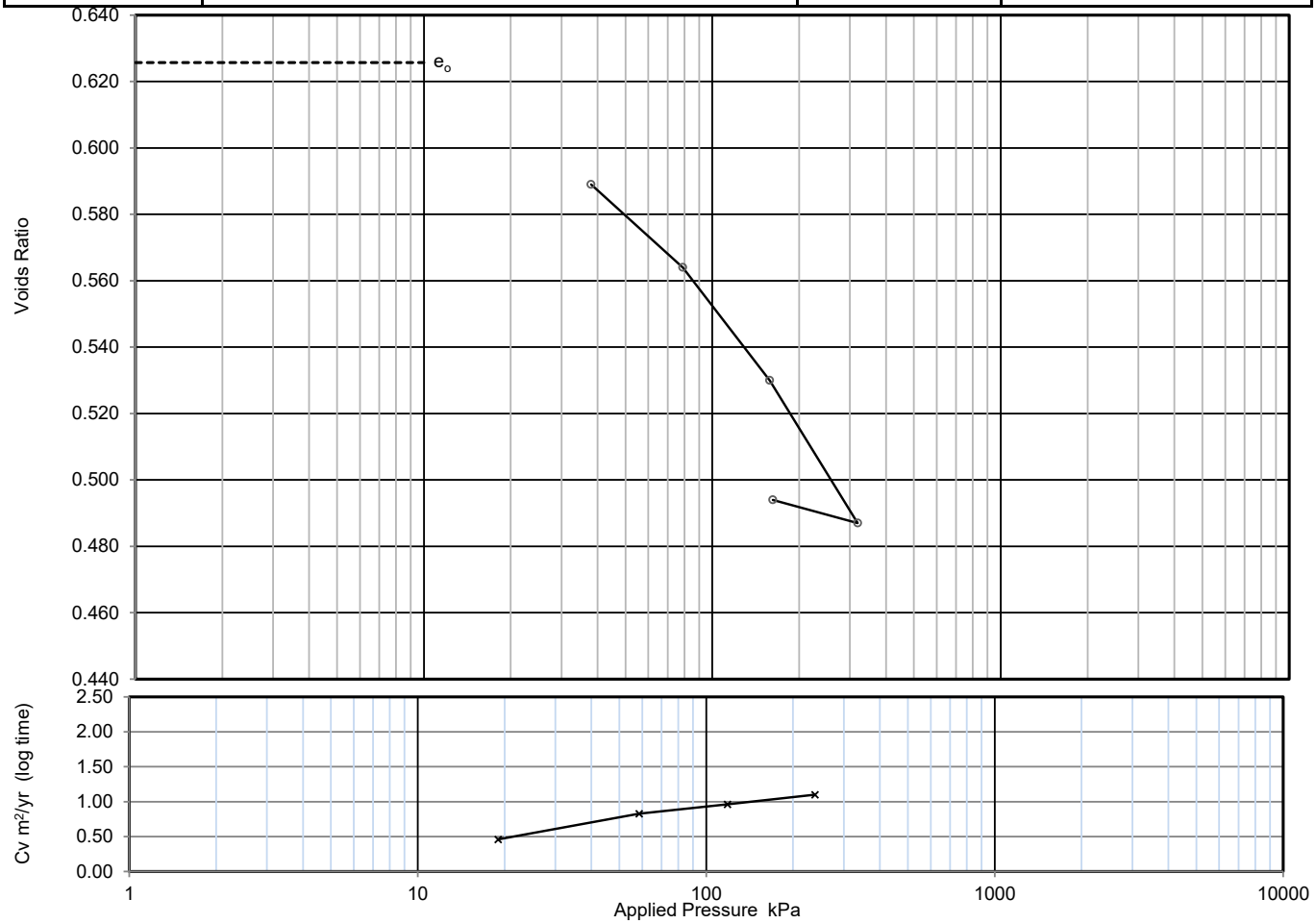
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LAB 13R - Version 6

UKAS TESTING

10122

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH11
Site Name	Rosslare OWH - GI				Sample No.		7
Soil Description	Greyish brown slightly sandy silty CLAY.				Sample Depth (m)	Top	2.00
						Bottom	2.45
Specimen Reference	5	Specimen Depth	2.05	m	Sample Type		UT
Specimen Description	Greyish brown slightly sandy silty CLAY.				KeyLAB ID		Caus2024013155
Test Method	BS1377:Part 5:1990, clause 3				Date started		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.626	-	-	-	-
38	0.589	0.6	0.46	0.4	0.0016
79	0.564	0.38	0.83	1.3	0.002
158	0.530	0.28	0.96	1.6	0.0022
319	0.487	0.17	1.1	1.8	0.0021
162	0.494	0.03			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.29	mm
Moisture Content	24.0	28.0	%
Bulk density	2.02	2.27	Mg/m3
Dry density	1.63	1.77	Mg/m3
Voids Ratio	0.626	0.494	
Saturation	102	150	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

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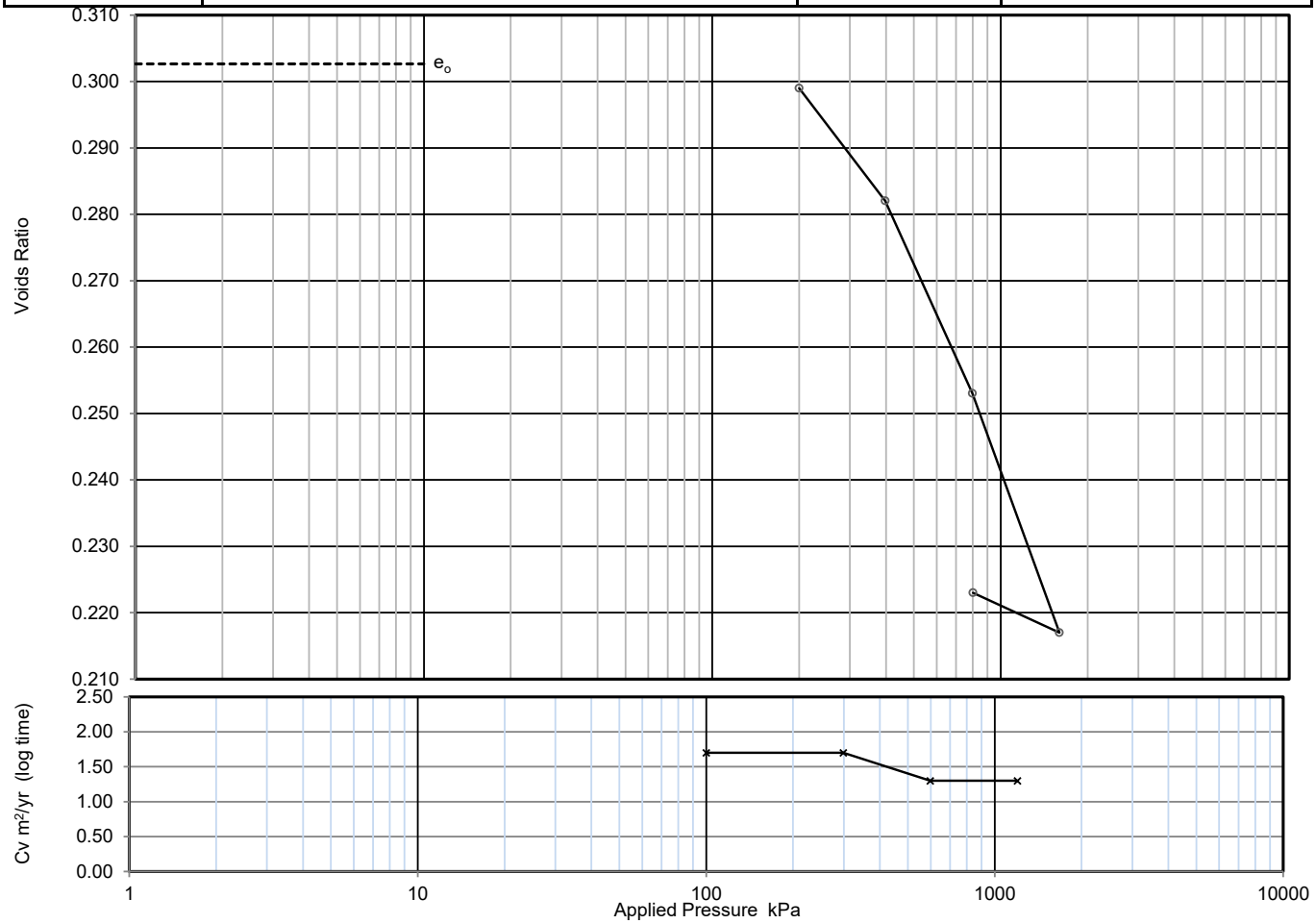
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LAB 13R - Version 6

UKAS TESTING

10122

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH25
Site Name	Rosslare OWH - GI				Sample No.		12
Soil Description	Greyish brown slightly sandy silty CLAY.				Sample Depth (m)	Top	1.70
						Bottom	2.15
Specimen Reference	5	Specimen Depth	1.75	m	Sample Type		UT
Specimen Description	Greyish brown slightly sandy silty CLAY.				KeyLAB ID		Caus2024013164
Test Method	BS1377:Part 5:1990, clause 3				Date started		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.303	-	-	-	-
200	0.299	0.013	1.7	1.9	0.00064
398	0.282	0.069	1.7	7.9	0.0012
798	0.253	0.056	1.3	1.7	0.0019
1,598	0.217	0.036	1.3	1.5	0.0025
802	0.223	0.0062			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.68	mm
Moisture Content	20.0	22.0	%
Bulk density	2.43	2.64	Mg/m3
Dry density	2.03	2.17	Mg/m3
Voids Ratio	0.303	0.223	
Saturation	172	261	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

Printed :

01/03/2024 10:11

LAB 13R - Version 6

UKAS TESTING

10122

Summary of Laboratory Vane Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description at test horizon	Moisture Content %	Vane shear strength		Sensitivity	Remarks
	Ref	Top	Base	Type			Undisturbed kPa	Remoulded kPa		
M-BH07	8	3.80	3.90	UT	Greyish brown slightly sandy slightly gravelly silty CLAY.	24	70			
M-BH11	7	2.00	2.45	UT	Greyish brown slightly sandy silty CLAY.	25	34			
M-BH25	12	1.70	2.15	UT	Greyish brown slightly sandy silty CLAY.	22	130			

Notes	Date Printed	Approved By	Table
Tests performed in accordance with BS 1377:Part 7:clause 3 using 19mm x 30mm vane Tests carried out in nominally 100mm diameter tube unless noted otherwise Shear strengths are average of at least 3 tests unless noted otherwise	03/01/2024 00:00	Stephen Watson	1 sheet 1

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH03	Sample Reference		6	
Depth (m)	7.00	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Grey sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	10.0	10.0	10.0
Bulk Density (Mg/m^3)	2.08	2.10	2.08
Dry Density (Mg/m^3)	1.89	1.91	1.89
Voids Ratio	0.399	0.390	0.402
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	0.873	0.962	1.976
Shearing			
Rate of Strain (mm/min)	0.114	0.114	0.114
Peak Shear Stress (kPa)	61.2	110.1	200.7
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	4.497	4.803	5.703
Final Conditions			
Water Content (%)	17.0	19.0	21.0
Dry Density (Mg/m^3)	2.08	2.15	2.39
Voids Ratio	0.322	0.282	0.217

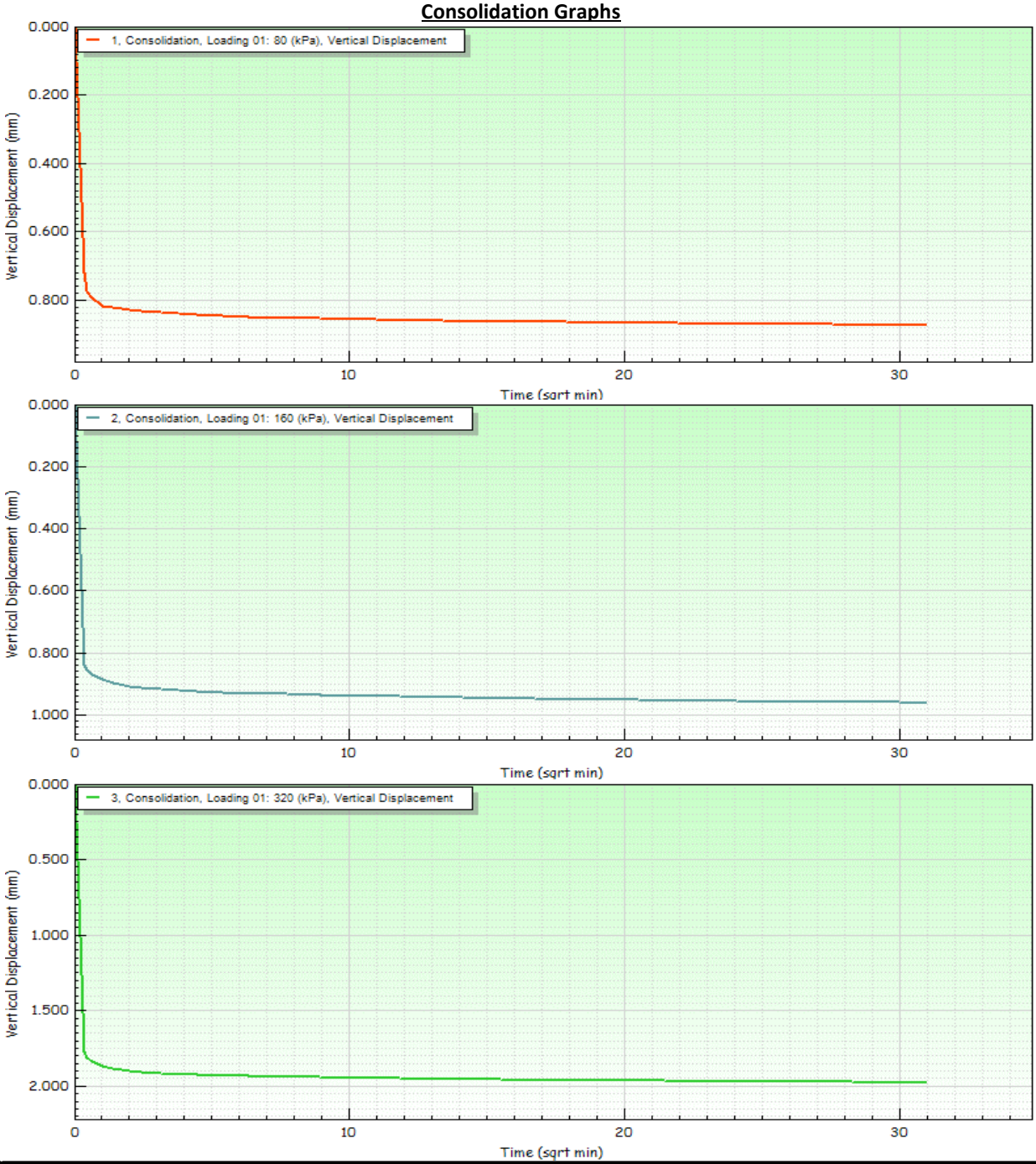
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH03	Sample Reference	6	
Depth (m)	7.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

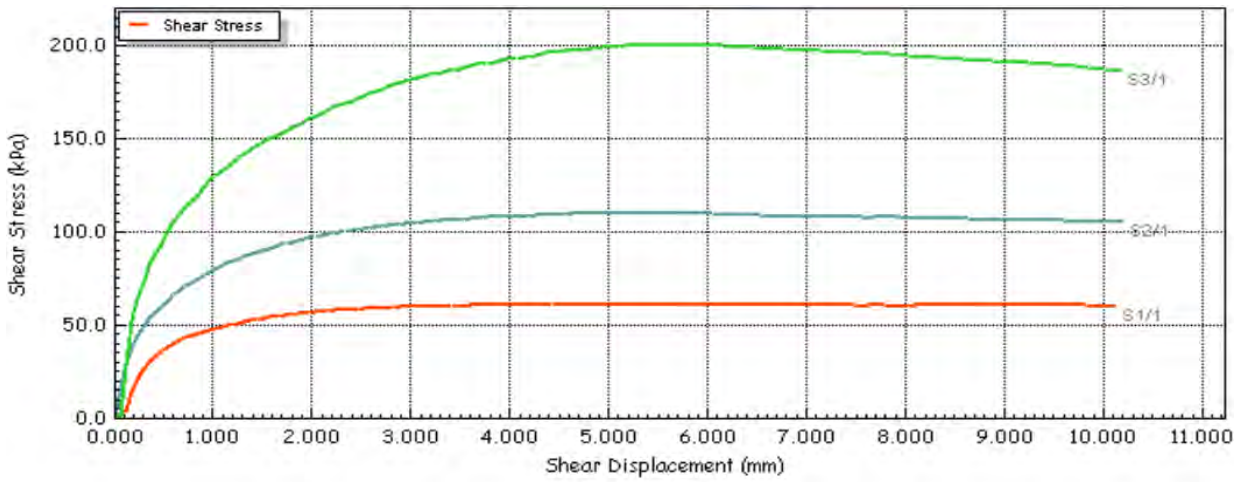


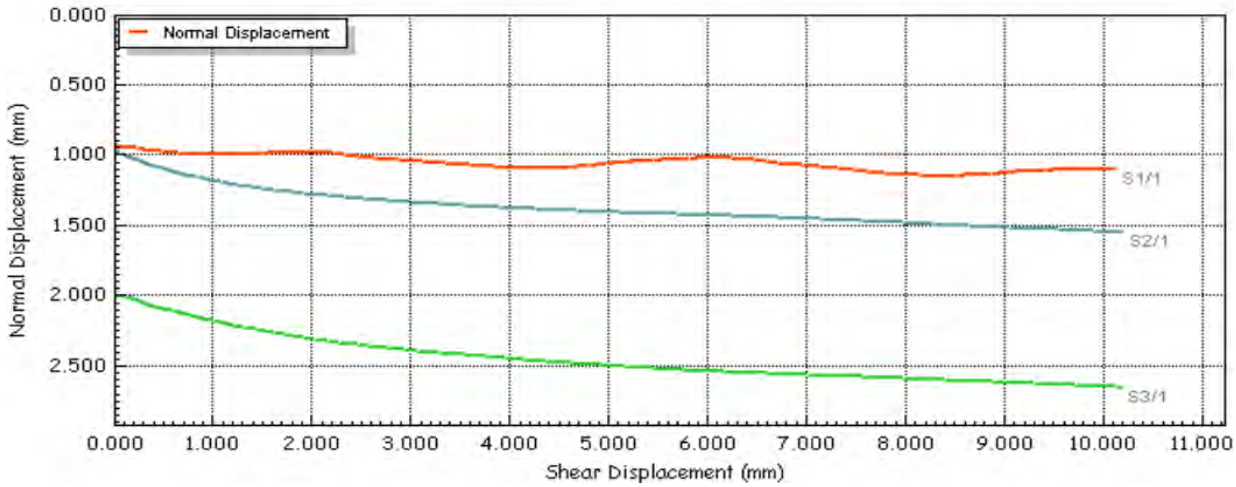
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH03	Sample Reference	6	
Depth (m)	7.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



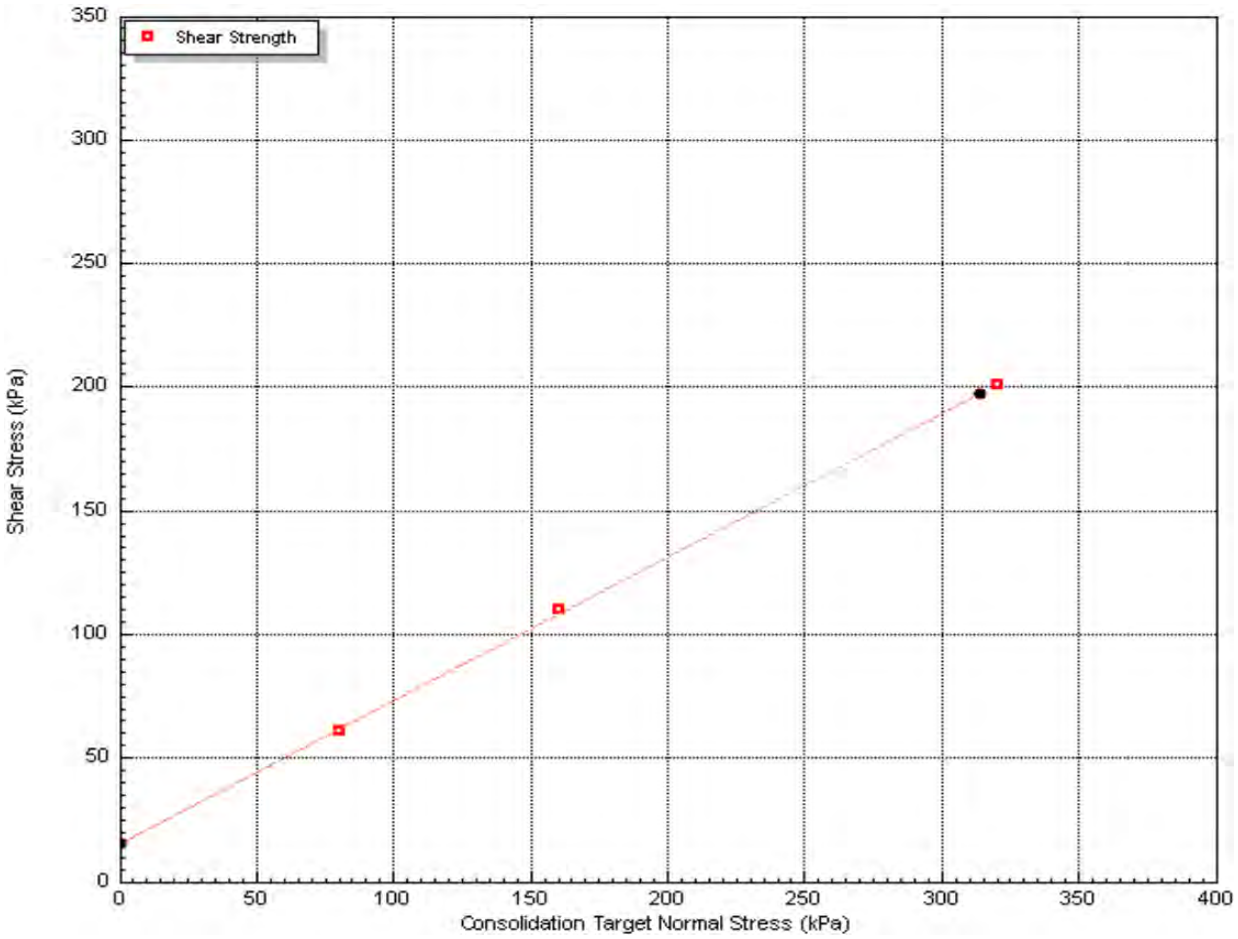


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH03	Sample Reference	6	
Depth (m)	7.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	16		
Angle of Shearing Resistance (°)	30.0		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

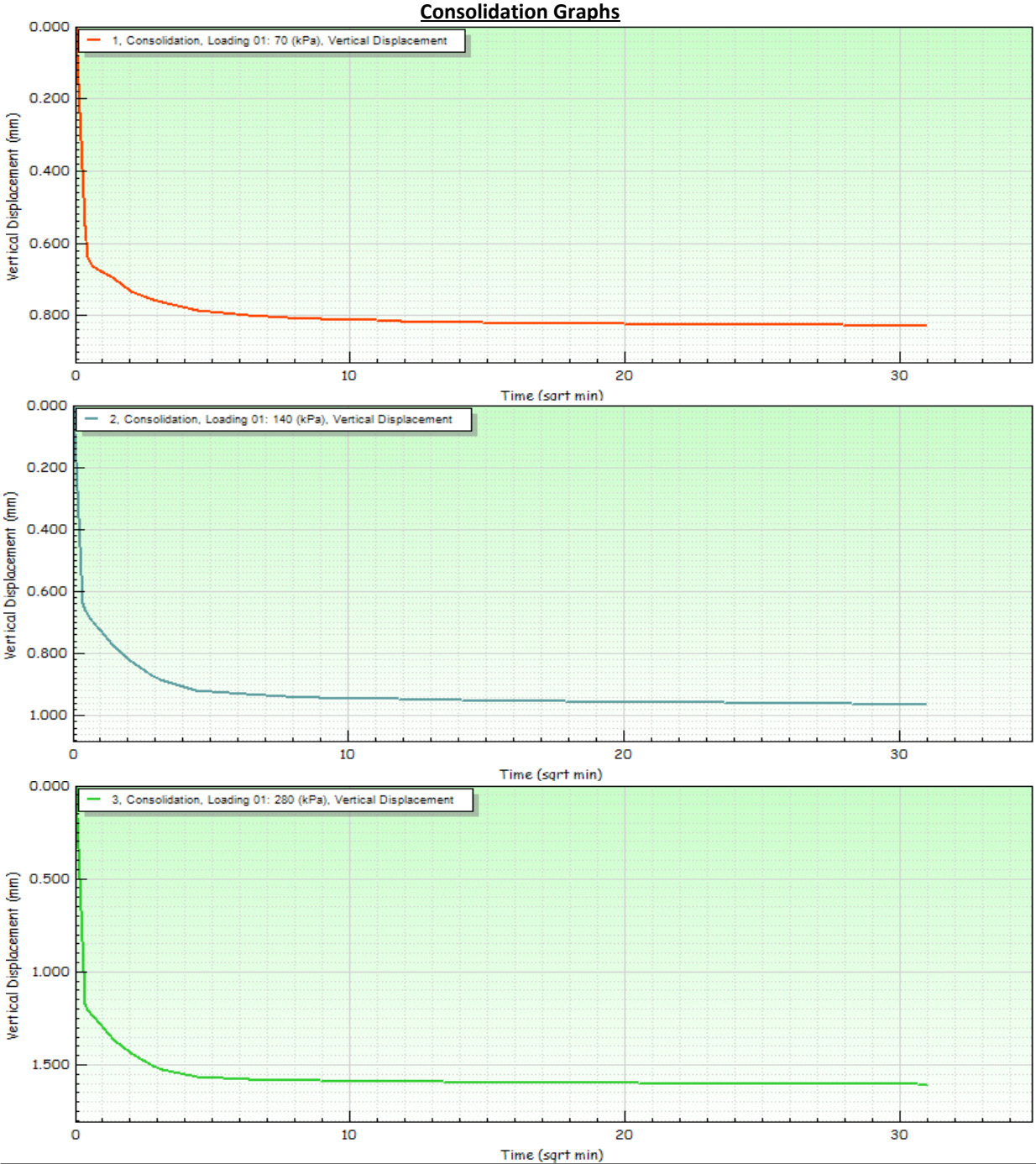
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH25	Sample Reference		5	
Depth (m)	5.20	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	17.0	17.0	17.0
Bulk Density (Mg/m^3)	2.16	2.18	2.18
Dry Density (Mg/m^3)	1.85	1.87	1.87
Voids Ratio	0.431	0.414	0.415
Consolidation			
Normal Pressure (kPa)	70	140	280
Vertical Displacement (mm)	0.828	0.964	1.607
Shearing			
Rate of Strain (mm/min)	0.081	0.081	0.081
Peak Shear Stress (kPa)	61.2	95.8	166.0
Hoz Displacement (mm)	8.4	8.4	8.4
Hoz Displacement at Peak Shear Stress (mm)	1.617	1.917	2.517
Final Conditions			
Water Content (%)	17.0	19.0	20.0
Dry Density (Mg/m^3)	2.02	2.08	2.24
Voids Ratio	0.369	0.334	0.291

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH25	Sample Reference	5	
Depth (m)	5.20	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

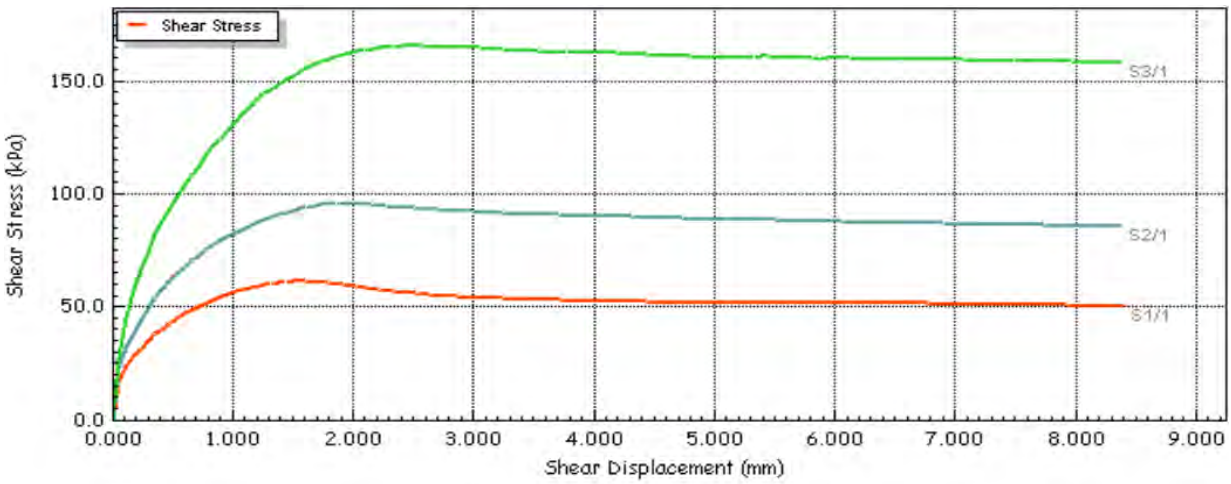


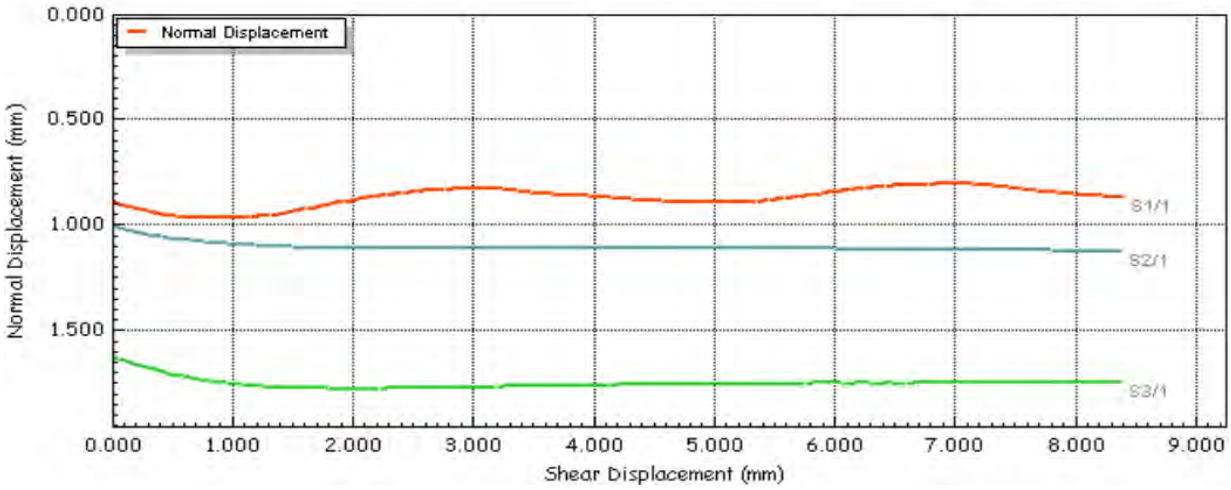
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH25	Sample Reference		5	
Depth (m)	5.20	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



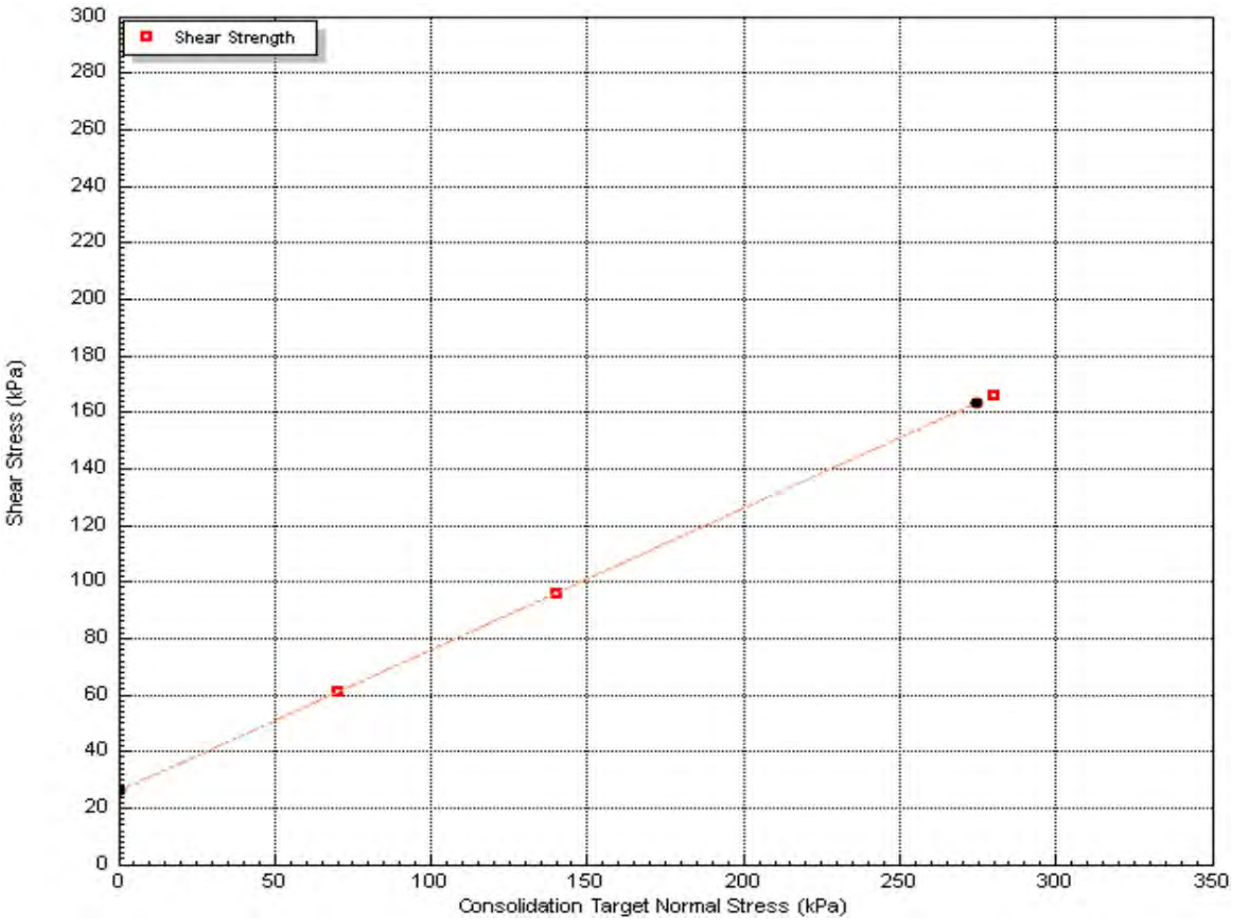


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH25	Sample Reference	5	
Depth (m)	5.20	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	26		
Angle of Shearing Resistance (°)	26.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

LABORATORY REPORT

Contract Number: PSL24/0788

Report Date: 19 February 2024

Client's Reference: 23-0585

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

For the attention of: Stephen Watson

Contract Title: Rosslare Europort Offshore Renewable Energy Hub SI

Date Received: 31/1/2024
Date Commenced: 31/1/2024
Date Completed: 19/2/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Managing Director)
R Berriman (Associate Director)
S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
D Burton (Advanced Testing Manager)

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DN4 0AR
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awatkins@prosoils.co.uk

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details				
	Depth	1.90-2.35m UT6		
	Description	Brown slightly sandy CLAY.		
	Type	Undisturbed, vertical orientation.		
	Initial Sample Length	L_0	(mm)	211.0
	Initial Sample Diameter	D_0	(mm)	105.0
	Initial Sample Weight	W_0	(gr)	3732.0
	Initial Bulk Density	ρ_0	(Mg/m3)	2.04
	Particle Density	ρ_s	(Mg/m3)	2.66

sketch showing specimen location in original sample

Initial Conditions			Stage 1	2
Initial Cell Pressure	σ_{3i}	(kPa)	550	
Initial Back Pressure	U_{bi}	(kPa)	500	
Membrane Thickness	m_b	(mm)	0.600	
Displacement Input	L_{IP}	(mm)	CH 2	
Load Input	N_{IP}	(N)	CH 1	
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 3	
Sample Volume	V	(cc)	CH 6	
Initial Moisture	ω_i	(%)	21	
Initial Dry Density	ρ_{di}	(Mg/m3)	1.69	
Initial Voids Ratio	e_i	.	0.570	
Initial Degree of Saturation	S_i	(%)	96	
B Value	B	.	0.96	

Final Conditions				
Final Moisture	ω_f	(%)	21	
Final Dry Density	ρ_{df}	(Mg/m3)	1.72	
Final Voids Ratio	e_f	.	0.546	
Final Degree of Saturation	S_f	(%)	100.0	
			Stage 1	2
Failure Criteria		.	Max. Dev.	
Strain At Failure	ε_f	(%)	14.00	
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	136.7	
Minor Stress At Failure	σ_3'	(kPa)	79.0	
Major Stress At Failure	σ_1'	(kPa)	215.7	
Principal Stress Ratio At Failure	σ_1'/σ_3'		2.730	
PwP At Failure Criteria	u_f		471.0	

Notes



Plastic

Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH02 1.90-2.35m	
			Test Date	01/02/2024	
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH02	
			Sample	1.90-2.35m	
Client	Causeway Geotech		Depth	1.90-2.35m UT6	
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

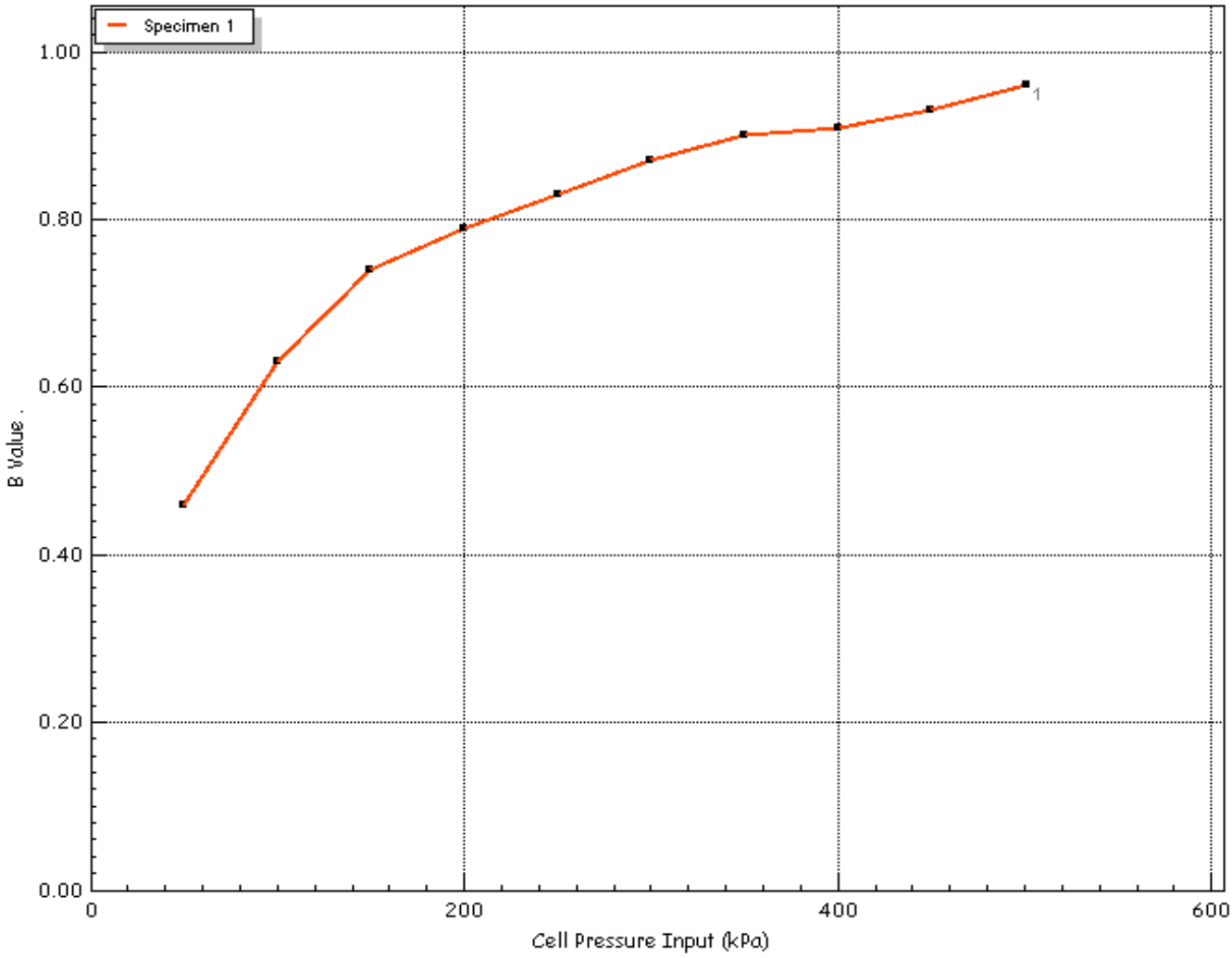
PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	σ	(kPa)	500
Pore Water Pressure Input	u pwp	(kPa)	478
B Value	B	.	0.96



PSL PROFESSIONAL SOILS LABORATORY UKAS TESTING 4043	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH02 1.90-2.35m
				Test Date	01/02/2024
	Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH02
				Sample	1.90-2.35m
	Client	Causeway Geotech		Depth	1.90-2.35m UT6
	Operator	David Burton	Checked S.Royle	Approved	S.Royle

PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Consolidation Plots

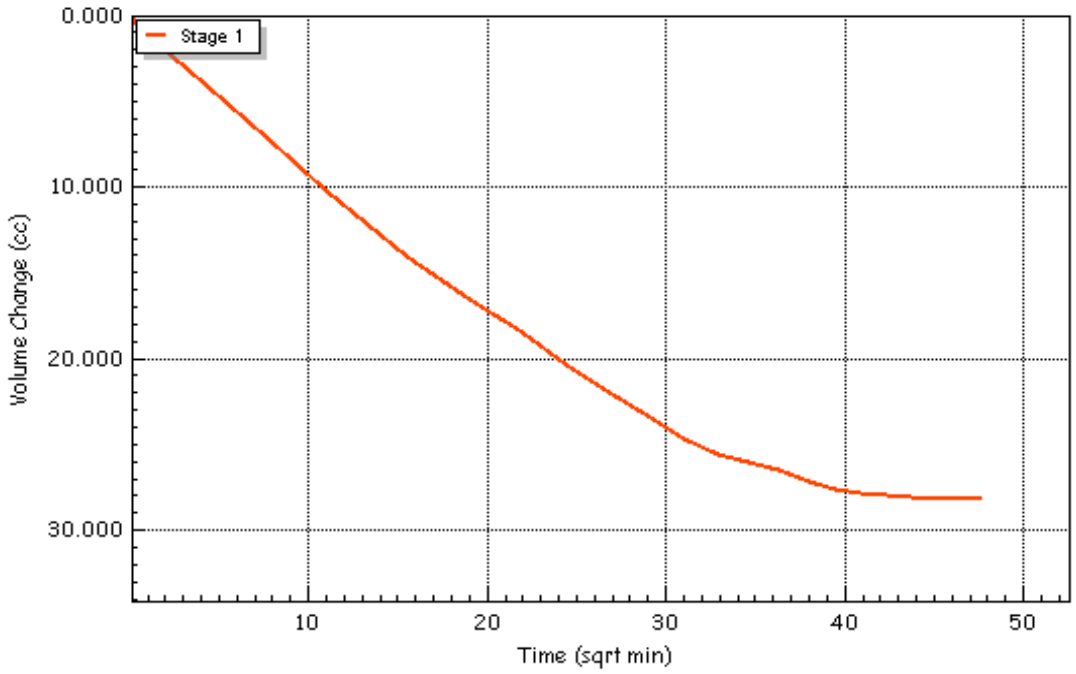
Initial Conditions

Initial Cell Pressure	σ_3	(kPa)	550
Initial Back Pressure	u_{bi}	(kPa)	500
Pore Water Pressure Input	u_{pwp}	(kPa)	553
Drainage Method			Radial+One End

Final Conditions

PWP Dissipation %	U%	(%)	96.21
Volumetric Strain	ε_v%	(%)	1.54
Corrected Length	L_c	(mm)	209.9
Corrected Area	A_c	(cm2)	85.70
Corrected Volume	V_c	(cc)	1798.871
t100	t_{100}	(min)	891.47
Consolidation	c_v	(m2/year)	0.003
Compressibility	m_v	(m2/MN)	0.304
Test Time	t_F	(h:m:s)	26:44:38
Estimated Strain to Failure	ε %	(%)	5.0
Shear Machine Speed	d_r	(mm/min)	0.00654

Notes



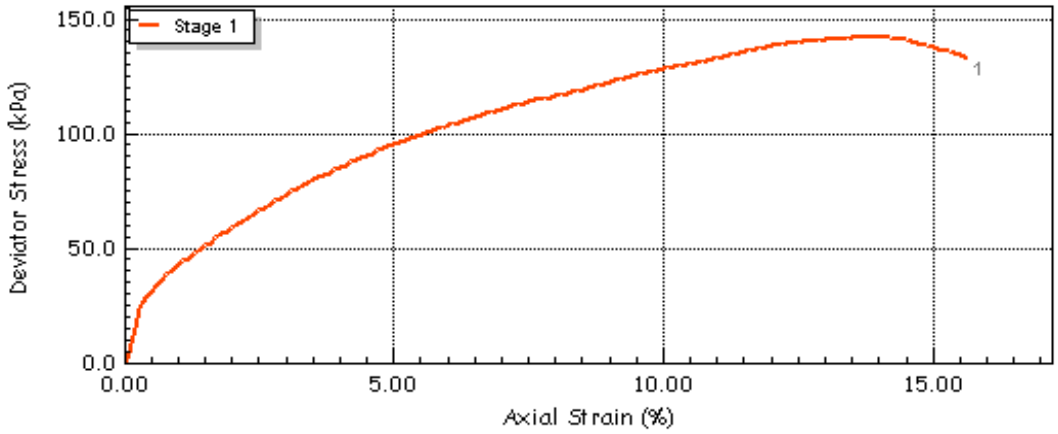
Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH02 1.90-2.35m
				Test Date	01/02/2024
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI			Borehole	M-BH02
				Sample	1.90-2.35m
Client	Causeway Geotech			Depth	1.90-2.35m UT6
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

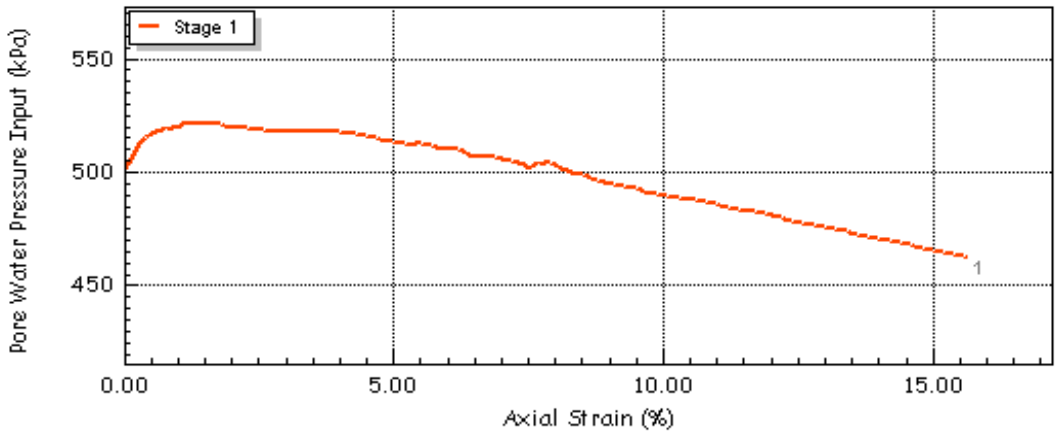
PSL Laboratory

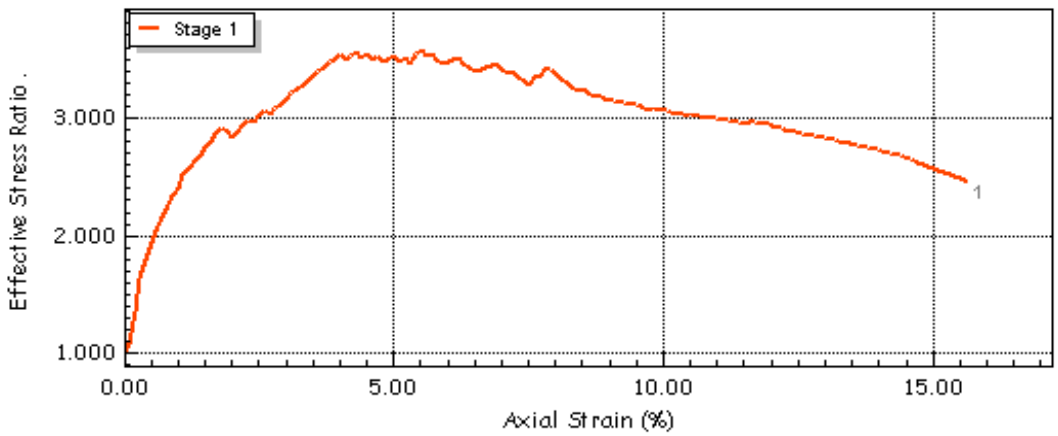
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







PSL PROFESSIONAL SOILS LABORATORY UKAS TESTING 4043	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH02 1.90-2.35m
				Test Date	01/02/2024
	Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH02
				Sample	1.90-2.35m
	Client	Causeway Geotech		Depth	1.90-2.35m UT6
	Operator	David Burton	Checked S.Royle	Approved	S.Royle

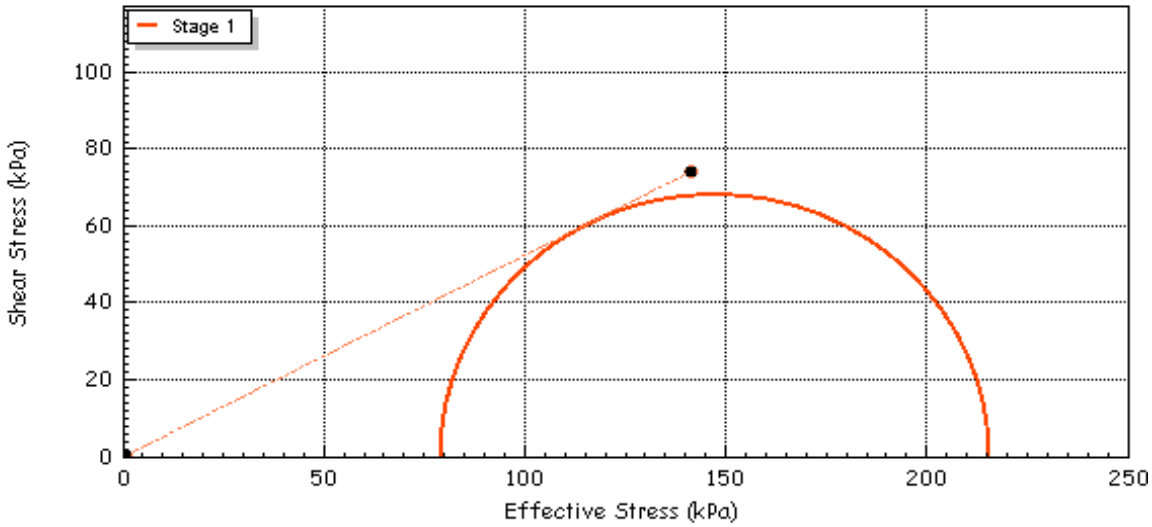
PSL Laboratory

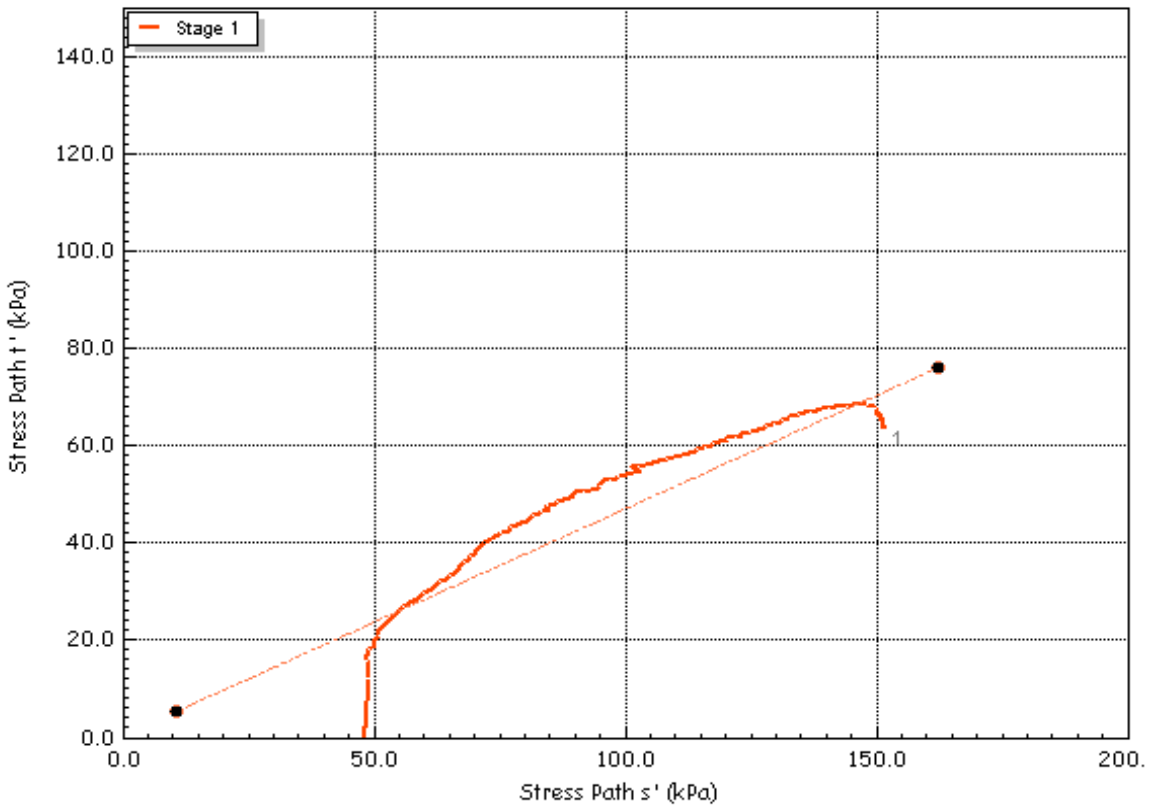
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective	c'	(kPa)	0.00	Effective Cohesion	c'	(kPa)	0.00
Effective Friction	ϕ'	(deg)	27.7	Effective Friction	ϕ'	(deg)	27.7





Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH02 1.90-2.35m	
			Test Date	01/02/2024	
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH02	
			Sample	1.90-2.35m	
Client	Causeway Geotech		Depth		
Operator	David Burton	Checked	Sean Royle	Approved	Sean Royle

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details				
	Depth	1.80-2.25m UT7		
	Description	Brown slightly sandy CLAY.		
	Type	Undisturbed, vertical orientation.		
	Initial Sample Length	L_0	(mm)	211.0
	Initial Sample Diameter	D_0	(mm)	105.0
	Initial Sample Weight	W_0	(gr)	3700.0
	Initial Bulk Density	ρ_0	(Mg/m3)	2.03
	Particle Density	ρ_s	(Mg/m3)	2.66

sketch showing specimen location in original sample

Initial Conditions			Stage 1	2
Initial Cell Pressure	σ_{3i}	(kPa)	700	
Initial Back Pressure	U_{bi}	(kPa)	650	
Membrane Thickness	m_b	(mm)	0.600	
Displacement Input	L_{IP}	(mm)	CH 2	
Load Input	N_{IP}	(N)	CH 1	
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 3	
Sample Volume	V	(cc)	CH 6	
Initial Moisture	ω_i	(%)	20	
Initial Dry Density	ρ_{di}	(Mg/m3)	1.68	
Initial Voids Ratio	e_i	.	0.580	
Initial Degree of Saturation	S_i	(%)	93	
B Value	B	.	0.95	

Final Conditions				
Final Moisture	ω_f	(%)	21	
Final Dry Density	ρ_{df}	(Mg/m3)	1.70	
Final Voids Ratio	e_f	.	0.564	
Final Degree of Saturation	S_f	(%)	97.1	
			Stage 1	2
Failure Criteria		.	Max. Dev.	
Strain At Failure	ε_f	(%)	19.80	
Stress At Failure	$(\sigma_1-\sigma_3)$	(kPa)	187.6	
Minor Stress At Failure	σ_3'	(kPa)	119.7	
Major Stress At Failure	σ_1'	(kPa)	307.3	
Principal Stress Ratio At Failure	σ_1'/σ_3'		2.567	
PwP At Failure Criteria	u_f		580.3	

Notes



Plastic

Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH07 1.80-2.25m	
			Test Date	01/02/2024	
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH07	
			Sample	1.80-2.25m	
Client	Causeway		Depth	1.80-2.25m UT7	
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

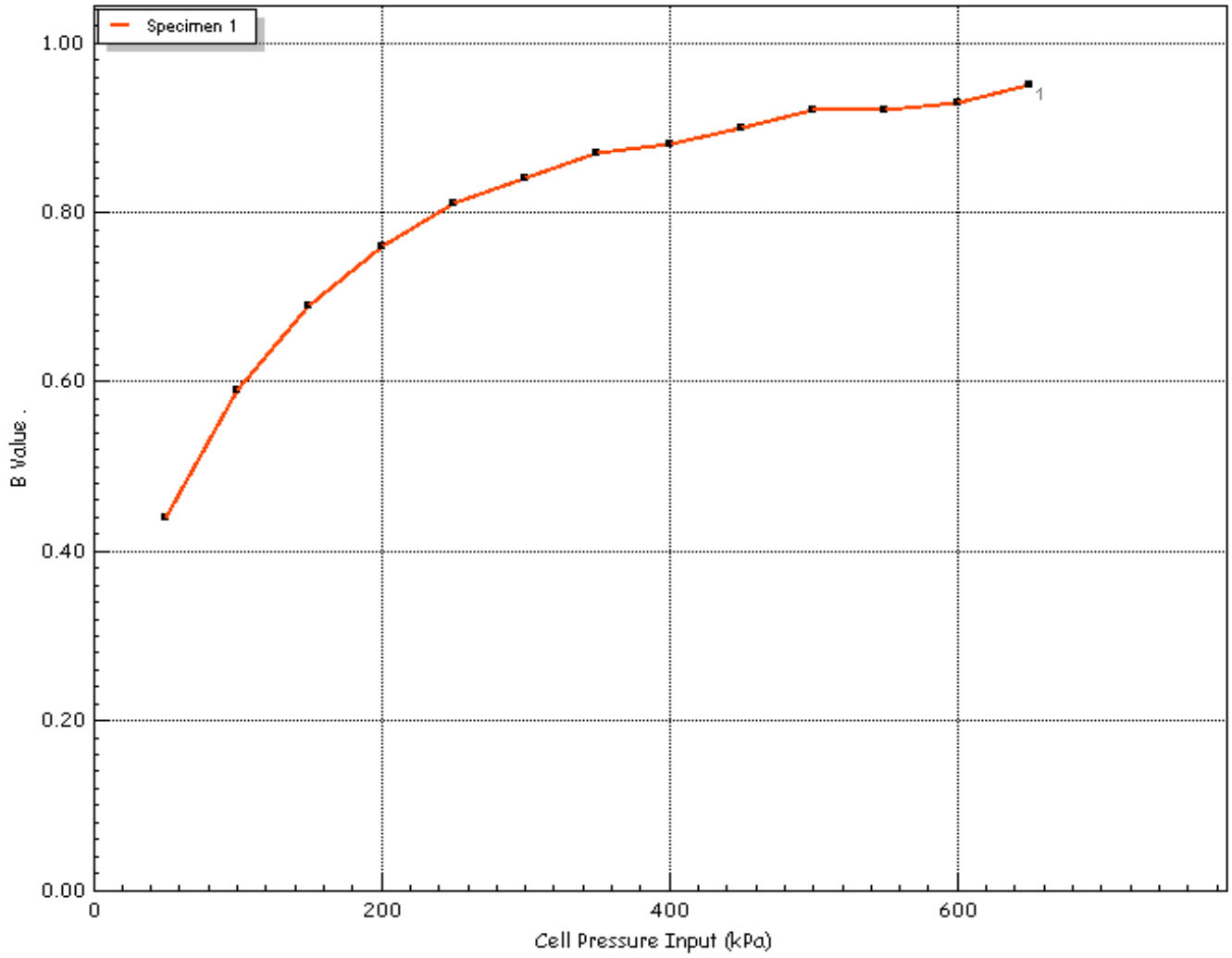
PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	σ	(kPa)	650
Pore Water Pressure Input	u pwp	(kPa)	638
B Value	B	.	0.95



Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH07 1.80-2.25m
				Test Date	01/02/2024
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI			Borehole	M-BH07
				Sample	1.80-2.25m
Client	Causeway			Depth	1.80-2.25m UT7
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Consolidation Plots

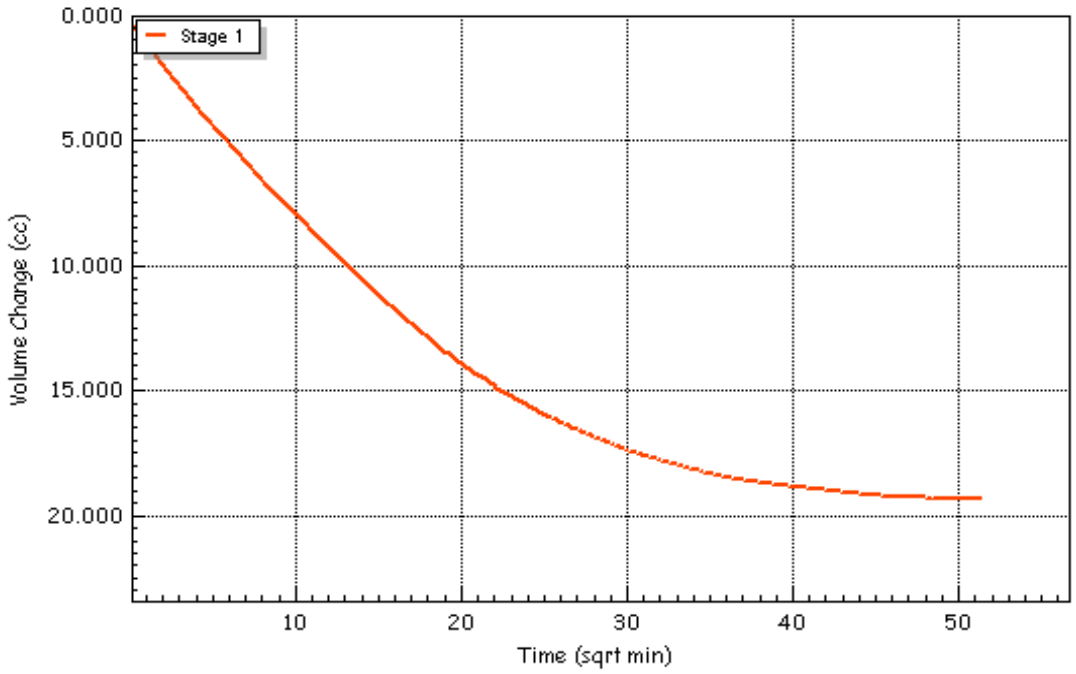
Initial Conditions

Initial Cell Pressure	σ_3	(kPa)	700
Initial Back Pressure	u_{bi}	(kPa)	650
Pore Water Pressure Input	u_{pwp}	(kPa)	683
Drainage Method			Radial+One End

Final Conditions

PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	ε_v%	(%)	1.06
Corrected Length	L_C	(mm)	210.3
Corrected Area	A_C	(cm2)	85.98
Corrected Volume	V_C	(cc)	1807.725
t100	t_{100}	(min)	660.61
Consolidation	c_V	(m2/year)	0.003
Compressibility	m_V	(m2/MN)	0.323
Test Time	t_F	(h:m:s)	19:49:05
Estimated Strain to Failure	ε%	(%)	5.0
Shear Machine Speed	d_r	(mm/min)	0.00884

Notes

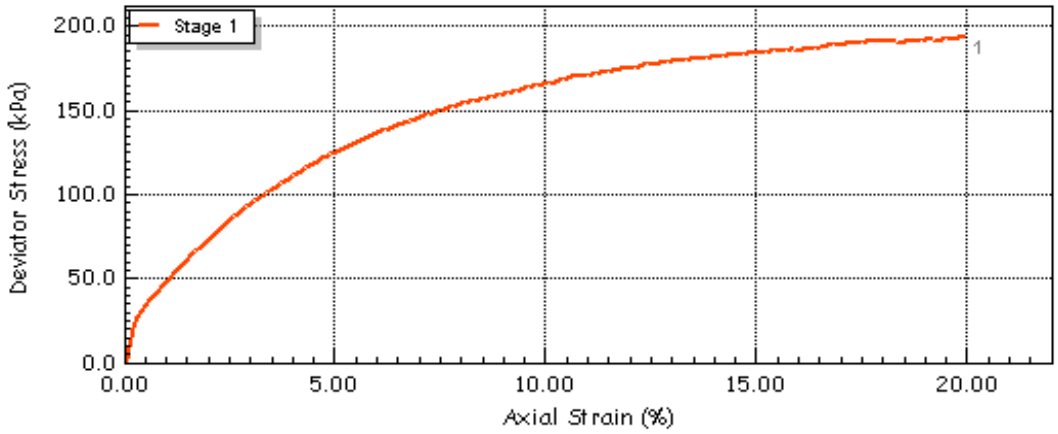


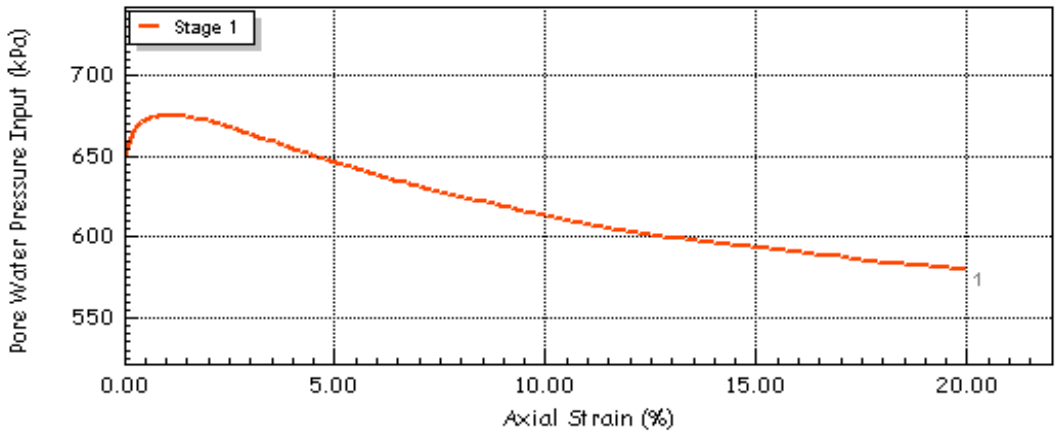
Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH07 1.80-2.25m
				Test Date	01/02/2024
	Rosslare Europort Offshore			Borehole	M-BH07
Jobfile	Renewable Energy HUB SI			Sample	1.80-2.25m
Client	Causeway			Depth	1.80-2.25m UT7
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

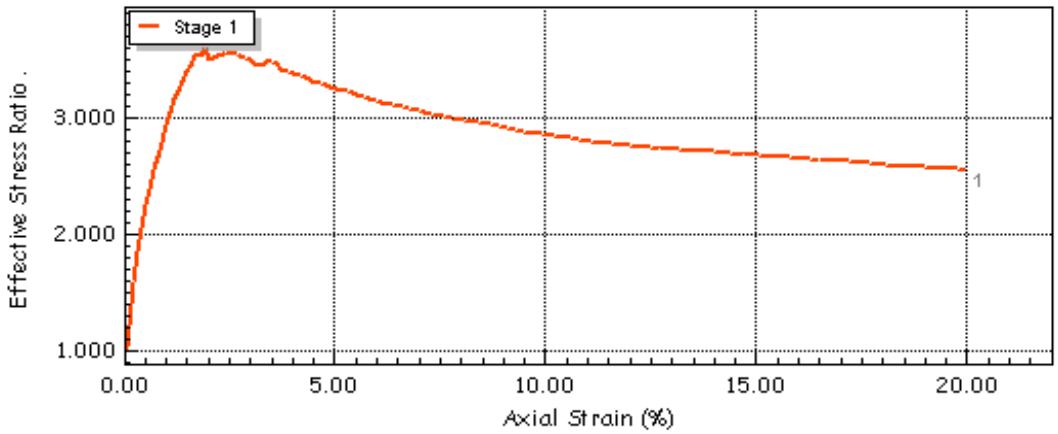
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







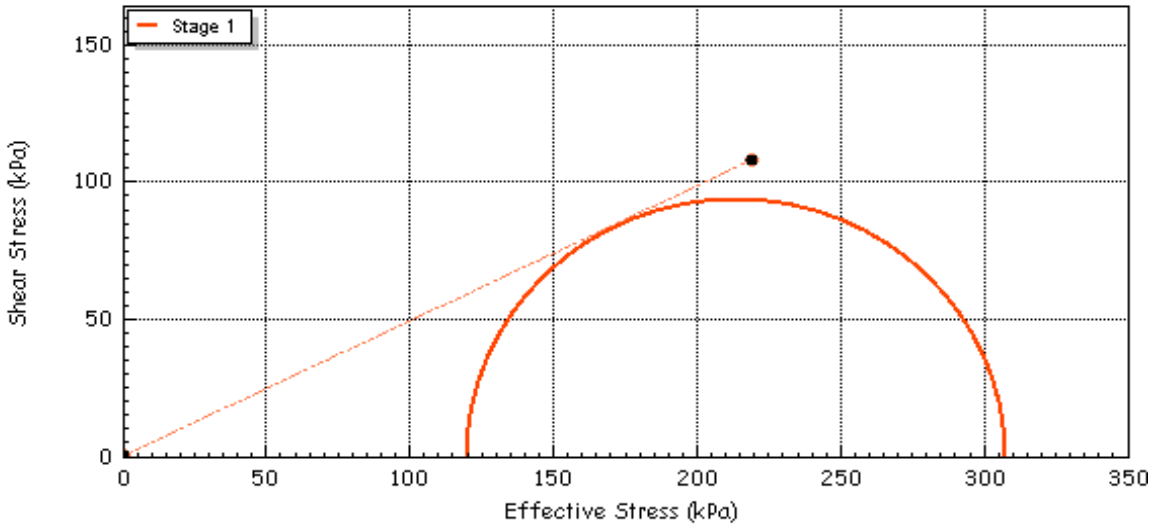
Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH07 1.80-2.25m
				Test Date	01/02/2024
	Rosslare Europort Offshore			Borehole	M-BH07
Jobfile	Renewable Energy HUB SI			Sample	1.80-2.25m
Client	Causeway			Depth	1.80-2.25m UT7
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

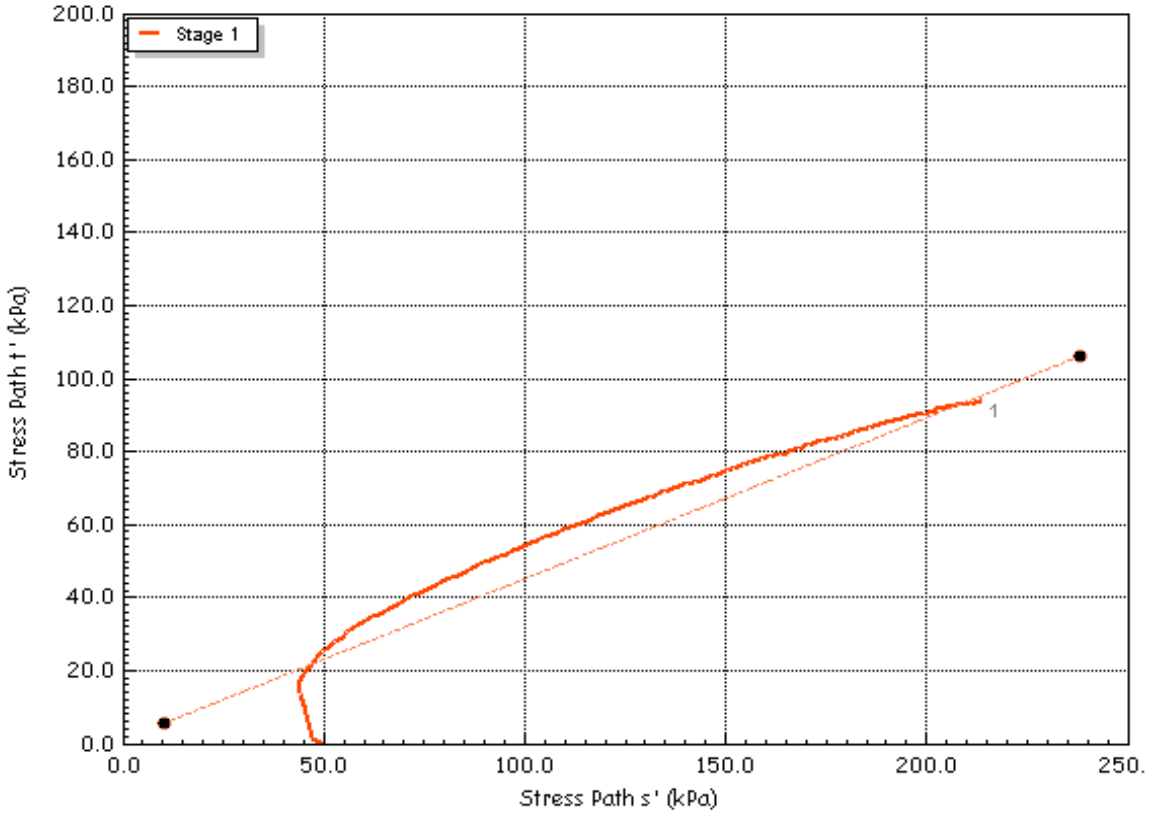
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective	c'	(kPa)	0.00	Effective Cohesion	c'	(kPa)	0.00
Effective Friction	ϕ'	(deg)	26.3	Effective Friction	ϕ'	(deg)	26.3





Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH07 1.80-2.25m	
			Test Date	01/02/2024	
Jobfile	Rosslare Europort Offshore Renewable Energy HUB SI		Borehole	M-BH07	
			Sample	1.80-2.25m	
Client	Causeway		Depth		
Operator	David Burton	Checked	Sean Royle	Approved	Sean Royle

Certificate of Analysis

Certificate Number	24-02880	*Issued:*	19-Feb-24

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

Our Reference	24-02880
Client Reference	23-0585
Order No	(not supplied)
Contract Title	ROSSLARE EUROPORT OFFSHORE RENEWABLE ENERGY HUB SI
Description	5 Soil samples.
Date Received	12-Feb-24
Date Started	12-Feb-24
Date Completed	19-Feb-24
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

ilac-MRA UKAS TESTING 2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-02880
Client Ref 23-0585
Contract Title ROSSLARE EUROPORT OFFSHORE RENEWABLE ENERGY HUB SI

			Lab No	2298475	2298476	2298477	2298478	2298479
			.Sample ID	M-BH02	M-BH07	M-BH11	M-BH38	M-BH38
			Depth	0.90	2.80	2.00	1.00	2.00
			Other ID	4	6	9	5	6
			Sample Type	D	D	D	D	D
			Sampling Date	09/02/2024	09/02/2024	09/02/2024	09/02/2024	09/02/2024
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Inorganics								
pH	DETSC 2008#		pH	8.5			8.6	
Organic matter	DETSC 2002#	0.1	%	1.1	0.4	0.8		1.0
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	1200			2300	
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	230			480	

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 24-02880
Client Ref 23-0585
Contract ROSSLARE EUROPORT OFFSHORE RENEWABLE ENERGY HUB SI

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2298475	M-BH02 0.90 SOIL	09/02/24	PT 500ml		
2298476	M-BH07 2.80 SOIL	09/02/24	PT 500ml		
2298477	M-BH11 2.00 SOIL	09/02/24	PT 500ml		
2298478	M-BH38 1.00 SOIL	09/02/24	PT 500ml		
2298479	M-BH38 2.00 SOIL	09/02/24	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

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

End of Report

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / G02	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH03	6	7.00	SB	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH25	5	5.20	SB	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
06 February 2024	07 February 2024

CAUSEWAY GEOTECH

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Company Number: NI610766

REGIONAL OFFICE
Causeway Geotech (IRL) Ltd
Unit 1 Fingal House
Stephenstown Industrial Estate
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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

25 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 20/02/2024 and 25/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G03

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	BS 1377-2: 1990: Cl 3.2	16
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	15
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	16
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	16
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	2
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	1
	Extra over days (more than initial 3 days)		1

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	pH Value of Soil		1
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited (UKAS 2139)	Sulphate Content water extract		1
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Organic Matter Content		4
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Water soluble chloride content		1
SOIL – subcontracted to Pro Soils Limited *(UKAS 4043)*	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	1
	Extra over days (more than initial 4 days)		4

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk	Density dry	w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		Mg/m3		%	%	%	%	%	Mg/m3	
M-BH05	5	6.50	8.00	SB	Brown sandy silty CLAY.			32	95	35 -1pt	17	18		CL/CI
M-BH23	8	1.20		D	Brown sandy slightly gravelly silty CLAY.			14	88	28 -1pt	14	14		CL
M-BH23	2	2.00	3.50	SB	Brown sandy silty CLAY.			18	95	27 -1pt	14	13		CL
M-BH23	10	5.00		D	Brown slightly sandy silty CLAY.			15	98	36 -1pt	17	19		CI
M-BH23	12	6.40		D	Brown slightly sandy silty CLAY.			17	99	39 -1pt	18	21		CI
M-BH23	13	7.40		D	Brown sandy slightly gravelly silty CLAY.			20	97	44 -1pt	21	23		CI
M-BH23	7	9.50	11.00	SB	Brown sandy slightly gravelly silty CLAY.			13	57	38 -1pt	20	18		CI
M-BH26	7	1.60		D	Brown sandy slightly gravelly silty CLAY.			15	76	24 -1pt	13	11		CL
M-BH26	8	2.00		D	Brown sandy slightly gravelly silty CLAY.			7.6	44	20 -1pt	13	7		CL
M-BH26	10	3.00		D	Brown sandy gravelly silty CLAY.			6	43	26 -1pt	15	11		CL
M-BH26	12	4.00		D	Brown sandy slightly gravelly silty CLAY.			6.6	63	26 -1pt	15	11		CL
M-BH26	15	5.60		D	Brown sandy slightly gravelly silty CLAY.			8	47	33 -1pt	18	15		CL

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

LAB 01R Version 6

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

14/03/2024

Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk	Density dry	w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		Mg/m3		%	%	%	%	%	Mg/m3	
M-BH29	6	0.60		D	Brown sandy slightly gravelly silty CLAY.			16	88	37 -1pt	15	22		CI
M-BH29	2	2.10	3.60	SB	Brown slightly sandy silty CLAY.			19	96	41 -1pt	19	22		CI
M-BH29	12	4.80		D	Brown clayey fine to coarse SAND.			18	100	24 -1pt	17	7		CL
M-BH29	14	7.00		D	Brown silty fine to coarse SAND.			17						

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

LAB 01R Version 6

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

14/03/2024

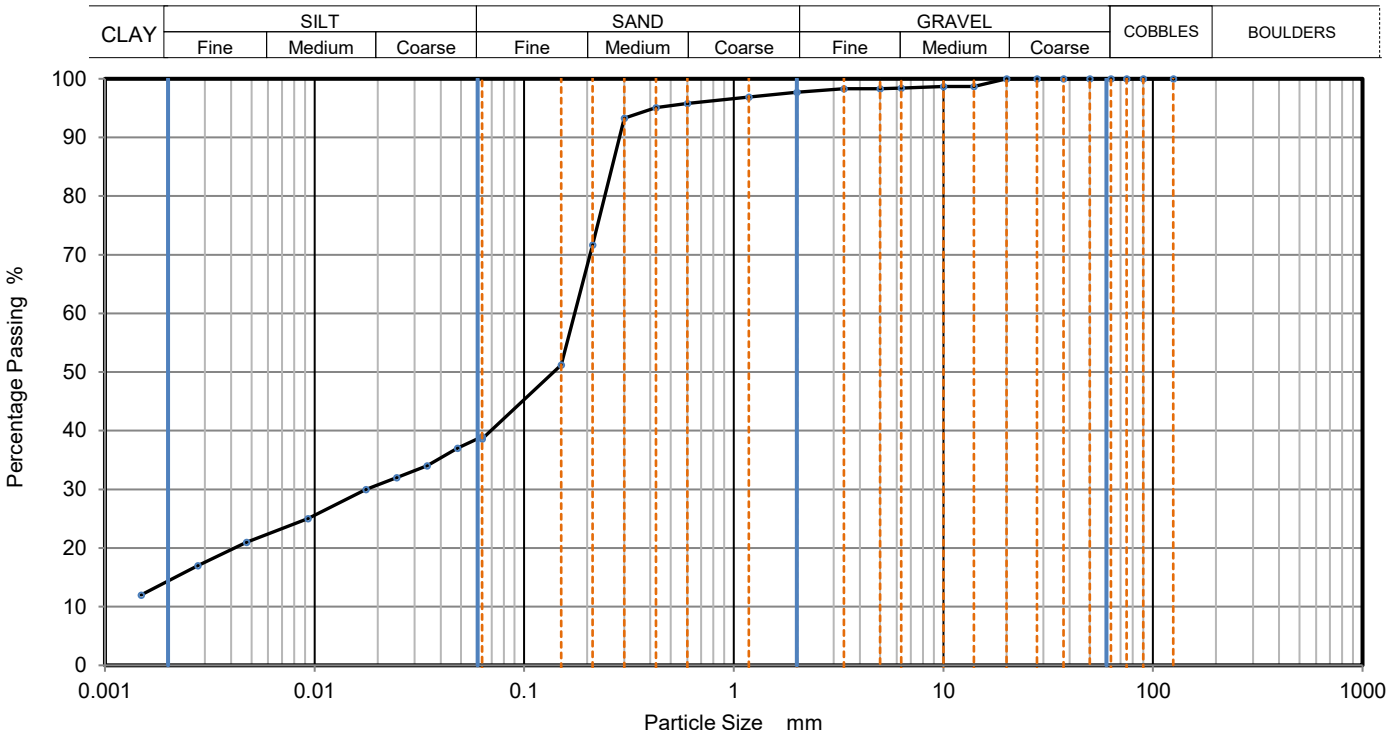
Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH05
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown slightly gravelly clayey fine to coarse SAND.			Sample Depth (m) Top	0.50
				Base	2.00
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020925



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	39
90	100	0.04803	37
75	100	0.03443	34
63	100	0.02466	32
50	100	0.01755	30
37.5	100	0.00929	25
28	100	0.00473	21
20	100	0.00278	17
14	99	0.00149	12
10	99		
6.3	98		
5	98		
3.35	98		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	93		
0.212	72		
0.15	51		
0.063	39		

Dry Mass of sample, g: 349

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.3
Sand	59.0
Silt	24.3
Clay	14.4

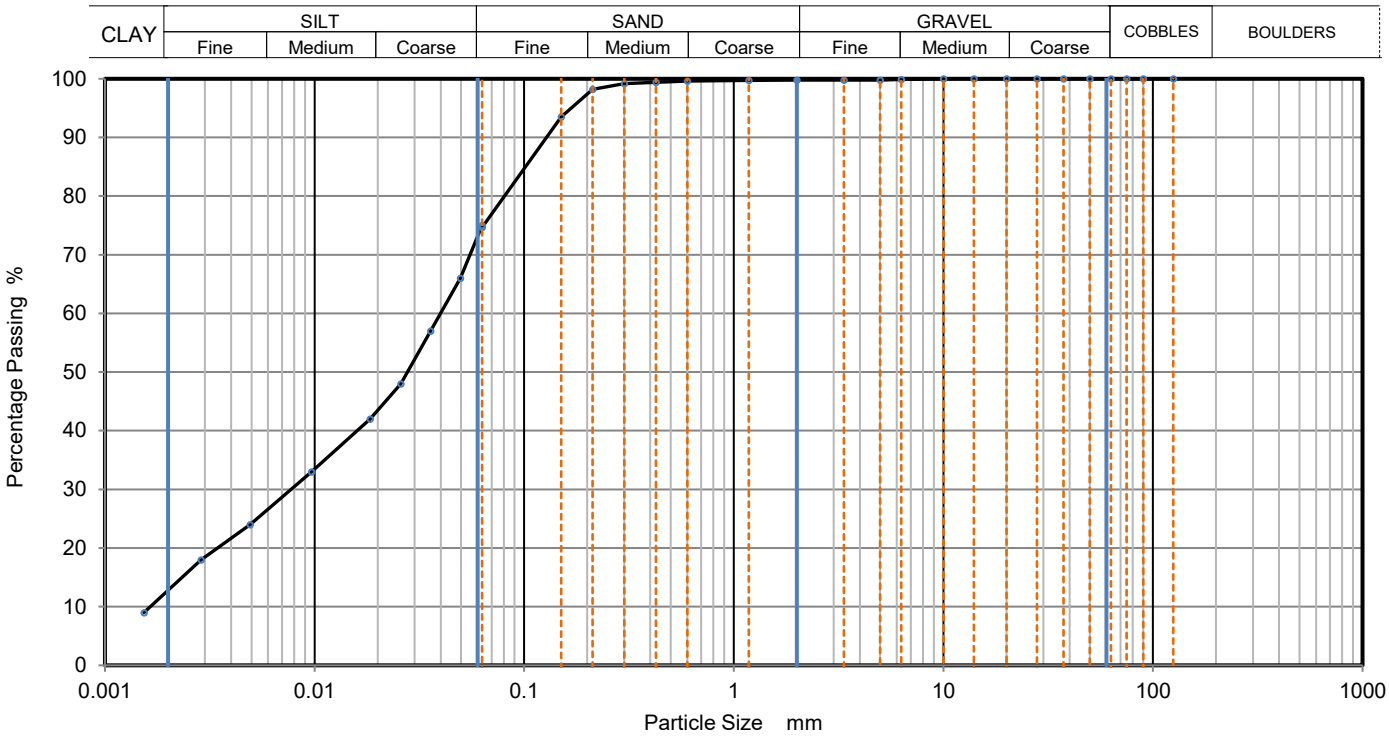
Grading Analysis		
D100	mm	
D60	mm	0.174
D30	mm	0.0169
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH05
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	5.00
				Base	6.50
Specimen Reference	3	Specimen Depth	5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020927



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	75
90	100	0.04965	66
75	100	0.03577	57
63	100	0.02576	48
50	100	0.01843	42
37.5	100	0.00968	33
28	100	0.00492	24
20	100	0.00287	18
14	100	0.00153	9
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	99		
0.212	98		
0.15	94		
0.063	75		

Dry Mass of sample, g: 505

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.2
Sand	25.1
Silt	61.9
Clay	12.8

Grading Analysis		
D100	mm	
D60	mm	0.0403
D30	mm	0.0078
D10	mm	0.00165
Uniformity Coefficient		24
Curvature Coefficient		0.91

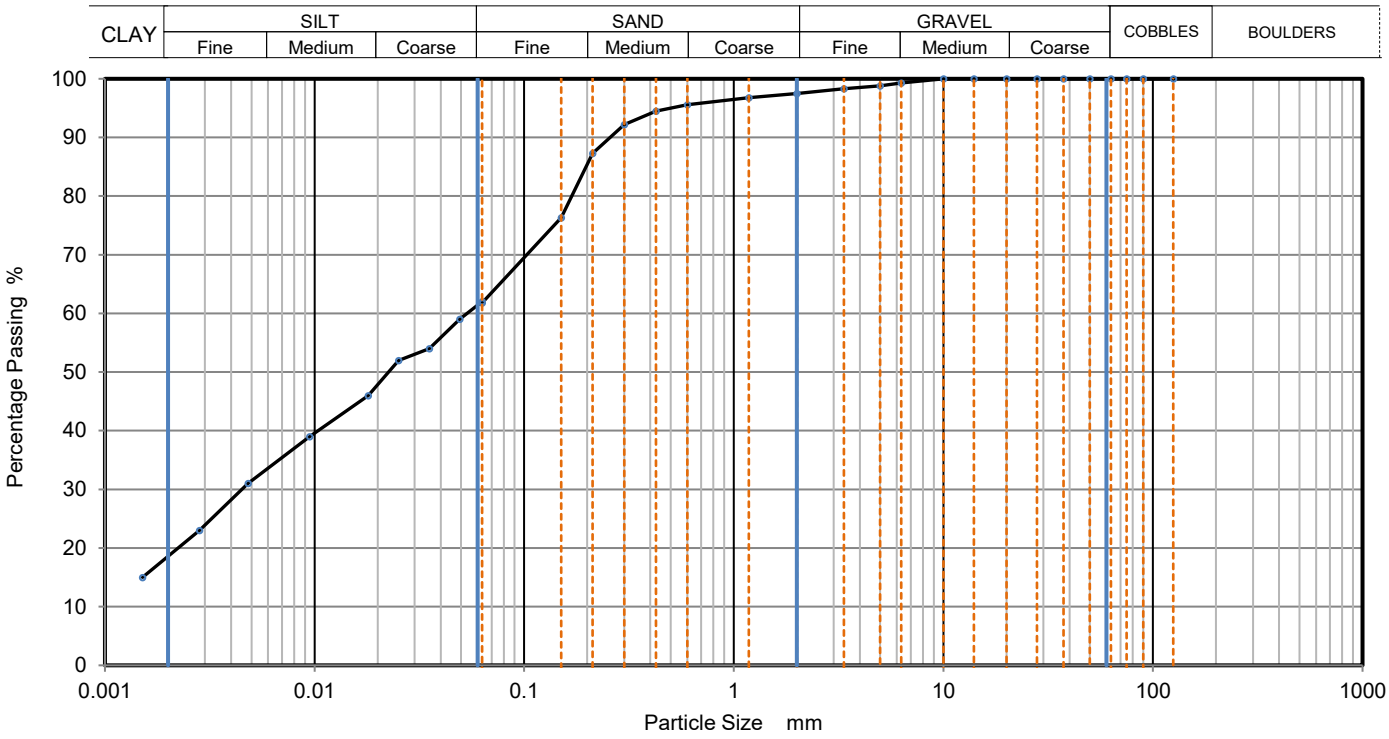
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH23
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	2.00
				Base	3.50
Specimen Reference	5	Specimen Depth	2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020930



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	62
90	100	0.04933	59
75	100	0.03533	54
63	100	0.02514	52
50	100	0.01800	46
37.5	100	0.00946	39
28	100	0.00481	31
20	100	0.00283	23
14	100	0.00151	15
10	100		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	92		
0.212	87		
0.15	76		
0.063	62		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.5
Sand	35.7
Silt	42.9
Clay	18.9

Grading Analysis		
D100	mm	
D60	mm	0.0532
D30	mm	0.00452
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

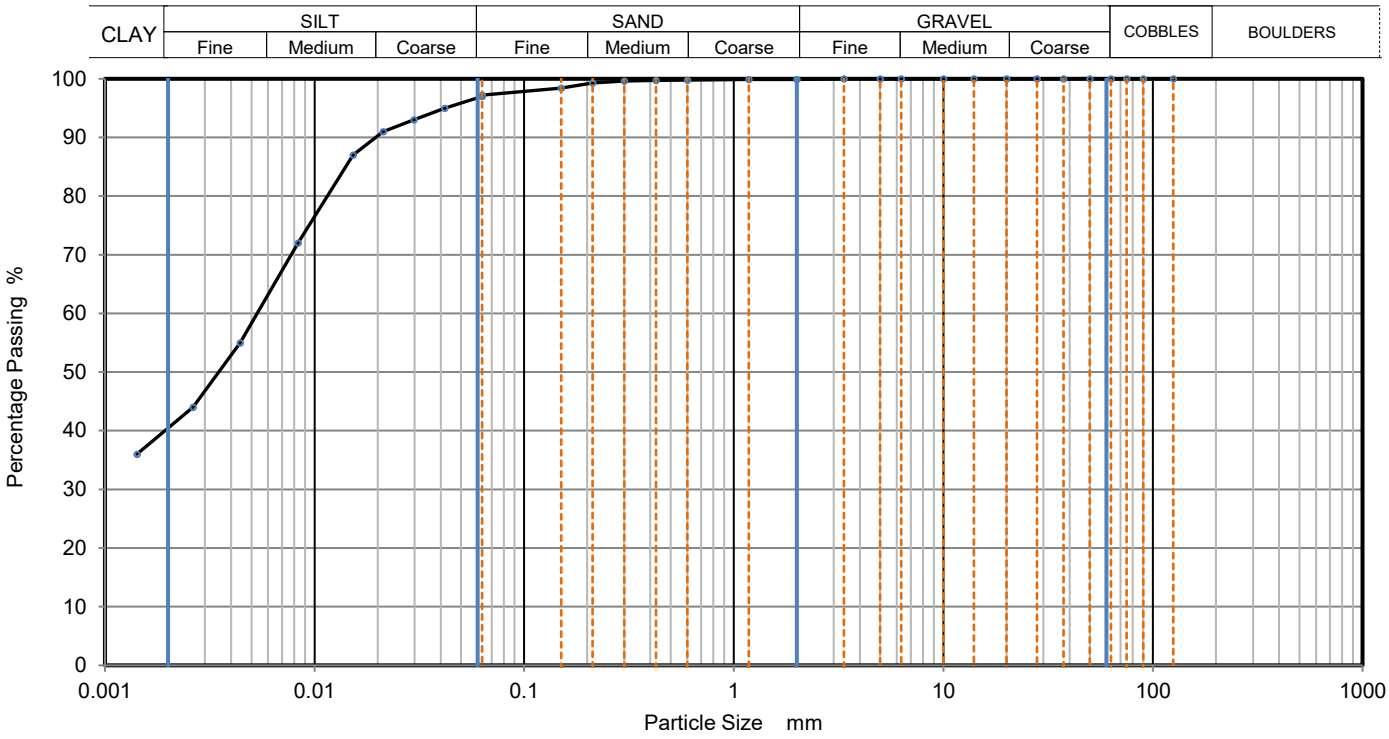
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH23
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	3.50
				Base	5.00
Specimen Reference	3	Specimen Depth	3.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020931



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	97
90	100	0.04172	95
75	100	0.02977	93
63	100	0.02123	91
50	100	0.01528	87
37.5	100	0.00834	72
28	100	0.00441	55
20	100	0.00263	44
14	100	0.00142	36
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	100		
0.212	99		
0.15	98		
0.063	97		

Dry Mass of sample, g: 503

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.1
Sand	2.8
Silt	56.5
Clay	40.6

Grading Analysis		
D100	mm	
D60	mm	0.00534
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

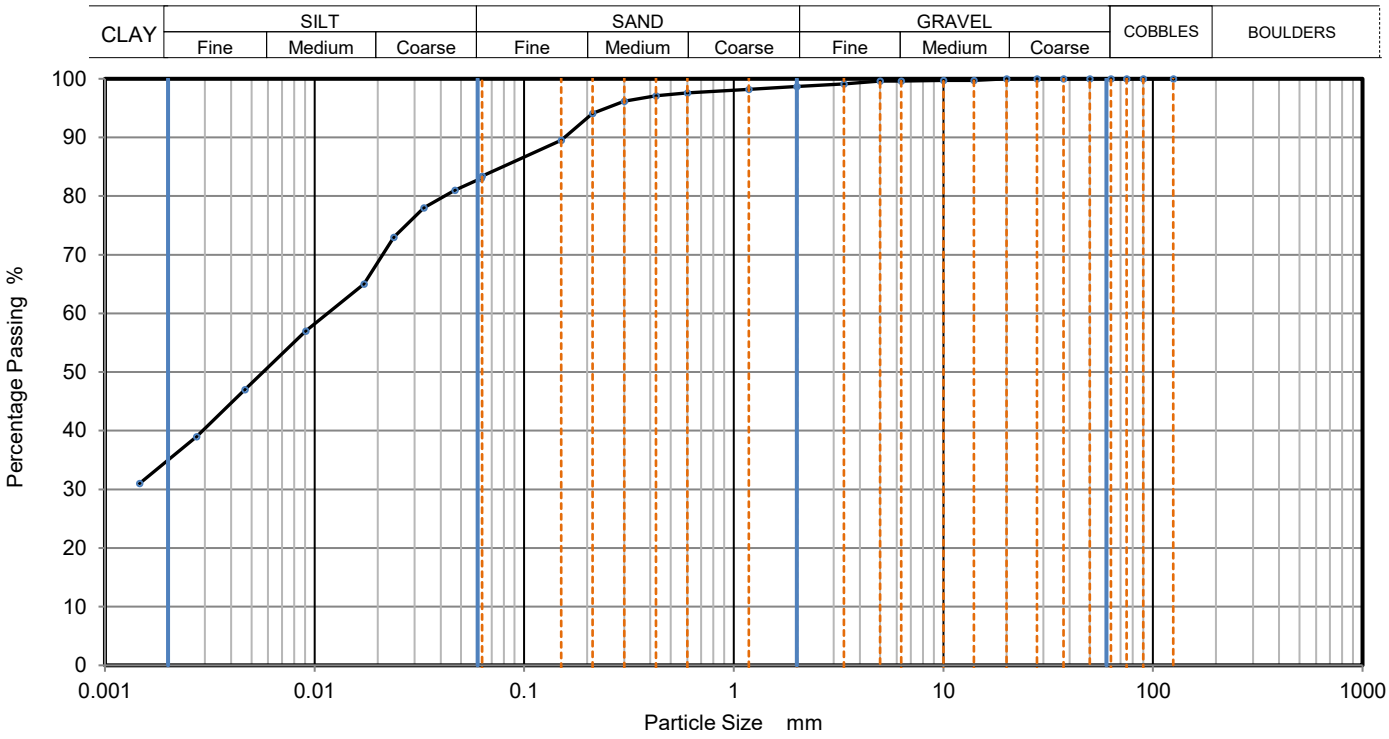
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH23
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	5.00
				Base	6.50
Specimen Reference	3	Specimen Depth	5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020933



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06236	83
90	100	0.04671	81
75	100	0.03326	78
63	100	0.02385	73
50	100	0.01721	65
37.5	100	0.00906	57
28	100	0.00465	47
20	100	0.00273	39
14	100	0.00146	31
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	90		
0.063	83		

Dry Mass of sample, g: 502

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.3
Sand	15.3
Silt	48.2
Clay	35.2

Grading Analysis		
D100	mm	
D60	mm	0.0113
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

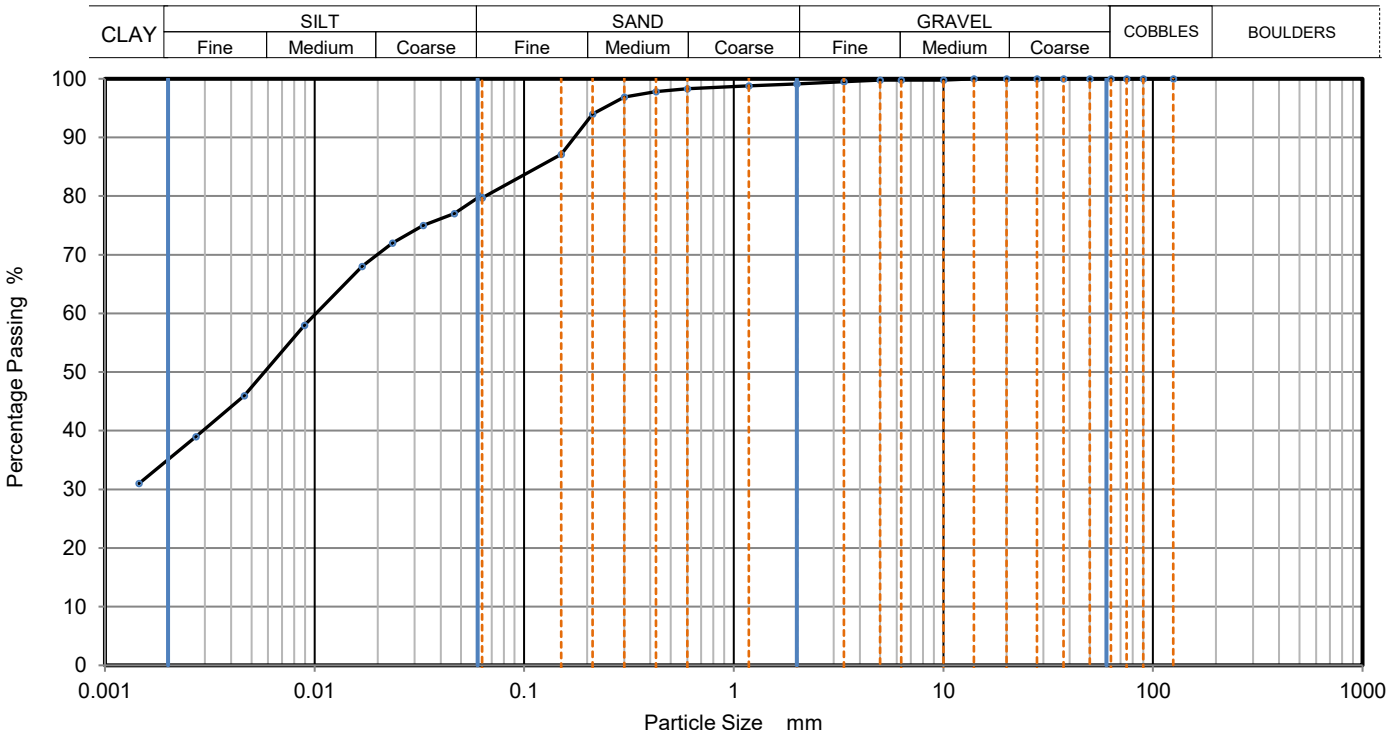
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH23
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	6.50
				Base	8.00
Specimen Reference	3	Specimen Depth	6.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020935



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06190	80
90	100	0.04637	77
75	100	0.03303	75
63	100	0.02352	72
50	100	0.01687	68
37.5	100	0.00895	58
28	100	0.00462	46
20	100	0.00271	39
14	100	0.00145	31
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	97		
0.212	94		
0.15	87		
0.063	80		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.9
Sand	19.4
Silt	44.6
Clay	35.1

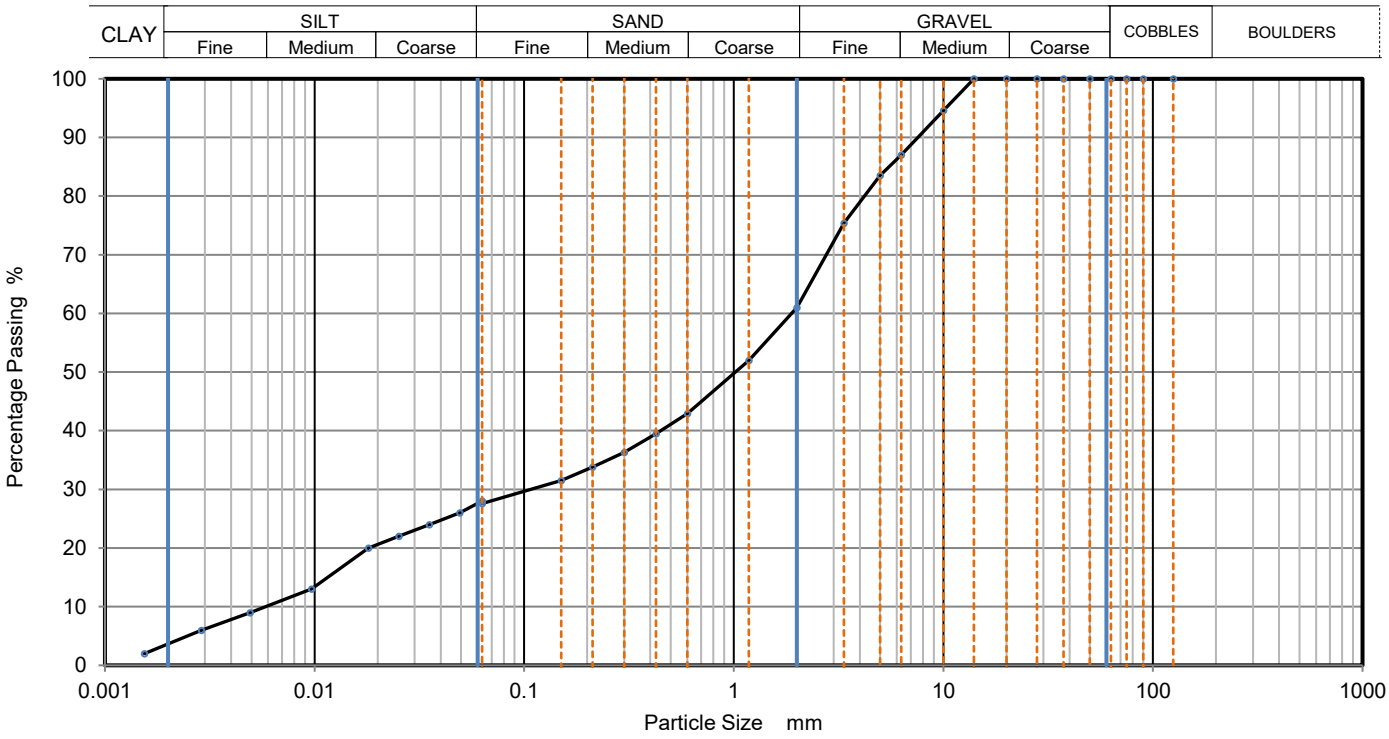
Grading Analysis		
D100	mm	
D60	mm	0.0102
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH23
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	8.00
				Base	9.50
Specimen Reference	3	Specimen Depth	8 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020937



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	28
90	100	0.04933	26
75	100	0.03533	24
63	100	0.02529	22
50	100	0.01810	20
37.5	100	0.00968	13
28	100	0.00492	9
20	100	0.00289	6
14	100	0.00154	2
10	95		
6.3	87		
5	84		
3.35	75		
2	61		
1.18	52		
0.6	43	Particle density	(assumed)
0.425	40	2.65	Mg/m3
0.3	36		
0.212	34		
0.15	32		
0.063	28		

Dry Mass of sample, g: 503

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	39.0
Sand	33.4
Silt	23.9
Clay	3.7

Grading Analysis		
D100	mm	
D60	mm	1.89
D30	mm	0.107
D10	mm	0.00576
Uniformity Coefficient		330
Curvature Coefficient		1.1

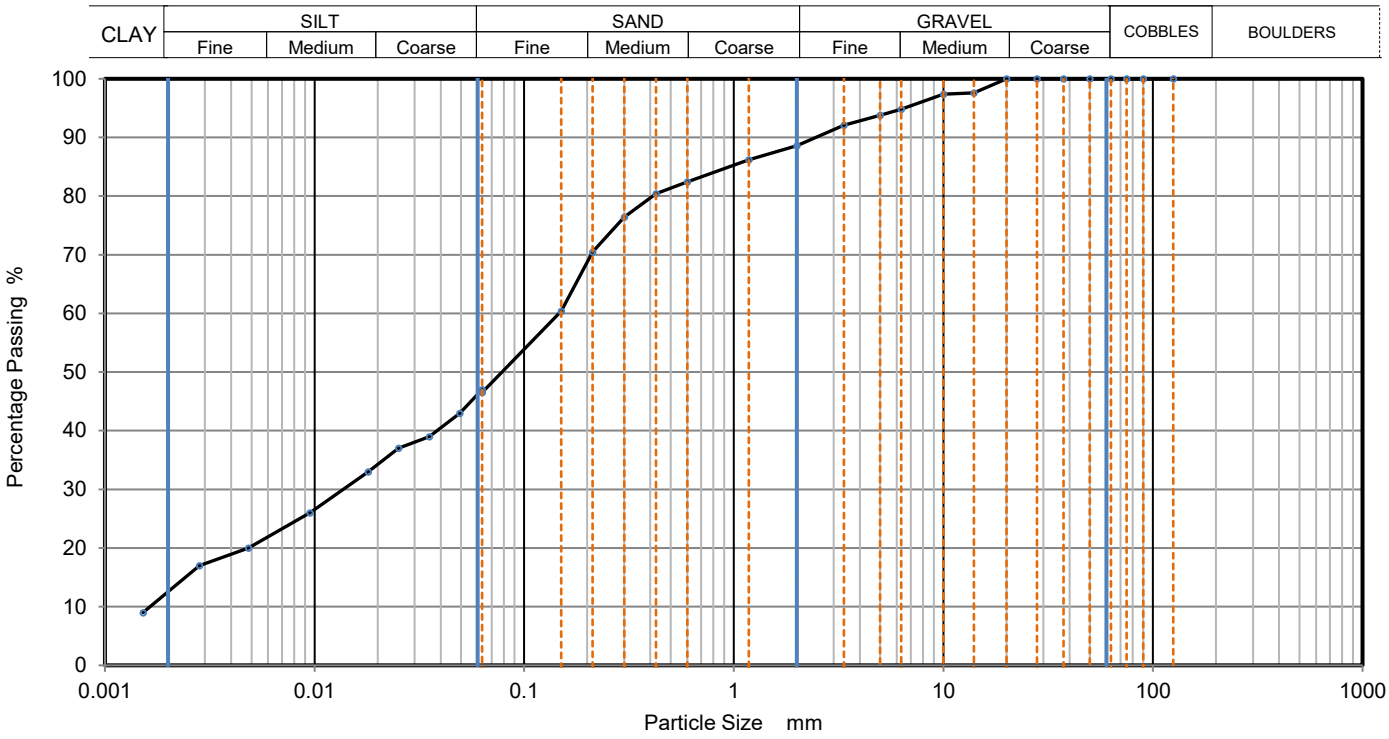
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH26
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.60
				Base	2.00
Specimen Reference	3	Specimen Depth	0.6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020939



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	47
90	100	0.04933	43
75	100	0.03533	39
63	100	0.02514	37
50	100	0.01800	33
37.5	100	0.00952	26
28	100	0.00484	20
20	100	0.00283	17
14	98	0.00152	9
10	97		
6.3	95		
5	94		
3.35	92		
2	89		
1.18	86		
0.6	82	Particle density	(assumed)
0.425	80	2.65	Mg/m3
0.3	76		
0.212	71		
0.15	60		
0.063	47		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	11.4
Sand	42.1
Silt	33.9
Clay	12.6

Grading Analysis		
D100	mm	
D60	mm	0.147
D30	mm	0.0134
D10	mm	0.00161
Uniformity Coefficient		91
Curvature Coefficient		0.76

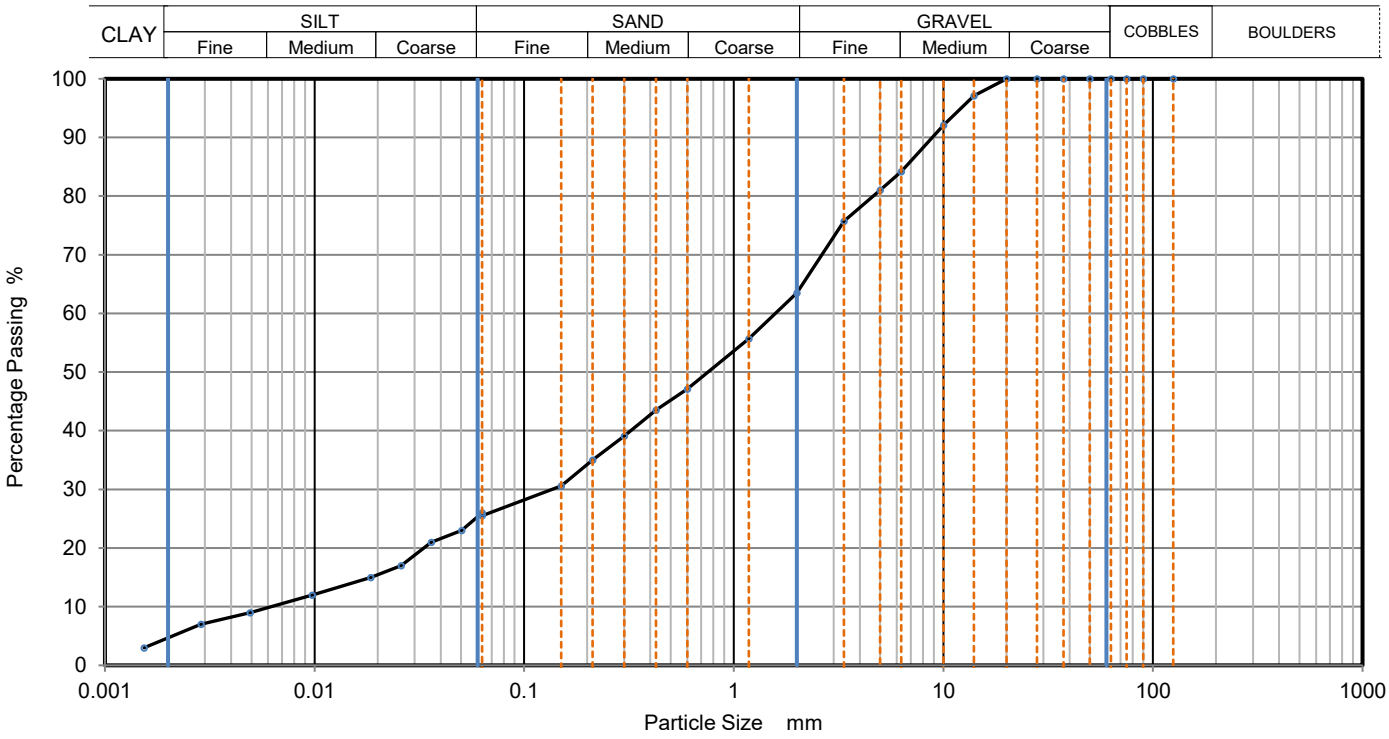
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH26
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	2.00
				Base	3.00
Specimen Reference	3	Specimen Depth	2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020942



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	26
90	100	0.05026	23
75	100	0.03599	21
63	100	0.02592	17
50	100	0.01855	15
37.5	100	0.00975	12
28	100	0.00493	9
20	100	0.00288	7
14	97	0.00154	3
10	92		
6.3	84		
5	81		
3.35	76		
2	64		
1.18	56		
0.6	47	Particle density	(assumed)
0.425	44	2.65	Mg/m3
0.3	39		
0.212	35		
0.15	31		
0.063	26		

Dry Mass of sample, g: 506

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	36.5
Sand	38.0
Silt	20.6
Clay	4.9

Grading Analysis		
D100	mm	
D60	mm	1.58
D30	mm	0.136
D10	mm	0.0061
Uniformity Coefficient		260
Curvature Coefficient		1.9

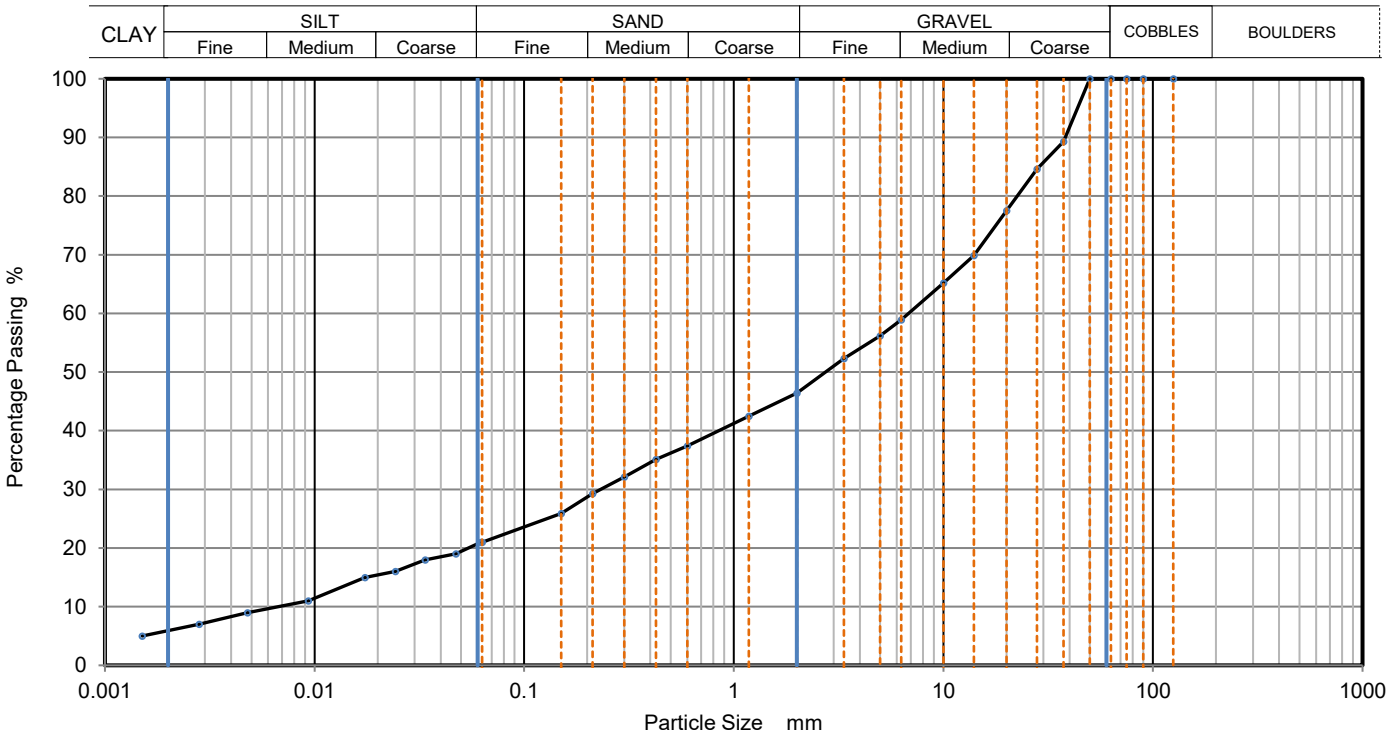
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH26
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown sandy gravelly silty CLAY.			Sample Depth (m) Top	3.00
				Base	4.00
Specimen Reference	3	Specimen Depth	3 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020946



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06219	21
90	100	0.04728	19
75	100	0.03367	18
63	100	0.02431	16
50	100	0.01743	15
37.5	89	0.00935	11
28	85	0.00479	9
20	78	0.00281	7
14	70	0.00151	5
10	65		
6.3	59		
5	56		
3.35	52		
2	46		
1.18	43		
0.6	37	Particle density	(assumed)
0.425	35	2.65	Mg/m3
0.3	32		
0.212	29		
0.15	26		
0.063	21		

Dry Mass of sample, g: 4704

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	53.6
Sand	25.4
Silt	15.5
Clay	5.5

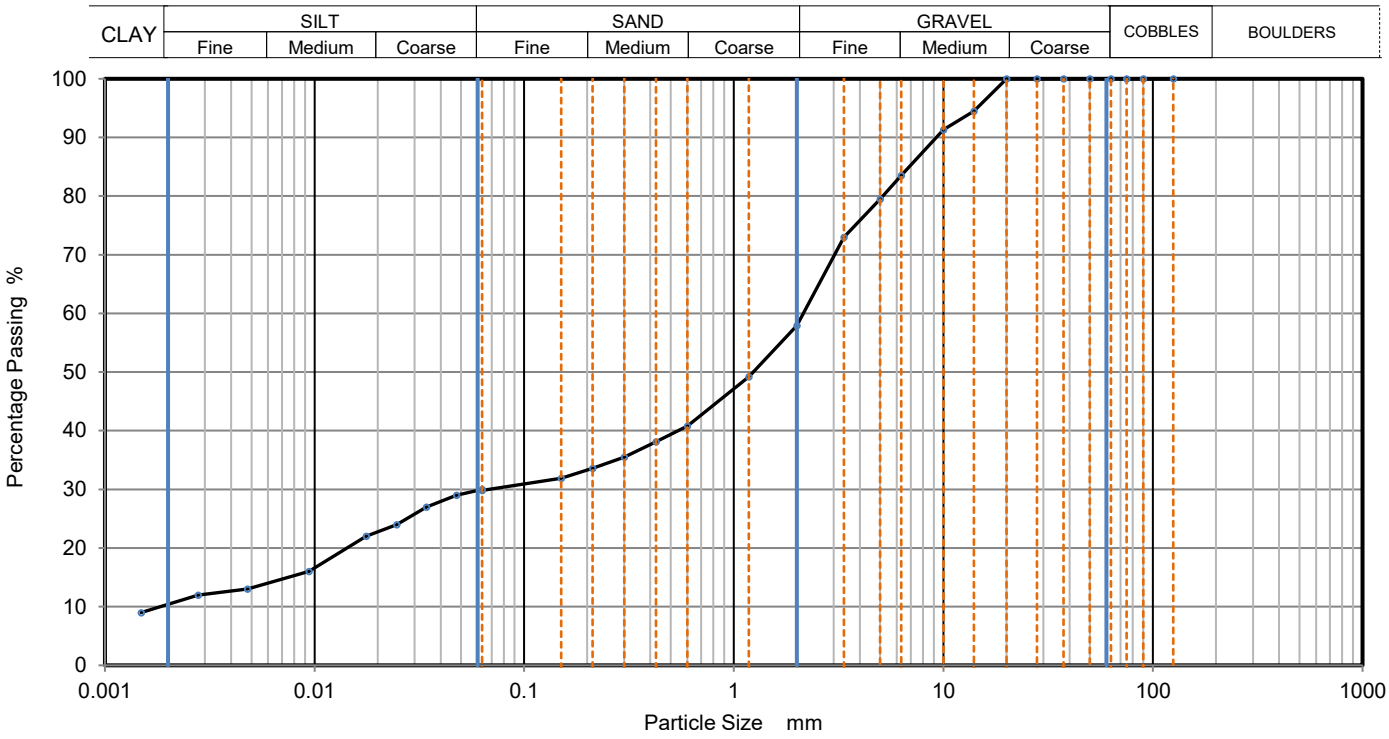
Grading Analysis		
D100	mm	
D60	mm	6.82
D30	mm	0.232
D10	mm	0.00696
Uniformity Coefficient		980
Curvature Coefficient		1.1

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH26
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	5.00
				Base	6.50
Specimen Reference	3	Specimen Depth	5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020948



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	30
90	100	0.04762	29
75	100	0.03415	27
63	100	0.02464	24
50	100	0.01766	22
37.5	100	0.00941	16
28	100	0.00479	13
20	100	0.00278	12
14	95	0.00149	9
10	91		
6.3	84		
5	80		
3.35	73		
2	58		
1.18	49		
0.6	41	Particle density	(assumed)
0.425	38	2.65	Mg/m3
0.3	36		
0.212	34		
0.15	32		
0.063	30		

Dry Mass of sample, g: 511

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	42.1
Sand	28.0
Silt	19.2
Clay	10.7

Grading Analysis		
D100	mm	
D60	mm	2.15
D30	mm	0.0672
D10	mm	0.00173
Uniformity Coefficient		1200
Curvature Coefficient		1.2

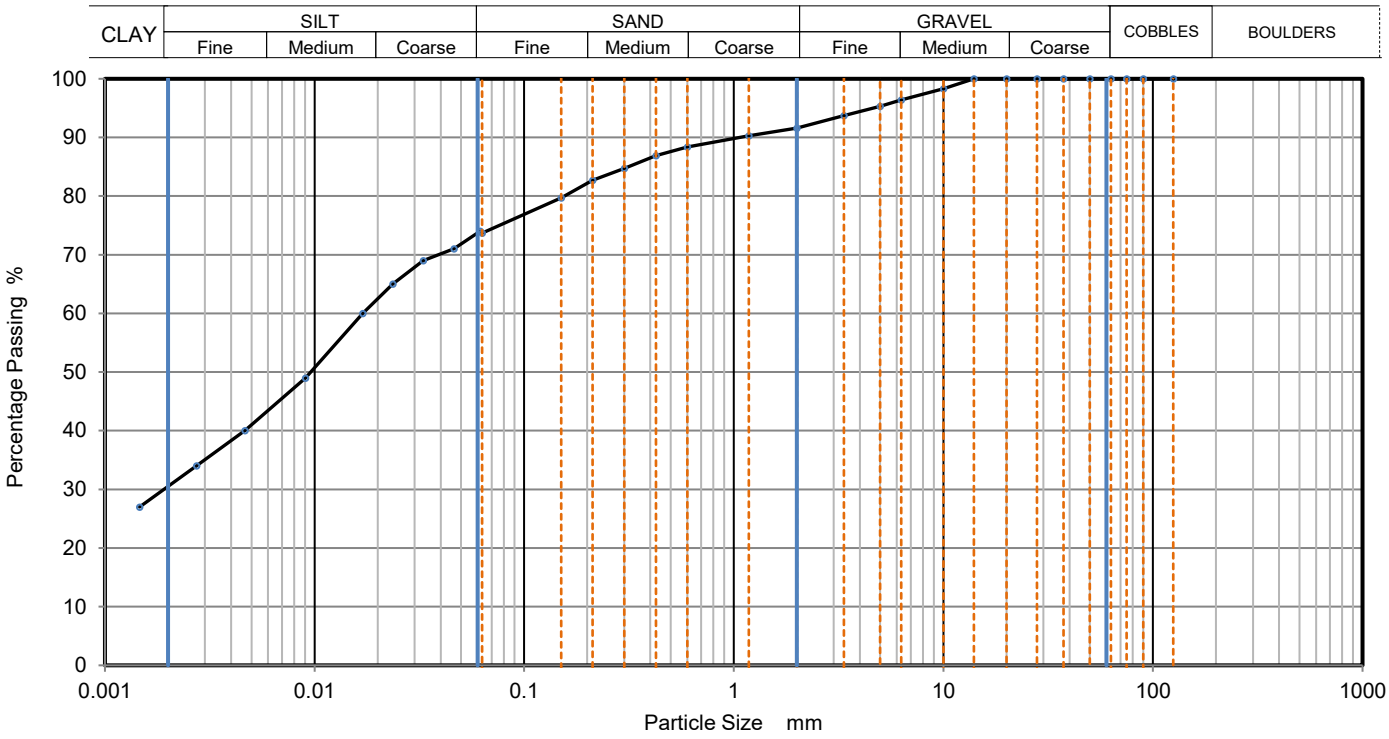
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH29
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.60
				Base	2.10
Specimen Reference	3	Specimen Depth	0.6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020950



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06172	74
90	100	0.04624	71
75	100	0.03295	69
63	100	0.02364	65
50	100	0.01696	60
37.5	100	0.00906	49
28	100	0.00465	40
20	100	0.00273	34
14	100	0.00146	27
10	98		
6.3	96		
5	95		
3.35	94		
2	92		
1.18	90		
0.6	88	Particle density	(assumed)
0.425	87	2.65	Mg/m3
0.3	85		
0.212	83		
0.15	80		
0.063	74		

Dry Mass of sample, g: 321

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	8.4
Sand	17.8
Silt	43.6
Clay	30.2

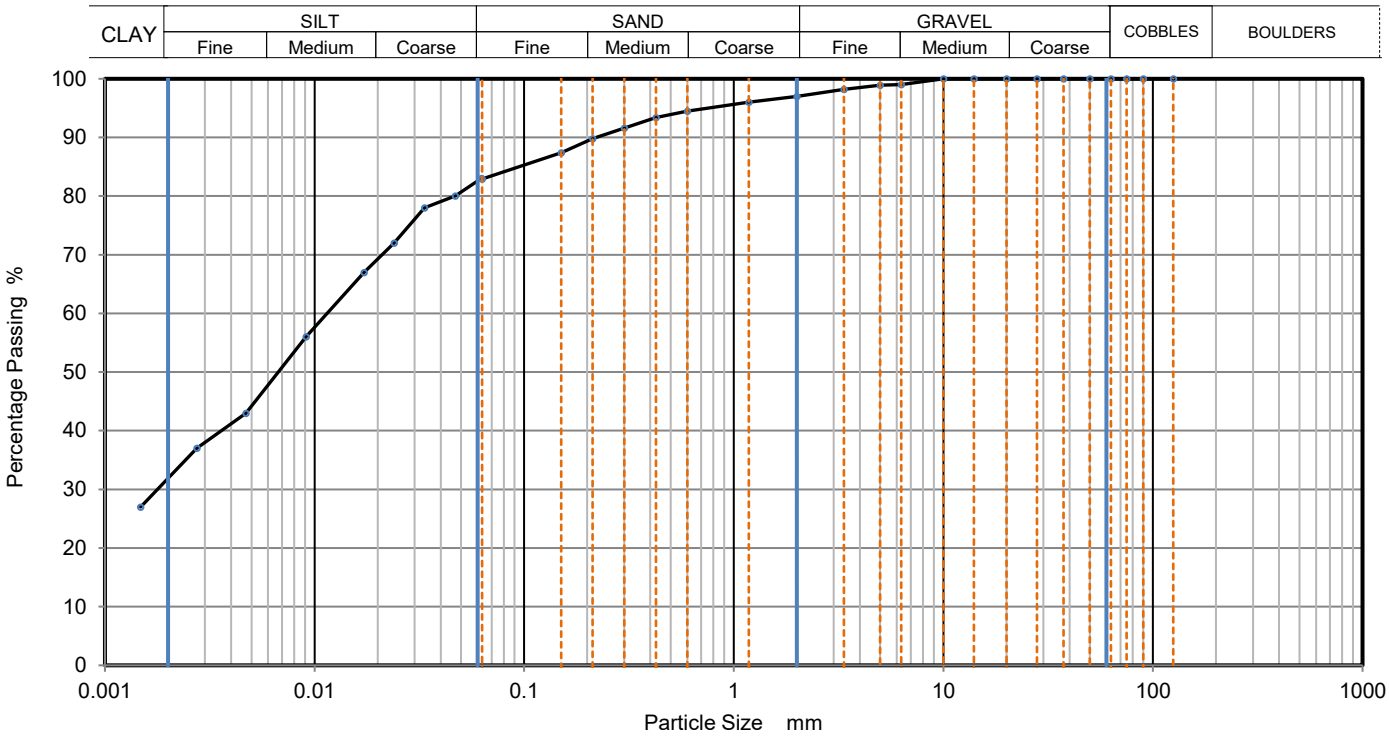
Grading Analysis		
D100	mm	
D60	mm	0.0167
D30	mm	0.00197
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH29
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	3.60
				Base	4.60
Specimen Reference	3	Specimen Depth	3.6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020954



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06266	83
90	100	0.04694	80
75	100	0.03343	78
63	100	0.02398	72
50	100	0.01719	67
37.5	100	0.00912	56
28	100	0.00470	43
20	100	0.00275	37
14	100	0.00148	27
10	100		
6.3	99		
5	99		
3.35	98		
2	97		
1.18	96		
0.6	95	Particle density 2.65	(assumed) Mg/m3
0.425	93		
0.3	92		
0.212	90		
0.15	87		
0.063	83		

Dry Mass of sample, g: 302

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	3.0
Sand	14.2
Silt	50.9
Clay	31.9

Grading Analysis		
D100	mm	
D60	mm	0.0115
D30	mm	0.00179
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

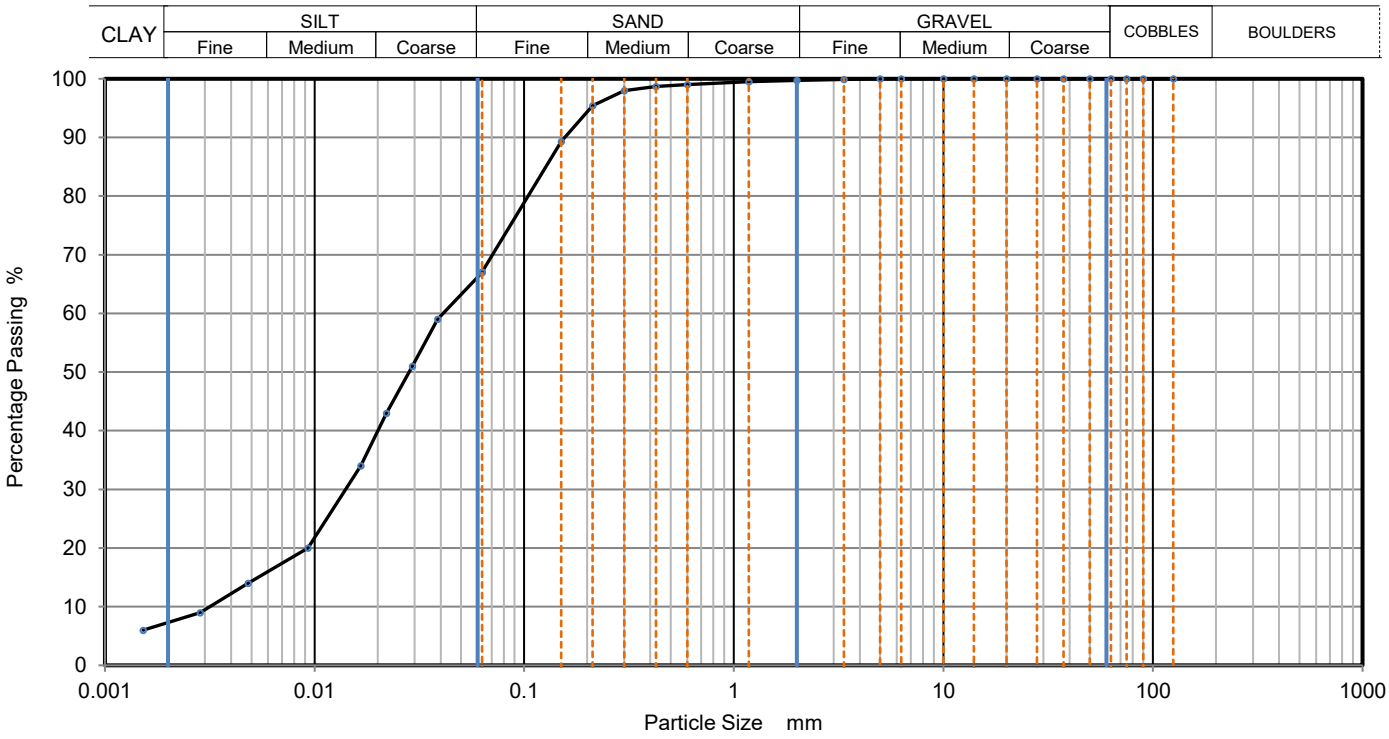
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH29
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown clayey fine to coarse SAND.			Sample Depth (m) Top	5.00
				Base	6.50
Specimen Reference	3	Specimen Depth	5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020957



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	67
90	100	0.03863	59
75	100	0.02931	51
63	100	0.02205	43
50	100	0.01659	34
37.5	100	0.00929	20
28	100	0.00482	14
20	100	0.00284	9
14	100	0.00152	6
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	95		
0.15	89		
0.063	67		

Dry Mass of sample, g: 313

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.3
Sand	32.6
Silt	59.9
Clay	7.2

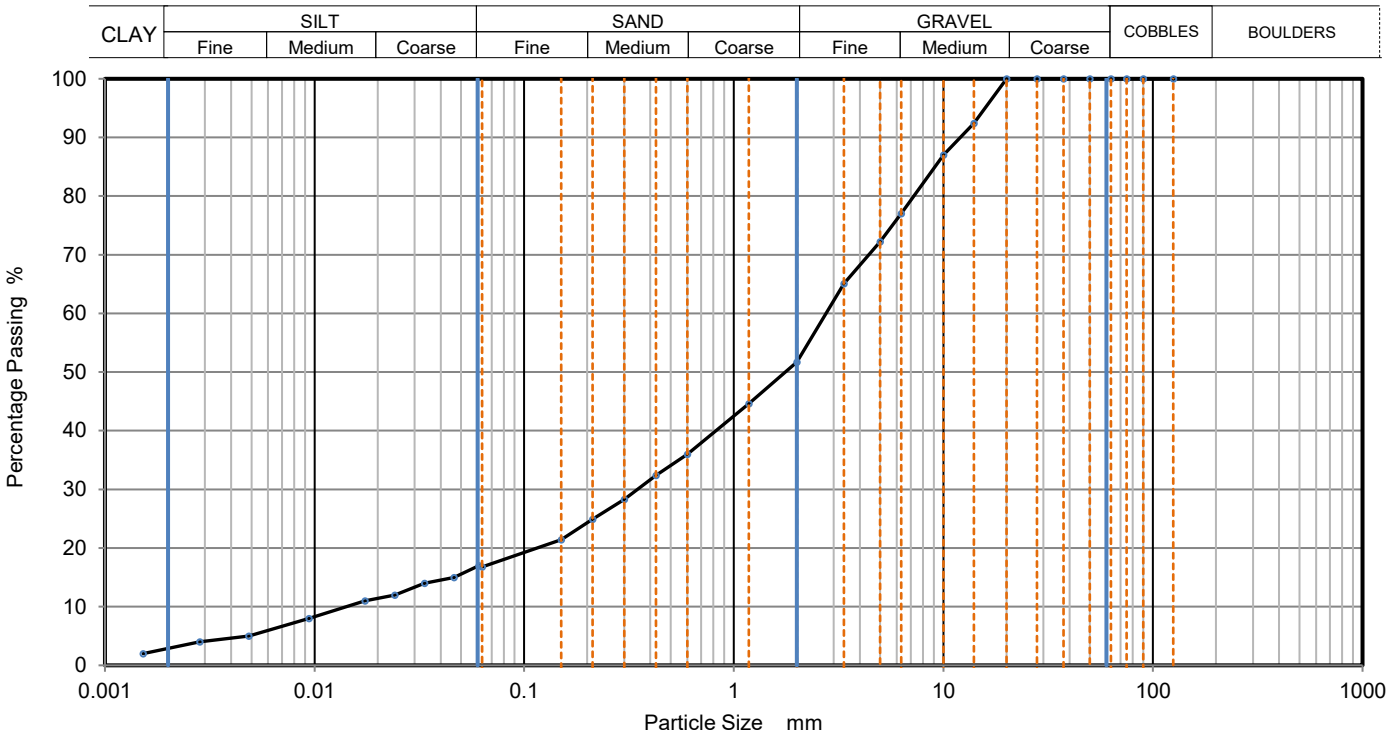
Grading Analysis		
D100	mm	
D60	mm	0.0407
D30	mm	0.0139
D10	mm	0.00316
Uniformity Coefficient		13
Curvature Coefficient		1.5

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH39A
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.20
				Base	1.70
Specimen Reference	3	Specimen Depth	0.2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020960



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06077	17
90	100	0.04624	15
75	100	0.03343	14
63	100	0.02415	12
50	100	0.01743	11
37.5	100	0.00941	8
28	100	0.00484	5
20	100	0.00283	4
14	92	0.00152	2
10	87		
6.3	77		
5	72		
3.35	65		
2	52		
1.18	45		
0.6	36	Particle density	(assumed)
0.425	32	2.65	Mg/m3
0.3	28		
0.212	25		
0.15	21		
0.063	17		

Dry Mass of sample, g: 515

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	48.3
Sand	34.9
Silt	13.6
Clay	3.2

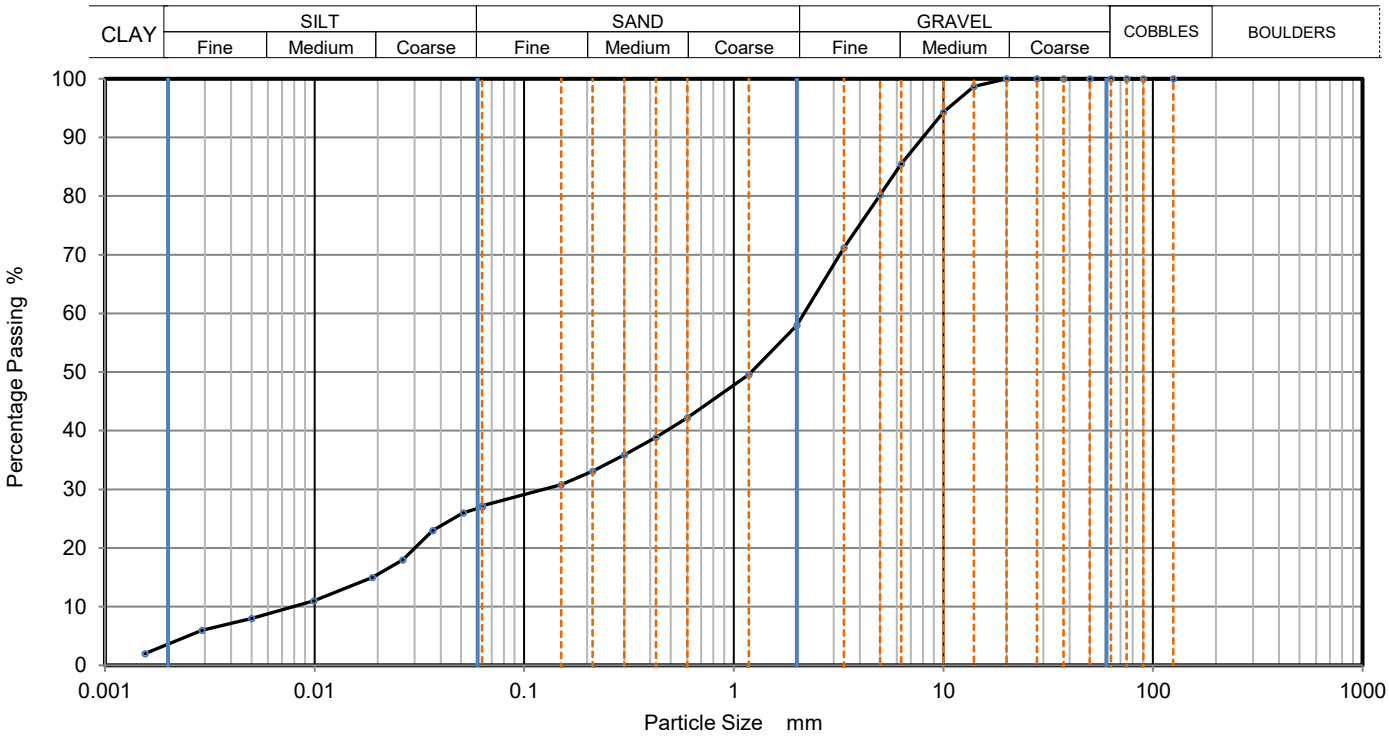
Grading Analysis		
D100	mm	
D60	mm	2.75
D30	mm	0.346
D10	mm	0.0144
Uniformity Coefficient		190
Curvature Coefficient		3

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH39A
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Grey sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.70
				Base	2.80
Specimen Reference	3	Specimen Depth	1.7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024020961



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	27
90	100	0.05121	26
75	100	0.03664	23
63	100	0.02636	18
50	100	0.01885	15
37.5	100	0.00989	11
28	100	0.00500	8
20	100	0.00290	6
14	99	0.00155	2
10	94		
6.3	86		
5	80		
3.35	71		
2	58		
1.18	50		
0.6	42	Particle density	(assumed)
0.425	39	2.65	Mg/m3
0.3	36		
0.212	33		
0.15	31		
0.063	27		

Dry Mass of sample, g: 403

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	42.0
Sand	30.8
Silt	23.8
Clay	3.4

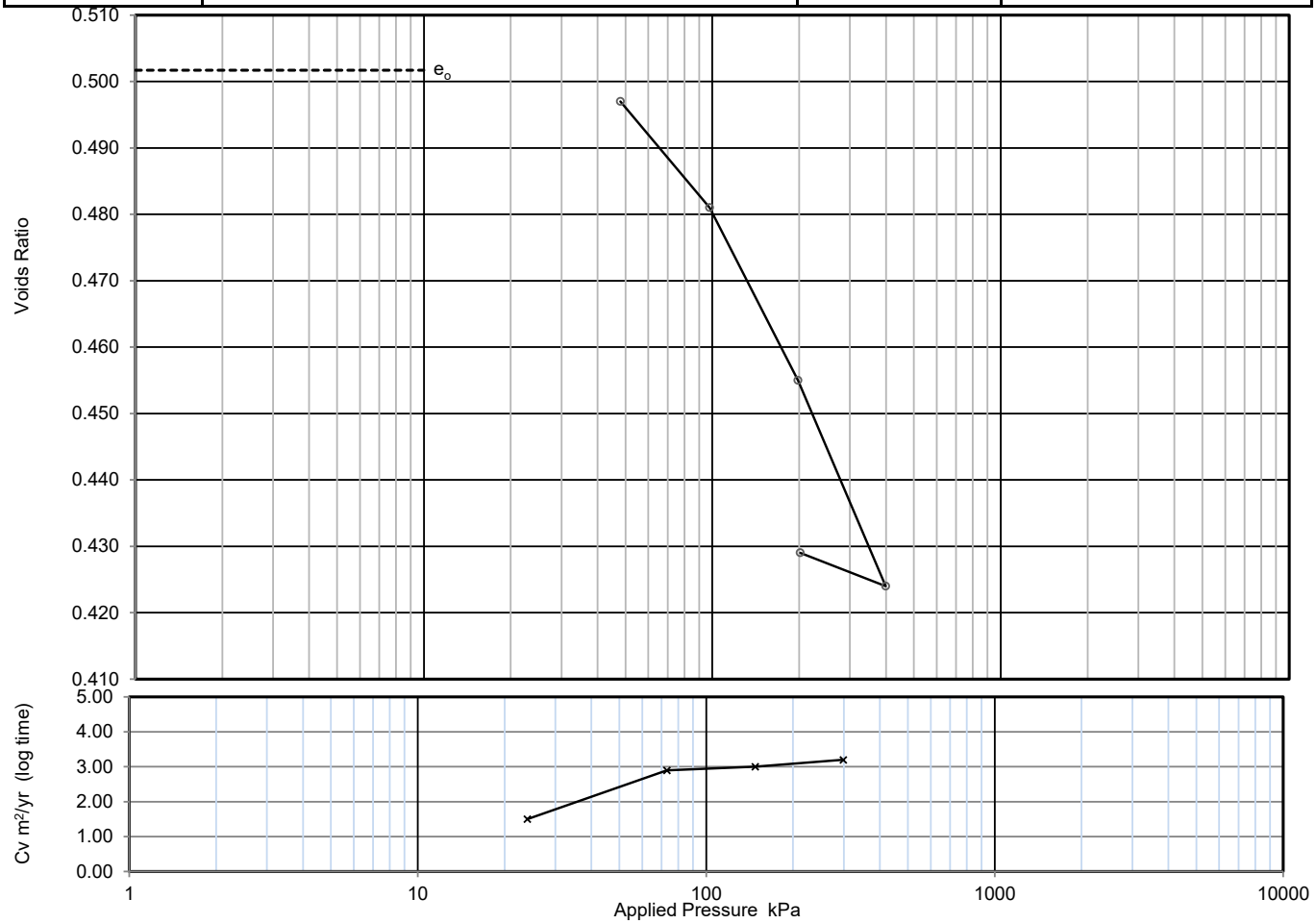
Grading Analysis		
D100	mm	
D60	mm	2.16
D30	mm	0.124
D10	mm	0.00868
Uniformity Coefficient		250
Curvature Coefficient		0.82

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH29
Site Name	Rosslare OWH - GI				Sample No.		15
Soil Description	Brown slightly sandy silty CLAY.				Sample Depth (m)	Top	2.10
						Bottom	2.55
Specimen Reference	5	Specimen Depth	2.1	m	Sample Type		UT
Specimen Description	Brown slightly sandy silty CLAY.				KeyLAB ID		Caus2024020952
Test Method	BS1377:Part 5:1990, clause 3				Date started		04/03/2024



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.502	-	-	-	-
48	0.497	0.064	1.5	1.4	0.00068
98	0.481	0.21	2.9	7.9	0.00036
198	0.455	0.18	3	62	0.0012
399	0.424	0.1	3.2	8.7	0.0015
202	0.429	0.018			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.94	mm
Moisture Content	21.0	22.0	%
Bulk density	2.13	2.26	Mg/m3
Dry density	1.76	1.85	Mg/m3
Voids Ratio	0.502	0.429	
Saturation	109	136	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

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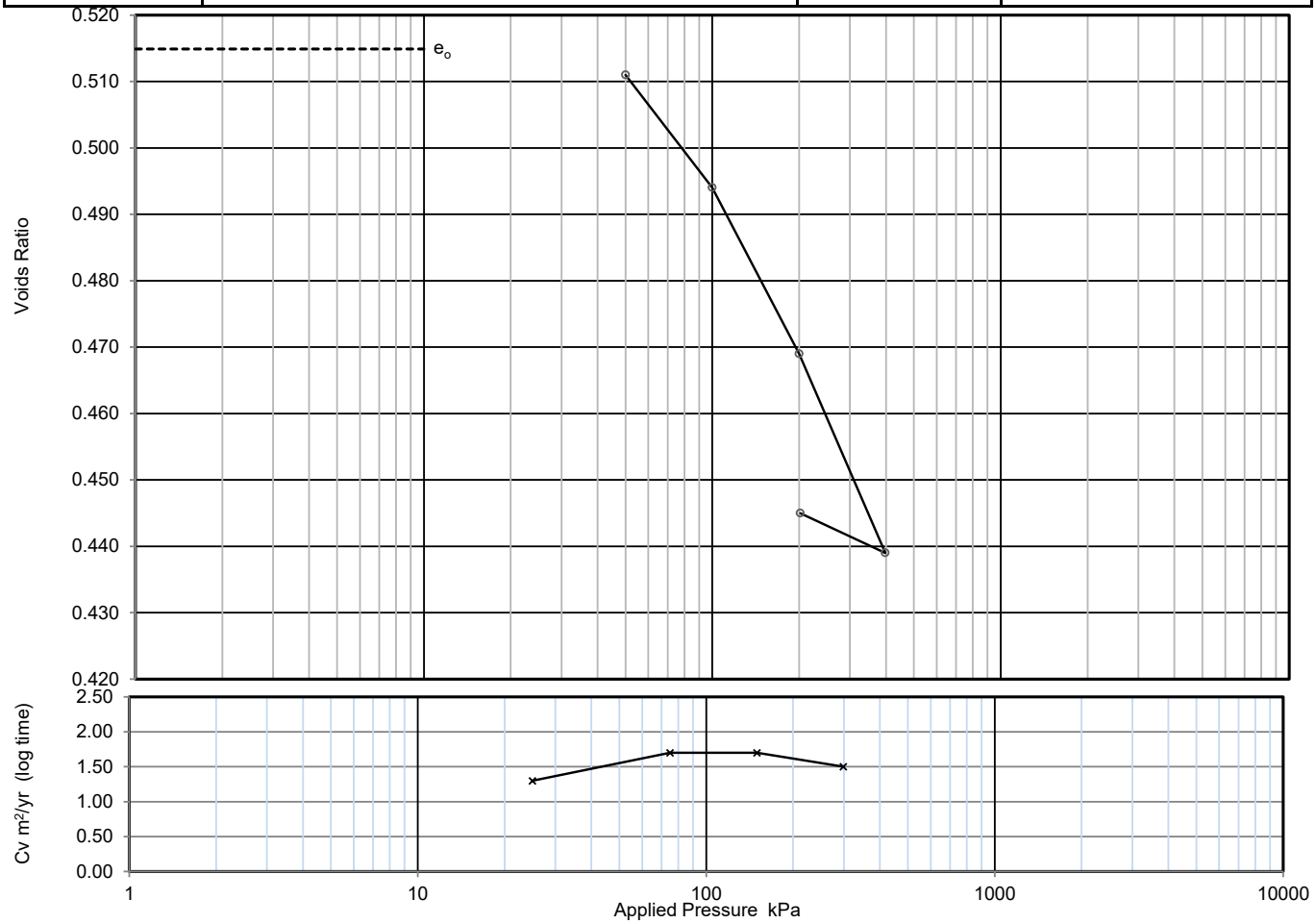
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LAB 13R - Version 6

UKAS TESTING

10122

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH29
Site Name	Rosslare OWH - GI				Sample No.		16
Soil Description	Brown sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	4.60
						Bottom	5.05
Specimen Reference	3	Specimen Depth	4.6	m	Sample Type		UT
Specimen Description	Brown sandy slightly gravelly silty CLAY.				KeyLAB ID		Caus2024020955
Test Method	BS1377:Part 5:1990, clause 3				Date started		04/03/2024



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.515	-	-	-	-
50	0.511	0.056	1.3	1.5	0.00039
100	0.494	0.23	1.7	3.6	0.00097
200	0.469	0.16	1.7	2.8	0.0013
398	0.439	0.1	1.5	4.1	0.0013
202	0.445	0.024			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	19.90	18.99	mm
Moisture Content	21.0	23.0	%
Bulk density	2.12	2.26	Mg/m3
Dry density	1.75	1.83	Mg/m3
Voids Ratio	0.515	0.445	
Saturation	110	137	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen Watson

Printed :

14/03/2024 17:03

LAB 13R - Version 6

UKAS TESTING

10122

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare Europort Offshore		
Location Number	M-BH29	Sample Reference		5	
Depth (m)	6.50	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown slightly sandy silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	7.2	7.2	7.2
Bulk Density (Mg/m^3)	2.12	2.11	2.13
Dry Density (Mg/m^3)	1.98	1.97	1.98
Voids Ratio	0.339	0.345	0.335
Consolidation			
Normal Pressure (kPa)	70	140	280
Vertical Displacement (mm)	0.473	0.508	1.690
Shearing			
Rate of Strain (mm/min)	0.106	0.106	0.106
Peak Shear Stress (kPa)	73.7	101.9	181.6
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	1.083	1.737	5.703
Final Conditions			
Water Content (%)	15.0	15.0	15.0
Dry Density (Mg/m^3)	2.04	2.06	2.40
Voids Ratio	0.315	0.308	0.205

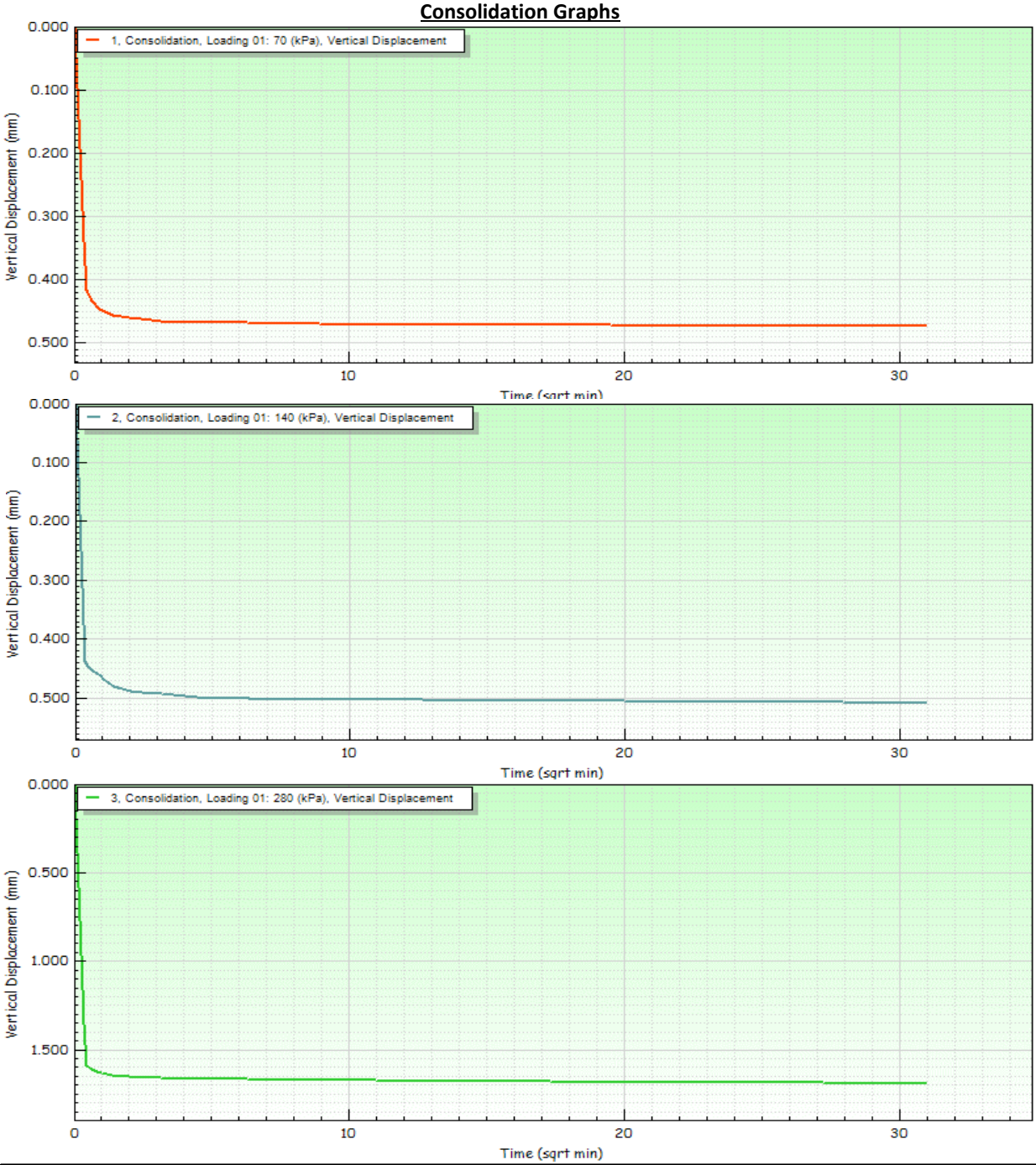
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare Europort Offshore	
Location Number	M-BH29	Sample Reference	5	
Depth (m)	6.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

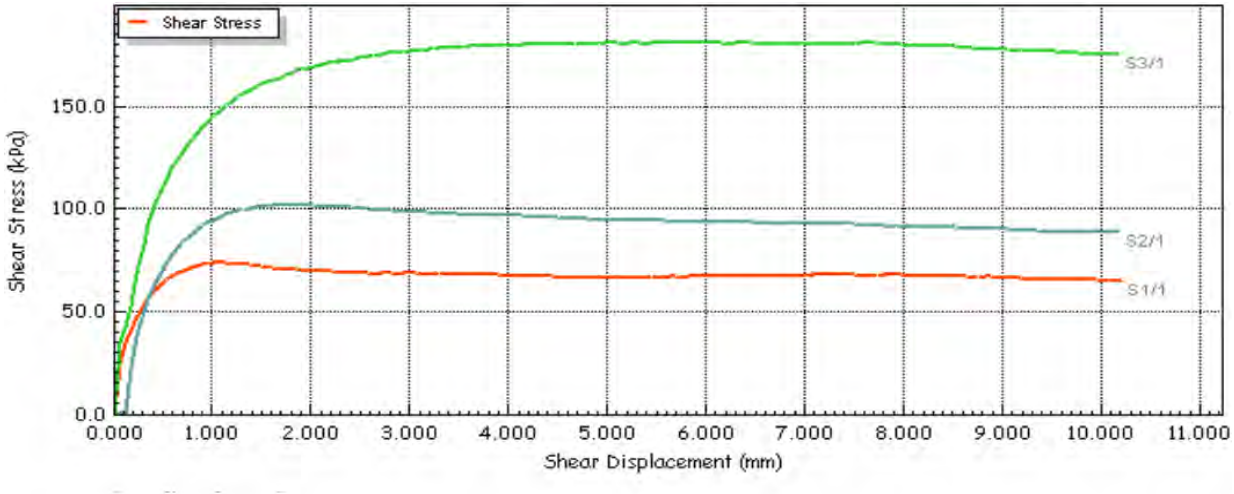


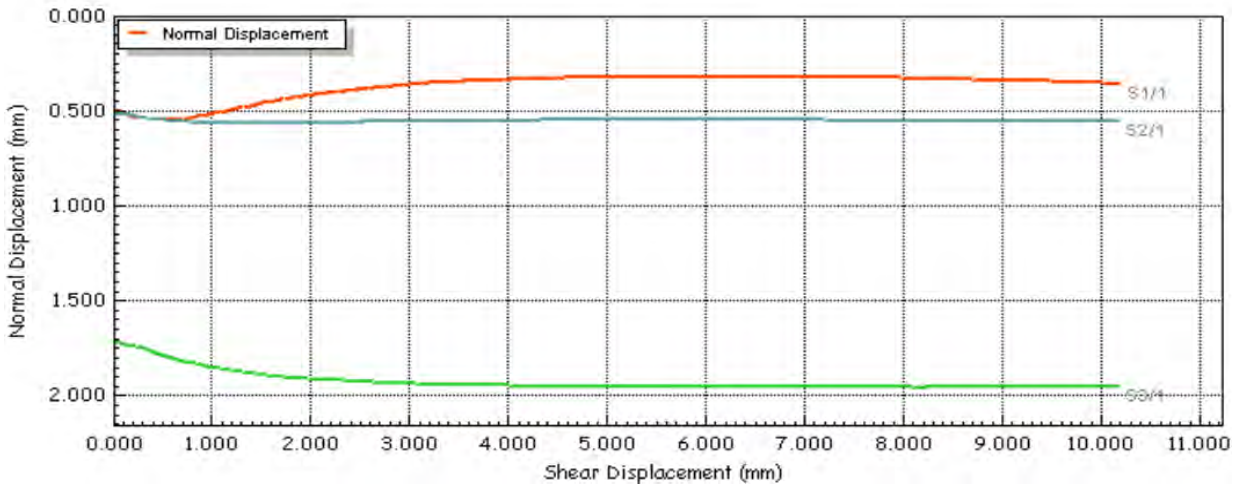
	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare Europort Offshore	
Location Number	M-BH29	Sample Reference	5	
Depth (m)	6.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



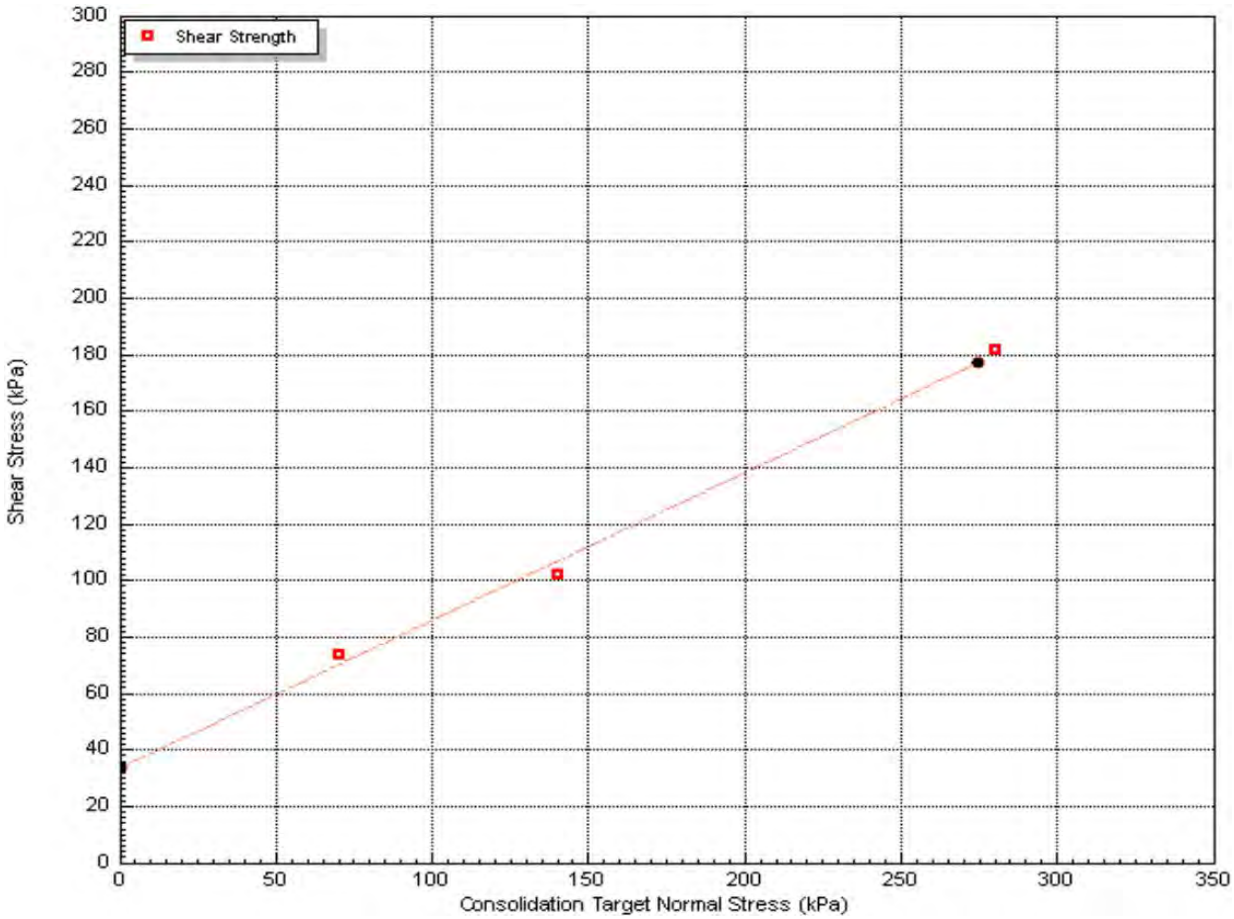


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare Europort Offshore	
Location Number	M-BH29	Sample Reference	5	
Depth (m)	6.50	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	34		
Angle of Shearing Resistance (°)	27.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

LABORATORY REPORT

Contract Number: PSL24/1340

Report Date: 13 March 2024

Client's Reference: 23-0585 G03

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

For the attention of: Stephen Watson

Contract Title: Rosslare Eurport Offshore Renewable Energy Hub SI

Date Received: 22/2/2024
Date Commenced: 22/2/2024
Date Completed: 13/3/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Managing Director)	R Berriman (Associate Director)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	D Burton (Advanced Testing Manager)

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Doncaster,
DN4 0AR
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awatkins@prosoils.co.uk

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details				
 *sketch showing specimen location in original sample*	Depth			4.60-5.05m UT16
	Description			Brown slightly gravelly slightly sandy CLAY.
	Type			Undisturbed, vertical orientation.
	Initial Sample Length	L_0	(mm)	211.0
	Initial Sample Diameter	D_0	(mm)	104.0
	Initial Sample Weight	W_0	(gr)	3428.0
	Initial Bulk Density	ρ_0	(Mg/m3)	1.91
	Particle Density	ρ_s	(Mg/m3)	2.66

Initial Conditions			Stage 1	2	3	4
Initial Cell Pressure	σ_{3i}	(kPa)	450	500	600	
Initial Back Pressure	U_{bi}	(kPa)	400	400	400	
Membrane Thickness	m_b	(mm)	0.400			
Displacement Input	L_{IP}	(mm)	CH 2			
Load Input	N_{IP}	(N)	CH 1			
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 3			
Sample Volume	V	(cc)	CH 6			
Initial Moisture	ω_i	(%)	22			
Initial Dry Density	ρ_{di}	(Mg/m3)	1.56			
Initial Voids Ratio	e_i	.	0.700			
Initial Degree of Saturation	S_i	(%)	85			
B Value	B	.	0.96			

Final Conditions						
Final Moisture	ω_f	(%)	21			
Final Dry Density	ρ_{df}	(Mg/m3)	1.62			
Final Voids Ratio	e_f	.	0.639			
Final Degree of Saturation	S_f	(%)	87.7			
			Stage 1	2	3	4
Failure Criteria		.	Max. Dev.	Max. Dev.	Max. Dev.	
Strain At Failure	ε_f	(%)	5.71	10.62	18.04	
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	76.4	120.5	212.2	
Minor Stress At Failure	σ_3'	(kPa)	39.4	71.6	152.8	
Major Stress At Failure	σ_1'	(kPa)	115.8	192.0	365.0	
Principal Stress Ratio At Failure	σ_1'/σ_3'		2.939	2.683	2.389	
PwP At Failure Criteria	u_f		410.8	428.8	447.0	

Notes



Plastic

Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH29 4.60-5.05m	
			Test Date	26/02/2024	
Jobfile	Rosslare Eurosport Offshore Renewable Energy Hub SI		Borehole	M-BH29	
			Sample	4.60-5.05m	
Client	Causeway		Depth	4.60-5.05m UT16	
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

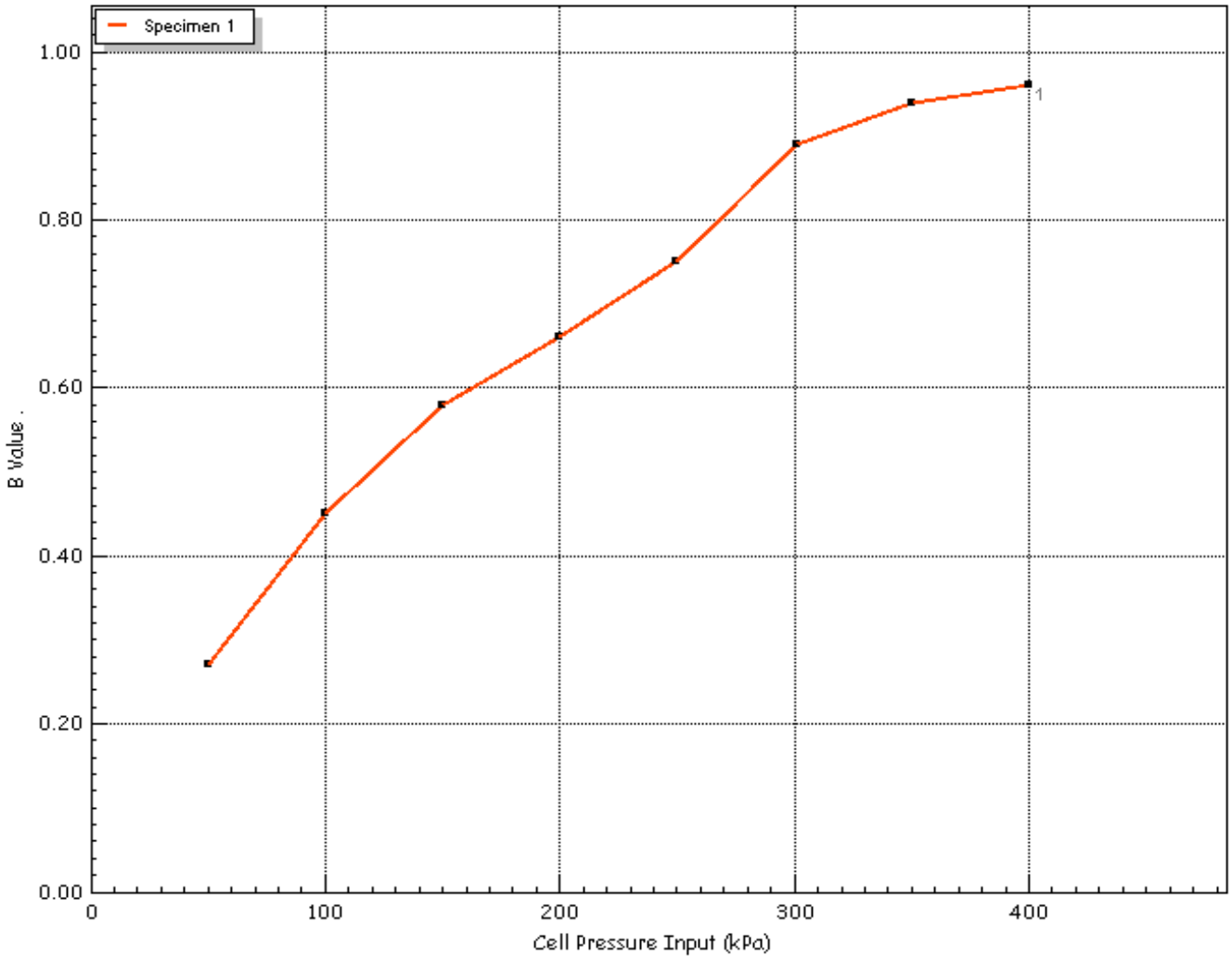
PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	σ	(kPa)	400
Pore Water Pressure Input	u pwp	(kPa)	365
B Value	B	.	0.96



Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH29 4.60-5.05m
				Test Date	26/02/2024
	Rosslare Eurosport Offshore			Borehole	M-BH29
Jobfile	Renewable Energy Hub SI			Sample	4.60-5.05m
Client	Causeway			Depth	4.60-5.05m UT16
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

PSL Laboratory

Effective Stress Triaxial Compression

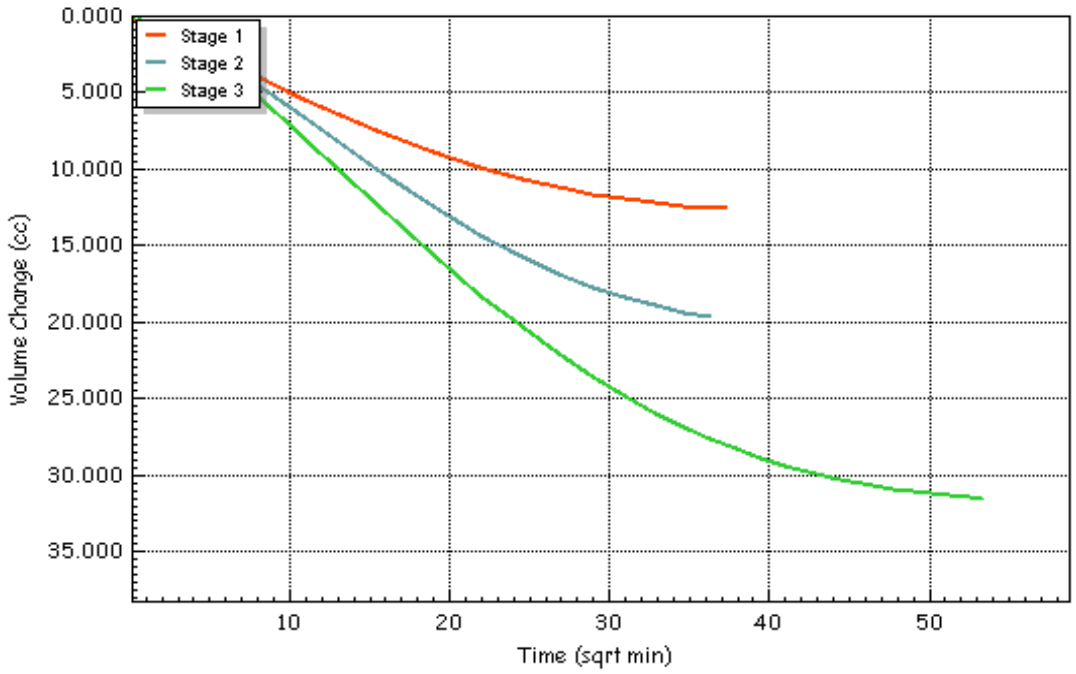
Consolidated Undrained

Consolidation Plots

Initial Conditions					
			Stage 1	2	3
Initial Cell Pressure	σ_3	(kPa)	450	500	600
Initial Back Pressure	u_{bi}	(kPa)	400	400	400
Pore Water Pressure Input	u_{pwp}	(kPa)	414	452	509
Drainage Method			Radial+One End		

Final Conditions					
			Stage 1	2	3
PWP Dissipation %	U%	(%)	100.00	100.00	95.40
Volumetric Strain	ε_v%	(%)	0.70	1.10	1.76
Corrected Length	L_C	(mm)	210.5	197.8	185.4
Corrected Area	A_C	(cm2)	84.55	89.00	93.25
Corrected Volume	V_C	(cc)	1779.812	1760.088	1728.528
t100	t_{100}	(min)	565.32	738.42	1226.02
Consolidation	c_V	(m2/year)	0.004	0.003	0.002
Compressibility	m_V	(m2/MN)	0.491	0.213	0.170
Test Time	t_F	(h:m:s)	16:57:34	22:09:09	36:46:50
Estimated Strain to Failure	ε%	(%)	5.0	5.0	5.0
Shear Machine Speed	d_r	(mm/min)	0.01034	0.01034	0.01034

Notes



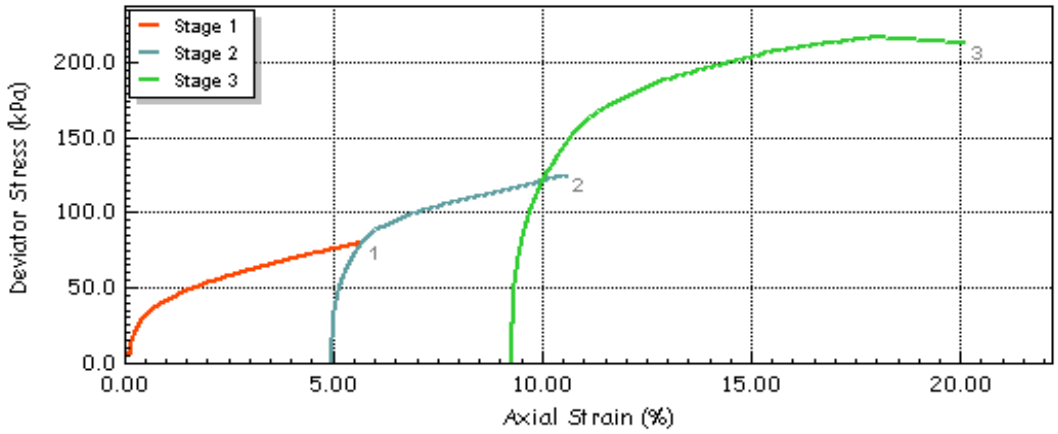
Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH29 4.60-5.05m
				Test Date	26/02/2024
	Rosslare Eurosport Offshore			Borehole	M-BH29
Jobfile	Renewable Energy Hub SI			Sample	4.60-5.05m
Client	Causeway			Depth	4.60-5.05m UT16
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

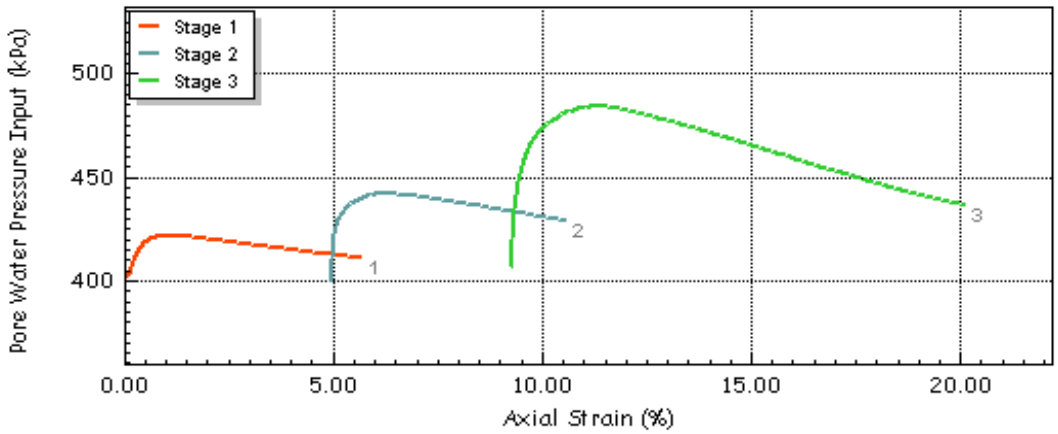
PSL Laboratory

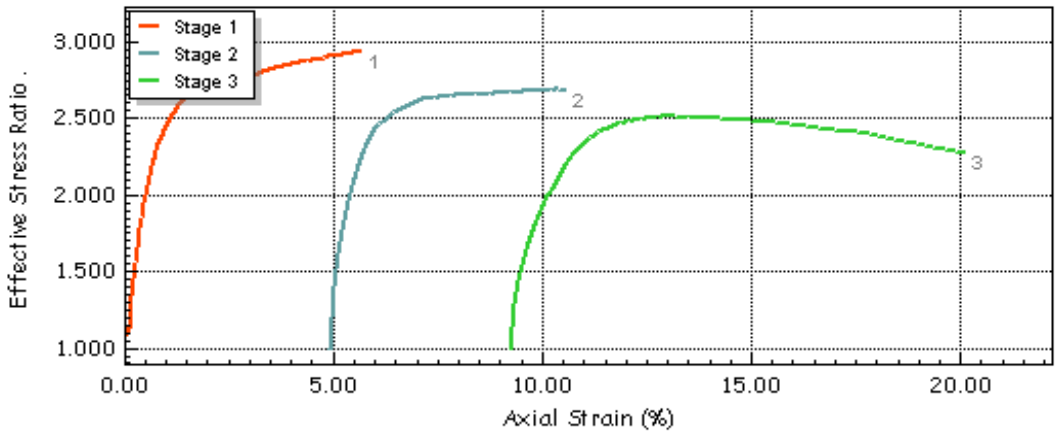
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







PSL PROFESSIONAL SOILS LABORATORY — UKAS TESTING 4043	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH29 4.60-5.05m
				Test Date	26/02/2024
		Rosslare Eurosport Offshore		Borehole	M-BH29
	Jobfile	Renewable Energy Hub SI		Sample	4.60-5.05m
	Client	Causeway		Depth	4.60-5.05m UT16
	Operator	David Burton	Checked S.Royle	Approved	S.Royle

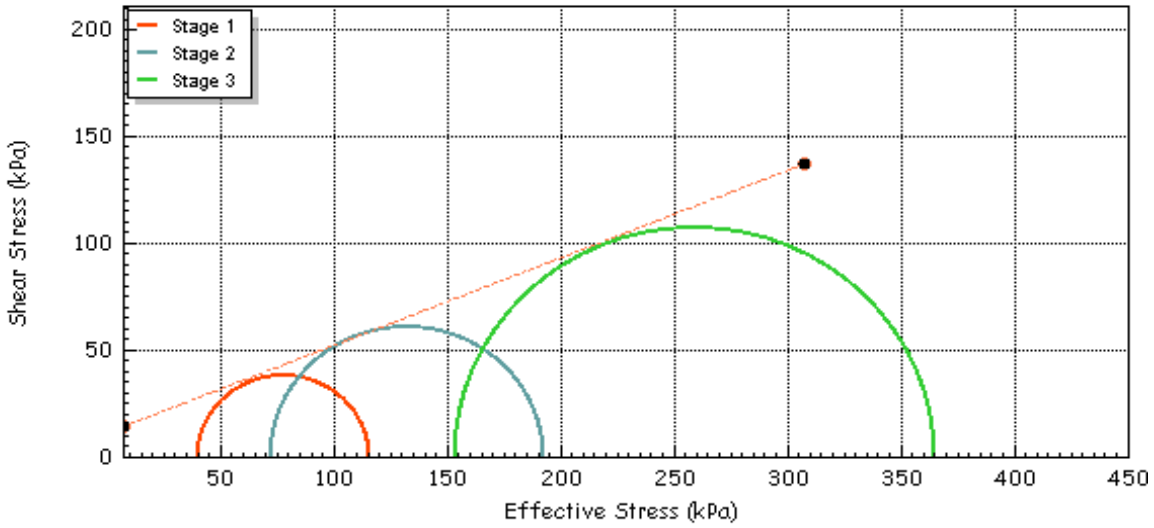
PSL Laboratory

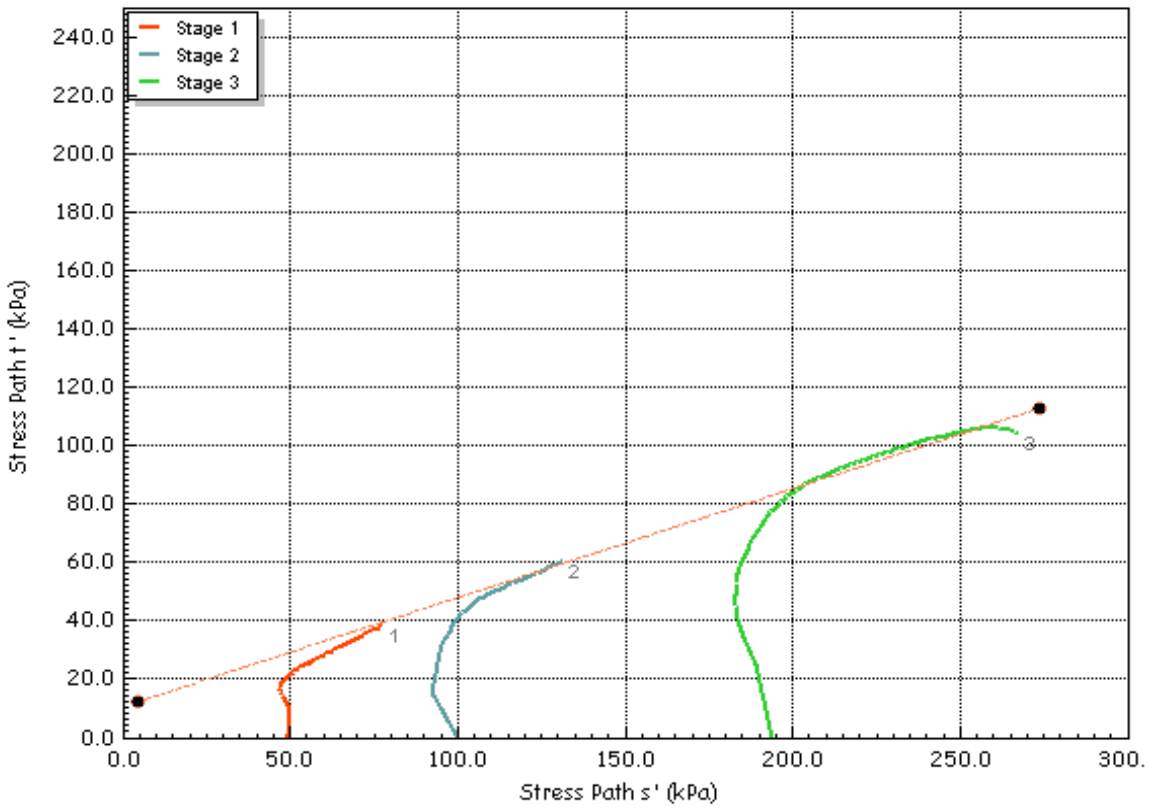
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective	c'	(kPa)	11.45	Effective Cohesion	c'	(kPa)	11.45
Effective Friction	ϕ'	(deg)	22.0	Effective Friction	ϕ'	(deg)	22.0





Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH29 4.60-5.05m	
			Test Date	26/02/2024	
Jobfile	Rosslare Eurosport Offshore Renewable Energy Hub SI		Borehole	M-BH29	
			Sample	4.60-5.05m	
Client	Causeway		Depth	4.60-5.05m UT16	
Operator	David Burton	Checked S.Royle	Approved	S.Royle	

Certificate of Analysis

Certificate Number	24-03484	*Issued:*	22-Feb-24

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

Our Reference	24-03484
Client Reference	23-0585
Order No	(not supplied)
Contract Title	Rosslare Europort Offshore Renewable Energy Hub SI
Description	5 Soil samples.
Date Received	19-Feb-24
Date Started	19-Feb-24
Date Completed	22-Feb-24
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-03484
Client Ref 23-0585
Contract Title Rosslare Europort Offshore Renewable Energy Hub SI

			Lab No	2301610	2301611	2301612	2301613	2301614
			.Sample ID	M-BH05	M-BH23	M-BH23	M-BH26	M-BH26
			Depth	2.50	7.40	8.00	0.80	2.60
			Other ID	2	13	6	6	9
			Sample Type	B	D	B	D	D
			Sampling Date	16/02/2024	16/02/2024	16/02/2024	16/02/2024	16/02/2024
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Inorganics								
pH	DETSC 2008#		pH					8.7
Organic matter	DETSC 2002#	0.1	%	0.6	0.9	0.5	< 0.1	
Chloride	DETSC 2055	1	mg/kg					982
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l					69

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 24-03484
Client Ref 23-0585
Contract Rosslare Europort Offshore Renewable Energy Hub SI

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2301610	M-BH05 2.50 SOIL	16/02/24	PT 500ml		
2301611	M-BH23 7.40 SOIL	16/02/24	PT 500ml		
2301612	M-BH23 8.00 SOIL	16/02/24	PT 500ml		
2301613	M-BH26 0.80 SOIL	16/02/24	PT 500ml		
2301614	M-BH26 2.60 SOIL	16/02/24	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / G03	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH29	15	2.10	UT	UU Triaxial	Insufficient intact material to obtain test specimen	CANCEL TEST
M-BH29	5	6.50	SB	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH39A	2	1.70	SB	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH39A	2	1.70	SB	60mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out PSD in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
05 March 2024	12 March 2024

CAUSEWAY GEOTECH

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Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

28 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub S
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 20/02/2024 and 28/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G04

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	BS 1377-2: 1990: Cl 3.2	15
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	13
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	1
SOIL	Particle density by Gas jar method	BS 1377-2: 1990: Cl 8.2	2
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	15
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	14
SOIL	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377-4: 1990: Cl 3.5 & 3.6	2
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	1
SOIL	Laboratory Vane Shear Strength (3 determinations) *	BS 1377-7: 1990: Cl 3	1
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	2
	Extra over days (more than initial 3 days)		4

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	pH Value of Soil		1
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Organic Matter Content		3
SOIL – subcontracted to Pro Soils Limited *(UKAS 4043)*	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	1
	Extra over days (more than initial 4 days)		3
SOIL – subcontracted to Pro Soils Limited *(UKAS 4043)*	Laboratory Vane Shear	BS 1377-7: 1990: Cl 3	1

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.: 23-0585

Project Name: Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk / dry Mg/m3		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
M-BH10	7	1.50		D	Brown clayey fine to coarse SAND.			19	99	25 -1pt	13	12		CL
M-BH10	11	5.50		D	Brown sandy slightly gravelly silty CLAY.			19	97	46 -1pt	20	26		CI
M-BH10	14	8.50		D	Greyish brown sandy slightly gravelly silty CLAY.			12	79	34 -1pt	16	18		CL
M-BH17	5	1.50		D	Greyish brown sandy slightly gravelly silty CLAY.			11	71	32 -1pt	17	15		CL
M-BH18	8	0.50		D	Greyish brown slightly sandy silty CLAY.			25	94	44 -1pt	19	25		CI
M-BH18	9	1.50		D	Greyish brown sandy silty CLAY.			13	89	40 -1pt	18	22		CI
M-BH18	11	3.50		D	Greyish brown slightly sandy silty CLAY.			14	96	30 -1pt	17	13	2.64-gj	CL
M-BH18	17	3.50	3.95	UT	Greyish brown slightly sandy silty CLAY.			13						
M-BH18	12	4.50		D	Brown slightly gravelly slightly clayey fine to coarse SAND.			6.3	NP					
M-BH18	7	6.50	8.00	SB	Brown clayey fine to coarse SAND.			15	73	31 -1pt	19	12		CL
M-BH19	4	1.40		D	Brown sandy silty CLAY.			11	61	29 -1pt	18	11		CL
M-BH19	6	3.40		D	Brown sandy silty CLAY.			12	53	35 -1pt	22	13		CL/CI

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

LAB 01R Version 6

Key

Density test | Liquid Limit | Particle density

Linear measurement unless : | 4pt cone unless : | sp - small pyknometer

wd - water displacement | cas - Casagrande method | gj - gas jar

wi - immersion in water | 1pt - single point test

Date Printed: 28/03/2024

Approved By: Stephen Watson

UKAS TESTING 10122

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk	Density dry	w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		Mg/m3		%	%	%	%	%	Mg/m3	
M-BH20	3	1.80		D	Brown sandy silty CLAY.			38	98	42 -1pt	25	17		CI
M-BH34	5	1.20		D	Brown sandy silty CLAY.			14	93	27 -1pt	18	9		CL
M-BH37	3	1.50		D	Brown sandy silty CLAY.			10	53	34 -1pt	18	16		CL

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

LAB 01R Version 6

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

28/03/2024

Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

Density Tests - Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Linear Measurement			Immersion in water			Water displacement			Remarks
	Ref	Top	Base	Type		Bulk density Mg/m3	Dry density Mg/m3	w %	Bulk density Mg/m3	Dry density Mg/m3	w %	Bulk density Mg/m3	Dry density Mg/m3	w %	
M-BH34	3	2.70	4.20	SB	Brown sandy silty CLAY.	2.26	2.02	12							

Legend w water content of the density test specimen

LAB 28R - Version 1

Notes

Tests carried out in accordance with BS1377-2:2022 Clause 8 unless stated otherwise

Date Printed

28/03/2024

Approved By

Stephen Watson

UKAS TESTING

10122

Particle Density by Gas Jar Tests - Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description at test horizon	Particle Density Mg/m3	Remarks
	Ref	Top	Base	Type			
M-BH18	11	3.50		D	Greyish brown slightly sandy silty CLAY.	2.64	
M-BH34	6	2.70		D	Greyish brown slightly sandy silty CLAY.	2.67	

LAB 04R Version 6

Notes

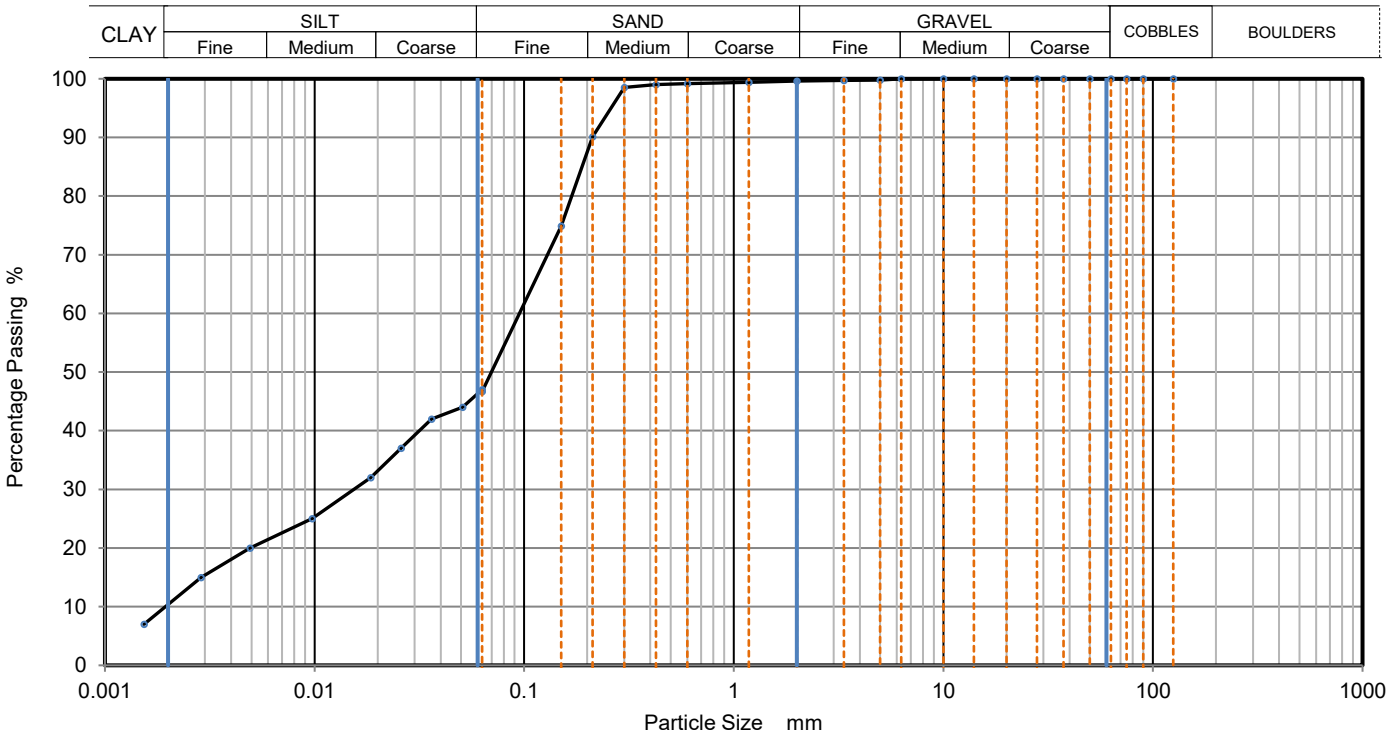
Gas Jar tests to BS1377-2 :2022 Clause 9.2

Date Printed

28/03/2024

UKAS TESTING

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-BH10
Site Name	Rosslare OWH - GI				Sample No.		1
Specimen Description	Brown clayey fine to coarse SAND.				Sample Depth (m)	Top	1.50
						Base	2.70
Specimen Reference	2	Specimen Depth	1.5	m	Sample Type		SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202402198



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	47
90	100	0.05090	44
75	100	0.03621	42
63	100	0.02591	37
50	100	0.01853	32
37.5	100	0.00973	25
28	100	0.00492	20
20	100	0.00287	15
14	100	0.00153	7
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	99		
0.212	90		
0.15	75		
0.063	47		

Dry Mass of sample, g: 359

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.4
Sand	52.9
Silt	36.2
Clay	10.5

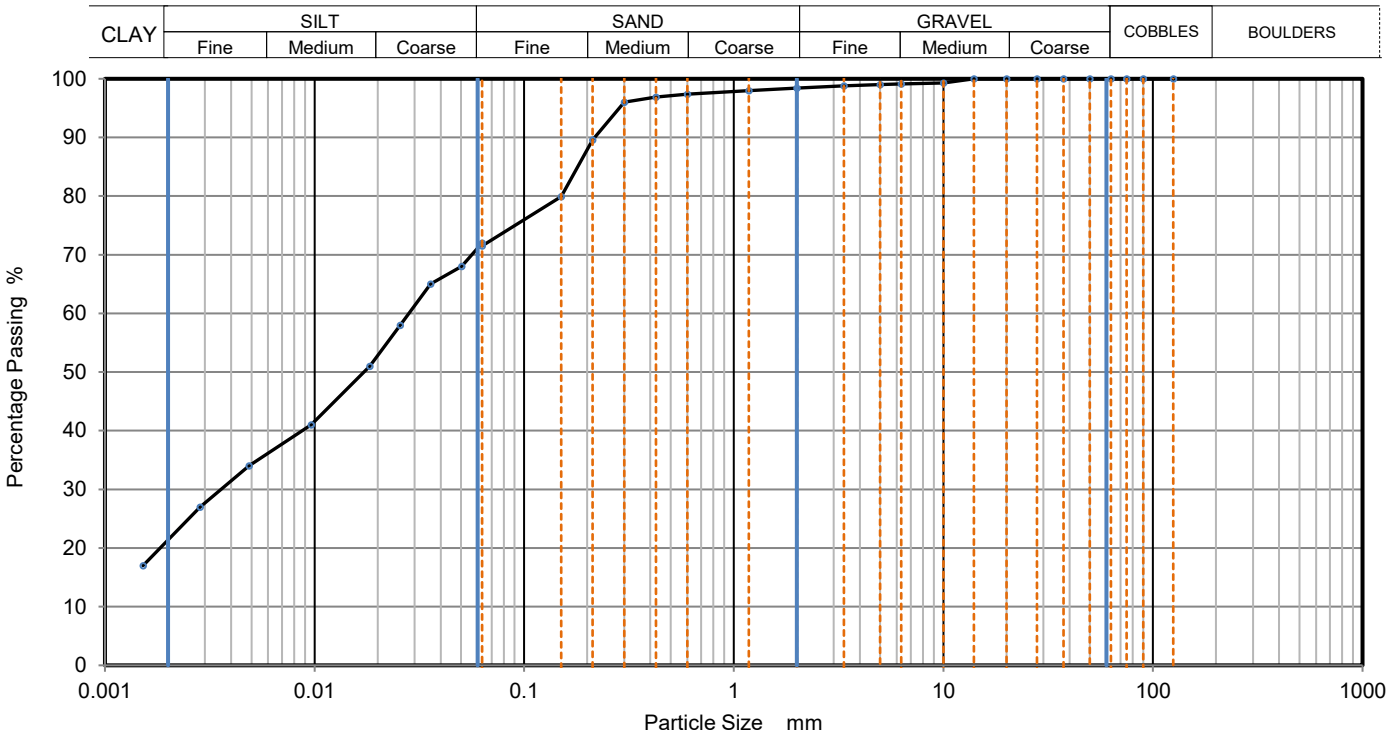
Grading Analysis		
D100	mm	
D60	mm	0.0948
D30	mm	0.0156
D10	mm	0.00192
Uniformity Coefficient		49
Curvature Coefficient		1.3

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-BH10
Site Name	Rosslare OWH - GI				Sample No.		2
Specimen Description	Brown sandy silty CLAY.				Sample Depth (m)	Top	2.70
						Base	4.20
Specimen Reference	2	Specimen Depth	2.7	m	Sample Type		SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202402199



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	72
90	100	0.05028	68
75	100	0.03577	65
63	100	0.02560	58
50	100	0.01832	51
37.5	100	0.00963	41
28	100	0.00487	34
20	100	0.00284	27
14	100	0.00152	17
10	99		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	90		
0.15	80		
0.063	72		

Dry Mass of sample, g: 364

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.6
Sand	26.9
Silt	50.0
Clay	21.5

Grading Analysis		
D100	mm	
D60	mm	0.0284
D30	mm	0.00353
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

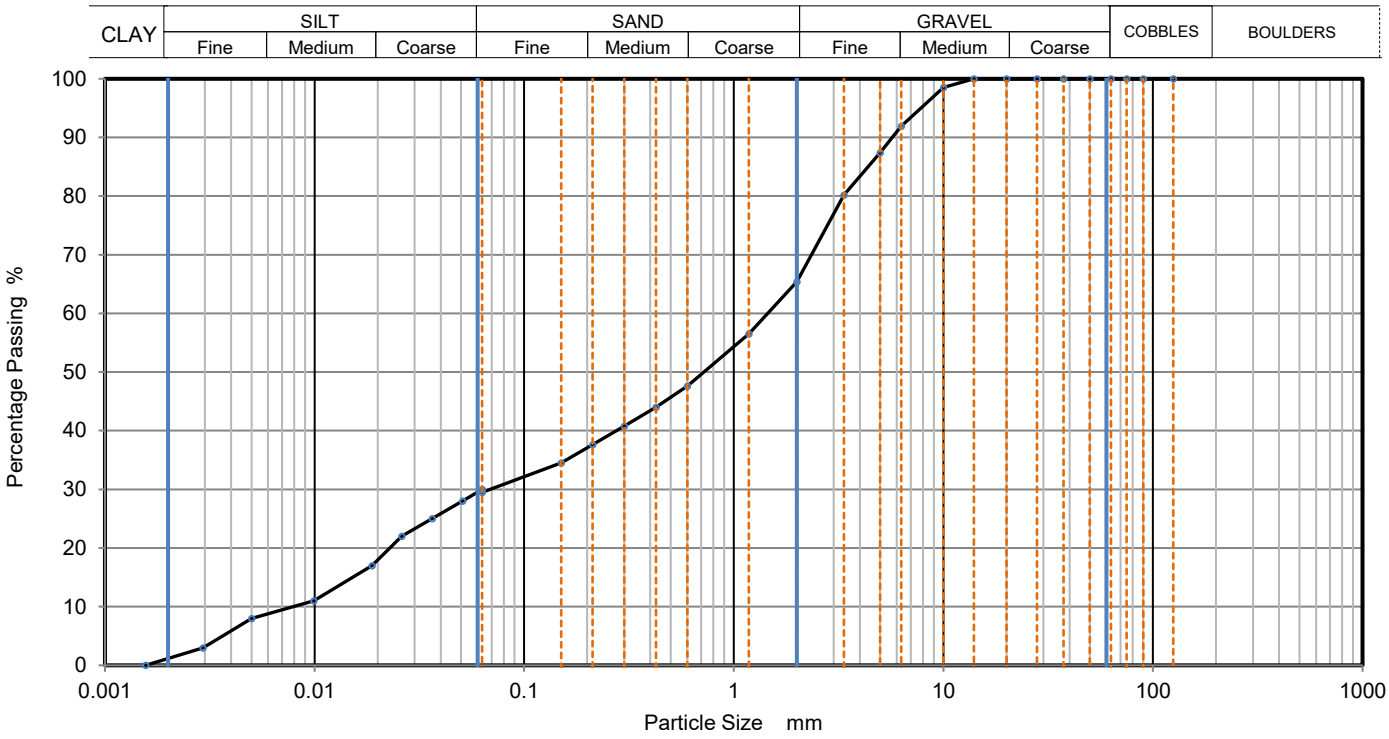
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH10
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	7.20
				Base	8.70
Specimen Reference	2	Specimen Depth	7.2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021912



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	30
90	100	0.05090	28
75	100	0.03644	25
63	100	0.02608	22
50	100	0.01876	17
37.5	100	0.00991	11
28	100	0.00501	8
20	100	0.00294	3
14	100	0.00156	0
10	99		
6.3	92		
5	87		
3.35	80		
2	65		
1.18	57		
0.6	48	Particle density	(assumed)
0.425	44	2.65	Mg/m3
0.3	41		
0.212	38		
0.15	35		
0.063	30		

Dry Mass of sample, g: 375

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	34.6
Sand	35.8
Silt	28.4
Clay	1.2

Grading Analysis		
D100	mm	
D60	mm	1.45
D30	mm	0.0682
D10	mm	0.00819
Uniformity Coefficient		180
Curvature Coefficient		0.39

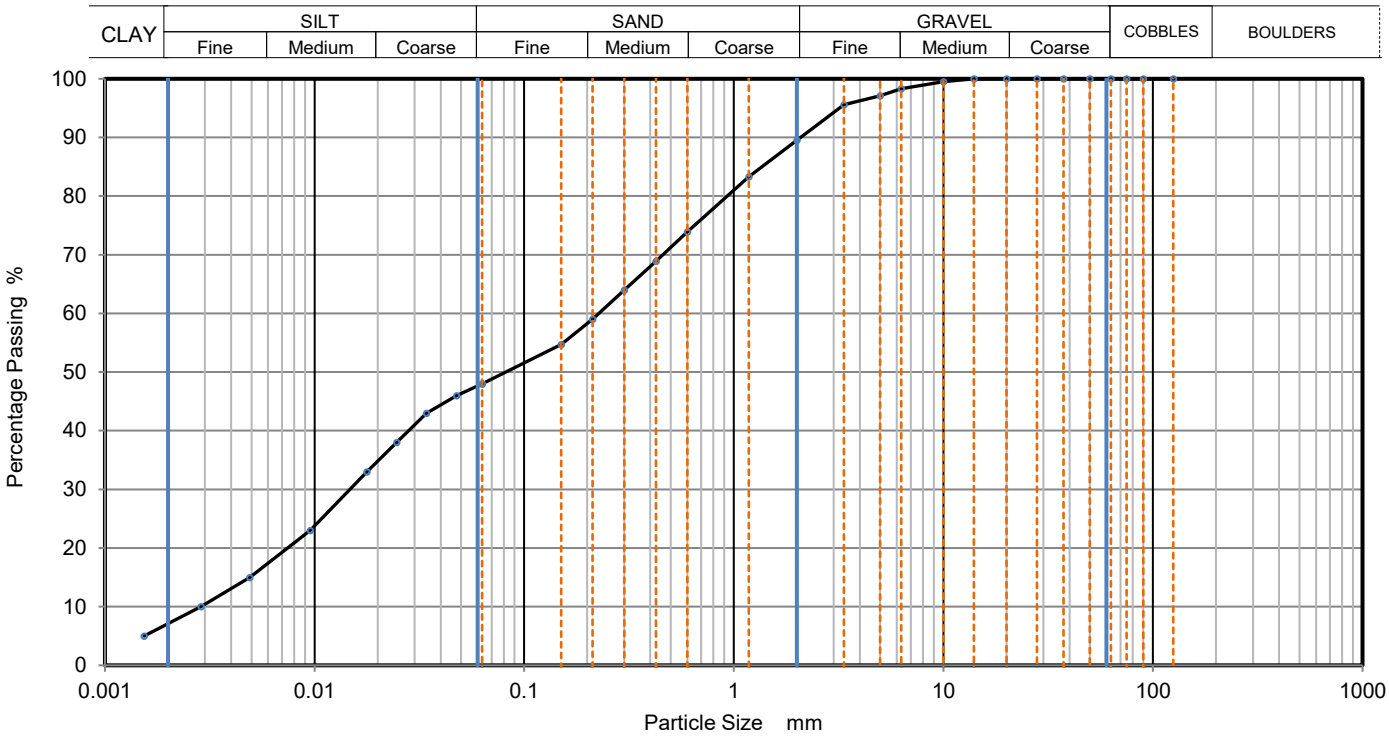
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH10
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Greyish brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	8.70
				Base	10.20
Specimen Reference	2	Specimen Depth	8.7 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021914



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	48
90	100	0.04762	46
75	100	0.03415	43
63	100	0.02464	38
50	100	0.01777	33
37.5	100	0.00952	23
28	100	0.00490	15
20	100	0.00288	10
14	100	0.00154	5
10	100		
6.3	98		
5	97		
3.35	96		
2	90		
1.18	83		
0.6	74	Particle density	(assumed)
0.425	69	2.65	Mg/m3
0.3	64		
0.212	59		
0.15	55		
0.063	48		

Dry Mass of sample, g: 361

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	10.5
Sand	41.5
Silt	41.0
Clay	7.0

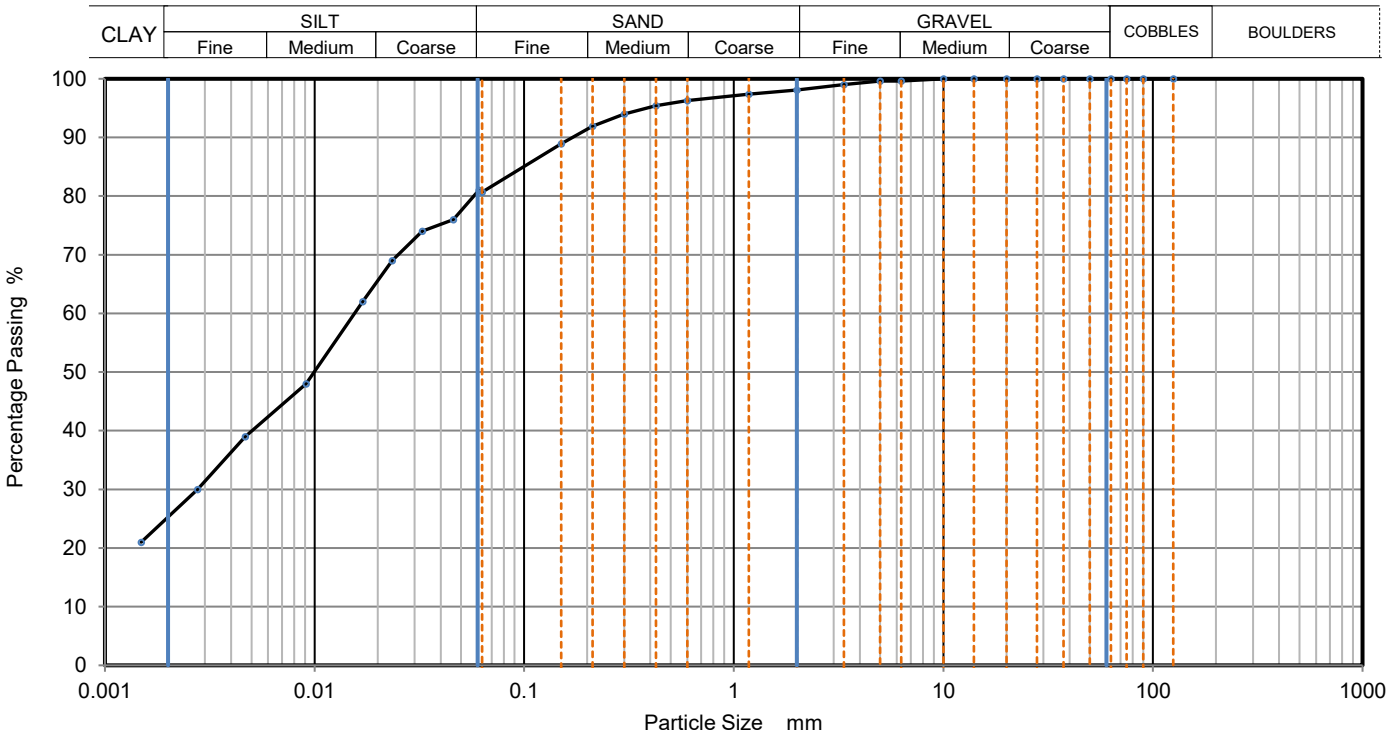
Grading Analysis		
D100	mm	
D60	mm	0.227
D30	mm	0.0146
D10	mm	0.0029
Uniformity Coefficient		78
Curvature Coefficient		0.33

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH17
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.00
				Base	1.50
Specimen Reference	2	Specimen Depth	0 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021915



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06077	81
90	100	0.04589	76
75	100	0.03270	74
63	100	0.02347	69
50	100	0.01696	62
37.5	100	0.00912	48
28	100	0.00468	39
20	100	0.00276	30
14	100	0.00149	21
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	97		
0.6	96	Particle density 2.65	(assumed) Mg/m3
0.425	95		
0.3	94		
0.212	92		
0.15	89		
0.063	81		

Dry Mass of sample, g: 303

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.9
Sand	17.4
Silt	55.6
Clay	25.1

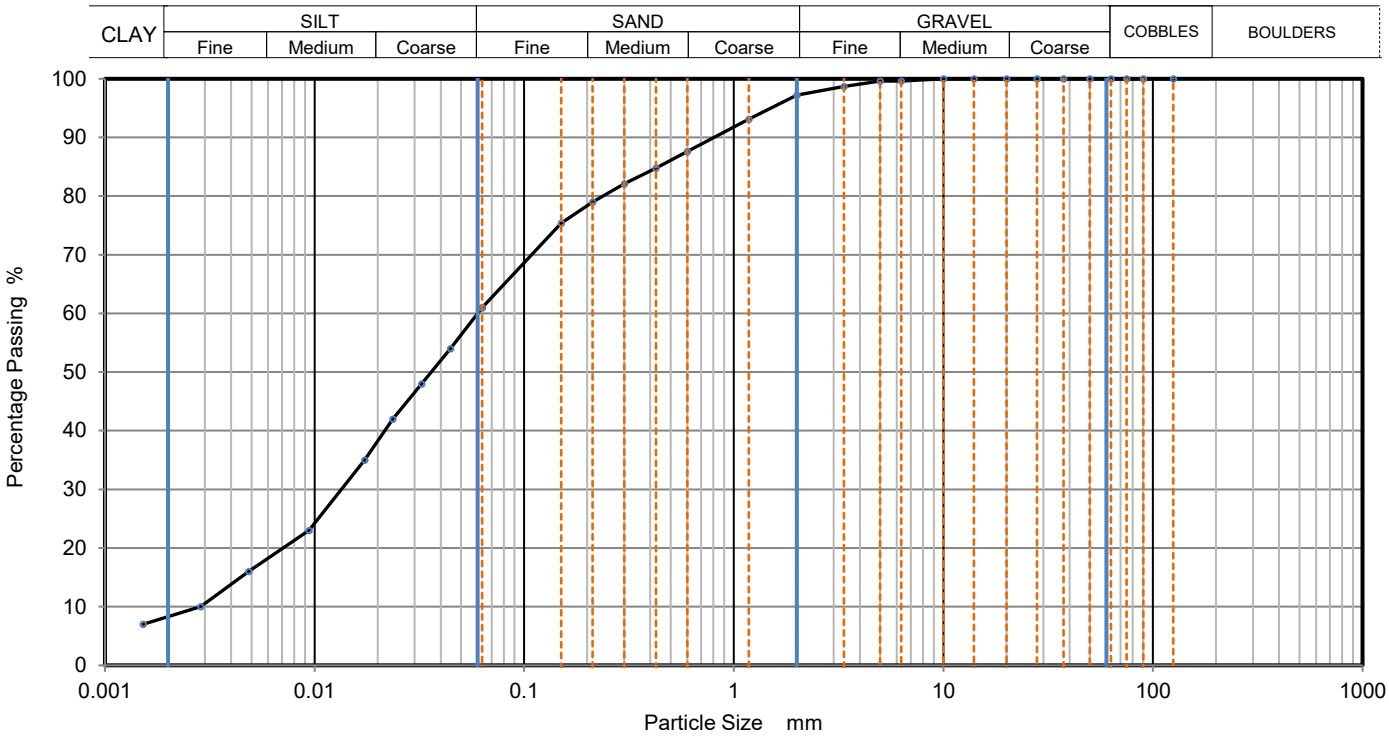
Grading Analysis		
D100	mm	
D60	mm	0.0153
D30	mm	0.00277
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH17
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Greyish brown sandy silty CLAY.			Sample Depth (m) Top	3.00
				Base	4.50
Specimen Reference	3	Specimen Depth	3 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021917



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	61
90	100	0.04446	54
75	100	0.03245	48
63	100	0.02364	42
50	100	0.01731	35
37.5	100	0.00941	23
28	100	0.00484	16
20	100	0.00286	10
14	100	0.00152	7
10	100		
6.3	100		
5	100		
3.35	99		
2	97		
1.18	93		
0.6	88	Particle density	(assumed)
0.425	85	2.65	Mg/m3
0.3	82		
0.212	79		
0.15	75		
0.063	61		

Dry Mass of sample, g: 328

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.8
Sand	36.2
Silt	52.5
Clay	8.5

Grading Analysis		
D100	mm	
D60	mm	0.0601
D30	mm	0.0134
D10	mm	0.00276
Uniformity Coefficient		22
Curvature Coefficient		1.1

Remarks

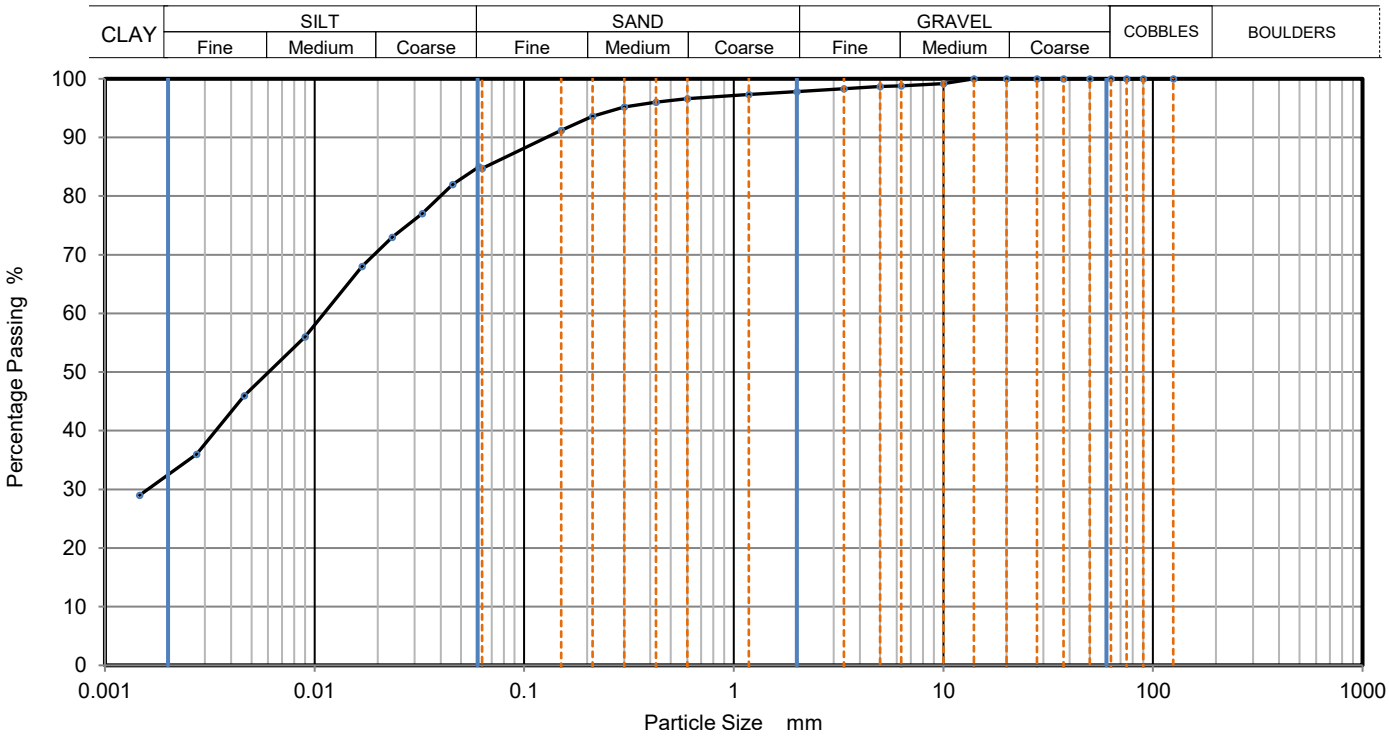
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH18
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.50
				Base	1.50
Specimen Reference	2	Specimen Depth	0.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021919



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06077	85
90	100	0.04554	82
75	100	0.03270	77
63	100	0.02347	73
50	100	0.01684	68
37.5	100	0.00900	56
28	100	0.00462	46
20	100	0.00273	36
14	100	0.00146	29
10	99		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	95		
0.212	94		
0.15	91		
0.063	85		

Dry Mass of sample, g: 335

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.2
Sand	13.0
Silt	52.1
Clay	32.7

Grading Analysis		
D100	mm	
D60	mm	0.0113
D30	mm	0.00159
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

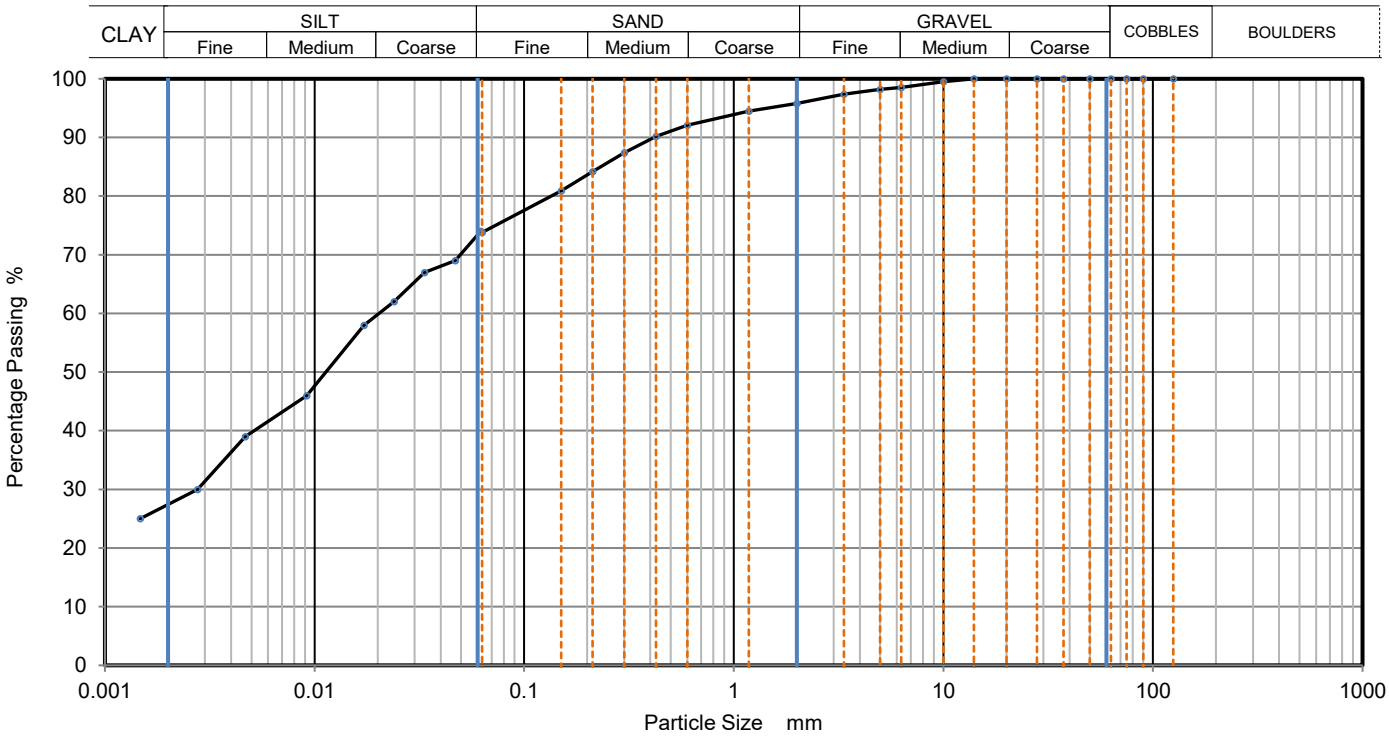
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH18
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Greyish brown sandy silty CLAY.			Sample Depth (m) Top	1.50
				Base	2.50
Specimen Reference	2	Specimen Depth	1.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021921



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06219	74
90	100	0.04694	69
75	100	0.03343	67
63	100	0.02398	62
50	100	0.01719	58
37.5	100	0.00918	46
28	100	0.00468	39
20	100	0.00276	30
14	100	0.00147	25
10	100		
6.3	99		
5	98		
3.35	97		
2	96		
1.18	95		
0.6	92	Particle density	(assumed)
0.425	90	2.65	Mg/m3
0.3	87		
0.212	84		
0.15	81		
0.063	74		

Dry Mass of sample, g: 305

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	4.2
Sand	22.0
Silt	46.2
Clay	27.6

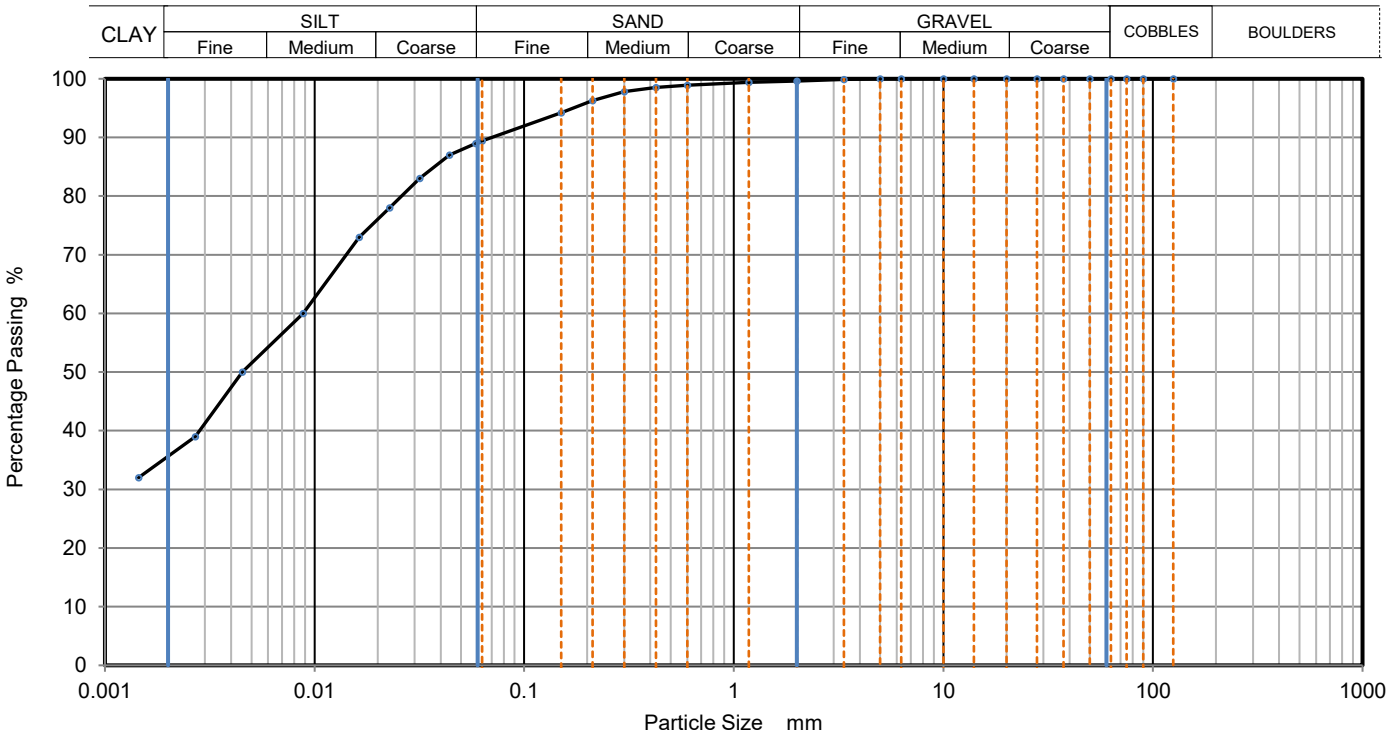
Grading Analysis		
D100	mm	
D60	mm	0.0204
D30	mm	0.00277
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH18
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	2.50
				Base	3.50
Specimen Reference	2	Specimen Depth	2.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021923



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05881	89
90	100	0.04410	87
75	100	0.03170	83
63	100	0.02277	78
50	100	0.01635	73
37.5	100	0.00882	60
28	100	0.00453	50
20	100	0.00270	39
14	100	0.00145	32
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	96		
0.15	94		
0.063	89		

Dry Mass of sample, g: 325

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.4
Sand	10.2
Silt	53.7
Clay	35.7

Grading Analysis		
D100	mm	
D60	mm	0.00898
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

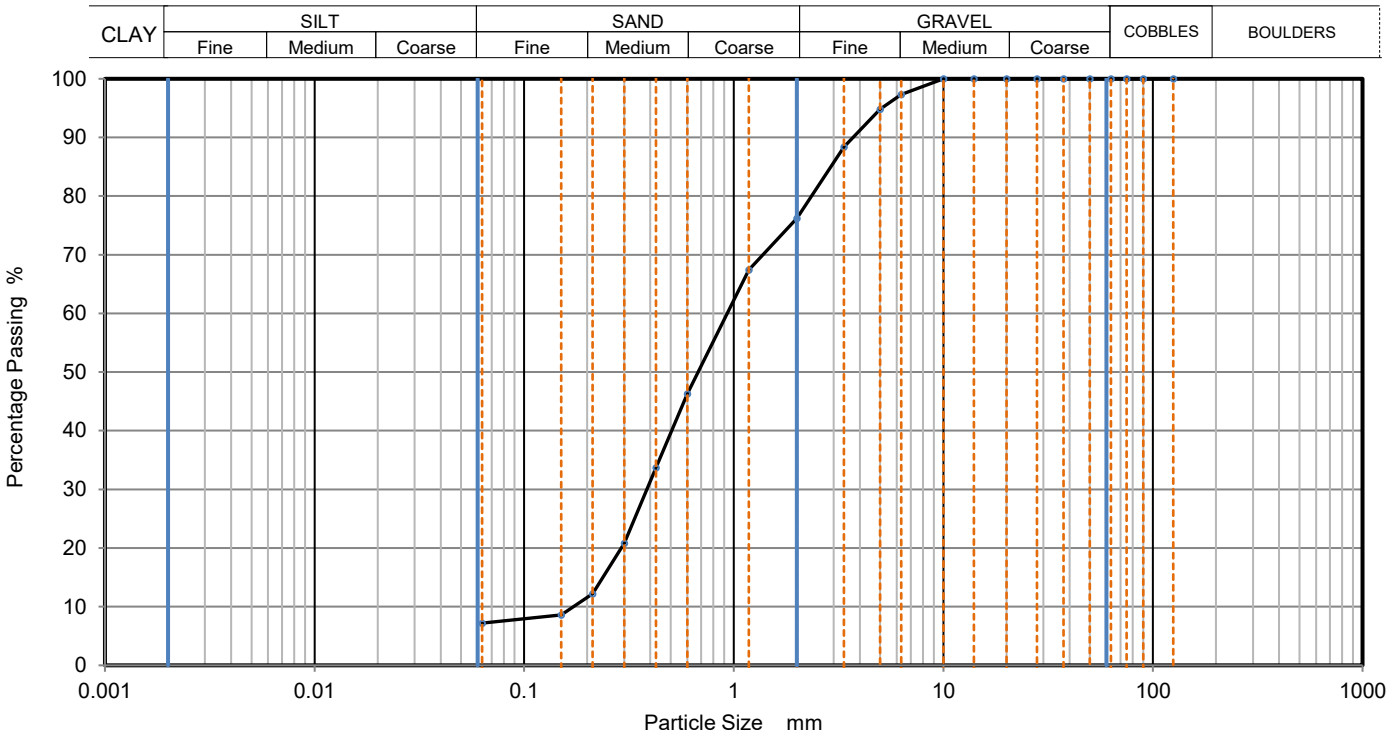
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH18
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly gravelly slightly clayey fine to coarse SAND.			Sample Depth (m) Top	4.50
				Base	5.00
Specimen Reference	2	Specimen Depth	4.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024021927



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	97		
5	95		
3.35	88		
2	76		
1.18	67		
0.6	46		
0.425	34		
0.3	21		
0.212	12		
0.15	9		
0.063	7		

Dry Mass of sample, g: 307

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	23.8
Sand	69.0
Fines <0.063mm	7.0

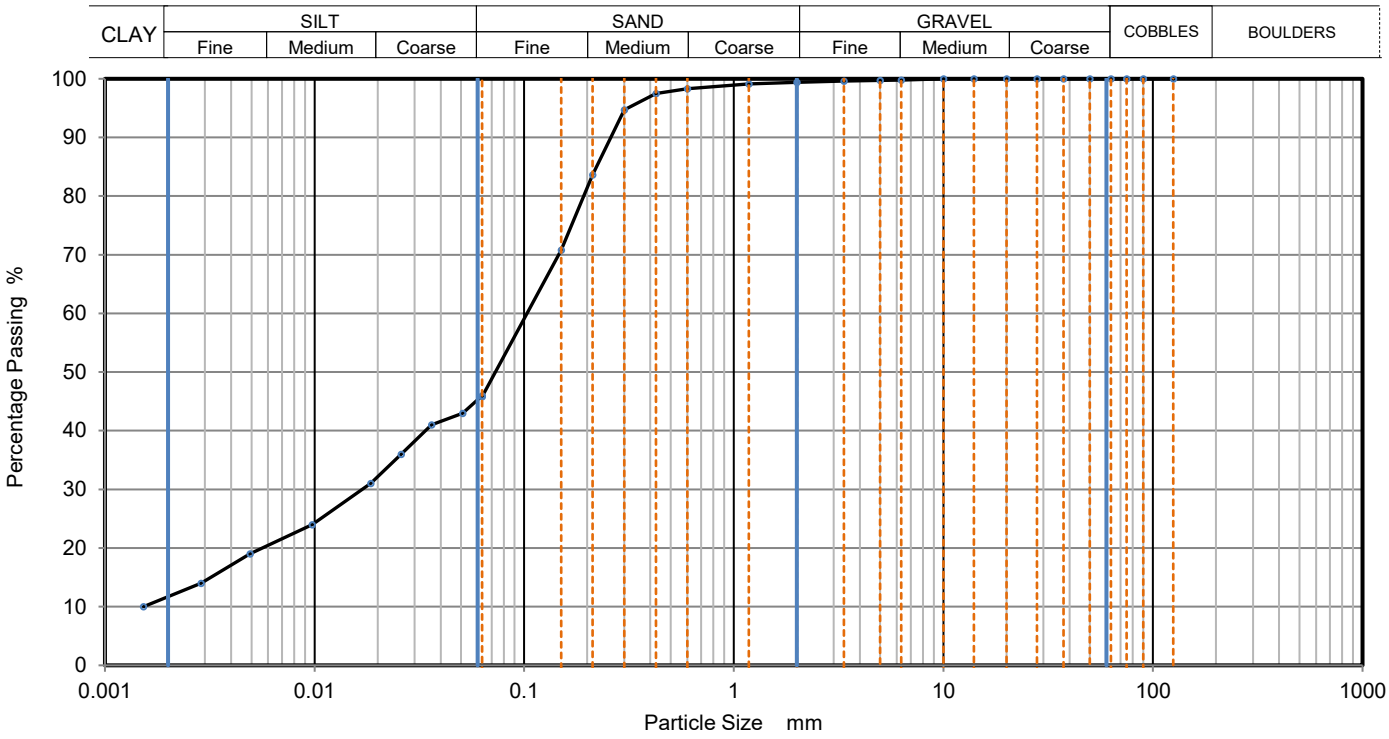
Grading Analysis		
D100	mm	
D60	mm	0.931
D30	mm	0.385
D10	mm	0.171
Uniformity Coefficient		5.4
Curvature Coefficient		0.93

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH18
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Brown clayey fine to coarse SAND.			Sample Depth (m) Top	5.00
				Base	6.50
Specimen Reference	2	Specimen Depth	5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021929



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	46
90	100	0.05090	43
75	100	0.03621	41
63	100	0.02591	36
50	100	0.01853	31
37.5	100	0.00973	24
28	100	0.00492	19
20	100	0.00287	14
14	100	0.00153	10
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	95		
0.212	84		
0.15	71		
0.063	46		

Dry Mass of sample, g: 312

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.6
Sand	53.6
Silt	34.1
Clay	11.7

Grading Analysis		
D100	mm	
D60	mm	0.103
D30	mm	0.0165
D10	mm	0.0016
Uniformity Coefficient		64
Curvature Coefficient		1.6

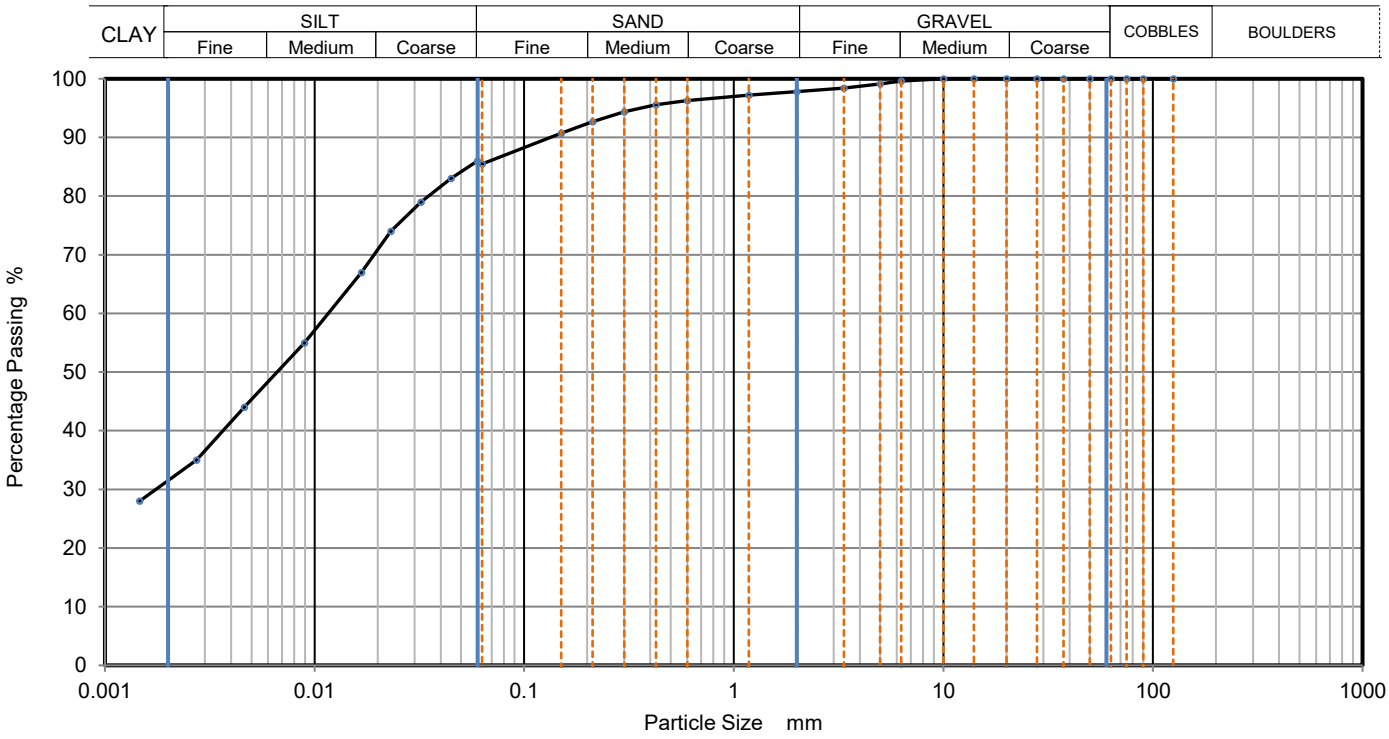
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH19
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.00
				Base	1.40
Specimen Reference	2	Specimen Depth	0 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021932



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05980	86
90	100	0.04482	83
75	100	0.03220	79
63	100	0.02312	74
50	100	0.01672	67
37.5	100	0.00894	55
28	100	0.00462	44
20	100	0.00273	35
14	100	0.00146	28
10	100		
6.3	100		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	94		
0.212	93		
0.15	91		
0.063	86		

Dry Mass of sample, g: 306

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.2
Sand	12.3
Silt	54.3
Clay	31.2

Grading Analysis		
D100	mm	
D60	mm	0.0114
D30	mm	0.0018
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

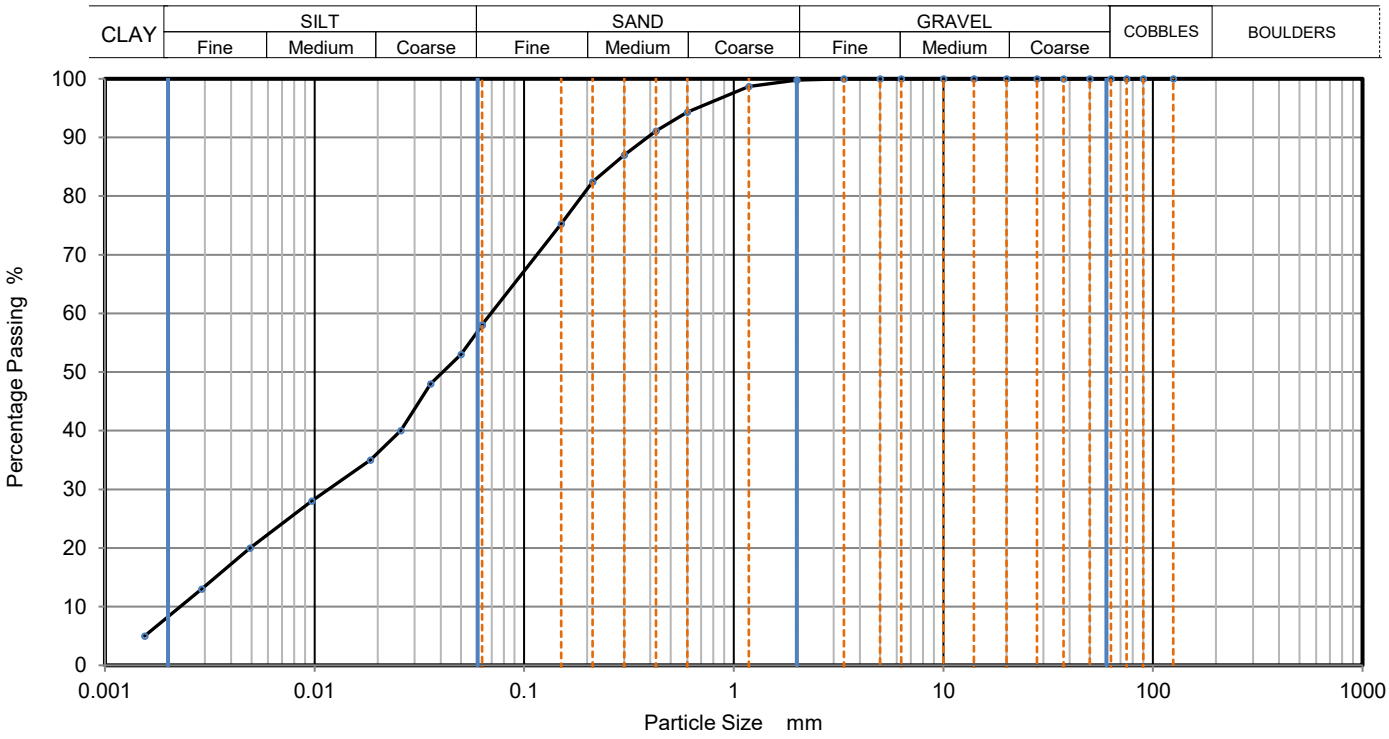
Remarks

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

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH20
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	0.80
				Base	2.30
Specimen Reference	2	Specimen Depth	0.8 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021936



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	58
90	100	0.04994	53
75	100	0.03577	48
63	100	0.02577	40
50	100	0.01844	35
37.5	100	0.00969	28
28	100	0.00493	20
20	100	0.00289	13
14	100	0.00155	5
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	94	Particle density	(assumed)
0.425	91	2.65	Mg/m3
0.3	87		
0.212	82		
0.15	75		
0.063	58		

Dry Mass of sample, g: 328

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.2
Sand	41.8
Silt	49.8
Clay	8.2

Grading Analysis		
D100	mm	
D60	mm	0.0694
D30	mm	0.0117
D10	mm	0.00233
Uniformity Coefficient		30
Curvature Coefficient		0.85

Remarks

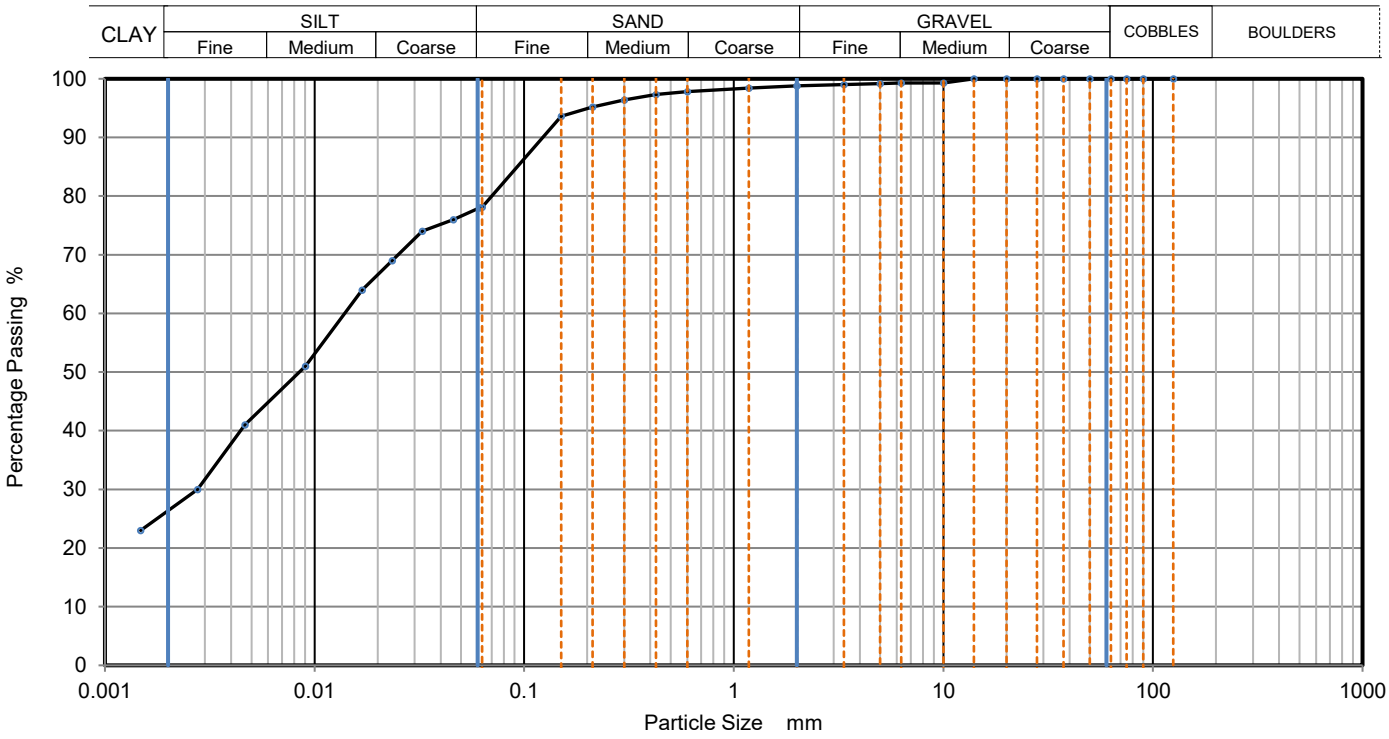
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH34
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	0.00
				Base	1.20
Specimen Reference	2	Specimen Depth	0 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021938



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06124	78
90	100	0.04589	76
75	100	0.03270	74
63	100	0.02347	69
50	100	0.01684	64
37.5	100	0.00906	51
28	100	0.00465	41
20	100	0.00276	30
14	100	0.00148	23
10	99		
6.3	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	95		
0.15	94		
0.063	78		

Dry Mass of sample, g: 305

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.2
Sand	20.6
Silt	51.9
Clay	26.3

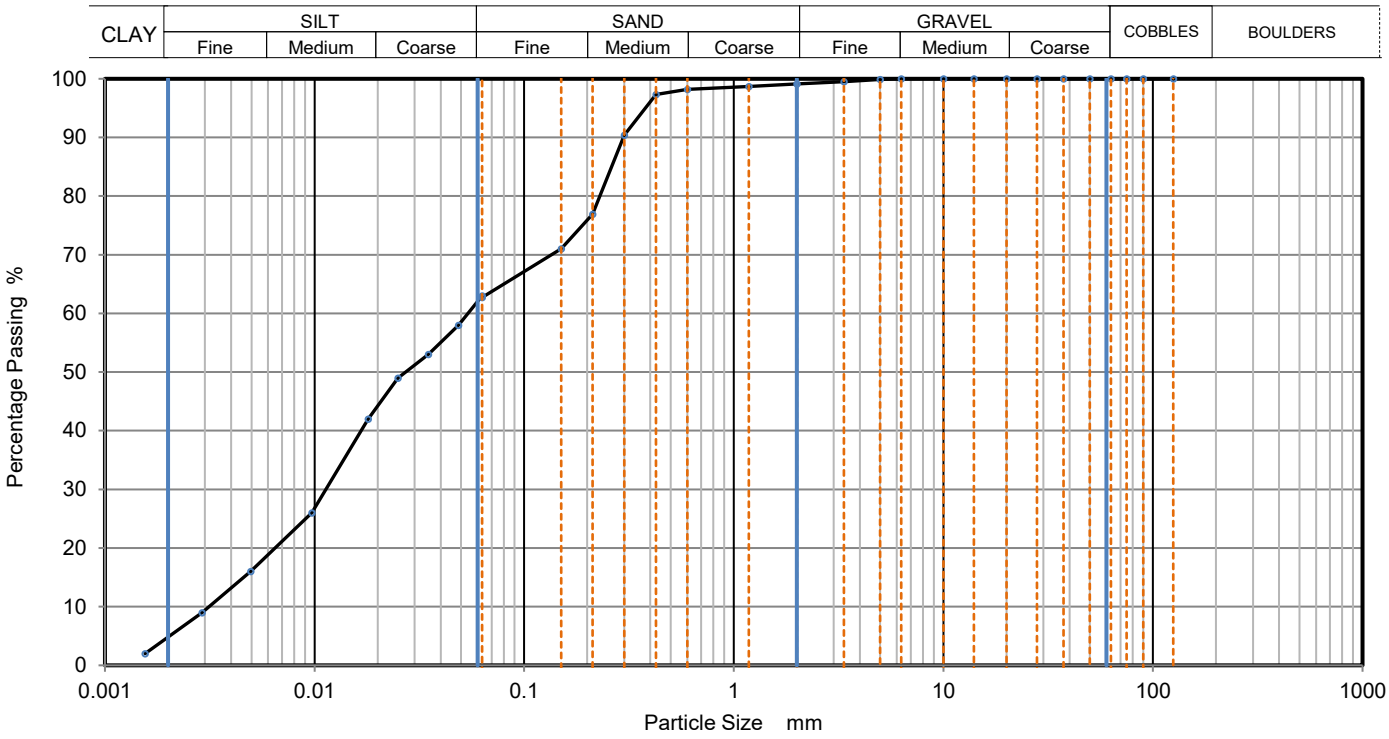
Grading Analysis		
D100	mm	
D60	mm	0.0139
D30	mm	0.00278
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH34
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	1.20
				Base	2.70
Specimen Reference	2	Specimen Depth	1.2 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021940



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	63
90	100	0.04863	58
75	100	0.03485	53
63	100	0.02497	49
50	100	0.01800	42
37.5	100	0.00969	26
28	100	0.00495	16
20	100	0.00291	9
14	100	0.00155	2
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	90		
0.212	77		
0.15	71		
0.063	63		

Dry Mass of sample, g: 358

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.9
Sand	36.4
Silt	57.6
Clay	5.1

Grading Analysis		
D100	mm	
D60	mm	0.0542
D30	mm	0.0115
D10	mm	0.00307
Uniformity Coefficient		18
Curvature Coefficient		0.79

Remarks

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

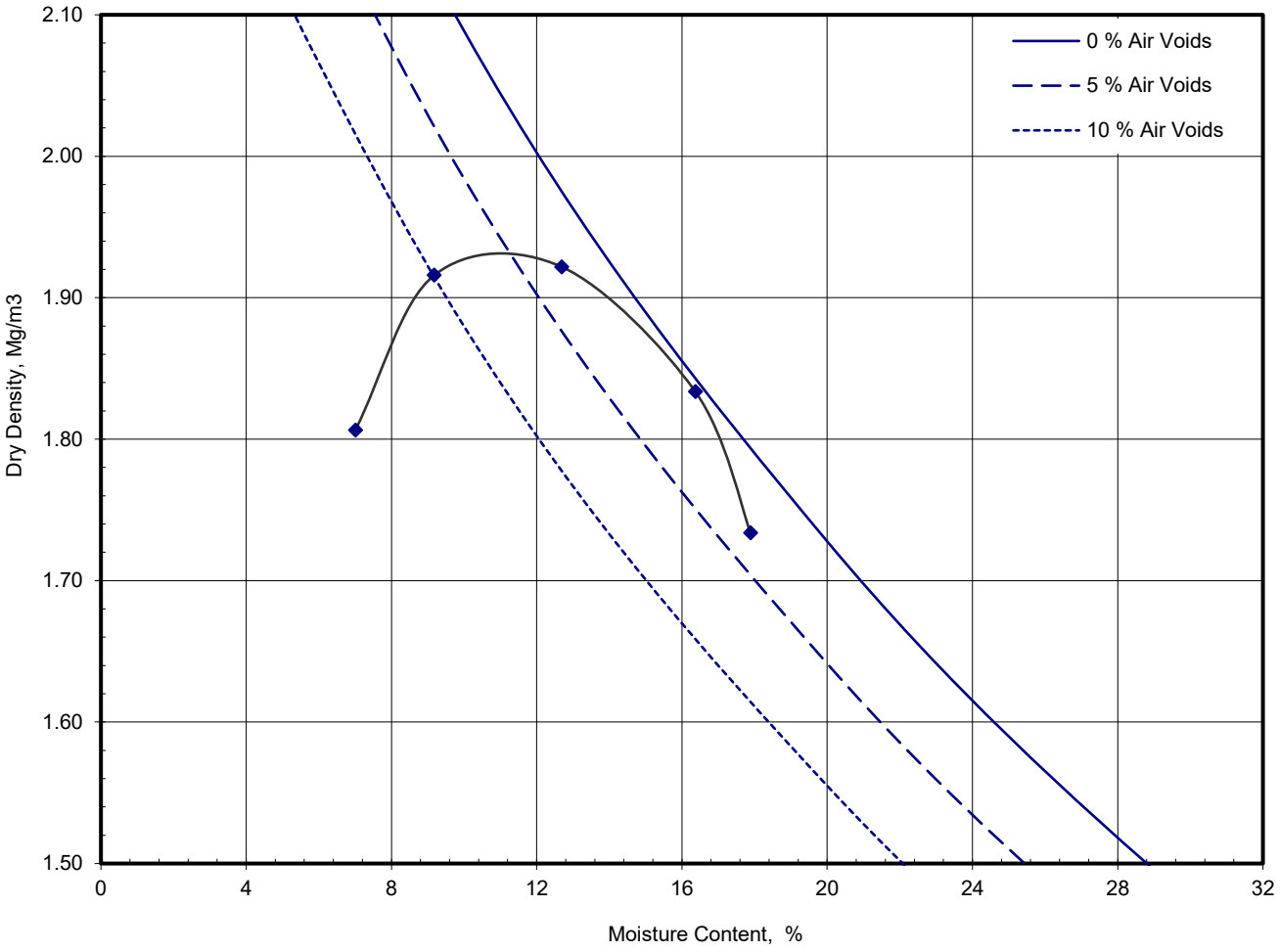
Approved
Stephen Watson

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UKAS TESTING

10122

CAUSEWAY GEOTECH	**Dry Density / Moisture Content Relationship Heavy Compaction**			Job Ref	**23-0585**
				Borehole / Pit No	M-BH18
Site Name	**Rosslare OWH - GI**			Sample No	4
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	3.50
				Sample Depth (m) Base	4.50
Specimen Ref.	2	Specimen Depth	m	Sample Type	SB
Test Method	BS1377:Part 4:1990, clause 3.5, 4.5kg rammer			Keylab ID	Caus2024021925
				Compaction Test Reference/No.	



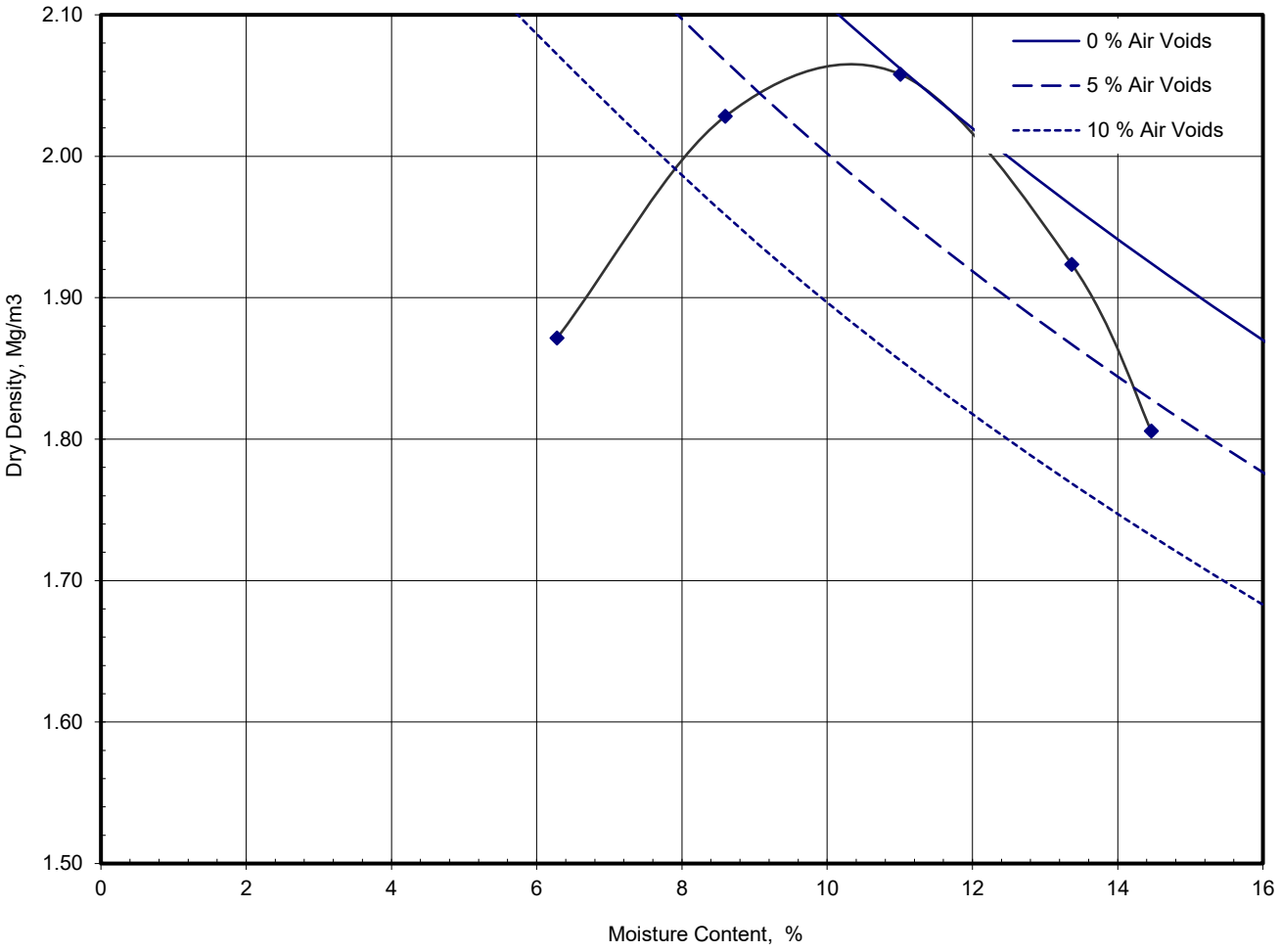
Preparation		Material used was air dried
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Measured using gas jar	Mg/m³	2.64

Maximum Dry Density	Mg/m³	**1.92**
Optimum Moisture Content	%	**13**

LAB 09R - Version 6

Approved	Remarks	UKAS TESTING 10122
Stephen Watson		

CAUSEWAY GEOTECH	**Dry Density / Moisture Content Relationship Heavy Compaction**			Job Ref	**23-0585**
				Borehole / Pit No	M-BH34
Site Name	**Rosslare OWH - GI**			Sample No	3
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	2.70
				Sample Depth (m) Base	4.20
Specimen Ref.	3	Specimen Depth	m	Sample Type	SB
Test Method	BS1377:Part 4:1990, clause 3.5, 4.5kg rammer			Keylab ID	Caus2024021941
				Compaction Test Reference/No.	



Preparation		Material used was air dried
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	2
Particle Density - Measured using gas jar	Mg/m³	2.67

Maximum Dry Density	Mg/m³	**2.06**
Optimum Moisture Content	%	**11**

LAB 09R - Version 6

Approved	Remarks	UKAS TESTING 10122
Stephen Watson		

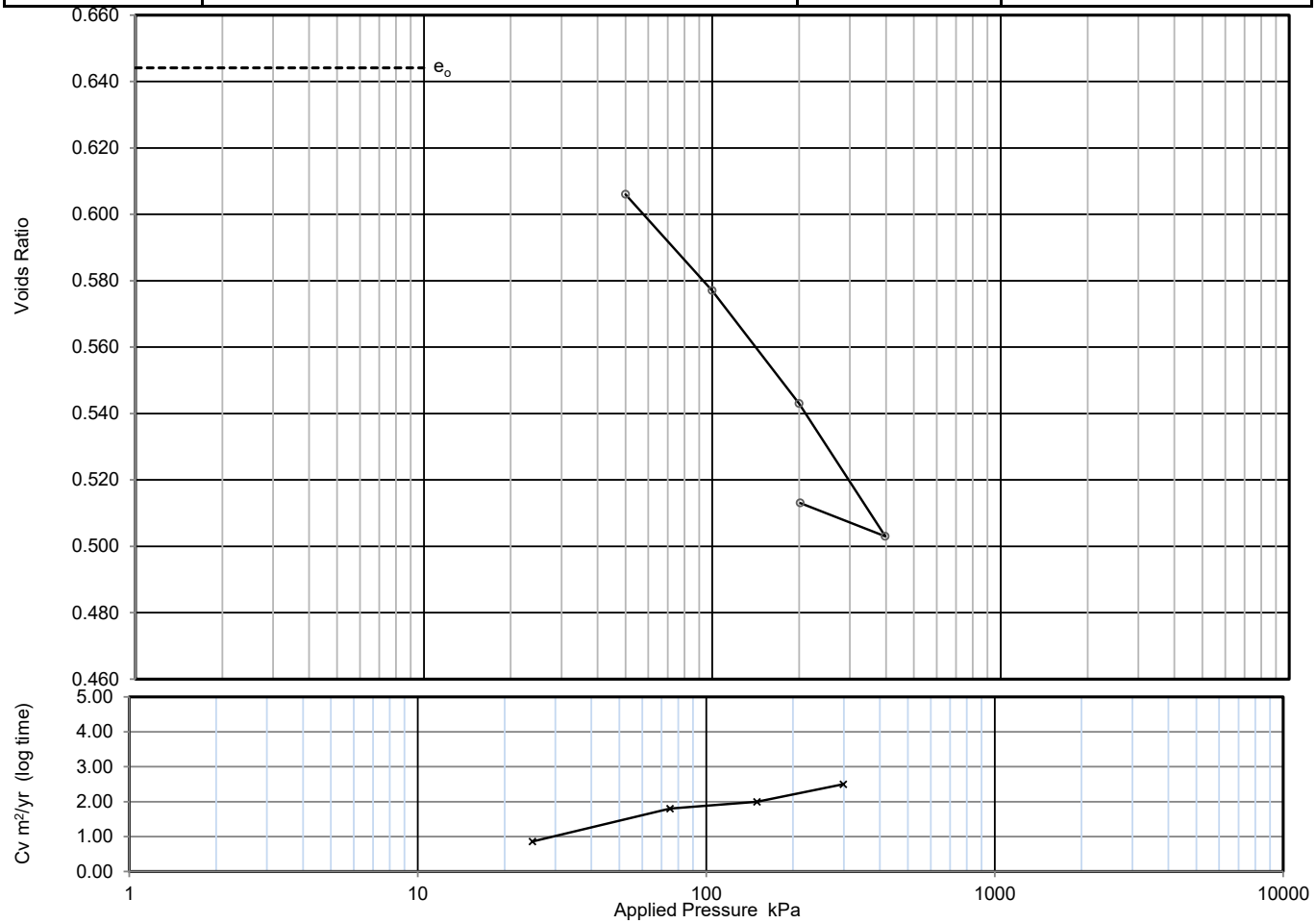
Summary of Laboratory Vane Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description at test horizon	Moisture Content %	Vane shear strength		Sensitivity	Remarks
	Ref	Top	Base	Type			Undisturbed kPa	Remoulded kPa		
M-BH18	16	1.50	1.95	UT	Greyish brown sandy silty CLAY.	20	81			

Notes	Date Printed	Approved By	Table
Tests performed in accordance with BS 1377:Part 7:clause 3 using 19mm x 30mm vane Tests carried out in nominally 100mm diameter tube unless noted otherwise Shear strengths are average of at least 3 tests unless noted otherwise	28/03/2024	Stephen Watson	1 sheet 1

CAUSEWAY GEOTECH	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3				Job Ref		23-0585
					Borehole/Pit No.		M-BH18
Site Name	Rosslare OWH - GI				Sample No.		16
Soil Description	Greyish brown sandy silty CLAY.				Sample Depth (m)	Top	1.50
						Bottom	1.95
Specimen Reference	3	Specimen Depth	1.55	m	Sample Type		UT
Specimen Description	Greyish brown sandy silty CLAY.				KeyLAB ID		Caus2024021920
Test Method	BS1377:Part 5:1990, clause 3				Date started		22/03/2024



Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/yr	C_v ($t_{90, root}$) m^2/yr	C_{sec}
0.0	0.644	-	-	-	-
50	0.606	0.47	0.86	0.94	0.0020
100	0.577	0.35	1.8	7.1	0.0014
200	0.543	0.22	2.0	15	0.0014
398	0.503	0.13	2.5	11	0.0019
202	0.513	0.033			

Preparation

Particle density assumed 2.65 Mg/m^3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	20.00	18.40	mm
Moisture Content	25	26	%
Bulk density	2.02	2.21	Mg/m^3
Dry density	1.61	1.75	Mg/m^3
Voids Ratio	0.644	0.513	
Saturation	103	134	%
Average temperature for test	20		°C
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

C_v plotted at mid point of load increments

C_v corrected to 20°C

Approved

Stephen Watson

Printed :

28/03/2024 12:36

LAB 13R - Version 6

UKAS TESTING

10122

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH10	Sample Reference		4	
Depth (m)	5.70	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown sandy silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	17.0	17.0	17.0
Bulk Density (Mg/m^3)	1.81	1.79	1.80
Dry Density (Mg/m^3)	1.55	1.53	1.54
Voids Ratio	0.710	0.734	0.724
Consolidation			
Normal Pressure (kPa)	70	140	280
Vertical Displacement (mm)	0.892	2.258	3.367
Shearing			
Rate of Strain (mm/min)	0.060	0.060	0.060
Peak Shear Stress (kPa)	39.3	76.3	130.1
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	6.777	7.443	7.377
Final Conditions			
Water Content (%)	26.0	24.0	23.0
Dry Density (Mg/m^3)	1.71	2.00	2.34
Voids Ratio	0.592	0.495	0.393

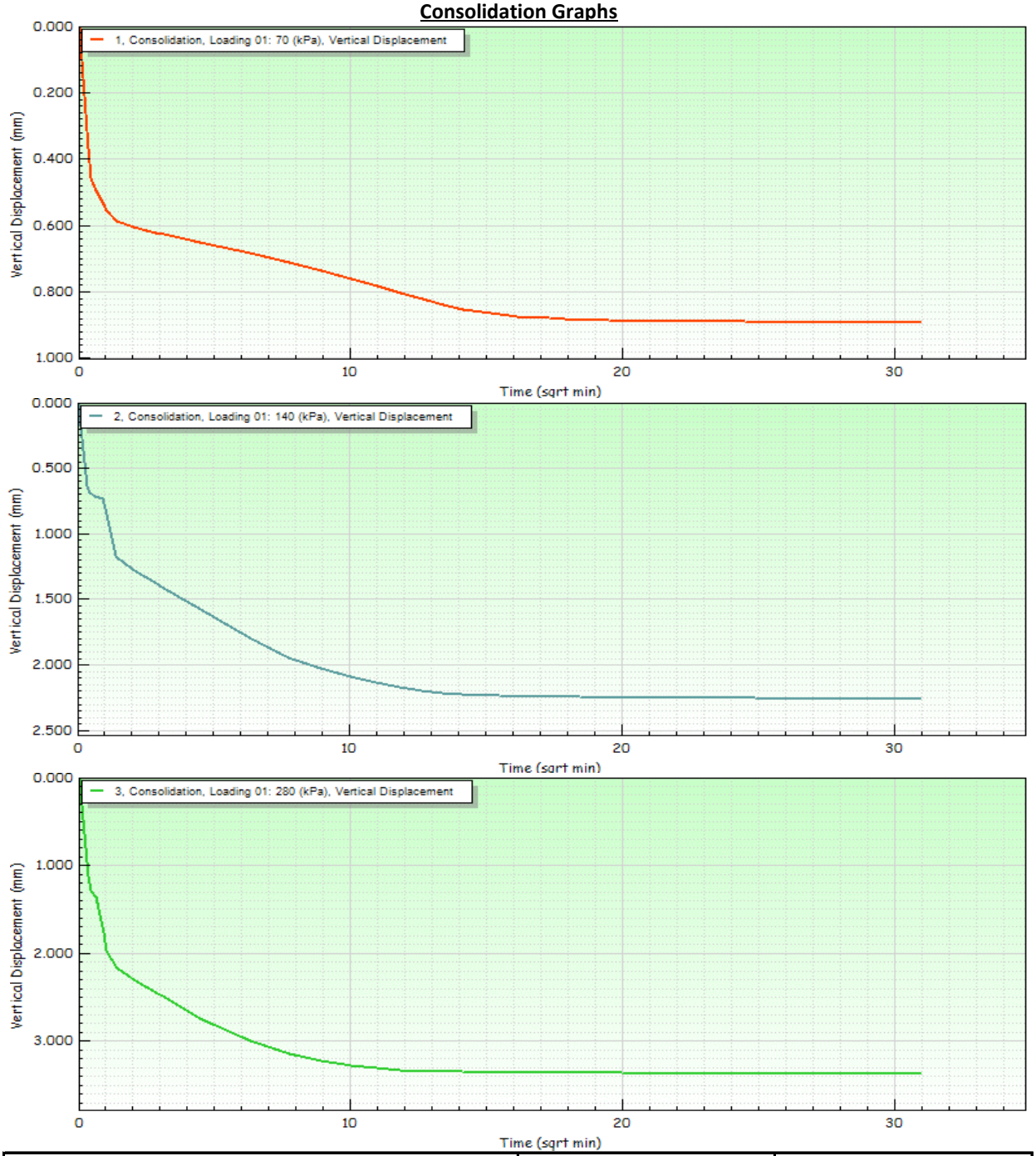
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH10	Sample Reference	4	
Depth (m)	5.70	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

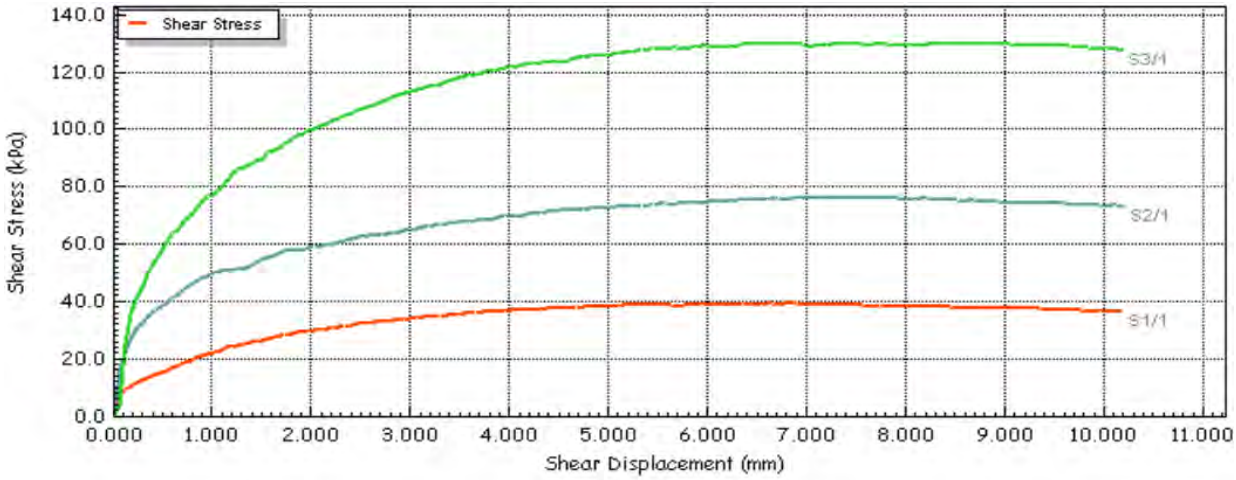


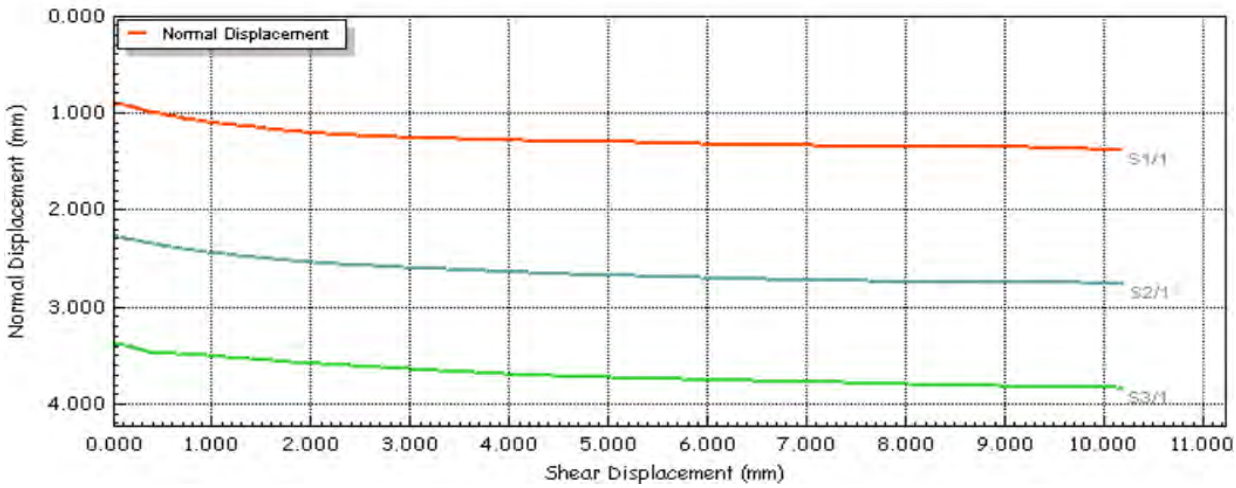
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH10	Sample Reference	4	
Depth (m)	5.70	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



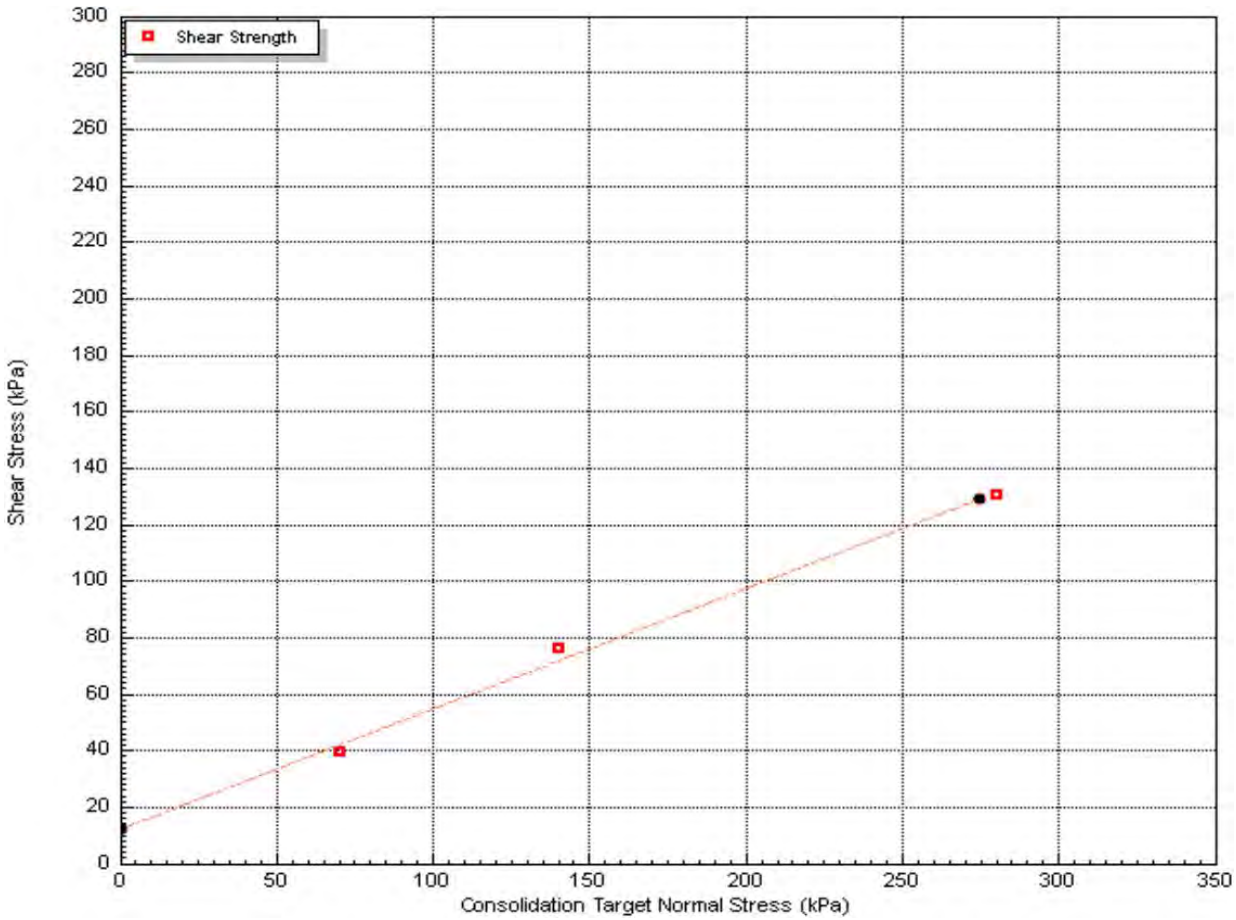


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH10	Sample Reference	4	
Depth (m)	5.70	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	12		
Angle of Shearing Resistance (°)	23.0		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

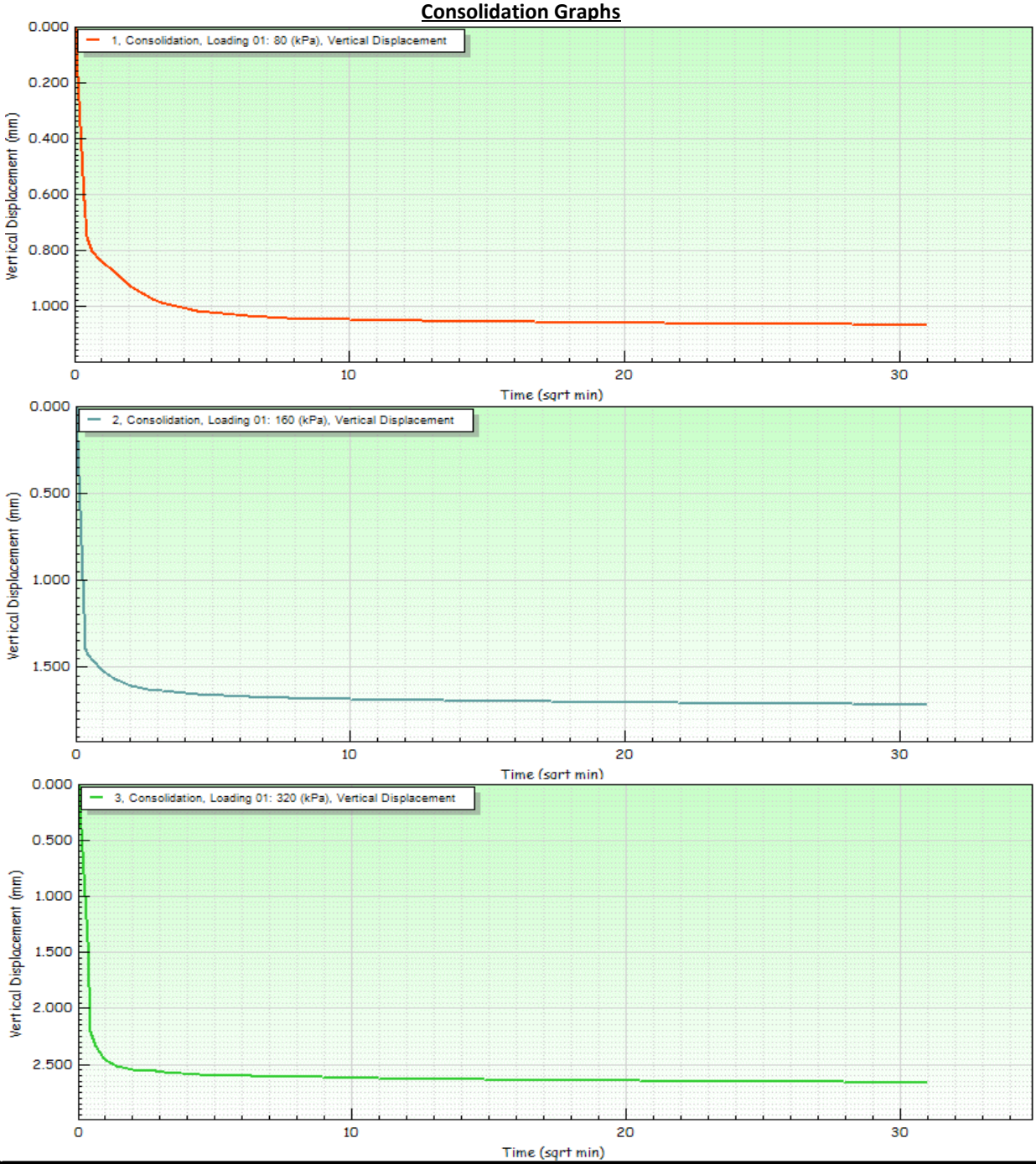
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH17	Sample Reference		3	
Depth (m)	3.00	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	8.6	8.6	8.6
Bulk Density (Mg/m^3)	1.95	1.95	1.94
Dry Density (Mg/m^3)	1.80	1.79	1.79
Voids Ratio	0.474	0.478	0.483
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	1.069	1.716	2.662
Shearing			
Rate of Strain (mm/min)	0.070	0.070	0.070
Peak Shear Stress (kPa)	61.4	114.2	193.4
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	10.119	5.223	6.657
Final Conditions			
Water Content (%)	19.0	20.0	19.0
Dry Density (Mg/m^3)	2.05	2.21	2.49
Voids Ratio	0.354	0.308	0.238

	Tested	Approved
UKAS TESTING 10122 CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH17	Sample Reference	3	
Depth (m)	3.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

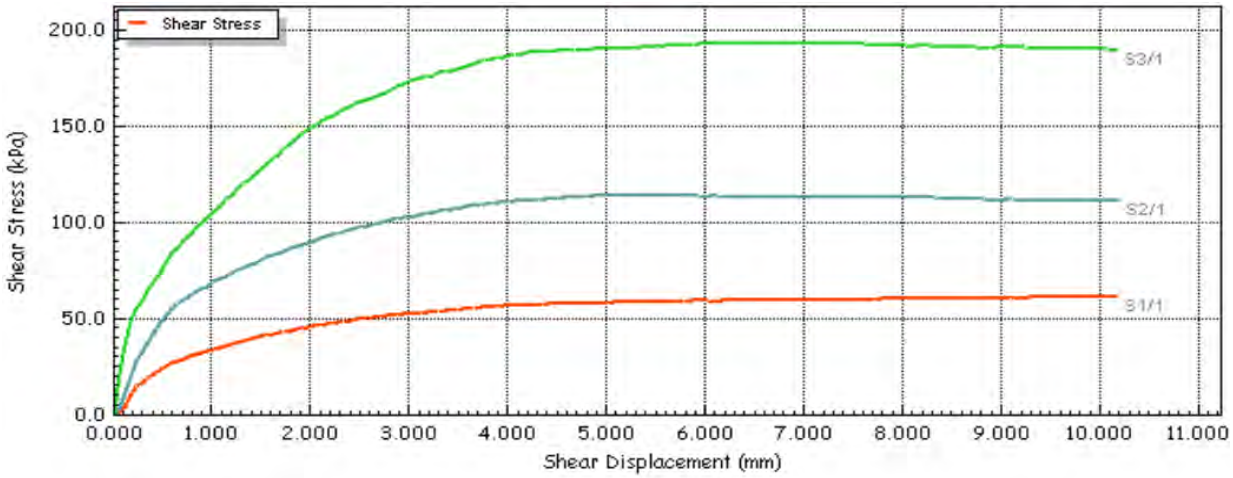


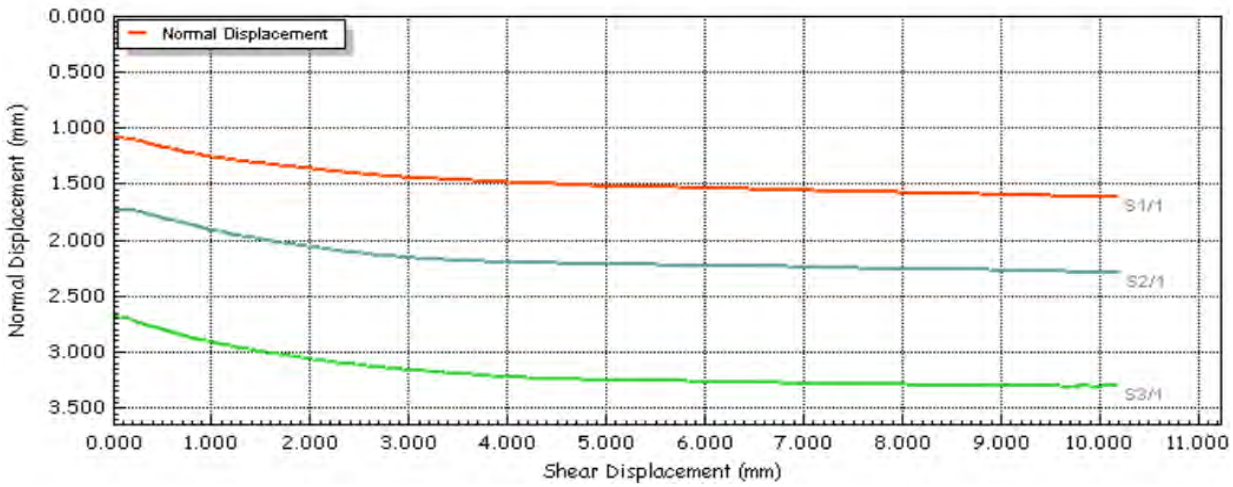
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH17	Sample Reference	3	
Depth (m)	3.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



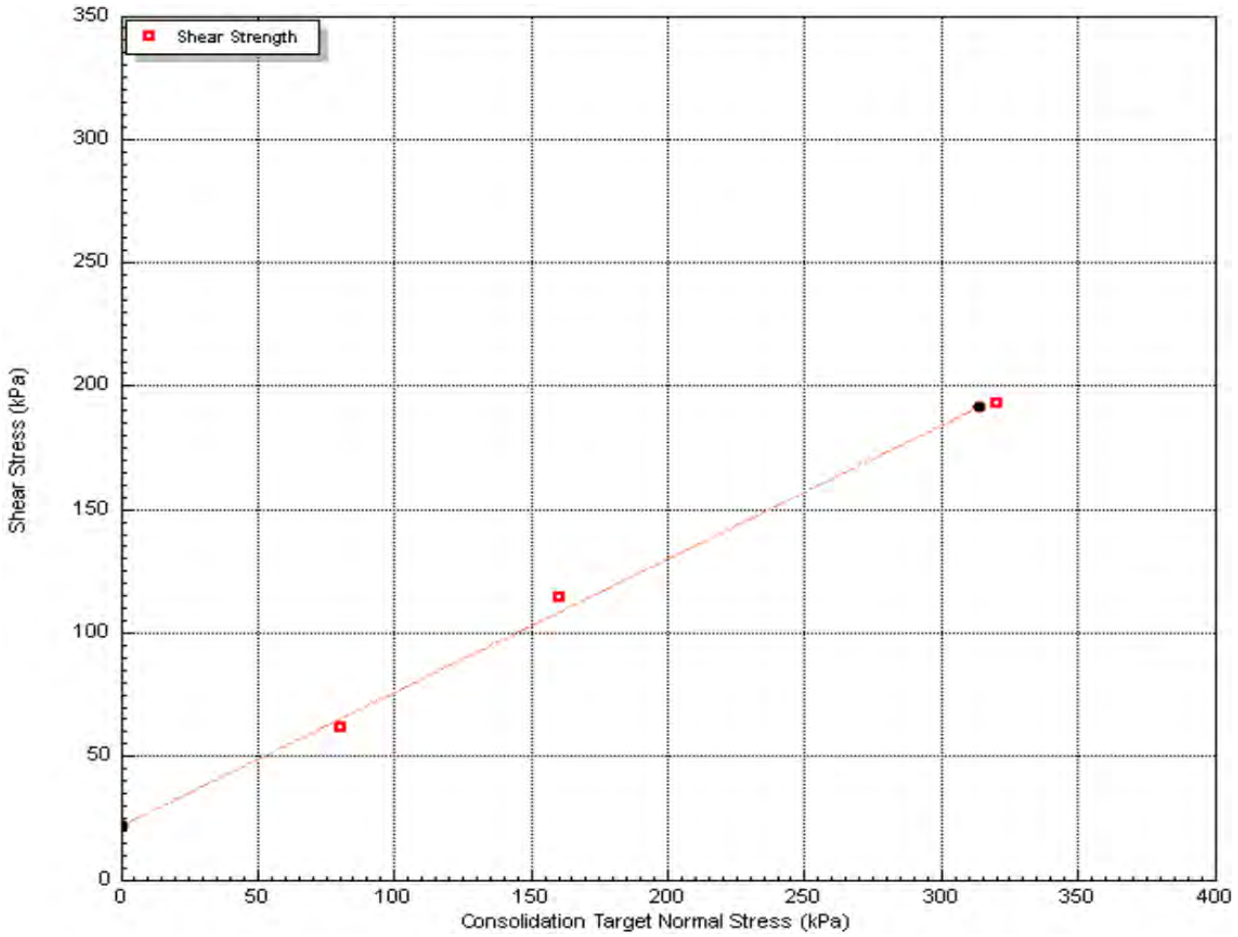


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH17	Sample Reference	3	
Depth (m)	3.00	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	22		
Angle of Shearing Resistance (°)	28.5		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Certificate of Analysis

Certificate Number 24-05101 *Issued:* 14-Mar-24

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

Our Reference 24-05101

Client Reference ~ 23-0585

Order No ~ (not supplied)

Contract Title ~ Rosslare Europort Offshore Renewable Energy Hub SI

Description 3 Soil samples.

Date Received 11-Mar-24

Date Started 11-Mar-24

Date Completed 14-Mar-24

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-05101
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort Offshore Renewable Energy Hub SI

			Lab No	2310318	2310319	2310320
			Sample ID ~	M-BH18	M-BH19	M-BH20
			Depth ~	1.50	0.00	0.80
			Other ID ~	9	3	2
			Sample Type ~	D	D	D
			Sampling Date ~	08/03/2024	08/03/2024	08/03/2024
			Sampling Time ~	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
pH	DETSC 2008#		pH			8.2
Organic matter	DETSC 2002#	0.1	%	0.2	< 0.1	3.6

Key: ~ Sample details provided by client and can affect the validity of the results
: # -MCERTS (accreditation only applies if report carries the MCERTS logo).: n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 24-05101
Client Ref ~ 23-0585
Contract ~ Rosslare Europort Offshore Renewable Energy Hub SI

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2310318	M-BH18 1.50 SOIL	08/03/24	PT 500ml		
2310319	M-BH19 0.00 SOIL	08/03/24	PT 500ml		
2310320	M-BH20 0.80 SOIL	08/03/24	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

LABORATORY REPORT

Contract Number: PSL24/1795

Report Date: 26 March 2024

Client's Reference: 23-0585 G04

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

For the attention of: Stephen Watson

Contract Title: Rosslaire Europort Offshore Renewable Energy Hub SI

Date Received: 11/3/2024
Date Commenced: 11/3/2024
Date Completed: 26/3/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Managing Director)	R Berriman (Associate Director)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	D Burton (Advanced Testing Manager)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
M-BH18	17	UT	3.50	3.95	Brown slightly sandy CLAY.

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Rosslare Europort Offshore Renewable Energy Hub SI

Contract No:
PSL24/1795
Client Ref:
23-0585

SUMMARY OF LABORATORY HAND VANES

(BS1377 : PART 7 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Peak Shear Strength kPa	Residual Shear Strength kPa	Remarks
M-BH18	17	UT	3.50	3.95	27.0	50		

* This test is out of our UKAS scope

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	Rosslare Europort Offshore Renewable Energy Hub SI	Contract No: PSL24/1795 Client Ref: 23-0585

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details				
 *sketch showing specimen location in original sample*	Depth			3.50-3.95m UT17
	Description			Brown slightly sandy CLAY.
	Type			Undisturbed, vertical orientation.
	Initial Sample Length	L_0	(mm)	211.0
	Initial Sample Diameter	D_0	(mm)	104.0
	Initial Sample Weight	W_0	(gr)	3504.0
	Initial Bulk Density	ρ_0	(Mg/m3)	1.95
	Particle Density	ρ_s	(Mg/m3)	2.66

Initial Conditions			Stage 1	2	3	4
Initial Cell Pressure	σ_{3i}	(kPa)	380	460	620	
Initial Back Pressure	U_{bi}	(kPa)	300	300	300	
Membrane Thickness	m_b	(mm)	0.600			
Displacement Input	L_{IP}	(mm)	CH 2			
Load Input	N_{IP}	(N)	CH 1			
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 5			
Sample Volume	V	(cc)	CH 6			
Initial Moisture	ω_i	(%)	27			
Initial Dry Density	ρ_{di}	(Mg/m3)	1.54			
Initial Voids Ratio	e_i	.	0.729			
Initial Degree of Saturation	S_i	(%)	99			
B Value	B	.	0.97			

Final Conditions						
Final Moisture	ω_f	(%)	23			
Final Dry Density	ρ_{df}	(Mg/m3)	1.78			
Final Voids Ratio	e_f	.	0.495			
Final Degree of Saturation	S_f	(%)	100.0			
			Stage 1	2	3	4
Failure Criteria		.	Max. Dev.	Max. Dev.	Max. Dev.	
Strain At Failure	ε_f	(%)	1.95	7.77	16.62	
Stress At Failure	$(\sigma_1-\sigma_3)$	(kPa)	102.0	137.8	274.6	
Minor Stress At Failure	σ_3'	(kPa)	57.0	84.0	198.0	
Major Stress At Failure	σ_1'	(kPa)	159.0	221.8	472.6	
Principal Stress Ratio At Failure	σ_1'/σ_3'		2.790	2.640	2.387	
PwP At Failure Criteria	u_f		323.0	376.0	422.0	

Notes



Plastic

Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH18 3.50-3.95m	
			Test Date	13/03/2024	
Jobfile	Rosslare Europort Offshore Energy HUB SI		Borehole	M-BH18	
			Sample	3.50-3.95m	
Client	Causeway Geotech		Depth	3.50-3.95m UT17	
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

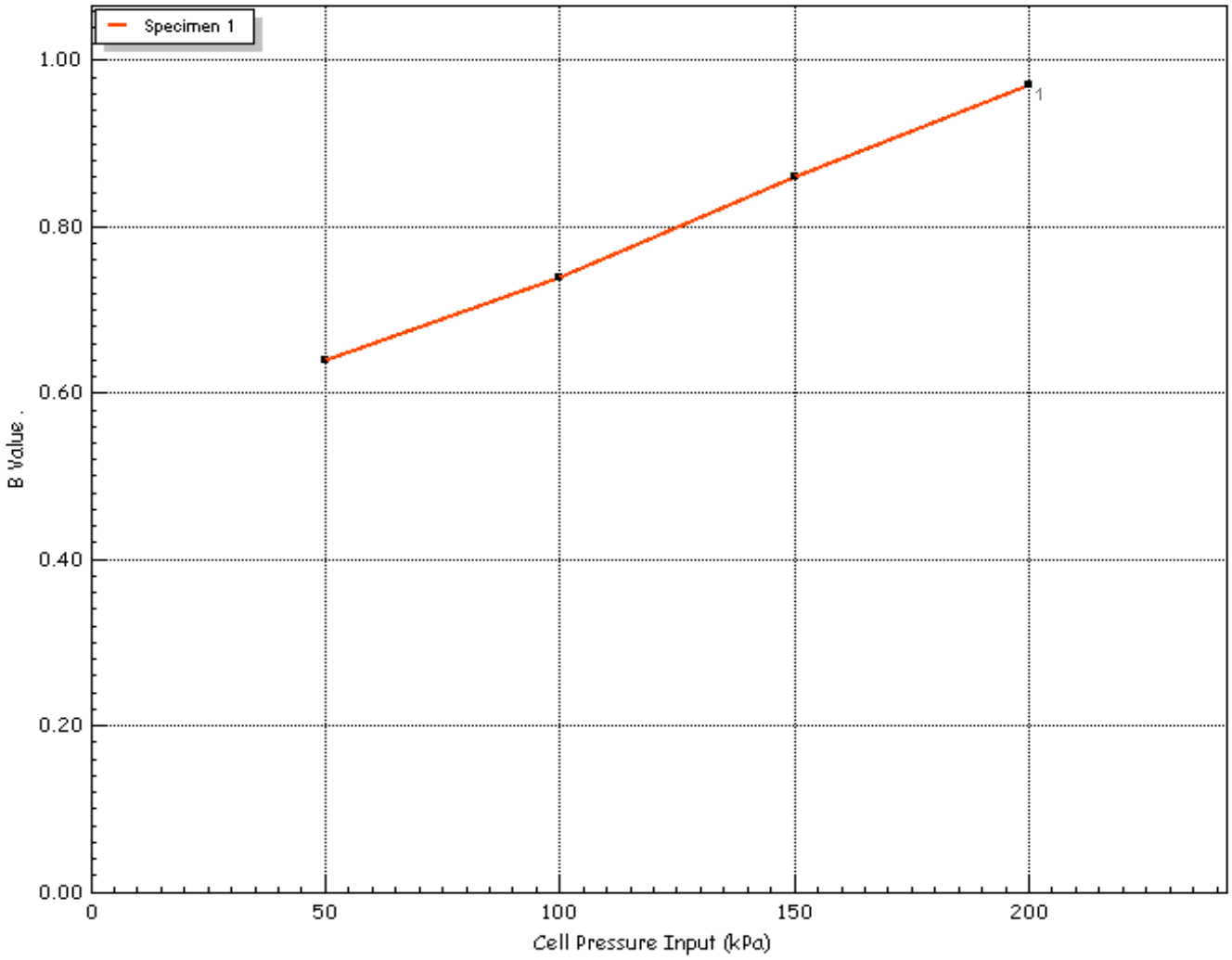
PSL Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	σ	(kPa)	200
Pore Water Pressure Input	u pwp	(kPa)	202
B Value	B	.	0.97



Test Method	BS1377-8 : 1990 : Clause 7			Test Name	M-BH18 3.50-3.95m
				Test Date	13/03/2024
Jobfile	Rosslare Europort Offshore Energy HUB SI			Borehole	M-BH18
				Sample	3.50-3.95m
Client	Causeway Geotech			Depth	3.50-3.95m UT17
Operator	David Burton	Checked	S.Royle	Approved	S.Royle

PSL Laboratory

Effective Stress Triaxial Compression

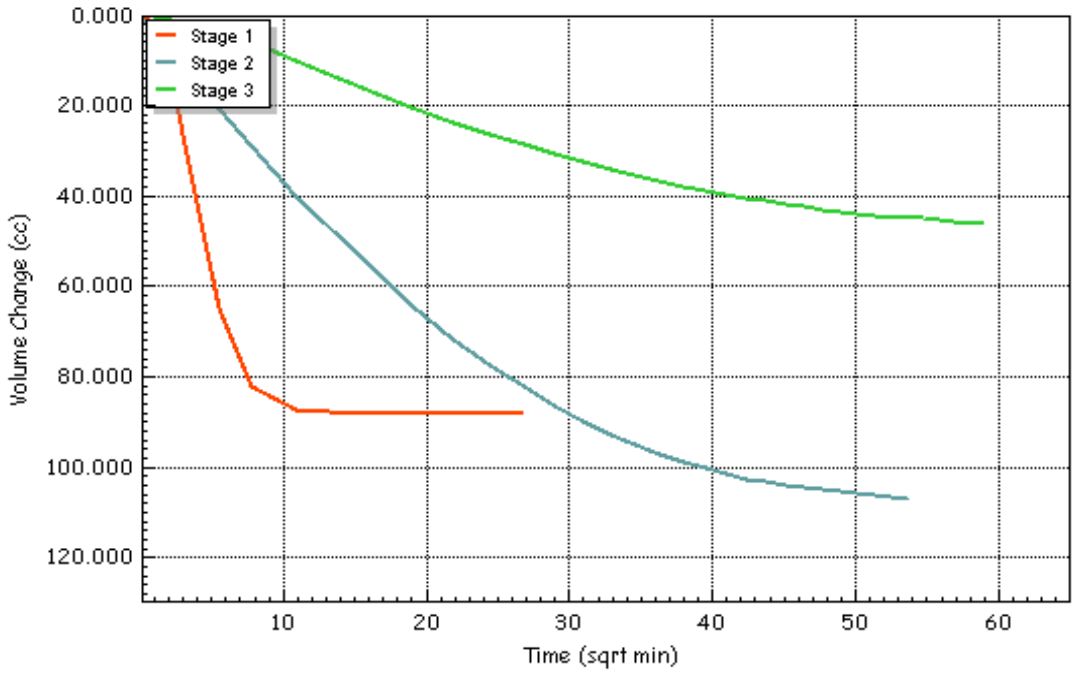
Consolidated Undrained

Consolidation Plots

Initial Conditions			Stage 1	2	3
Initial Cell Pressure	σ_3	(kPa)	380	460	620
Initial Back Pressure	u_{bi}	(kPa)	300	300	300
Pore Water Pressure Input	u_{pwp}	(kPa)	383	457	518
Drainage Method			Radial+One End		

Final Conditions			Stage 1	2	3
PWP Dissipation %	U%	(%)	100.00	95.54	95.40
Volumetric Strain	ε_v%	(%)	4.92	5.97	2.58
Corrected Length	L_C	(mm)	207.5	199.1	186.5
Corrected Area	A_C	(cm2)	82.16	80.28	83.19
Corrected Volume	V_C	(cc)	1704.160	1597.157	1550.886
t100	t_{100}	(min)	50.20	866.35	1497.12
Consolidation	c_v	(m2/year)	0.043	0.002	0.001
Compressibility	m_v	(m2/MN)	0.590	0.398	0.124
Test Time	t_F	(h:m:s)	02:00:00	25:59:25	44:54:48
Estimated Strain to Failure	ε%	(%)	5.0	5.0	5.0
Shear Machine Speed	d_r	(mm/min)	0.08647	0.08647	0.08647

Notes



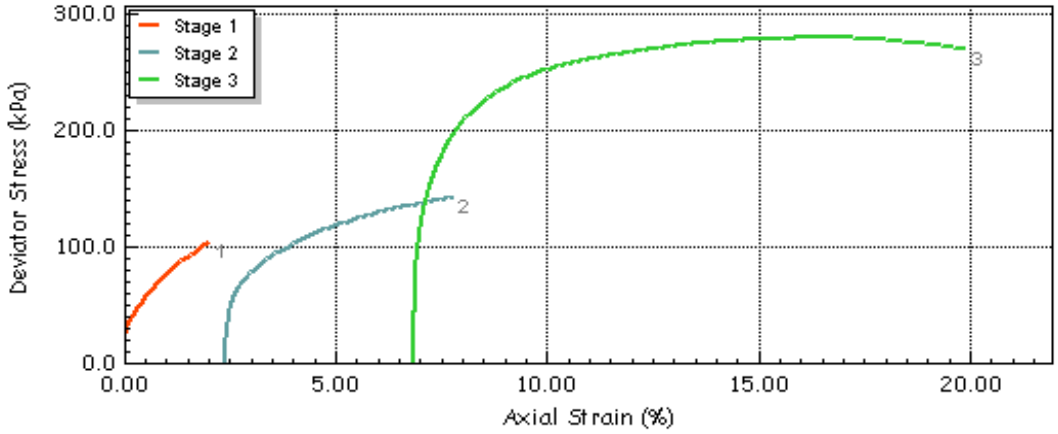
Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH18 3.50-3.95m	
			Test Date	13/03/2024	
Jobfile	Rosslare Europort Offshore Energy HUB SI		Borehole	M-BH18	
			Sample	3.50-3.95m	
Client	Causeway Geotech		Depth	3.50-3.95m UT17	
Operator	David Burton	Checked S.Royle		Approved S.Royle	

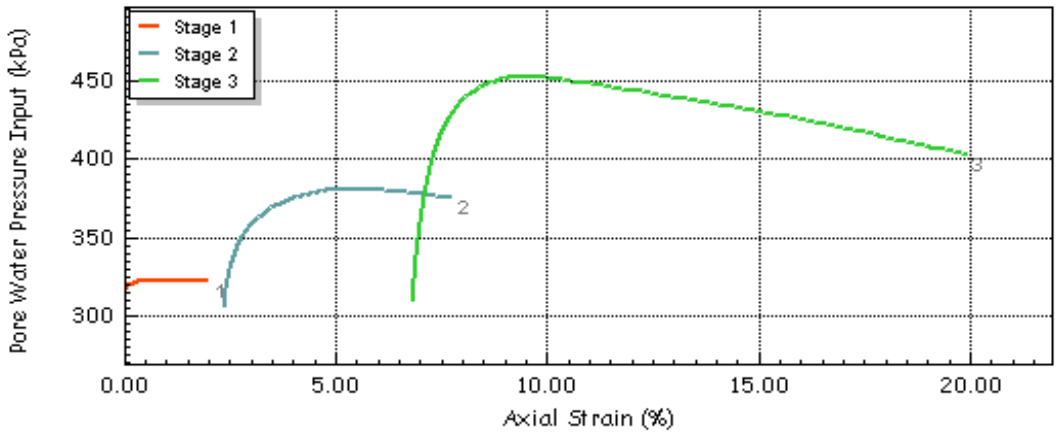
PSL Laboratory

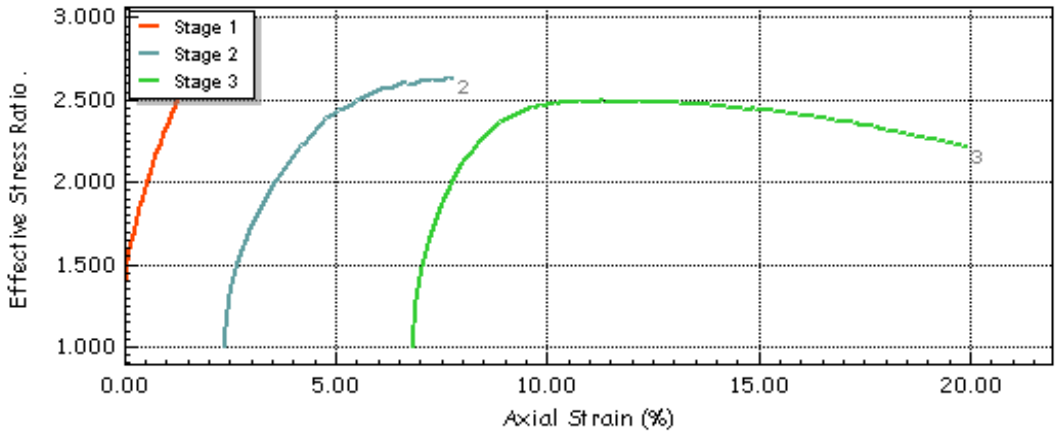
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







PSL PROFESSIONAL SOILS LABORATORY UKAS TESTING 4043	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH18 3.50-3.95m
				Test Date	13/03/2024
	Jobfile	Rosslare Europort Offshore Energy HUB SI		Borehole	M-BH18
				Sample	3.50-3.95m
	Client	Causeway Geotech		Depth	3.50-3.95m UT17
	Operator	David Burton	Checked	S.Royle	Approved S.Royle

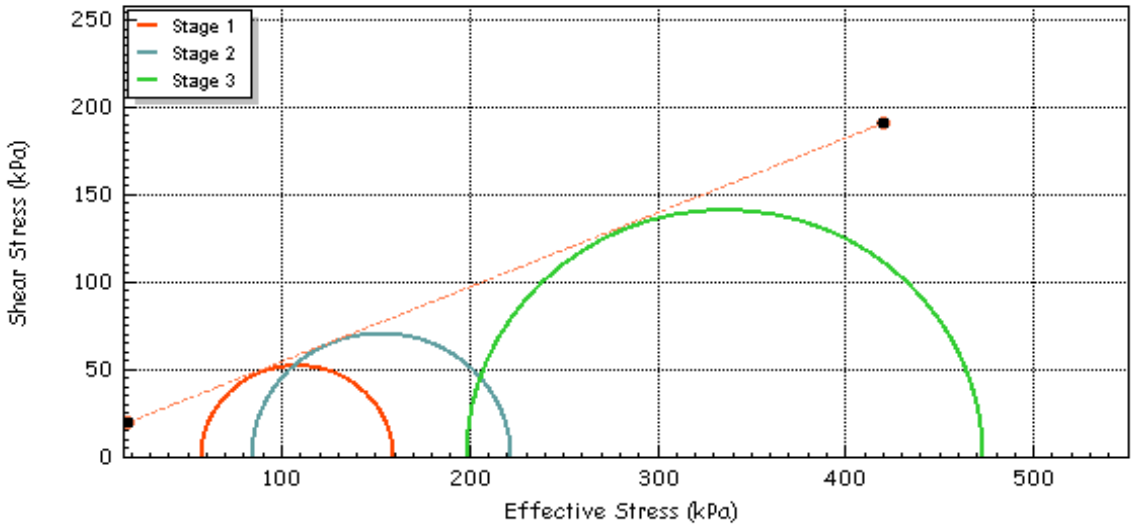
PSL Laboratory

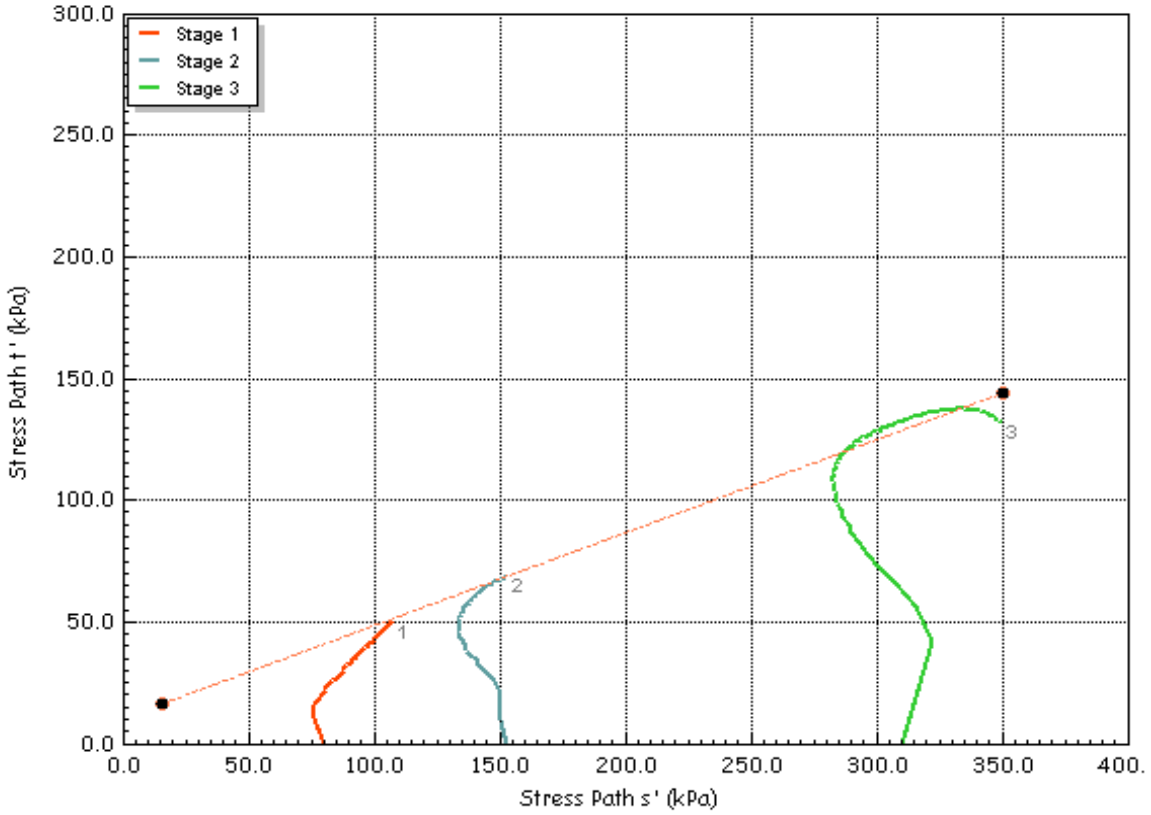
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective	c'	(kPa)	10.64	Effective Cohesion	c'	(kPa)	10.64
Effective Friction	ϕ'	(deg)	22.4	Effective Friction	ϕ'	(deg)	22.4





PSL PROFESSIONAL SOILS LABORATORY	Test Method	BS1377-8 : 1990 : Clause 7		Test Name	M-BH18 3.50-3.95m
				Test Date	13/03/2024
	Jobfile	Rosslare Europort Offshore Energy HUB SI		Borehole	M-BH18
				Sample	3.50-3.95m
	Client	Causeway Geotech		Depth	3.50-3.95m UT17
	Operator	David Burton	Checked	S.Royle	Approved S.Royle

CAUSEWAY GEOTECH

HEAD OFFICE
Causeway Geotech Ltd
8 Drumahiskey Road
Ballymoney
Co. Antrim, N. Ireland, BT53 7QL
NI: +44 (0)28 276 66640
Registered in Northern Ireland.
Company Number: NI610766

REGIONAL OFFICE
Causeway Geotech (IRL) Ltd
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

27 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 20/02/2024 and 27/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G05

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	BS 1377-2: 1990: Cl 3.2	10
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	10
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	12
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	12
SOIL	Particle density by Gas jar method	BS 1377-2: 1990: Cl 8.2	1
SOIL	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377-4: 1990: Cl 3.5 & 3.6	1
SOIL	Moisture Condition Value at natural moisture content	BS 1377-4: 1990: Cl 5.4	1
SOIL	Laboratory Vane Shear Strength (3 determinations) *	BS 1377-7: 1990: Cl 3	1
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	1
	Extra over days (more than initial 3 days)		0

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.: 23-0585

Project Name: Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk	Density dry	w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		Mg/m3		%	%	%	%	%	Mg/m3	
M-BH21	12	0.60		D	Brown slightly sandy silty CLAY.			24	98	44 -1pt	20	24		CI
M-BH21	13	2.60		D	Brown sandy slightly gravelly silty CLAY.			20	88	36 -1pt	20	16	2.65-gj	CI
M-BH24	4	4.00	5.50	SB	Brown slightly sandy silty CLAY.			21	96	37 -1pt	19	18		CI
M-BH24	6	7.00	8.50	SB	Brown sandy slightly gravelly silty CLAY.			26	98	45 -1pt	21	24		CI
M-BH27	4	0.30		D	Brown sandy slightly gravelly silty CLAY.			12	73	22 -1pt	15	7		CL
M-BH27	6	2.30		D	Brown sandy slightly gravelly silty CLAY.			7.8	65	22 -1pt	14	8		CL
M-BH28	4	1.00		D	Brown sandy slightly gravelly silty CLAY.			9.4	49	28 -1pt	22	6		ML/CL
M-BH30	5	1.40		D	Brown sandy slightly gravelly silty CLAY.			15	20	29 -1pt	22	7		ML/CL
M-CPT02	2	1.50	3.00	SB	Brown sandy slightly gravelly silty CLAY.			21	97	37 -1pt	20	17		CI
M-CPT02	3	3.00	4.50	SB	Brown sandy slightly gravelly silty CLAY.			23	97	40 -1pt	21	19		CI

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

LAB 01R Version 6

Key

Density test | Liquid Limit | Particle density

Linear measurement unless : | 4pt cone unless : | sp - small pyknometer

wd - water displacement | cas - Casagrande method | gj - gas jar

wi - immersion in water | 1pt - single point test

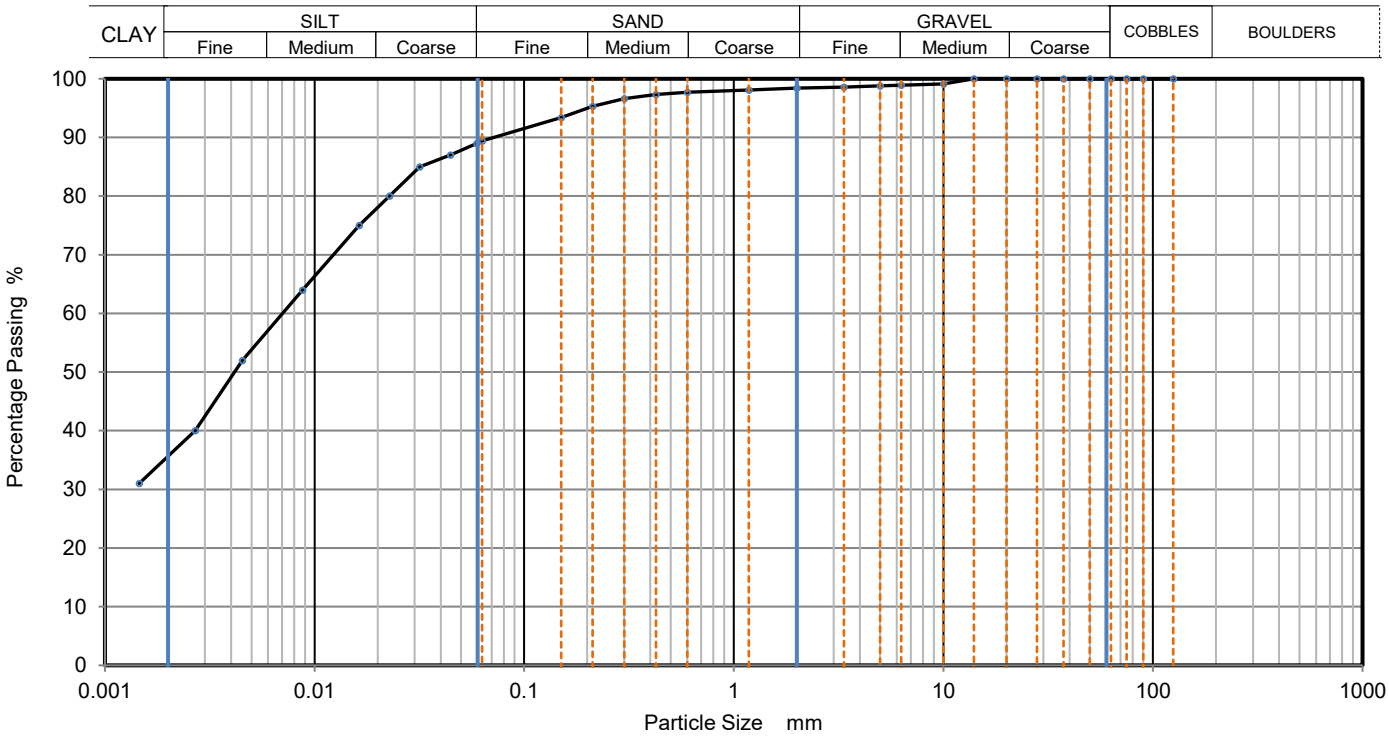
Date Printed: 27/03/2024

Approved By: Stephen Watson

UKAS TESTING 10122

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH21
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.60
				Base	1.60
Specimen Reference	3	Specimen Depth	0.6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021944



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05931	89
90	100	0.04446	87
75	100	0.03170	85
63	100	0.02277	80
50	100	0.01635	75
37.5	100	0.00876	64
28	100	0.00453	52
20	100	0.00270	40
14	100	0.00146	31
10	99		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	97		
0.212	95		
0.15	93		
0.063	89		

Dry Mass of sample, g: 301

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.6
Sand	8.9
Silt	54.1
Clay	35.4

Grading Analysis		
D100	mm	
D60	mm	0.00719
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

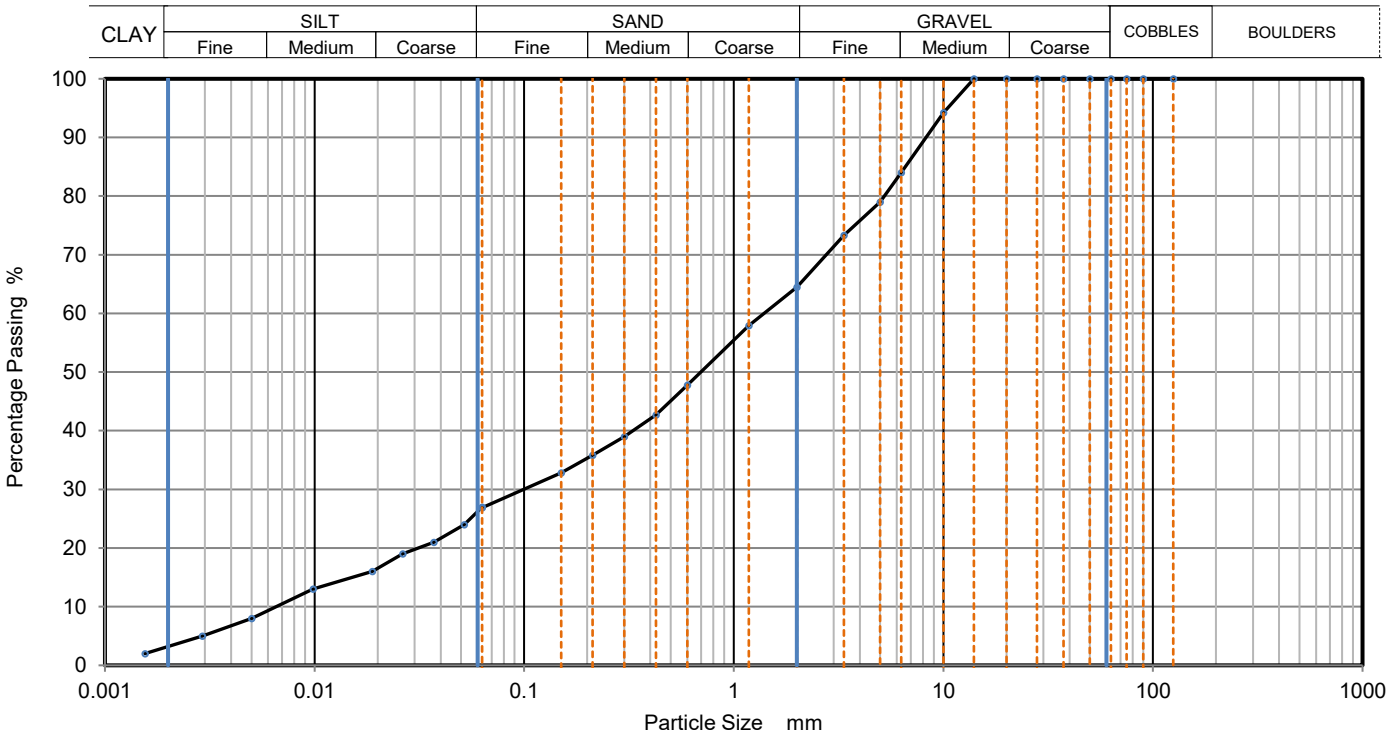
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH21
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	3.60
				Base	4.60
Specimen Reference	5	Specimen Depth	3.6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021949



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	27
90	100	0.05182	24
75	100	0.03707	21
63	100	0.02636	19
50	100	0.01885	16
37.5	100	0.00984	13
28	100	0.00500	8
20	100	0.00292	5
14	100	0.00155	2
10	94		
6.3	84		
5	79		
3.35	73		
2	65		
1.18	58		
0.6	48	Particle density	(assumed)
0.425	43	2.65	Mg/m3
0.3	39		
0.212	36		
0.15	33		
0.063	27		

Dry Mass of sample, g: 43

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	35.5
Sand	37.6
Silt	24.0
Clay	2.9

Grading Analysis		
D100	mm	
D60	mm	1.4
D30	mm	0.0998
D10	mm	0.00673
Uniformity Coefficient		210
Curvature Coefficient		1.1

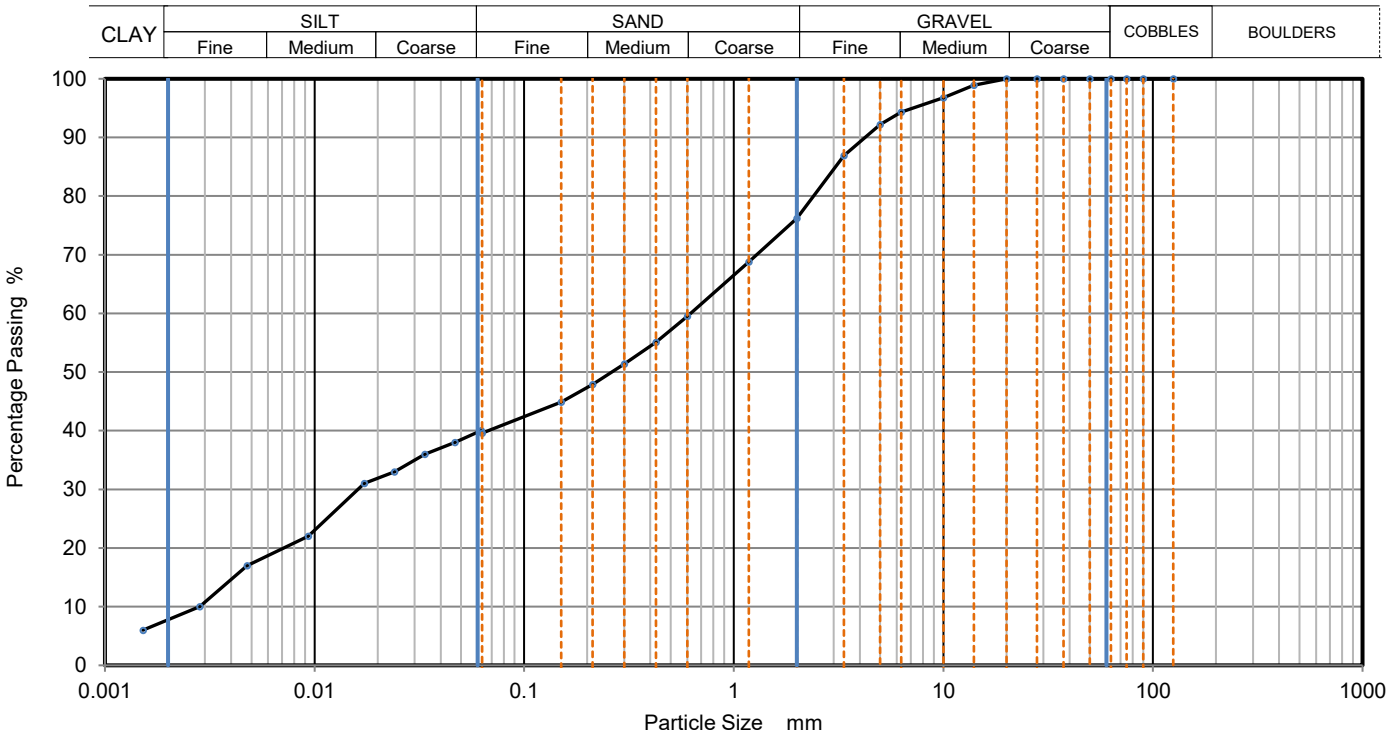
Remarks

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Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH21
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	4.60
				Base	5.60
Specimen Reference	3	Specimen Depth	4.6 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021950



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06242	40
90	100	0.04676	38
75	100	0.03355	36
63	100	0.02406	33
50	100	0.01725	31
37.5	100	0.00932	22
28	100	0.00477	17
20	100	0.00284	10
14	99	0.00152	6
10	97		
6.3	94		
5	92		
3.35	87		
2	76		
1.18	69		
0.6	60	Particle density	(assumed)
0.425	55	2.65	Mg/m3
0.3	51		
0.212	48		
0.15	45		
0.063	40		

Dry Mass of sample, g: 405

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	23.8
Sand	36.6
Silt	31.5
Clay	8.1

Grading Analysis		
D100	mm	
D60	mm	0.623
D30	mm	0.0165
D10	mm	0.00274
Uniformity Coefficient		230
Curvature Coefficient		0.16

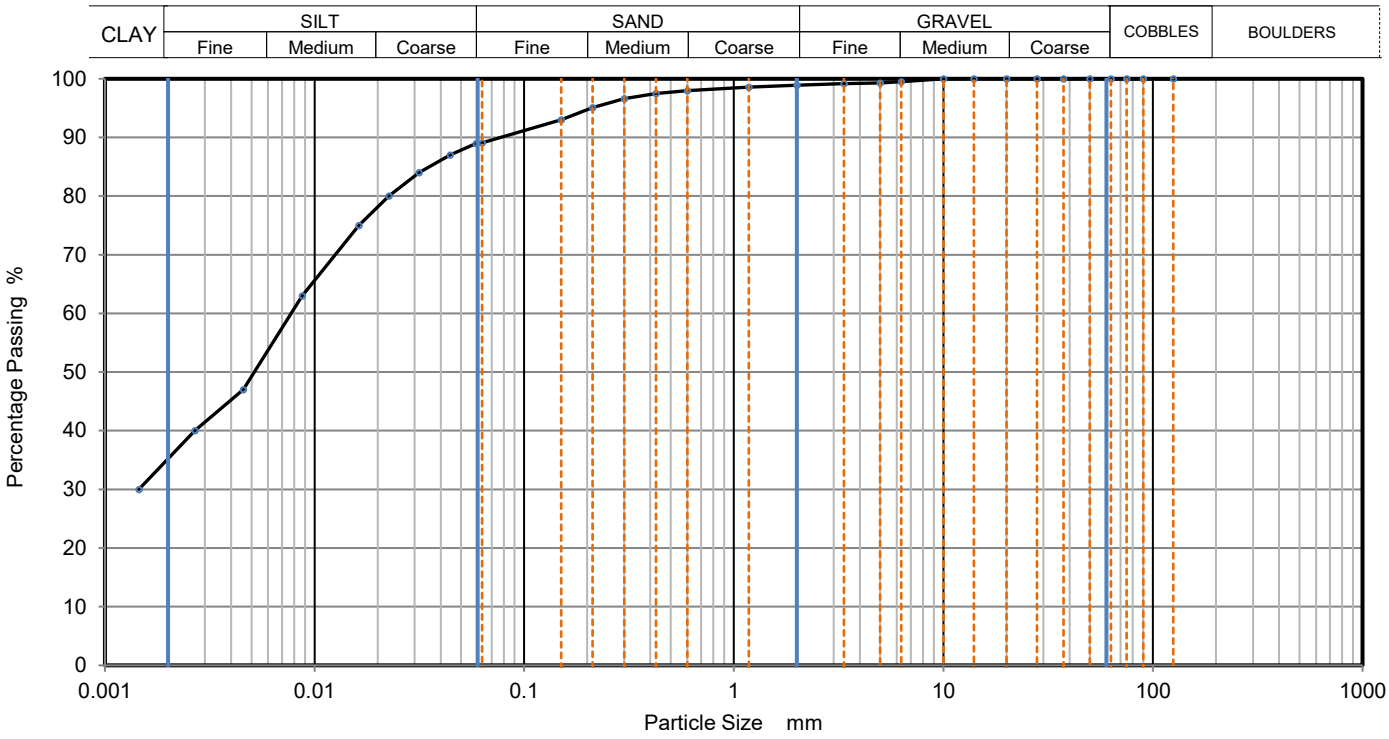
Remarks

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

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Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH24
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.00
				Base	2.50
Specimen Reference	3	Specimen Depth	1 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021951



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05905	89
90	100	0.04428	87
75	100	0.03157	84
63	100	0.02268	80
50	100	0.01629	75
37.5	100	0.00872	63
28	100	0.00457	47
20	100	0.00269	40
14	100	0.00145	30
10	100		
6.3	100		
5	99		
3.35	99		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	97		
0.212	95		
0.15	93		
0.063	89		

Dry Mass of sample, g: 319

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.1
Sand	9.8
Silt	53.7
Clay	35.4

Grading Analysis		
D100	mm	
D60	mm	0.00766
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

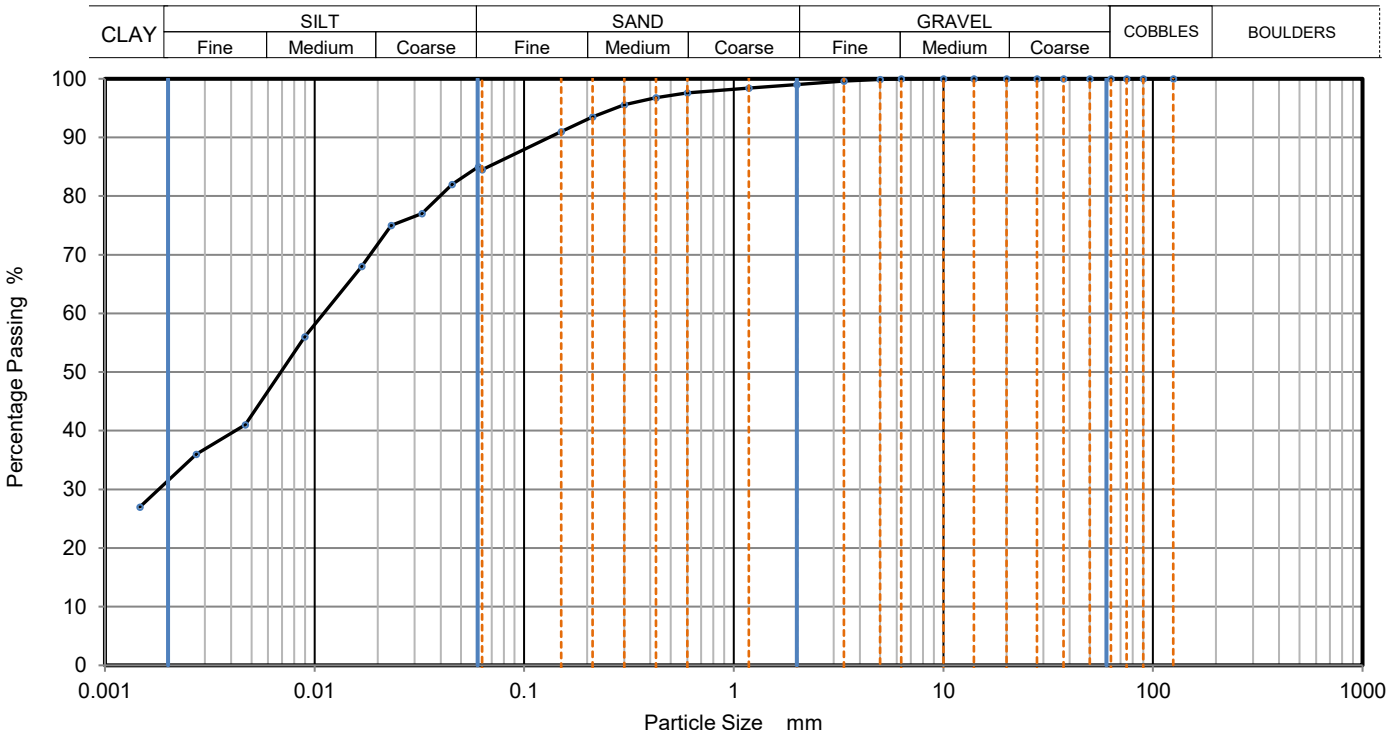
Remarks

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

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Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH24
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	2.50
				Base	4.00
Specimen Reference	3	Specimen Depth	2.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021952



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06052	85
90	100	0.04536	82
75	100	0.03257	77
63	100	0.02321	75
50	100	0.01677	68
37.5	100	0.00897	56
28	100	0.00466	41
20	100	0.00272	36
14	100	0.00147	27
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	98		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	91		
0.063	85		

Dry Mass of sample, g: 307

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.0
Sand	14.4
Silt	53.2
Clay	31.4

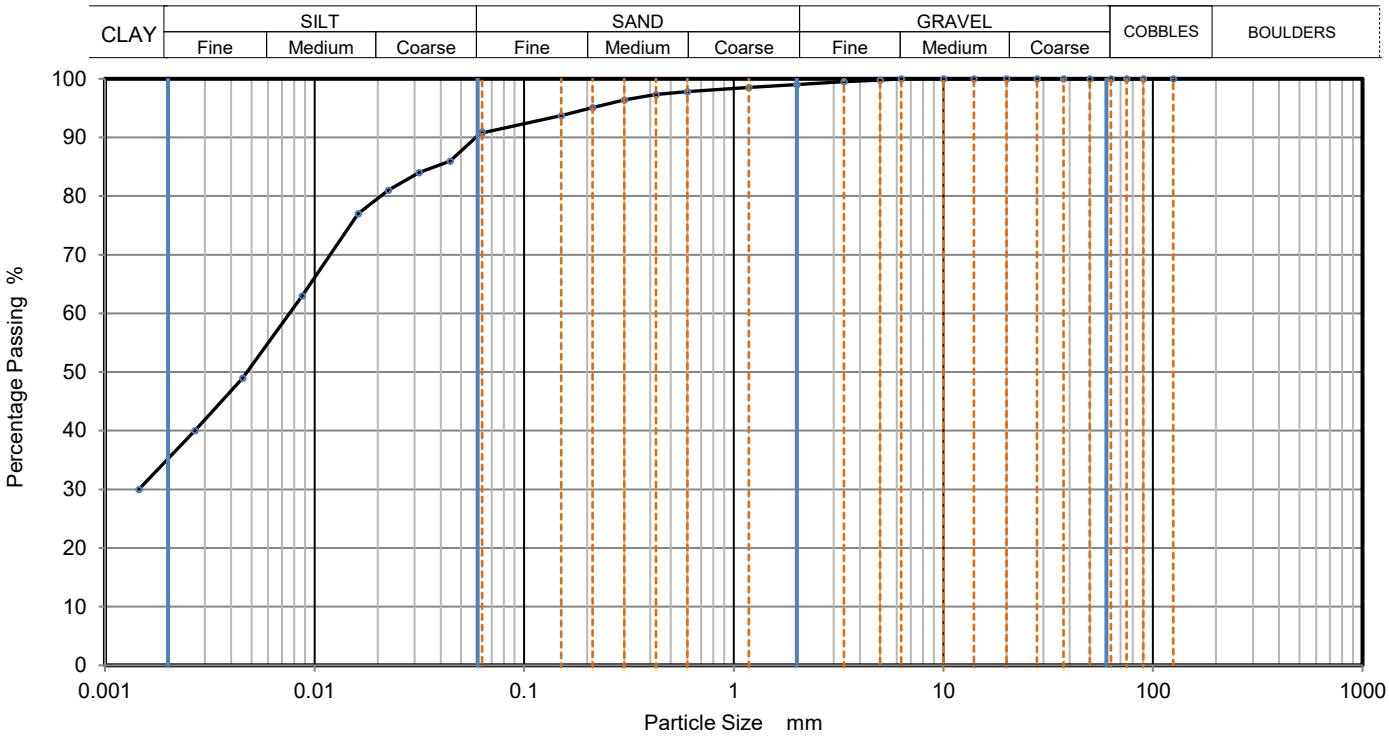
Grading Analysis		
D100	mm	
D60	mm	0.0113
D30	mm	0.00183
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH24
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	5.50
				Base	7.00
Specimen Reference	3	Specimen Depth	5.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021954



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	91
90	100	0.04428	86
75	100	0.03157	84
63	100	0.02250	81
50	100	0.01616	77
37.5	100	0.00872	63
28	100	0.00454	49
20	100	0.00269	40
14	100	0.00145	30
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	95		
0.15	94		
0.063	91		

Dry Mass of sample, g: 310

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.0
Sand	8.2
Silt	55.7
Clay	35.1

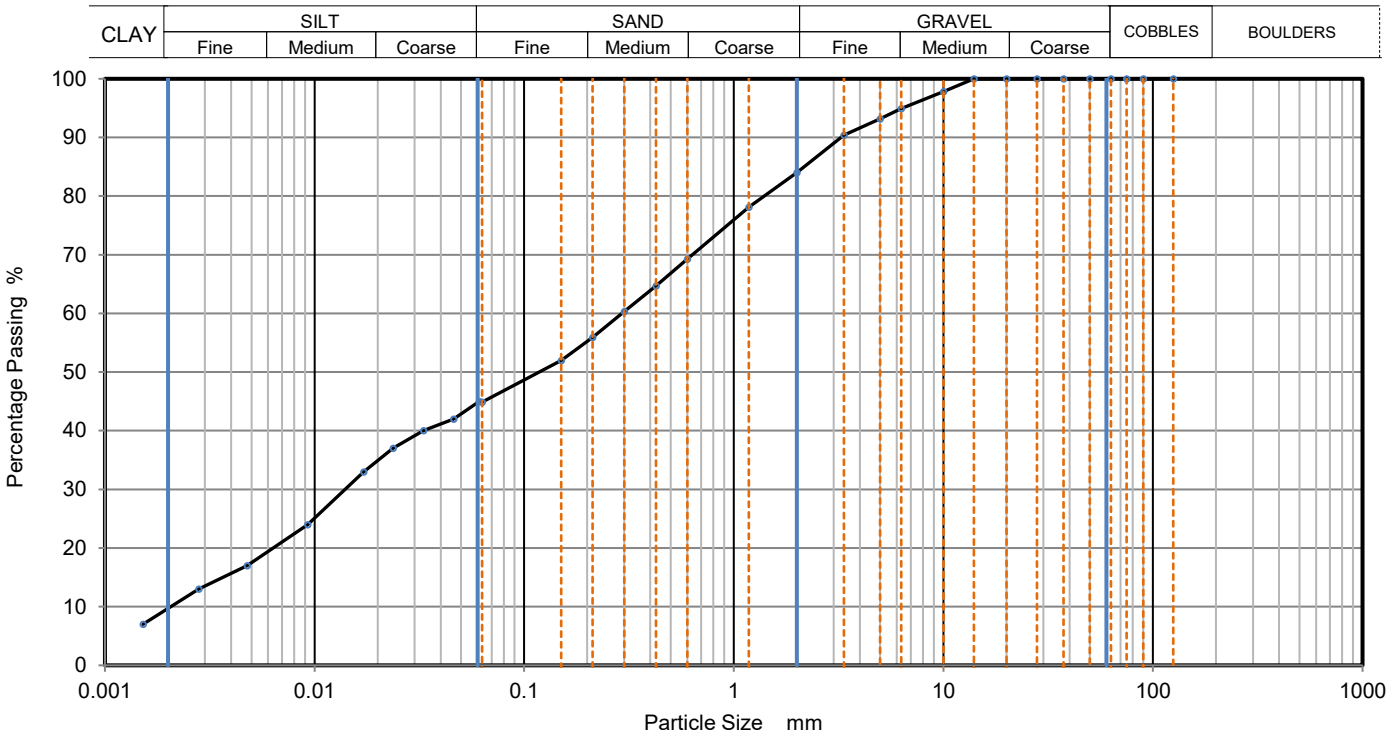
Grading Analysis		
D100	mm	
D60	mm	0.00763
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH24
Site Name	Rosslare OWH - GI			Sample No.	7
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	8.50
				Base	10.00
Specimen Reference	3	Specimen Depth	8.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021956



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06100	45
90	100	0.04606	42
75	100	0.03306	40
63	100	0.02372	37
50	100	0.01713	33
37.5	100	0.00926	24
28	100	0.00477	17
20	100	0.00281	13
14	100	0.00152	7
10	98		
6.3	95		
5	93		
3.35	90		
2	84		
1.18	78		
0.6	69	Particle density	(assumed)
0.425	65	2.65	Mg/m3
0.3	60		
0.212	56		
0.15	52		
0.063	45		

Dry Mass of sample, g: 317

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	16.0
Sand	39.1
Silt	35.3
Clay	9.6

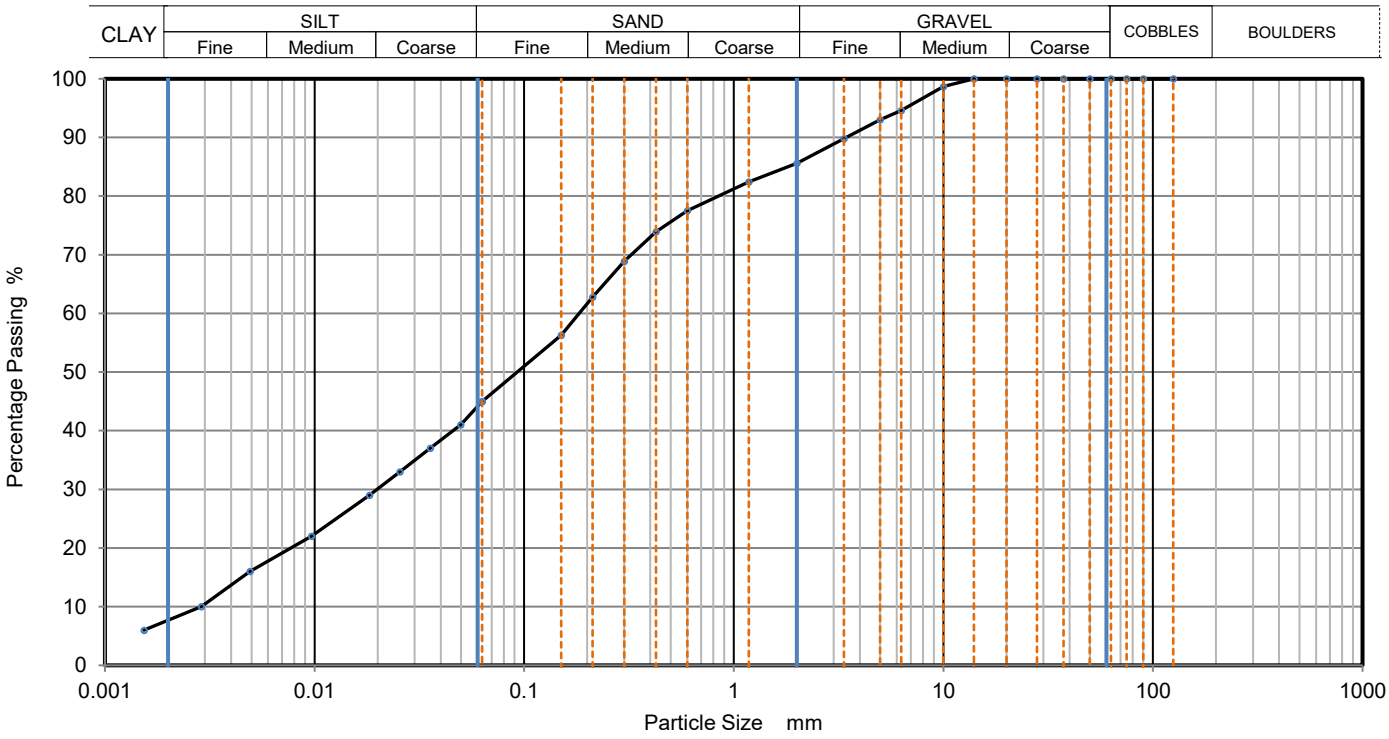
Grading Analysis		
D100	mm	
D60	mm	0.292
D30	mm	0.014
D10	mm	0.00208
Uniformity Coefficient		140
Curvature Coefficient		0.32

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH27
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.30
				Base	2.30
Specimen Reference	3	Specimen Depth	1.3 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021958



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	45
90	100	0.04977	41
75	100	0.03565	37
63	100	0.02553	33
50	100	0.01827	29
37.5	100	0.00966	22
28	100	0.00491	16
20	100	0.00288	10
14	100	0.00153	6
10	99		
6.3	95		
5	93		
3.35	90		
2	86		
1.18	82		
0.6	78	Particle density	(assumed)
0.425	74	2.65	Mg/m3
0.3	69		
0.212	63		
0.15	56		
0.063	45		

Dry Mass of sample, g: 415

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	14.4
Sand	40.5
Silt	37.6
Clay	7.5

Grading Analysis		
D100	mm	
D60	mm	0.183
D30	mm	0.0193
D10	mm	0.00294
Uniformity Coefficient		62
Curvature Coefficient		0.69

Remarks

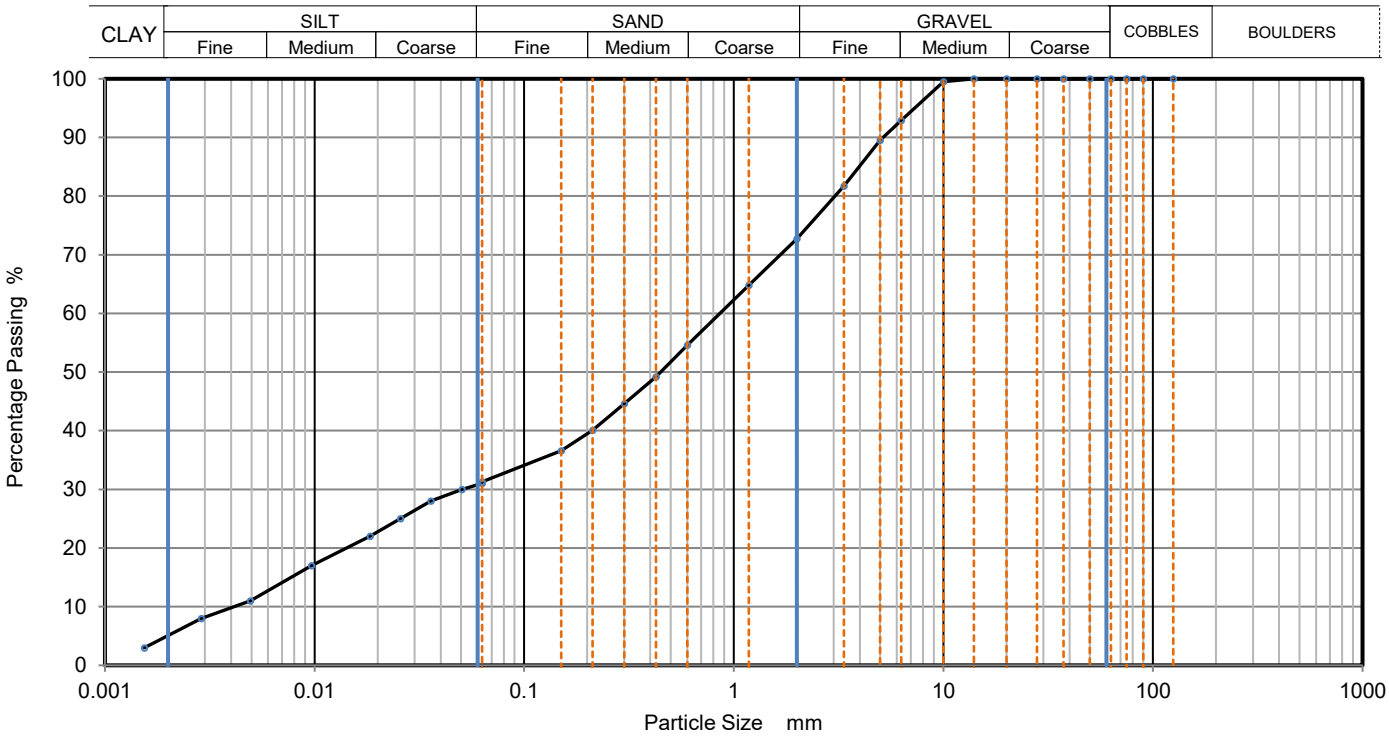
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Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH28
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.00
				Base	2.50
Specimen Reference	3	Specimen Depth	1 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021961



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	31
90	100	0.05042	30
75	100	0.03588	28
63	100	0.02568	25
50	100	0.01838	22
37.5	100	0.00966	17
28	100	0.00494	11
20	100	0.00288	8
14	100	0.00154	3
10	100		
6.3	93		
5	90		
3.35	82		
2	73		
1.18	65		
0.6	55	Particle density	(assumed)
0.425	49	2.65	Mg/m3
0.3	45		
0.212	40		
0.15	37		
0.063	31		

Dry Mass of sample, g: 361

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.3
Sand	41.4
Silt	26.2
Clay	5.1

Grading Analysis		
D100	mm	
D60	mm	0.858
D30	mm	0.0524
D10	mm	0.00419
Uniformity Coefficient		200
Curvature Coefficient		0.76

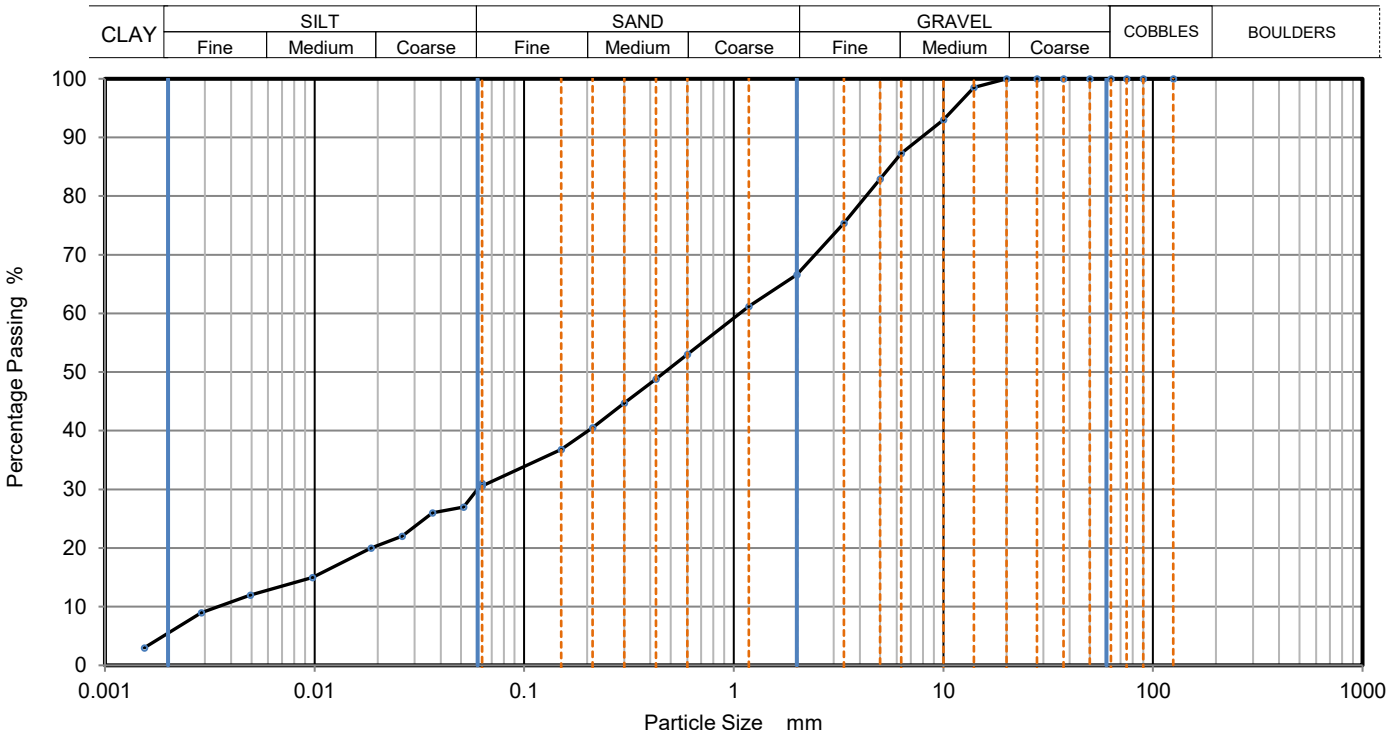
Remarks

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

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Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH30
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.40
				Base	2.40
Specimen Reference	3	Specimen Depth	1.4 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021964



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	31
90	100	0.05137	27
75	100	0.03655	26
63	100	0.02615	22
50	100	0.01860	20
37.5	100	0.00977	15
28	100	0.00494	12
20	100	0.00288	9
14	99	0.00154	3
10	93		
6.3	87		
5	83		
3.35	75		
2	67		
1.18	61		
0.6	53	Particle density	(assumed)
0.425	49	2.65	Mg/m3
0.3	45		
0.212	41		
0.15	37		
0.063	31		

Dry Mass of sample, g: 326

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	33.4
Sand	36.0
Silt	25.1
Clay	5.5

Grading Analysis		
D100	mm	
D60	mm	1.07
D30	mm	0.0608
D10	mm	0.00366
Uniformity Coefficient		290
Curvature Coefficient		0.94

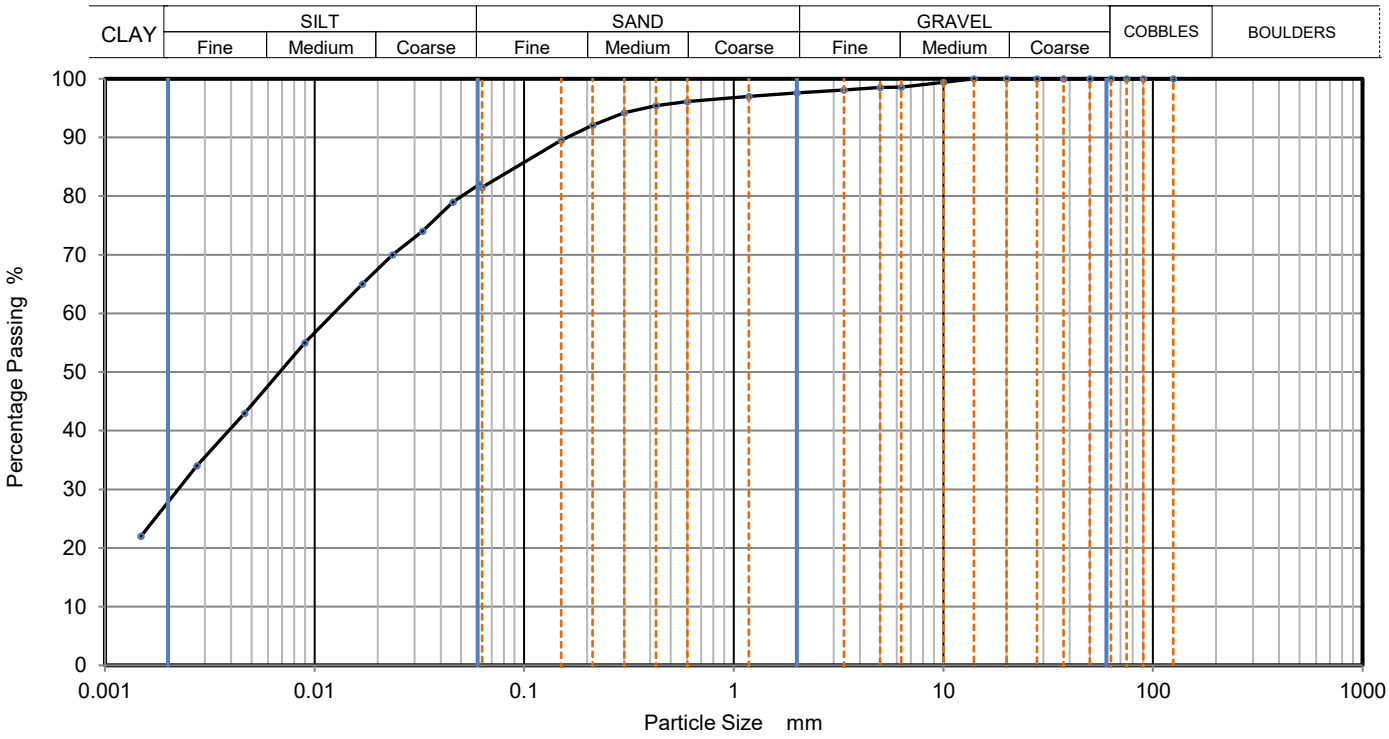
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-CPT02
Site Name	Rosslare OWH - GI			Sample No.	1
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.00
				Base	1.50
Specimen Reference	3	Specimen Depth	1 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021965



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06100	82
90	100	0.04571	79
75	100	0.03282	74
63	100	0.02355	70
50	100	0.01689	65
37.5	100	0.00897	55
28	100	0.00463	43
20	100	0.00274	34
14	100	0.00148	22
10	99		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	94		
0.212	92		
0.15	90		
0.063	82		

Dry Mass of sample, g: 312

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.4
Sand	16.0
Silt	54.2
Clay	27.4

Grading Analysis		
D100	mm	
D60	mm	0.0124
D30	mm	0.00228
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

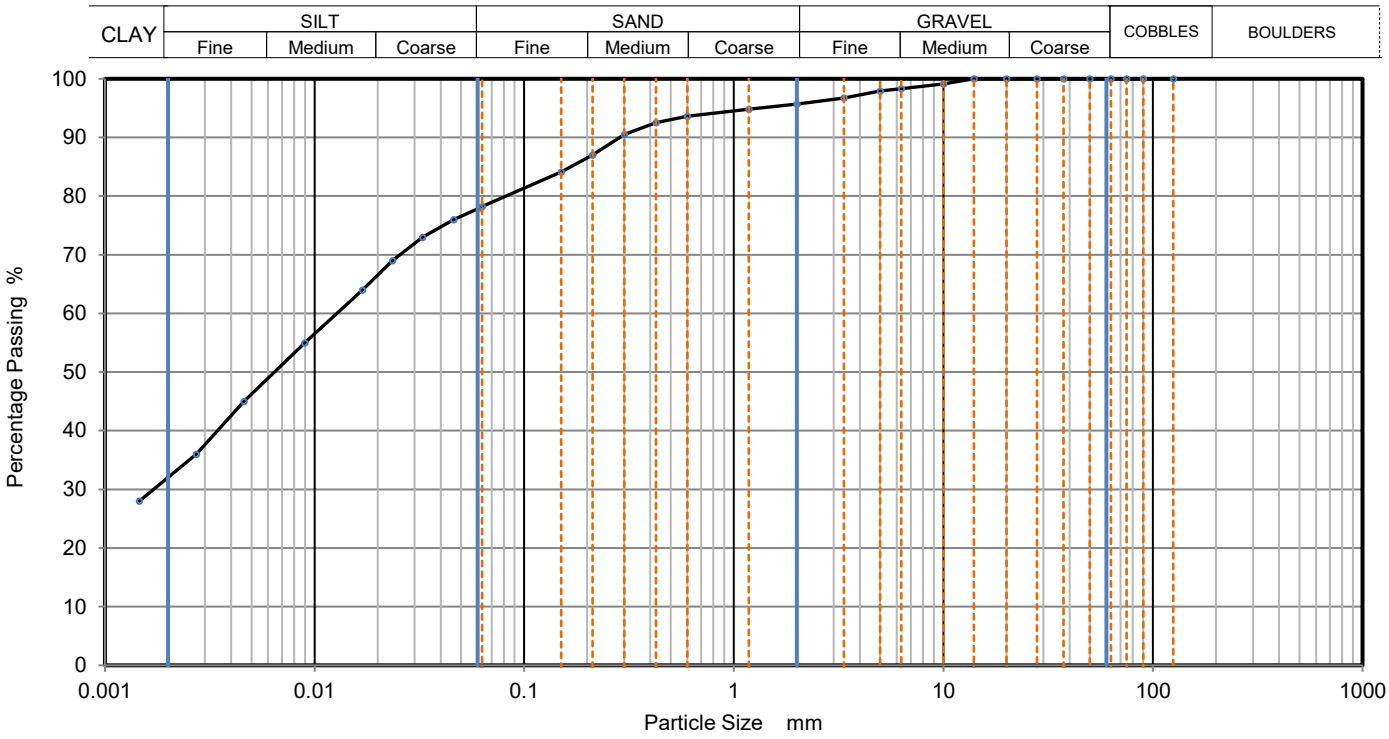
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-CPT02
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	4.50
				Base	6.00
Specimen Reference	3	Specimen Depth	4.5 m	Sample Type	SB
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024021968



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06148	78
90	100	0.04606	76
75	100	0.03282	73
63	100	0.02355	69
50	100	0.01689	64
37.5	100	0.00897	55
28	100	0.00460	45
20	100	0.00272	36
14	100	0.00146	28
10	99		
6.3	98		
5	98		
3.35	97		
2	96		
1.18	95		
0.6	94	Particle density	(assumed)
0.425	93	2.65	Mg/m3
0.3	91		
0.212	87		
0.15	84		
0.063	78		

Dry Mass of sample, g: 305

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	4.3
Sand	17.5
Silt	46.2
Clay	32.0

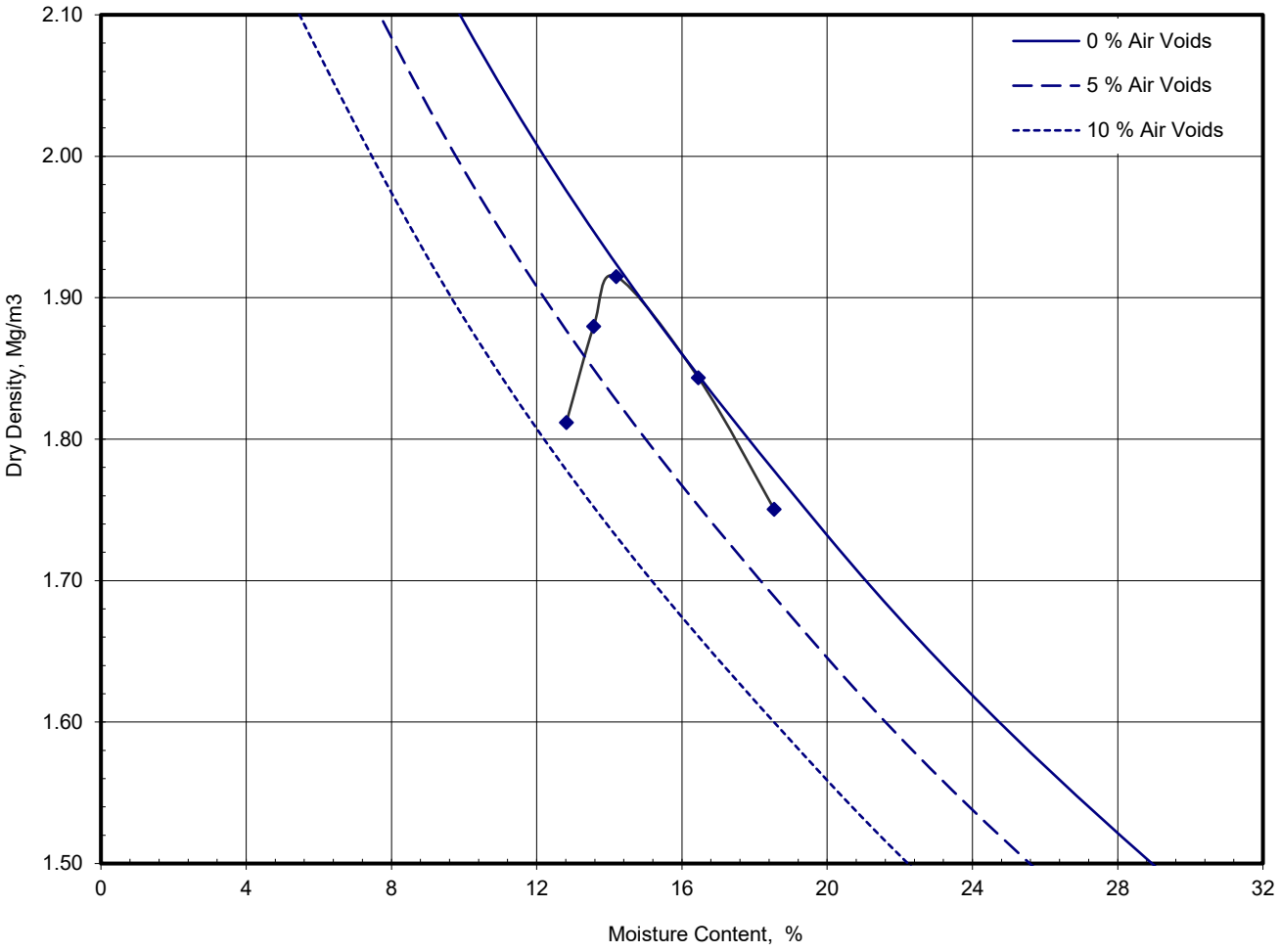
Grading Analysis		
D100	mm	
D60	mm	0.0129
D30	mm	0.00167
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**Dry Density / Moisture Content Relationship Heavy Compaction**			Job Ref	**23-0585**
				Borehole / Pit No	M-BH21
Site Name	**Rosslare OWH - GI**			Sample No	4
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	2.60
				Sample Depth (m) Base	3.60
Specimen Ref.	5	Specimen Depth	m	Sample Type	SB
Test Method	BS1377:Part 4:1990, clause 3.5, 4.5kg rammer			Keylab ID	Caus2024021948
				Compaction Test Reference/No.	



Preparation		Material used was air dried
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Measured using gas jar	Mg/m³	2.65

Maximum Dry Density	Mg/m³	**1.91**
Optimum Moisture Content	%	**14**

LAB 09R - Version 6

Approved	Remarks	UKAS TESTING 10122
Stephen Watson		

Moisture Condition Value at Natural Moisture Content
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Retained on 20mm sieve %	Moisture Content <20mm %	Moisture Condition Value	Method of Interpretation	Remarks
	Ref	Top	Base	Type						
M-BH21	4	2.60	3.60	SB	Brown sandy slightly gravelly silty CLAY.	0	20.3	10.7	Best fit line	

LAB 10R - Version 7

Key

Test performed in accordance with BS1377:Part4:1990, clause 5.4 unless annotated otherwise

Date Printed

27/03/2024

Approved By

Stephen Watson

UKAS TESTING

10122

Summary of Laboratory Vane Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Hole No.	Sample				Specimen Description at test horizon	Moisture Content %	Vane shear strength		Sensitivity	Remarks
	Ref	Top	Base	Type			Undisturbed kPa	Remoulded kPa		
M-BH21	11	1.60		UT	Brown sandy slightly gravelly silty CLAY.	31	82			

Notes	Date Printed	Approved By	Table
Tests performed in accordance with BS 1377:Part 7:clause 3 using 19mm x 30mm vane Tests carried out in nominally 100mm diameter tube unless noted otherwise Shear strengths are average of at least 3 tests unless noted otherwise	27/03/2024	Stephen Watson	1 sheet 1

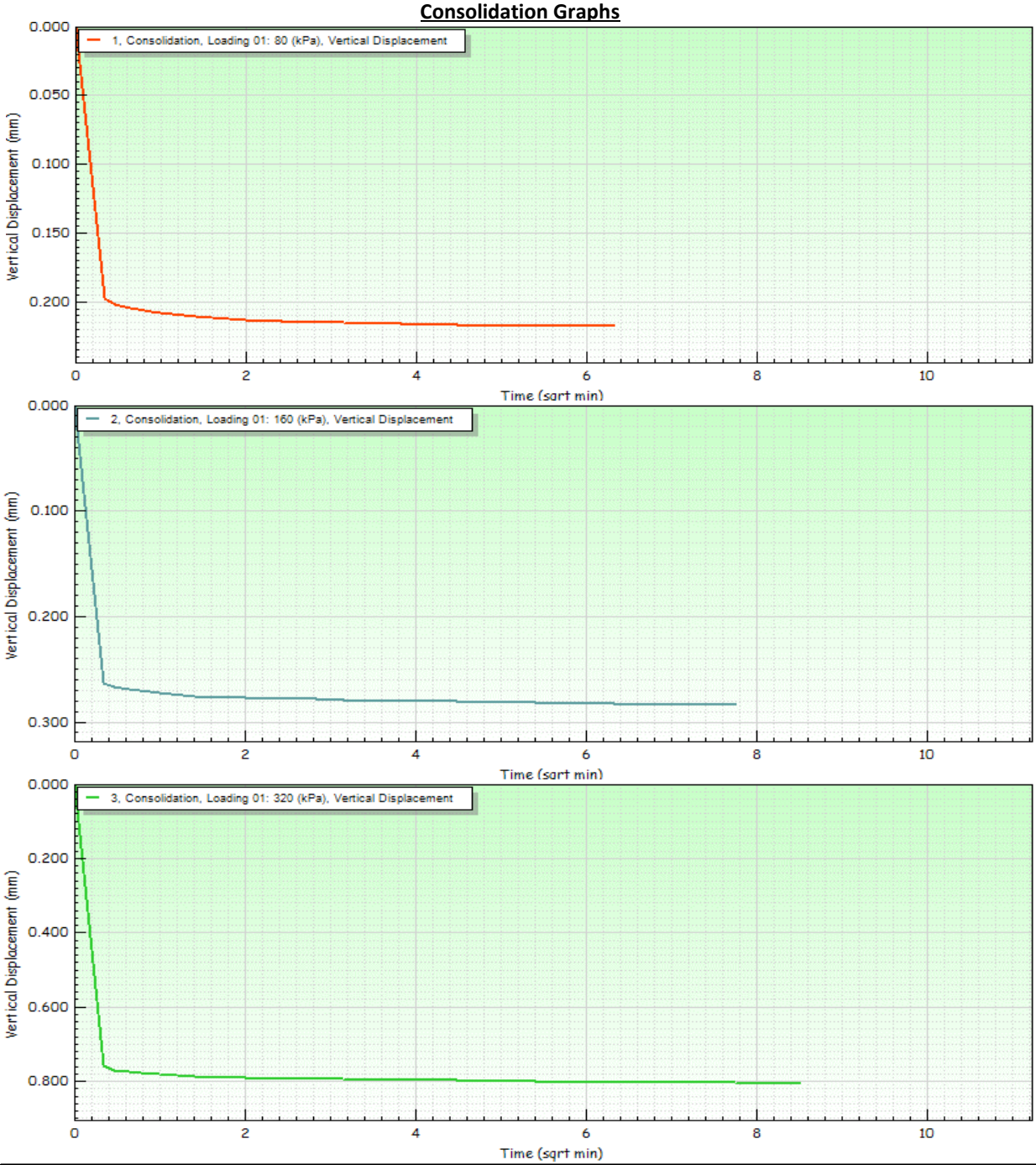
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH21	Sample Reference		5	
Depth (m)	3.60	Sample Submerged?		Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown slightly gravelly slightly clayey fine to coarse SAND.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	7.7	7.7	7.7
Bulk Density (Mg/m^3)	1.87	1.86	1.87
Dry Density (Mg/m^3)	1.73	1.73	1.73
Voids Ratio	0.529	0.531	0.528
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	0.217	0.283	0.806
Shearing			
Rate of Strain (mm/min)	0.600	0.600	0.600
Peak Shear Stress (kPa)	72.4	121.8	232.9
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	2.337	3.123	3.423
Final Conditions			
Water Content (%)	15.0	15.0	15.0
Dry Density (Mg/m^3)	1.76	1.76	1.83
Voids Ratio	0.519	0.504	0.460

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH21	Sample Reference	5	
Depth (m)	3.60	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

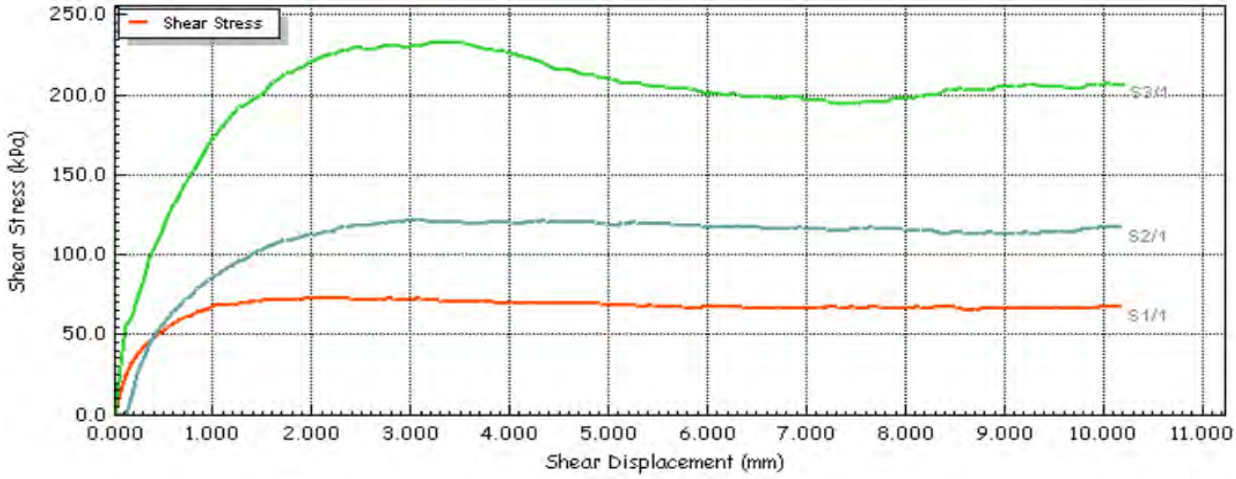


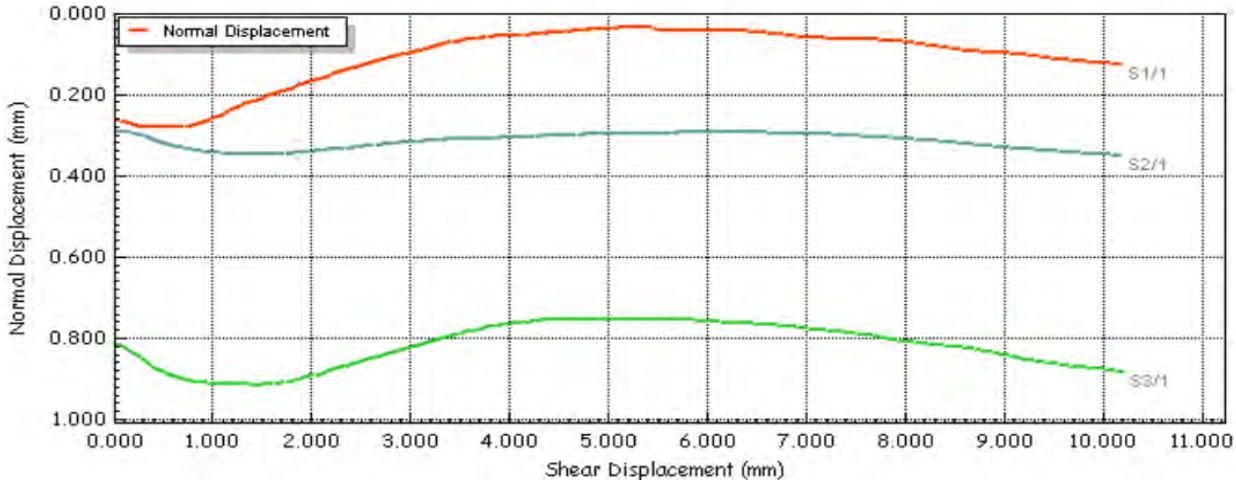
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH21	Sample Reference	5	
Depth (m)	3.60	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



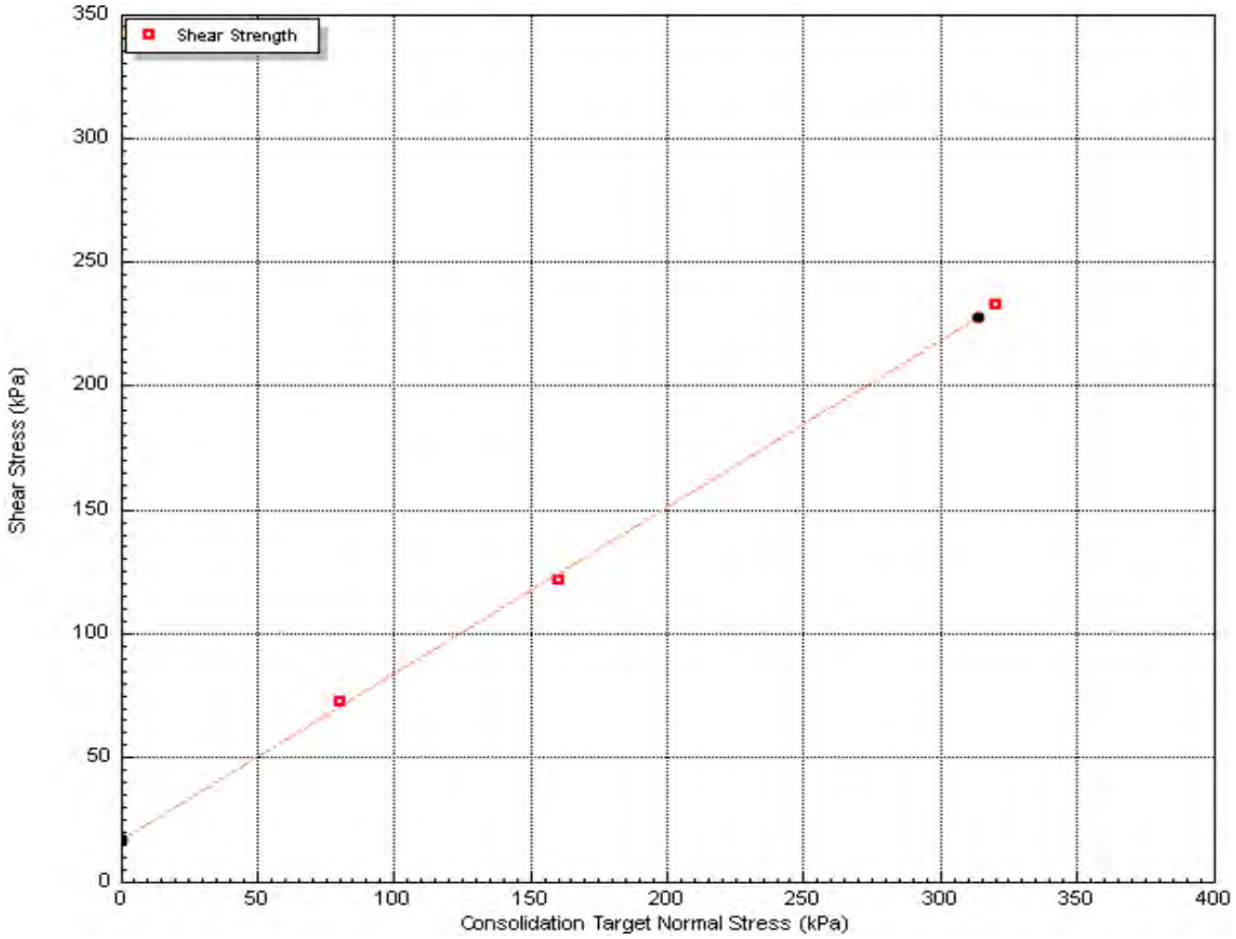


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH21	Sample Reference	5	
Depth (m)	3.60	Sample Submerged?	Yes	~~No~~
Sample Type	SB	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	17		
Angle of Shearing Resistance (°)	34.0		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / G05	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH30	7	1.40	UT	Oedometer	Sample was too granular to obtain test specimen	CANCEL TEST

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
12 March 2024	12 March 2024

CAUSEWAY GEOTECH

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Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

5 April 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub S
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/02/2024 and 05/04/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G06

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	BS 1377-2: 1990: Cl 3.2	6
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	6
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	12
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	8
SOIL	Laboratory Vane Shear Strength (3 determinations) *	BS 1377-7: 1990: Cl 3	1
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	1
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	3
	Extra over days (more than initial 3 days)		3

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Organic Matter Content		1

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.: 23-0585

Project Name: Rosslare OWH - GI

Hole No.	Sample				Specimen Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
M-BH22	18	1.20		D	Brown slightly sandy silty CLAY.			12	55	28 -1pt	19	9		CL
M-BH22	25	7.20		D	Brown sandy silty CLAY.			22	90	39 -1pt	23	16		CI
M-BH22	29	10.00		D	Brown sandy slightly gravelly silty CLAY.			10	57	30 -1pt	19	11		CL
M-BH32	15	4.00		D	Greyish brown sandy slightly gravelly silty CLAY.			20	92	34 -1pt	19	15		CL
M-BH33	14	3.00		D	Greyish brown slightly sandy silty CLAY.			21	97	40 -1pt	22	18		CI
M-BH41	14	2.50		D	Brown sandy silty CLAY.			22	97	34 -1pt	22	12		CL

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

LAB 01R Version 6

Key

Density test | Liquid Limit | Particle density

Linear measurement unless : | 4pt cone unless : | sp - small pyknometer

wd - water displacement | cas - Casagrande method | gj - gas jar

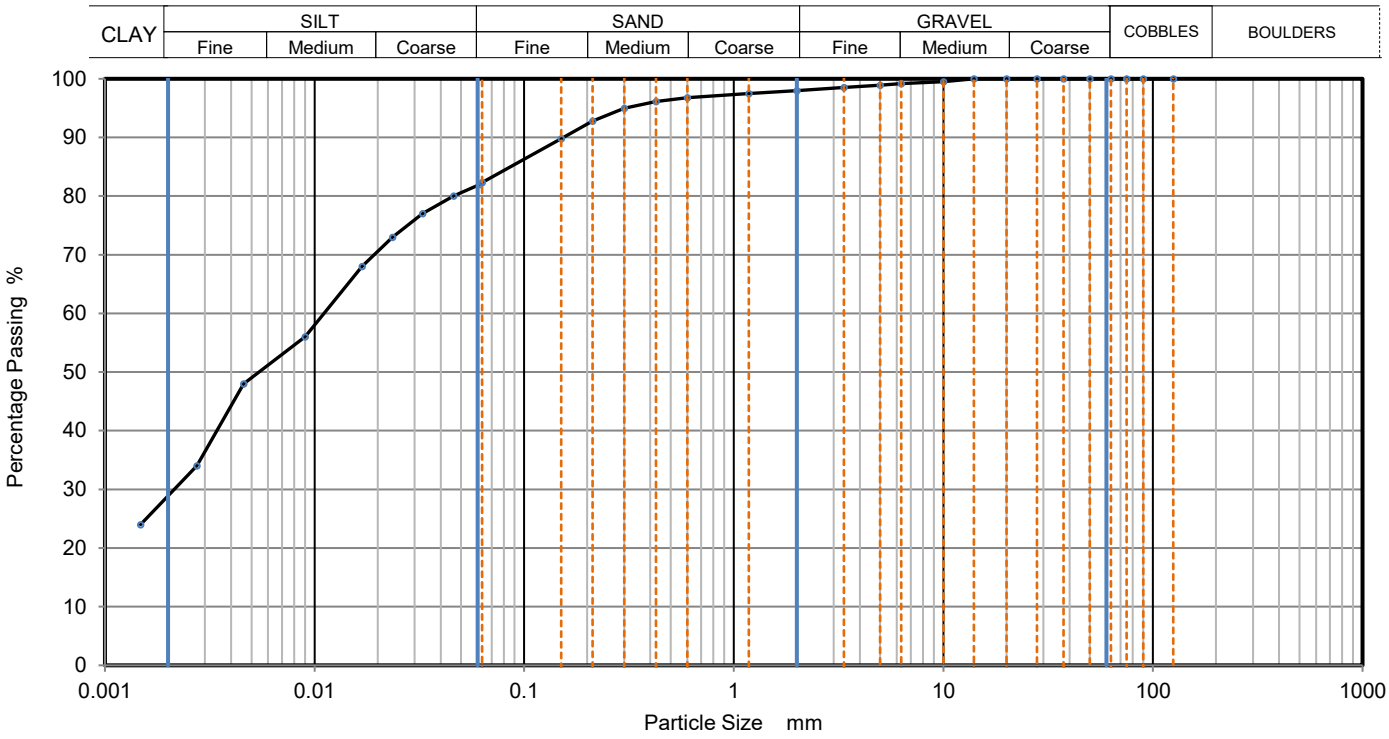
wi - immersion in water | 1pt - single point test

Date Printed: 04/04/2024 00:00

Approved By: Stephen Watson

UKAS TESTING 10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-BH22
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.70
				Base	2.70
Specimen Reference	2	Specimen Depth	1.7 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403041



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06144	82
90	100	0.04603	80
75	100	0.03279	77
63	100	0.02352	73
50	100	0.01687	68
37.5	100	0.00901	56
28	100	0.00459	48
20	100	0.00275	34
14	100	0.00148	24
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	95		
0.212	93		
0.15	90		
0.063	82		

Dry Mass of sample, g: 511

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.0
Sand	15.7
Silt	53.4
Clay	28.9

Grading Analysis		
D100	mm	
D60	mm	0.0113
D30	mm	0.00214
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

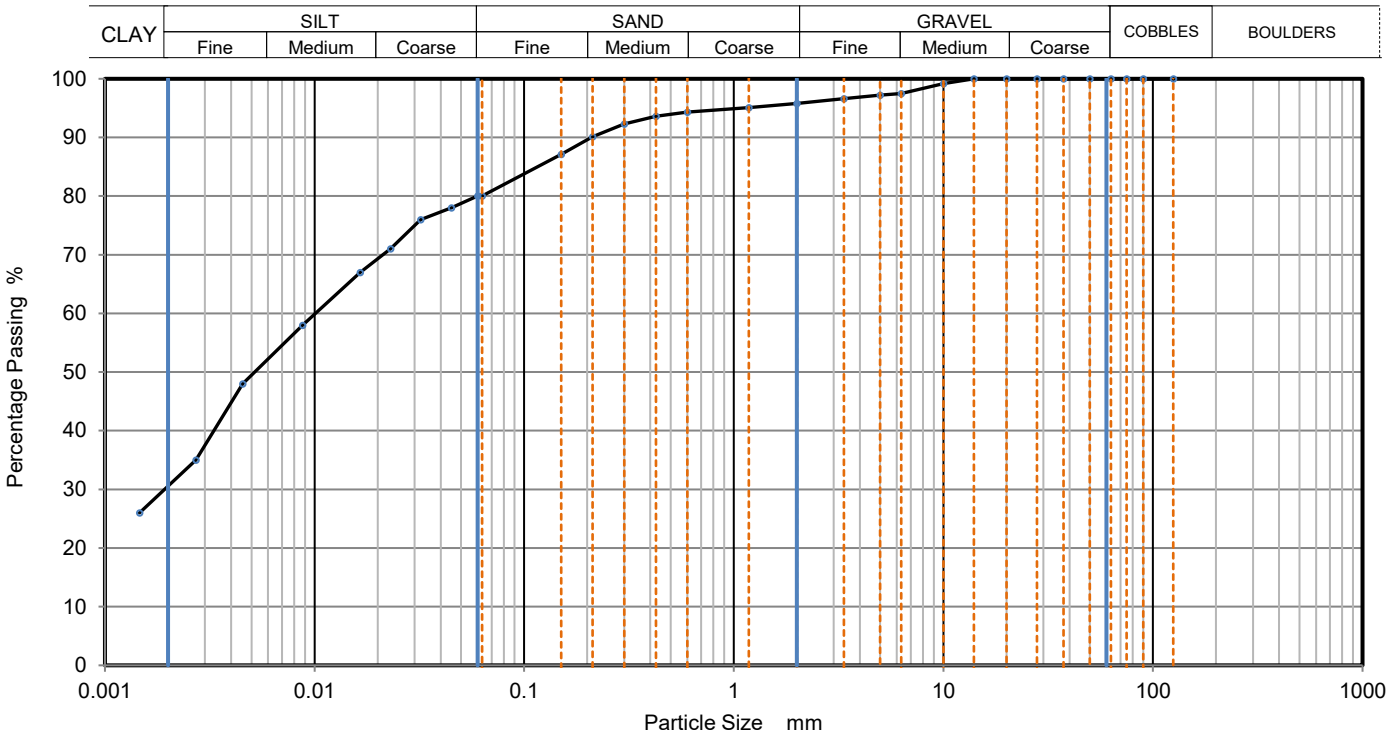
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH22
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	3.65
				Base	4.20
Specimen Reference	3	Specimen Depth	3.65 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403043



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06003	80
90	100	0.04499	78
75	100	0.03206	76
63	100	0.02301	71
50	100	0.01651	67
37.5	100	0.00877	58
28	100	0.00453	48
20	100	0.00271	35
14	100	0.00146	26
10	99		
6.3	98		
5	97		
3.35	97		
2	96		
1.18	95		
0.6	94	Particle density	(assumed)
0.425	94	2.65	Mg/m3
0.3	92		
0.212	90		
0.15	87		
0.063	80		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	4.2
Sand	15.8
Silt	49.7
Clay	30.3

Grading Analysis		
D100	mm	
D60	mm	0.00987
D30	mm	0.00195
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

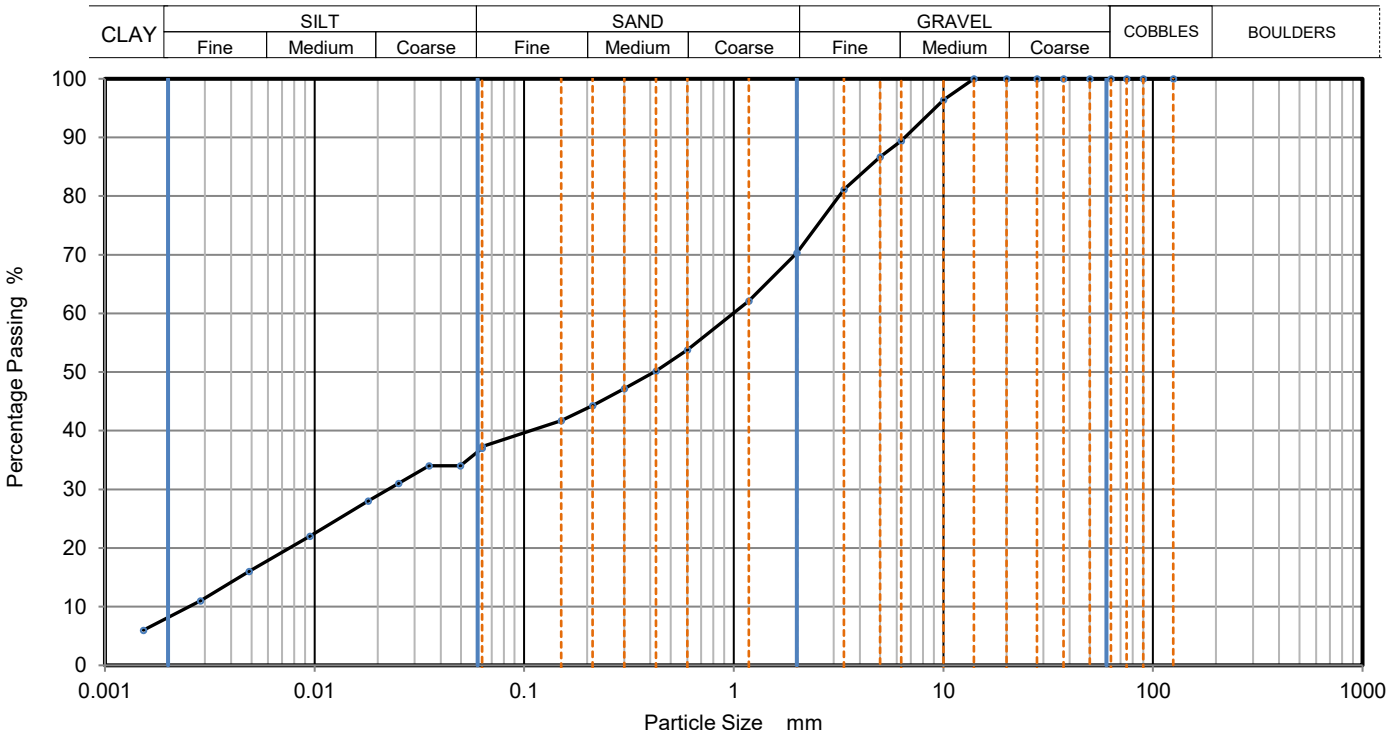
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH22
Site Name	Rosslare OWH - GI			Sample No.	15
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	10.50
				Base	10.85
Specimen Reference	2	Specimen Depth	10.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403046



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	37
90	100	0.04965	34
75	100	0.03510	34
63	100	0.02514	31
50	100	0.01800	28
37.5	100	0.00952	22
28	100	0.00487	16
20	100	0.00286	11
14	100	0.00153	6
10	96		
6.3	89		
5	87		
3.35	81		
2	70		
1.18	62		
0.6	54	Particle density	(assumed)
0.425	50	2.65	Mg/m3
0.3	47		
0.212	44		
0.15	42		
0.063	37		

Dry Mass of sample, g: 505

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.7
Sand	33.0
Silt	29.1
Clay	8.2

Grading Analysis		
D100	mm	
D60	mm	0.997
D30	mm	0.0224
D10	mm	0.00254
Uniformity Coefficient		390
Curvature Coefficient		0.2

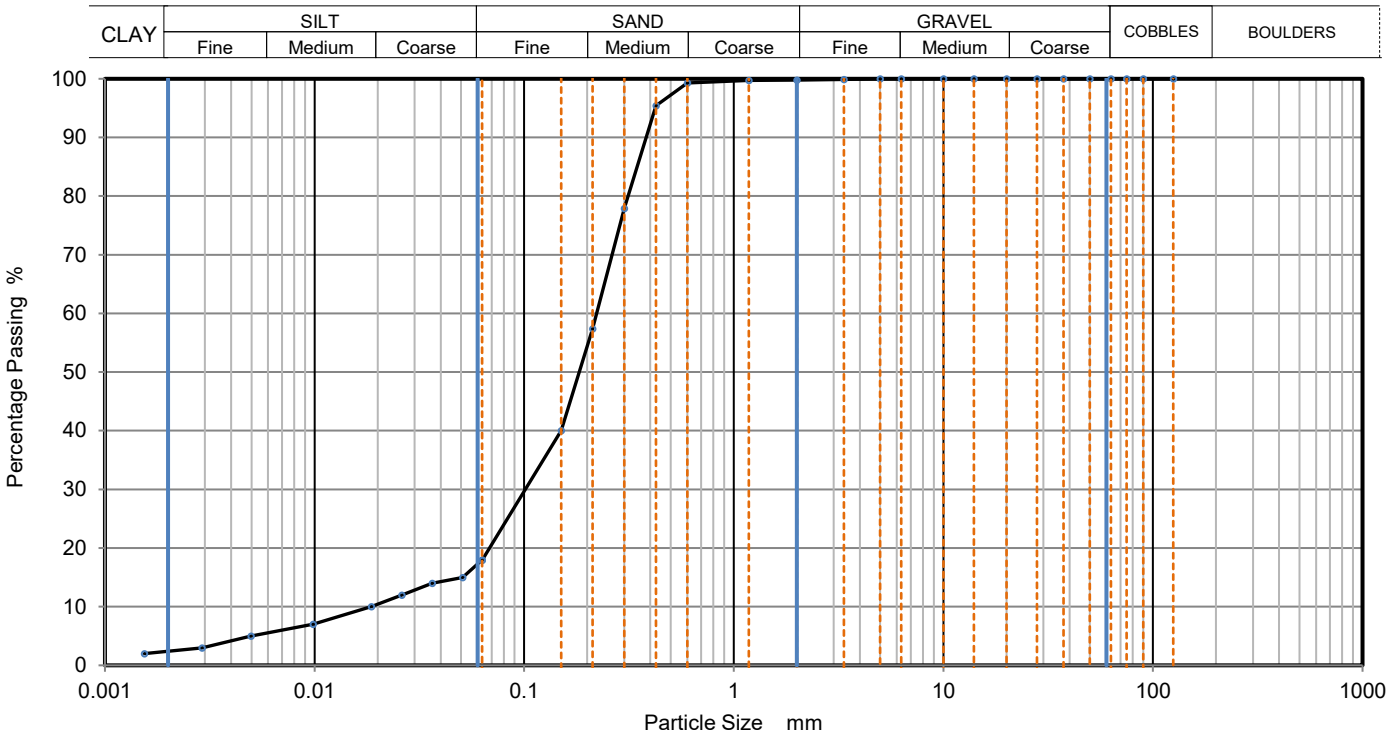
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH31
Site Name	Rosslare OWH - GI			Sample No.	2
Specimen Description	Brown silty fine to coarse SAND.			Sample Depth (m) Top	0.50
				Base	1.50
Specimen Reference	2	Specimen Depth	0.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403047



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	18
90	100	0.05090	15
75	100	0.03642	14
63	100	0.02606	12
50	100	0.01864	10
37.5	100	0.00984	7
28	100	0.00497	5
20	100	0.00290	3
14	100	0.00154	2
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	78		
0.212	57		
0.15	40		
0.063	18		

Dry Mass of sample, g: 225

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.2
Sand	81.9
Silt	15.5
Clay	2.4

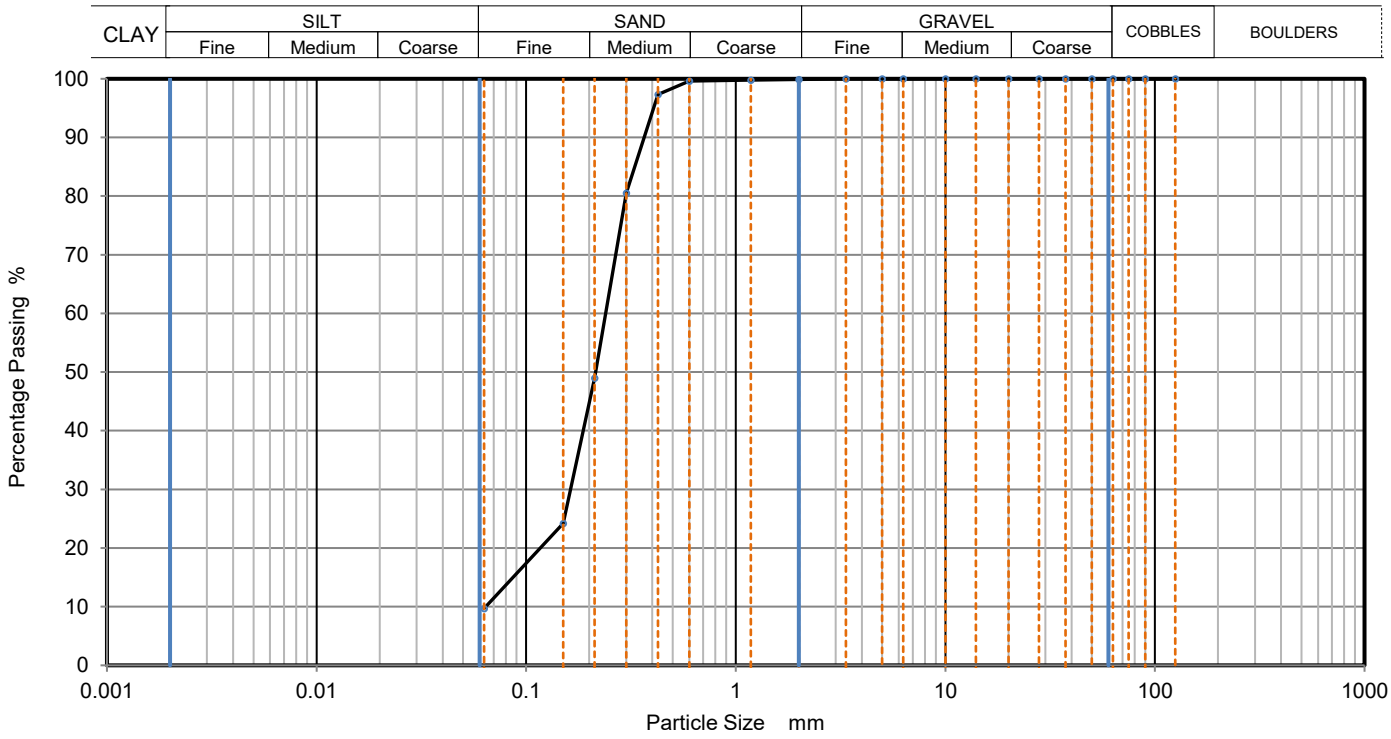
Grading Analysis		
D100	mm	
D60	mm	0.222
D30	mm	0.101
D10	mm	0.0179
Uniformity Coefficient		12
Curvature Coefficient		2.6

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-BH31
Site Name	Rosslare OWH - GI				Sample No.		4
Specimen Description	Brown slightly silty fine to coarse SAND.				Sample Depth (m)	Top	2.50
						Base	3.50
Specimen Reference	2	Specimen Depth	2.5	m	Sample Type		B
Test Method	BS1377:Part 2:1990, clause 9.2				KeyLAB ID		Caus202403048



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	97		
0.3	81		
0.212	49		
0.15	24		
0.063	10		

Dry Mass of sample, g	310

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.1
Sand	90.2
Fines <0.063mm	10.0

Grading Analysis		
D100	mm	
D60	mm	0.239
D30	mm	0.163
D10	mm	0.0641
Uniformity Coefficient		3.7
Curvature Coefficient		1.7

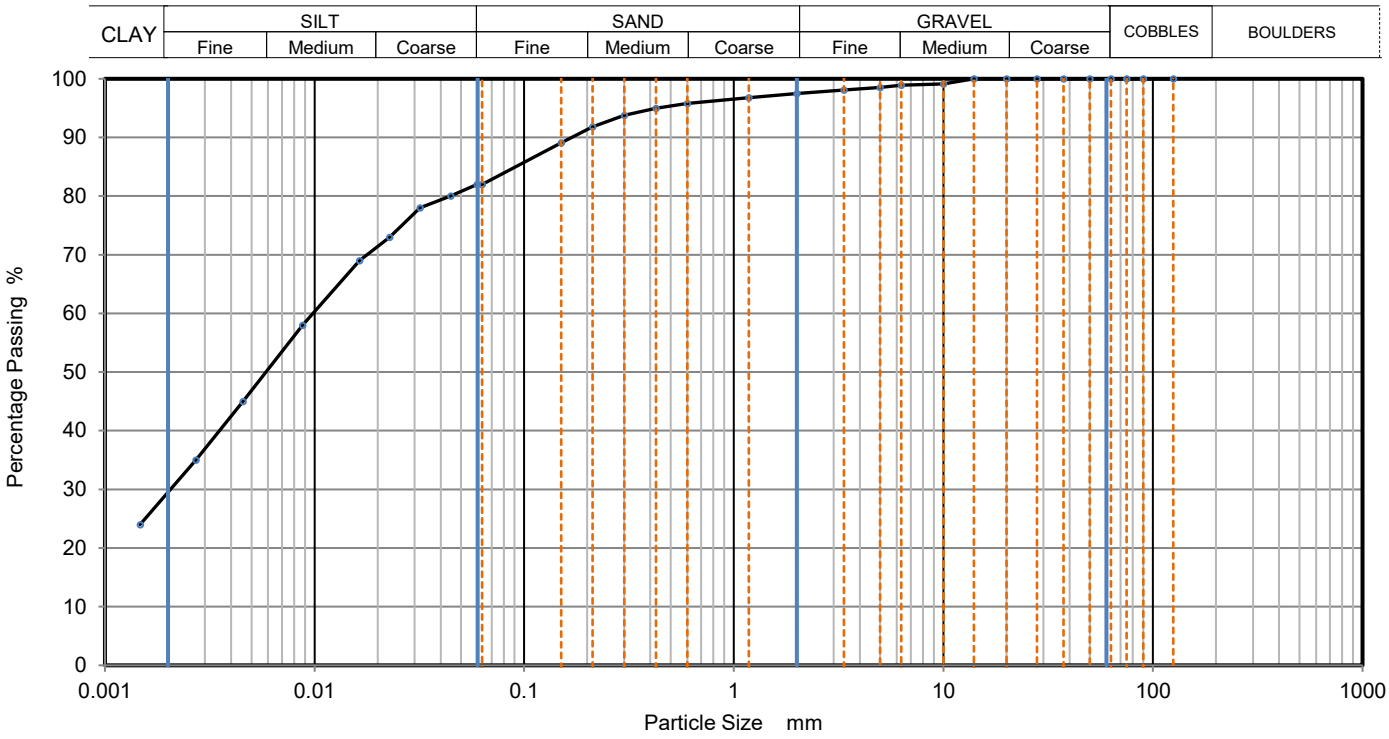
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH32
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	2.50
				Base	3.50
Specimen Reference	2	Specimen Depth	2.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030410



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05956	82
90	100	0.04464	80
75	100	0.03181	78
63	100	0.02284	73
50	100	0.01639	69
37.5	100	0.00877	58
28	100	0.00456	45
20	100	0.00271	35
14	100	0.00147	24
10	99		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	94		
0.212	92		
0.15	89		
0.063	82		

Dry Mass of sample, g: 520

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.5
Sand	15.5
Silt	52.9
Clay	29.1

Grading Analysis		
D100	mm	
D60	mm	0.0097
D30	mm	0.0021
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

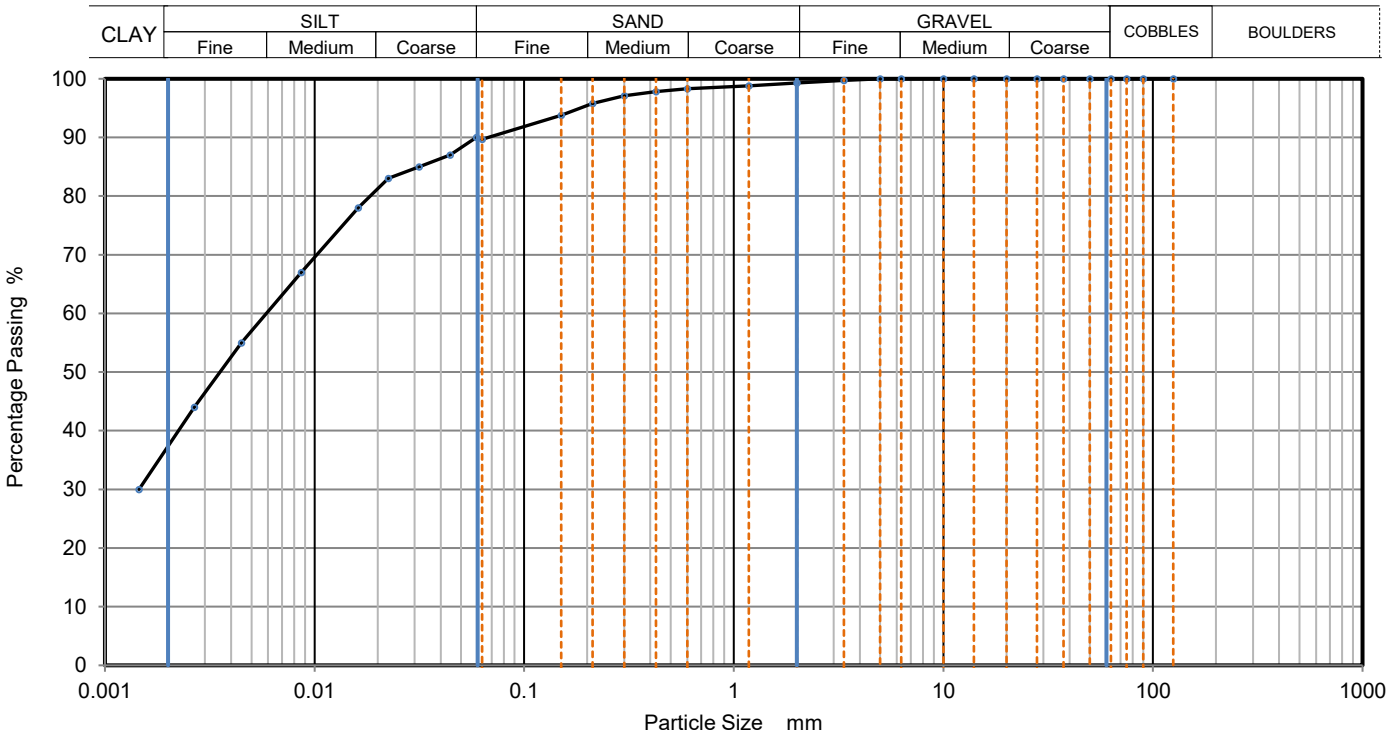
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH33
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.50
				Base	2.50
Specimen Reference	2	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030413



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05908	90
90	100	0.04428	87
75	100	0.03156	85
63	100	0.02249	83
50	100	0.01615	78
37.5	100	0.00865	67
28	100	0.00447	55
20	100	0.00267	44
14	100	0.00145	30
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	97		
0.212	96		
0.15	94		
0.063	90		

Dry Mass of sample, g: 274

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.7
Sand	9.6
Silt	52.5
Clay	37.2

Grading Analysis		
D100	mm	
D60	mm	0.00589
D30	mm	0.00146
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

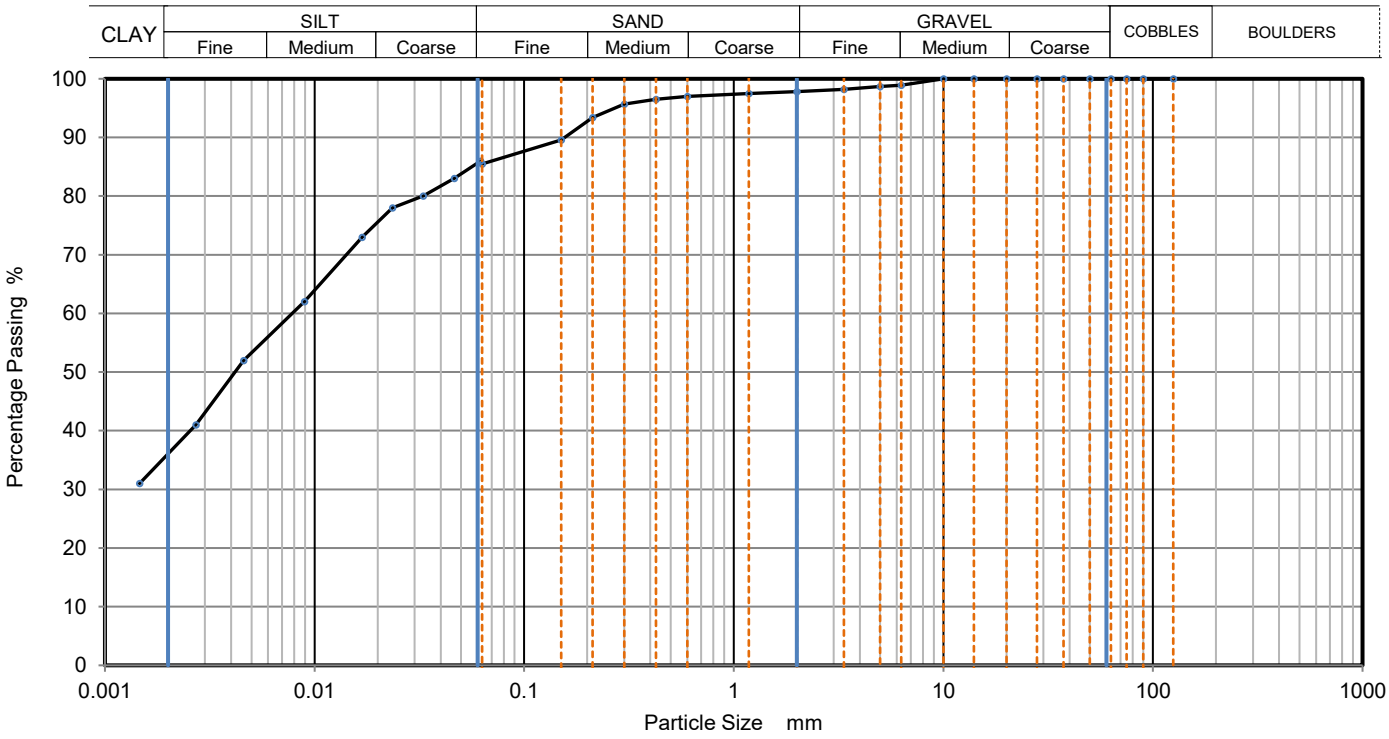
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH33
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Greyish brown slightly sandy silty CLAY.			Sample Depth (m) Top	3.50
				Base	4.50
Specimen Reference	2	Specimen Depth	3.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030415



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06190	86
90	100	0.04637	83
75	100	0.03303	80
63	100	0.02352	78
50	100	0.01687	73
37.5	100	0.00895	62
28	100	0.00459	52
20	100	0.00271	41
14	100	0.00146	31
10	100		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	93		
0.15	90		
0.063	86		

Dry Mass of sample, g: 249

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.2
Sand	12.4
Silt	49.1
Clay	36.3

Grading Analysis		
D100	mm	
D60	mm	0.00777
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

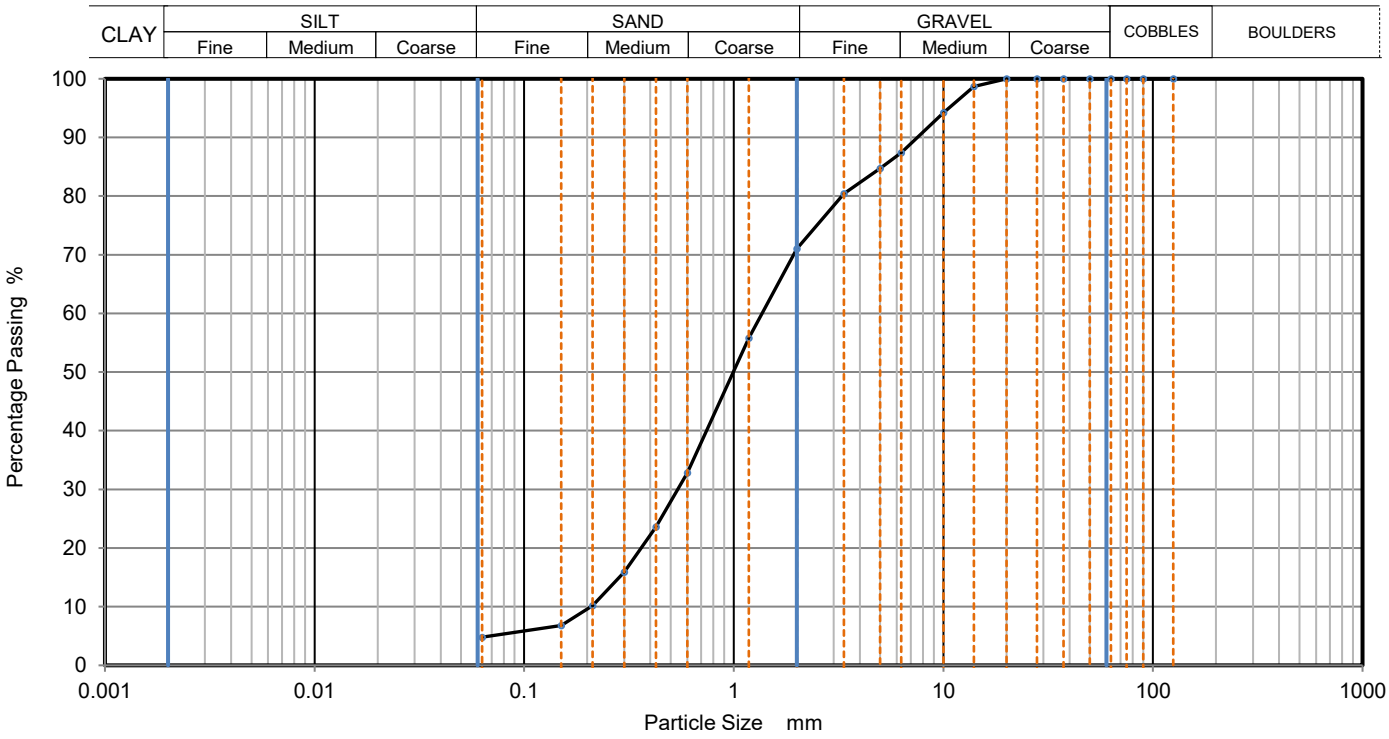
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH35
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly gravelly slightly silty fine to coarse SAND.			Sample Depth (m) Top	1.50
				Base	2.50
Specimen Reference	2	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024030416



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	94		
6.3	87		
5	85		
3.35	80		
2	71		
1.18	56		
0.6	33		
0.425	24		
0.3	16		
0.212	10		
0.15	7		
0.063	5		

Dry Mass of sample, g: 512

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.0
Sand	66.2
Fines <0.063mm	5.0

Grading Analysis		
D100	mm	
D60	mm	1.36
D30	mm	0.54
D10	mm	0.209
Uniformity Coefficient		6.5
Curvature Coefficient		1

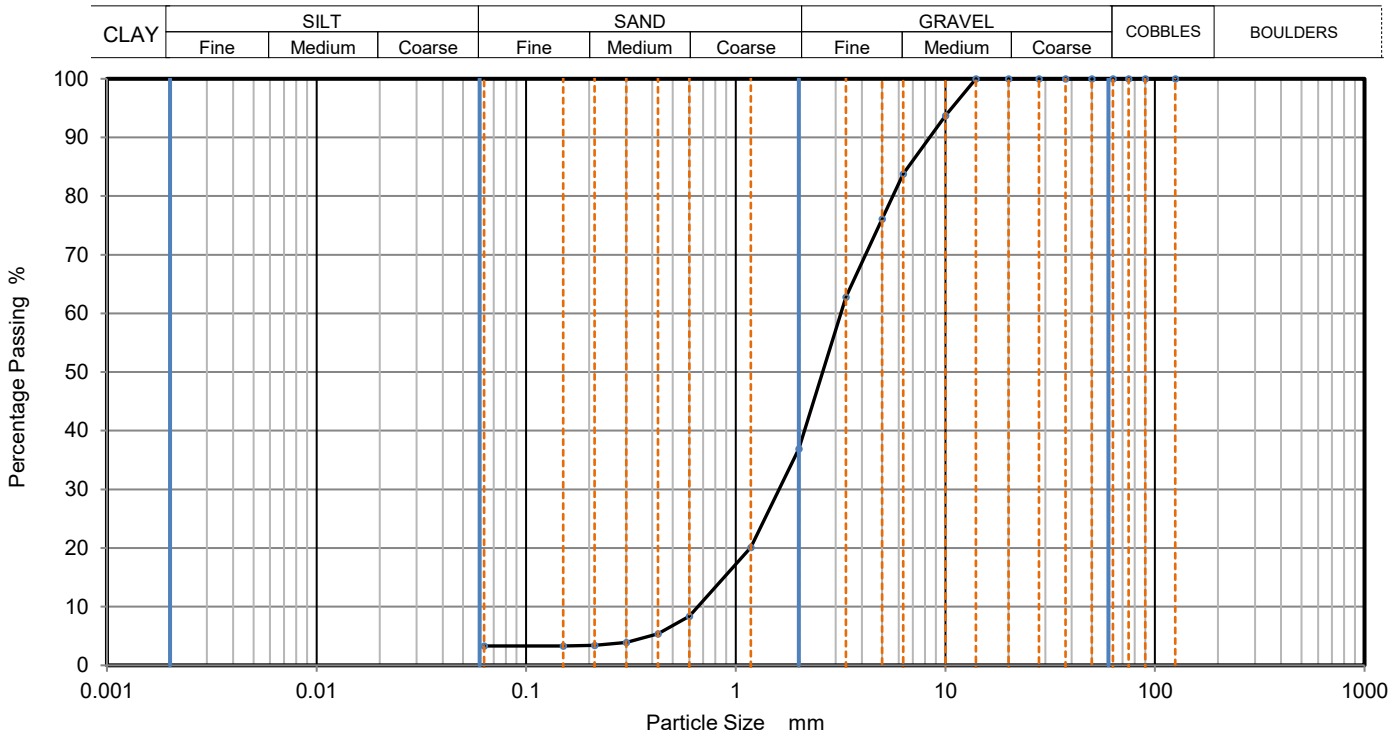
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH35
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Brown slightly gravelly slightly silty fine to coarse SAND.			Sample Depth (m) Top	4.50
				Base	5.50
Specimen Reference	2	Specimen Depth	4.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024030418



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	94		
6.3	84		
5	76		
3.35	63		
2	37		
1.18	20		
0.6	8		
0.425	5		
0.3	4		
0.212	3		
0.15	3		
0.063	3		

Dry Mass of sample, g: 345

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	63.1
Sand	33.7
Fines <0.063mm	3.0

Grading Analysis		
D100	mm	
D60	mm	3.17
D30	mm	1.61
D10	mm	0.659
Uniformity Coefficient		4.8
Curvature Coefficient		1.2

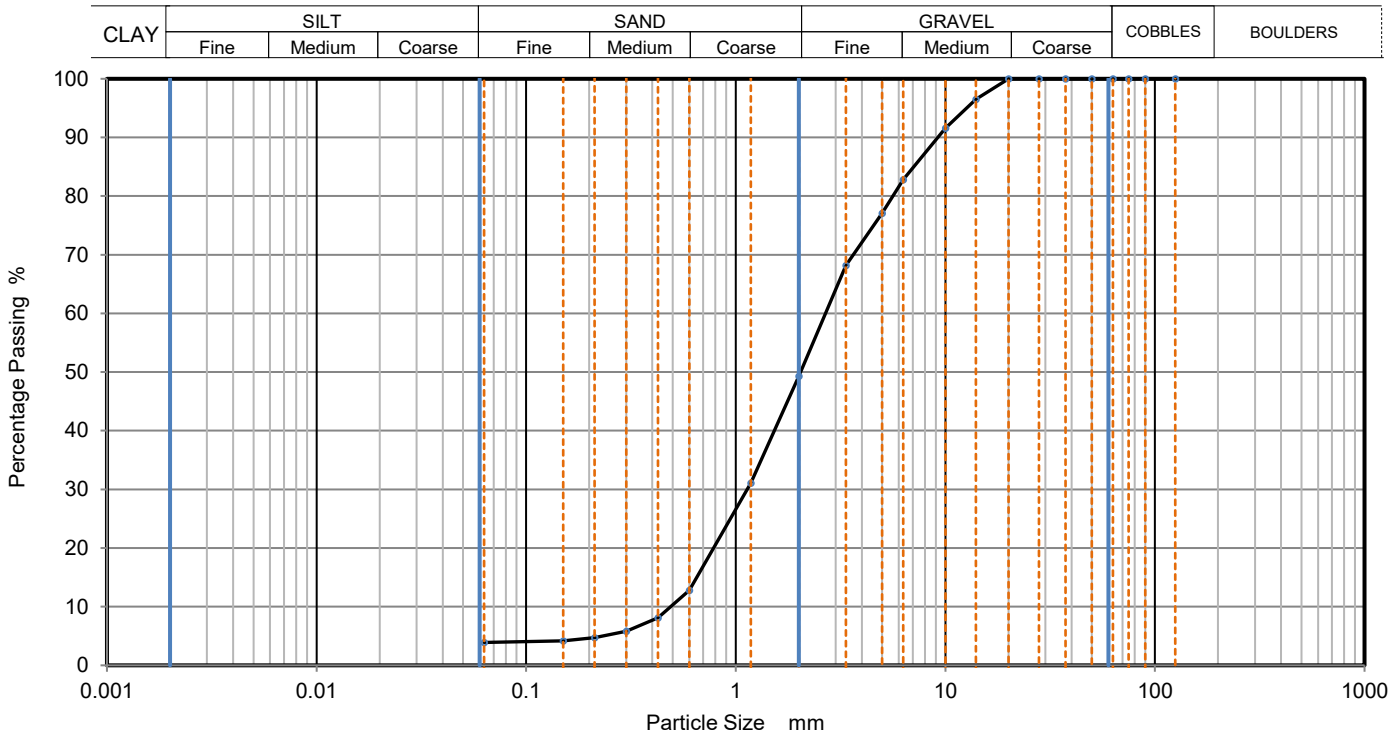
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH36
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly gravelly slightly silty fine to coarse SAND.			Sample Depth (m) Top	2.85
				Base	4.30
Specimen Reference	2	Specimen Depth	2.85 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024030419



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	92		
6.3	83		
5	77		
3.35	68		
2	49		
1.18	31		
0.6	13		
0.425	8		
0.3	6		
0.212	5		
0.15	4		
0.063	4		

Dry Mass of sample, g: 257

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	50.7
Sand	45.4
Fines <0.063mm	4.0

Grading Analysis		
D100	mm	
D60	mm	2.68
D30	mm	1.13
D10	mm	0.49
Uniformity Coefficient		5.5
Curvature Coefficient		0.98

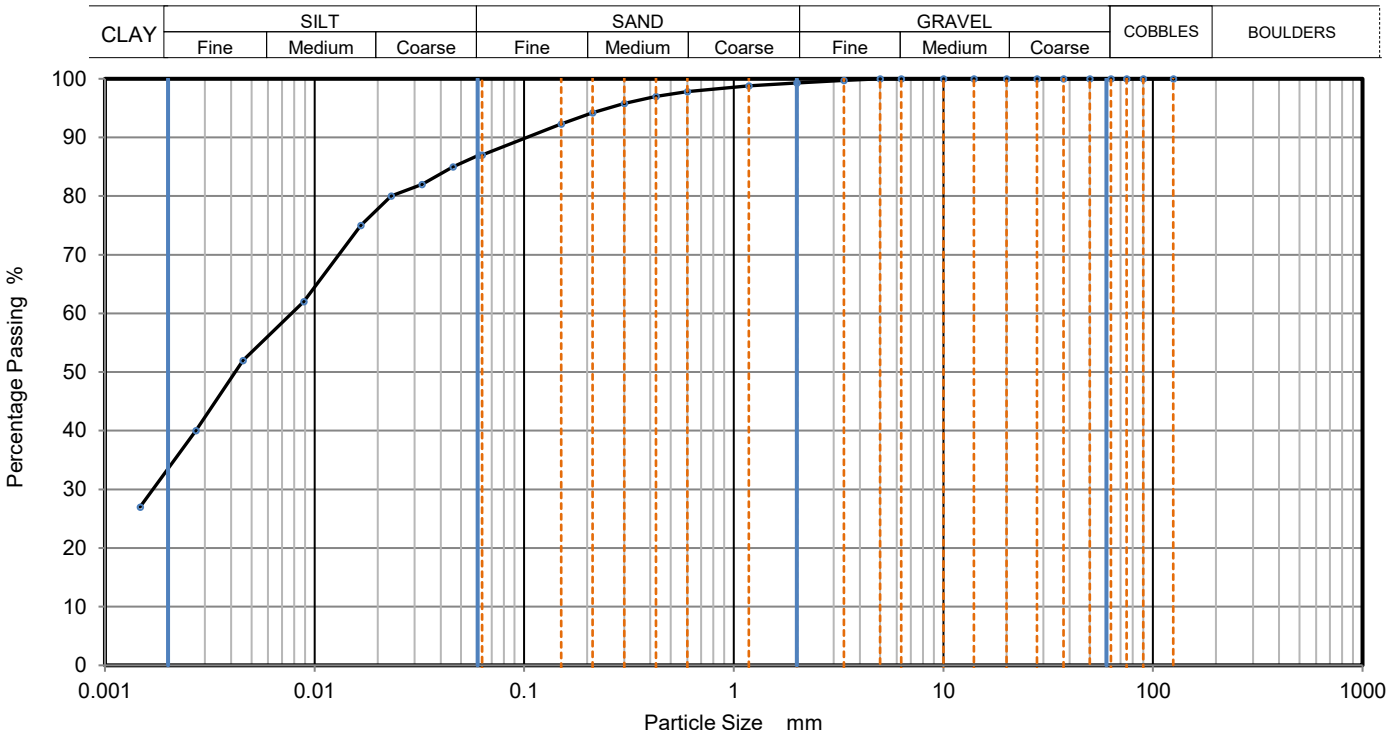
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-BH41
Site Name	Rosslare OWH - GI				
Sample No.					6
Specimen Description	Brown sandy silty CLAY.			Sample Depth (m) Top	5.00
				Base	6.00
Specimen Reference	2	Specimen Depth	5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030421



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06097	87
90	100	0.04568	85
75	100	0.03255	82
63	100	0.02318	80
50	100	0.01663	75
37.5	100	0.00889	62
28	100	0.00456	52
20	100	0.00271	40
14	100	0.00147	27
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density 2.65	(assumed) Mg/m3
0.425	97		
0.3	96		
0.212	94		
0.15	92		
0.063	87		

Dry Mass of sample, g: 244

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.7
Sand	12.3
Silt	53.4
Clay	33.6

Grading Analysis		
D100	mm	
D60	mm	0.0077
D30	mm	0.00168
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

Summary of Laboratory Vane Test Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

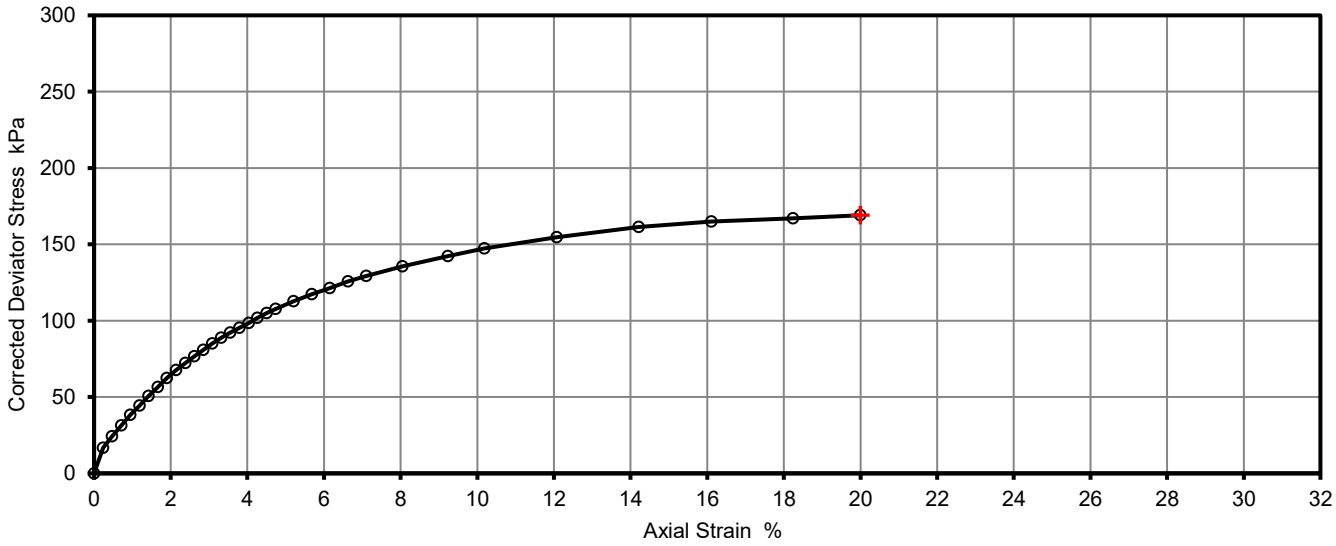
Hole No.	Sample				Specimen Description at test horizon	Moisture Content %	Vane shear strength		Sensitivity	Remarks
	Ref	Top	Base	Type			Undisturbed kPa	Remoulded kPa		
M-BH32	19	4.00	4.45	UT	Greyish brown sandy slightly gravelly silty CLAY.	21	130			

Notes	Date Printed	Approved By	Table
Tests performed in accordance with BS 1377:Part 7:clause 3 using 19mm x 30mm vane Tests carried out in nominally 100mm diameter tube unless noted otherwise Shear strengths are average of at least 3 tests unless noted otherwise	04/04/2024 00:00	Stephen Watson	1 sheet 1

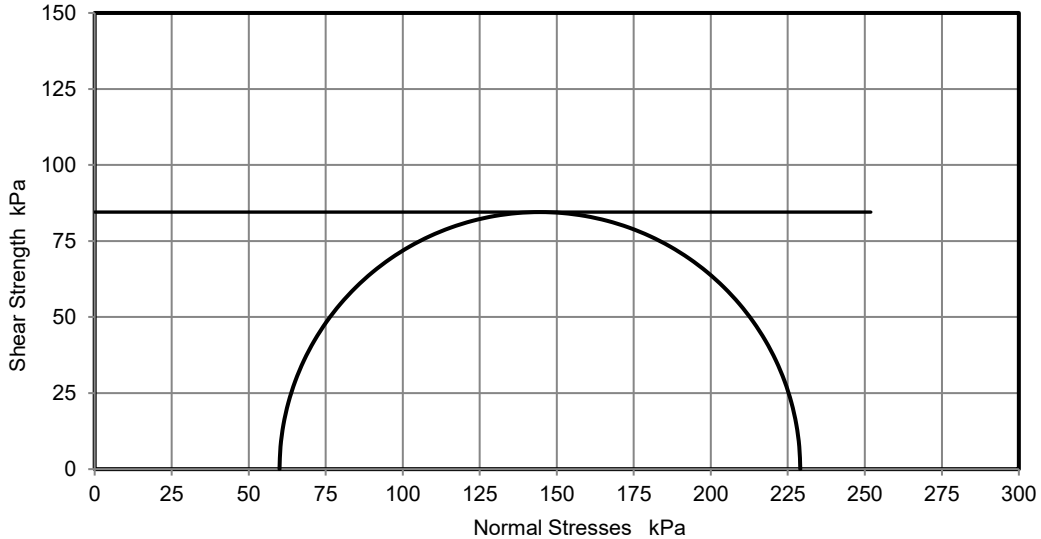
CAUSEWAY GEOTECH	**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**			Job Ref	23-0585
				Borehole/Pit No.	M-BH22
Site Name	Rosslare OWH - GI			Sample No.	30
Soil Description	Brown slightly sandy silty CLAY.			Depth	2.70
Specimen Reference	2	Specimen Depth	2.75 m	Sample Type	UT
Specimen Description	Stiff brown slightly sandy silty CLAY.			KeyLAB ID	Caus202403042
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	14/03/2024

Sample Condition		UNDISTURBED	
Test Number		1	
Length		210.1	mm
Diameter		105.3	mm
Bulk Density		2.13	Mg/m3
Moisture Content		19	%
Dry Density		1.79	Mg/m3
Rate of Strain		3.0	%/min
Cell Pressure		60	kPa
At failure	Axial Strain	20.0	%
	Deviator Stress, (σ1 - σ3)f	169	kPa
	Undrained Shear Strength, cu	85	kPa ½(σ1 - σ3)f
	Mode of Failure		

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks

No failure defined. Testing terminated at 20% axial strain.

Approved: Stephen Watson

Printed: 04/04/2024 12:19

UKAS TESTING
10122

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH22	Sample Reference		5	
Depth (m)	3.65	Sample Submerged?		Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown slightly sandy silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	25.0	25.0	25.0
Bulk Density (Mg/m^3)	2.01	2.02	2.00
Dry Density (Mg/m^3)	1.61	1.62	1.60
Voids Ratio	0.650	0.640	0.656
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	1.699	2.136	2.840
Shearing			
Rate of Strain (mm/min)	0.045	0.045	0.045
Peak Shear Stress (kPa)	41.5	89.7	161.8
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	6.003	4.743	6.243
Final Conditions			
Water Content (%)	27.0	25.0	25.0
Dry Density (Mg/m^3)	1.90	2.04	2.18
Voids Ratio	0.483	0.442	0.392

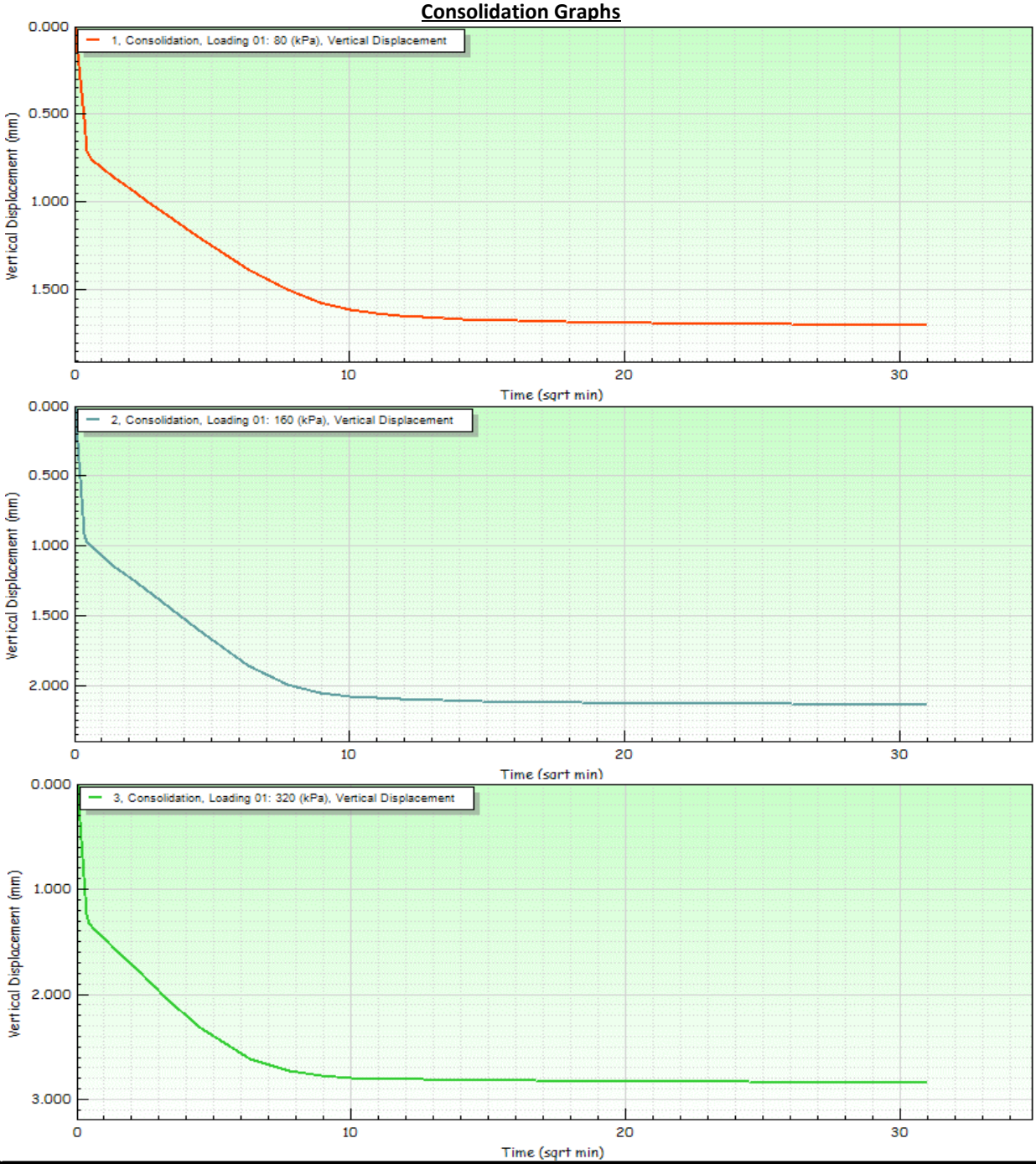
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH22	Sample Reference	5	
Depth (m)	3.65	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

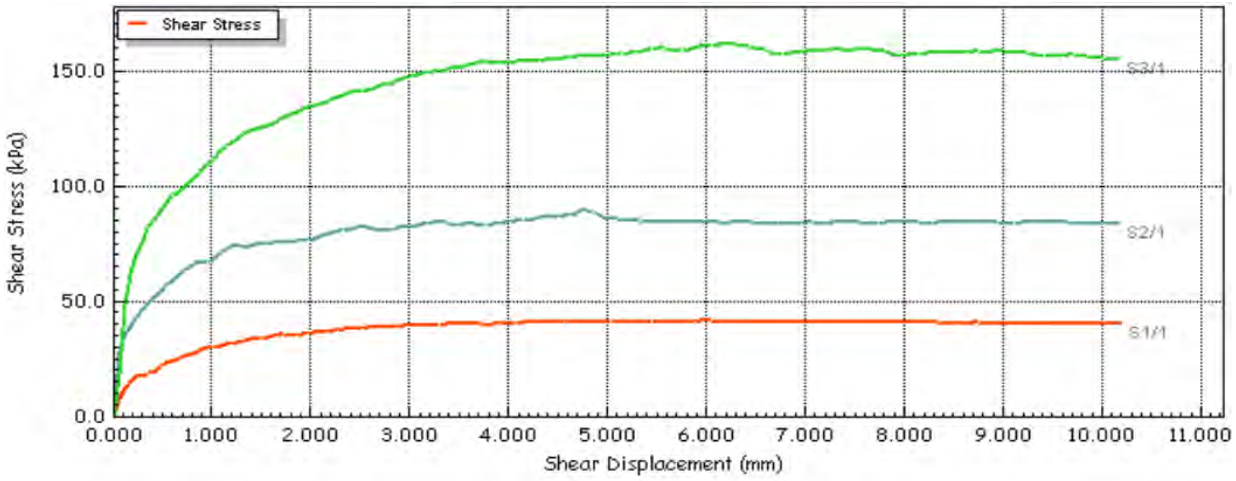


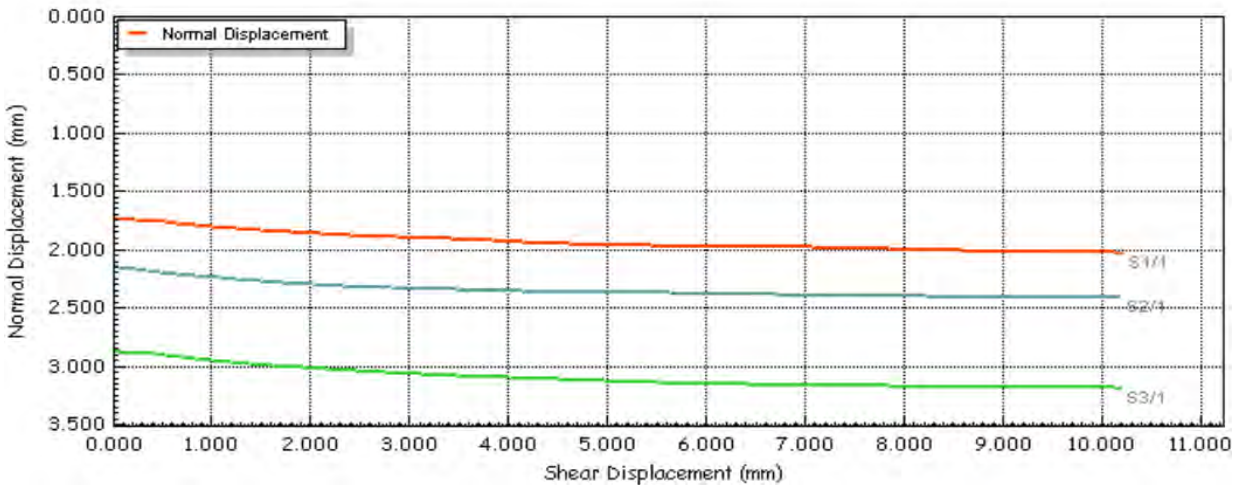
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH22	Sample Reference		5	
Depth (m)	3.65	Sample Submerged?		Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



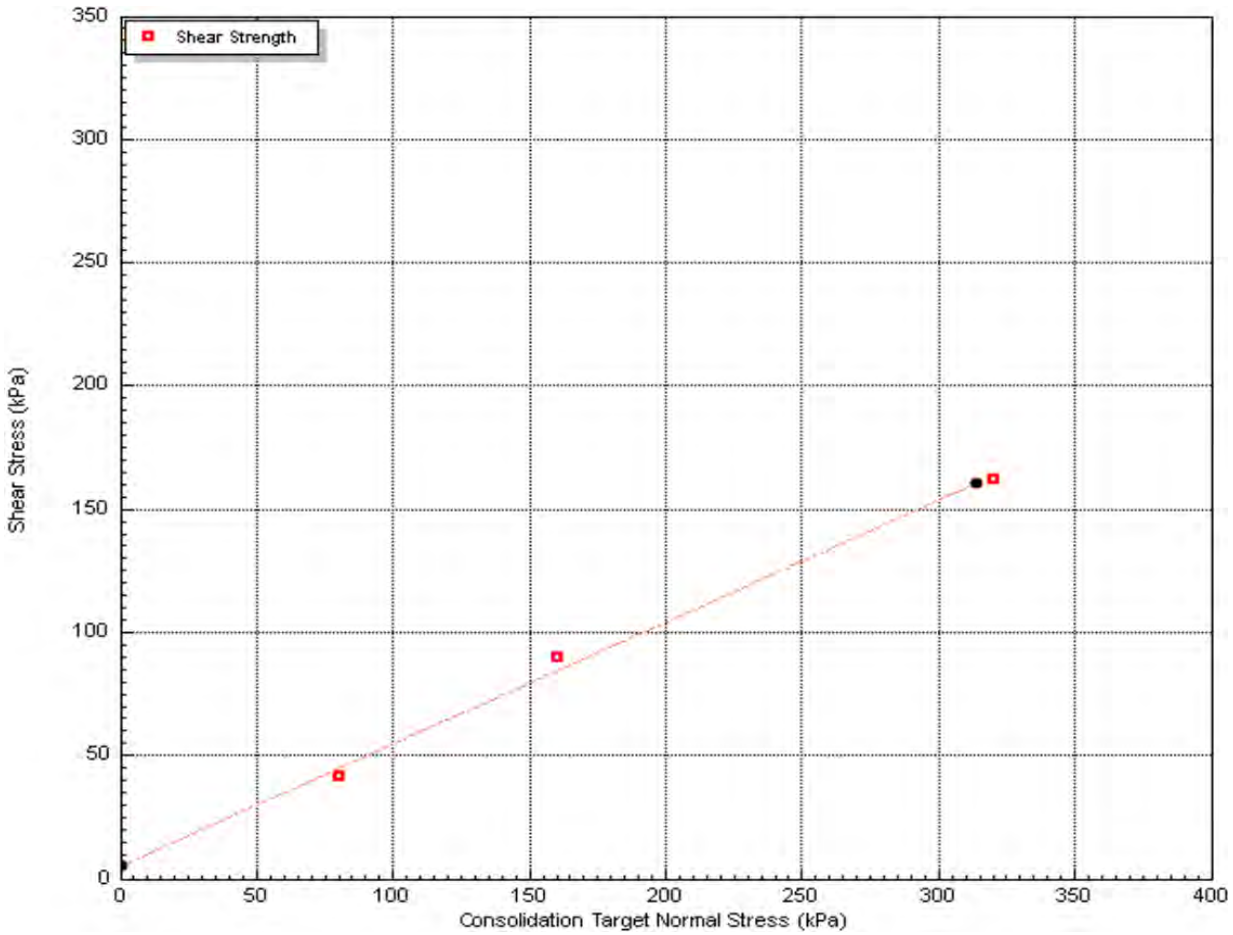


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH22	Sample Reference	5	
Depth (m)	3.65	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	5		
Angle of Shearing Resistance (°)	26.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH31	Sample Reference		5	
Depth (m)	3.50	Sample Submerged?		Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown slightly silty fine to coarse SAND.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	19.0	19.0	19.0
Bulk Density (Mg/m^3)	1.92	1.94	1.92
Dry Density (Mg/m^3)	1.62	1.63	1.62
Voids Ratio	0.637	0.622	0.639
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	0.381	0.469	0.923
Shearing			
Rate of Strain (mm/min)	0.600	0.600	0.600
Peak Shear Stress (kPa)	70.3	132.4	214.0
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	2.637	2.337	2.337
Final Conditions			
Water Content (%)	22.0	21.0	22.0
Dry Density (Mg/m^3)	1.64	1.68	1.74
Voids Ratio	0.602	0.584	0.560

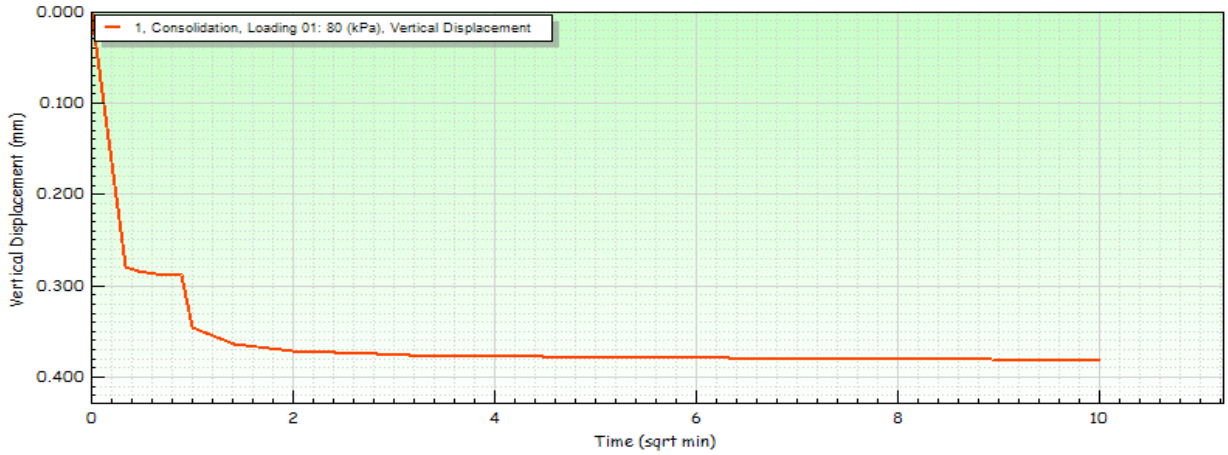
UKAS TESTING
10122

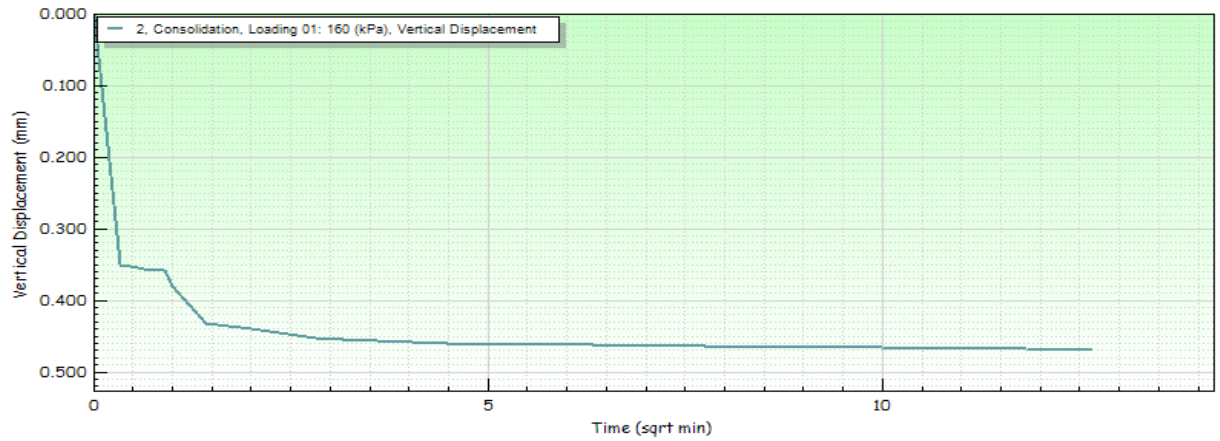
CAUSEWAY GEOTECH

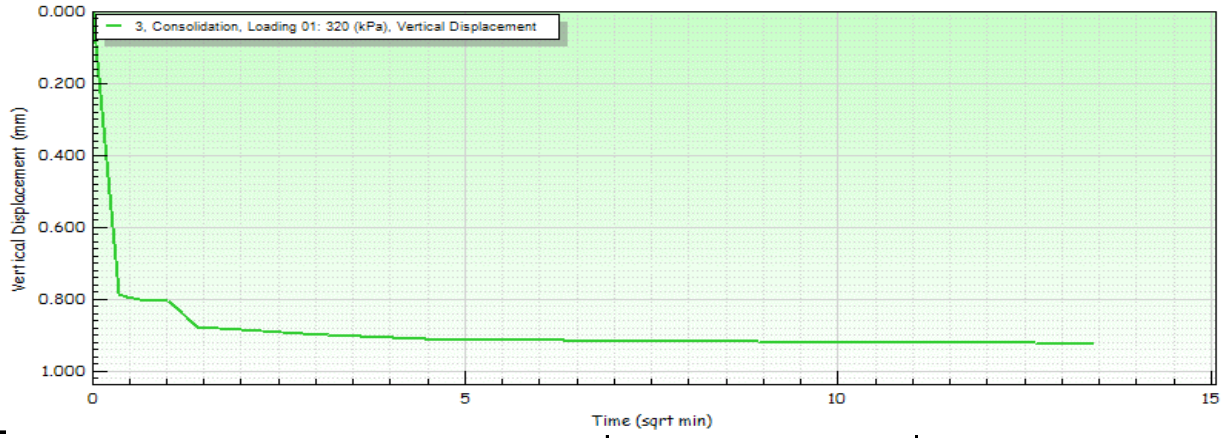
Tested	Approved
Aaron Nutt	

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH31	Sample Reference	5	
Depth (m)	3.50	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs





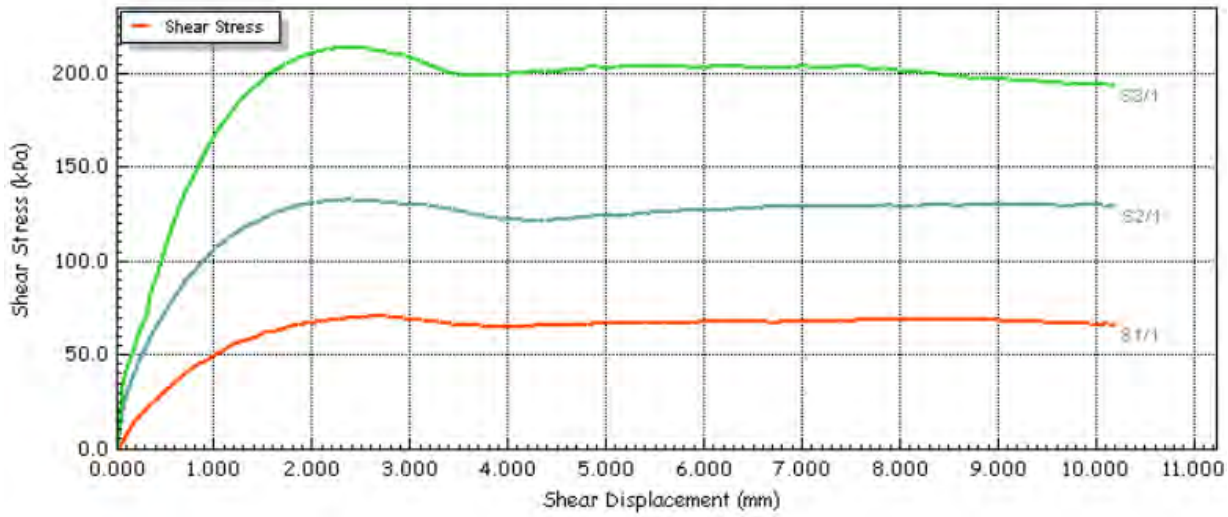


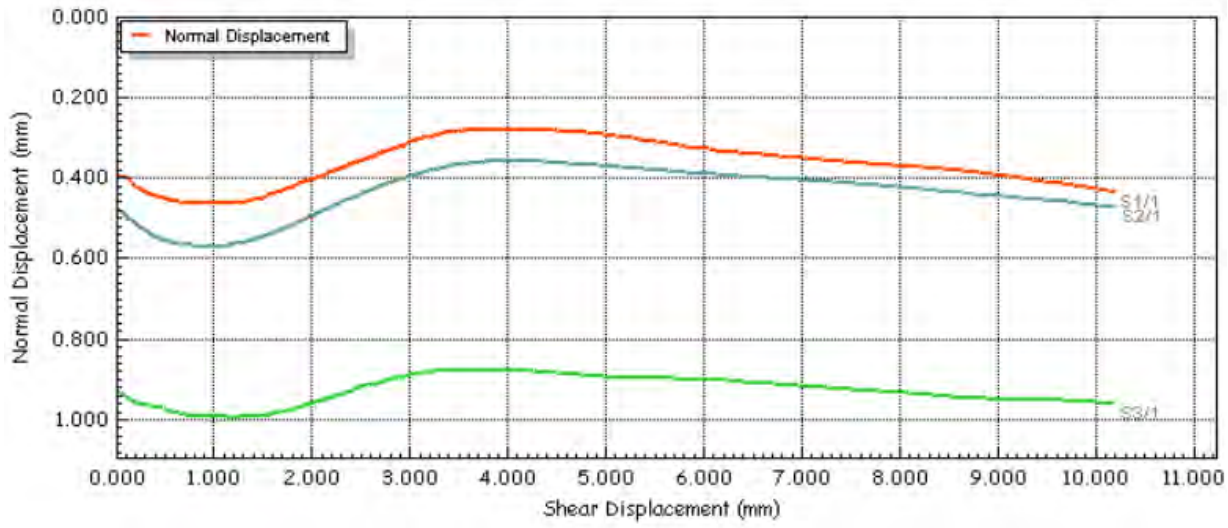
	Tested	Approved
10122	Aaron Nutt	

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH31	Sample Reference		5	
Depth (m)	3.50	Sample Submerged?		Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



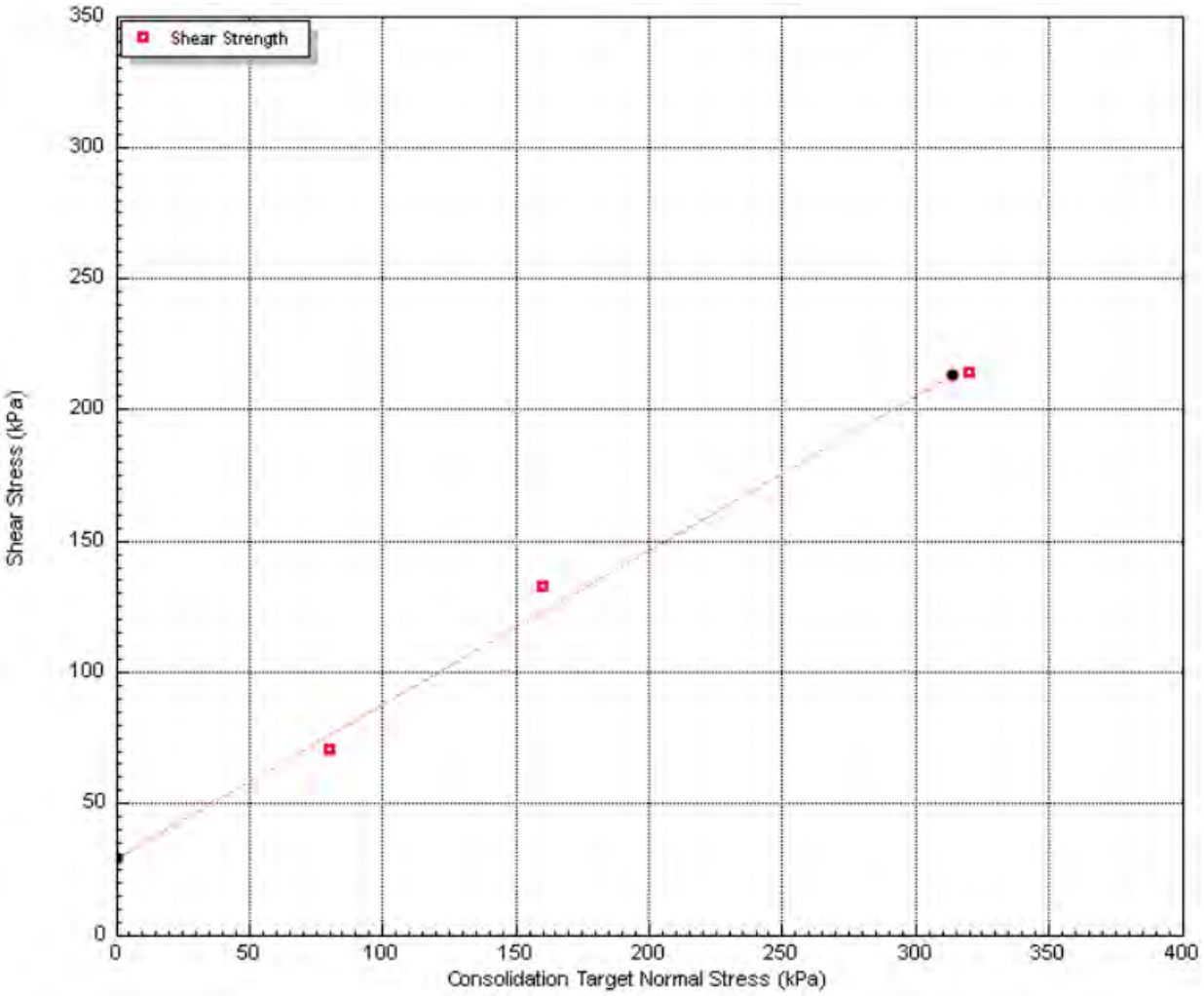


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH31	Sample Reference	5	
Depth (m)	3.50	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	30		
Angle of Shearing Resistance (°)	30.5		



UKAS TESTING 10122 / CAUSEWAY GEOTECH	**Tested**	**Approved**
	Aaron Nutt	

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH35	Sample Reference		5	
Depth (m)	3.50	Sample Submerged?		Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)		2.65	Assumed
Description	Brown slightly gravelly slightly silty fine to coarse SAND.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	7.9	7.9	7.9
Bulk Density (Mg/m^3)	1.85	1.85	1.86
Dry Density (Mg/m^3)	1.72	1.71	1.72
Voids Ratio	0.545	0.549	0.539
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	0.273	0.901	0.561
Shearing			
Rate of Strain (mm/min)	0.600	0.600	0.600
Peak Shear Stress (kPa)	51.6	121.4	232.8
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	4.923	5.277	7.077
Final Conditions			
Water Content (%)	16.0	17.0	17.0
Dry Density (Mg/m^3)	1.72	1.80	1.72
Voids Ratio	0.454	0.432	0.472

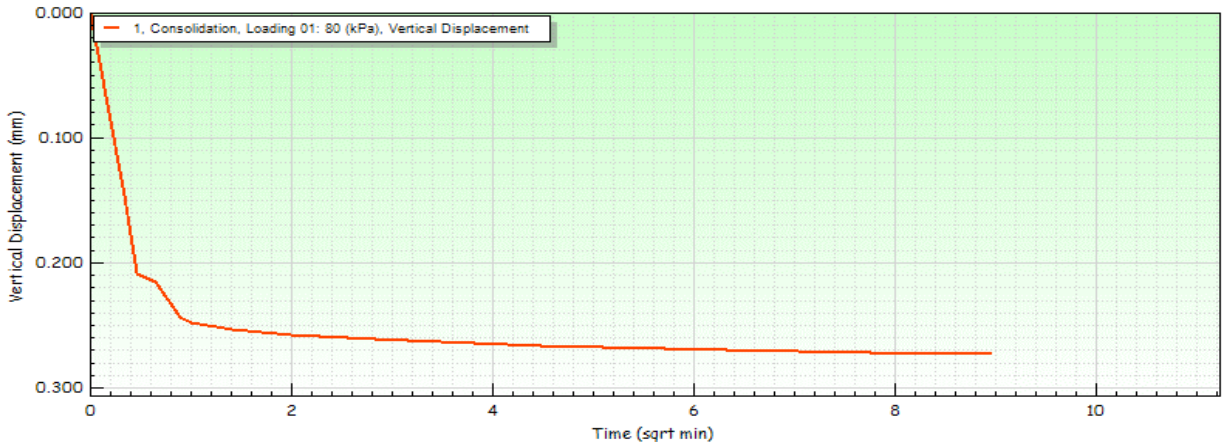
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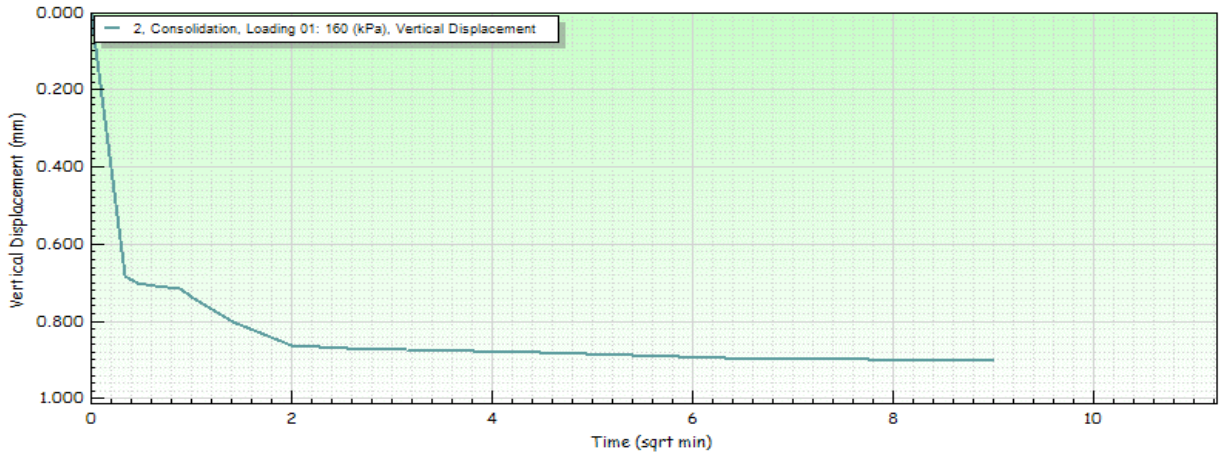
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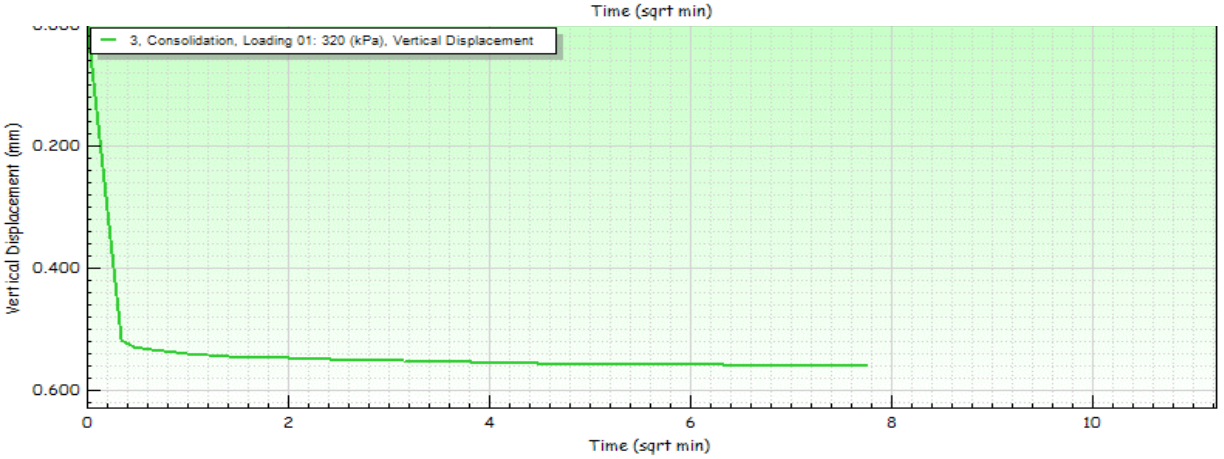
Tested	Approved
Aaron Nutt	

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH35	Sample Reference	5	
Depth (m)	3.50	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs





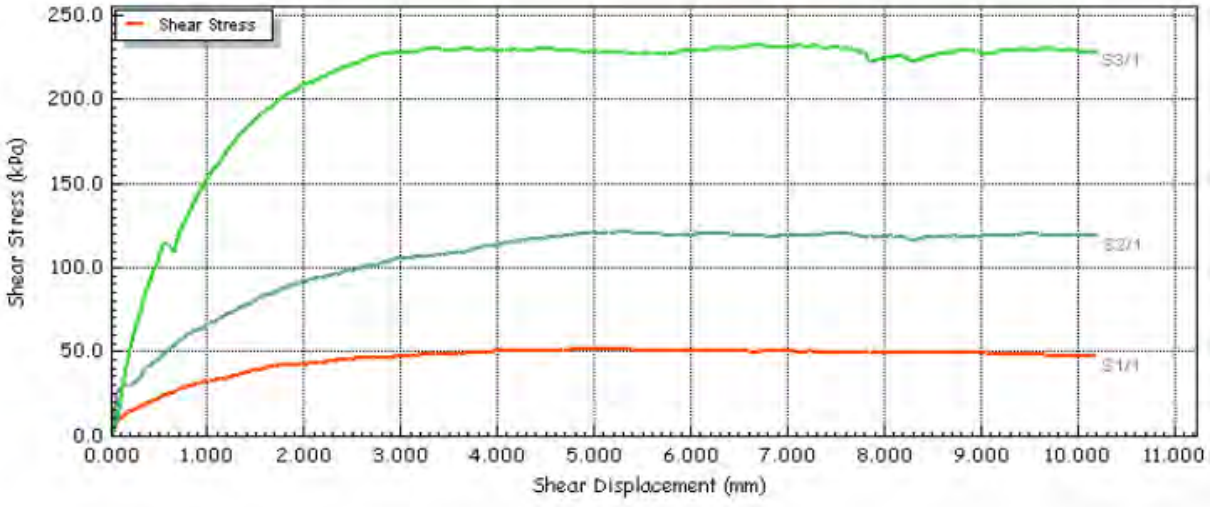


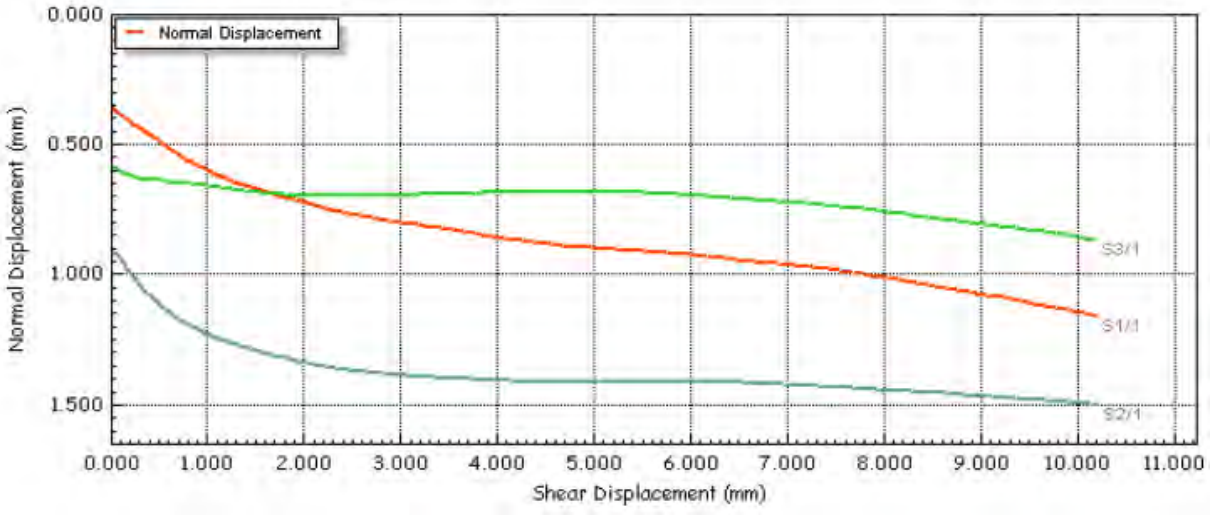
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH35	Sample Reference	5	
Depth (m)	3.50	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



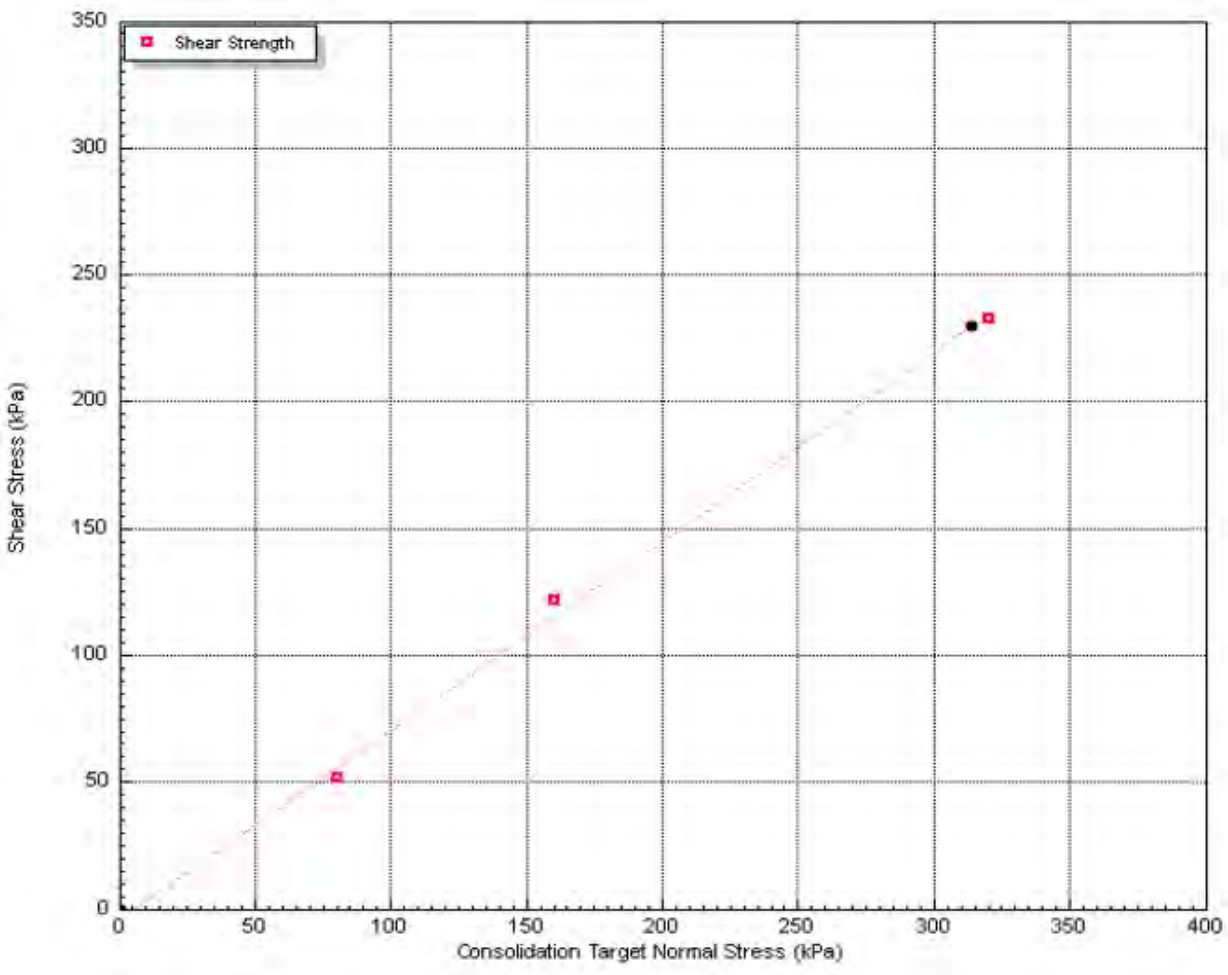


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH35	Sample Reference	5	
Depth (m)	3.50	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	-4		
Angle of Shearing Resistance (°)	35.0		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	

Lab Sheet Reference : LAB25R - Version 4

Certificate of Analysis

Certificate Number 24-05676 *Issued:* 20-Mar-24

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

Our Reference 24-05676

Client Reference ~ 23-0585

Order No ~ (not supplied)

Contract Title ~ Rosslare Europort

Description One Soil sample.

Date Received 18-Mar-24

Date Started 18-Mar-24

Date Completed 20-Mar-24

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-05676
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort

Lab No	2313628
Sample ID ~	M-BH22
Depth ~	1.20
Other ID ~	18
Sample Type ~	D
Sampling Date ~	15/03/2024
Sampling Time ~	n/s

Test	Method	LOD	Units	
Inorganics				
Organic matter	DETSC 2002#	0.1	%	< 0.1

Information in Support of the Analytical Results

Our Ref 24-05676
Client Ref ~ 23-0585
Contract ~ Rosslare Europort

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2313628	M-BH22 1.20 SOIL	15/03/24	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Key:

~ Sample details are provided by the client and can affect the validity of the results
***** -not accredited.
# -MCERTS (accreditation only applies if report carries the MCERTS logo).
$ -subcontracted.
n/s -not supplied.
I/S -insufficient sample.
U/S -unsuitable sample.
t/f -to follow.
nd -not detected.

End of Report

CAUSEWAY GEOTECH

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Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

28 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/02/2024 and 28/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

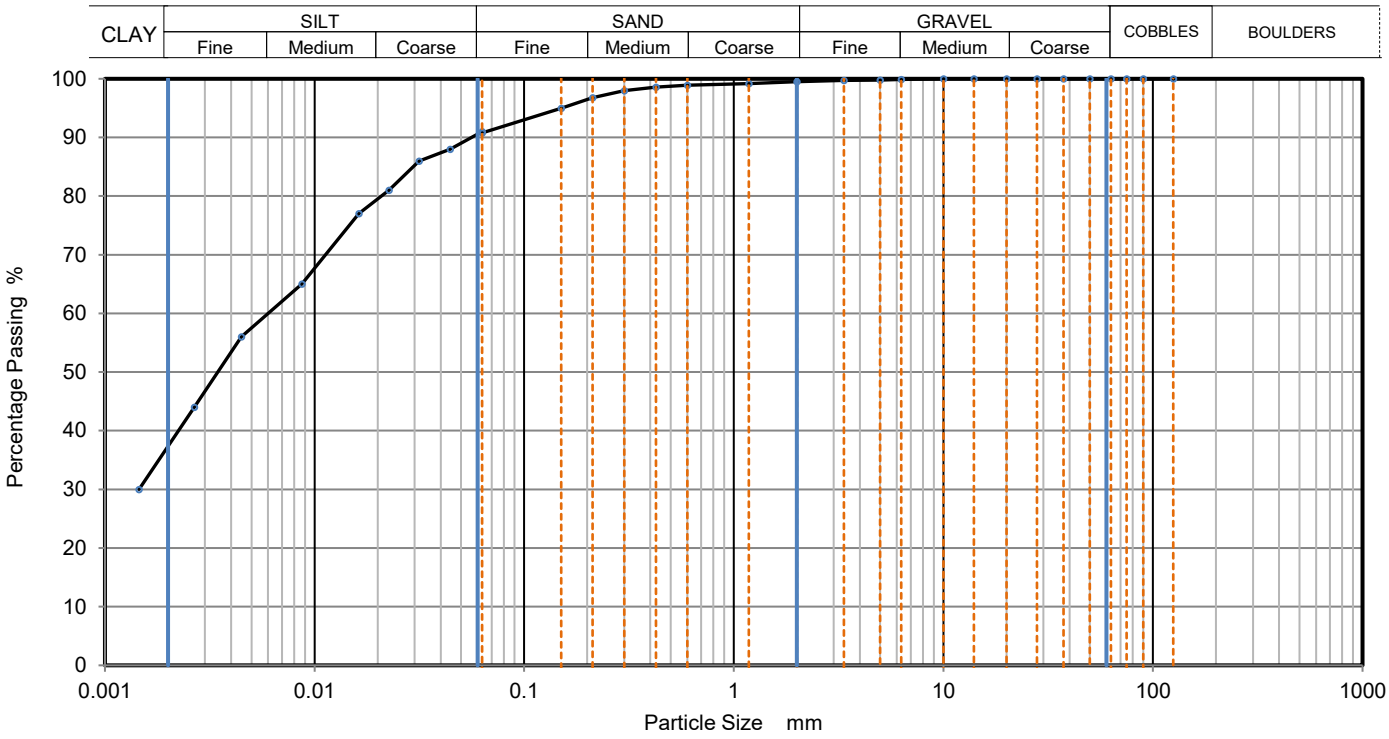
Report Reference: Schedule G07

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	4

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-VC08
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.60
				Base	1.10
Specimen Reference	2	Specimen Depth	0.6 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030422



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	91
90	100	0.04428	88
75	100	0.03156	86
63	100	0.02267	81
50	100	0.01627	77
37.5	100	0.00871	65
28	100	0.00447	56
20	100	0.00267	44
14	100	0.00145	30
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	97		
0.15	95		
0.063	91		

Dry Mass of sample, g: 356

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.5
Sand	8.7
Silt	53.2
Clay	37.6

Grading Analysis		
D100	mm	
D60	mm	0.00601
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

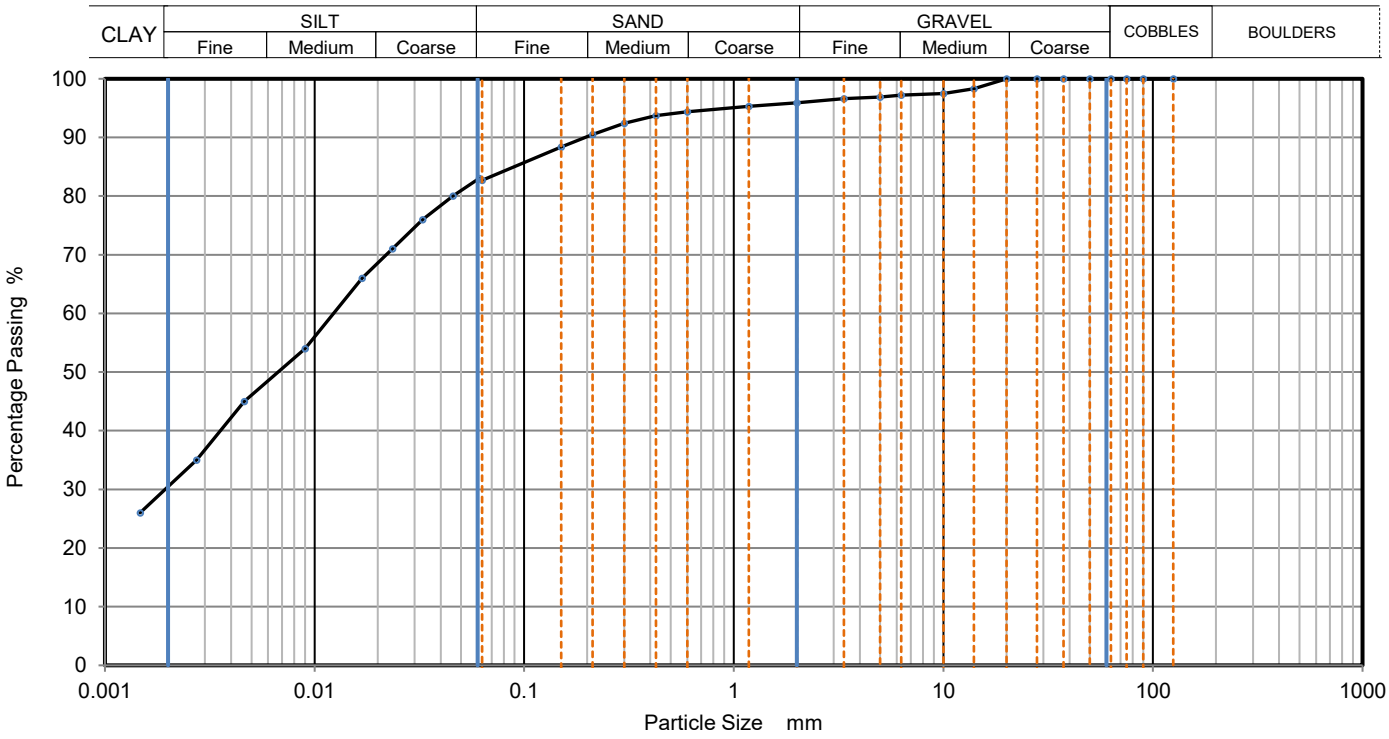
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen Watson

UKAS TESTING

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-VC16
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.70
				Base	1.40
Specimen Reference	2	Specimen Depth	0.7 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030423



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06097	83
90	100	0.04568	80
75	100	0.03279	76
63	100	0.02352	71
50	100	0.01687	66
37.5	100	0.00901	54
28	100	0.00462	45
20	100	0.00273	35
14	98	0.00147	26
10	98		
6.3	97		
5	97		
3.35	97		
2	96		
1.18	95		
0.6	94	Particle density	(assumed)
0.425	94	2.65	Mg/m3
0.3	92		
0.212	91		
0.15	88		
0.063	83		

Dry Mass of sample, g: 507

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	4.1
Sand	13.2
Silt	52.0
Clay	30.7

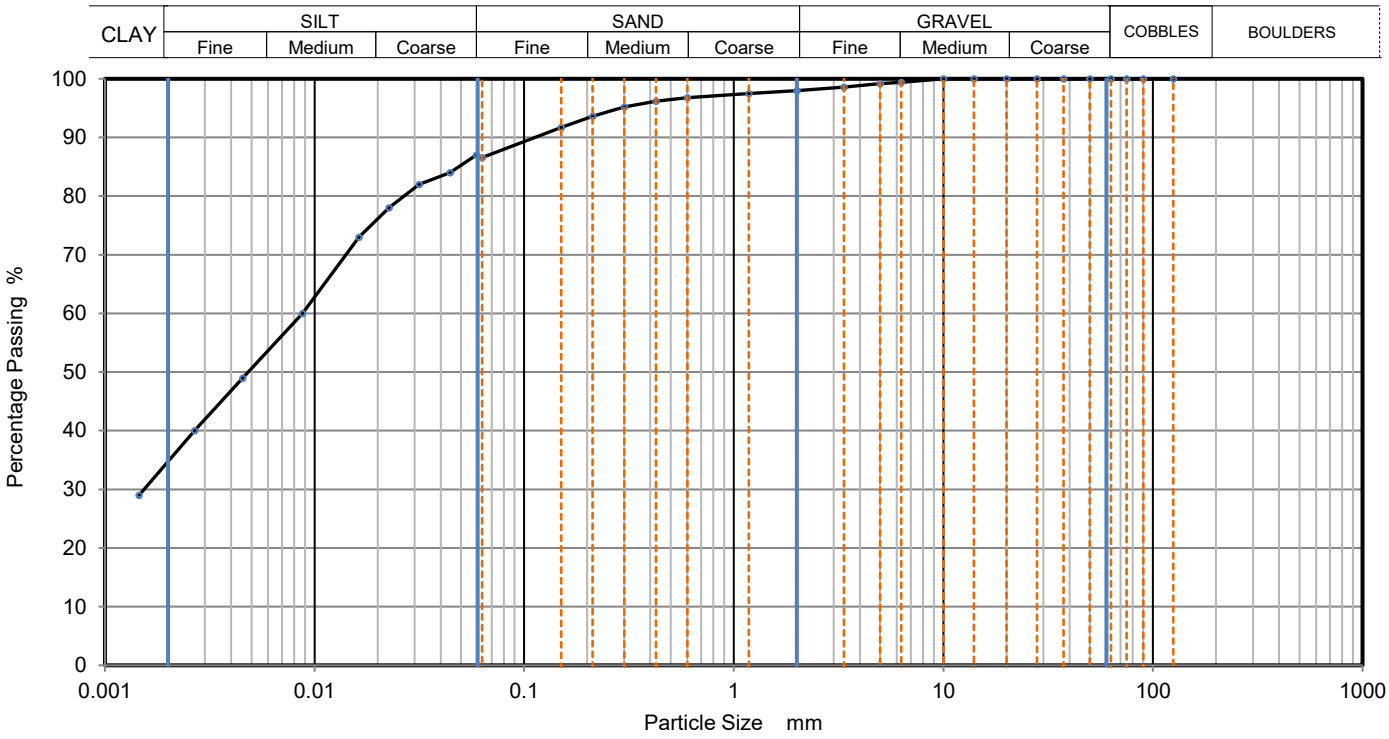
Grading Analysis		
D100	mm	
D60	mm	0.0122
D30	mm	0.00191
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-VC47
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.00
				Base	2.00
Specimen Reference	2	Specimen Depth	1 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030424



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05908	87
90	100	0.04428	84
75	100	0.03156	82
63	100	0.02267	78
50	100	0.01627	73
37.5	100	0.00877	60
28	100	0.00453	49
20	100	0.00268	40
14	100	0.00145	29
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	95		
0.212	94		
0.15	92		
0.063	87		

Dry Mass of sample, g: 501

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.0
Sand	11.4
Silt	52.0
Clay	34.6

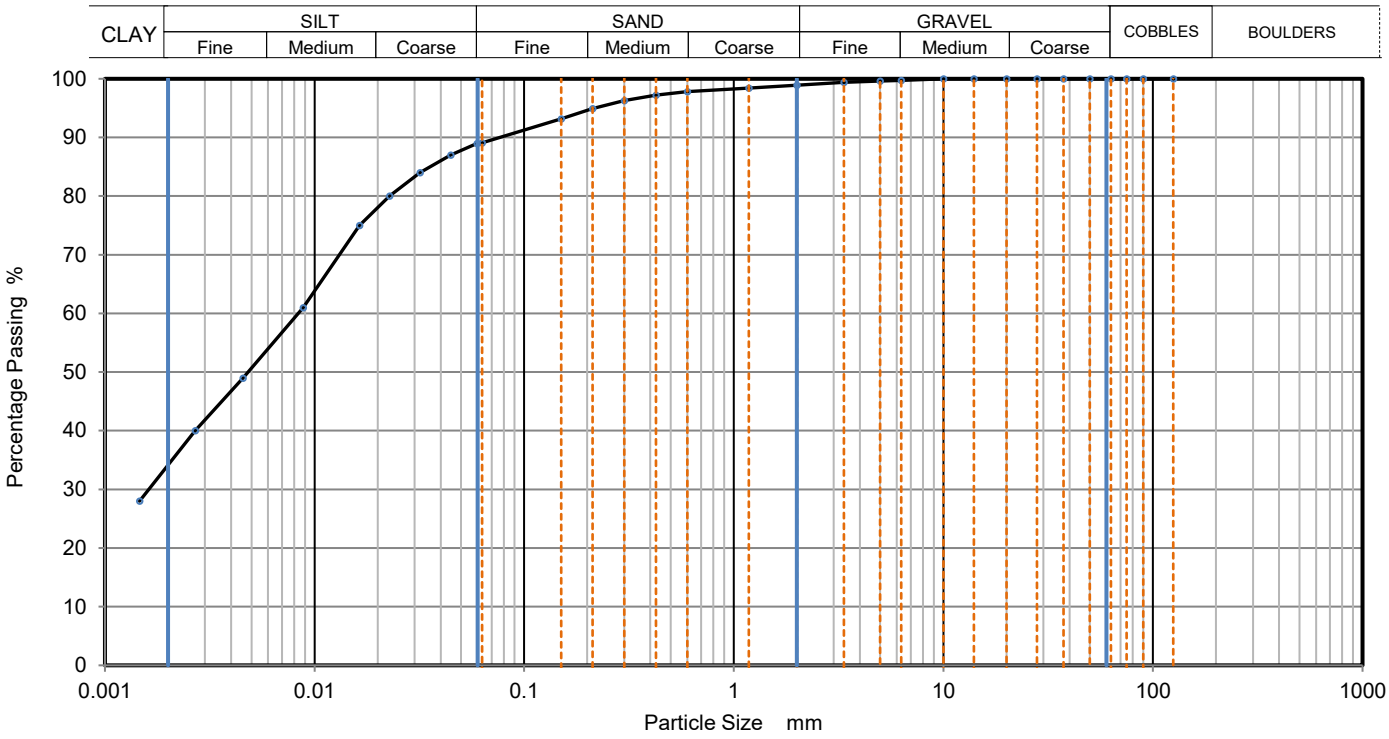
Grading Analysis		
D100	mm	
D60	mm	0.00879
D30	mm	0.00155
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-VC60
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.25
				Base	1.10
Specimen Reference	2	Specimen Depth	0.25 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024030425



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05956	89
90	100	0.04464	87
75	100	0.03181	84
63	100	0.02284	80
50	100	0.01639	75
37.5	100	0.00883	61
28	100	0.00456	49
20	100	0.00270	40
14	100	0.00146	28
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	98	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	95		
0.15	93		
0.063	89		

Dry Mass of sample, g: 451

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.1
Sand	9.8
Silt	55.0
Clay	34.1

Grading Analysis		
D100	mm	
D60	mm	0.00836
D30	mm	0.00161
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

UKAS TESTING

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NI: +44 (0)28 276 66640
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Stephenstown Industrial Estate
Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

28 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/02/2024 and 28/03/2024.

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Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

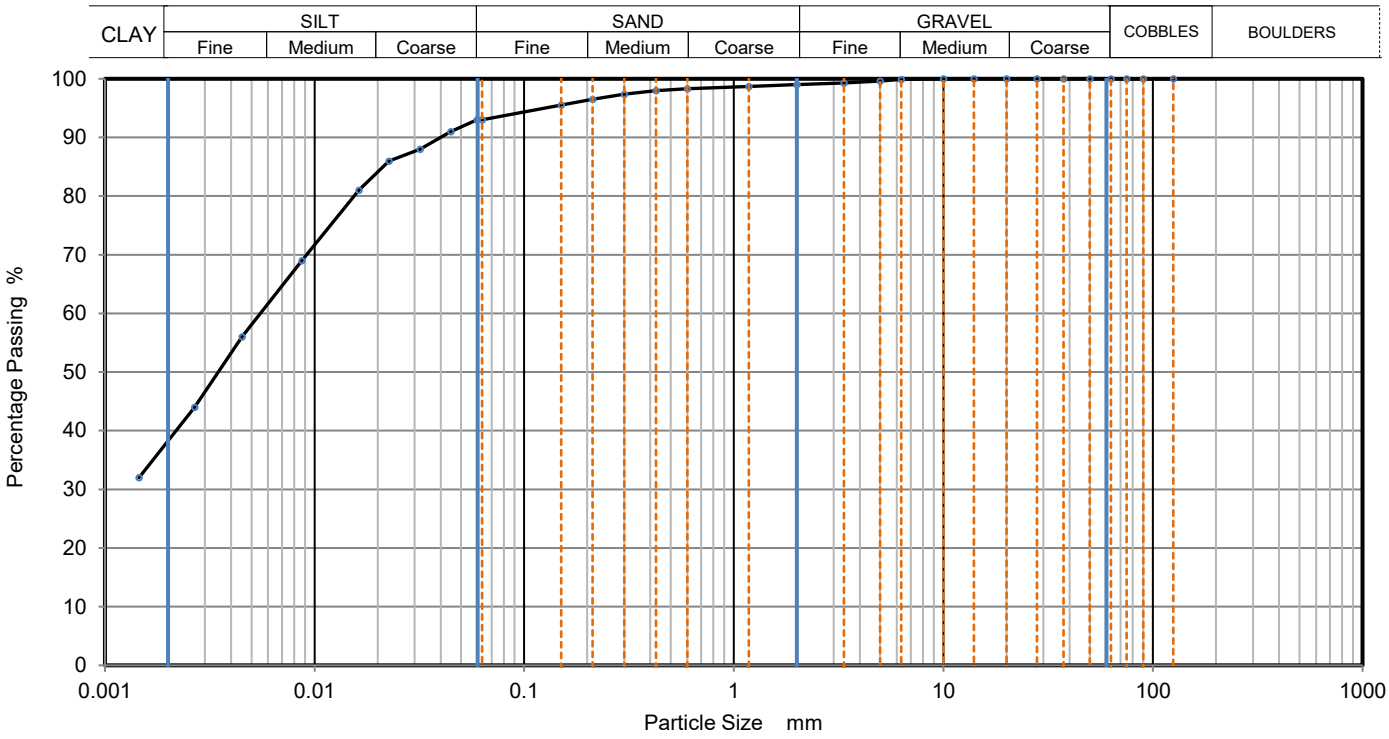
Report Reference: Schedule G08

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	5
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	5

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-VC05
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	2.00
				Sample Depth (m) Base	
Specimen Reference	1	Specimen Depth	2 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403190



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05956	93
90	100	0.04464	91
75	100	0.03181	88
63	100	0.02267	86
50	100	0.01627	81
37.5	100	0.00871	69
28	100	0.00450	56
20	100	0.00268	44
14	100	0.00145	32
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	97		
0.212	97		
0.15	96		
0.063	93		

Dry Mass of sample, g: 510

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.0
Sand	6.0
Silt	54.8
Clay	38.2

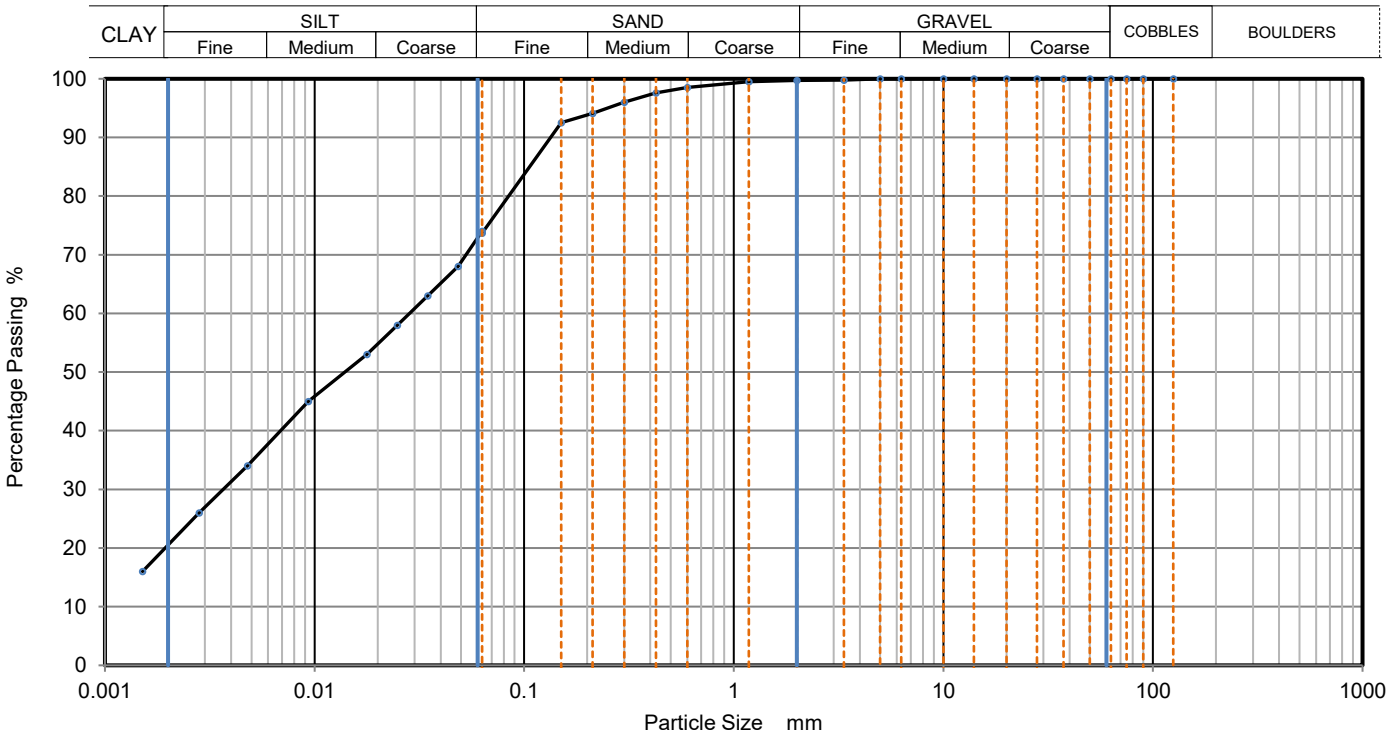
Grading Analysis		
D100	mm	
D60	mm	0.0055
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-VC26
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.00
				Sample Depth (m) Base	
Specimen Reference	1	Specimen Depth	1 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403191



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	74
90	100	0.04836	68
75	100	0.03465	63
63	100	0.02482	58
50	100	0.01778	53
37.5	100	0.00935	45
28	100	0.00479	34
20	100	0.00281	26
14	100	0.00151	16
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	93		
0.063	74		

Dry Mass of sample, g: 500

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.3
Sand	26.0
Silt	53.1
Clay	20.6

Grading Analysis		
D100	mm	
D60	mm	0.0283
D30	mm	0.0036
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

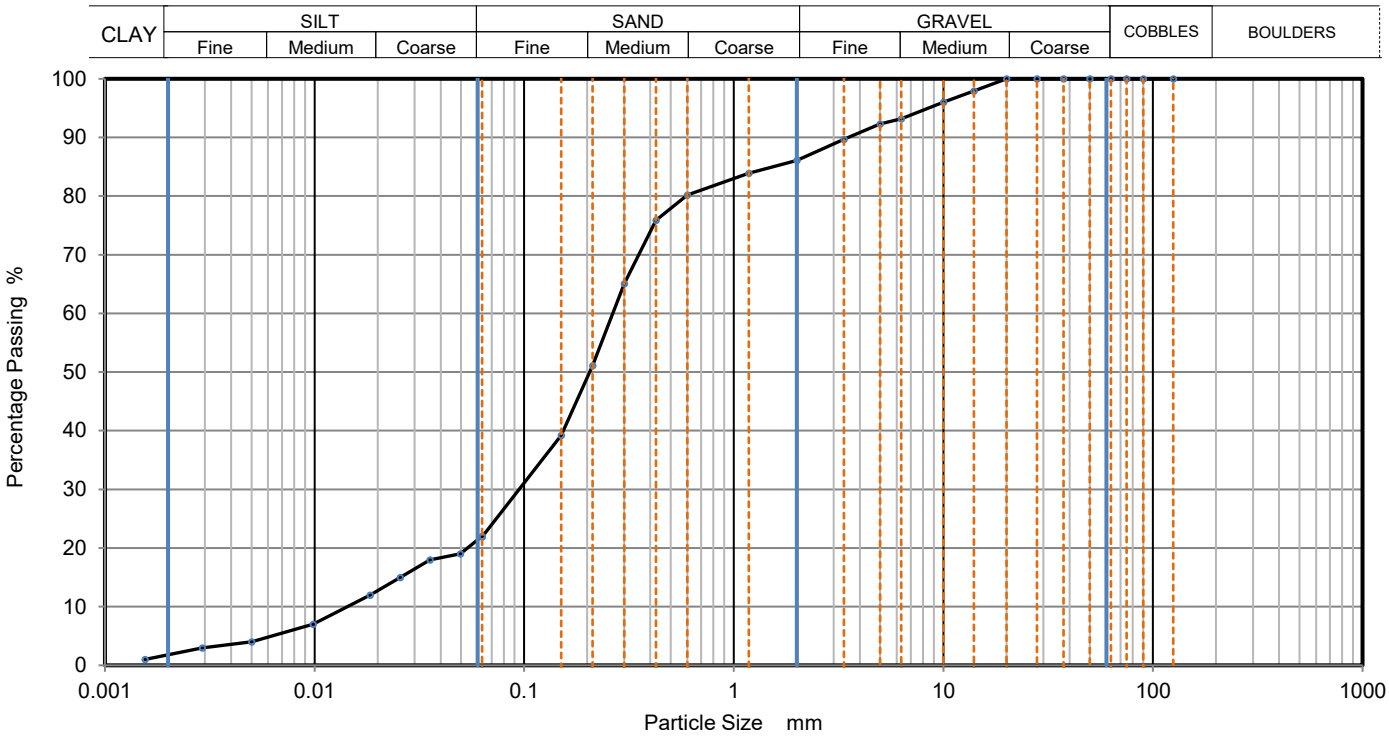
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-VC34
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown slightly gravelly clayey fine to coarse SAND.			Sample Depth (m) Top	0.00
				Base	
Specimen Reference	1	Specimen Depth	0 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403192



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	22
90	100	0.04965	19
75	100	0.03555	18
63	100	0.02560	15
50	100	0.01843	12
37.5	100	0.00984	7
28	100	0.00500	4
20	100	0.00292	3
14	98	0.00155	1
10	96		
6.3	93		
5	92		
3.35	90		
2	86		
1.18	84		
0.6	80	Particle density	(assumed)
0.425	76	2.65	Mg/m3
0.3	65		
0.212	51		
0.15	39		
0.063	22		

Dry Mass of sample, g: 372

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	13.9
Sand	64.3
Silt	20.2
Clay	1.6

Grading Analysis		
D100	mm	
D60	mm	0.264
D30	mm	0.0947
D10	mm	0.0141
Uniformity Coefficient		19
Curvature Coefficient		2.4

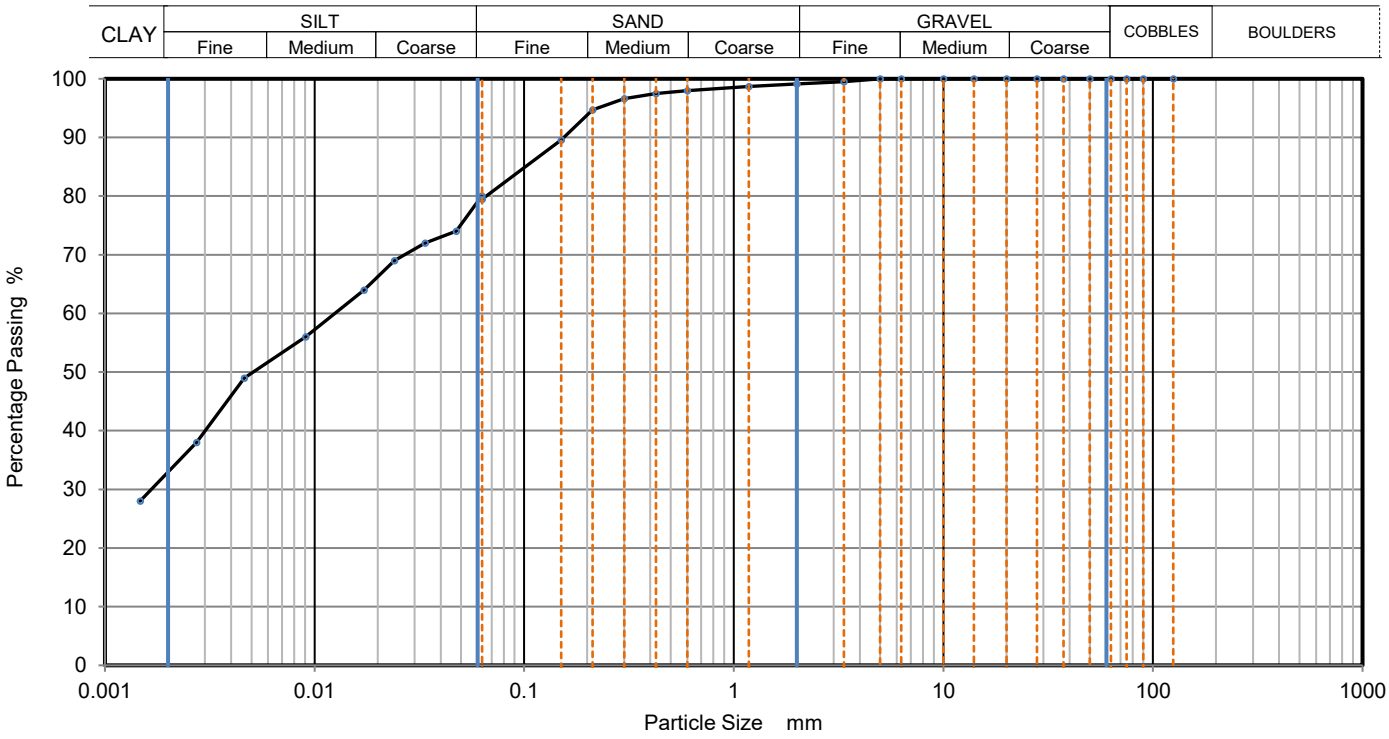
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					M-VC40
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	0.00
				Base	
Specimen Reference	1	Specimen Depth	0 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403193



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06281	80
90	100	0.04737	74
75	100	0.03373	72
63	100	0.02402	69
50	100	0.01721	64
37.5	100	0.00906	56
28	100	0.00462	49
20	100	0.00273	38
14	100	0.00147	28
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	97		
0.212	95		
0.15	90		
0.063	80		

Dry Mass of sample, g: 390

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.9
Sand	19.6
Silt	46.2
Clay	33.3

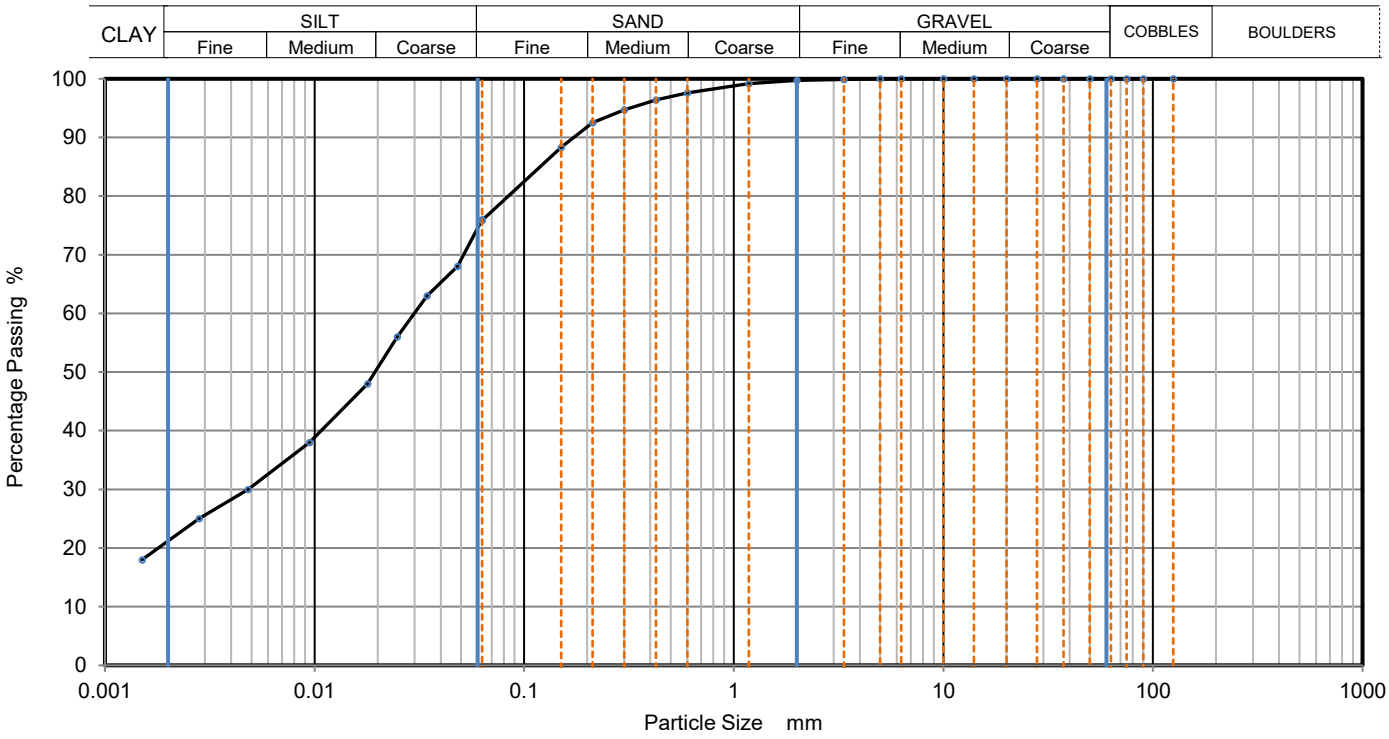
Grading Analysis		
D100	mm	
D60	mm	0.0122
D30	mm	0.00164
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**23-0585**
				Borehole/Pit No.	M-VC56
Site Name	Rosslare OWH - GI			Sample No.	5
Specimen Description	Brown slightly sandy silty CLAY.			Sample Depth (m) Top	1.00
				Sample Depth (m) Base	
Specimen Reference	1	Specimen Depth	1 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus202403194



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	76
90	100	0.04803	68
75	100	0.03443	63
63	100	0.02482	56
50	100	0.01789	48
37.5	100	0.00946	38
28	100	0.00481	30
20	100	0.00281	25
14	100	0.00150	18
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	98	Particle density 2.65	(assumed) Mg/m3
0.425	96		
0.3	95		
0.212	93		
0.15	88		
0.063	76		

Dry Mass of sample, g: 363

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.3
Sand	23.8
Silt	54.7
Clay	21.2

Grading Analysis		
D100	mm	
D60	mm	0.0299
D30	mm	0.00463
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

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Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

28 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/02/2024 and 28/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

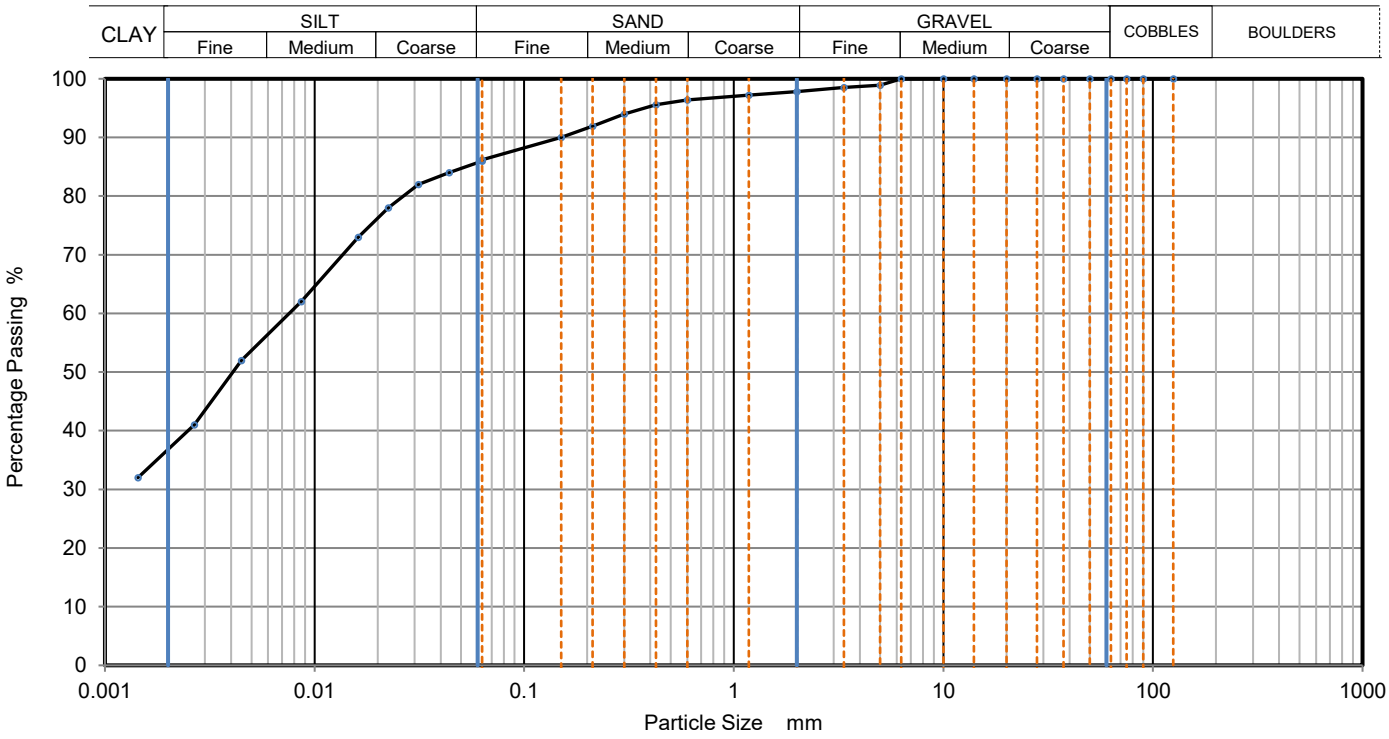
Report Reference: Schedule G09

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	2
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	2

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-VC42
Site Name	Rosslare OWH - GI				Sample No.		5
Specimen Description	Brown slightly sandy silty CLAY.				Sample Depth (m)	Top	1.20
						Base	
Specimen Reference	1	Specimen Depth	1.2	m	Sample Type		B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202403195



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	86
90	100	0.04393	84
75	100	0.03131	82
63	100	0.02249	78
50	100	0.01615	73
37.5	100	0.00865	62
28	100	0.00447	52
20	100	0.00267	41
14	100	0.00144	32
10	100		
6.3	100		
5	99		
3.35	99		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	94		
0.212	92		
0.15	90		
0.063	86		

Dry Mass of sample, g: 500

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.2
Sand	11.7
Silt	49.2
Clay	36.9

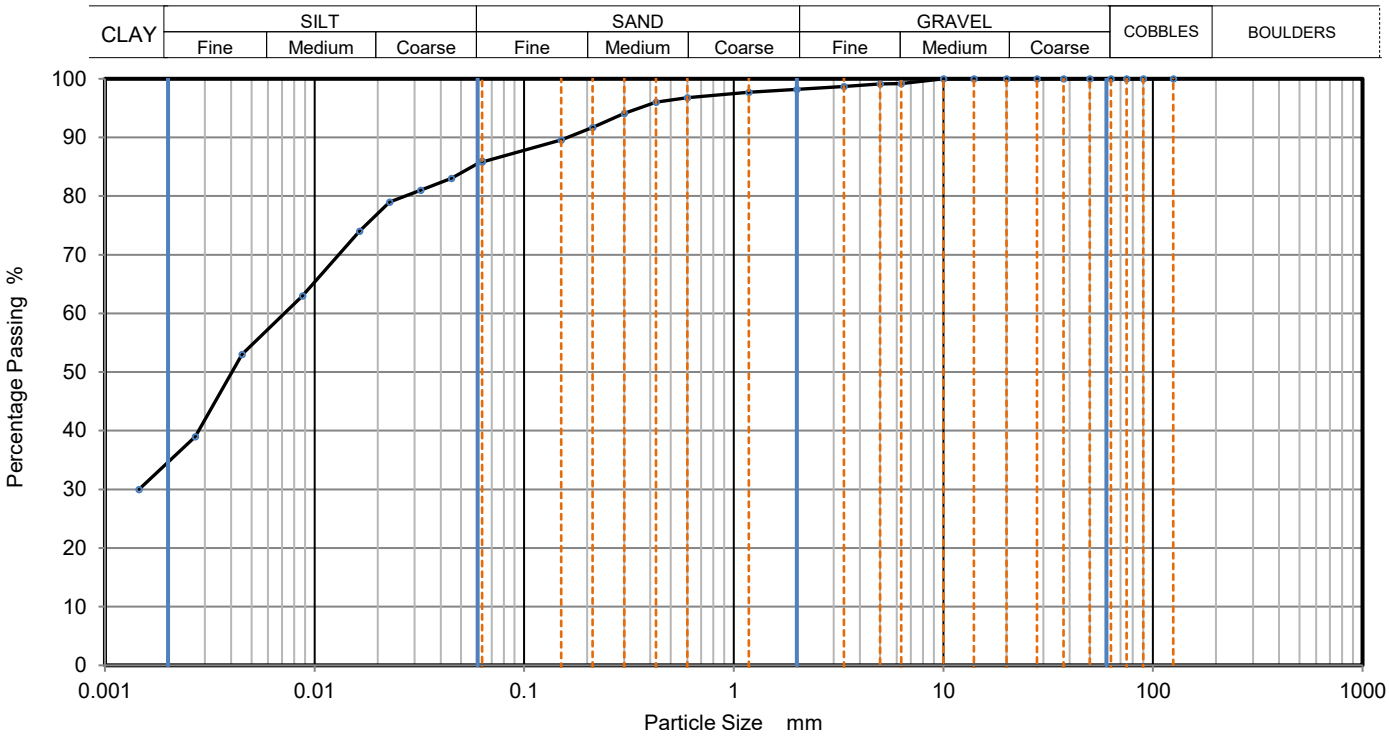
Grading Analysis		
D100	mm	
D60	mm	0.00742
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		23-0585
					Borehole/Pit No.		M-VC48
Site Name	Rosslare OWH - GI				Sample No.		5
Specimen Description	Brown slightly sandy silty CLAY.				Sample Depth (m)	Top	1.00
						Base	
Specimen Reference	1	Specimen Depth	1	m	Sample Type		B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5				KeyLAB ID		Caus202403196



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	86
90	100	0.04499	83
75	100	0.03206	81
63	100	0.02284	79
50	100	0.01639	74
37.5	100	0.00877	63
28	100	0.00450	53
20	100	0.00270	39
14	100	0.00145	30
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	94		
0.212	92		
0.15	90		
0.063	86		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	1.8
Sand	12.4
Silt	50.9
Clay	34.9

Grading Analysis		
D100	mm	
D60	mm	0.00727
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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

Approved
Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

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Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

8 April 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 11/03/2024 and 08/04/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Schedule G10

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	3
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	1
	Extra over days (more than initial 3 days)		3

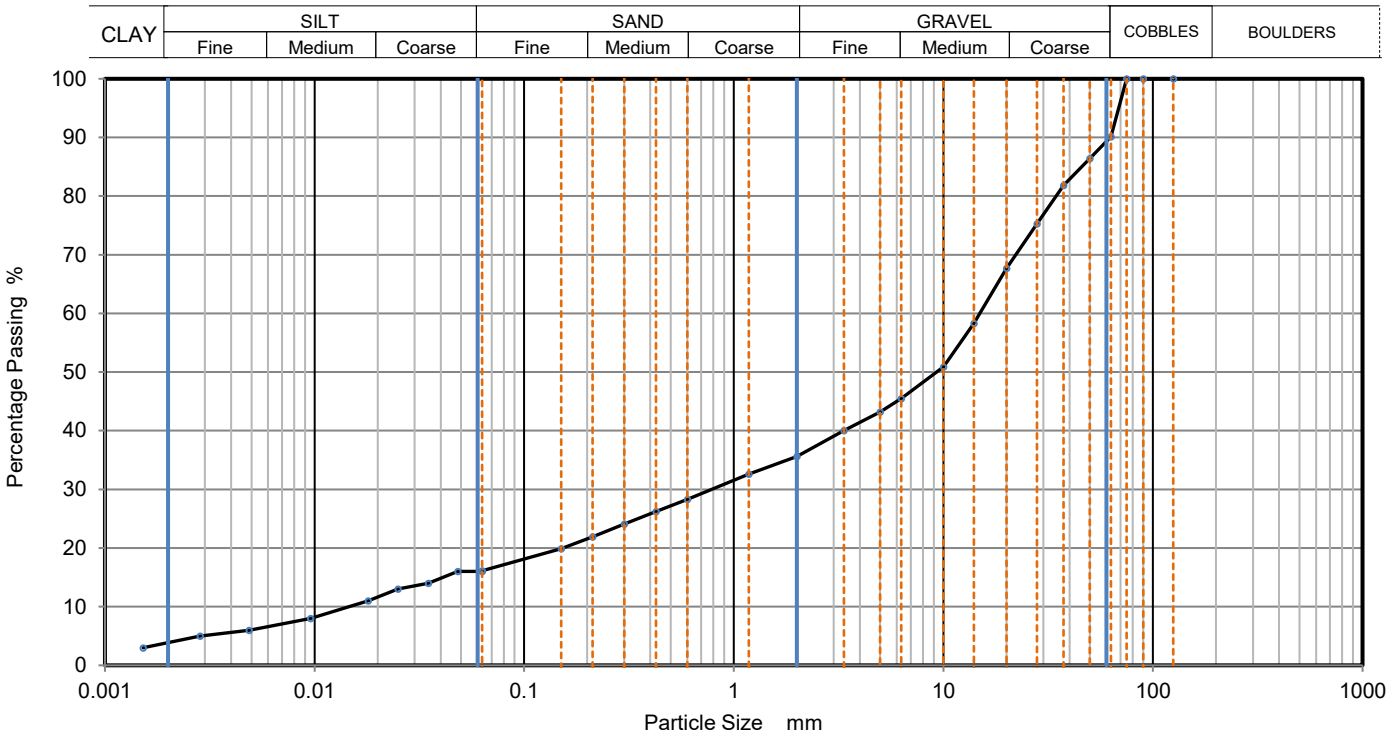
SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	Organic Matter Content		1

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					L-BH01
Site Name	Rosslare OWH - GI			Sample No.	3
Specimen Description	Grey sandy gravelly silty CLAY.			Sample Depth (m) Top	1.50
				Base	3.30
Specimen Reference	2	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024031162



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	16
90	100	0.04829	16
75	100	0.03485	14
63	90	0.02497	13
50	86	0.01800	11
37.5	82	0.00958	8
28	75	0.00487	6
20	68	0.00284	5
14	58	0.00152	3
10	51		
6.3	46		
5	43		
3.35	40		
2	36		
1.18	33		
0.6	28	Particle density	(assumed)
0.425	26	2.65	Mg/m3
0.3	24		
0.212	22		
0.15	20		
0.063	16		

Dry Mass of sample, g: 16862

Sample Proportions	% dry mass
Cobbles	9.9
Gravel	54.5
Sand	19.6
Silt	12.2
Clay	3.8

Grading Analysis		
D100	mm	
D60	mm	15
D30	mm	0.782
D10	mm	0.0154
Uniformity Coefficient		970
Curvature Coefficient		2.7

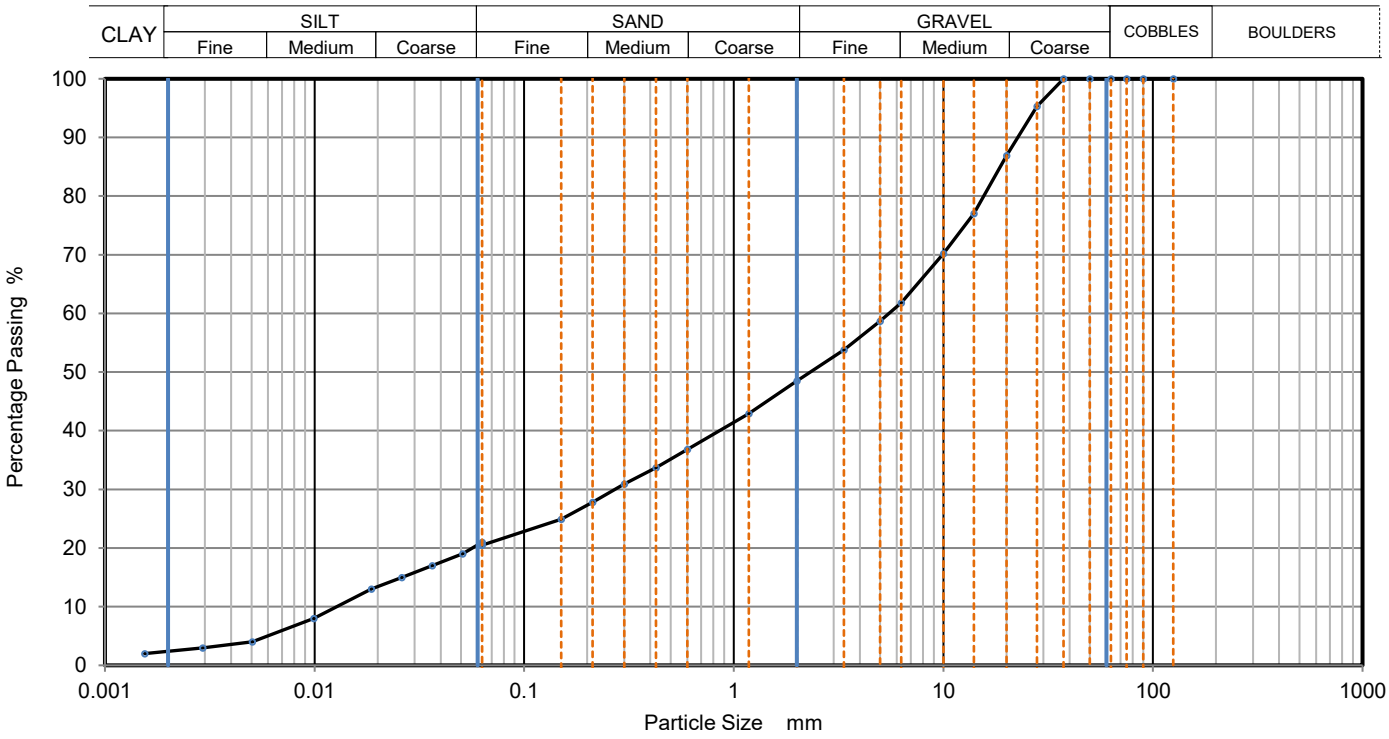
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					L-BH01
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Grey sandy gravelly silty CLAY.			Sample Depth (m) Top	6.00
				Base	7.50
Specimen Reference	3	Specimen Depth	6 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024031163



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	21
90	100	0.05090	19
75	100	0.03644	17
63	100	0.02608	15
50	100	0.01866	13
37.5	100	0.00991	8
28	95	0.00504	4
20	87	0.00292	3
14	77	0.00155	2
10	70		
6.3	62		
5	59		
3.35	54		
2	49		
1.18	43		
0.6	37	Particle density	(assumed)
0.425	34	2.65	Mg/m3
0.3	31		
0.212	28		
0.15	25		
0.063	21		

Dry Mass of sample, g: 2807

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	51.5
Sand	28.0
Silt	17.9
Clay	2.6

Grading Analysis		
D100	mm	
D60	mm	5.49
D30	mm	0.271
D10	mm	0.0132
Uniformity Coefficient		420
Curvature Coefficient		1

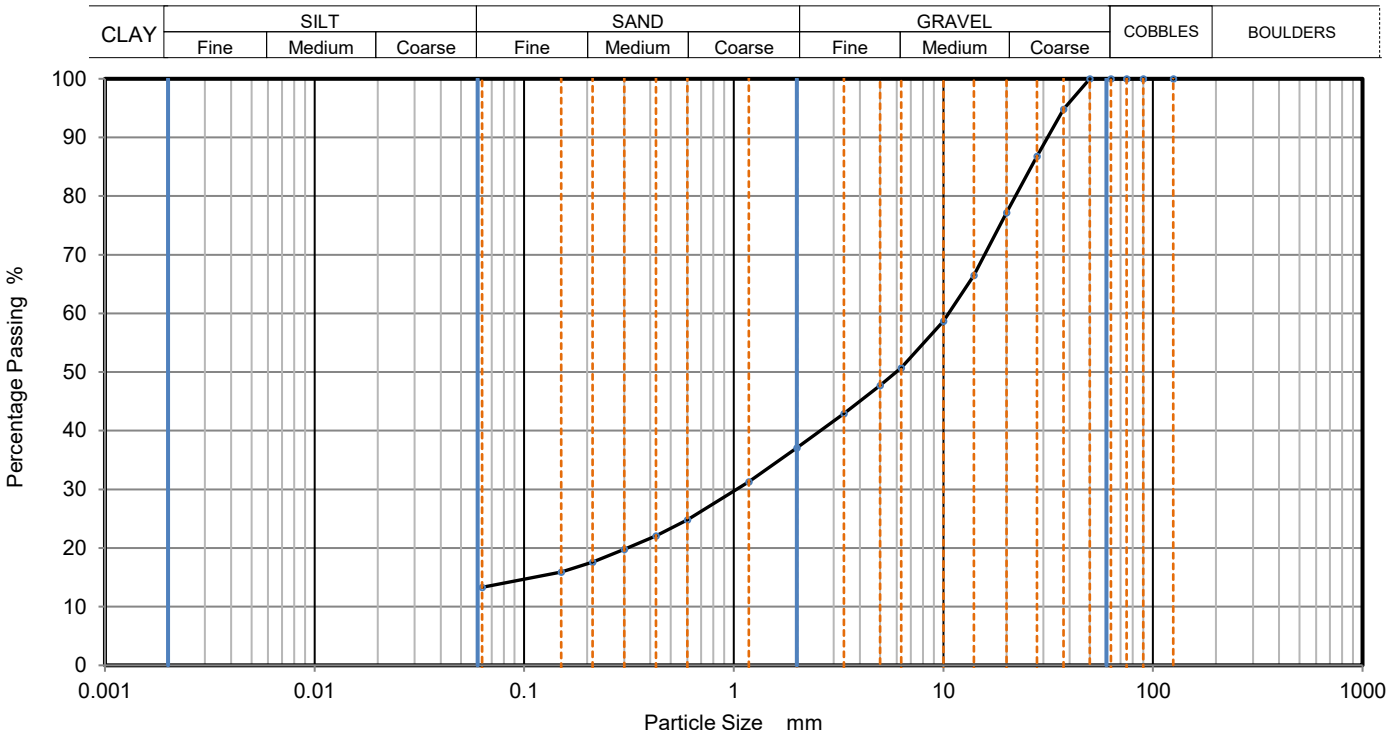
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

				Job Ref	**23-0585**
				Borehole/Pit No.	L-BH03
Site Name	Rosslare OWH - GI			Sample No.	4
Specimen Description	Greyish brown gravelly slightly clayey fine to coarse SAND.			Sample Depth (m) Top	2.50
				Base	3.50
Specimen Reference	2	Specimen Depth	2.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2024031164



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	95		
28	87		
20	77		
14	67		
10	59		
6.3	51		
5	48		
3.35	43		
2	37		
1.18	31		
0.6	25		
0.425	22		
0.3	20		
0.212	18		
0.15	16		
0.063	13		

Dry Mass of sample, g: 3300

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	62.9
Sand	23.8
Fines <0.063mm	13.0

Grading Analysis		
D100	mm	
D60	mm	10.6
D30	mm	1.03
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

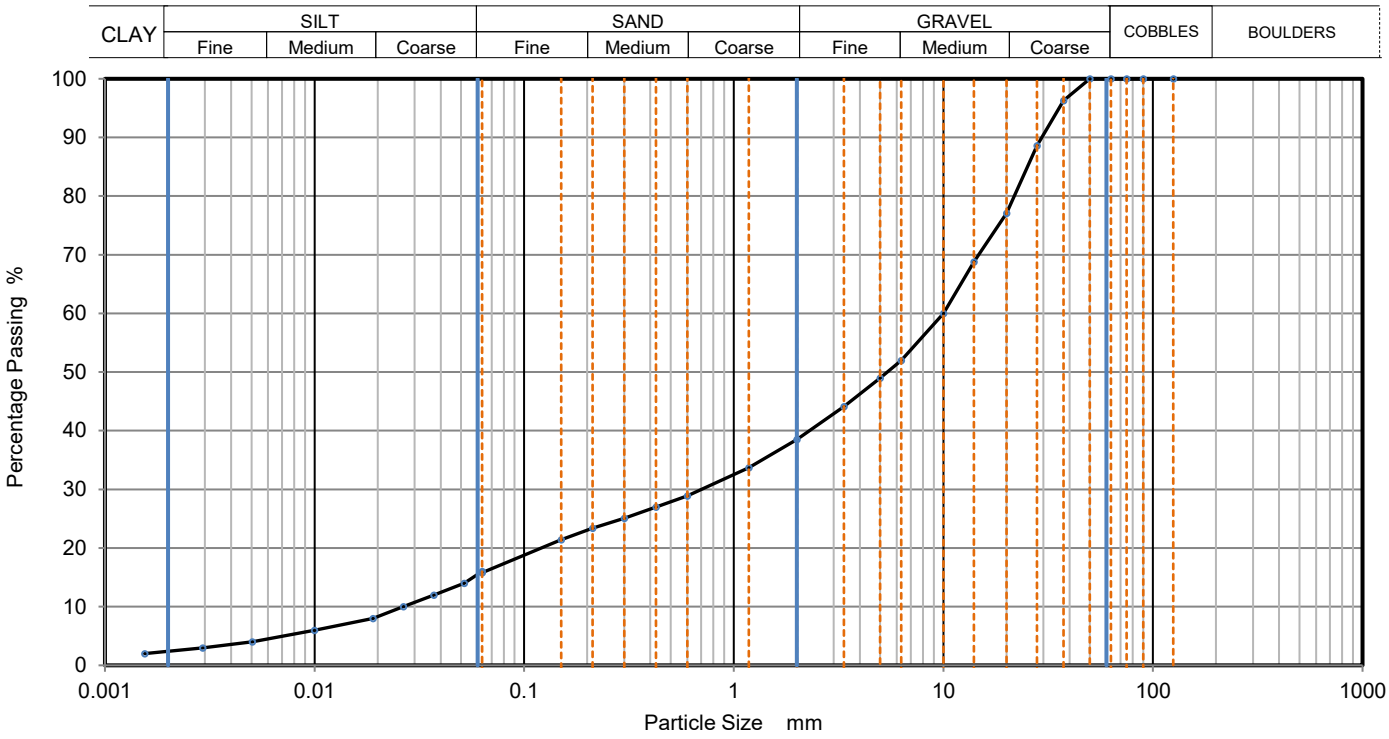
Remarks

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

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					23-0585
Borehole/Pit No.					L-BH03
Site Name	Rosslare OWH - GI			Sample No.	6
Specimen Description	Grey sandy gravelly silty CLAY.			Sample Depth (m) Top	4.50
				Base	5.50
Specimen Reference	2	Specimen Depth	4.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2024031166



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	16
90	100	0.05184	14
75	100	0.03710	12
63	100	0.02654	10
50	100	0.01898	8
37.5	96	0.00996	6
28	89	0.00504	4
20	77	0.00292	3
14	69	0.00155	2
10	60		
6.3	52		
5	49		
3.35	44		
2	39		
1.18	34		
0.6	29	Particle density	(assumed)
0.425	27	2.65	Mg/m3
0.3	25		
0.212	23		
0.15	21		
0.063	16		

Dry Mass of sample, g: 2982

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	61.5
Sand	22.6
Silt	13.7
Clay	2.2

Grading Analysis		
D100	mm	
D60	mm	10
D30	mm	0.698
D10	mm	0.0255
Uniformity Coefficient		390
Curvature Coefficient		1.9

Remarks

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

Approved
Stephen Watson

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	L-BH01	Sample Reference		6	
Depth (m)	6.00	Sample Submerged?		Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	9.7	9.7	9.7
Bulk Density (Mg/m^3)	2.25	2.26	2.24
Dry Density (Mg/m^3)	2.05	2.06	2.05
Voids Ratio	0.295	0.287	0.396
Consolidation			
Normal Pressure (kPa)	75	150	300
Vertical Displacement (mm)	0.982	1.094	1.318
Shearing			
Rate of Strain (mm/min)	0.073	0.073	0.073
Peak Shear Stress (kPa)	75.5	137.9	247.5
Hoz Displacement (mm)	9.0	9.0	9.0
Hoz Displacement at Peak Shear Stress (mm)	2.337	2.457	2.637
Final Conditions			
Water Content (%)	12.0	15.0	13.0
Dry Density (Mg/m^3)	2.19	2.23	2.33
Voids Ratio	0.235	0.221	0.206

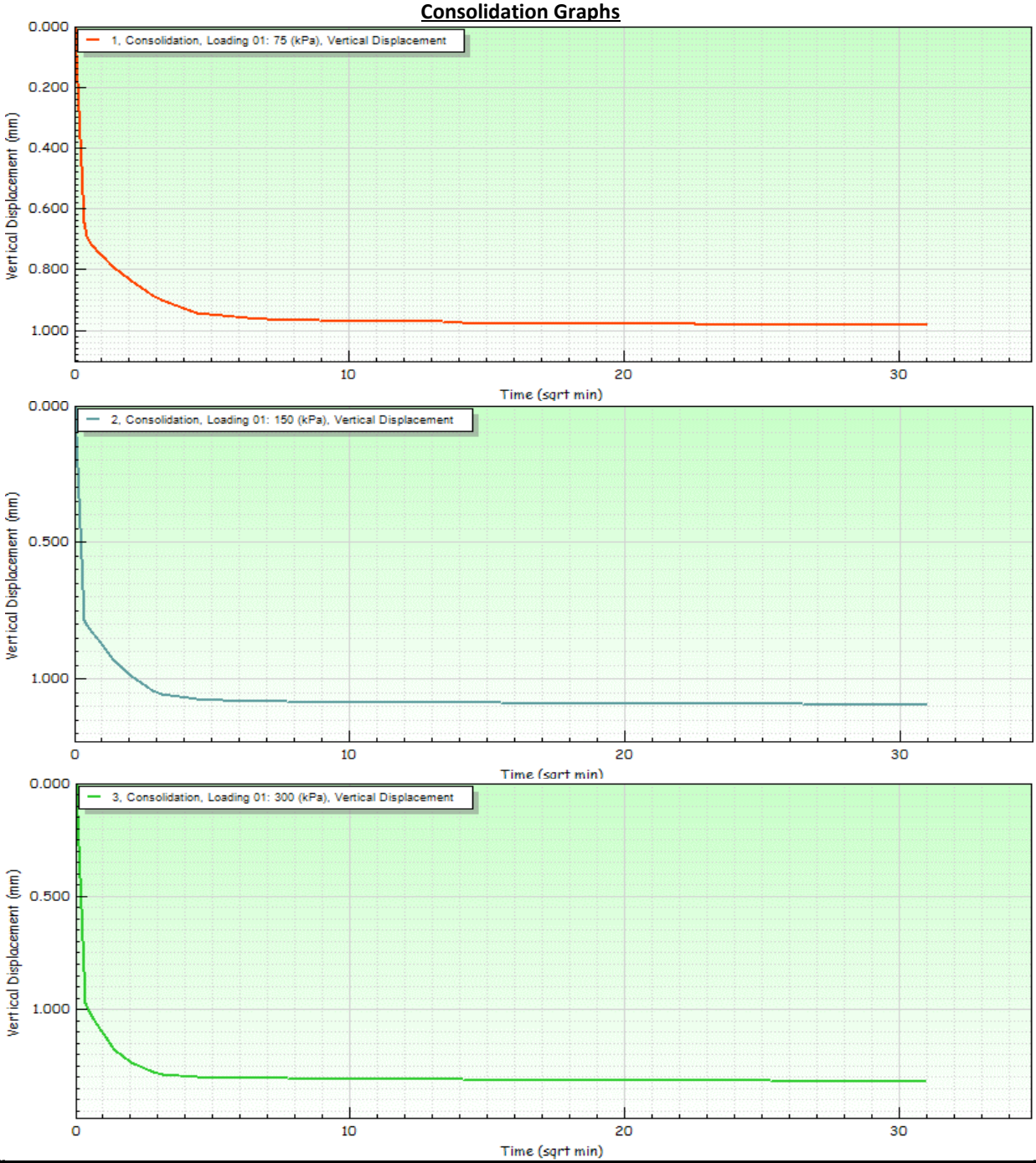
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	L-BH01	Sample Reference	6	
Depth (m)	6.00	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

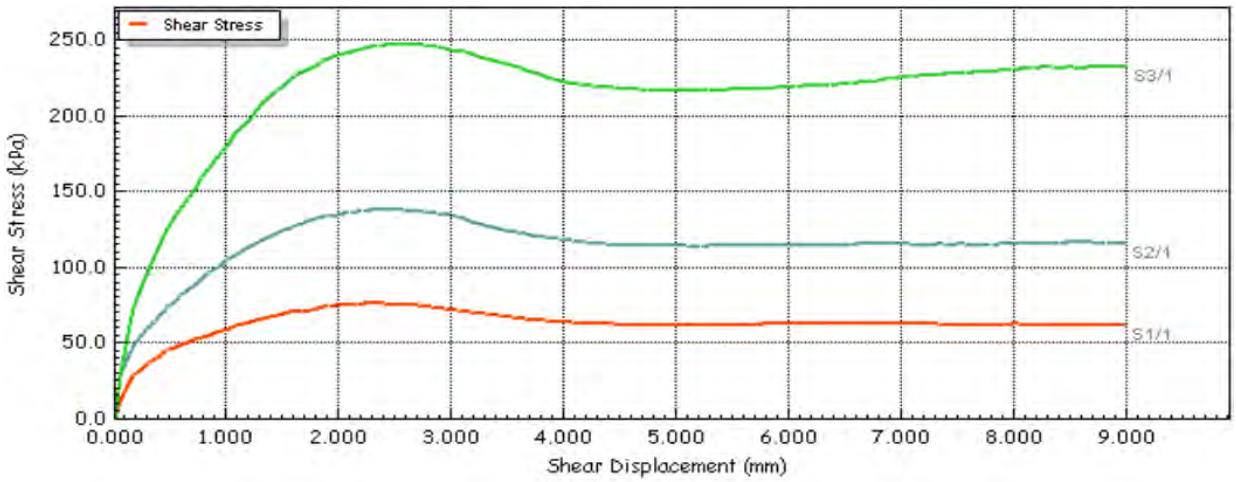


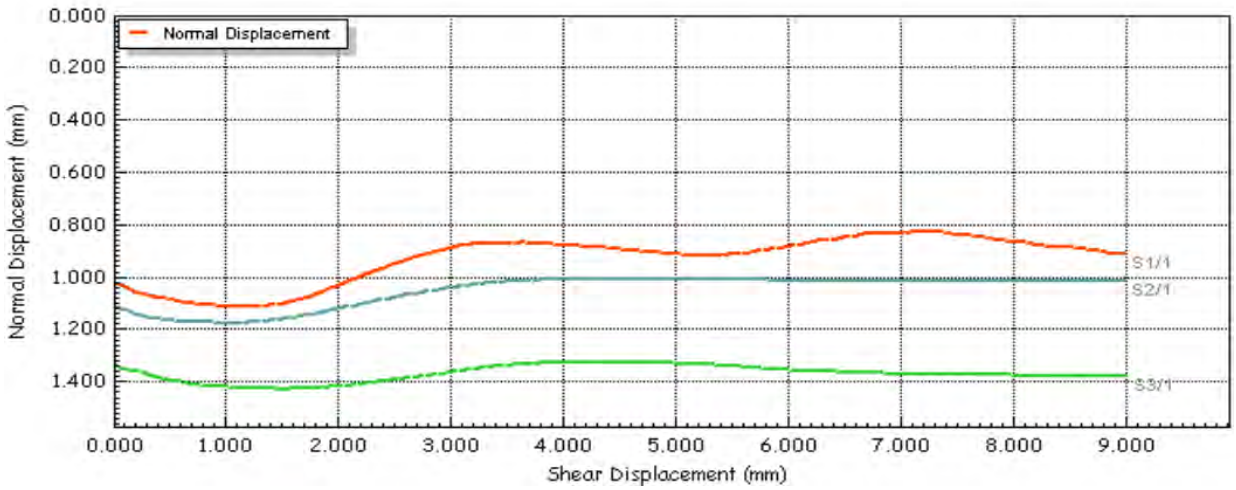
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	L-BH01	Sample Reference	6	
Depth (m)	6.00	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



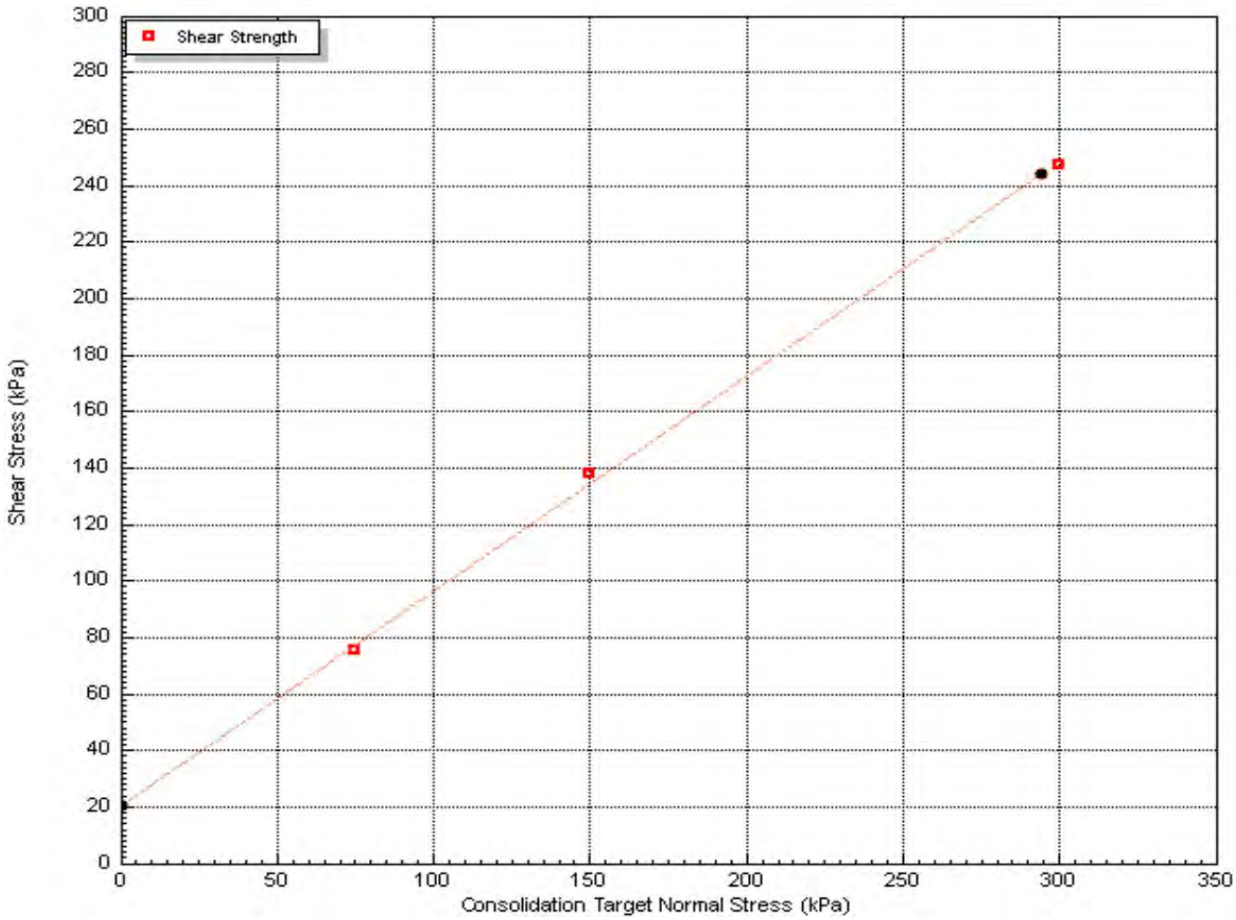


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	L-BH01	Sample Reference	6	
Depth (m)	6.00	Sample Submerged?	Yes	~~No~~
Sample Type	B	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	21		
Angle of Shearing Resistance (°)	37.0		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Certificate of Analysis

Certificate Number 24-05907 *Issued:* 22-Mar-24

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

Our Reference 24-05907

Client Reference ~ 23-0585

Order No ~ (not supplied)

Contract Title ~ Rosslare Europort

Description One Soil sample.

Date Received 20-Mar-24

Date Started 20-Mar-24

Date Completed 22-Mar-24

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-05907
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort

Lab No	2314775
Sample ID ~	L-BH03
Depth ~	4.20
Other ID ~	11
Sample Type ~	D
Sampling Date ~	19/03/2024
Sampling Time ~	n/s

Test	Method	LOD	Units	
Inorganics				
Organic matter	DETSC 2002#	0.1	%	0.2

Information in Support of the Analytical Results

Our Ref 24-05907
Client Ref ~ 23-0585
Contract ~ Rosslare Europort

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2314775	L-BH03 4.20 SOIL	19/03/24	PT 500ml		

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Key:

~ Sample details are provided by the client and can affect the validity of the results

***** -not accredited.

-MCERTS (accreditation only applies if report carries the MCERTS logo).

$ -subcontracted.

n/s -not supplied.

I/S -insufficient sample.

U/S -unsuitable sample.

t/f -to follow.

nd -not detected.

End of Report

CAUSEWAY GEOTECH

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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

16 February 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/01/2024 and 16/02/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R01

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	11
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	2
	Extra over days (more than initial 3 days)		4

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	2
ROCK	Point load index	ISRM (2007)	3

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH06	Sample Reference		1	
Depth (m)	10.50	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Grey sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	7.9	7.9	7.9
Bulk Density (Mg/m^3)	1.94	1.96	1.96
Dry Density (Mg/m^3)	1.80	1.82	1.82
Voids Ratio	0.473	0.460	0.458
Consolidation			
Normal Pressure (kPa)	100	200	400
Vertical Displacement (mm)	1.595	2.251	3.198
Shearing			
Rate of Strain (mm/min)	0.062	0.062	0.062
Peak Shear Stress (kPa)	72.8	130.0	237.6
Hoz Displacement (mm)	8.3	8.3	8.3
Hoz Displacement at Peak Shear Stress (mm)	7.623	5.823	6.003
Final Conditions			
Water Content (%)	18.0	18.0	19.0
Dry Density (Mg/m^3)	2.16	2.40	2.71
Voids Ratio	0.329	0.255	0.184

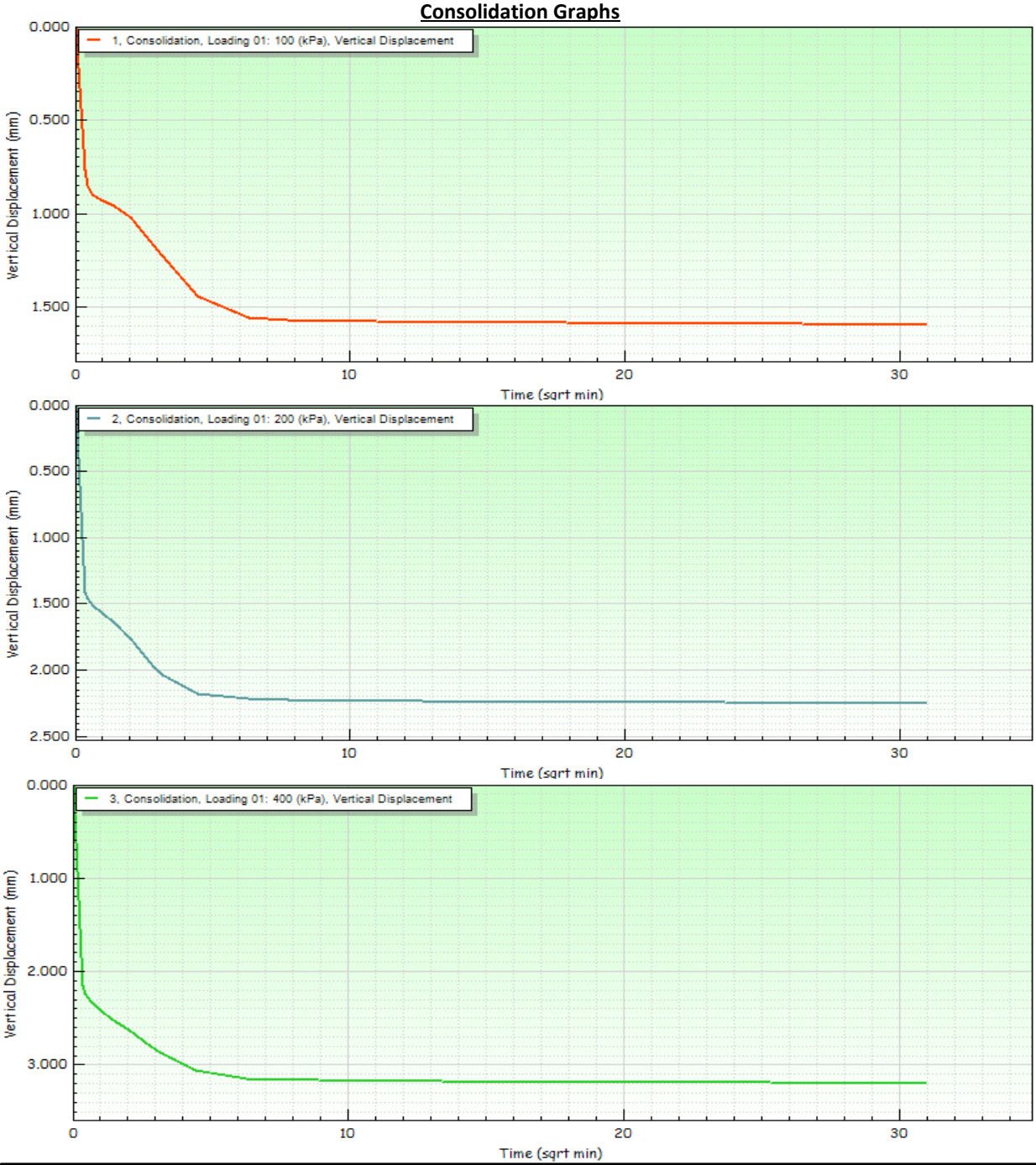
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH06	Sample Reference	1	
Depth (m)	10.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

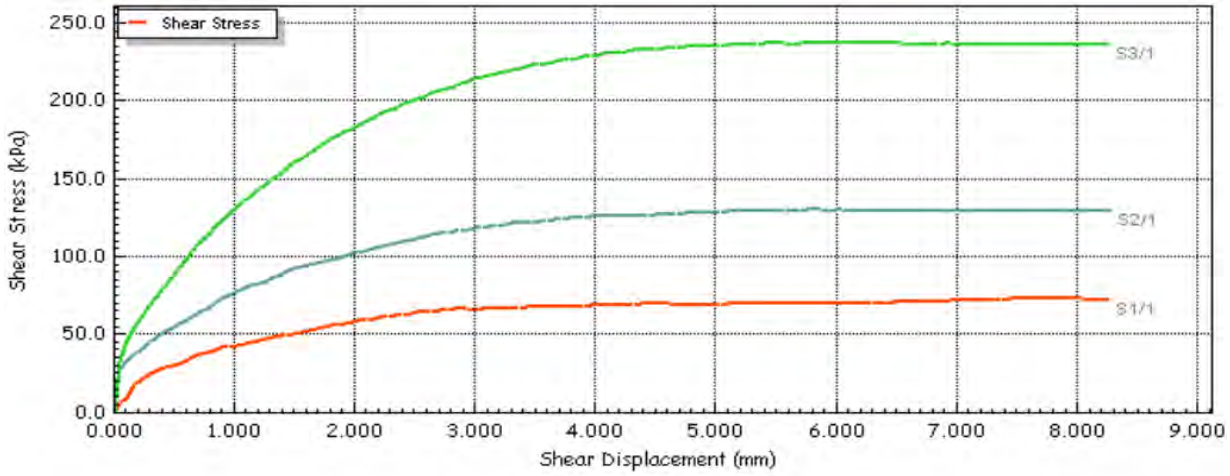


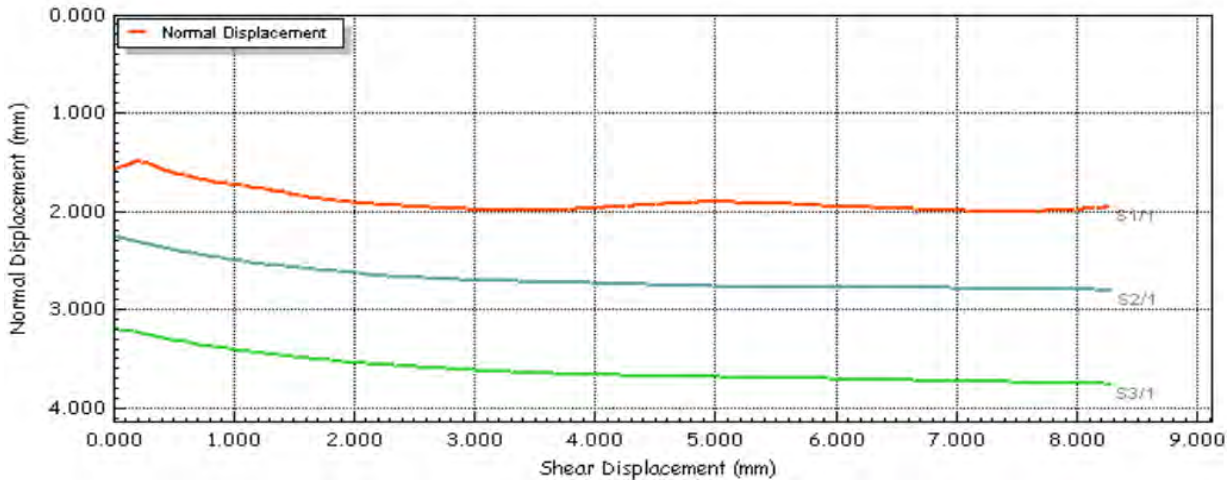
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH06	Sample Reference	1	
Depth (m)	10.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage

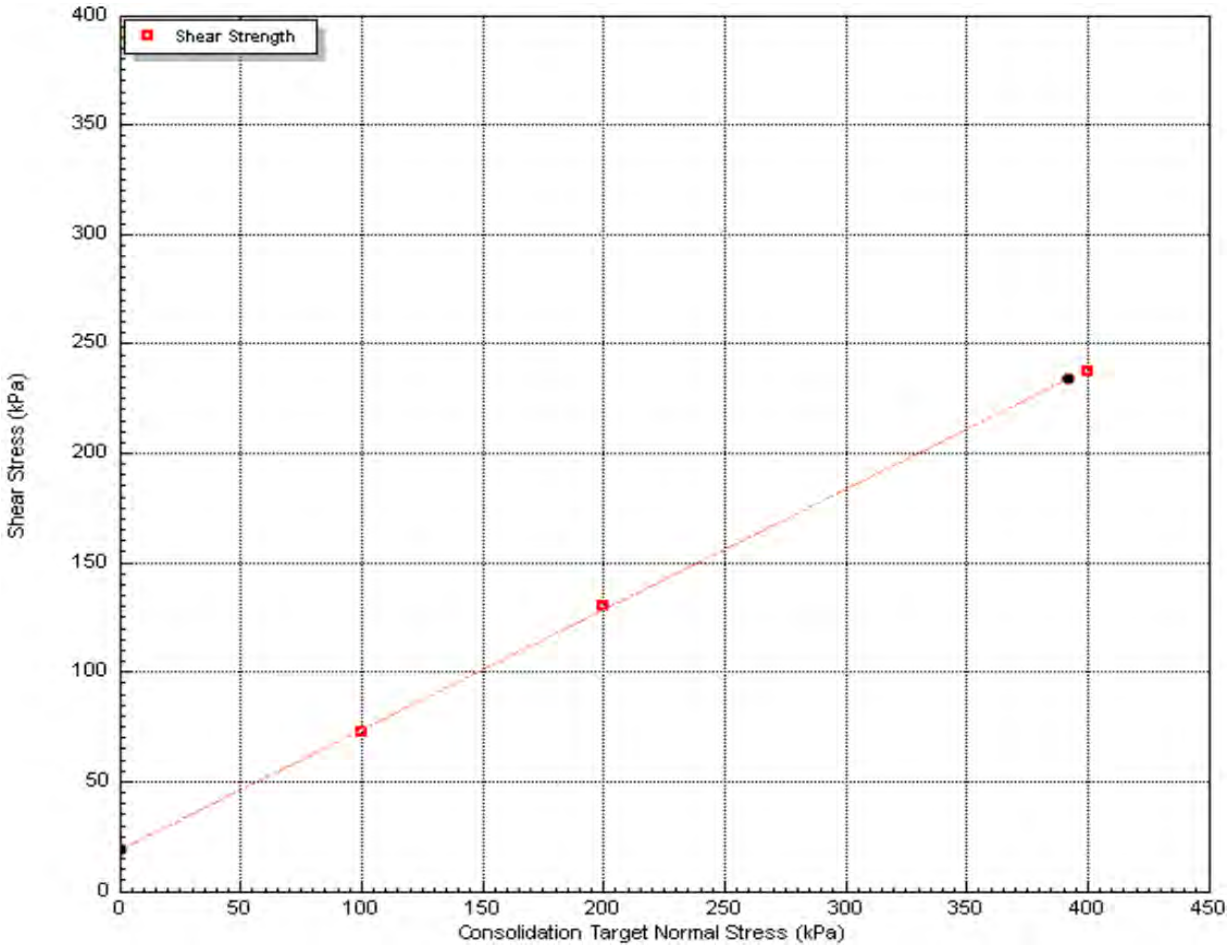




	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH06	Sample Reference	1	
Depth (m)	10.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	19		
Angle of Shearing Resistance (°)	28.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH08	Sample Reference		1	
Depth (m)	6.50	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Dark grey sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	12.0	12.0	12.0
Bulk Density (Mg/m^3)	2.25	2.24	2.24
Dry Density (Mg/m^3)	2.01	2.00	2.00
Voids Ratio	0.316	0.324	0.325
Consolidation			
Normal Pressure (kPa)	70	140	280
Vertical Displacement (mm)	0.375	0.728	1.382
Shearing			
Rate of Strain (mm/min)	0.060	0.060	0.060
Peak Shear Stress (kPa)	61.0	99.6	183.9
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	1.257	2.763	6.477
Final Conditions			
Water Content (%)	15.0	15.0	16.0
Dry Density (Mg/m^3)	2.06	2.14	2.32
Voids Ratio	0.298	0.267	0.209

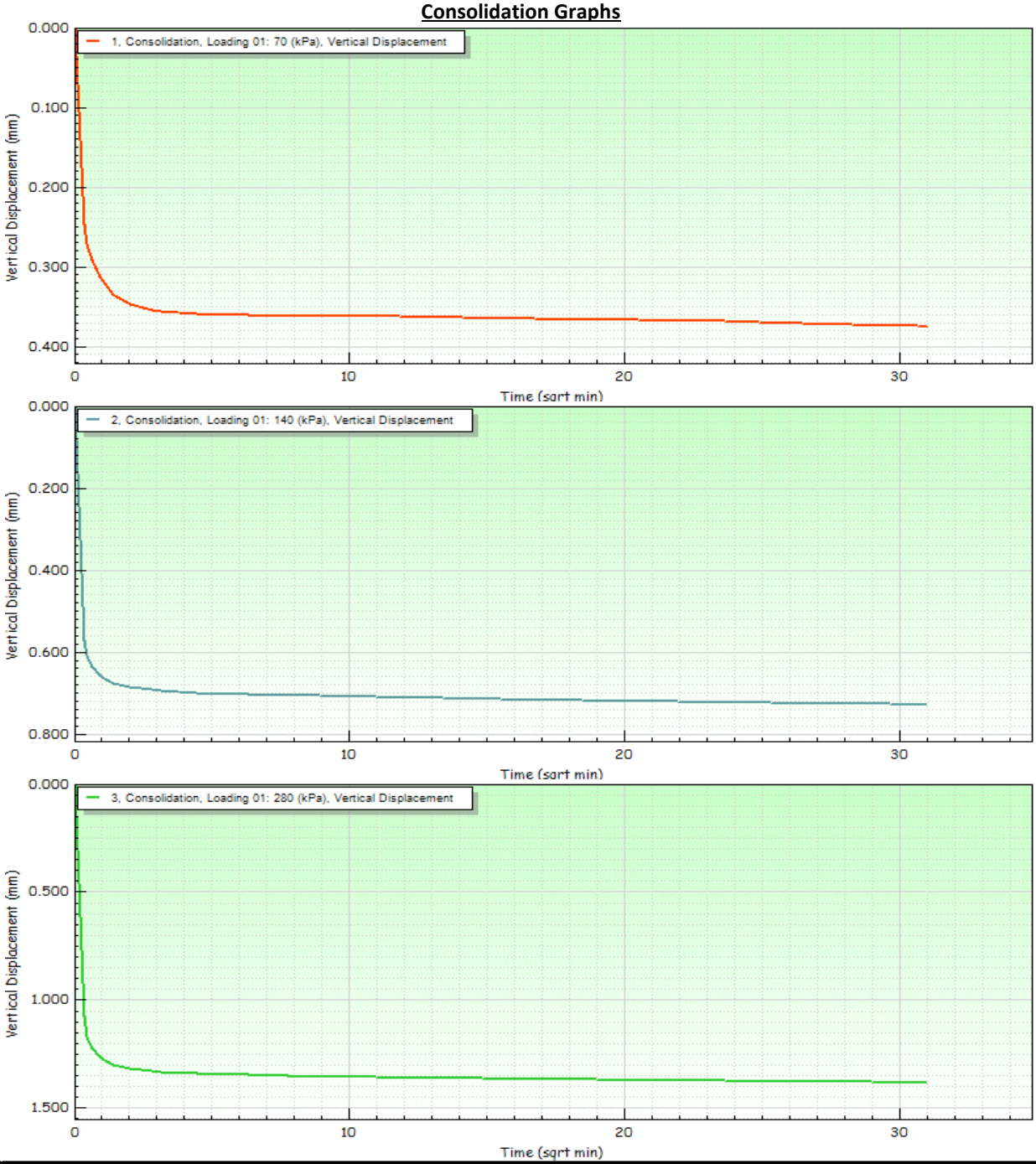
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH08	Sample Reference	1	
Depth (m)	6.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

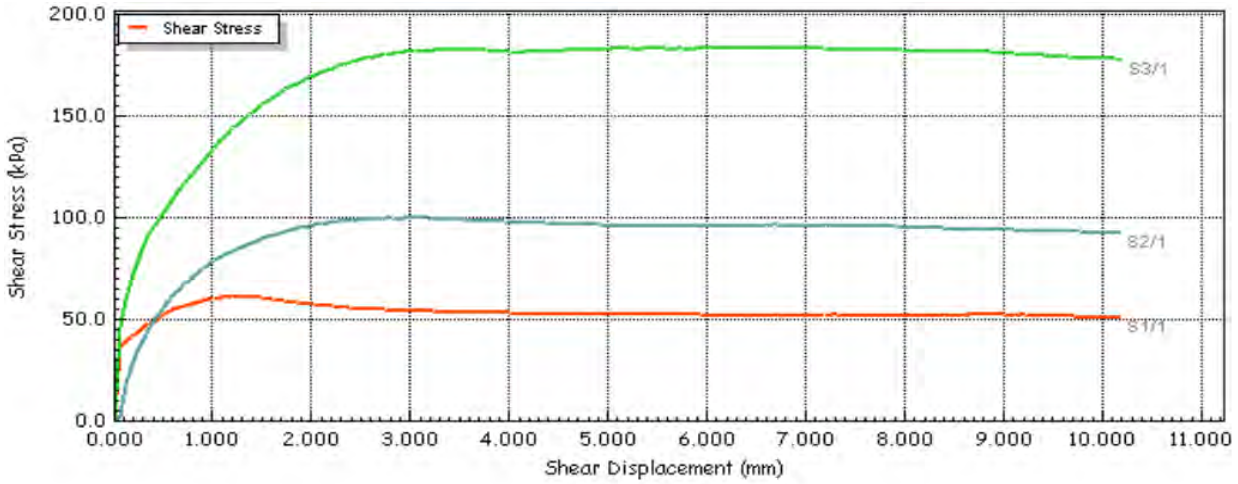


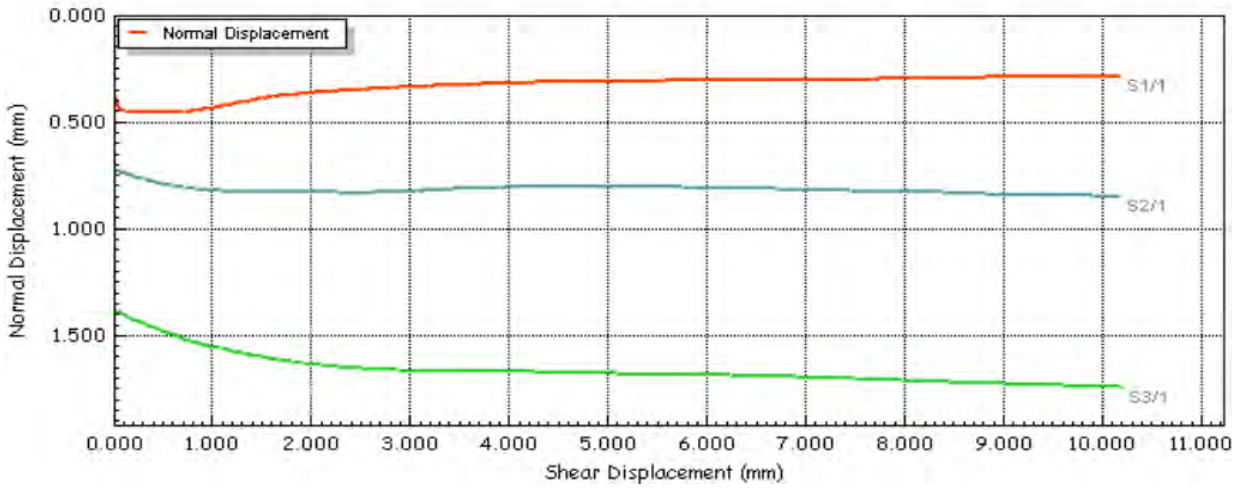
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH08	Sample Reference	1	
Depth (m)	6.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



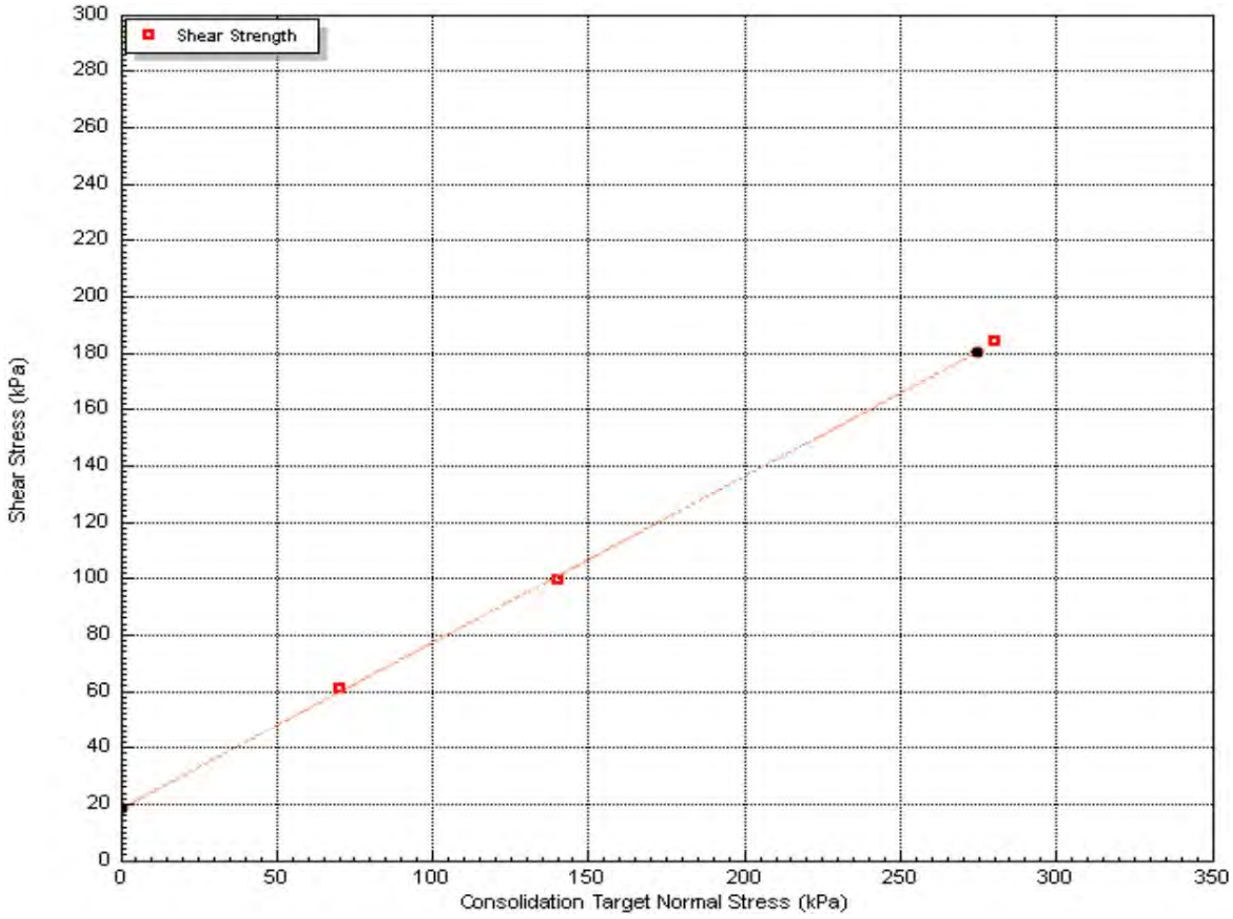


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH08	Sample Reference	1	
Depth (m)	6.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	19		
Angle of Shearing Resistance (°)	30.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

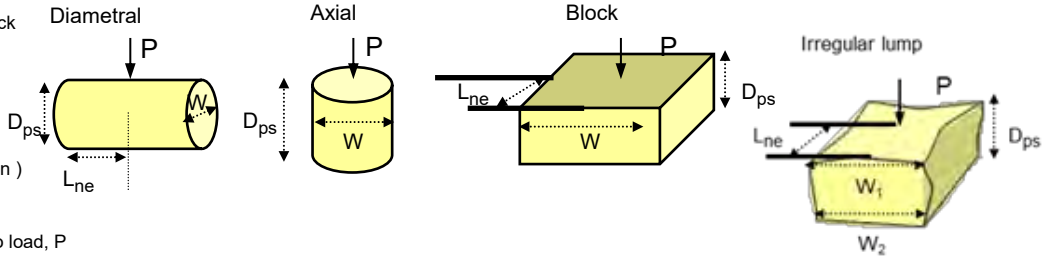
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth m	Ref.	Type	Ref.	Depth m		Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm	kN	mm	Is MPa	Is(50) MPa	
M-BH01	11.75	1	C	2	11.75	GNEISS	A	U	NO		100.9	87.0	83.0	9.1	103.3	0.9	1.2	
M-BH01	12.00	2	C	2	12.00	GNEISS	A	U	YES		101.0	78.0	76.0	4.6	98.9	0.5	0.6	
M-BH01	12.10	3	C	2	12.10	GNEISS	A	U	YES		101.1	83.0	80.0	14.9	101.5	1.4	2.0	
M-BH01	13.40	4	C	2	13.40	GNEISS	A	U	YES		100.6	81.0	78.0	12.7	100.0	1.3	1.7	
M-BH01	15.20	5	C	2	15.20	GNEISS	A	U	NO		101.0	89.0	83.0	12.6	103.3	1.2	1.6	
M-BH01	16.60	6	C	2	16.60	GNEISS	A	U	YES		101.2	106.0	103.0	0.7	115.2	0.1	0.1	
M-BH01	16.70	7	C	2	16.70	GNEISS	A	U	YES		101.2	94.0	90.0	6.6	107.7	0.6	0.8	
M-BH12	6.50	1	C	2	6.50	GNEISS	A	U	NO		100.2	76.0	62.0	7.5	88.9	0.9	1.2	
M-BH14	6.30	2	C	2	6.30	DIORITE	A	U	YES		100.9	75.0	72.0	15.4	96.2	1.7	2.2	
M-BH14	8.15	3	C	2	8.15	DIORITE	A	U	YES		100.4	91.0	87.0	26.7	105.5	2.4	3.4	
M-BH15	7.40	2	C	2	7.40	GNEISS	A	U	YES		101.2	88.0	79.0	16.2	100.9	1.6	2.2	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 02/06/2024 00:00

Approved By: Stephen Watson

UKAS TESTING
10122

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

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

Certificate No : **24/134 - 01-1**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 31st January 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	See Page 2
Date Sampled	:	Not Supplied
Date Tested	:	31st January 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 4 inclusive

Comments

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

Remarks

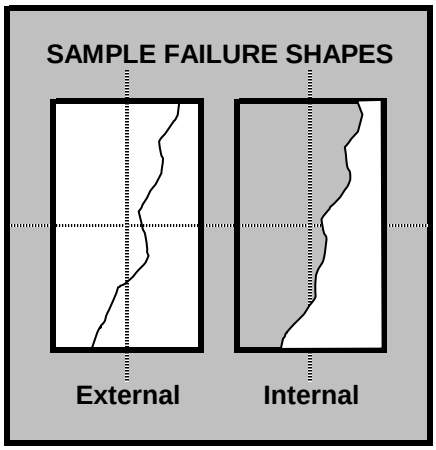
Approved for Issue

T McLelland (Director)

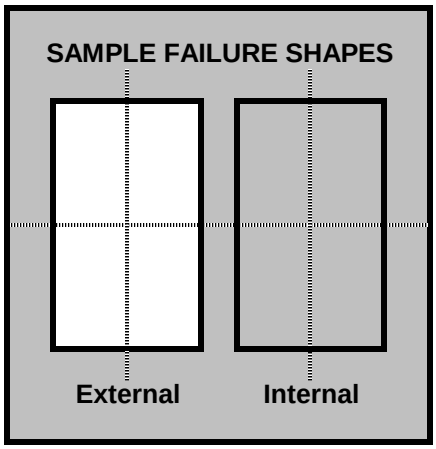
Date 05/02/2024

UKAS TESTING
2643

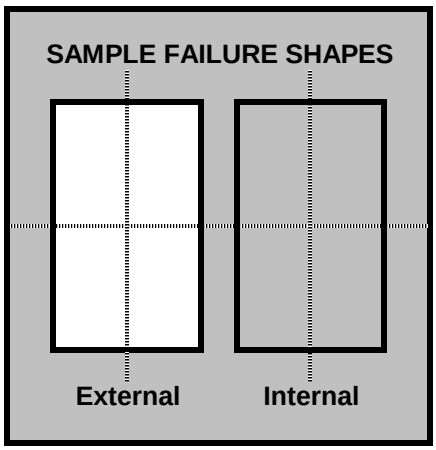
BOREHOLE		**M-BH14**
SAMPLE		**C1**
DEPTH	m	**6.40-6.80**
SAMPLE DIAMETER	mm	**100.79**
SAMPLE HEIGHT	mm	**201.49**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.3**
TEST DURATION	min.sec	**2.15**
DATE OF TESTING		**02/02/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**42.9**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**5.4**
WATER CONTENT (ISRM Suggested Methods)	%	**0.4**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.86**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.85**



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



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

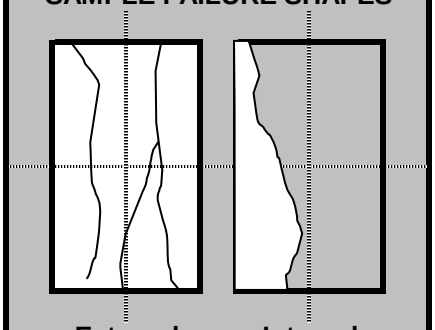


Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

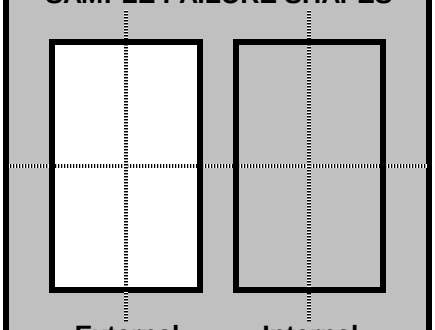
BOREHOLE		**M-BH15**
SAMPLE		**C1**
DEPTH	m	**5.00-5.30**
SAMPLE DIAMETER	mm	**101.24**
SAMPLE HEIGHT	mm	**204.77**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.7**
TEST DURATION	min.sec	**8.15**
DATE OF TESTING		**02/02/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**355.4**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**44.1**
WATER CONTENT (ISRM Suggested Methods)	%	**0.2**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.70**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.69**

SAMPLE FAILURE SHAPES



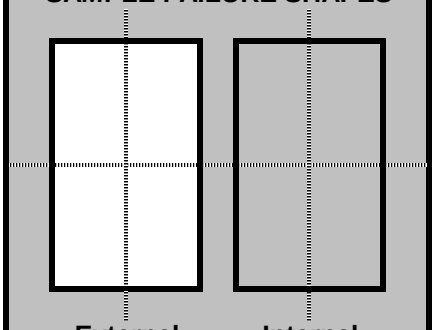
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)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

SAMPLE FAILURE SHAPES



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

SAMPLE FAILURE SHAPES



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
M-BH12	C2	8.10-8.30	As Received	D	101.70	101.70	101.70	13.74	1.33	1.83
				A	101.70	68.01	35.72	15.18	3.28	3.77
				A	101.70	68.43	36.16	14.00	2.99	3.44

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	3.61
Mean Is(50) - Diametrical tests	1.83
Ia(50)	1.97

Tested in accordance with ISRM (2007)

SUMMARY OF POINT LOAD TEST RESULTS

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R01	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH01		12.00-13.50	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH01		15.40-16.90	C	UCS	No suitable sample available (dimensions) Run above checked	2 PL's taken in lieu
M-BH06		10.50	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH08		6.50	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH08		8.00-9.50	C	UCS/PL	No suitable samples available (dimensions) Runs above and below checked	CANCEL TESTS
M-BH08		12.50-14.00	C	PL	No suitable sample available (dimensions) Runs above and below checked	CANCEL TEST
M-BH12	2	8.10-8.30	C	UCS	Sample fractured during test preparation at the rock lab	3 PL's taken in lieu

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

Laboratory Signature Joseph Nicholl	Project Manager Signature Neil Haggan
Date 06 February 2024	Date 19 February 2024

CAUSEWAY GEOTECH

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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

17 February 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 29/01/2024 and 16/02/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R02

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	13
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	1
	Extra over days (more than initial 3 days)		2

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	1
ROCK	Point load index	ISRM (2007)	3

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH07	Sample Reference		1	
Depth (m)	4.80	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	9.3	9.3	9.3
Bulk Density (Mg/m^3)	2.11	2.11	2.08
Dry Density (Mg/m^3)	1.93	1.93	1.91
Voids Ratio	0.375	0.373	0.390
Consolidation			
Normal Pressure (kPa)	100	200	400
Vertical Displacement (mm)	0.636	0.960	1.913
Shearing			
Rate of Strain (mm/min)	0.064	0.064	0.064
Peak Shear Stress (kPa)	85.9	146.5	247.5
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	9.957	4.977	6.177
Final Conditions			
Water Content (%)	17.0	17.0	15.0
Dry Density (Mg/m^3)	2.08	2.17	2.45
Voids Ratio	0.306	0.275	0.203

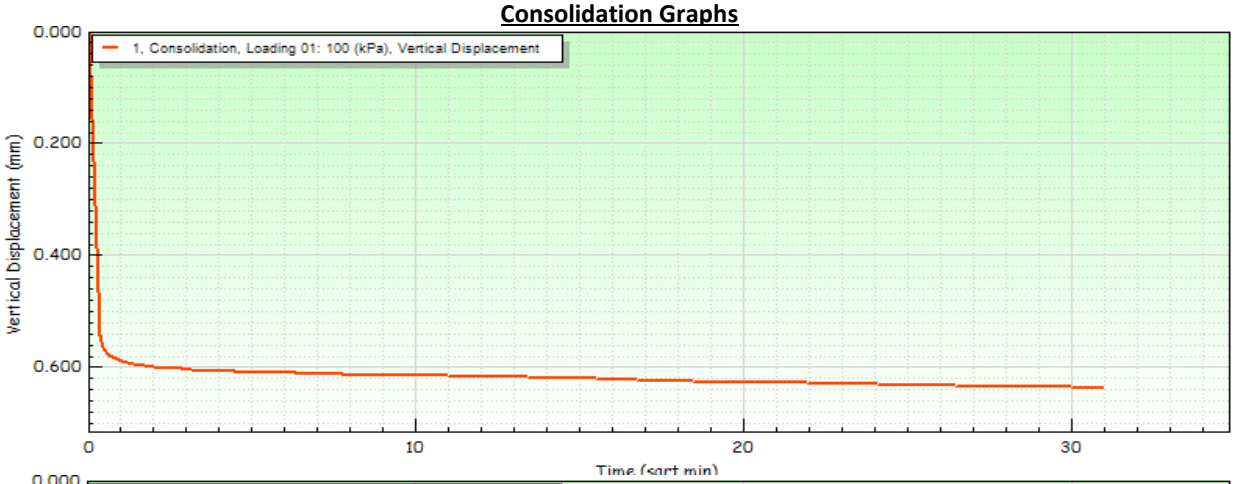
UKAS TESTING
10122

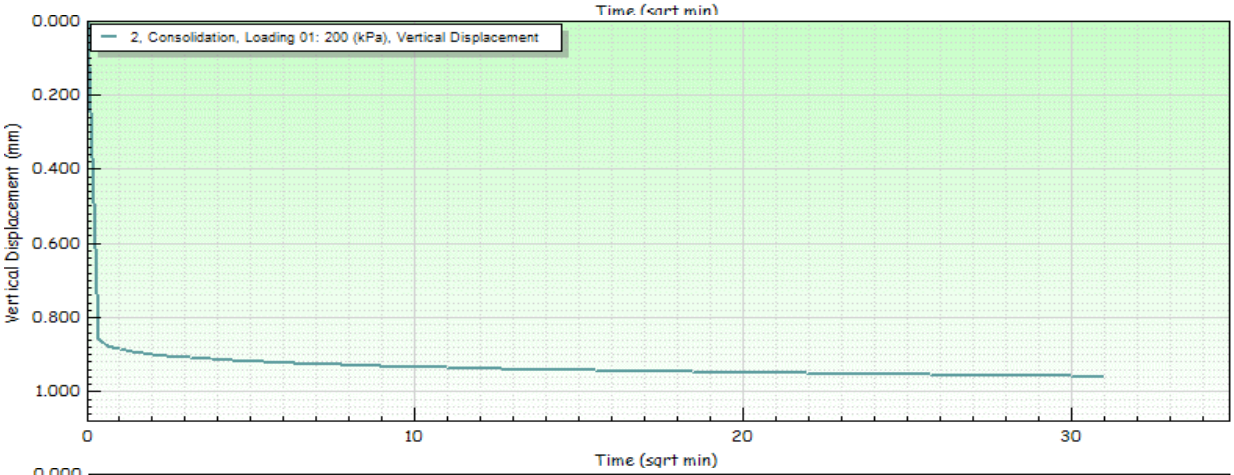
CAUSEWAY GEOTECH

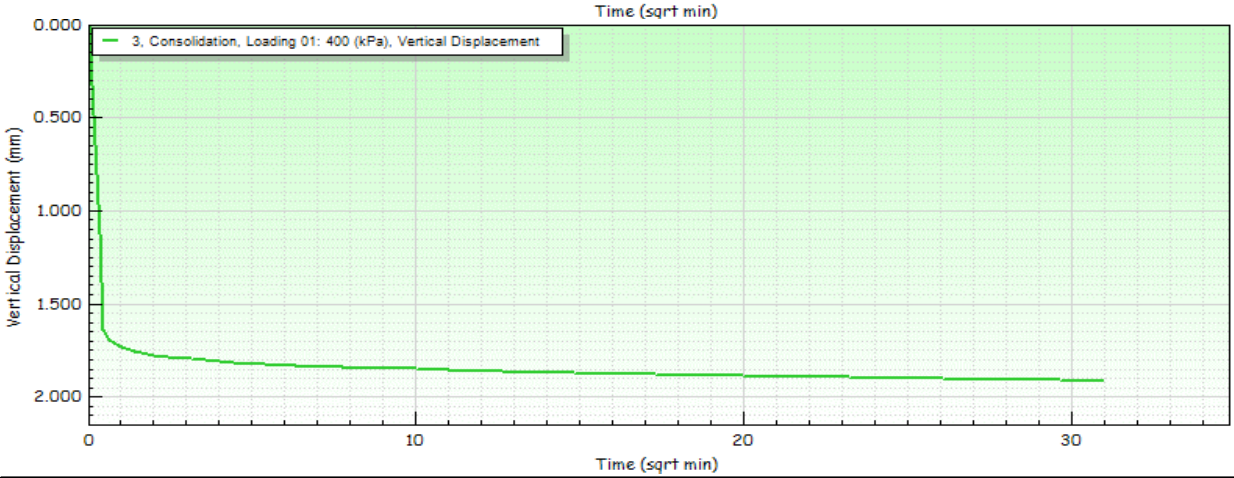
Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH07	Sample Reference	1	
Depth (m)	4.80	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs





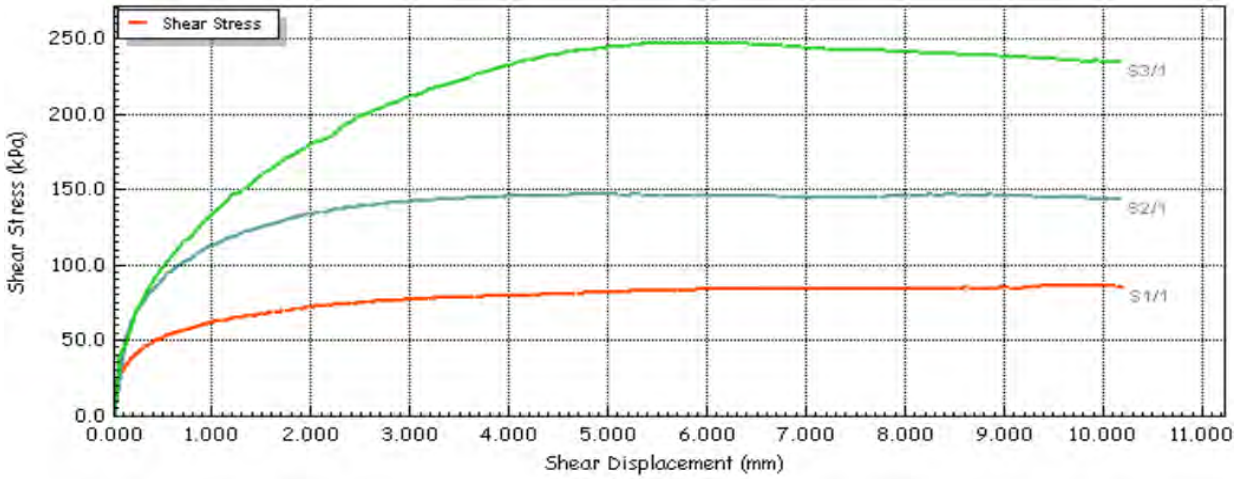


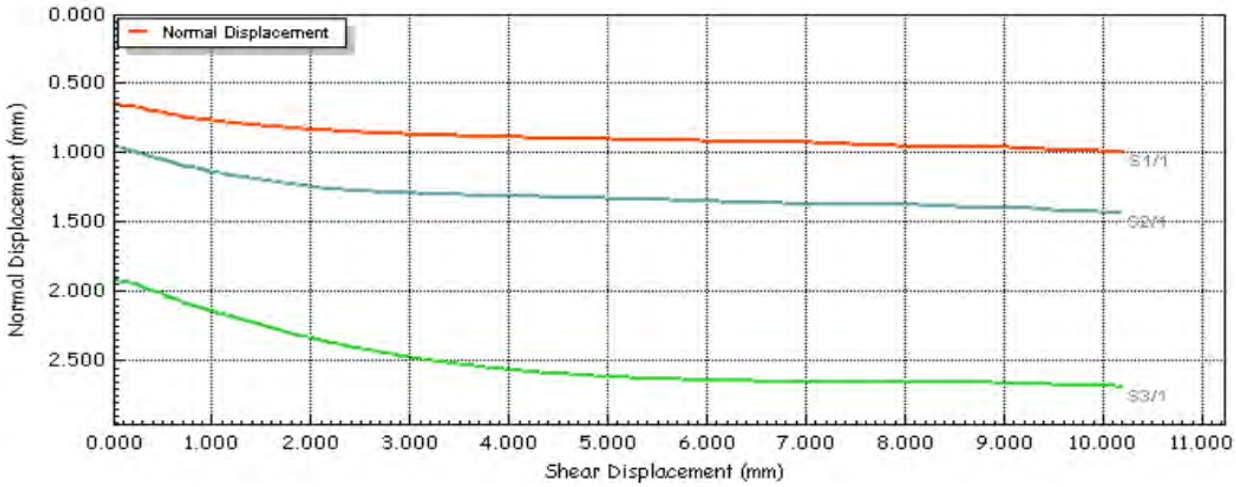
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH07	Sample Reference		1	
Depth (m)	4.80	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



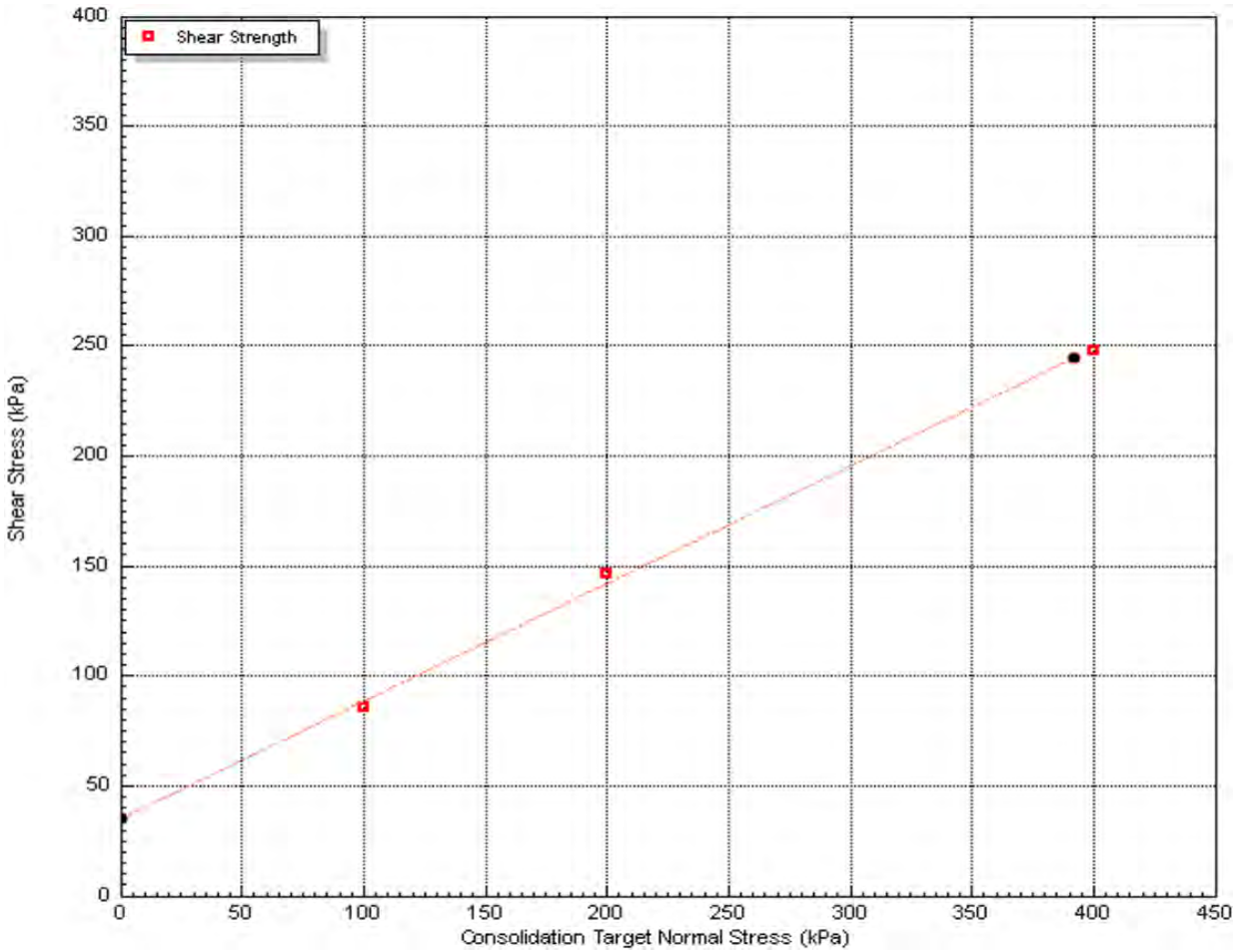


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH07	Sample Reference	1	
Depth (m)	4.80	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	35		
Angle of Shearing Resistance (°)	28.0		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

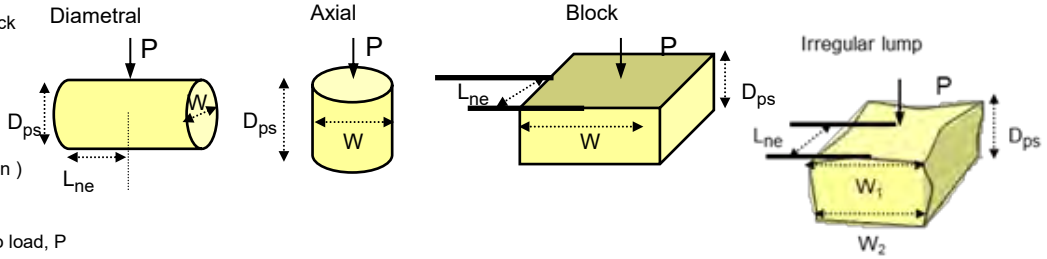
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth m	Ref.	Type	Ref.	Depth m		Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm	kN	mm	Is MPa	Is(50) MPa	
M-BH02	11.90	2	C	2	11.90	MUDSTONE	A	U	YES		101.5	60.0	57.0	0.3	85.8	0.0	0.1	
M-BH02	12.80	3	C	2	12.80	MUDSTONE	A	U	YES		101.1	54.0	53.0	0.2	82.6	0.0	0.0	
M-BH02	12.90	4	C	2	12.90	MUDSTONE	A	U	YES		101.7	62.0	60.0	0.3	88.1	0.0	0.0	
M-BH02	13.40	5	C	2	13.40	MUDSTONE	A	U	YES		101.4	72.0	70.0	0.6	95.1	0.1	0.1	
M-BH03	8.50	1	C	2	8.50	MUDSTONE	A	U	YES		101.3	34.0	30.0	0.4	62.2	0.1	0.1	
M-BH03	8.55	2	C	2	8.55	MUDSTONE	A	U	YES		101.4	29.0	27.0	0.2	59.0	0.1	0.1	
M-BH03	9.00	3	C	2	9.00	MUDSTONE	A	U	YES		101.4	21.0	20.0	0.1	50.8	0.0	0.0	
M-BH03	10.00	4	C	2	10.00	MUDSTONE	A	U	YES		101.5	37.0	35.0	0.1	67.3	0.0	0.0	
M-BH07	5.00	2	C	2	5.00	MUDSTONE	A	U	YES		101.4	85.0	84.0	0.2	104.1	0.0	0.0	
M-BH09	4.30	2	C	2	4.30	GNEISS	A	U	YES		101.5	91.0	78.0	16.6	100.4	1.6	2.3	
M-BH09	6.20	3	C	2	6.20	GNEISS	A	U	NO		101.2	59.0	56.0	14.4	84.9	2.0	2.5	
M-BH11	8.15	1	C	2	8.15	GNEISS	A	U	NO		101.0	75.0	70.0	17.3	94.9	1.9	2.6	
M-BH11	9.80	3	C	2	9.80	GNEISS	A	U	YES		101.0	70.0	65.0	11.3	91.4	1.4	1.8	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 02/06/2024 00:00

Approved By: Stephen Watson

UKAS TESTING
10122

LABORATORY TEST CERTIFICATE

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Tel: 0141 774 4032

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

Certificate No : **24/134 - 01-2**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 31st January 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	See Page 2
Date Sampled	:	Not Supplied
Date Tested	:	31st January 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 3 inclusive

Comments

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

Remarks

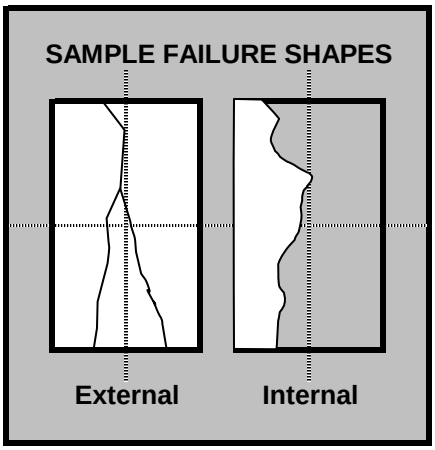
Approved for Issue

T McLelland (Director)

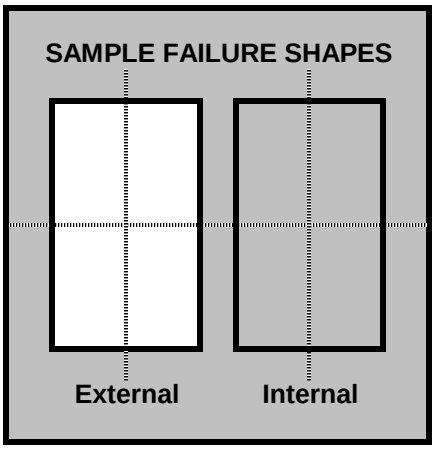
Date 05/02/2024

UKAS TESTING
2643

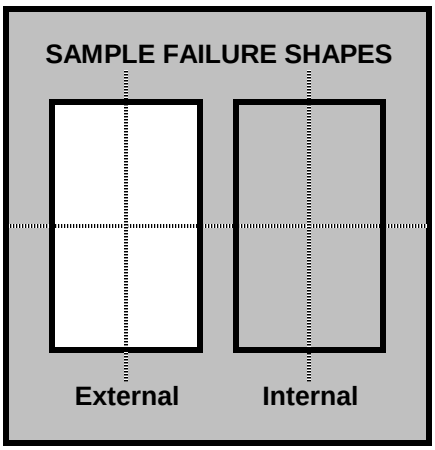
BOREHOLE		**M-BH09**
SAMPLE		**C1**
DEPTH	m	**3.90-4.30**
SAMPLE DIAMETER	mm	**101.73**
SAMPLE HEIGHT	mm	**208.71**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.4**
TEST DURATION	min.sec	**3.35**
DATE OF TESTING		**02/02/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**83.5**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**10.3**
WATER CONTENT (ISRM Suggested Methods)	%	**0.3**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.71**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.70**



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



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



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
M-BH11	C2	10.60-11.00	As Received	I	91.12	68.27	40.17	4.42	0.95	1.09
				I	79.82	69.12	47.01	6.18	1.29	1.50
				I	70.01	56.33	35.59	8.02	2.53	2.67

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	-
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM (2007)

SUMMARY OF POINT LOAD TEST RESULTS

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R02	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH02		5.90	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	CANCEL TEST
M-BH02		11.90-13.40	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH03		8.50-10.00	C	UCS	No suitable sample available (dimensions) Run below checked	2 PL's taken in lieu
M-BH07		4.80	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH11	2	10.60-11.00	C	UCS	Sample fractured during test preparation at the rock lab	3 PL's taken in lieu
M-BH25		7.20	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	CANCEL TEST

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
06 February 2024	19 February 2024

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R02	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH02		5.90	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	CANCEL TEST
M-BH02		11.90-13.40	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH03		8.50-10.00	C	UCS	No suitable sample available (dimensions) Run below checked	2 PL's taken in lieu
M-BH07		4.80	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	Carry out 60mm Shearbox in lieu
M-BH25		7.20	C	300mm Shearbox	Insufficient material for test retained on 20mm sieve, despite combining with additional runs in same strata	CANCEL TEST

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
06 February 2024	07 February 2024

CAUSEWAY GEOTECH

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Causeway Geotech Ltd
8 Drumahiskey Road
Ballymoney
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Company Number: NI610766

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Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

4 April 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 19/02/2024 and 04/04/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R03

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	17
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	3
	Extra over days (more than initial 3 days)		6

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	1
ROCK	Point load index	ISRM (2007)	6

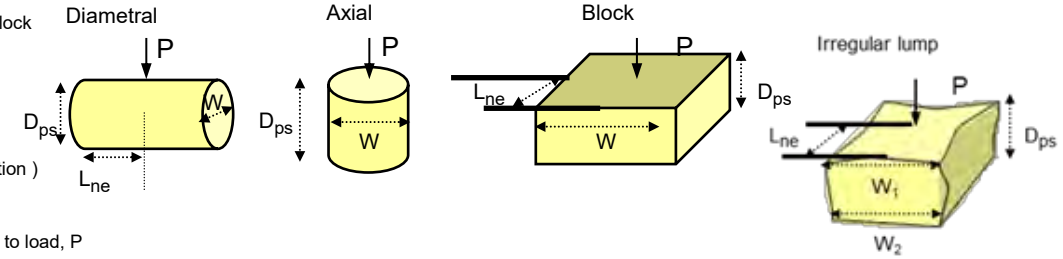
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
M-BH05	10.50	2	C	2	10.50	MUDSTONE	A	U	YES		100.6	48.0	43.0	2.4	74.2	0.4	0.5	
M-BH05	13.00	3	C	2	13.00	MUDSTONE	A	U	YES		100.7	68.0	62.0	9.2	89.2	1.2	1.5	
M-BH05	15.50	4	C	2	15.50	MUDSTONE	A	U	YES		100.7	72.0	67.0	6.3	92.7	0.7	1.0	
M-BH05	15.60	5	C	2	15.60	MUDSTONE	A	U	YES		100.9	38.0	36.0	1.5	68.0	0.3	0.4	
M-BH05	15.80	6	C	2	15.80	MUDSTONE	A	U	YES		100.4	74.0	62.0	12.0	89.0	1.5	2.0	
M-BH23	12.50	3	C	2	12.50	MUDSTONE	A	U	YES		93.2	42.0	40.0	0.3	68.9	0.1	0.1	
M-BH23	13.50	1	C	2	13.50	MUDSTONE	A	U	YES		92.1	35.0	34.0	0.4	63.1	0.1	0.1	
M-BH23	13.55	2	C	2	13.55	MUDSTONE	A	U	YES		92.5	39.0	38.0	0.4	66.9	0.1	0.1	
M-BH26	10.00	5	C	2	10.00	MUDSTONE	A	U	YES		100.8	76.0	73.0	5.6	96.8	0.6	0.8	
M-BH26	11.00	3	C	2	11.00	MUDSTONE	A	U	YES		100.5	106.0	103.0	4.1	114.8	0.3	0.5	
M-BH26	11.10	4	C	2	11.10	MUDSTONE	A	U	YES		100.7	88.0	85.0	4.3	104.4	0.4	0.5	
M-BH26	14.80	7	C	2	14.80	MUDSTONE	A	U	YES		100.6	84.0	81.0	13.8	101.9	1.3	1.8	
M-BH26	18.30	8	C	2	18.30	MUDSTONE	A	U	YES		99.1	69.0	66.0	4.9	91.3	0.6	0.8	
M-BH29	10.80	2	C	2	10.80	MUDSTONE	A	U	YES		94.7	54.0	52.0	0.7	79.2	0.1	0.1	
M-BH39A	3.60	1	C	2	3.60	MUDSTONE	A	U	YES		101.0	94.0	89.0	8.3	107.0	0.7	1.0	
M-BH39A	3.70	2	C	2	3.70	MUDSTONE	A	U	YES		101.1	71.0	70.0	3.2	94.9	0.4	0.5	
M-BH39A	6.60	4	C	2	6.60	MUDSTONE	A	U	YES		101.1	87.0	85.0	1.5	104.6	0.1	0.2	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 25/03/2024

Approved By: Stephen Watson

UKAS TESTING
10122

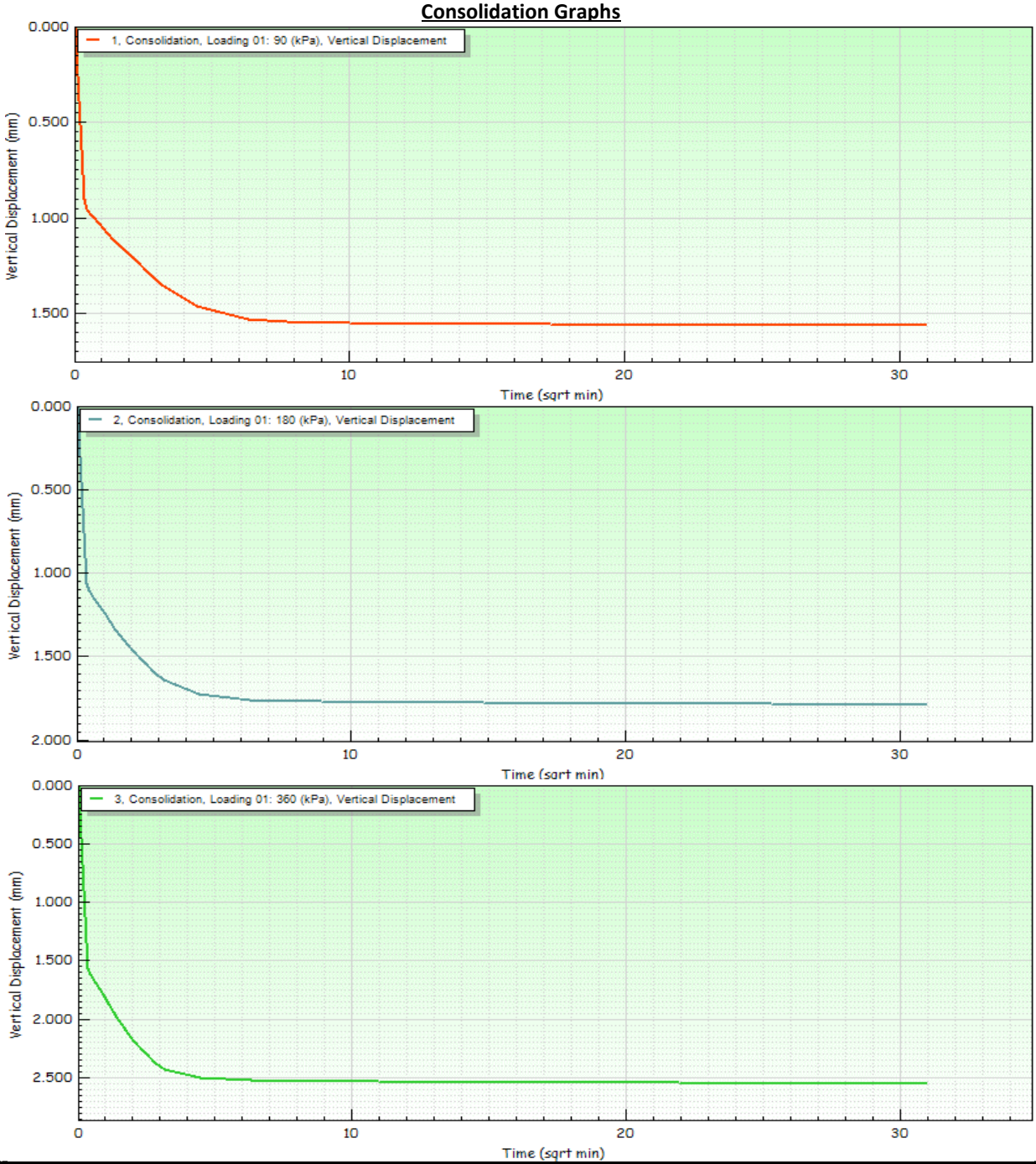
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH05	Sample Reference		1	
Depth (m)	8.00	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	16.0	16.0	16.0
Bulk Density (Mg/m^3)	2.17	2.17	2.17
Dry Density (Mg/m^3)	1.87	1.87	1.87
Voids Ratio	0.417	0.416	0.413
Consolidation			
Normal Pressure (kPa)	90	180	360
Vertical Displacement (mm)	1.560	1.787	2.549
Shearing			
Rate of Strain (mm/min)	0.081	0.081	0.081
Peak Shear Stress (kPa)	67.4	124.5	219.7
Hoz Displacement (mm)	8.6	8.6	8.6
Hoz Displacement at Peak Shear Stress (mm)	3.537	3.603	3.537
Final Conditions			
Water Content (%)	17.0	21.0	22.0
Dry Density (Mg/m^3)	2.17	2.24	2.47
Voids Ratio	0.299	0.271	0.217

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH05	Sample Reference	1	
Depth (m)	8.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

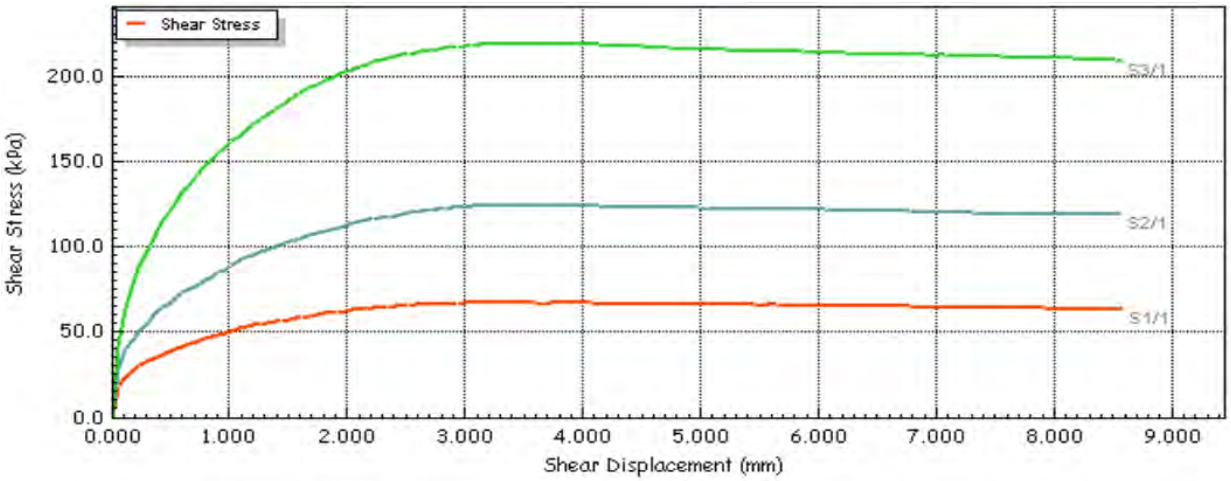


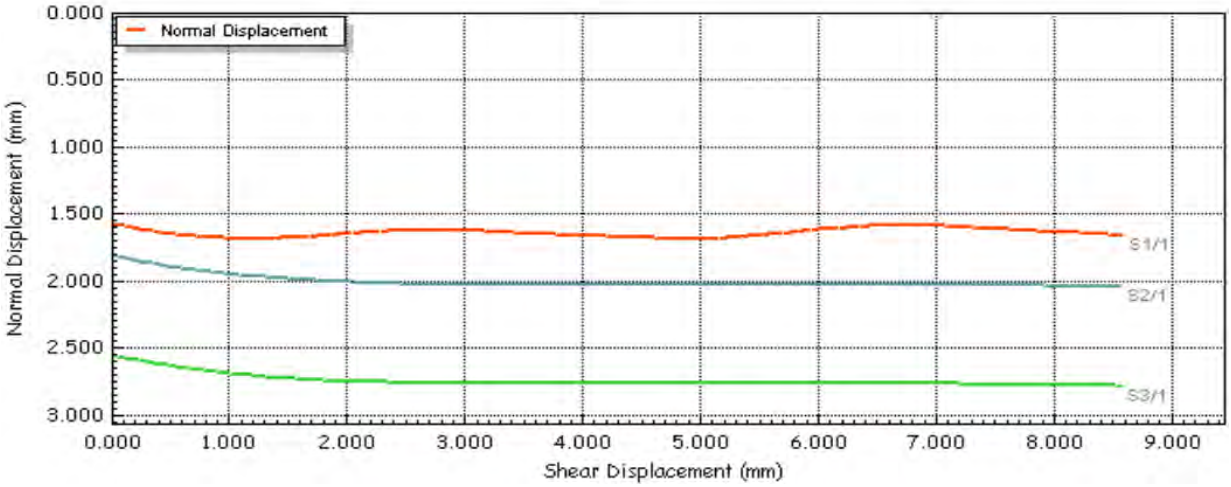
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH05	Sample Reference	1	
Depth (m)	8.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



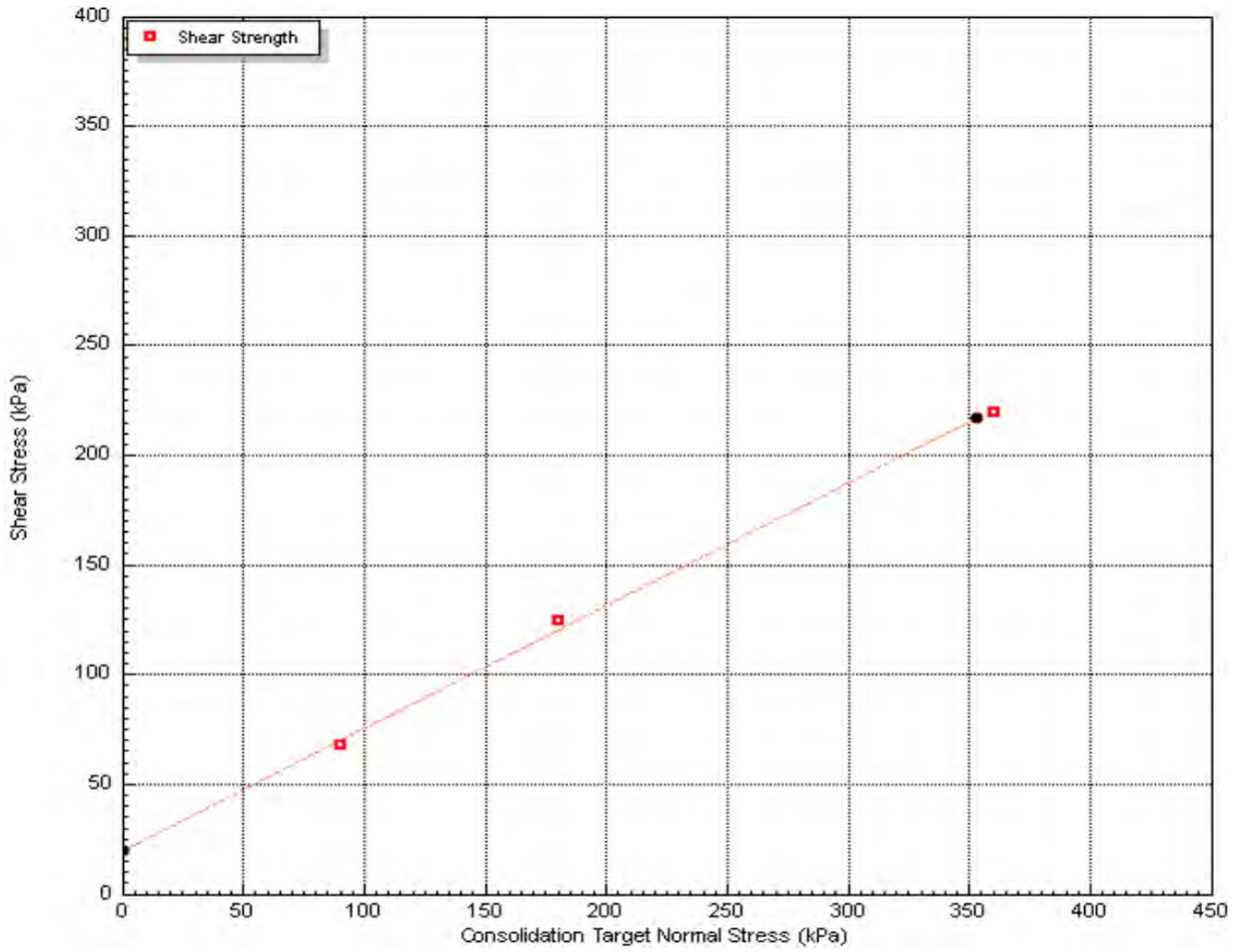


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH05	Sample Reference	1	
Depth (m)	8.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	20		
Angle of Shearing Resistance (°)	29.0		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH23	Sample Reference		4	
Depth (m)	14.00	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	18.0	18.0	18.0
Bulk Density (Mg/m^3)	2.14	2.15	2.13
Dry Density (Mg/m^3)	1.81	1.81	1.80
Voids Ratio	0.466	0.463	0.471
Consolidation			
Normal Pressure (kPa)	125	250	500
Vertical Displacement (mm)	1.458	1.910	2.359
Shearing			
Rate of Strain (mm/min)	0.093	0.093	0.093
Peak Shear Stress (kPa)	81.4	157.6	304.4
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	3.003	5.757	3.423
Final Conditions			
Water Content (%)	20.0	19.0	19.0
Dry Density (Mg/m^3)	2.11	2.24	2.37
Voids Ratio	0.341	0.296	0.269

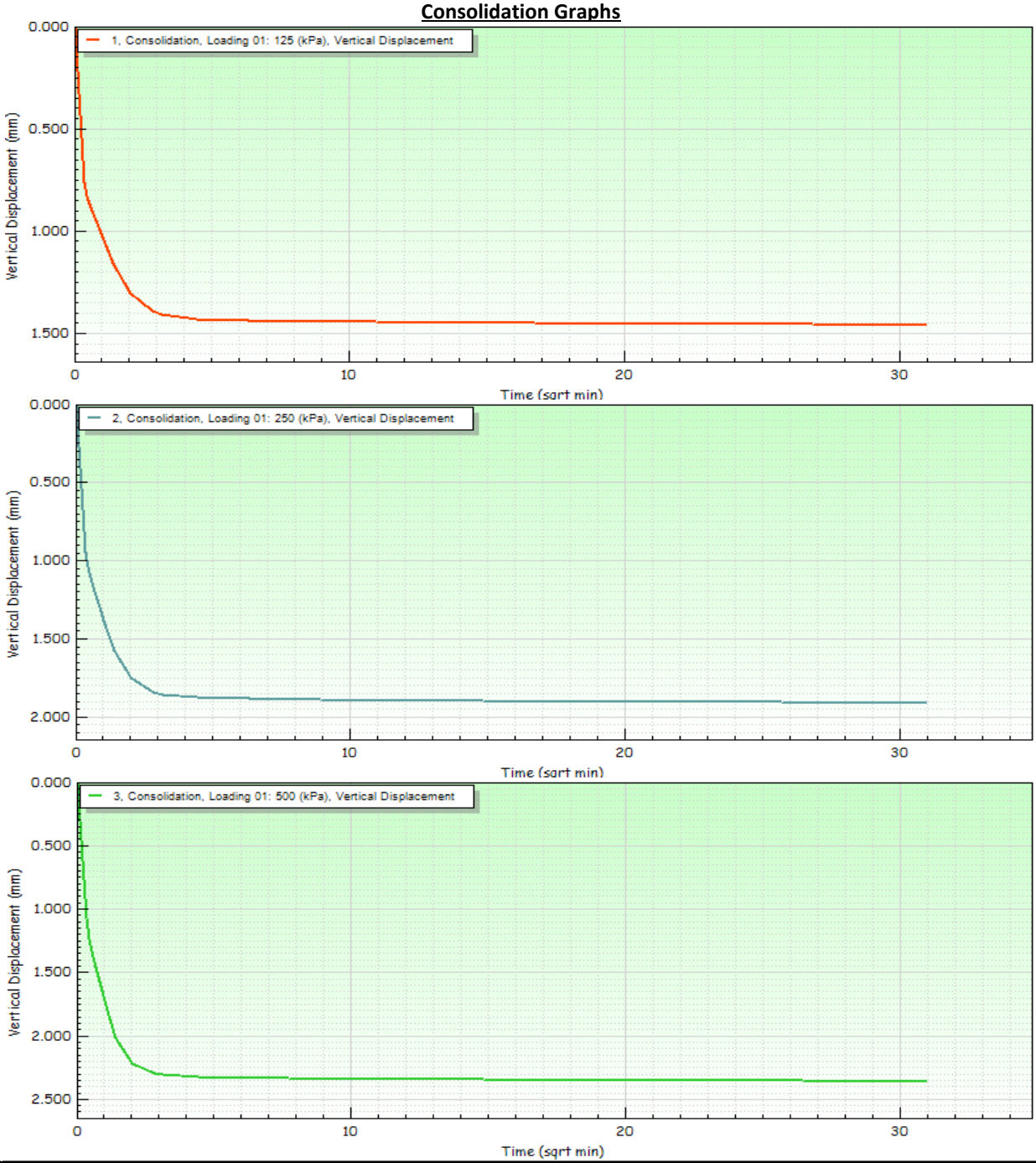
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH23	Sample Reference	4	
Depth (m)	14.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

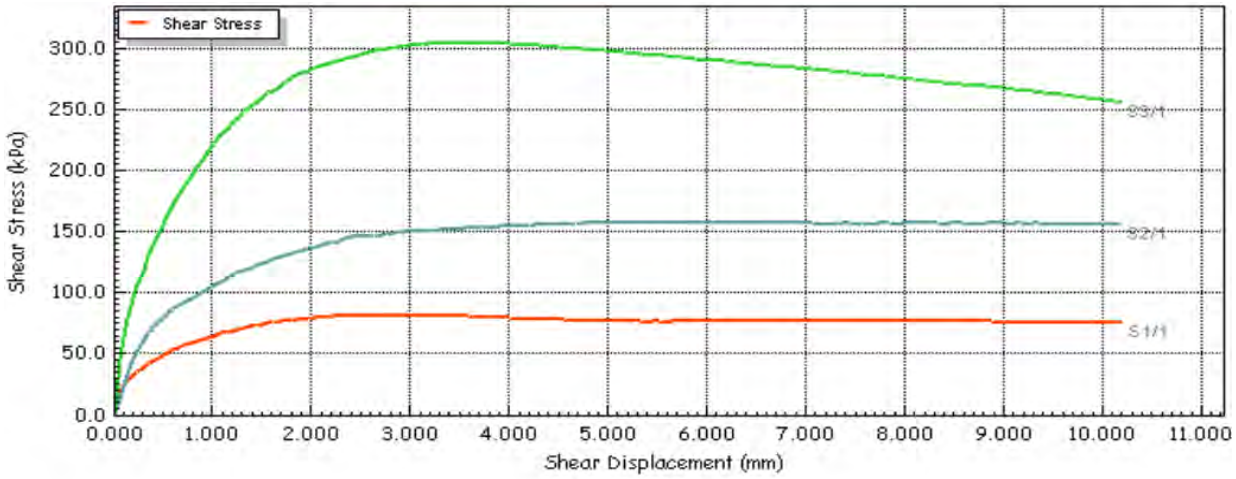


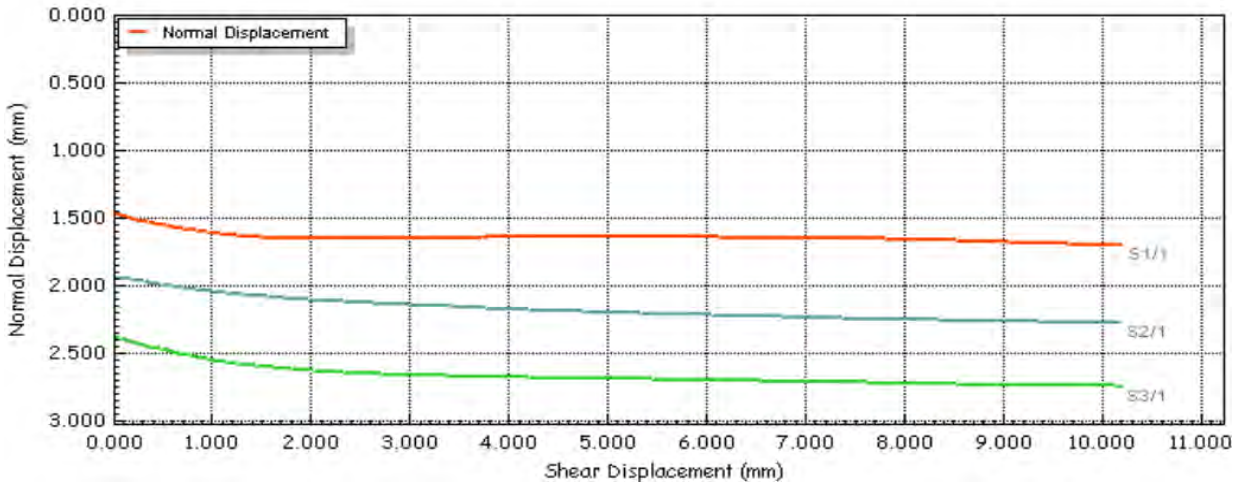
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH23	Sample Reference		4	
Depth (m)	14.00	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



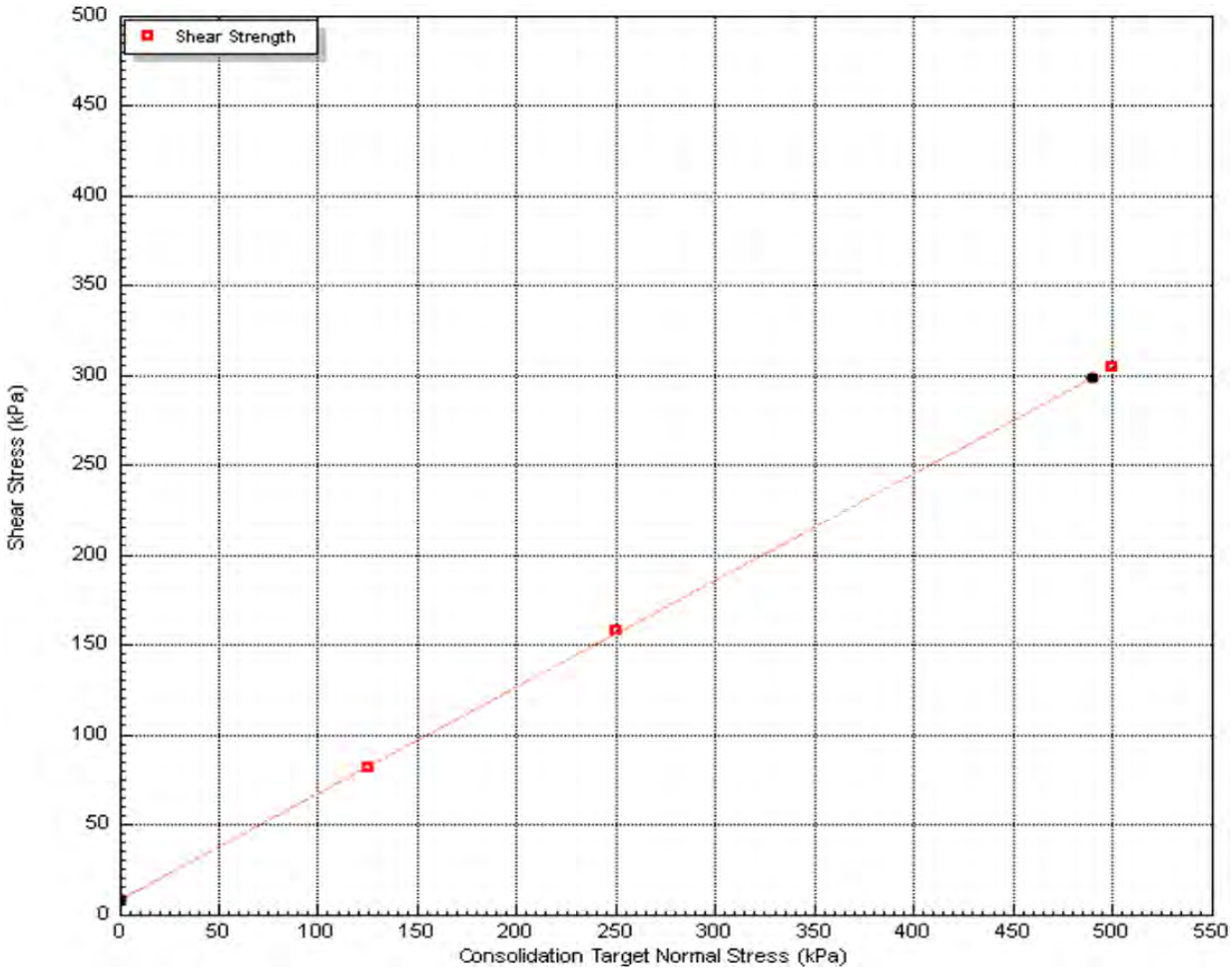


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH23	Sample Reference	4	
Depth (m)	14.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	8		
Angle of Shearing Resistance (°)	30.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	**Aaron Nutt**	**Joseph Nicholl**

Lab Sheet Reference : LAB25R - Version 4

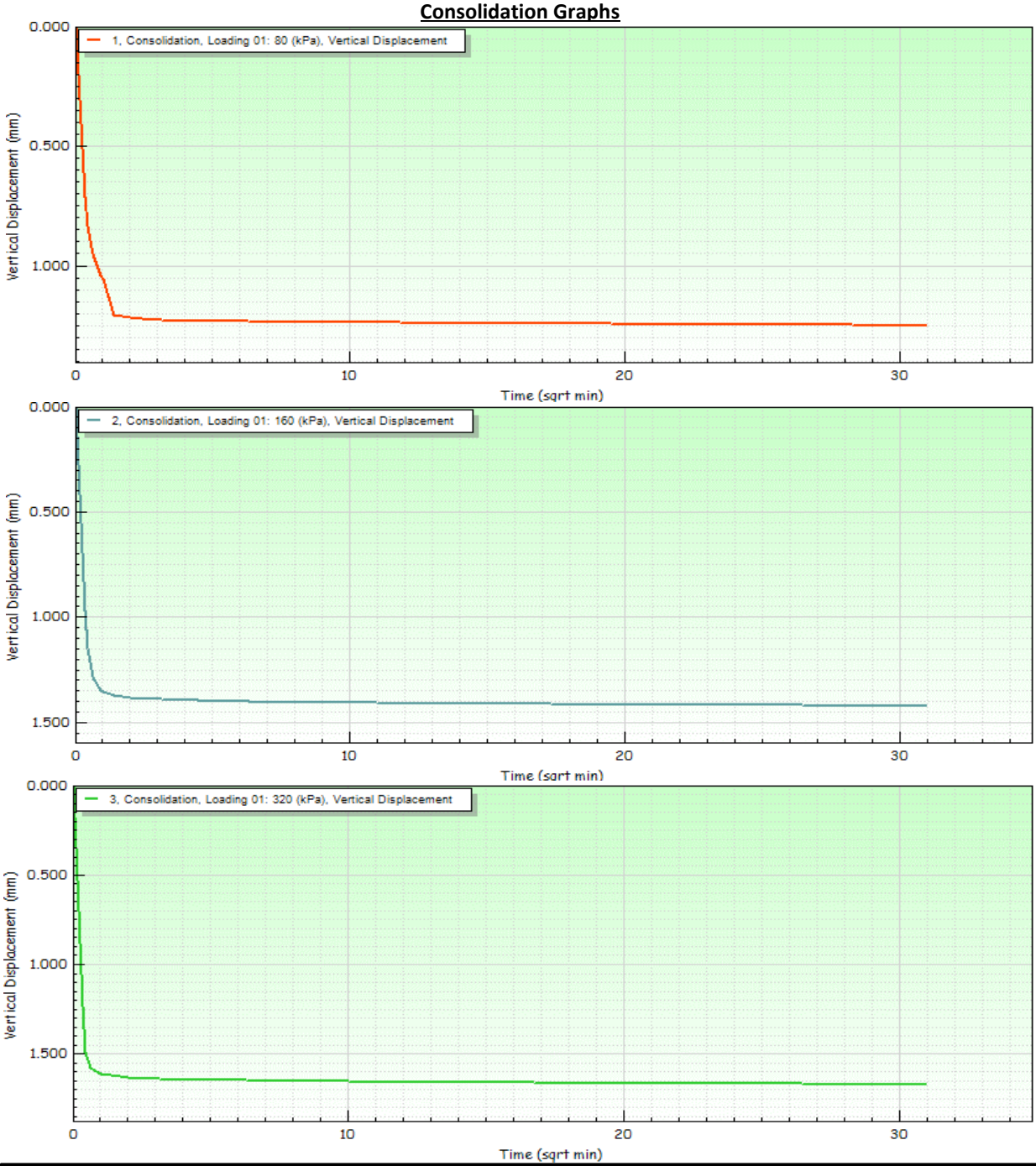
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH29	Sample Reference		1	
Depth (m)	8.00	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	20.0	20.0	20.0
Bulk Density (Mg/m^3)	2.14	2.15	2.15
Dry Density (Mg/m^3)	1.79	1.79	1.80
Voids Ratio	0.481	0.479	0.476
Consolidation			
Normal Pressure (kPa)	80	160	320
Vertical Displacement (mm)	1.250	1.421	1.670
Shearing			
Rate of Strain (mm/min)	0.118	0.118	0.118
Peak Shear Stress (kPa)	48.9	114.6	239.6
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	7.557	7.023	4.077
Final Conditions			
Water Content (%)	19.0	19.0	18.0
Dry Density (Mg/m^3)	2.02	2.06	2.14
Voids Ratio	0.365	0.654	0.331

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH29	Sample Reference	1	
Depth (m)	8.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

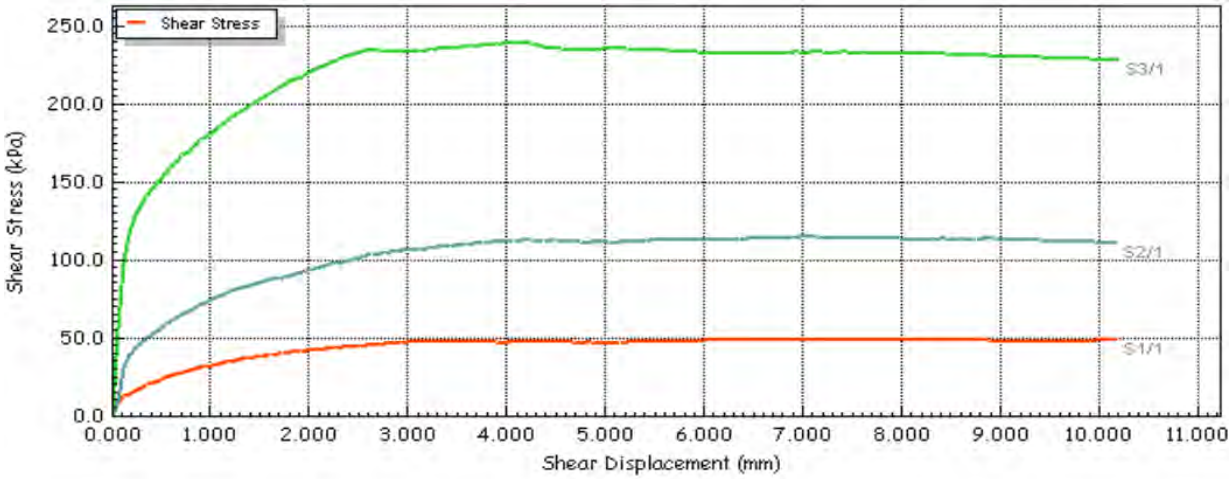


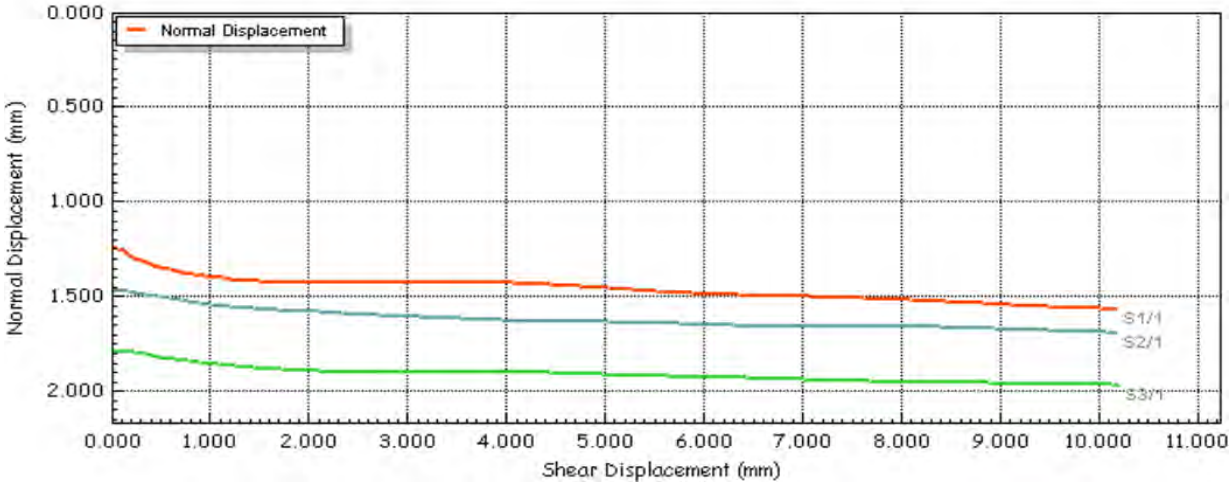
	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH29	Sample Reference	1	
Depth (m)	8.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Shear Stage



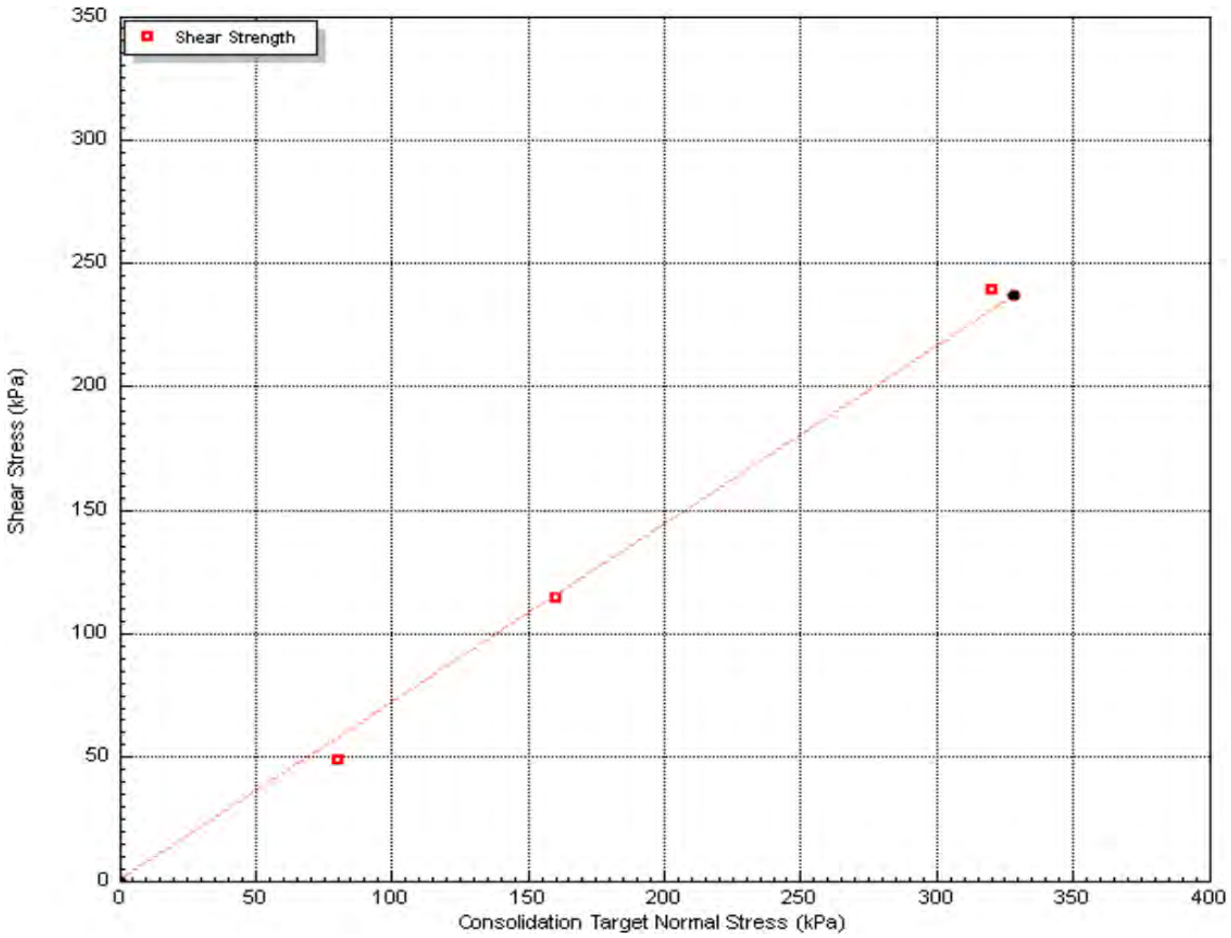


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH29	Sample Reference	1	
Depth (m)	8.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	1		
Angle of Shearing Resistance (°)	35.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

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

Certificate No : **24/134 - 02-1**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 08th March 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Cores
Date Sampled	:	Not Supplied
Date Tested	:	08th March 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 4 inclusive

Comments

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

Remarks

Approved for Issue

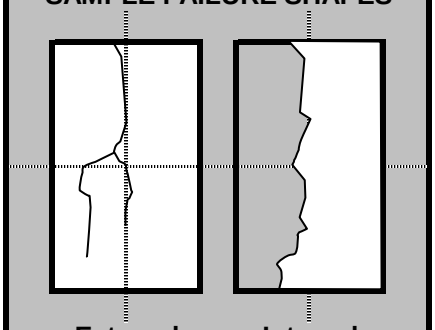
T McLelland (Director)

Date 04/04/2024

UKAS TESTING
2643

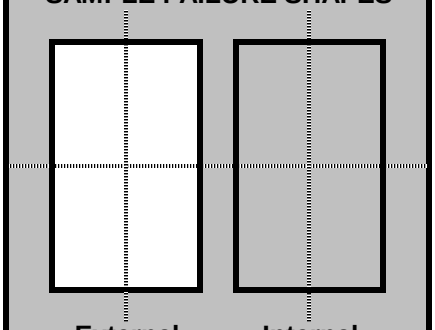
BOREHOLE		**M-BH26**
SAMPLE		**C9**
DEPTH	m	**19.20-19.60**
SAMPLE DIAMETER	mm	**100.24**
SAMPLE HEIGHT	mm	**203.08**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.8**
TEST DURATION	min.sec	**4.07**
DATE OF TESTING		**14/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**193.8**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**24.6**
WATER CONTENT (ISRM Suggested Methods)	%	**1.1**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.71**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.68**

SAMPLE FAILURE SHAPES



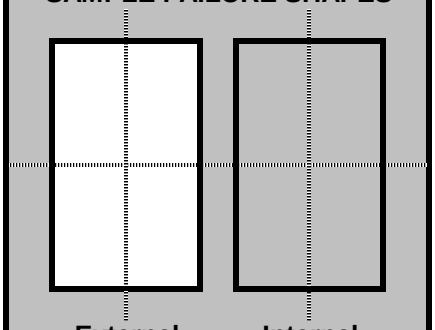
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)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

SAMPLE FAILURE SHAPES



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

SAMPLE FAILURE SHAPES



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
M-BH26	C6	14.50-14.75	As Received	I	70.11	59.94	40.25	3.79	1.06	1.15
				I	51.12	47.80	35.11	4.11	1.80	1.76
				I	58.88	55.53	41.13	6.03	1.96	2.05

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	-
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM (2007)

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
M-BH39A	C3	5.20-5.70	As Received	I	50.11	44.19	30.61	3.82	1.96	1.85
				I	87.03	54.97	27.27	2.46	0.81	0.85
				I	49.37	48.96	38.14	6.00	2.50	2.48

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	-
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM (2007)

SUMMARY OF POINT LOAD TEST RESULTS

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R03	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH05	1	8.00-9.50	C	Large Shear Box	Insufficient material passing test sieve to obtain test specimen	Carry out Small Shear Box in lieu
M-BH05		15.50-17.00	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH23		11.00-12.50	C	PL	No suitable sample available (dimensions)	CANCEL TEST
M-BH23		12.50-14.00	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH23	4	14.00-15.50	C	Large Shear Box	Insufficient material passing test sieve to obtain test specimen	Carry out Small Shear Box in lieu
M-BH26		7.00	C	Shearbox	Insufficient material passing test sieve to obtain test specimen	CANCEL TEST
M-BH26		9.00	C	UCS & PL	No suitable sample available (dimensions) Runs above and below checked	CANCEL TEST
M-BH26		10.00-11.50	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH26	6	14.50-14.75	C	UCS	Rock lab found sample to be badly fractured when prepping sample for UCS testing	PL's taken in lieu
M-BH29	1	8.00-9.50	C	Large Shear Box	Insufficient material passing test sieve to obtain test specimen	Carry out Small Shear Box in lieu
BH-39A	3	5.20-5.70	C	UCS	Rock lab found sample to be badly fractured when prepping sample for UCS testing	PL's taken in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
25 March 2024	04 April 2024

CAUSEWAY GEOTECH

HEAD OFFICE
Causeway Geotech Ltd
8 Drumahiskey Road
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Registered in Northern Ireland.
Company Number: NI610766

REGIONAL OFFICE
Causeway Geotech (IRL) Ltd
Unit 1 Fingal House
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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

4 April 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 19/02/2024 and 04/04/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R04

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	14
SOIL	Direct Shear Test using 60mm Small Shearbox (up to 3 days)	BS EN ISO 17892-10:2018	2
	Extra over days (more than initial 3 days)		6

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	1
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Saturation Water Content	BS1377-2 :2022	3
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Schmidt Rebound Hardness Test		1

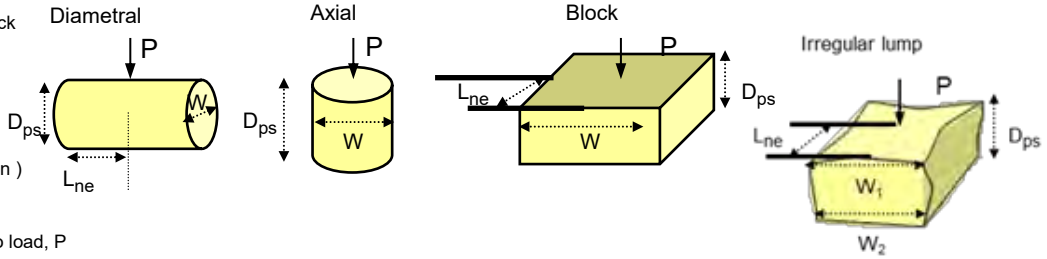
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
M-BH10	13.00	2	C	2	13.00	MUDSTONE	A	U	YES		87.6	47.0	44.0	6.2	70.1	1.3	1.5	
M-BH10	14.70	5	C	2	14.70	MUDSTONE	A	U	YES		100.2	56.0	54.0	0.9	83.0	0.1	0.2	
M-BH10	23.00	7	C	2	23.00	MUDSTONE	A	U	YES		100.7	72.0	70.0	0.8	94.7	0.1	0.1	
M-BH17	6.20	2	C	2	6.20	MUDSTONE	A	U	YES		94.2	24.0	23.0	0.1	52.5	0.0	0.0	
M-BH17	7.60	4	C	2	7.60	MUDSTONE	A	U	YES		96.6	41.0	38.0	0.7	68.4	0.1	0.2	
M-BH18	13.00	2	C	2	13.00	MUDSTONE	A	U	YES		100.2	63.0	61.0	0.4	88.2	0.1	0.1	
M-BH19	4.50	2	C	2	4.50	MUDSTONE	A	U	YES		100.4	57.0	56.0	0.3	84.6	0.0	0.1	
M-BH19	4.80	1	C	2	4.80	MUDSTONE	A	U	YES		101.2	76.0	73.0	0.2	97.0	0.0	0.0	
M-BH19	6.10	4	C	2	6.10	MUDSTONE	A	U	YES		101.9	96.0	94.0	0.2	110.4	0.0	0.0	
M-BH19	10.30	5	C	2	10.30	MUDSTONE	A	U	YES		101.2	82.0	81.0	0.2	102.2	0.0	0.0	
M-BH20	2.70	1	C	2	2.70	AMPHIBOLITE	A	U	YES		101.0	64.0	61.0	2.3	88.6	0.3	0.4	
M-BH34	4.80	1	C	2	4.80	MUDSTONE	A	U	YES		101.1	74.0	67.0	0.2	92.9	0.0	0.0	
M-BH37	2.50	1	C	2	2.50	MUDSTONE	A	U	YES		100.6	48.0	47.0	0.4	77.6	0.1	0.1	
M-BH37	4.00	2	C	2	4.00	MUDSTONE	A	U	YES		100.7	36.0	34.0	0.7	66.0	0.2	0.2	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 28/03/2024

Approved By: Stephen Watson

UKAS TESTING
10122

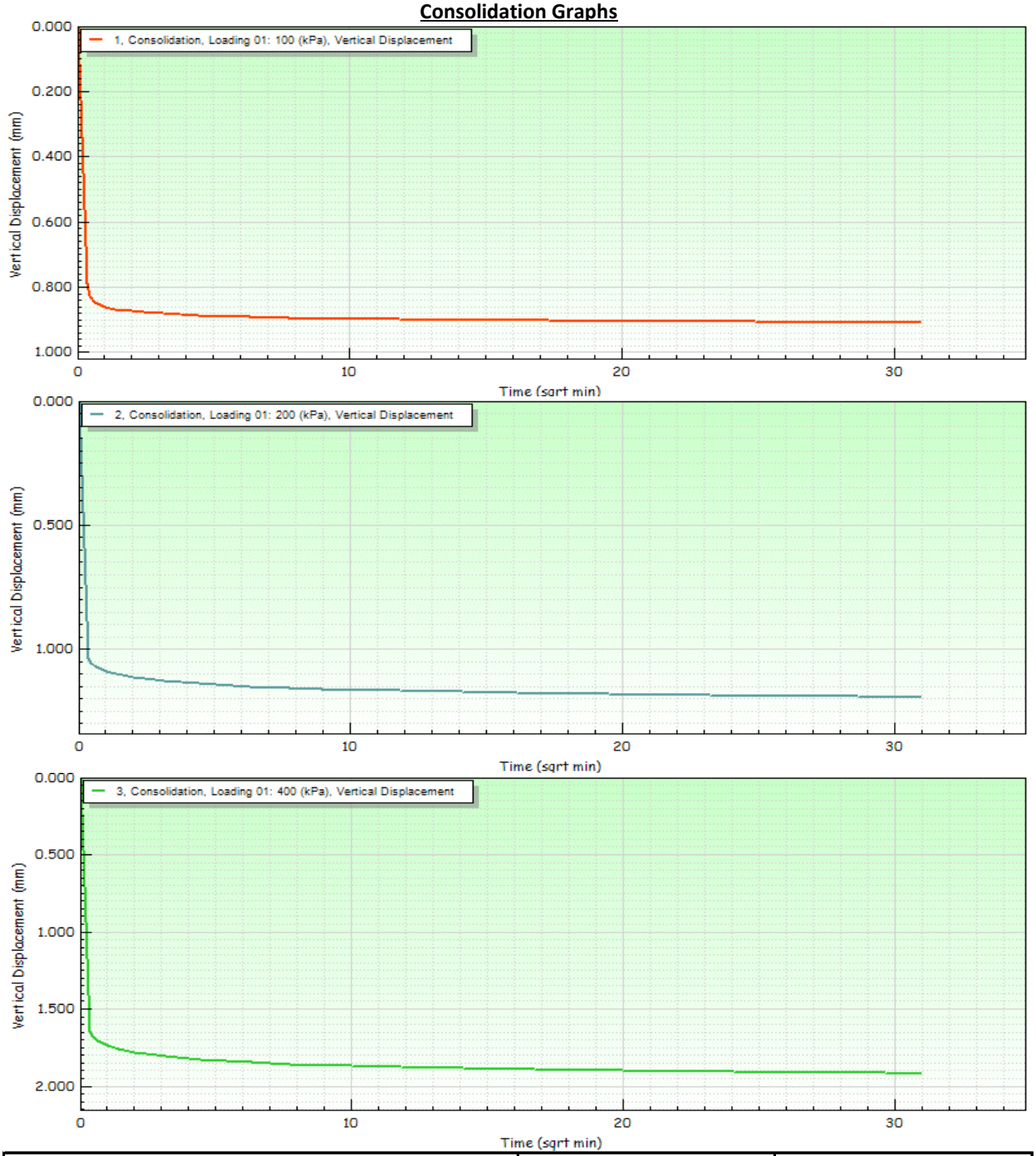
Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH17	Sample Reference		1	
Depth (m)	4.50	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown snady slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	9.1	9.1	9.1
Bulk Density (Mg/m^3)	2.00	1.99	2.01
Dry Density (Mg/m^3)	1.83	1.83	1.85
Voids Ratio	0.446	0.450	0.436
Consolidation			
Normal Pressure (kPa)	100	200	400
Vertical Displacement (mm)	0.908	1.193	1.919
Shearing			
Rate of Strain (mm/min)	0.110	0.110	0.110
Peak Shear Stress (kPa)	86.6	147.0	271.2
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	9.357	6.543	5.397
Final Conditions			
Water Content (%)	16.0	17.0	16.0
Dry Density (Mg/m^3)	2.02	2.14	2.38
Voids Ratio	0.365	0.303	0.232

	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH17	Sample Reference	1	
Depth (m)	4.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

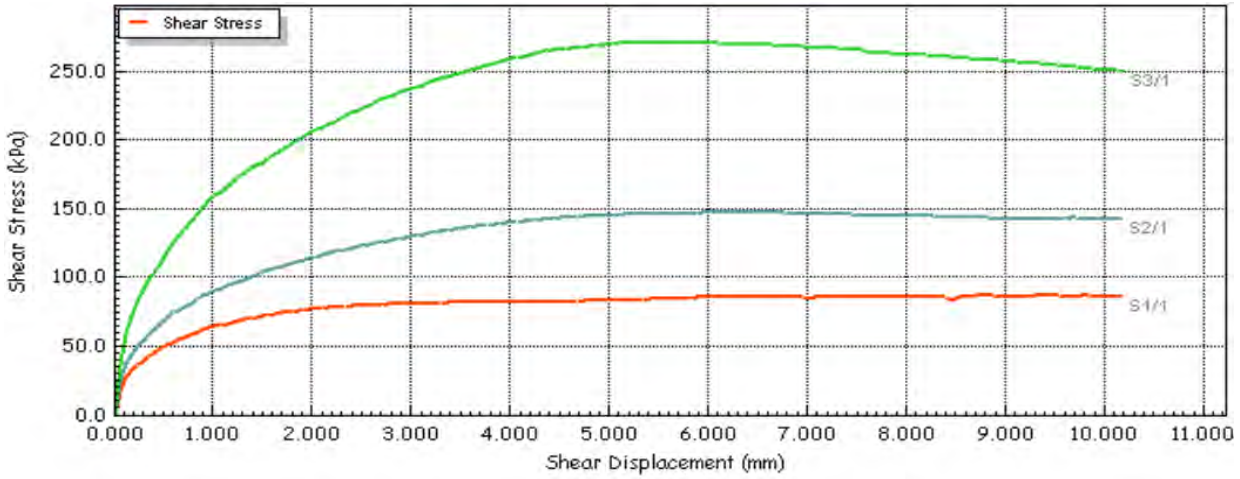


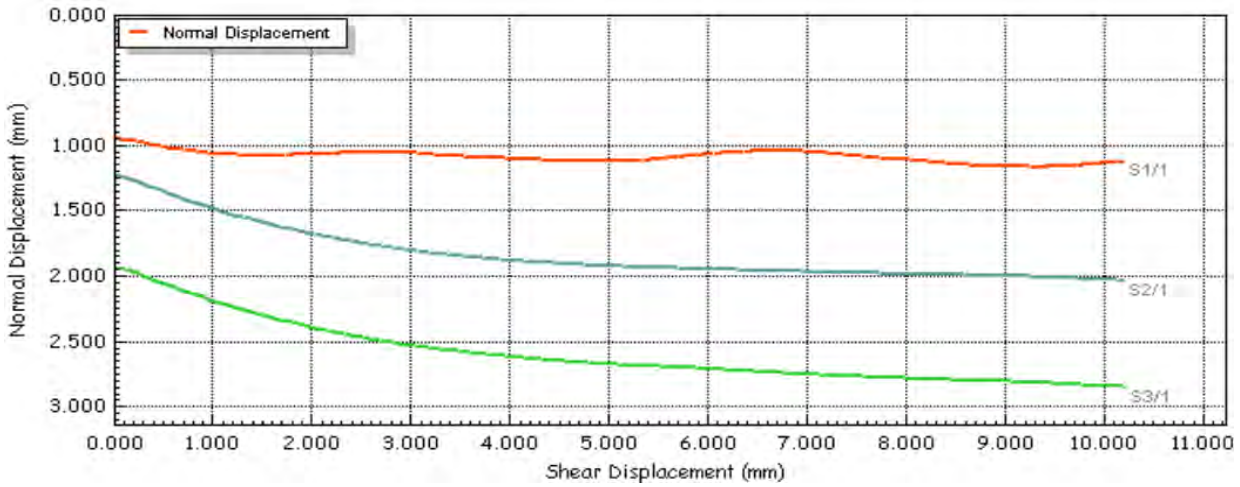
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH17	Sample Reference		1	
Depth (m)	4.50	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



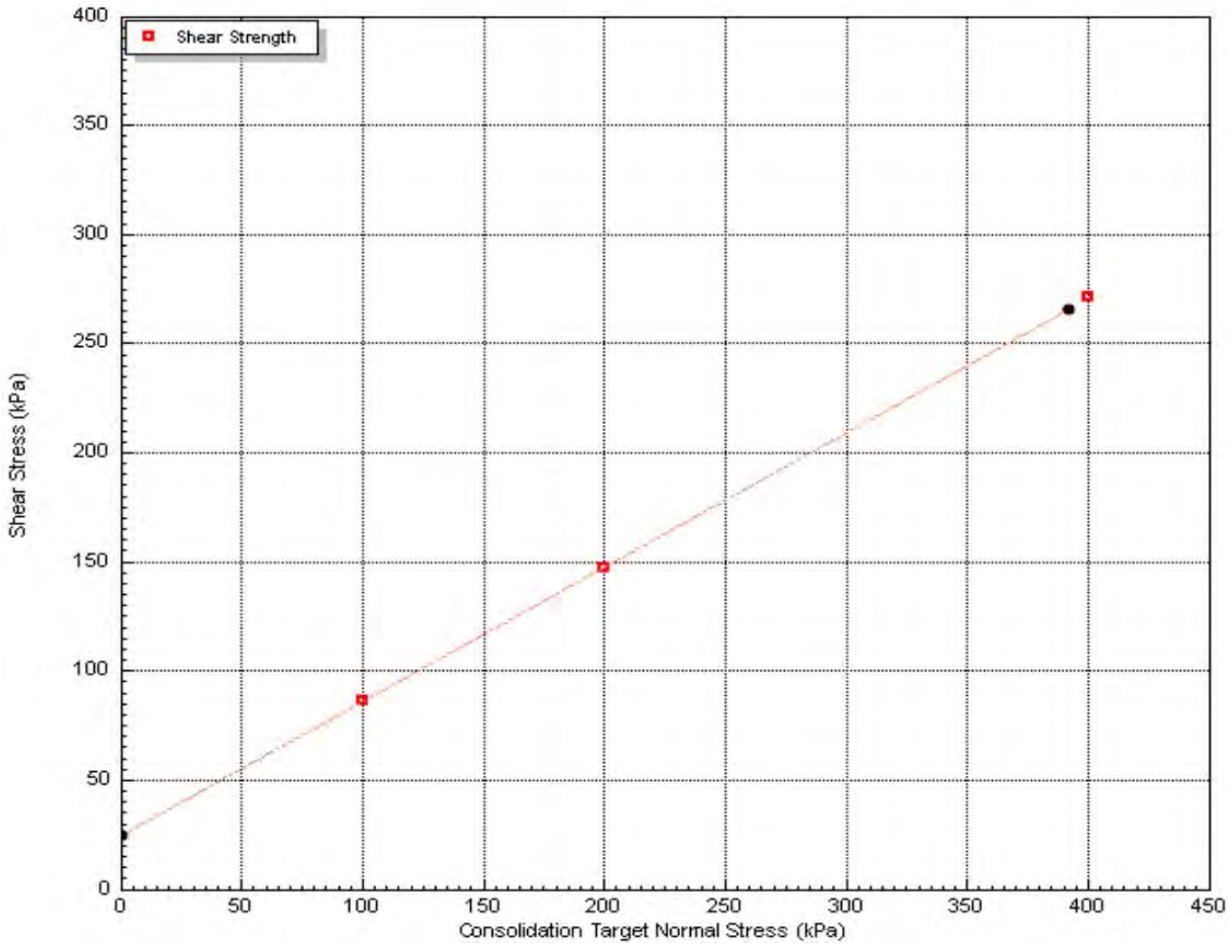


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH17	Sample Reference	1	
Depth (m)	4.50	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	25		
Angle of Shearing Resistance (°)	31.5		



	Tested	Approved
10122	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH18	Sample Reference		1	
Depth (m)	10.00	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed
Description	Greyish brown sandy slightly gravelly silty CLAY.				
Sample Preparation	Sample is recompacted using material passing 2mm test sieve				

Stage	1	2	3
Initial Conditions			
Height (mm)	20.0	20.0	20.0
Diameter (mm)	60.0	60.0	60.0
Water Content (%)	12.0	12.0	12.0
Bulk Density (Mg/m^3)	2.20	2.20	2.19
Dry Density (Mg/m^3)	1.97	1.97	1.96
Voids Ratio	0.348	0.347	0.350
Consolidation			
Normal Pressure (kPa)	200	400	800
Vertical Displacement (mm)	1.127	1.843	1.983
Shearing			
Rate of Strain (mm/min)	0.073	0.073	0.073
Peak Shear Stress (kPa)	138.3	263.8	482.0
Hoz Displacement (mm)	10.2	10.2	10.2
Hoz Displacement at Peak Shear Stress (mm)	9.357	4.623	4.263
Final Conditions			
Water Content (%)	16.0	27.0	15.0
Dry Density (Mg/m^3)	2.23	2.47	2.50
Voids Ratio	0.248	0.175	0.175

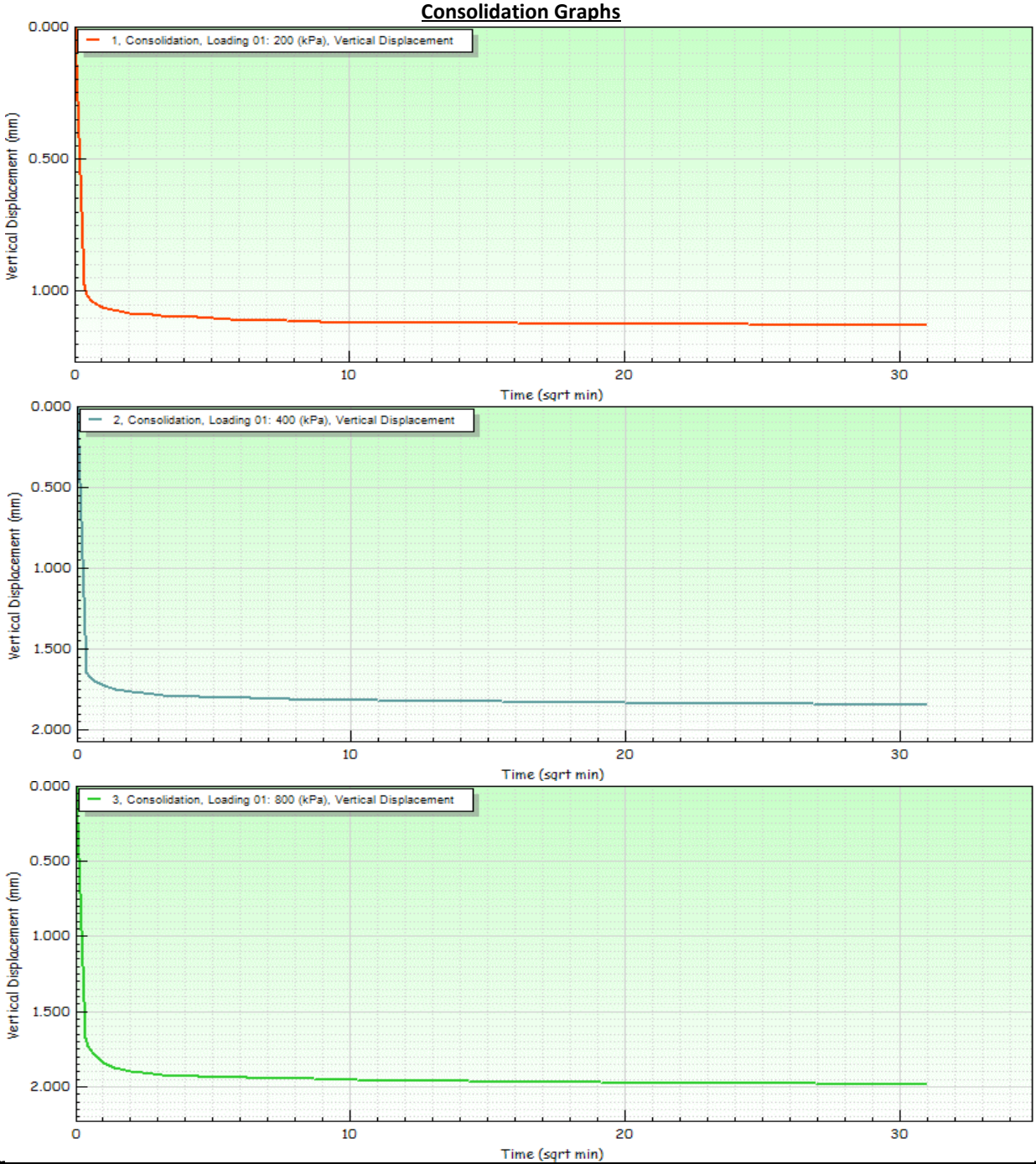
UKAS TESTING
10122

CAUSEWAY GEOTECH

Tested	Approved
Aaron Nutt	Joseph Nicholl

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH18	Sample Reference	1	
Depth (m)	10.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Consolidation Graphs

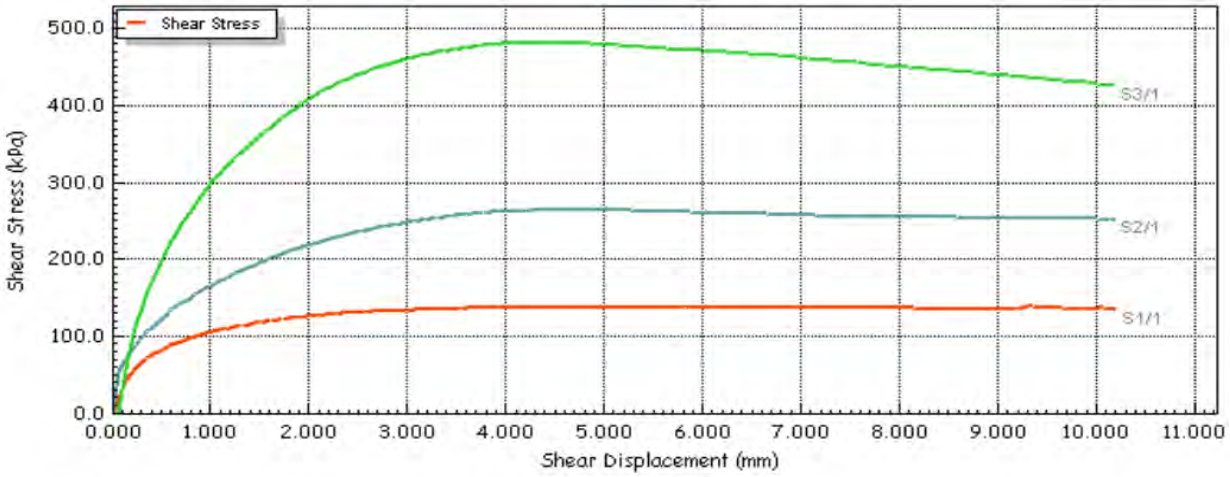


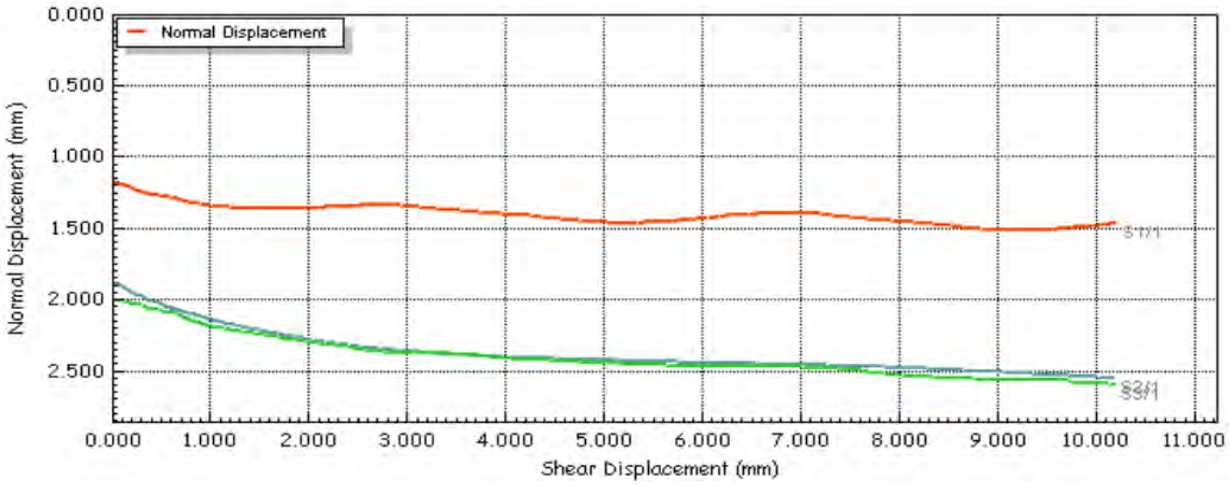
	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018					
Project Number	23-0585	Project	Rosslare OWH - GI		
Location Number	M-BH18	Sample Reference		1	
Depth (m)	10.00	Sample Submerged?		Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)		2.65	Assumed

Shear Stage



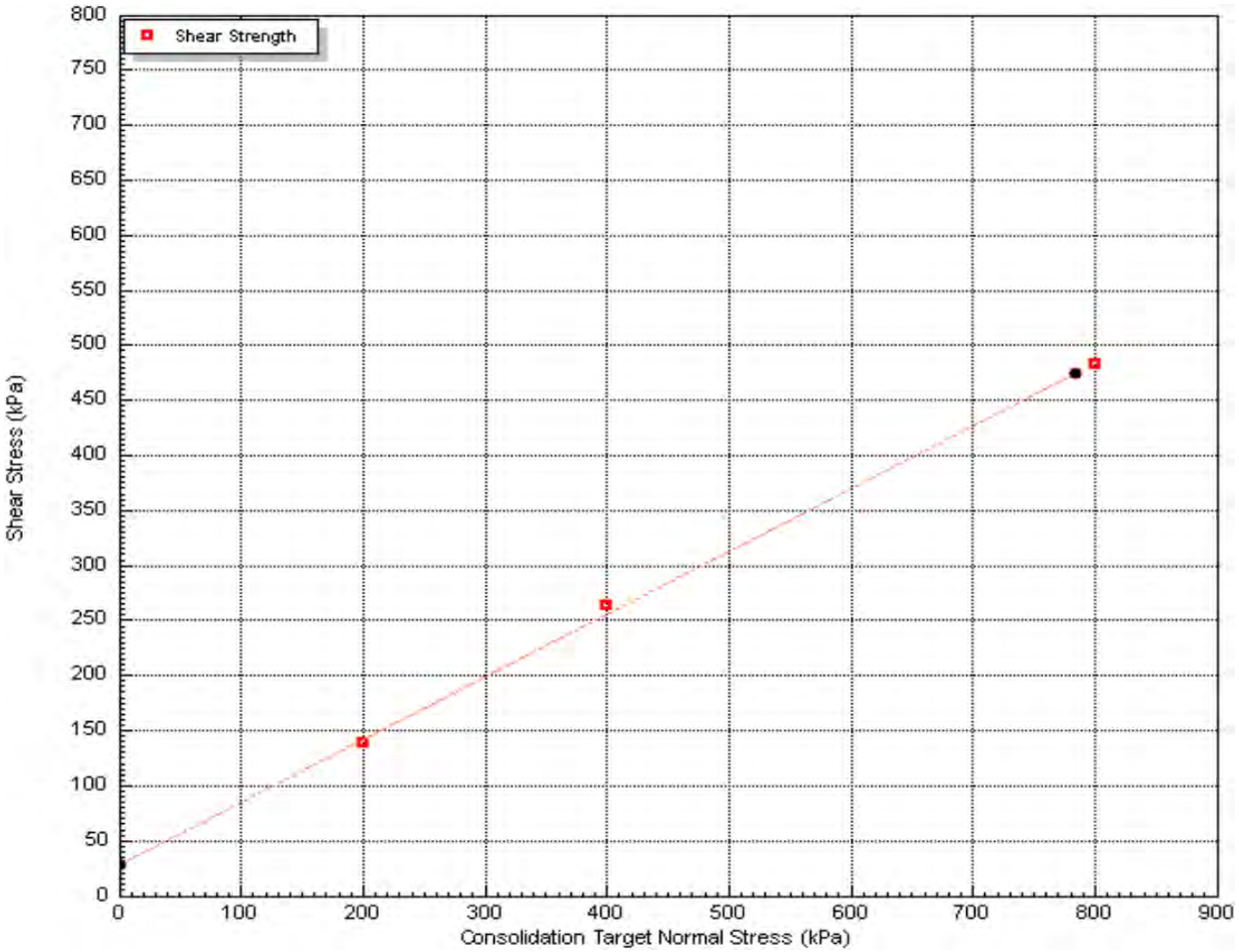


	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

Direct Shear Test BS EN ISO 17892-10:2018				
Project Number	23-0585	Project	Rosslare OWH - GI	
Location Number	M-BH18	Sample Reference	1	
Depth (m)	10.00	Sample Submerged?	Yes	~~No~~
Sample Type	C	Particle Density (Mg/m^3)	2.65	Assumed

Stage	1	2	3
Envelope Failure Results			
Apparent Cohesion (kPa)	29		
Angle of Shearing Resistance (°)	29.5		



	Tested	Approved
UKAS TESTING 10122 / CAUSEWAY GEOTECH	Aaron Nutt	Joseph Nicholl

Lab Sheet Reference : LAB25R - Version 4

LABORATORY TEST CERTIFICATE

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

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

Certificate No : **24/134 - 02-2**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 08th March 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Cores
Date Sampled	:	Not Supplied
Date Tested	:	08th March 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 4 inclusive

Comments

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

Remarks

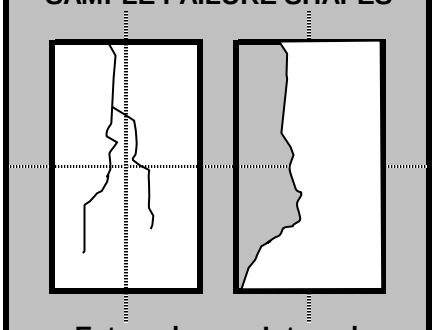
Approved for Issue

Date 04/04/2024

T McLelland (Director)

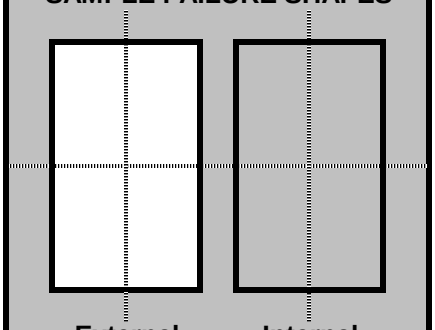
BOREHOLE		**M-BH20**
SAMPLE		**C2**
DEPTH	m	**4.30-4.90**
SAMPLE DIAMETER	mm	**100.78**
SAMPLE HEIGHT	mm	**197.62**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.7**
TEST DURATION	min.sec	**5.22**
DATE OF TESTING		**14/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**233.6**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**29.3**
WATER CONTENT (ISRM Suggested Methods)	%	**0.3**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.72**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.72**

SAMPLE FAILURE SHAPES



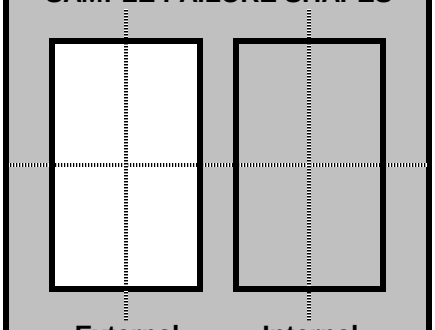
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)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

SAMPLE FAILURE SHAPES



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

SAMPLE FAILURE SHAPES



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE	SAMPLE	DEPTH (m)	SCHMIDT REBOUND HARDNESS (N/mm^2)
M-BH10	C3	13.20-14.70	<10 <10 <10 <10 <10 <10 <10 <10 <10 <10

SUMMARY OF SCHMIDT REBOUND HARDNESS TEST

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	SATURATION WATER CONTENT (%)
M-BH10	C1	11.00-11.10	1.3
M-BH10	C4	14.80-15.00	2.4
M-BH10	C6	22.20-22.40	1.0

Tested in accordance with BS 1377 - 2 : 2022 : Clause 4.2

SUMMARY OF SATURATION WATER CONTENT OF CHALK TEST RESULTS

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R04	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH10		13.20-14.70	C	UCS	No suitable sample available (structureless) Runs above and below checked	CANCEL TEST
M-BH10		13.20-14.70	C	Triaxial Testing	Rock lab found sample to be badly fractured when prepping sample for testing	Complete Schmidt hammer test
M-BH10		14.70-16.20	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu
M-BH17	3	7.50-7.60	C	Saturated Moisture Content	No suitable sample available; sample behaviour is effectively a clay	CANCEL TEST
M-BH17		7.50-9.00	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu
M-BH18		13.00-14.50	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu
M-BH19		4.40-5.90	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu
M-BH19	3	5.90-7.40	C	Saturated Moisture Content	No suitable sample available; sample behaviour is effectively a clay	CANCEL TEST
M-BH19		5.90-7.40	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
25 March 2024	4 April 2024

CAUSEWAY GEOTECH

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REGIONAL OFFICE
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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

4 April 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 19/02/2024 and 04/04/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R05

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	11

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	1
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Saturation Water Content of Rock	BS 1377-2: 2022	1

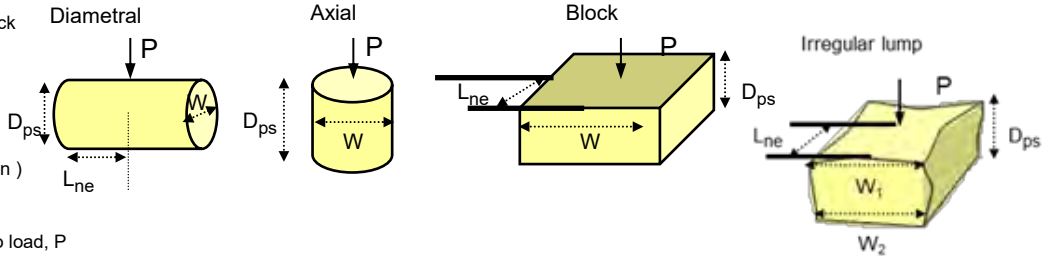
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
M-BH27	3.40	2	C	2	3.40	MUDSTONE	A	U	YES		101.3	94.0	71.0	0.4	95.7	0.0	0.1	
M-BH27	3.70	3	C	2	3.70	MUDSTONE	A	U	YES		101.4	85.0	54.0	0.3	83.5	0.0	0.1	
M-BH27	4.90	4	C	2	4.90	MUDSTONE	A	U	YES		100.9	76.0	74.0	0.5	97.5	0.1	0.1	
M-BH27	6.40	5	C	2	6.40	MUDSTONE	A	U	YES		101.0	52.0	50.0	0.9	80.2	0.1	0.2	
M-BH28	4.00	3	C	2	4.00	AMPHIBOLITE	A	U	YES		100.7	65.0	61.0	1.0	88.4	0.1	0.2	
M-BH28	4.30	1	C	2	4.30	AMPHIBOLITE	A	U	YES		99.8	74.0	70.0	3.3	94.3	0.4	0.5	
M-BH28	4.40	2	C	2	4.40	AMPHIBOLITE	A	U	YES		99.8	79.0	72.0	2.5	95.7	0.3	0.4	
M-BH28	4.60	5	C	2	4.60	AMPHIBOLITE	A	U	NO		100.3	88.0	85.0	26.5	104.2	2.4	3.4	
M-BH28	6.00	6	C	2	6.00	AMPHIBOLITE	A	U	YES		100.6	102.0	100.0	2.4	113.2	0.2	0.3	
M-BH30	4.00	1	C	2	4.00	AMPHIBOLITE	A	U	YES		100.8	68.0	65.0	2.4	91.3	0.3	0.4	
M-BH30	5.30	2	C	2	5.30	AMPHIBOLITE	A	U	YES		100.8	56.0	55.0	0.8	84.0	0.1	0.1	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 27/03/2024

Approved By: Stephen Watson

UKAS TESTING
10122

LABORATORY TEST CERTIFICATE

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

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

Certificate No : **24/134 - 02-3**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 08th March 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Cores
Date Sampled	:	Not Supplied
Date Tested	:	08th March 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 3 inclusive

Comments

The results contained in this report relate to the sample(s) as received
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All remaining samples for this project will be disposed of 28 days after issue of this test certificate

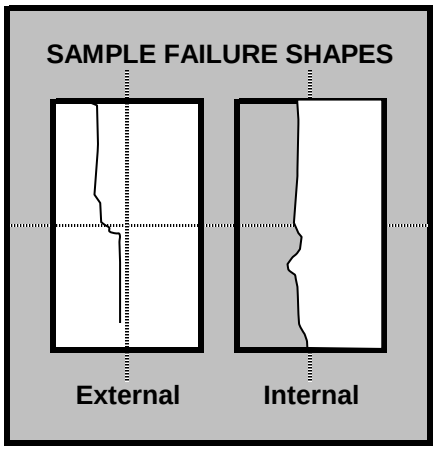
Remarks

Approved for Issue

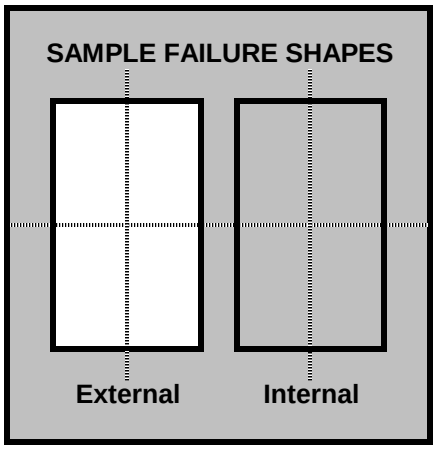
Date 04/04/2024

T McLelland (Director)

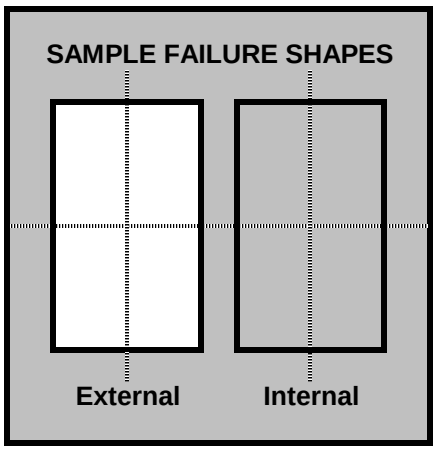
BOREHOLE		**M-BH28**
SAMPLE		**C4**
DEPTH	m	**5.00-5.30**
SAMPLE DIAMETER	mm	**100.59**
SAMPLE HEIGHT	mm	**201.52**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.5**
TEST DURATION	min.sec	**6.19**
DATE OF TESTING		**14/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**189.4**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**23.8**
WATER CONTENT (ISRM Suggested Methods)	%	**0.5**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.67**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.66**



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



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



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE	SAMPLE	DEPTH (m)	SATURATION WATER CONTENT (%)
M-BH27	C1	3.30-4.80	12.0

Tested in accordance with BS 1377 - 2 : 2022 : Clause 4.2

SUMMARY OF SATURATION WATER CONTENT OF CHALK TEST RESULTS

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R05	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH27		3.30-4.80	C	UCS	No suitable sample available (dimensions) Run below checked	PL taken in lieu
M-BH28		3.00-4.50	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
25 March 2024	4 April 2024

CAUSEWAY GEOTECH

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Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

5 April 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 19/02/2024 and 05/04/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R06

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	8

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	2
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Saturation Water Content	BS1377-2 :2022	2
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Schmidt Rebound Hardness Test		1

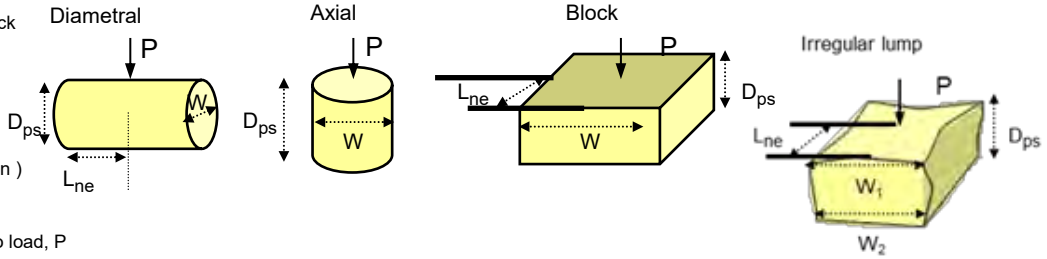
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
M-BH22	12.60	2	C	2	12.60	SANDSTONE	A	U	YES		100.6	88.0	84.0	65.5	103.7	6.1	8.5	
M-BH33	9.00	1	C	2	9.00	DOLERITE	A	U	YES		100.1	69.0	66.0	5.5	91.7	0.7	0.9	
M-BH33	9.15	2	C	2	9.15	DOLERITE	A	U	YES		100.2	48.0	44.0	6.3	74.9	1.1	1.3	
M-BH33	9.50	3	C	2	9.50	DOLERITE	A	U	YES		100.1	56.0	53.0	3.9	82.2	0.6	0.7	
M-BH33	10.70	4	C	2	10.70	DOLERITE	A	U	YES		100.3	104.0	102.0	4.0	114.1	0.3	0.4	
M-BH41	14.00	3	C	2	14.00	MUDSTONE	A	U	YES		101.1	76.0	74.0	0.3	97.6	0.0	0.0	
M-BH41	14.30	1	C	2	14.30	MUDSTONE	A	U	YES		100.9	91.0	87.0	3.9	105.7	0.3	0.5	
M-BH41	16.00	4	C	2	18.00	MUDSTONE	A	U	YES		101.0	84.0	81.0	5.3	102.1	0.5	0.7	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 04/05/2024 00:00

Approved By: Stephen Watson

UKAS TESTING
10122

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

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

Certificate No : **24/134 - 02-4**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 08th March 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Cores
Date Sampled	:	Not Supplied
Date Tested	:	08th March 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 5 inclusive

Comments

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

Remarks

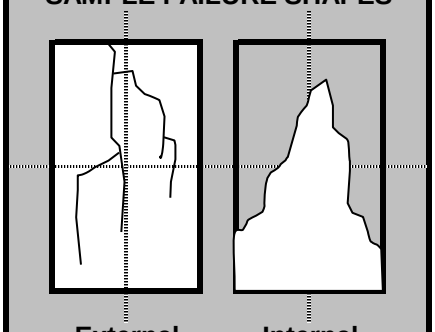
Approved for Issue

Date 04/04/2024

T McLelland (Director)

BOREHOLE		**M-BH22**
SAMPLE		**C3**
DEPTH	m	**13.70-13.95**
SAMPLE DIAMETER	mm	**100.89**
SAMPLE HEIGHT	mm	**135.22**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.7**
TEST DURATION	min.sec	**9.46**
DATE OF TESTING		**14/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**414.9**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**51.9**
WATER CONTENT (ISRM Suggested Methods)	%	**0.6**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.74**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.72**

SAMPLE FAILURE SHAPES

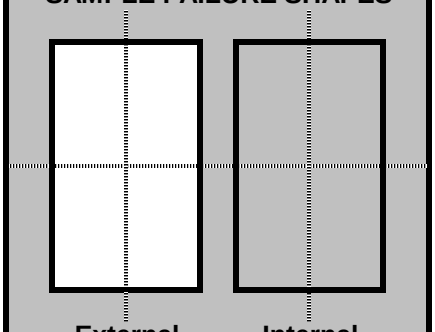


External **Internal**

Test specimen does not meet specified length / diameter ratio requirements; results may differ from test specimen that meets requirements

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

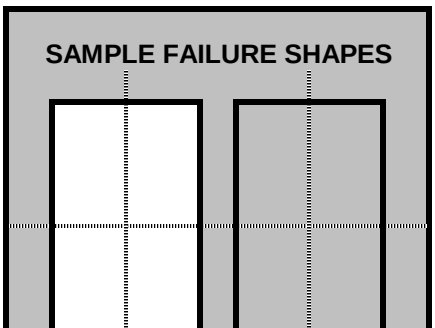
SAMPLE FAILURE SHAPES



External **Internal**

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

SAMPLE FAILURE SHAPES

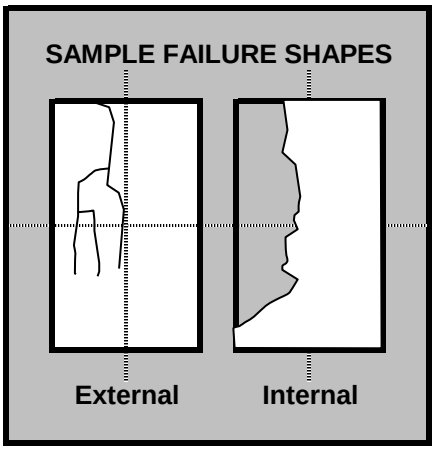


External **Internal**

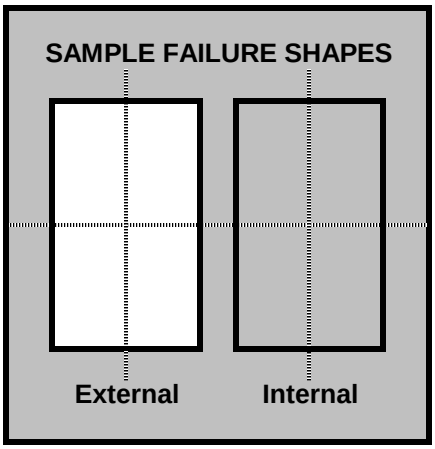
Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

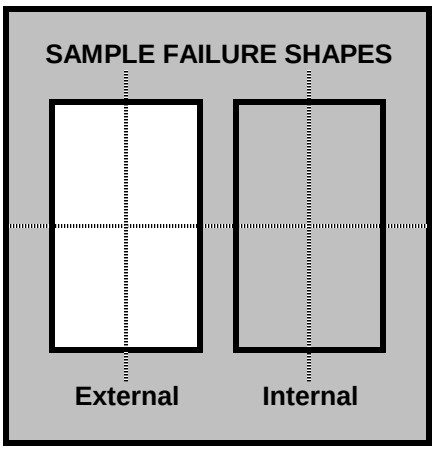
BOREHOLE		**M-BH40**
SAMPLE		**C1**
DEPTH	m	**3.90-4.40**
SAMPLE DIAMETER	mm	**100.65**
SAMPLE HEIGHT	mm	**200.10**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.8**
TEST DURATION	min.sec	**4.15**
DATE OF TESTING		**14/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**188.8**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**23.7**
WATER CONTENT (ISRM Suggested Methods)	%	**0.5**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.79**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.77**



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



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



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE	SAMPLE	DEPTH (m)	SCHMIDT REBOUND HARDNESS (N/mm^2)
M-BH41	C2	13.00-14.50	<10 <10 <10 <10 <10 <10 <10 <10 <10 <10

SUMMARY OF SCHMIDT REBOUND HARDNESS TEST

BOREHOLE	SAMPLE	DEPTH (m)	SATURATION WATER CONTENT (%)
M-BH22	C1	11.20-11.70	1.8
M-BH22	C4	14.50-14.70	3.0

Tested in accordance with BS 1377 - 2 : 2022 : Clause 4.2

SUMMARY OF SATURATION WATER CONTENT OF CHALK TEST RESULTS

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R06	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH22		11.70-13.20	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu
M-BH22	3	13.70-13.95	C	UCS	Sample short following preparation	Non-standard UCS completed
M-BH33		9.00-10.50	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH41		13.00-14.50	C	UCS	No suitable sample available (dimensions) Runs above and below checked	PL taken in lieu
M-BH41	2	13.00-14.50	C	Triaxial Testing	Rock lab found sample to be badly fractured when prepping sample for testing	Complete Schmidt hammer test
M-BH41		16.00-17.50	C	UCS	No suitable sample available (dimensions) Run above checked	PL taken in lieu

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

Laboratory Signature Joseph Nicholl	Project Manager Signature Neil Haggan
Date 25 March 2024	Date 05 April 2024

HEAD OFFICE
Causeway Geotech Ltd
8 Drumahiskey Road
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Co. Antrim, N. Ireland, BT53 7QL
NI: +44 (0)28 276 66640
Registered in Northern Ireland.
Company Number: NI610766

REGIONAL OFFICE
Causeway Geotech (IRL) Ltd
Unit 1 Fingal House
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Balbriggan, Co Dublin, Ireland, K32 VR66
ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

27 March 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 19/02/2024 and 27/03/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R07

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	3

SUB-CONTRACTED TESTS

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

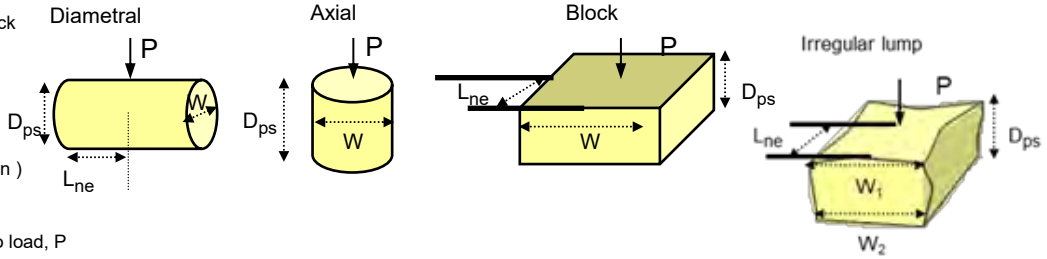
Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 23	3

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
L-BH01	9.20	1	C	1	9.20	AMPHIBOLITE	A	U			101.1	89.0	86.0	39.5	105.2	3.6	5.0	
L-BH03	12.05	2	C	1	12.05	AMPHIBOLITE	A	U			101.2	84.0	81.0	2.2	102.2	0.2	0.3	
L-BH04	10.50	2	C	1	10.50	AMPHIBOLITE	A	U			101.0	94.0	90.0	37.3	107.6	3.2	4.5	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 27/03/2024

Approved By: Stephen Watson

UKAS TESTING
10122

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

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

Certificate No : **24/134 - 03-1**

To : **Stephen Watson**

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

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Rosslare OWH - GI and delivered to our laboratory on 18th March 2024.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Cores
Date Sampled	:	Not Supplied
Date Tested	:	18th March 2024 Onwards
Source	:	23-0585 - Rosslare OWH - GI

Test Results

As Detailed On Page 2 to Page 4 inclusive

Comments

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

Remarks

Approved for Issue

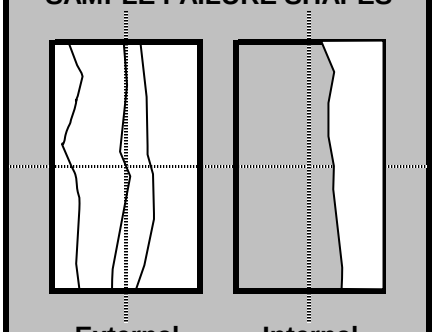
T McLelland (Director)

Date 21/03/2024

UKAS TESTING
2643

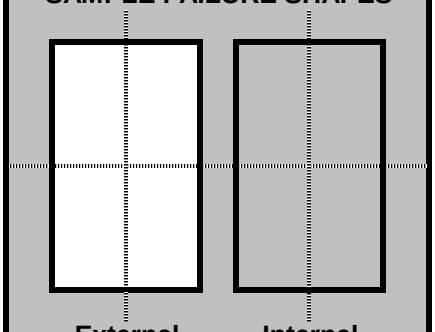
BOREHOLE		**L-BH01**
SAMPLE		**C2**
DEPTH	m	**11.15-11.50**
SAMPLE DIAMETER	mm	**101.28**
SAMPLE HEIGHT	mm	**206.30**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**1.3**
TEST DURATION	min.sec	**10.40**
DATE OF TESTING		**20/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**814.5**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**101.1**
WATER CONTENT (ISRM Suggested Methods)	%	**0.2**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.81**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.80**

SAMPLE FAILURE SHAPES



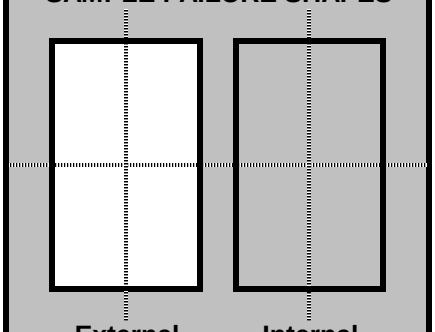
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)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

SAMPLE FAILURE SHAPES



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

SAMPLE FAILURE SHAPES

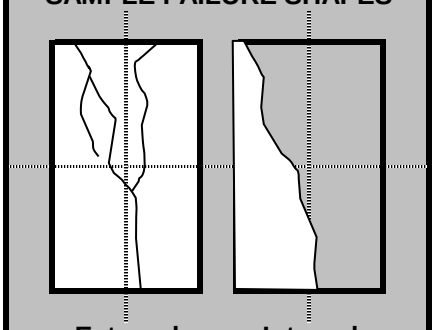


Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

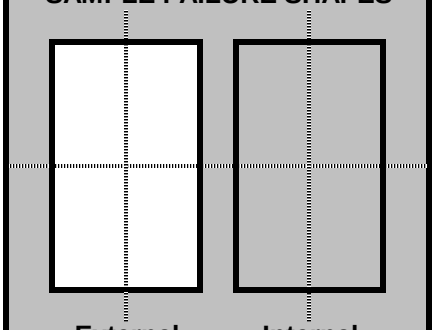
BOREHOLE		**L-BH03**
SAMPLE		**C1**
DEPTH	m	**11.50-11.95**
SAMPLE DIAMETER	mm	**100.84**
SAMPLE HEIGHT	mm	**206.41**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.9**
TEST DURATION	min.sec	**2.35**
DATE OF TESTING		**20/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**130.5**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**16.3**
WATER CONTENT (ISRM Suggested Methods)	%	**0.2**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.75**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.75**

SAMPLE FAILURE SHAPES



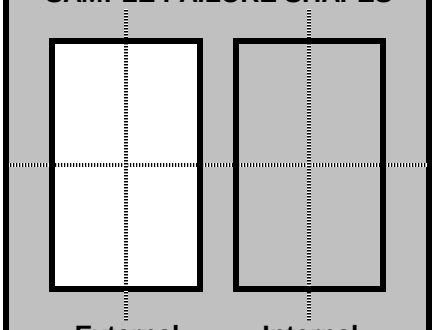
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)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

SAMPLE FAILURE SHAPES



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

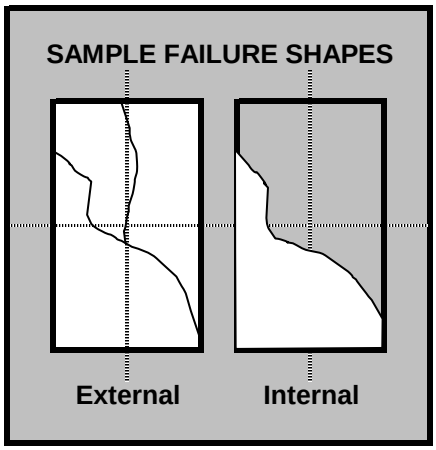
SAMPLE FAILURE SHAPES



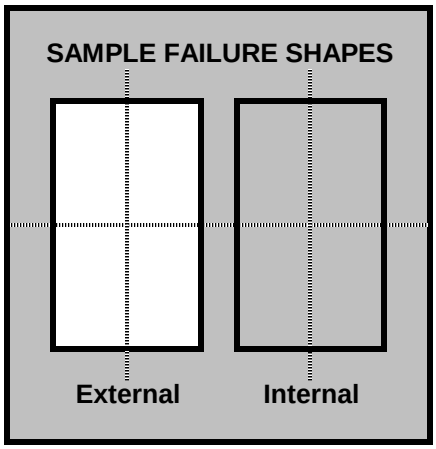
Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

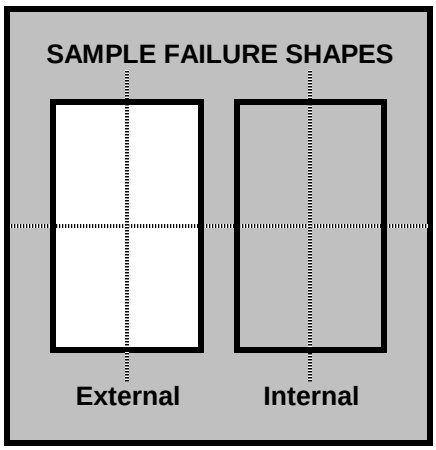
BOREHOLE		**L-BH04**
SAMPLE		**C1**
DEPTH	m	**10.75-11.00**
SAMPLE DIAMETER	mm	**101.16**
SAMPLE HEIGHT	mm	**205.13**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**1.2**
TEST DURATION	min.sec	**5.14**
DATE OF TESTING		**20/03/2024**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**362.8**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**45.1**
WATER CONTENT (ISRM Suggested Methods)	%	**0.2**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.74**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.73**



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



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



Tested in accordance with ASTM D7012 - 23

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

CAUSEWAY GEOTECH

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SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

5 June 2024

Project Name:	Rosslare Europort Offshore Renewable Energy Hub SI
Project No.:	23-0585
Client:	Iarnród Éireann
Engineer:	GDG

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 30/05/2024 and 05/06/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001
UKAS MANAGEMENT SYSTEMS 9235
UKAS TESTING 10122
AGS
BRITISH DRILLING ASSOCIATION

Project Name: Rosslare Europort Offshore Renewable Energy Hub SI

Report Reference: Rock Schedule R08

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	35
ROCK	Uniaxial Compressive Strength (UCS)	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	9

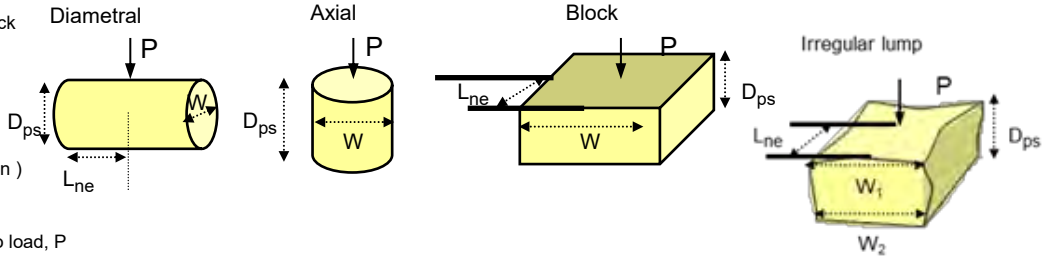
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
L-BH01	9.00	3	C	2	9.00	AMPHIBOLITE	A	U	YES		101.0	72.0	70.0	6.0	94.9	0.7	0.9	
L-BH01	10.50	6	C	2	10.50	AMPHIBOLITE	A	U	YES		100.9	56.0	52.0	8.2	81.7	1.2	1.5	
L-BH01	10.60	5	C	2	10.60	AMPHIBOLITE	A	U	YES		101.0	64.0	59.0	9.2	87.1	1.2	1.6	
L-BH03	12.00	5	C	2	12.00	AMPHIBOLITE	A	U	YES		101.3	87.0	84.0	8.9	104.1	0.8	1.1	
L-BH03	12.15	4	C	2	12.15	AMPHIBOLITE	A	U	YES		101.1	76.0	74.0	2.1	97.6	0.2	0.3	
L-BH03	12.60	6	C	2	12.60	AMPHIBOLITE	A	U	YES		100.9	63.0	60.0	2.2	87.8	0.3	0.4	
L-BH04	9.10	4	C	2	9.10	AMPHIBOLITE	A	U	YES		101.1	72.0	68.0	19.4	93.6	2.2	2.9	
L-BH04	9.20	3	C	2	9.20	AMPHIBOLITE	A	U	NO		101.0	112.0	106.0	20.8	116.8	1.5	2.2	
L-BH04	9.30	5	C	2	9.30	AMPHIBOLITE	A	U	YES		100.8	61.0	54.0	35.3	83.2	5.1	6.4	
L-BH04	9.40	6	C	2	9.40	AMPHIBOLITE	A	U	NO		100.3	95.0	92.0	26.2	108.4	2.2	3.2	
L-BH04	10.20	8	C	2	10.20	AMPHIBOLITE	A	U	NO		100.4	72.0	70.0	19.2	94.6	2.1	2.9	
L-BH04	10.35	7	C	2	10.35	AMPHIBOLITE	A	U	NO		100.2	82.0	80.0	17.6	101.0	1.7	2.4	
L-BH04	11.00	9	C	2	11.00	AMPHIBOLITE	A	U	NO		100.9	105.0	101.0	30.8	113.9	2.4	3.4	
M-BH12	6.50	3	C	2	6.50	GNEISS	A	U	NO		100.7	96.0	90.0	29.6	107.4	2.6	3.6	
M-BH12	6.80	4	C	2	6.80	GNEISS	A	U	YES		101.1	86.0	82.0	27.9	102.7	2.6	3.7	
M-BH12	8.70	6	C	2	8.70	AMPHIBOLITE	A	U	YES		100.9	85.0	82.0	20.1	102.6	1.9	2.6	
M-BH12	9.40	7	C	2	9.40	AMPHIBOLITE	A	U	NO		100.9	106.0	101.0	38.3	113.9	3.0	4.3	
M-BH13	6.70	4	C	2	6.70	AMPHIBOLITE	A	U	NO		101.5	89.0	86.0	22.2	105.4	2.0	2.8	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

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Approved By: Stephen Watson

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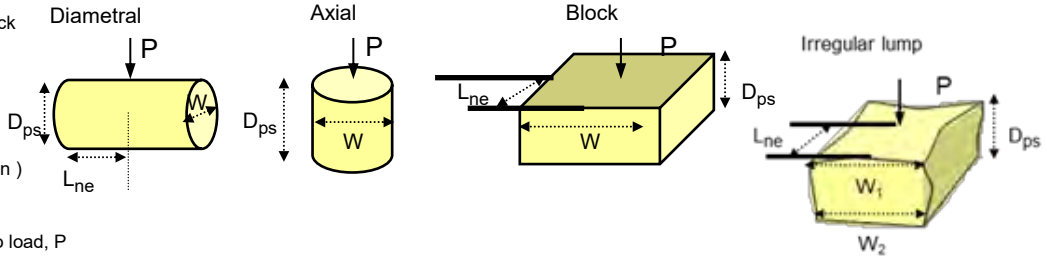
CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
23-0585	Rosslare OWH - GI

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
M-BH13	7.60	3	C	2	7.60	AMPHIBOLITE	A	U	YES		101.5	65.0	63.0	16.8	90.2	2.1	2.7	
M-BH14	5.40	4	C	2	5.40	AMPHIBOLITE	A	U	YES		100.8	78.0	77.0	3.7	99.4	0.4	0.5	
M-BH14	5.50	5	C	2	5.50	AMPHIBOLITE	A	U	YES		100.9	74.0	72.0	13.6	96.2	1.5	2.0	
M-BH14	6.00	6	C	2	6.00	AMPHIBOLITE	A	U	YES		100.8	85.0	84.0	3.8	103.8	0.4	0.5	
M-BH14	6.20	7	C	2	6.20	AMPHIBOLITE	A	U	YES		100.9	77.0	76.0	4.9	98.8	0.5	0.7	
M-BH14	7.25	9	C	2	7.25	AMPHIBOLITE	A	U	YES		100.7	96.0	92.0	12.1	108.6	1.0	1.5	
M-BH14	7.80	10	C	2	7.80	AMPHIBOLITE	A	U	YES		100.7	84.0	80.0	11.2	101.3	1.1	1.5	
M-BH15	4.70	4	C	2	4.70	GNEISS	A	U	NO		100.9	95.0	93.0	35.9	109.3	3.0	4.3	
M-BH15	4.90	5	C	2	4.90	GNEISS	A	U	NO		101.0	79.0	77.0	48.4	99.5	4.9	6.7	
M-BH15	6.70	7	C	2	6.70	GNEISS	A	U	YES		101.0	97.0	94.0	27.6	109.9	2.3	3.3	
M-BH15	6.90	8	C	2	6.90	GNEISS	A	U	NO		100.9	89.0	84.0	27.8	103.9	2.6	3.6	
M-BH16	6.50	1	C	2	6.50	AMPHIBOLITE	A	U	NO		101.3	94.0	91.0	24.4	108.3	2.1	2.9	
M-BH16	6.60	2	C	2	6.60	AMPHIBOLITE	A	U	YES		101.2	78.0	74.0	22.0	97.6	2.3	3.1	
M-BH16	6.70	3	C	2	6.70	GNEISS	A	U	YES		100.5	75.0	74.0	1.8	97.3	0.2	0.3	
M-BH16	7.70	4	C	2	7.70	GNEISS	A	U	YES		100.7	78.0	76.0	2.1	98.7	0.2	0.3	
M-BH16	8.40	7	C	2	8.40	AMPHIBOLITE	A	U	YES		101.4	83.0	81.0	3.4	102.3	0.3	0.4	
M-BH16	8.80	6	C	2	8.80	AMPHIBOLITE	A	U	YES		101.7	94.0	91.0	2.4	108.6	0.2	0.3	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

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Approved By: Stephen Watson

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UNIAXIAL COMPRESSIVE STRENGTH
ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	AMPHIBOLITE			Location ID	L-BH01
Sample Type	C	Sample number	4	Top Depth	10.70
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	11.00
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053138

Specimen Details

Test number	1	
Diameter	101.2	mm
Height	218.5	mm
Water Content	0.2	%
Sample Mass	4948	g
Bulk Density	2.82	Mg/m3
Dry Density	2.81	Mg/m3
Length to Diameter Ratio	2.2	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	43.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	515.3	kN
Unconfined Compressive Strength	64.1	MPa
Mode of failure	Axial Cleavage	

Test Remarks

Approved

Stephen Watson

UKAS TESTING
10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	AMPHIBOLITE			Location ID	L-BH03
Sample Type	C	Sample number	3	Top Depth	12.75
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	13.00
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053141

Specimen Details

Test number	1	
Diameter	101	mm
Height	167.4	mm
Water Content	0.4	%
Sample Mass	3684	g
Bulk Density	2.75	Mg/m3
Dry Density	2.74	Mg/m3
Length to Diameter Ratio	1.7	

Specimen Remarks

Did not meet the ISRM length to diameter ratio. Non-standard test carried out.

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	7.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	38.2	kN
Unconfined Compressive Strength	4.8	MPa
Mode of failure	Single Shear	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	GNEISS			Location ID	M-BH12
Sample Type	C	Sample number	5	Top Depth	9.50
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	9.90
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053110

Specimen Details

Test number	1	
Diameter	101.1	mm
Height	225.7	mm
Water Content	0.2	%
Sample Mass	4931	g
Bulk Density	2.72	Mg/m3
Dry Density	2.71	Mg/m3
Length to Diameter Ratio	2.2	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	68.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	310.3	kN
Unconfined Compressive Strength	38.7	MPa
Mode of failure	Axial Cleavage	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	AMPHIBOLITE			Location ID	M-BH13
Sample Type	C	Sample number		Top Depth	6.50
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	6.70
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053113

Specimen Details

Test number	1	
Diameter	101.4	mm
Height	229.6	mm
Water Content	0.3	%
Sample Mass	5156	g
Bulk Density	2.78	Mg/m3
Dry Density	2.77	Mg/m3
Length to Diameter Ratio	2.3	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	23.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	335.4	kN
Unconfined Compressive Strength	41.5	MPa
Mode of failure	Fragmented	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	AMPHIBOLITE			Location ID	M-BH13
Sample Type	C	Sample number	2	Top Depth	7.75
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	8.00
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053114

Specimen Details

Test number	1	
Diameter	101.5	mm
Height	196.4	mm
Water Content	0.2	%
Sample Mass	4534	g
Bulk Density	2.85	Mg/m3
Dry Density	2.84	Mg/m3
Length to Diameter Ratio	1.9	

Specimen Remarks

Did not meet the ISRM length to diamter ratio. Non-standard test carried out.

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	58.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	312.2	kN
Unconfined Compressive Strength	38.6	MPa
Mode of failure	Multiple Shear	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	AMPHIBOLITE			Location ID	M-BH14
Sample Type	C	Sample number	8	Top Depth	6.80
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	7.25
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053121

Specimen Details

Test number	1	
Diameter	100.8	mm
Height	230.8	mm
Water Content	0.2	%
Sample Mass	5234	g
Bulk Density	2.84	Mg/m3
Dry Density	2.83	Mg/m3
Length to Diameter Ratio	2.3	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	48.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	240.7	kN
Unconfined Compressive Strength	30.2	MPa
Mode of failure	Single Shear	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	GNEISS			Location ID	M-BH15
Sample Type	C	Sample number	3	Top Depth	5.70
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	6.00
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053124

Specimen Details

Test number	1	
Diameter	100.9	mm
Height	214.1	mm
Water Content	0.3	%
Sample Mass	4728	g
Bulk Density	2.76	Mg/m3
Dry Density	2.75	Mg/m3
Length to Diameter Ratio	2.1	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	19.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	226.5	kN
Unconfined Compressive Strength	28.3	MPa
Mode of failure	Axial Cleavage	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description				Location ID	M-BH15
Sample Type	C	Sample number	6	Top Depth	6.40
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	6.70
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053127

Specimen Details

Test number	1	
Diameter	101.1	mm
Height	221.4	mm
Water Content	0.2	%
Sample Mass	4888	g
Bulk Density	2.75	Mg/m3
Dry Density	2.75	Mg/m3
Length to Diameter Ratio	2.2	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	33.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	481.6	kN
Unconfined Compressive Strength	60.0	MPa
Mode of failure	Axial Cleavage	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH	**UNIAXIAL COMPRESSIVE STRENGTH** ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006				
Site Name	Rosslare OWH - GI			Project number	23-0585
Sample Description	AMPHIBOLITE			Location ID	M-BH16
Sample Type	C	Sample number	5	Top Depth	9.10
Date of sampling	NOT KNOWN	Date of receipt	02/05/2024	Base Depth	9.50
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1			Keylab ID	Caus2024053134

Specimen Details

Test number	1	
Diameter	101.5	mm
Height	199.1	mm
Water Content	0.2	%
Sample Mass	4449	g
Bulk Density	2.76	Mg/m3
Dry Density	2.75	Mg/m3
Length to Diameter Ratio	2	

Specimen Remarks

Test Results

Load Frame	LF01	
Test Supplier	Impact Test Equipment	
Test Machine	CT341	
Test Date	04/06/2024	
Test Duration	23.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	314.1	kN
Unconfined Compressive Strength	38.8	MPa
Mode of failure	Axial Cleavage	

Test Remarks

Approved

Stephen Watson

UKAS TESTING

10122

LABORATORY RESTRICTION REPORT

Project Reference	23-0585	To	Neil Haggan
Project Name	Rosslare Europort OWH Ground Investigation	Position	Project Manager
TR reference	23-0585 / R08	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
M-BH14		5.30-6.80	C	UCS	No suitable sample remaining (dimensions) Runs above and below checked	2 PL's taken in lieu
M-BH16		6.50-8.00	C	UCS	No suitable sample available (dimensions) Runs above and below checked	2 PL's taken in lieu
L-BH04		9.00-10.50	C	UCS	No suitable sample available (dimensions) Run below checked	2 PL's taken in lieu
L-BH04		10.50-11.10	C	UCS	No suitable sample remaining (dimensions) Runs above and below checked	2 PL's taken in lieu

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

Laboratory Signature	Project Manager Signature
Joseph Nicholl	Neil Haggan
Date	Date
05 June 2024	05 June 2024

CAUSEWAY GEOTECH

APPENDIX H

ENVIRONMENTAL LABORATORY TEST RESULTS



Certificate of Analysis

Certificate Number 24-11252-1 *Issued:* 14-Jun-24

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

Our Reference 24-11252-1

Client Reference ~ 23-0585

Order No ~ (not supplied)

Contract Title ~ Rosslare Europort ORE GI

Description 12 Soil samples, 12 Leachate prepared by DETS samples.

Date Received 03-Jun-24

Date Started 03-Jun-24

Date Completed 14-Jun-24

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

Notes **This report supersedes 24-11252; Amendments made to Report:**
Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345448	2345449	2345450	2345451	2345452	2345453
	Sample ID ~	L-BH01	L-BH03	L-BH04	M-BH11	M-BH12	M-BH13
	Depth ~	0.00	1.20	0.00	2.00	4.50	0.50
	Other ID ~	100	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004	0.1	%	17	16	15	15	27	5.5
Metals							
Antimony	DETSC 2301*	1	mg/kg	1.2	1.2	< 1.0	1.3	< 1.0	1.7
Arsenic	DETSC 2301#	0.2	mg/kg	9.3	13	4.2	10	9.1	8.9
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.7	< 0.2	0.5	0.5	0.5
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	5.3	5.3	4.2	3.2	11	1.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.2	< 0.1	< 0.1	0.1	0.2
Chromium III	DETSC 2301*	0.15	mg/kg	23	27	9.9	23	21	69
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21	25	5.9	19	15	35
Lead	DETSC 2301#	0.3	mg/kg	11	13	5.8	10	17	6.6
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	0.4	0.6	0.7	< 0.4	0.5	< 0.4
Nickel	DETSC 2301#	1	mg/kg	26	29	7.9	25	16	42
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	32	36	16	32	30	67
Zinc	DETSC 2301#	1	mg/kg	62	72	38	66	67	75
Inorganics							
pH	DETSC 2008#		pH	8.8	8.6	8.8	7.1	8.1	9.1
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	0.6	< 0.6	< 0.6	< 0.6	0.9	< 0.6
Organic matter	DETSC 2002#	0.1	%	0.4	1.5	0.6	0.5	2.3	0.3
Ammoniacal Nitrogen as NH3	DETSC 2119	0.5	mg/kg	6.2	6.9	7.0	11	8.3	1.7
Chloride	DETSC 2055	1	mg/kg	4060	3470	4960	3690	10200	1410
Nitrate as NO3	DETSC 2055	1	mg/kg	12	4.8	4.4	4.7	1.5	< 1.0
Nitrite as NO2	DETSC 2055	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ortho Phosphate as P	DETSC 2205*	0.1	mg/kg	0.42	0.32	< 0.10	0.13	< 0.10	< 0.10
Sulphide	DETSC 2024*	10	mg/kg	16	< 10	< 10	< 10	16	< 10
Sulphate as SO4, Total	DETSC 2321#	100	mg/kg	1530	934	2360	1010	3990	354
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >EC10-EC12: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	1.94	< 1.50	< 1.50	1.65
Aliphatic >EC12-EC16: EH_2D_AL	DETSC 3521#	1.2	mg/kg	< 1.20	< 1.20	1.49	< 1.20	< 1.20	< 1.20
Aliphatic >EC16-EC21: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC21-EC35: EH_2D_AL	DETSC 3521#	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC35-EC40: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345448	2345449	2345450	2345451	2345452	2345453
	Sample ID ~	L-BH01	L-BH03	L-BH04	M-BH11	M-BH12	M-BH13
	Depth ~	0.00	1.20	0.00	2.00	4.50	0.50
	Other ID ~	100	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Aliphatic C5-C44: EH_2D+HS_1D_AL	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >EC10-EC12: EH_2D_AR	DETSC 3521#	0.9	mg/kg	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90
Aromatic >EC12-EC16: EH_2D_AR	DETSC 3521#	0.5	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aromatic >EC16-EC21: EH_2D_AR	DETSC 3521#	0.6	mg/kg	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
Aromatic >EC21-EC35: EH_2D_AR	DETSC 3521#	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC35-EC40: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC40-EC44: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic C5-C44: EH_2D+HS_1D_AR	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
TPH Ali/Aro C5-C44: EH_2D+HS_1D_Total	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345454	2345455	2345456	2345457	2345458	2345459
	Sample ID ~	M-BH16	M-BH18	M-BH21	M-BH22	M-BH25	M-BH27
	Depth ~	0.50	5.00	3.60	10.00	5.20	1.30
	Other ID ~	100	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004	0.1	%	10	13	12	9.1	8.5	7.4
Metals							
Antimony	DETSC 2301*	1	mg/kg	2.4	< 1.0	< 1.0	1.5	2.1	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	6.1	6.9	10	12	20	7.5
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.4	0.4	0.8	1.0	0.4
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	3.2	0.8	1.8	1.2	1.6	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1	0.2	< 0.1
Chromium III	DETSC 2301*	0.15	mg/kg	69	20	23	29	34	29
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	40	22	23	37	40	20
Lead	DETSC 2301#	0.3	mg/kg	6.8	12	14	25	23	5.3
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	< 0.4	< 0.4	0.9	< 0.4	1.0	< 0.4
Nickel	DETSC 2301#	1	mg/kg	52	20	24	31	36	22
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	60	27	29	43	33	36
Zinc	DETSC 2301#	1	mg/kg	99	55	65	90	99	58
Inorganics							
pH	DETSC 2008#		pH	8.6	8.2	8.2	8.3	8.3	8.9
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Organic matter	DETSC 2002#	0.1	%	0.8	1.9	0.8	< 0.1	0.4	0.3
Ammoniacal Nitrogen as NH3	DETSC 2119	0.5	mg/kg	0.87	1.7	1.3	2.7	3.3	1.4
Chloride	DETSC 2055	1	mg/kg	3340	2130	3220	1370	975	829
Nitrate as NO3	DETSC 2055	1	mg/kg	1.8	< 1.0	< 1.0	< 1.0	< 1.0	1.5
Nitrite as NO2	DETSC 2055	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ortho Phosphate as P	DETSC 2205*	0.1	mg/kg	< 0.10	0.12	< 0.10	0.15	0.37	0.11
Sulphide	DETSC 2024*	10	mg/kg	43	24	24	35	20	< 10
Sulphate as SO4, Total	DETSC 2321#	100	mg/kg	1090	608	1260	613	216	461
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >EC10-EC12: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC12-EC16: EH_2D_AL	DETSC 3521#	1.2	mg/kg	< 1.20	< 1.20	< 1.20	< 1.20	< 1.20	< 1.20
Aliphatic >EC16-EC21: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC21-EC35: EH_2D_AL	DETSC 3521#	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC35-EC40: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

				Lab No	2345454	2345455	2345456	2345457	2345458	2345459
				Sample ID ~	M-BH16	M-BH18	M-BH21	M-BH22	M-BH25	M-BH27
				Depth ~	0.50	5.00	3.60	10.00	5.20	1.30
				Other ID ~	100	100	100	100	100	100
				Sample Type ~	ES	ES	ES	ES	ES	ES
				Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
				Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Aliphatic C5-C44: EH_2D+HS_1D_AL	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >EC10-EC12: EH_2D_AR	DETSC 3521#	0.9	mg/kg	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90
Aromatic >EC12-EC16: EH_2D_AR	DETSC 3521#	0.5	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aromatic >EC16-EC21: EH_2D_AR	DETSC 3521#	0.6	mg/kg	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
Aromatic >EC21-EC35: EH_2D_AR	DETSC 3521#	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC35-EC40: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC40-EC44: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic C5-C44: EH_2D+HS_1D_AR	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
TPH Ali/Aro C5-C44: EH_2D+HS_1D_Total	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs										
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345460	2345461	2345462	2345463	2345464	2345465
	Sample ID ~	L-BH01	L-BH03	L-BH04	M-BH11	M-BH12	M-BH13
	Depth ~	0.00	1.20	0.00	2.00	4.50	0.50
	Other ID ~	100	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
BS EN 12457 10:1	DETSC 1009*			Y	Y	Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.1	1.2	0.71	0.61	0.89	0.57
Boron, Dissolved	DETSC 2306*	0.012	mg/l	0.13	0.094	0.16	0.059	0.23	0.054
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	15	12	33	14	21	7.8
Chromium III, Dissolved	DETSC 2306*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	1.2	1.1	0.8	0.8	1.6
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.48	0.70	< 0.25	< 0.25	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	1.6	1.9	1.5	1.0	0.6	1.0
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics							
Conductivity	DETSC 2009	1	uS/cm	976	751	1480	763	1450	570
pH	DETSC 2008		pH	7.8	8.2	7.5	8.2	7.5	7.6
Cyanide, Total	DETSC 2130	0.04	mg/l	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Cyanide, Free Low Level	DETSC 2131	0.0001	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Phenol - Monohydric Low Level	DETSC 2131	0.0015	mg/l	< 0.0015	< 0.0015	< 0.0015	0.0020	< 0.0015	0.0022
Thiocyanate	DETSC 2130	20	ug/l	< 20	51	< 20	< 20	< 20	< 20
Dissolved Organic Carbon	DETSC 2085	2	mg/l	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Un-Ionised Ammonia	*	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as NH3	DETSC 2207	0.0183	mg/l	0.034	< 0.018	< 0.018	< 0.018	< 0.018	< 0.018
Nitrate as NO3	DETSC 2055	0.1	mg/l	1.8	1.6	2.2	1.5	2.8	1.2
Nitrite as NO2	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ortho Phosphate as P	DETSC 2205	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphate as SO4	DETSC 2055	0.1	mg/l	94	30	96	29	59	19
Sulphide	DETSC 2208	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphur as S, Total	DETSC 2320*	10	mg/l	36	12	53	11	31	< 10
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C10-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

			Lab No	2345460	2345461	2345462	2345463	2345464	2345465
			Sample ID ~	L-BH01	L-BH03	L-BH04	M-BH11	M-BH12	M-BH13
			Depth ~	0.00	1.20	0.00	2.00	4.50	0.50
			Other ID ~	100	100	100	100	100	100
			Sample Type ~	ES	ES	ES	ES	ES	ES
			Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
			Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C35-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C10-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ali/Aro C10-C44: EH_CU_1D_Total	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PAHs									
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.03	0.02	0.02	0.02
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.03	< 0.01	0.04	0.05	0.06	0.03
Pyrene	DETSC 3304	0.01	ug/l	0.03	< 0.01	0.04	0.06	0.08	0.03
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	0.02	< 0.01	0.03	0.04	0.05	0.02
Chrysene	DETSC 3304	0.01	ug/l	0.01	< 0.01	0.07	0.05	0.06	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.03	< 0.01	0.04	0.17	0.23	0.03
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.01	< 0.01	0.01	0.05	0.06	0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.02	0.09	0.13	0.02
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.02	0.12	0.14	0.02
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	0.03	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.03	0.13	0.16	0.03
PAH Total	DETSC 3304	0.2	ug/l	0.23	< 0.20	0.38	0.79	1.0	0.23

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

			Lab No	2345466	2345467	2345468	2345469	2345470	2345471
			Sample ID ~	M-BH16	M-BH18	M-BH21	M-BH22	M-BH25	M-BH27
			Depth ~	0.50	5.00	3.60	10.00	5.20	1.30
			Other ID ~	100	100	100	100	100	100
			Sample Type ~	ES	ES	ES	ES	ES	ES
			Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
			Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
BS EN 12457 10:1	DETSC 1009*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.74	0.41	0.42	0.29	0.46	0.71
Boron, Dissolved	DETSC 2306*	0.012	mg/l	0.059	0.029	0.050	0.023	0.046	0.031
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.12	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	7.3	41	26	23	8.3	9.3
Chromium III, Dissolved	DETSC 2306*	1	ug/l	1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.5	1.1	0.9	0.8	0.9	1.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	1.2	0.12	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.5	0.80	0.46	0.62	1.7	0.70
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	2.5	0.6	< 0.6	< 0.6	< 0.6	2.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	1.7	1.8	1.3	< 1.3	< 1.3	< 1.3
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	695	849	1040	444	321	476
pH	DETSC 2008		pH	8.4	7.4	6.3	6.4	6.6	6.9
Cyanide, Total	DETSC 2130	0.04	mg/l	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Cyanide, Free Low Level	DETSC 2131	0.0001	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Phenol - Monohydric Low Level	DETSC 2131	0.0015	mg/l	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Thiocyanate	DETSC 2130	20	ug/l	29	< 20	< 20	< 20	26	27
Dissolved Organic Carbon	DETSC 2085	2	mg/l	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Un-Ionised Ammonia	*	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as NH3	DETSC 2207	0.0183	mg/l	< 0.018	0.12	0.26	0.19	0.17	0.071
Nitrate as NO3	DETSC 2055	0.1	mg/l	1.5	1.8	2.0	1.4	1.2	1.2
Nitrite as NO2	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ortho Phosphate as P	DETSC 2205	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphate as SO4	DETSC 2055	0.1	mg/l	29	28	50	23	12	11
Sulphide	DETSC 2208	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphur as S, Total	DETSC 2320*	10	mg/l	12	12	20	< 10	< 10	< 10
Petroleum Hydrocarbons									
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C10-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

			Lab No	2345466	2345467	2345468	2345469	2345470	2345471
			Sample ID ~	M-BH16	M-BH18	M-BH21	M-BH22	M-BH25	M-BH27
			Depth ~	0.50	5.00	3.60	10.00	5.20	1.30
			Other ID ~	100	100	100	100	100	100
			Sample Type ~	ES	ES	ES	ES	ES	ES
			Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
			Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C35-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C10-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ali/Aro C10-C44: EH_CU_1D_Total	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PAHs									
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 5.00	< 0.05	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	0.02	< 0.01	< 1.00	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 1.00	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 1.00	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.03	0.05	2.0	0.05	0.01	0.06
Anthracene	DETSC 3304	0.01	ug/l	0.02	0.02	< 1.00	0.02	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.08	0.12	1.4	0.18	0.02	0.04
Pyrene	DETSC 3304	0.01	ug/l	0.09	0.13	1.3	0.18	0.02	0.03
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	0.05	0.10	< 1.00	0.10	0.01	0.01
Chrysene	DETSC 3304	0.01	ug/l	0.06	0.12	< 1.00	0.11	0.02	0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.13	0.30	< 1.00	0.23	0.04	0.03
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.04	0.08	< 1.00	0.06	0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.09	0.16	< 1.00	0.16	0.03	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.09	0.16	< 1.00	0.10	0.02	0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.02	0.03	< 1.00	0.02	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.11	0.19	< 1.00	0.13	0.04	0.02
PAH Total	DETSC 3304	0.2	ug/l	0.82	1.5	< 20.00	1.3	0.22	0.21

Summary of Asbestos Analysis
Soil Samples

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2345448	L-BH01 100 0.00	SOIL	NAD	none	Josh Best
2345449	L-BH03 100 1.20	SOIL	NAD	none	Josh Best
2345450	L-BH04 100 0.00	SOIL	NAD	none	Josh Best
2345451	M-BH11 100 2.00	SOIL	NAD	none	Josh Best
2345452	M-BH12 100 4.50	SOIL	NAD	none	Josh Best
2345453	M-BH13 100 0.50	SOIL	NAD	none	Josh Best
2345454	M-BH16 100 0.50	SOIL	NAD	none	Josh Best
2345455	M-BH18 100 5.00	SOIL	NAD	none	Josh Best
2345456	M-BH21 100 3.60	SOIL	NAD	none	Josh Best
2345457	M-BH22 100 10.00	SOIL	NAD	none	Josh Best
2345458	M-BH25 100 5.20	SOIL	NAD	none	Josh Best
2345459	M-BH27 100 1.30	SOIL	NAD	none	Josh Best

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

Information in Support of the Analytical Results

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract ~ Rosslare Europort ORE GI

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2345448	L-BH01 0.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345449	L-BH03 1.20 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345450	L-BH04 0.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345451	M-BH11 2.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345452	M-BH12 4.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345453	M-BH13 0.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345454	M-BH16 0.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345455	M-BH18 5.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345456	M-BH21 3.60 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345457	M-BH22 10.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345458	M-BH25 5.20 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345459	M-BH27 1.30 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345460	L-BH01 0.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345461	L-BH03 1.20 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345462	L-BH04 0.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345463	M-BH11 2.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345464	M-BH12 4.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345465	M-BH13 0.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345466	M-BH16 0.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345467	M-BH18 5.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345468	M-BH21 3.60 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345469	M-BH22 10.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345470	M-BH25 5.20 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345471	M-BH27 1.30 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	

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

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

Information in Support of the Analytical Results

Our Ref 24-11252-1
Client Ref ~ 23-0585
Contract ~ Rosslare Europort ORE GI

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

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

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic >EC10-EC12	EH_2D_AL
Aliphatic >EC12-EC16	EH_2D_AL
Aliphatic >EC16-EC21	EH_2D_AL
Aliphatic >EC21-EC35	EH_2D_AL
Aliphatic >EC35-EC40	EH_2D_AL
Aliphatic >EC40-EC44	EH_2D_AL
Aliphatic C5-C44	EH_2D+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic >EC10-EC12	EH_2D_AR
Aromatic >EC12-EC16	EH_2D_AR
Aromatic >EC16-EC21	EH_2D_AR
Aromatic >EC21-EC35	EH_2D_AR
Aromatic >EC35-EC40	EH_2D_AR
Aromatic >EC40-EC44	EH_2D_AR
Aromatic C5-C44	EH_2D+HS_1D_AR
TPH Ali/Aro C5-C44	EH_2D+HS_1D_Total
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C10-C44	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C44	EH_CU_1D_AL

Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C44	EH_CU_1D_AR
Aromatic C10-C44	EH_CU_1D_AR
Ali/Aro C10-C44	EH_CU_1D_Total

Key:

~ Sample details are provided by the client and can affect the validity of the results
***** -not accredited.
# -MCERTS (accreditation only applies if report carries the MCERTS logo).
$ -subcontracted.
n/s -not supplied.
I/S -insufficient sample.
U/S -unsuitable sample.
t/f -to follow.
nd -not detected.

End of Report

Certificate of Analysis

Certificate Number	24-11255	*Issued:*	13-Jun-24

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

Our Reference	24-11255
Client Reference ~	23-0585
Order No ~	(not supplied)
Contract Title ~	Rosslare Europort ORE GI
Description	11 Soil samples, 11 Leachate prepared by DETS samples.
Date Received	03-Jun-24
Date Started	03-Jun-24
Date Completed	13-Jun-24
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

				Lab No	2345481	2345482	2345483	2345484	2345485	2345486
				Sample ID ~	M-BH28	M-BH29	M-BH30	M-BH31	M-BH32	M-BH34
				Depth ~	1.00	6.50	1.40	3.50	5.50	1.20
				Other ID ~	100	100	100	100	100	100
				Sample Type ~	ES	ES	ES	ES	ES	ES
				Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
				Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Preparation										
Moisture Content	DETSC 1004	0.1	%	7.9	7.2	7.9	16	17	9.7
Metals										
Antimony	DETSC 2301*	1	mg/kg	2.5	1.5	1.0	< 1.0	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	12	15	9.3	10	12	9.6
Beryllium	DETSC 2301#	0.2	mg/kg	1.7	1.2	1.0	0.2	0.8	0.6
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	2.6	1.1	1.4	1.8	5.4	1.3
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.3	< 0.1
Chromium III	DETSC 2301*	0.15	mg/kg	120	38	37	11	31	20
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	65	44	31	11	26	19
Lead	DETSC 2301#	0.3	mg/kg	19	23	6.6	5.3	14	12
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	18	0.9	0.8	< 0.4	0.6	< 0.4
Nickel	DETSC 2301#	1	mg/kg	60	42	35	11	35	23
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	64	33	38	17	40	23
Zinc	DETSC 2301#	1	mg/kg	120	100	110	33	79	70
Inorganics										
pH	DETSC 2008#		pH	8.6	8.0	8.9	8.7	8.5	8.3
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Organic matter	DETSC 2002#	0.1	%	0.3	0.2	0.5	0.1	0.9	0.3
Ammoniacal Nitrogen as NH3	DETSC 2119	0.5	mg/kg	4.6	0.70	0.89	3.1	2.9	2.9
Chloride	DETSC 2055	1	mg/kg	1760	1870	2060	4090	7000	3060
Nitrate as NO3	DETSC 2055	1	mg/kg	< 1.0	1.5	< 1.0	< 1.0	< 1.0	1.4
Nitrite as NO2	DETSC 2055	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ortho Phosphate as P	DETSC 2205*	0.1	mg/kg	< 0.10	< 0.10	0.13	0.15	0.40	< 0.10
Sulphide	DETSC 2024*	10	mg/kg	< 10	< 10	< 10	20	20	20
Sulphate as SO4, Total	DETSC 2321#	100	mg/kg	494	388	347	751	1150	841
Petroleum Hydrocarbons										
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >EC10-EC12: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC12-EC16: EH_2D_AL	DETSC 3521#	1.2	mg/kg	< 1.20	< 1.20	< 1.20	< 1.20	< 1.20	< 1.20
Aliphatic >EC16-EC21: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC21-EC35: EH_2D_AL	DETSC 3521#	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC35-EC40: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345481	2345482	2345483	2345484	2345485	2345486
	Sample ID ~	M-BH28	M-BH29	M-BH30	M-BH31	M-BH32	M-BH34
	Depth ~	1.00	6.50	1.40	3.50	5.50	1.20
	Other ID ~	100	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Aliphatic C5-C44: EH_2D+HS_1D_AL	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >EC10-EC12: EH_2D_AR	DETSC 3521#	0.9	mg/kg	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90
Aromatic >EC12-EC16: EH_2D_AR	DETSC 3521#	0.5	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aromatic >EC16-EC21: EH_2D_AR	DETSC 3521#	0.6	mg/kg	< 0.60	2.53	1.11	< 0.60	< 0.60	1.38
Aromatic >EC21-EC35: EH_2D_AR	DETSC 3521#	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC35-EC40: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC40-EC44: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic C5-C44: EH_2D+HS_1D_AR	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
TPH Ali/Aro C5-C44: EH_2D+HS_1D_Total	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

			Lab No	2345487	2345488	2345489	2345490	2345491
			Sample ID ~	M-BH36	M-BH37	M-BH39A	M-BH40	M-CPT32
			Depth ~	2.00	0.50	1.70	1.00	1.00
			Other ID ~	100	100	100	100	100
			Sample Type ~	ES	ES	ES	ES	ES
			Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
			Sampling Time ~	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Preparation								
Moisture Content	DETSC 1004	0.1	%	18	7.5	6.6	15	5.9
Metals								
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.2	1.2	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	10	17	6.1	14	12
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.8	0.6	0.3	0.3
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	5.2	1.7	2.6	1.3	1.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.1	< 0.1	< 0.1	< 0.1
Chromium III	DETSC 2301*	0.15	mg/kg	26	29	29	18	18
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21	33	42	18	20
Lead	DETSC 2301#	0.3	mg/kg	11	12	13	10	7.1
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	0.08	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	< 0.4	< 0.4	0.4	0.5	< 0.4
Nickel	DETSC 2301#	1	mg/kg	30	29	28	16	17
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	34	61	36	27	27
Zinc	DETSC 2301#	1	mg/kg	72	94	77	54	54
Inorganics								
pH	DETSC 2008#		pH	8.4	8.7	8.9	8.8	8.7
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Organic matter	DETSC 2002#	0.1	%	1.0	5.4	0.2	0.6	0.2
Ammoniacal Nitrogen as NH3	DETSC 2119	0.5	mg/kg	1.6	2.7	0.68	< 0.50	0.86
Chloride	DETSC 2055	1	mg/kg	5670	2360	1570	1130	1530
Nitrate as NO3	DETSC 2055	1	mg/kg	< 1.0	< 1.0	4.3	< 1.0	6.5
Nitrite as NO2	DETSC 2055	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ortho Phosphate as P	DETSC 2205*	0.1	mg/kg	0.26	0.10	0.12	< 0.10	< 0.10
Sulphide	DETSC 2024*	10	mg/kg	20	20	< 10	< 10	< 10
Sulphate as SO4, Total	DETSC 2321#	100	mg/kg	1130	792	249	332	451
Petroleum Hydrocarbons								
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >EC10-EC12: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	1.79	1.62
Aliphatic >EC12-EC16: EH_2D_AL	DETSC 3521#	1.2	mg/kg	< 1.20	< 1.20	1.52	1.70	1.33
Aliphatic >EC16-EC21: EH_2D_AL	DETSC 3521#	1.5	mg/kg	< 1.50	< 1.50	< 1.50	< 1.50	< 1.50
Aliphatic >EC21-EC35: EH_2D_AL	DETSC 3521#	3.4	mg/kg	38.90	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC35-EC40: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44: EH_2D_AL	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40	< 3.40	< 3.40

Summary of Chemical Analysis
Soil Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345487	2345488	2345489	2345490	2345491
	Sample ID ~	M-BH36	M-BH37	M-BH39A	M-BH40	M-CPT32
	Depth ~	2.00	0.50	1.70	1.00	1.00
	Other ID ~	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Aliphatic C5-C44: EH_2D+HS_1D_AL	DETSC 3521*	10	mg/kg	38.90	< 10.00	< 10.00	< 10.00	< 10.00
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >EC10-EC12: EH_2D_AR	DETSC 3521#	0.9	mg/kg	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90
Aromatic >EC12-EC16: EH_2D_AR	DETSC 3521#	0.5	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aromatic >EC16-EC21: EH_2D_AR	DETSC 3521#	0.6	mg/kg	0.86	0.73	< 0.60	< 0.60	< 0.60
Aromatic >EC21-EC35: EH_2D_AR	DETSC 3521#	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC35-EC40: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic >EC40-EC44: EH_2D_AR	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40	< 1.40	< 1.40
Aromatic C5-C44: EH_2D+HS_1D_AR	DETSC 3521*	10	mg/kg	< 10.00	< 10.00	< 10.00	< 10.00	< 10.00
TPH Ali/Aro C5-C44: EH_2D+HS_1D_Total	DETSC 3521*	10	mg/kg	38.90	< 10.00	< 10.00	< 10.00	< 10.00
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs								
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols								
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

	Lab No	2345492	2345493	2345494	2345495	2345496	2345497
	Sample ID ~	M-BH28	M-BH29	M-BH30	M-BH31	M-BH32	M-BH34
	Depth ~	1.00	6.50	1.40	3.50	5.50	1.20
	Other ID ~	100	100	100	100	100	100
	Sample Type ~	ES	ES	ES	ES	ES	ES
	Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
	Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
BS EN 12457 10:1	DETSC 1009*			Y	Y	Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	< 0.16	1.3	0.52	0.43	0.76	0.29
Boron, Dissolved	DETSC 2306*	0.012	mg/l	0.097	0.020	0.030	0.078	0.13	0.024
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	7.3	19	4.9	13	13	18
Chromium III, Dissolved	DETSC 2306*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.9	2.3	1.0	1.0	0.9	0.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.31
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	0.34	< 0.25	0.27	0.49	0.26
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	< 0.6	< 0.6	1.0	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	2.5	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics							
Conductivity	DETSC 2009	1	uS/cm	371	479	392	923	1240	574
pH	DETSC 2008		pH	7.0	6.5	6.8	6.9	6.9	6.7
Cyanide, Total	DETSC 2130	0.04	mg/l	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Cyanide, Free Low Level	DETSC 2131	0.0001	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001
Phenol - Monohydric Low Level	DETSC 2131	0.0015	mg/l	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Thiocyanate	DETSC 2130	20	ug/l	< 20	< 20	< 20	< 20	20	< 20
Dissolved Organic Carbon	DETSC 2085	2	mg/l	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Un-Ionised Ammonia	*	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as NH3	DETSC 2207	0.0183	mg/l	< 0.018	0.14	0.074	< 0.018	0.086	0.074
Nitrate as NO3	DETSC 2055	0.1	mg/l	1.8	1.3	1.2	1.8	2.1	1.2
Nitrite as NO2	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ortho Phosphate as P	DETSC 2205	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphate as SO4	DETSC 2055	0.1	mg/l	46	12	17	41	52	19
Sulphide	DETSC 2208	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphur as S, Total	DETSC 2320*	10	mg/l	18	< 10	< 10	840	1100	580
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C10-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

				Lab No	2345492	2345493	2345494	2345495	2345496	2345497
				Sample ID ~	M-BH28	M-BH29	M-BH30	M-BH31	M-BH32	M-BH34
				Depth ~	1.00	6.50	1.40	3.50	5.50	1.20
				Other ID ~	100	100	100	100	100	100
				Sample Type ~	ES	ES	ES	ES	ES	ES
				Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
				Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C35-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C10-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ali/Aro C10-C44: EH_CU_1D_Total	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PAHs										
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	0.06	0.06	0.06	0.09
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.03
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.01	0.03	0.11
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.15
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.02	0.05	0.15
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.08
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.10
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.09
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.07
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.05
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.08
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	0.23	1.1

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

			Lab No	2345498	2345499	2345500	2345501	2345502
			Sample ID ~	M-BH36	M-BH37	M-BH39A	M-BH40	M-CPT32
			Depth ~	2.00	0.50	1.70	1.00	1.00
			Other ID ~	100	100	100	100	100
			Sample Type ~	ES	ES	ES	ES	ES
			Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
			Sampling Time ~	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Preparation								
BS EN 12457 10:1	DETSC 1009*			Y	Y	Y	Y	Y
Metals								
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.62	0.69	0.25	0.48	0.51
Boron, Dissolved	DETSC 2306*	0.012	mg/l	0.12	0.031	0.072	0.092	0.033
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	1.0	0.27	0.09
Calcium, Dissolved	DETSC 2306	0.09	mg/l	16	7.3	7.0	16	10
Chromium III, Dissolved	DETSC 2306*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	0.6	1.6	0.9	1.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.67	1.2	0.30	0.34	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	0.7	0.6	0.7	< 0.6	0.9
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics								
Conductivity	DETSC 2009	1	uS/cm	1130	566	492	1060	366
pH	DETSC 2008		pH	7.2	7.2	7.4	7.0	7.2
Cyanide, Total	DETSC 2130	0.04	mg/l	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Cyanide, Free Low Level	DETSC 2131	0.0001	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Phenol - Monohydric Low Level	DETSC 2131	0.0015	mg/l	0.0024	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Thiocyanate	DETSC 2130	20	ug/l	26	28	< 20	< 20	< 20
Dissolved Organic Carbon	DETSC 2085	2	mg/l	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Un-Ionised Ammonia	*	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as NH3	DETSC 2207	0.0183	mg/l	0.022	0.12	0.23	0.13	0.029
Nitrate as NO3	DETSC 2055	0.1	mg/l	1.7	1.2	1.2	2.0	1.1
Nitrite as NO2	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ortho Phosphate as P	DETSC 2205	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphate as SO4	DETSC 2055	0.1	mg/l	35	19	11	39	17
Sulphide	DETSC 2208	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphur as S, Total	DETSC 2320*	10	mg/l	1100	630	290	760	310
Petroleum Hydrocarbons								
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C10-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C44: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Summary of Chemical Analysis
Leachate Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

				Lab No	2345498	2345499	2345500	2345501	2345502
				Sample ID ~	M-BH36	M-BH37	M-BH39A	M-BH40	M-CPT32
				Depth ~	2.00	0.50	1.70	1.00	1.00
				Other ID ~	100	100	100	100	100
				Sample Type ~	ES	ES	ES	ES	ES
				Sampling Date ~	31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
				Sampling Time ~	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C35-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C10-C44: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ali/Aro C10-C44: EH_CU_1D_Total	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PAHs									
Naphthalene	DETSC 3304	0.05	ug/l	0.06	0.06	0.07	0.06	0.07
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.02	0.03	0.02	0.02
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.02	0.03	0.01	0.01
Pyrene	DETSC 3304	0.01	ug/l	0.02	0.02	0.04	0.01	0.02
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	0.01	0.02	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Summary of Asbestos Analysis
Soil Samples

Our Ref 24-11255
Client Ref ~ 23-0585
Contract Title ~ Rosslare Europort ORE GI

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2345481	M-BH28 100 1.00	SOIL	NAD	none	Ben Barsby
2345482	M-BH29 100 6.50	SOIL	NAD	none	Ben Barsby
2345483	M-BH30 100 1.40	SOIL	NAD	none	Ben Barsby
2345484	M-BH31 100 3.50	SOIL	NAD	none	Ben Barsby
2345485	M-BH32 100 5.50	SOIL	NAD	none	Ben Barsby
2345486	M-BH34 100 1.20	SOIL	NAD	none	Ben Barsby
2345487	M-BH36 100 2.00	SOIL	NAD	none	Ben Barsby
2345488	M-BH37 100 0.50	SOIL	NAD	none	Ben Barsby
2345489	M-BH39A 100 1.70	SOIL	NAD	none	Ben Barsby
2345490	M-BH40 100 1.00	SOIL	NAD	none	Ben Barsby
2345491	M-CPT32 100 1.00	SOIL	NAD	none	Ben Barsby

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

Information in Support of the Analytical Results

Our Ref 24-11255
Client Ref ~ 23-0585
Contract ~ Rosslare Europort ORE GI

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2345481	M-BH28 1.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345482	M-BH29 6.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345483	M-BH30 1.40 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345484	M-BH31 3.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345485	M-BH32 5.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345486	M-BH34 1.20 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345487	M-BH36 2.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345488	M-BH37 0.50 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345489	M-BH39A 1.70 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345490	M-BH40 1.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345491	M-CPT32 1.00 SOIL	31/05/24	GJ 250ml, GJ 60ml, PT 1L		
2345492	M-BH28 1.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345493	M-BH29 6.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345494	M-BH30 1.40 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345495	M-BH31 3.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345496	M-BH32 5.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345497	M-BH34 1.20 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345498	M-BH36 2.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345499	M-BH37 0.50 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345500	M-BH39A 1.70 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345501	M-BH40 1.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	
2345502	M-CPT32 1.00 LEACHATE	31/05/24	GJ 250ml, GJ 60ml, PT 1L	pH/Cond (1 days)	

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

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

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

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic >EC10-EC12	EH_2D_AL
Aliphatic >EC12-EC16	EH_2D_AL
Aliphatic >EC16-EC21	EH_2D_AL
Aliphatic >EC21-EC35	EH_2D_AL
Aliphatic >EC35-EC40	EH_2D_AL
Aliphatic >EC40-EC44	EH_2D_AL
Aliphatic C5-C44	EH_2D+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic >EC10-EC12	EH_2D_AR
Aromatic >EC12-EC16	EH_2D_AR
Aromatic >EC16-EC21	EH_2D_AR
Aromatic >EC21-EC35	EH_2D_AR
Aromatic >EC35-EC40	EH_2D_AR
Aromatic >EC40-EC44	EH_2D_AR
Aromatic C5-C44	EH_2D+HS_1D_AR
TPH Ali/Aro C5-C44	EH_2D+HS_1D_Total
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C10-C44	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C44	EH_CU_1D_AL
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR

Aromatic C35-C44	EH_CU_1D_AR
Aromatic C10-C44	EH_CU_1D_AR
Ali/Aro C10-C44	EH_CU_1D_Total

Key:
~ Sample details are provided by the client and can affect the validity of the results
***** -not accredited.
# -MCERTS (accreditation only applies if report carries the MCERTS logo).
$ -subcontracted.
n/s -not supplied.
I/S -insufficient sample.
U/S -unsuitable sample.
t/f -to follow.
nd -not detected.

End of Report

CAUSEWAY GEOTECH

APPENDIX I

MARINE SEDIMENT LABORATORY TEST RESULTS



Certificate of Analysis

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

Test Report ID MAR02231

Issue Version: 1

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

Customer Reference: Rosslare - Marine Institute Analysis

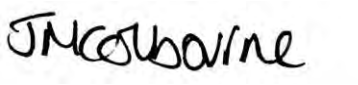
Date Sampled: 12-Feb-24

Date Samples Received: 04-Mar-24

Test Report Date: 03-Apr-24

Condition of samples: Ambient Satisfactory

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



Authorised by: Jane Colbourne

Position: Customer Service Specialist

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Certificate of Analysis

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

Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Method No	SUB_02*
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Visual Description**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	Brownish grey SAND with some shell fragments
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	Brownish grey slightly sandy SILT with some shell fragments
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	Brownish grey sandy SILT with some shell fragments
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	Brownish grey slightly sandy SILT with some shell fragments
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	Greyish grown silty CLAY
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	Greyish brown silty CLAY
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	Brown silty SAND with some shell fragments
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	Brownish grey SAND

* See Report Notes

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	%	%	%	%	%	Mg/m3
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Particle Density**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	21.3	78.7	4.01	53.51	42.48	2.66
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	18.4	81.6	9.49	27.85	62.66	2.65
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	22.1	77.9	0.52	53.98	45.50	2.66
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	33.7	66.3	0.08	24.28	75.64	2.67
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	19.4	80.6	5.22	16.33	78.45	2.71
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	19.0	81.0	3.81	9.44	86.76	2.71
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	24.5	75.5	0.18	61.40	38.42	2.68
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	22.2	77.8	0.06	46.23	53.71	2.68
		Reference Material (% Recovery)	NA	NA	NA	NA	NA	NA
		QC Blank	NA	NA	NA	NA	NA	NA

* See Report Notes

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	% m/m	%m/m
		Method No	WSLM59*	ANC*
		Limit of Detection	0.02	0.12
		Accreditation	UKAS	No
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**	**Carbonate Equivalent (%CO3)**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	0.57	7.2
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	0.49	19.9
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	0.45	5.28
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	0.52	7.7
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	0.39	8.16
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	0.46	7.7
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	0.43	7.9
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	0.47	9.8
		Reference Material (% Recovery)	92	97
		QC Blank	<0.02	<0.12

* See Report Notes

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*
		Limit of Detection	0.14	0.03	1	0.7	0.6	0.01	0.4
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic as As**	**Cadmium as Cd**	**Chromium as Cr**	**Copper as Cu**	**Lead as Pb**	**Mercury as Hg**	**Nickel as Ni**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	5.0	<0.03	19.4	6.5	9.0	<0.01	8.6
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	5.3	<0.03	17.9	6.2	8.1	<0.01	6.3
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	5.1	<0.03	24.8	6.2	10.2	<0.01	8.4
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	5.8	<0.03	28.4	5.3	12.5	<0.01	10.2
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	8.2	<0.03	47.9	12.6	11.7	<0.01	19.6
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	18.7	0.05	71.3	22.3	18.3	<0.01	37.1
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	5.7	<0.03	25.5	9.9	10.6	<0.01	10.1
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	4.8	<0.03	29.5	8.6	11.4	<0.01	10.2
Certified Reference Material 2702 (Measured Value)			47.97	0.844	314.7	115.9	98.78	0.357	73.51
Certified Reference Material 2702 (Certified Value)			45.3	0.817	352	117.7	132.8	0.447	75.4
Certified Reference Material 2702 (% Recovery)			102	83	96	100	76	77	105
QC Blank			<0.14	<0.03	<1	<0.7	<0.6	<0.01	<0.4

* See Report Notes

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ICPMS-MWSED*	ICPOES-MWSED*	ICPOES-MWSED*
		Limit of Detection	3.5	1750	2
		Accreditation	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Zinc as Zn**	**Aluminium as Al**	**Lithium as Li**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	20.9	24900	23.7
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	19.1	14700	17.3
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	25.7	28600	25.4
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	32.9	35300	30.3
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	40.2	42900	37.8
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	71.0	69400	62.7
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	30.5	30000	26.4
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	29.9	30700	27.3
Certified Reference Material 2702 (Measured Value)			512.7	91500	80.5
Certified Reference Material 2702 (Certified Value)			485.3	84000	78.2
Certified Reference Material 2702 (% Recovery)			106	101	87
QC Blank			<3.5	<1750	<2

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	<5	<5
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	<1	<1
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	<5	<5
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	<5	<5
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	<1	<1
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	<5	<5
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	<5	<5
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	<5	<5
Certified Reference Material BCR-646 (Measured Value)			628	307
Certified Reference Material BCR-646 (Certified Value)			770	480
Certified Reference Material BCR-646 (% Recovery)			82	64
QC Blank			<1	<1

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	<5	<5	<5	<5	<5	9.49
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	<5	<5	<5	<5	<5	<5
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	<5	<5	<5	9.80	10.5	18.9
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	<5	<5	<5	8.13	11.3	26.2
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	<5	<5	<5	<5	<5	6.62
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	<5	<5	<5	<5	<5	12.0
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	<5	<5	<5	<5	7.72	16.1
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	<5	<5	<5	7.38	7.02	14.1
Certified Reference Material Nist 1941b (Measured Value)			39.5	57.4	122	241	235	400
Certified Reference Material Nist 1941b (Certified Value)			38.4	53.3	184	335	358	453
Certified Reference Material Nist 1941b (% Recovery)			103	108	66	72	66	88
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

* See Report Notes

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	N*
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF***	**CHRYSENE***	**DBENZAH**	**FLUORANT**	**FLUORENE**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	<5	6.53	<5	<5	9.27	<5
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	<5	<5	<5	<5	<5	<5
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	8.99	13.1	14.6	<5	11.2	<5
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	17.3	18.7	13.8	<5	19.8	7.70
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	<5	<5	<5	<5	6.24	<5
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	13.1	13.5	14.4	<5	7.69	<5
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	13.5	12.4	10.8	<5	13.9	<5
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	9.82	11.2	11.5	<5	16.6	<5
Certified Reference Material Nist 1941b (Measured Value)			194	400	364	57.1	548	48.8
Certified Reference Material Nist 1941b (Certified Value)			307	225	399	53.0	651	85.0
Certified Reference Material Nist 1941b (% Recovery)			63	178	91	108	84	57
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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Test Report ID MAR02231
Issue Version 1
Customer Reference Rosslare - Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	8.00	7.30	10.1	7.15	18700
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	<5	<5	<5	<5	8250
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	10.4	14.6	10.5	9.08	23800
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	20.2	18.7	20.5	14.7	207000
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	<5	<5	<5	<5	9080
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	<5	9.85	24.9	10.7	199000
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	15.2	12.8	18.7	10.8	17100
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	10.3	8.97	21.7	12.9	12300
Certified Reference Material Nist 1941b (Measured Value)			260	542	330	420	1362
Certified Reference Material Nist 1941b (Certified Value)			341	848	406	581	1400
Certified Reference Material Nist 1941b (% Recovery)			76	64	81	72	97~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries
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Test Report ID MAR02231
Issue Version 1
Customer Reference Rosslare - Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	<0.08	<0.08	<0.08	<0.08	0.11	0.08	<0.08
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	0.09	<0.08	<0.08	<0.08	<0.08	<0.08	0.10
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	0.46	0.28	0.23	0.21	0.22	0.23	0.21
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	<0.08	<0.08	0.10	0.15	0.16	0.12	<0.08
Certified Reference Material Quasimeme QOR155MS (Measured Value)			0.50	1.96	4.96	2.47	8.99	12.3	11.2
Certified Reference Material Quasimeme QOR155MS(Certified Value)			0.49	1.94	5.05	2.42	8.85	13.9	11.9
Certified Reference Material Quasimeme QOR155MS (% Recovery)			100	101	98	102	102	89	94
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

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Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	N*	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**AHCH**	**BHCH**	**GHCH**	**DIELDRIN**	**HCB**	**DDE**	**DDT**	**DDD**
M-VC01 (ES01) 0.00-0.50m	MAR02231.001	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC03 (ES01) 0.00-0.50m	MAR02231.002	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC09 (ES01) 0.00-0.50m	MAR02231.003	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC10 (ES01) 0.00-0.40m	MAR02231.004	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC18 (ES02) 0.40-0.70m	MAR02231.005	Sediment	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1
M-VC46 (ES01) 0.00-0.35m	MAR02231.006	Sediment	<0.1	<0.1	<0.1	0.16	<0.1	0.17	<0.1	0.31
M-VC47 (ES01) 0.00-0.50m	MAR02231.007	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC47 (ES02) 1.60-1.95m	MAR02231.008	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.10
Certified Reference Material Quasimeme QOR155MS (Measured Value)			30.1	31.1	33.2	33.1	35.3	1.34	1.30	1.83
Certified Reference Material Quasimeme QOR155MS(Certified Value)			40.0	40.0	40.0	40.0	40.0	1.47	1.60	1.57
Certified Reference Material Quasimeme QOR155MS (% Recovery)			75	78	83	83	88	91	81	116
QC Blank			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

* See Report Notes

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

Test Report ID MAR02231
Issue Version 1
Customer Reference Rosslare - Marine Institute Analysis

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR02231.001-008	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ANC*	MAR02231.001-008	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMS-MWSED*	MAR02231.001-008	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPOES-MWSED*	MAR02231.001-008	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR02231.001-008	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR02231.001-008	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR02231.001, .003-004, .006-008	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/302	MAR02231.001-008	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected.However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (FLUORENE) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02231.001-008	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected.However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (HCB) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02231.001-008	Benzo[k]fluoranthene is known to coelute with Benzo[j]fluoranthene and these peaks can not be resolved. It is believed Benzo[j]fluoranthene is present in these samples therefore it is suggested that the Benzo[k]fluoranthene results should be taken as a Benzo[k]fluoranthene (inc. Benzo[j]fluoranthene). Benzo[j]fluoranthene is not UKAS accredited. This should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02231.001-008	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene).This should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

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

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Certificate of Analysis

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

Test Report ID	MAR02231
Issue Version	1
Customer Reference	Rosslare - Marine Institute Analysis

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

Analyte Definitions

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

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

Test Report ID MAR02235

Issue Version: 2

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

Customer Reference: 23-0585 - Rosslare

Date Sampled: 14-21-Feb-24

Date Samples Received: 11-Mar-24

Test Report Date: 19-Apr-24

Condition of samples: Ambient Satisfactory

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

This is a revised report containing updated metals results for sample 13 and replaces all previously issued versions.

JMColbourne

Authorised by: Jane Colbourne

Position: Customer Service Specialist

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Certificate of Analysis

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

Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Method No	SUB_02*
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Visual Description**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	Light brown SAND
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	Light brown slightly gravelly SAND with frequent shell fragments
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	Brown SAND
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	Brown grey very sandy clayey GRAVEL
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	Brown mottled grey slightly sandy slightly gravelly CLAY
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	Brownish grey sandy clayey GRAVEL
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	Grey brown silty CLAY
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	Grey brown SILT
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	Brownish grey sandy GRAVEL
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	Brown SILT
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	Light brown SAND
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	Grey brown silty CLAY
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	Brown mottled grey slightly sandy SILT
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	Brown SAND
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	Brown silty CLAY
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	Brown mottled grey slightly clayey very sandy GRAVEL
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	Grey brown slightly sandy CLAY
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	Grey brown slightly sandy CLAY
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	Brown mottled grey slightly sandy slightly gravelly CLAY
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	Brown clayey SILT
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	Brown mottled grey very sandy clayey GRAVEL
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	Brown mottled grey sandy SILT
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	Grey brown sandy SILT
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	Grey mottled brown silty CLAY
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	Grey brown slightly clayey SILT

* See Report Notes

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Certificate of Analysis

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

Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	%	%	%	%	%	Mg/m3
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Particle Density**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	19.5	80.5	11.57	34.56	53.87	2.64
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	19.2	80.8	36.92	60.32	2.76	2.67
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	16.1	83.9	3.65	86.39	9.96	2.65
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	13.9	86.1	57.22	38.67	4.11	2.77
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	11.8	88.2	68.67	13.57	17.75	2.76
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	20.6	79.4	2.88	3.63	93.50	2.73
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	19.5	80.5	5.07	2.35	92.58	2.72
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	35.0	65.0	3.51	44.26	52.23	2.63
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	8.1	91.9	97.39	2.51	0.10	2.74
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	16.5	83.5	2.53	6.11	91.35	2.70
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	17.9	82.1	1.28	94.53	4.19	2.69
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	14.6	85.4	1.79	12.00	86.21	2.70
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	10.1	89.9	43.84	29.73	26.43	2.77
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	15.3	84.7	5.39	1.29	93.32	2.66
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	19.8	80.2	1.28	0.97	97.75	2.70
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	5.2	94.8	83.03	13.11	3.86	2.72
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	21.6	78.4	1.33	1.68	96.99	2.70
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	14.7	85.3	1.55	4.92	93.54	2.70
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	13.9	86.1	52.56	40.75	6.69	2.68
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	17.9	82.1	3.38	3.04	93.58	2.70
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	8.2	91.8	29.73	33.71	36.56	2.79
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	15.5	84.5	5.15	62.10	32.75	2.66
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	36.1	63.9	1.26	32.09	66.65	2.61
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	28.3	71.7	38.17	27.52	34.32	2.72
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	29.7	70.3	1.28	32.57	66.15	2.64
		Reference Material (% Recovery)	NA	NA	NA	NA	NA	NA
		QC Blank	NA	NA	NA	NA	NA	NA

* See Report Notes

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

Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	% m/m	%m/m
		Method No	WSLM59*	ANC*
		Limit of Detection	0.02	0.12
		Accreditation	UKAS	No
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**	**Carbonate Equivalent (%CO3)**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	0.60	8.16
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	0.27	5.04
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	0.25	3.12
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	0.53	2.64
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	0.33	4.32
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	0.57	9.12
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	0.57	8.88
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	1.30	10.8
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	0.26	10.3
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	0.64	6.48
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	0.19	4.08
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	0.56	8.16
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	0.40	3.36
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	0.21	4.08
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	0.57	11.0
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	0.24	14.6
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	0.62	6.96
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	0.55	7.68
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	0.26	6.48
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	0.50	8.16
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	0.20	4.56
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	0.44	7.68
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	1.58	8.16
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	0.58	5.28
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	0.99	8.64
		Reference Material (% Recovery)	101	100
		QC Blank	<0.02	<0.12

* See Report Notes

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

Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*	ICPMS-MWSED*
		Limit of Detection	0.14	0.03	1	0.7	0.6	0.01	0.4
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic as As**	**Cadmium as Cd**	**Chromium as Cr**	**Copper as Cu**	**Lead as Pb**	**Mercury as Hg**	**Nickel as Ni**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	9.8	0.10	35.7	12.6	15.8	0.10	14.6
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	6.1	0.05	23.4	21.3	7.3	0.02	10.2
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	8.2	0.07	30.4	16.4	11.0	<0.01	13.0
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	16.9	0.39	93.6	27.0	23.5	0.02	47.3
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	11.2	0.14	109	30.3	15.9	<0.01	48.1
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	15.5	0.15	92.3	24.2	19.6	0.01	42.0
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	16.4	0.39	100	26.0	23.1	0.02	47.8
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	9.7	0.17	51.0	14.6	19.4	<0.01	23.2
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	19.3	0.11	34.6	13.5	33.4	<0.01	16.4
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	13.7	0.27	70.8	22.4	18.7	<0.01	37.4
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	12.3	0.08	34.2	14.7	15.6	<0.01	16.6
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	16.3	0.17	89.3	24.5	19.3	<0.01	42.6
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	19.0	0.11	78.1	24.0	18.2	<0.01	40.2
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	11.1	0.04	28	13.1	11.4	<0.01	13.3
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	18.9	0.17	95.2	22.8	20.6	<0.01	44.6
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	16.9	0.14	44.2	24.4	54.4	0.05	24.8
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	16.6	0.19	107	30.0	23.8	0.02	51.8
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	21.2	0.36	109	33.2	26.3	0.06	53.3
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	9.3	0.09	32.4	9.1	11.7	0.02	14.7
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	16.6	0.26	77.2	22.1	19.2	<0.01	40.1
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	14.8	0.28	58.7	26.2	16.8	0.08	31.1
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	7.5	0.14	34.3	7.6	12.4	<0.01	12.7
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	10.1	0.14	324	14.2	20.6	0.06	29.8
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	13.0	0.21	94.6	53.9	24.8	0.02	47.3
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	10.9	0.17	49.8	13.8	19.0	<0.01	20.4
Certified Reference Material 2702 (Measured Value)			38.61	0.845	282.2	99.48	112.9	0.403	65.3
Certified Reference Material 2702 (Certified Value)			45.3	0.817	352	117.7	132.8	0.447	75.4
Certified Reference Material 2702 (% Recovery)			82	94	89	95	89	144	94
QC Blank			<0.14	<0.03	<1	<0.7	<0.6	<0.01	<0.4

* See Report Notes

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Certificate of Analysis

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

Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ICPMS-MWSED*	ICPOES-MWSED*	ICPOES-MWSED*
		Limit of Detection	3.5	1750	2
		Accreditation	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Zinc as Zn**	**Aluminium as Al**	**Lithium as Li**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	36.6	32600	26.2
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	26.5	25600	23.0
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	30.6	81200	59.4
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	93.4	26500	21.0
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	89.2	78100	48.6
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	81.2	85400	63.6
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	93.9	82600	56.3
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	69.9	53800	39.1
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	94.9	37500	29.9
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	75.6	75000	57.9
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	39.3	42200	32.5
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	79.3	79600	58.3
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	103	66300	98.9
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	34.4	44300	27.3
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	86.2	86700	64.8
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	69.1	50000	34.8
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	98.8	90200	65.9
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	106	83800	63.5
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	36.6	31000	28.0
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	73.7	68800	53.3
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	82.9	77600	67.4
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	38.3	30700	23.3
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	71.3	54100	43.7
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	93.1	73000	50.8
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	61.0	45000	33.1
Certified Reference Material 2702 (Measured Value)			416.2	84257	82.77
Certified Reference Material 2702 (Certified Value)			485.3	84000	78.2
Certified Reference Material 2702 (% Recovery)			96	93	81
QC Blank			<3.5	<1750	<2

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Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	<1	<1
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	<1	<1
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	<1	<1
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	<1	<1
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	<1	<1
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	<1	<1
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	<1	<1
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	<5	<5
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	<1	<1
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	<1	<1
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	<1	<1
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	<1	<1
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	<5	<5
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	<1	<1
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	<1	<1
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	<1	<1
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	<1	<1
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	<1	<1
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	<5	<5
Certified Reference Material BCR-646 (Measured Value)			612	312
Certified Reference Material BCR-646 (Certified Value)			770	480
Certified Reference Material BCR-646 (% Recovery)			79	65
QC Blank			<1	<1

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Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	<1	<1
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	<1	<1
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	<1	<1
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	<5	<5
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	<5	<5
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	<5	<5
Certified Reference Material BCR-646 (Measured Value)			837	415
Certified Reference Material BCR-646 (Certified Value)			770	480
Certified Reference Material BCR-646 (% Recovery)			109	86
QC Blank			<1	<1

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Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	1.64	1.59	<1	<1	<1	<1
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	<1	<1	<1	<1	<1	<1
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	3.12	3.22	2.52	<1	<1	<1
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	<1	<1	<1	1.16	1.22	2.97
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	<1	<1	<1	<1	<1	1.66
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	1.77	<1	<1	2.59	3.48	8.33
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	1.26	<1	1.40	3.54	4.31	12.0
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	<5	<5	4.60	10.0	10.7	18.7
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	<1	<1	<1	<1	<1	<1
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	1.59	<1	1.21	3.19	4.25	10.1
Certified Reference Material Nist 1941b (Measured Value)			36.5	62.0	117	204	197	388
Certified Reference Material Nist 1941b (Certified Value)			38.4	53.3	184	335	358	453
Certified Reference Material Nist 1941b (% Recovery)			95	116	64	61	55	86
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

* See Report Notes

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Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF***	**CHRYSENE***	**DBENZAH**	**FLUORANT**	**FLUORENE**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	<1	<1	<1	<1	2.89	6.11
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	<1	<1	<1	<1	<1	<1
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	<1	<1	<1	<1	4.75	10.1
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	1.93	1.88	2.70	<1	3.05	7.69
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	1.40	<1	1.84	<1	<1	<1
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	10.7	2.38	11.3	<1	5.96	5.16
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	14.0	2.82	13.8	1.66	7.61	10.6
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	15.9	15.6	17.5	<5	18.7	11.6
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	<1	<1	<1	<1	<1	<1
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	11.6	3.31	11.4	1.35	6.62	4.21
Certified Reference Material Nist 1941b (Measured Value)			227	334	331	54.7	521	47.5
Certified Reference Material Nist 1941b (Certified Value)			307	225	399	53.0	651	85.0
Certified Reference Material Nist 1941b (% Recovery)			74	148	83	103	80	56
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
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Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	<1	3.00	10.6	6.43	3850000
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	<1	1.24	<1	<1	27500
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	<1	8.77	12.0	8.46	6900000
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	1.39	9.22	5.99	3.64	29000
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	<1	2.00	3.58	1.45	3340
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	2.05	7.07	19.3	9.02	17700
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	3.12	7.19	21.3	12.3	32800
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	13.0	34.7	33.6	16.4	41100
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	<1	2.03	<1	<1	920
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	2.80	4.12	18.70	9.09	21200
Certified Reference Material Nist 1941b (Measured Value)			226	538	307	383	1352
Certified Reference Material Nist 1941b (Certified Value)			341	848	406	581	1400
Certified Reference Material Nist 1941b (% Recovery)			66	63	76	66	97~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries
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Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	<1	<1	<1	<1	<1	<1
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	1.26	<1	<1	2.11	2.55	6.17
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	<1	<1	<1	<1	<1	2.54
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	1.60	<1	<1	2.89	3.75	9.17
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	1.80	<1	<1	2.80	3.57	8.56
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	<1	<1	<1	<1	<1	1.55
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	1.77	<1	<1	2.85	3.75	10.0
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	<1	<1	<1	<1	<1	<1
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	<1	<1	<1	2.34	2.52	5.56
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	1.62	<1	<1	2.26	3.79	9.63
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	<1	<1	<1	<1	<1	2.35
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	1.72	<1	<1	3.42	3.97	10.6
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	9.05	<5	<5	14.1	14.0	40.5
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	<5	<5	<5	5.94	7.30	10.9
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	8.73	<5	<5	14.7	16.1	32.1
Certified Reference Material Nist 1941b (Measured Value)			34.1	56.6	117	214	220	387
Certified Reference Material Nist 1941b (Certified Value)			38.4	53.3	184	335	358	453
Certified Reference Material Nist 1941b (% Recovery)			89	106	64	64	61	85
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
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Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF***	**CHRYSENE***	**DBENZAH**	**FLUORANT**	**FLUORENE**
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	<1	<1	<1	<1	<1	<1
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	8.38	1.76	7.27	1.23	4.08	3.49
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	1.94	<1	1.71	<1	<1	1.13
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	11.2	2.91	11.0	1.59	5.68	4.04
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	12.1	2.48	10.3	1.40	5.70	4.81
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	<1	<1	<1	<1	<1	1.00
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	12.0	1.68	10.9	1.71	5.85	4.94
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	<1	<1	<1	<1	<1	1.30
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	3.30	3.11	3.45	<1	5.38	2.26
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	10.8	2.62	10.7	1.22	5.68	4.08
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	1.31	<1	1.87	<1	1.17	1.64
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	12.3	2.04	11.9	1.57	5.92	5.17
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	24.7	28.0	25.9	<5	30.6	18.0
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	<5	7.90	9.48	<5	<5	<5
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	16.1	20.1	25.8	2.90	32.6	23.0
Certified Reference Material Nist 1941b (Measured Value)			226	376	336	61.3	505	46.4
Certified Reference Material Nist 1941b (Certified Value)			307	225	399	53.0	651	85.0
Certified Reference Material Nist 1941b (% Recovery)			74	167	84	116	78	55
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

* See Report Notes

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Certificate of Analysis

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

Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	<1	<1	<1	<1	251
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	2.12	5.36	13.3	5.90	10800
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	<1	4.16	3.42	1.78	1220
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	2.47	5.44	16.9	8.15	14400
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	2.60	6.14	16.9	8.28	15400
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	<1	2.21	1.97	<1	1720
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	2.66	8.04	18.6	8.83	16300
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	<1	2.77	2.35	<1	11200
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	4.16	7.01	5.18	3.88	4810
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	2.47	4.57	17.5	8.05	37100
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	<1	5.49	4.19	2.45	4630
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	2.95	7.38	19.1	8.52	22000
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	25.8	52.2	38.6	23.2	49900
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	<5	8.91	10.2	7.42	13300
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	21.0	58.7	48.6	26.3	61400
Certified Reference Material Nist 1941b (Measured Value)			267	507	295	381	1443
Certified Reference Material Nist 1941b (Certified Value)			341	848	406	581	1400
Certified Reference Material Nist 1941b (% Recovery)			78	60	73	66	103~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries
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* See Report Notes

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Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	0.16	0.13
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	0.13	0.12	0.23	0.28	0.33	0.41	0.17
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	0.09	<0.08	<0.08	0.09	0.15	0.18	0.10
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	0.09	<0.08	<0.08	0.16	<0.08	0.16	<0.08
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material Quasimeme QOR155MS (Measured Value)			0.25	1.12	3.29	1.82	7.76	13.4	11.6
Certified Reference Material Quasimeme QOR155MS (Certified Value)			0.49	1.94	5.05	2.42	8.85	13.9	11.9
Certified Reference Material Quasimeme QOR155MS (% Recovery)			50	58	65	75	88	97	98
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

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Certificate of Analysis

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

Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	0.19	<0.08	0.13	0.15	0.15	0.17	<0.08
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	<0.08	<0.08	<0.08	0.13	<0.08	<0.08	<0.08
Certified Reference Material Quasimeme QOR155MS (Measured Value)			0.30	1.08	3.46	1.86	8.44	13.4	11.8
Certified Reference Material Quasimeme QOR155MS (Certified Value)			0.49	1.94	5.05	2.42	8.85	13.9	11.9
Certified Reference Material Quasimeme QOR155MS (% Recovery)			61	56	69	77	95	96	100
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

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Certificate of Analysis

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

Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	N*	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**AHCH**	**BHCH**	**GHCH**	**DIELDRIN**	**HCB**	**DDE**	**DDT**	**DDD**
GS01 (ES01) 0.00-0.15m	MAR02235.001	Sediment	<0.1	<0.1	<0.1	0.29	<0.1	<0.1	<0.1	<0.1
GS04 (ES01) 0.00-0.15m	MAR02235.002	Sediment	<0.1	<0.1	<0.1	0.29	<0.1	<0.1	<0.1	<0.1
GS05 (ES01) 0.00-0.15m	MAR02235.003	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC17 (ES01) 0.00-0.30m	MAR02235.004	Sediment	<0.1	<0.1	0.12	0.29	<0.1	<0.1	<0.1	<0.1
M-VC19 (ES01) 0.00-0.50m	MAR02235.005	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC23 (ES01) 0.00-0.50m	MAR02235.006	Sediment	<0.1	<0.1	0.10	0.19	<0.1	0.11	0.13	0.42
M-VC24 (ES01) 0.00-0.50m	MAR02235.007	Sediment	<0.1	<0.1	<0.1	0.93	0.19	<0.1	<0.1	0.25
M-VC26 (ES01) 0.00-0.30m	MAR02235.008	Sediment	<0.1	<0.1	<0.1	0.34	<0.1	0.10	<0.1	0.10
M-VC28 (ES01) 0.00-0.50m	MAR02235.009	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC30 (ES01) 0.00-0.50m	MAR02235.010	Sediment	<0.1	<0.1	<0.1	0.15	<0.1	<0.1	<0.1	<0.1
M-VC31 (ES01) 0.00-0.50m	MAR02235.011	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC33 (ES01) 0.00-0.50m	MAR02235.012	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Certified Reference Material Quasimeme QOR155MS (Measured Value)			38.6	43.7	42.8	45.5	0.1	1.1	0.6	0.7
Certified Reference Material Quasimeme QOR155MS (Certified Value)			40.0	40.0	40.0	40.0	0.11	1.47	1.60	1.57
Certified Reference Material Quasimeme QOR155MS (% Recovery)			97~	109~	107~	114~	50	72	38	46
QC Blank			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

For full analyte name see method summaries

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Certificate of Analysis

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Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	N*	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**AHCH**	**BHCH**	**GHCH**	**DIELDRIN**	**HCB**	**DDE**	**DDT**	**DDD**
M-VC34 (ES01) 0.00-0.30m	MAR02235.013	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC35 (ES01) 0.00-0.50m	MAR02235.014	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC36 (ES01) 0.00-0.30m	MAR02235.015	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC37 (ES01) 0.00-0.30m	MAR02235.016	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC39 (ES01) 0.00-0.30m	MAR02235.017	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC42 (ES01) 0.00-0.50m	MAR02235.018	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC45 (ES01) 0.00-0.40m	MAR02235.019	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC48 (ES01) 0.00-0.50m	MAR02235.020	Sediment	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC49 (ES01) 0.00-0.50m	MAR02235.021	Sediment	<0.1	<0.1	<0.1	0.28	<0.1	<0.1	<0.1	<0.1
M-VC52 (ES01) 0.00-0.50m	MAR02235.022	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M-VC53 (ES01) 0.00-0.50m	MAR02235.023	Sediment	<0.1	<0.1	<0.1	0.50	<0.1	0.15	<0.1	0.11
M-VC56 (ES01) 0.00-0.30m	MAR02235.024	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1
M-VC56 (ES02) 1.00-1.30m	MAR02235.025	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Certified Reference Material Quasimeme QOR155MS (Measured Value)			47.2	49.5	55.7	60.3	0.06	1.32	0.98	1.42
Certified Reference Material Quasimeme QOR155MS (Certified Value)			40.0	40.0	40.0	40.0	0.11	1.47	1.60	1.57
Certified Reference Material Quasimeme QOR155MS (% Recovery)			118~	124~	139~	151~	59	90	61	90
QC Blank			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

For full analyte name see method summaries

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Test Report ID MAR02235
Issue Version 2
Customer Reference 23-0585 - Rosslare

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR02235.001-025	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ANC*	MAR02235.001-025	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMS-MWSED*	MAR02235.001-025	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPOES-MWSED*	MAR02235.001-025	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR02235.001-025	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR02235.001-025	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR02235.008,.013, .019, .023-025	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/302	MAR02235.001-025	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected.However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (DIELDRIN) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02235.008, .023-025	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/303/304	MAR02235.001-025	Benzo[k]fluoranthene is known to coelute with Benzo[j]fluoranthene and these peaks can not be resolved. It is believed Benzo[j]fluoranthene is present in these samples therefore it is suggested that the Benzo[k]fluoranthene results should be taken as a Benzo[k]fluoranthene (inc. Benzo[j]fluoranthene). Benzo[j]fluoranthene is not UKAS accredited. This should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02235.001-025	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene).This should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

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

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Certificate of Analysis

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

Test Report ID	MAR02235
Issue Version	2
Customer Reference	23-0585 - Rosslare

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

Analyte Definitions

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

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CAUSEWAY GEOTECH

APPENDIX J

CONE PENETRATION TEST REPORT





Rosslare Europort Offshore Renewable Energy Hub – MARINE SITE INVESTIGATION

CONE PENETRATION TEST REPORT

Report No.: 23-0585_CPT

Client: Iarnród Éireann (Irish Rail)

Investigation Supervisor: GDG

5th July 2024

Final for Issue

Causeway Geotech Ltd
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL
Registered in Northern Ireland, Company Number: NI610766

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APPENDICES

Appendix A Project Summary
Appendix B Cone Penetration Test (CPTU) Logs
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SYMBOLS

English

a	area ratio of the cone (= A_n/A_c)
A	area
A_s	area of friction sleeve
B_q	pore pressure parameter (= $[u_2 - u_0] / [q_t - \sigma_{v0}]$)
D	diameter
f_s	unit sleeve friction resistance
f_t	corrected sleeve friction (for pore pressure effects)
F_s	total force acting on friction sleeve
F_R	normalized friction ratio (= $f_s / [q_t - \sigma_{v0}]$)
I_c	soil behaviour type index
I_x	inclination x axis
I_y	inclination y axis
L	length
N	number of blows of SPT
N_{60}	SPT energy ratio
p_a	reference stress (100 kPa)
q_c	measured cone resistance
q_t	corrected cone resistance (= $q_c - [1 - a] u_2$)
Q_c	total force acting on the cone (= $[q_c - \sigma_{v0}] / \sigma^1_{vo}$)
Q_t	normalized cone resistance (= $q_t - \sigma_{v0} / \sigma^1_{vo}$)
R_f	friction ratio (= $[f_t / q_t] \times 100$)
u	pore water pressure
u_0	in-situ pore pressure
u_1	pore pressure measured on the cone
u_2	pore pressure measured behind the cone
u_3	pore pressure measured behind the sleeve friction
U	normalized pore pressure
z	depth

Greek

α	constant
β	constant
Δu	excess pore pressure (= $u - u_0$)
ρ	density

ABBREVIATIONS

ASTM	American Society for Testing and Materials
CPTU	Cone Penetration Test with Pore Water Pressure Measurement (Piezocone Test)
DAS	Digital Acquisition System
GWT	Ground Water Table
NC	Normally Consolidated
OC	Over Consolidated
RTK	Real Time Kinetic
SBT	Soil Behaviour Type

GLOSSARY

CPT
Cone Penetration Test

Cone
Part of the penetrometer on which the end bearing is developed

Cone Penetrometer
Assembly containing the cone, friction sleeve, any other sensors, and connections to the push-rods

Cone resistance, q_c
Total force acting on the cone, Q_c, divided by the projected area of the cone, A_c

Corrected cone resistance, q_t
Cone resistance, q_c, corrected for pore water pressure effects

Corrected sleeve friction, f_t
Sleeve friction, f_t, corrected for pore water pressure effects on the ends of the friction sleeve

Data acquisition system
System used to measure and record the cone penetrometer measurements

Dissipation Test
Test where the decay of the pore water pressure is monitored during a pause in cone pushing

Drill'n CPT
The CPT module in use with the Comacchio Geo 602 rotary drilling rig

Filter element
Porous element inserted into the cone penetrometer to allow transmission of the pore water pressure to the pore pressure sensor

Friction ratio, R_f
The ratio (as %) of the sleeve friction, f_s, to the cone resistance, q_c, both measured at the same depth

Friction sleeve
Section of the cone penetrometer upon which the sleeve friction is measured

Normalized cone resistance, Q_c or Q_t
Cone resistance expressed in a non-dimensional form taking account of the stress changes in-situ, Q_c, or when the corrected cone resistance is used, Q_t

Normalized friction ratio, F_r
Sleeve friction normalized by the net cone resistance, q_n, where $q_n = q_t - \sigma_{v0}$

Piezocone
A cone penetrometer containing a pore pressure sensor

Pore pressure, u
Pore pressure generated during penetration and measured by a pore pressure sensor at u_1, u_2, or u_3

Pore pressure ratio, B_q
Net pore pressure normalized with respect to the net cone resistance

Push-rods
Thick-walled tubes or rods used for advancing the cone penetrometer

Sleeve friction, f_s
Total frictional force acting on the friction sleeve, F_s, divided by its surface area, A_s

Document Control Sheet

Report No.:		23-0585_CPT			
Project Title:		Rosslare Europort Offshore Renewable Energy Hub – Marine Site Investigation			
Client:		Iarnród Éireann (Irish Rail)			
Investigation Supervisor		GDG			
Revision:	A01	**Status:**	Final for issue	**Issue Date:**	5th July 2024
Prepared by:		**Reviewed by:**		**Approved by:**	
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The work on site and the final factual reporting have been undertaken in accordance with the international technical standard BS EN ISO 22476-1:2012.

Rosslare Europort Offshore Renewable Energy Hub

1 INTRODUCTION

Causeway Geotech Ltd (CGL) was engaged in a geotechnical site investigation at the Port of Rosslare in south-east Wexford at the request of GDG, ("the Investigation Supervisor"), acting on the behalf of Iarnród Éireann (Irish Rail) ("the Client"). The site investigation scope consisted of 34 Cone Penetration Tests with Pore Pressure Measurement (CPTU) and to provide information on the soil conditions and derived geotechnical parameters at:

Rosslare Europort,
Rosslare Harbour,
County Wexford,
Ireland,

All CPT locations were as provided/agreed by the Investigation Supervisor on site. A site map is included in Appendix A. The tests were stopped when they reached the Client's specified target depth or for other technical reasons, as detailed in the Project Summary in Appendix A and on each CPTU log included in Appendix B of this report.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Investigation Supervisor 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 FIELDWORK

2.1 Cone Penetration Tests

The project team and programme duration are summarised in the below table.

Table 1: Fieldwork Summary

CPT Operator(s)	Mark McKinney / Martin Jackson / Shane Johnston
Date Started	28th November 2023
Date Completed	27th February 2024
Causeway Geotech Project Manager	Neil Haggan
Causeway Geotech Site Agent(s)	Oliver Goddard /Myles Summersall / Luca Wright

A summary of all CPTU tests including relevant location details is included in Appendix A.

2.1.1 CPT Plant

Details of the CPTU rig used for this project are shown in the below table.

Table 2: Rig Details

Rig Name	Rig Details
SR2 and SR3	Fraste CRS-XL140 Duo and Fraste CRS-XL170 Duo tracked sonic rigs
CPT1	Eijkelkamp Drill'n CPT module

The full data sheet for the base sonic drilling rig and associated CPTU module is presented in Appendix A.

2.1.2 CPTU Cone(s)

Details of electric CPTU cone used on this project and conforming to the requirements of Application Class 2 of ISO 22476-1:2012, are shown in the below table.

Table 3: CPTU Cone Details

Cone Number/ID	Cross-section area	Filter Position
DS15-CFIIP.2271	15cm²	u_2
DS15-CFIIP.2272	15cm²	u_2

The full datasheet and relevant calibration certificates of the cones used are provided in Appendix A.

2.1.3 CPTU Test Summary

The details of the tests completed, and the cone's measured parameters are given in the below table.

Table 4: CPTU Test Summary

Number of CPTU Tests	34 CPTU tests
Depth Range of Tests	0.34-10.90m
Number of Dissipation Tests	40 dissipation tests over 23 locations
Measured Parameters	Cone Resistance (q_c), Sleeve Friction (f_s), Porewater Pressure in shoulder position (u_2), Inclination in X and Y axes

The scope of works included the above along with the provision of a factual report with estimated soil types, derived geotechnical parameters, and an associated AGS data file. Please note, (where present) the results of any dissipation tests are provided in electronic data format (.csv file) only.

2.1.4 Cone Calibration

The cone resistance and sleeve friction are recorded by a calibrated load cell within the cone. The CPTU load cell and pressure transducers are routinely calibrated by the manufacturer in line with ISO 22476-1:2012 standard. The cone calibration certificate for the cone used on this project is presented in Appendix A.

2.1.5 Cone Saturation

The pore water pressure is recorded using a calibrated pressure transducer located in the piezocone. A de-airing procedure is carried out prior to each test to ensure pore water pressure measurements are not affected by the presence of air in the measuring transducer. The cone and filter are saturated using a glycerine fluid with a viscosity of 10,000 CST.

2.1.6 Testing Procedure

The tests are carried out in accordance with the International Standard for Electrical Cone and Piezocone Penetration Test (ISO 22476-1:2012). The end depths of the tests are determined by either completion to the specified test depth or when the safe capacity of the equipment was reached. A summary of the tests performed as indicated on the daily production reports, is given in Appendix A.

The test data is transmitted from the digital CPTU through an umbilical cable that runs through the centre of the push rods to the data acquisition system (DAS). The test results are displayed in real time on the laptop logging screen with the results recorded onto the internal hard disc and backed up onto a USB stick.

The rate of penetration is kept constant at 20mm/s ±10% except when penetrating very dense/very stiff strata. Cone zero values are taken before each test is carried out to confirm it is within calibration. Then again at the end of each test, zero values are taken to see if there has been any drift throughout the test. These zero values are assessed during the post processing stage and represents a quality check on the data and the overall testing procedure. The individual test zero values are provided on the corresponding test results in Appendix B.

2.1.7 In-situ Pore Pressure

The in-situ or hydrostatic pore pressure is required for the calculation of several derived parameters included in this report. The water depths at the time of each CPTU test are recorded by the site crew and passed across to the processing team along with the raw data files for calculation purposes.

2.2 Positioning

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

The coordinates (Irish Transverse Mercator) and seabed elevations (mCD Rosslare) at each test location are included on the Project Summary in Appendix A and on the CPTU logs in Appendix B.

3 CPT PARAMETERS

All measured parameters of the CPTU tests are shown in Appendix B with relevant information about the results and data processing included in the following sections.

3.1 Processing of the Data

The measured parameters: cone end resistance (q_c), sleeve friction (f_s), porewater pressure measurements with the filter in the shoulder position (u_2), and the inclination for x and y axis (I_x and I_y), were recorded for every 10 mm of penetration.

Zero measurements are recorded before and after each CPTU test for each channel of the test cone. This is a routine site quality check; the zero measurements are presented on the CPTU logs in Appendix B.

The raw data from site is processed and presented using specialised CPT software (CPeT-IT). All interpretations on the CPTU results presented in this report are carried out following recommendations of Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson (Guide to Cone Penetration Testing, 2015) and BS EN ISO 22476-1:2012. The interpretations are provided for illustrative purposes only and should be carefully reviewed. Causeway Geotech Ltd does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software, and any designs should be based on the measured parameters which can be provided in AGS data format.

Measured parameters, as identified in Sections 3.2 and 3.3, have been used to derive all the geotechnical parameters, presented in Section 4.0. The plots include interpreted Soil Behaviour Type (SBT) based on the charts as described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1990) or normalized data (2010 and 2016).

3.2 Measured Parameters

3.2.1 Cone Resistance (q_c)

Cone resistance (q_c) is measured as the total force acting on the cone, divided by the projected area of the cone. The results are presented in MPa on the CPTU logs in Appendix B.

3.2.2 Sleeve Friction (f_s)

Sleeve friction (f_s) is measured as the total frictional force acting on the friction sleeve divided by its surface area. The results are presented in kPa on the CPTU logs in Appendix B.

3.2.3 Porewater Pressure (u_2)

The pore pressure (u_2) is measured throughout the test. If the strata are free-draining and saturation is maintained, normally hydrostatic pore pressure is measured. In materials that are not free draining, the total pore pressure will be recorded (hydrostatic plus any excess pore pressure) created by the cone penetrating through the material.

The filter element can be mounted in one of three positions, for all tests carried out on this project the filter was mounted in the u_2 position as shown on the following figure.

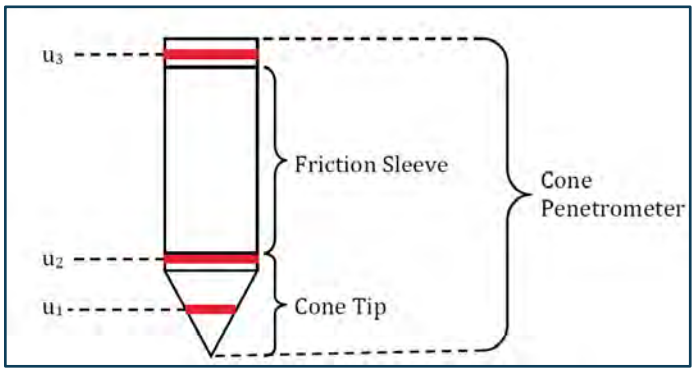


Figure 1: Pore pressure filter locations (after Lunne et al., 1997)

3.2.4 Inclination (I_x, I_y)

The Drill'n CPT module was set up to obtain a thrust direction as near as possible to the vertical. The CPTU cones have inclinometers incorporated to measure non-verticality of the test. For those test depths less than 15m, significant non-verticality is unusual, provided the initial thrust direction is vertical. However, for overwater tests, the depth from deck to bed needs also to be considered.

On this project, the 7" sonic casing string was used as a riser casing, with the sonic rods (with centralisers) then used to maintain verticality within the 7" string. The CPT rods were then passed through the centre of the sonic rods to the seabed where the CPTU tests were carried out.

3.3 Soil Behaviour

3.3.1 Friction Ratio (R_f)

The friction ratio (R_f) is the ratio between the sleeve friction and the cone resistance (Lunne, Robertson and Powell. 1997).

3.3.2 Pore Pressure Ratio (B_q)

The pore pressure ratio (B_q) is the ratio between the measured pore pressure generated during penetration and the corrected cone resistance minus the total overburden stress.

Pore pressure ratio as per Senneset and Janbu (1985) is given as:

$$B_q = \frac{u_2 - u_0}{q_t - \sigma_{vo}}$$

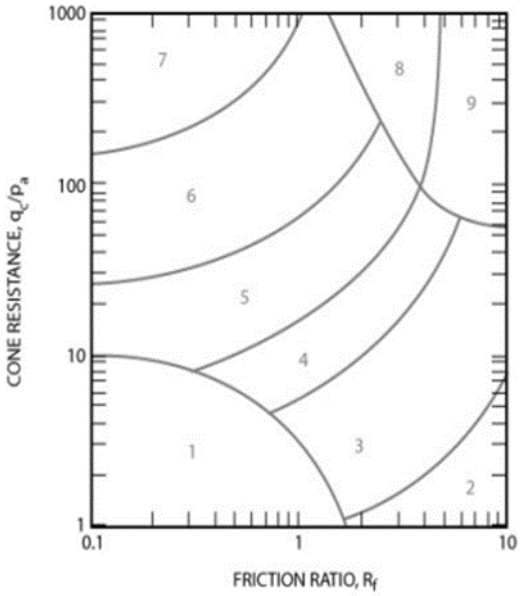
Where:

- u_2 pore pressure measured between the cone and friction sleeve
- u_0 equilibrium pore pressure
- σ_{vo} total overburden stress
- q_t cone resistance corrected for unequal end area effects

3.3.3 Soil Behaviour Type (SBT)

The estimation of soil behaviour type (SBT) using measurements of cone resistance and sleeve friction is based upon variations of both the friction ratio (R_f) and cone resistance (q_c). The friction ratio will vary depending on whether the soil is cohesive or granular in nature. The cone resistance will vary depending on the strength and densities of the soil.

The interpretation used in this report is Robertson et al. (2010), which is shown in the below Figure 2. The results are presented on the CPTU logs in Appendix B.



Zone	Soil Behavior Type
1	Sensitive, fine grained
2	Organic soils - clay
3	Clay – silty clay to clay
4	Silt mixtures – clayey silt to silty clay
5	Sand mixtures – silty sand to sandy silt
6	Sands – clean sand to silty sand
7	Gravelly sand to dense sand
8	Very stiff sand to clayey sand*
9	Very stiff fine grained*

* Heavily overconsolidated or cemented

P_a = atmospheric pressure = 100 kPa = 1 tsf

Figure 2: Non-Normalised CPT Soil Behaviour Type (SBT) chart as per Robinson et al (2010)

3.3.4 Soil behaviour type index (I_c)

The soil behaviour type index (I_c) was derived by Jefferies and Davies (1991) and was created to simplify the application of the CPTU SBT chart shown previously in Section 3.3.3. This approach has been modified for use with the Robertson (1990) normalised CPT soil classification chart shown in Figure 3. Here the normalised cone resistance (Q_t) and normalised friction ratio (F_r) can be combined into one Soil Behaviour Type Index (I_c) (Lunne et al., 1997).

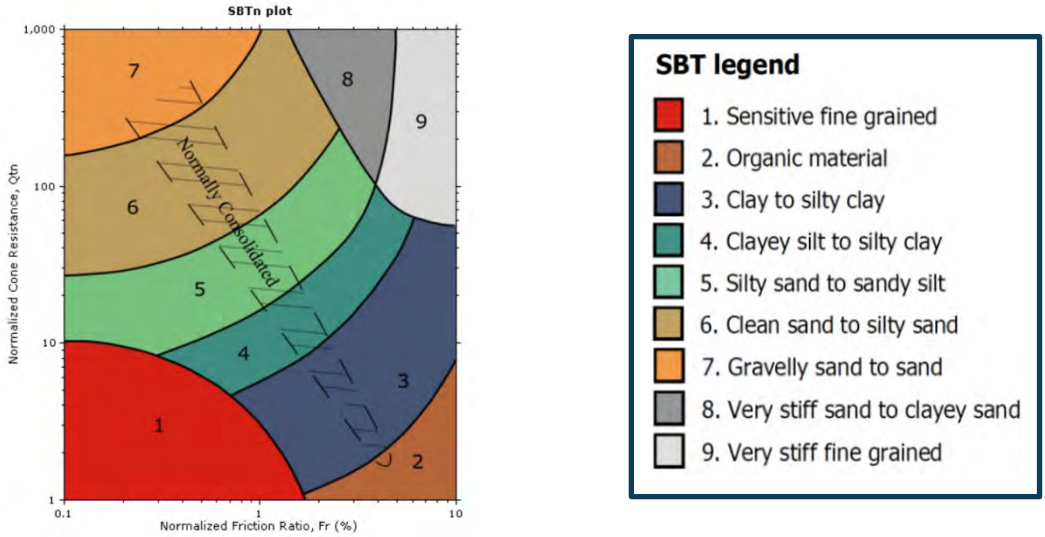


Figure 3: Soil Behaviour Type Index (I_c) Chart as per Robertson (1990)

The soil behaviour type index (I_c) can then be defined using Robertson (2010) formula as given below:

$$I_c = [(3.47 - \log Q_t)^2 + (\log F_r + 1.22)^2]^{0.5}$$

Where:

- Q_t normalized cone resistance which represents the simple normalization with a stress exponent (n) of 1.0m which applies to clay-like soils.
- F_r normalized friction ratio (%).

The boundaries of the soil behaviour type are given in Table 5 on the following page in terms of the index (I_c).

Table 5: Normalized CPTU Soil Behaviour Type (SBT_n) Index values (I_c) Robertson (2010)

Zone	Soil Behaviour Type	I_c
1	Sensitive fine grained	N/A
2	Organic Soils – clay	> 3.6
3	Clays – silty clay to clay	2.95 – 3.6
4	Silt mixtures – clayey silt to silty clay	2.60 – 2.95
5	Sand mixtures – silty sand to sandy silt	2.05 – 2.6
6	Sands – clean sand to silty sand	1.31 – 2.05
7	Gravelly sand to dense sand	< 1.31
8	Very dense sand to clayey sand*	N/A
9	Very stiff fine grained*	N/A

* Heavily over consolidated or cemented

The soils behaviour type index (I_c) does not apply to zones 1, 8 and 9. The profiles of I_c provide a simple guide to the continuous variation of soil behaviour type in a given soil profile based on the CPTU results, with a reliability greater than 80% compared with standard soil samples (Robertson, 2015).

3.4 Corrections

3.4.1 Corrected Cone Resistance (q_t)

For each test, the measured cone resistance (q_c) can be corrected for the ''unequal area effect'' due to the influence of the ambient pore water pressure acting on the cone.

The correction has been applied based on the following by Lunne, Robertson and Powell. (1997).

$$q_t = q_c - [u_2 \cdot (1 - \alpha)]$$

Where:

α cone area ratio

The cone used on this project has been calculated to have a cone area ratio of 0.79.

4 GEOTECHNICAL DERIVED PARAMETERS

There are a number of empirical correlations which can be used to derive geotechnical parameters from the processed CPTU data. All Geotechnical Parameter Relationships are presented in Appendix B. The results of all correlations used to obtain the geotechnical derived parameters are presented on the CPTU logs in Appendix B.

It should be noted that each empirical correlation is derived from historic and laboratory test data, which may not be appropriate for all soil types encountered on this site.

5 REFERENCES

British Standard BS5930:1999, "Code of practice for site investigations". BSI, 1999

British Standard BS EN ISO 22476-1:2012

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APPENDIX A – PROJECT SUMMARY

CPTU Test Summary

Location ID	Termination Depth (m)	Date of Test	Cone Used	Termination Reason
M-CPT01_BH	10.03	01/02/24	DS15-CFIIP.2272	Total Load Reached
M-CPT02	6.68	01/02/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT03_BH	7.68	15/12/23	DS15-CFIIP.2272	Total Load Reached
M-CPT04_BH	1.95	02/12/23	DS15-CFIIP.2272	Maximum Tip Load
M-CPT05_BH	9.29	03/01/4	DS15-CFIIP.2272	Maximum Tip Load
M-CPT06	7.76	27/02/24	DS15-CFIIP.2271	Maximum Tip Load
M-CPT07	9.37	16/01/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT08	10.29	03/02/24	DS15-CFIIP.2272	Total Load Reached
M-CPT09_BH	0.34	15/12/23	DS15-CFIIP.2272	Total Load Reached
M-CPT10_BH	9.47	14/01/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT11	6.84	10/02/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT12	3.37	27/01/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT13	2.34	05/02/24	DS15-CFIIP.2272	Cone Inclination
M-CPT14	0.83	21/02/24	DS15-CFIIP.2271	Cone Inclination
M-CPT16	1.48	13/01/24	DS15-CFIIP.2272	Cone Inclination
M-CPT17	9.67	16/02/24	DS15-CFIIP.2272	Cone Inclination
M-CPT18	9.50	03/02/24	DS15-CFIIP.2272	Cone Inclination
M-CPT19	7.87	04/02/24	DS15-CFIIP.2272	Cone Inclination
M-CPT20	7.00	04/02/24	DS15-CFIIP.2272	Cone Inclination
M-CPT21_BH	1.75	16/01/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT22	1.72	18/02/24	DS15-CFIIP.2271	Maximum Tip Load
M-CPT23_BH	10.56	04/01/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT24_BH	10.90	31/01/24	DS15-CFIIP.2272	Target Depth Reached
M-CPT25A	0.92	16/02/24	DS15-CFIIP.2271	Maximum Tip Load
M-CPT26_BH	0.87	05/01/24	DS15-CFIIP.2272	Cone Inclination
M-CPT27	7.45	14/02/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT31	1.15	19/02/24	DS15-CFIIP.2271	Maximum Tip Load
M-CPT33_BH	7.79	11/02/24	DS15-CFIIP.2272	Maximum Tip Load
M-CPT35	8.49	20/02/24	DS15-CFIIP.2271	Cone Inclination
M-CPT37	7.94	21/02/24	DS15-CFIIP.2271	Cone Inclination
M-CPT38_BH	5.75	19/12/23	DS15-CFIIP.2272	Maximum Tip Load
M-CPT39_BH	1.32	20/12/23	DS15-CFIIP.2272	Total Load Reached
M-CPT40	2.33	14/02/24	DS15-CFIIP.2272	Cone Inclination
M-CPT41_BH	10.03	17/02/24	DS15-CFIIP.2271	Maximum Tip Load

CPTU Test Coordinates and Levels

Location ID	Easting	Northing	Deck to bed (m)	Seabed (mCD)	Water Depth (m)	Casing Flush (m)
M-CPT01_BH	712929.972	613014.476	12.60	-4.898	9.00	1.50
M-CPT02	712894.352	612954.270	9.50	-4.527	6.00	1.00
M-CPT03_BH	712892.458	612852.304	13.00	-4.713	6.00	0.40
M-CPT04_BH	712869.318	612776.868	11.90	-3.782	9.00	1.50
M-CPT05_BH	712988.936	613078.707	13.00	-5.748	5.40	0.50 / 2.50
M-CPT06	713435.099	613372.317	14.90	-9.471	9.00	0.90
M-CPT07	712932.378	613052.647	11.45	-4.823	10.00	0.90
M-CPT08	712733.755	612952.911	11.30	-4.719	7.00	0.80
M-CPT09_BH	712825.480	612739.911	11.90	-3.599	5.60	0.20
M-CPT10_BH	713029.970	613014.814	12.30	-5.387	5.00	1.00 / 1.84
M-CPT11	712752.042	612867.822	12.20	-4.397	6.00	1.10 / 3.10
M-CPT12	712974.588	612773.713	10.80	-3.545	6.00	0.50 / 1.65
M-CPT13	712679.862	612769.162	13.00	-4.220	7.00	1.00
M-CPT14	712841.312	612677.188	10.50	-2.931	3.00	0.20
M-CPT16	712978.737	612669.447	6.20	-2.369	5.00	0.30
M-CPT17	712584.513	613030.264	11.60	-5.018	5.00	0.50
M-CPT18	712531.803	612955.536	12.35	-4.588	7.00	0.40
M-CPT19	712533.973	612869.280	12.40	-4.175	7.00	0.40
M-CPT20	712516.544	612759.303	11.60	-3.616	7.00	0.50
M-CPT21_BH	713316.307	613156.305	15.60	-10.401	10.00	0.25
M-CPT22	712495.914	612660.536	8.20	-3.322	3.00	1.00
M-CPT23_BH	712881.546	613051.614	11.50	-4.834	5.00	0.80
M-CPT24_BH	712730.031	613038.133	13.50	-5.381	6.00	0.90
M-CPT25A	713285.967	613318.821	12.30	-7.908	9.00	0.75
M-CPT26_BH	712435.003	613029.136	11.50	-4.561	6.00	0.60
M-CPT27	713054.995	613231.762	14.10	-6.470	7.00	0.85
M-CPT31	713591.249	613130.632	14.50	-8.165	9.00	0.70
M-CPT33_BH	713024.218	613163.553	12.10	-6.526	6.00	0.40
M-CPT35	712955.456	613201.830	12.60	-5.530	8.00	1.00
M-CPT37	712942.053	613133.558	12.00	-5.231	8.00	1.00
M-CPT38_BH	713071.205	612910.671	13.20	-4.905	5.00	0.40
M-CPT39_BH	713101.662	612785.821	11.80	-3.999	5.30	0.50
M-CPT40	713222.223	612803.663	9.80	-5.361	4.00	1.10
M-CPT41_BH	712918.052	613005.922	12.20	-4.851	7.00	0.40

DRILL'N CPT RIG

Drill'n CPT is a 10 or 20 ton fully automatic CPT tool placed in the break out clamps of a drill rig. Our Drill'n CPT tool allows you to convert every (sonic) drill rig into a CPT unit. It can deliver a continuous CPT measurement or measure in between sampling. It is also the perfect combination to advance casing through refusal layers and apply CPT testing to greater depths.

SPECIFICATIONS*	Drill'n CPT 10 Ton		Drill'n CPT 20 Ton	
CPT force max.	100 kN	22,480 lbf	200 kN	44,960 lbf
Oil pressure	75 bar	1,087 psi	150 bar	2,175 psi
Max. system pressure	210 bar	3,045 psi	210 bar	3,045 psi
Required oil flow	20 l/min	4.4 gpm	20 l/min	4.4 gpm
Max. oil flow	60 l/min	13.2 gpm	60 l/min	13.2 gpm
CPT speed	20...25 mm/s	0.065...0.1082 ft/s	20...25 mm/s	0.065...0.1082 ft/s
CPT stroke	800 mm	31.5 "	800 mm	31.5 "
Pull back force max.	120 kN	29,977 lbf	240 kN	53,954 lbf
Max. return speed in automatic mode	60 mm/s	0.196 ft/s	60 mm/s	0.196 ft/s
Depth registration encoder	up to 20 puls/mm	up to 500 puls/1"	up to 20 puls/mm	up to 500 puls/1"
CPT rod diameter	36...44 mm	1.417 - 1.732"	36...44 mm	1.417 - 1.732"
Hydraulic rod clamping cilinder	Standard	Standard	Standard	Standard
SonicCPT hydraulic clamping	Option	Option	Option	Option
Height	1,750 mm	68.9"	1,750 mm	68.9"
Width	700 mm	27.6"	700 mm	27.6"
Depth	600 mm	23.6"	600 mm	23.6"
Clamping diameter	190 mm	7.5"	190 mm	7.5"
Electrical power	24V-5A / 12V-10A	24V-5A / 12V-10A	24V-5A / 12V-10A	24V-5A / 12V-10A

* specifications are subject to changes





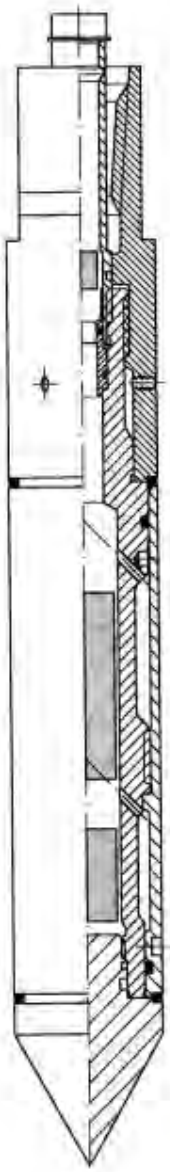
Drill'n CPT on MRS-XL MAX



CONE SPECIFICATION

GeoPoint Systems bv

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ING Bank: 68.73.01.385
Kvk-nr: 5249758
BTW nr: NL809151472B01



SPECIFICATIONS S15 SERIES ELECTRICAL CONES

The electronic subtraction cones have been developed to address the durability problems inherent in other cone designs. The unit consists of a single element temperature compensated strain gauge transducer for measuring both cone resistance and local sleeve friction. This design is therefore more robust than a compression type cone. The cone support electronics package is located directly behind the transducer. The precision strain gauge amplifiers and power supply eliminate the effects of cable resistance on the measurements. A standard subtraction cone is capable of measuring simultaneously the following channels: Tip, Local friction, Pore pressure, Temperature and Inclination.

GENERAL SPECIFICATIONS

Cone Tip Section Area	1,500 mm2
Friction Sleeve Surface	22,500 mm2
Total Length	325 mm
Weight	4200 g
Power Supply	± 15 VDC, 100 mA.
Output	0 – 10 VDC*
Working Temperature	0 - 60˚C
Storage Temperature	- 40 to + 85˚C
Connector	Lemo 10 pins (others on request)

TIP RESISTANCE

Range	100/150* kN
Accuracy	0.25 % FS
Maximum Load	150 % of range
Cone Area Ratio	0.75

LOCAL SLEEVE FRICTION

Range	100/150* kN
Accuracy	0.50 % FS
Maximum Load	150 %
Sleeve Area Ratio	1.0 (EA)

PORE PRESSURE

Range	1/2/5/10* MPa
Accuracy	0.5 % FS
Maximum Load	150 % of range

INCLINATION

Range	25 ˚ (biaxial)
Accuracy	< 2 ˚

All our equipment complies with the ISSMGE, ASTM, DIN and NEN Standards.

*Other ranges and voltage ranges available on request. Loadcells may be calibrated for lower ranges.

CONE CALIBRATION CERTIFICATION

Eijkelkamp GeoPoint
SoilSolutions

Kuipergatweg 22F
2171 AL Sassenheim
The Netherlands

T +31 71 301 9251
E info@eijkelkamp-geopoint.com
I eijkelkamp-geopoint.com

Cone Calibration Certificate

General

Certificate number	**GS-2271-001**	
Instrument Type	Digital Subtraction Cone	
Model	DS15-CFIIP	
Serial number	2271	
Client	Causeway Geotech LTD	

Calibration Instrument

Manufacturer	Hottinger Baldwin Messtechnik GmbH	
NMI certificate	2461165.00501	

Calibration Conditions

Ambient temperature	25.0	°C
Atmospheric pressure	1023	mBar

Cone Specifications

Cone base area	1500	mm2
Nominal load Tip Resistance	100	kN
Friction sleeve area	22500	mm2
Nominal load Local Friction	100	kN
Nominal load Pore Pressure	2000	kPa
Nominal Inclination	15	°
Temperature compensation (all channels)	0...+40	°C
Max. overload (all channels)	100	%
Cone area ratio (a)	0.79	
Friction area ratio (b)	1.00	

Standard and method of calibration NEN-EN ISO 22476-1:2022

Results The probe complies with the requirements of the above mentioned standard and indicated calibration class.

Maximum uncertainty transducer	qc	35 or 1%	kPa
	fs	5 or 1%	kPa
	u2	10 or 0.5%	kPa
	i	0.5	°

Relative uncertainty applies to the measured value not the measuring range

Calibrated by	H.Smit
Calibration date	22-08-2023
Signature	
QA Manager	R. Mosterd
Date	
Signature	

Expiration date according to NEN-EN ISO 22476-1 22-08-2024

Remarks:
This calibration is compliant with Eijkelkamp GeoPoint SoilSolutions BV internal quality system, internal calibration procedures and meets the requirements of NEN2649, NEN-EN-ISO 22476-1, NORSOK G-001, ISSMFE and ASTM using calibration equipment traceable to (Inter-)National Standards. The calibration results only relate to the probe identified in this certificate. This new certificate replaces all previously issued certificates for this probe.This certificate may not be reproduced other than in full and except with permission of Eijkelkamp GeoPoint SoilSolutions BV. Calibration certificates without signature are not valid.

Eijkelkamp GeoPoint SoilSolutions
V.A.T. NO: NL 8584.21.422.B01
Trade Reg. Arnhem no. 70686149

IBAN NL43 RABO 0326 7304 38
BIC: RABONL2U

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SoilSolutions

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The Netherlands

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I eijkelkamp-geopoint.com

Cone Calibration Certificate

General

Certificate number	**GS-2272-001**
Instrument Type	Digital Subtraction Cone
Model	DS15-CFIIP
Serial number	2272
Client	Causeway Geotech LTD

Calibration Instrument

Manufacturer	Hottinger Baldwin Messtechnik GmbH
NMi certificate	2461165.00501

Calibration Conditions

Ambient temperature	25.3	°C
Atmospheric pressure	1023	mBar

Cone Specifications

Cone base area	1500	mm2
Nominal load Tip Resistance	100	kN
Friction sleeve area	22500	mm2
Nominal load Local Friction	100	kN
Nominal load Pore Pressure	2000	kPa
Nominal Inclination	15	°
Temperature compensation (all channels)	0 ; +40	°C
Max. overload (all channels)	100	%
Cone area ratio (a)	0.79	
Friction area ratio (b)	1.00	

Standard and method of calibration NEN-EN ISO 22476-1:2022

Results The probe complies with the requirements of the above mentioned standard and indicated calibration class.

Maximum uncertainty transducer	qc	35 or 1%	kPa
	fs	5 or 1%	kPa
	u2	10 or 0.5%	kPa
	i	0.5	°

Relative uncertainty applies to the measured value not the measuring range.

Calibrated by	H.Smit
Calibration date	22-08-2023
Signature	
QA Manager	R. Mosterd
Date	
Signature	

Expiration date according to NEN-EN ISO 22476-1 22-08-2024

Remarks:
This calibration is compliant with Eijkelkamp GeoPoint SoilSolutions BV internal quality system, internal calibration procedures and meets the requirements of NEN2649, NEN-EN-ISO 22476-1, NORSOK G-001, ISSMFE and ASTM using calibration equipment traceable to (Inter-)National Standards. The calibration results only relate to the probe identified in this certificate. This new certificate replaces all previously issued certificates for this probe.This certificate may not be reproduced other than in full and except with permission of Eijkelkamp GeoPoint SoilSolutions BV. Calibration certificates without signature are not valid.

Eijkelkamp GeoPoint SoilSolutions
V.A.T. NO. NL 8584.21.432.B01
Trade Reg. Arnhem no. 70686149

IBAN NL43 RABO 0326 7404 38
BIC RABONL2U

APPENDIX B – CONE PENETRATION TEST (CPTU) LOGS

Rosslare Europort - Offshore Wind Hub GI

APPLICATION CLASS LOG - 200kN CPT 'N DRILL (ROYAL EIJKELKAMP)

Project No.	Client	Vessel:	Operations:
23-0585	Iarnrod Eireann (Irish Rail)	Causeway Giant 2	200kN CPT 'N DRILL

Date:	Start of Test Time:	Test Type	System	Cone Serial No.	Test ID	Maximum Absolute Value during Test (assessed from Data)			Calculated zero shifts (applicable to deck level measurements)			Relative/Percentage difference - Calculated zero shifts (applicable to deck level measurements)			Absolute Difference Classification			Percentage/Relative Difference Classification			Determined Application Class			CPT Test Class	Comments
						q_c (KPa)	f_s (KPa)	U_2 (KPa)	q_c (KPa)	f_s (KPa)	U_2 (KPa)	qc (%)	fs (%)	U_2 (%)	q_c	f_s	U_2	q_c	f_s	U_2	q_c	f_s	U_2		
01.12.2023	23:21	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT01_BH	38	494	939	29.4	0.0	0.0	0.08%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
02.12.2023	21:14	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT04_BH	41	112	190	40.6	0.0	0.0	0.10%	0.00%	0.00%	2	1	1	1	1	1	1	1	1	1	
15.12.2023	12:57	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT09_BH	25	66	-16	25.4	0.0	0.0	0.10%	0.00%	0.02%	1	1	1	1	1	1	1	1	1	1	
15.12.2023	21:33	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT03_BH	38	736	-199	38.0	0.0	0.0	0.10%	0.00%	0.00%	2	1	1	1	1	1	1	1	1	1	
19.12.2023	05:00	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT38_BH	33	436	-169	32.6	0.0	0.0	0.10%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
20.12.2023	08:09	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT39_BH	29	277	-168	2.2	0.0	0.0	0.01%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
03.01.2024	10:06	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT05_BH	41	323	726	3.2	0.0	0.0	0.01%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note first push
03.01.2024	18:31	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT05_BH_2	41	323	726	3.2	0.0	0.0	0.01%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note second push
04.01.2024	09:22	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT23_BH	31	524	622	33.4	0.0	0.0	0.11%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
05.01.2024	17:32	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT26_BH	18	147	-156	11.0	0.0	0.0	0.06%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
13.01.2024	12:11	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT16	28	384	-135	19.6	0.0	0.0	0.07%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	

Rosslare Europort - Offshore Wind Hub GI

APPLICATION CLASS LOG - 200kN CPT 'N DRILL (ROYAL EIJKELKAMP)

Project No.	Client	Vessel:	Operations:
23-0585	Iarnrod Eireann (Irish Rail)	Causeway Giant 2	200kN CPT 'N DRILL

Date:	Start of Test Time:	Test Type	System	Cone Serial No.	Test ID	Maximum Absolute Value during Test (assessed from Data)			Calculated zero shifts (applicable to deck level measurements)			Relative/Percentage difference - Calculated zero shifts (applicable to deck level measurements)			Absolute Difference Classification			Percentage/Relative Difference Classification			Determined Application Class			CPT Test Class	Comments
						q_c (KPa)	f_s (KPa)	U_2 (KPa)	q_c (KPa)	f_s (KPa)	U_2 (KPa)	qc (%)	fs (%)	U_2 (%)	q_c	f_s	U_2	q_c	f_s	U_2	q_c	f_s	U_2		
14.01.2024	07:55	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT10_BH	40	691	731	6.0	0.0	0.0	0.02%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note first push
14.01.2024	17:38	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT10_BH_2	40	691	731	125.0	0.0	0.0	0.31%	0.00%	0.00%	3	1	1	1	1	1	1	1	1	1	Note second push
14.01.2024	17:38	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT10_BH_3	40	691	731	29.2	0.0	0.0	0.07%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note third push
16.01.2024	12:43	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT21_BH	37	184	647	1.8	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
16.01.2024	19:55	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT07	44	687	61	2.0	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
27.01.2024	12:10	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT12	38	359	-156	149.6	0.0	0.0	0.40%	0.00%	0.00%	3	1	1	1	1	1	1	1	1	1	Note first push
27.01.2024	13:10	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT12_2	38	359	-156	38.2	0.0	0.0	0.10%	0.00%	0.00%	2	1	1	1	1	1	1	1	1	1	Note second push
31.01.2024	02:13	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT24_BH	27	560	1167	21.6	0.0	0.0	0.08%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
01.02.2024	23:18	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT02	49	-573	645	18.2	0.0	0.0	0.04%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
03.02.2024	10:21	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT08	31	430	957	6.4	0.0	0.0	0.02%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
03.02.2024	02:09	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT18	29	605	506	10.0	0.0	0.0	0.03%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	

Rosslare Europort - Offshore Wind Hub GI

APPLICATION CLASS LOG - 200kN CPT 'N DRILL (ROYAL EIJKELKAMP)

Project No.	Client	Vessel:	Operations:
23-0585	Iarnrod Eireann (Irish Rail)	Causeway Giant 2	200kN CPT 'N DRILL

Date:	Start of Test Time:	Test Type	System	Cone Serial No.	Test ID	Maximum Absolute Value during Test (assessed from Data)			Calculated zero shifts (applicable to deck level measurements)			Relative/Percentage difference - Calculated zero shifts (applicable to deck level measurements)			Absolute Difference Classification			Percentage/Relative Difference Classification			Determined Application Class			CPT Test Class	Comments
						q_c (KPa)	f_s (KPa)	U_2 (KPa)	q_c (KPa)	f_s (KPa)	U_2 (KPa)	qc (%)	fs (%)	U_2 (%)	q_c	f_s	U_2	q_c	f_s	U_2	q_c	f_s	U_2		
04.02.2024	09:05	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT19	40	1157	-179	49.4	0.0	0.0	0.12%	0.00%	0.00%	2	1	1	1	1	1	1	1	1	1	
04.02.2024	19:13	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT20	49	669	-158	21.8	0.0	0.0	0.04%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
05.02.2024	15:57	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT13	21	60	-111	10.4	0.0	0.0	0.05%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
10.02.2024	10:07	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT11	50	1034	-167	0.6	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note first push
10.02.2024	10:51	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT11_1	50	1034	-167	0.6	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note second push
10.02.2024	14:35	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT11_2	50	1034	-167	18.2	0.0	0.0	0.04%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note third push
11.02.2024	20:48	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT33_BH	39	637	1147	36.4	0.0	0.0	0.09%	0.00%	0.00%	2	1	1	1	1	1	1	1	1	1	
14.02.2024	14:50	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT40	18	154	74	9.8	0.0	0.0	0.05%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
14.02.2024	23:18	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT27	43	528	550	5.2	0.1	0.0	0.01%	0.01%	0.00%	1	1	1	1	1	1	1	1	1	1	
16.02.2024	06:53	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT17	26	460	725	0.4	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
16.02.2024	15:00	CPTU	Drill'nCPT	S15-CFIP2272	M-CPT25	0	0	0	216.8	0.0	0.0	-	-	-	4	1	1	-	-	-	-	-	-	-	Note Test Aborted

Rosslare Europort - Offshore Wind Hub GI

APPLICATION CLASS LOG - 200kN CPT 'N DRILL (ROYAL EIJKELKAMP)

Project No.	Client	Vessel:	Operations:
23-0585	Iarnrod Eireann (Irish Rail)	Causeway Giant 2	200kN CPT 'N DRILL

Date:	Start of Test Time:	Test Type	System	Cone Serial No.	Test ID	Maximum Absolute Value during Test (assessed from Data)			Calculated zero shifts (applicable to deck level measurements)			Relative/Percentage difference - Calculated zero shifts (applicable to deck level measurements)			Absolute Difference Classification			Percentage/Relative Difference Classification			Determined Application Class			CPT Test Class	Comments
						q_c (KPa)	f_s (KPa)	U_2 (KPa)	q_c (KPa)	f_s (KPa)	U_2 (KPa)	qc (%)	fs (%)	U_2 (%)	q_c	f_s	U_2	q_c	f_s	U_2	q_c	f_s	U_2		
17.02.2024	02:57	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT41_BH	40	365	625	20.0	0.0	0.0	0.05%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	Note Cone Changed
18.02.2024	10:31	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT22	46	405	-152	32.2	0.0	0.0	0.07%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
19.02.2024	09:14	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT31	42	151	375	0.4	0.0	0.0	0.00%	0.02%	0.00%	1	1	1	1	1	1	1	1	1	1	
20.02.2024	23:05	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT35	44	837	1134	2.8	0.0	0.0	0.01%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
21.02.2024	00:05	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT37	45	622	805	1.6	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
21.02.2024	08:49	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT14	16	522	-141	6.8	0.0	0.0	0.04%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	
27.02.2024	13:20	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT25A	44	408	13	16.6	0.0	0.0	0.04%	0.00%	0.02%	1	1	1	1	1	1	1	1	1	1	
27.02.2024	16:49	CPTU	Drill'nCPT	S15-CFIP2271	M-CPT06	46	157	-180	1.0	0.0	0.0	0.00%	0.00%	0.00%	1	1	1	1	1	1	1	1	1	1	

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236 \right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \leq 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a} \right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$ (applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Drained Friction Angle, φ (°) ::

$$\varphi = \varphi'_{cv} + 15.94 \cdot \log(Q_{tn,cs}) - 26.88$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c_cutoff}$)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$
$\alpha = 14$ for $Q_{tn} > 14$
$\alpha = Q_{tn}$ for $Q_{tn} \leq 14$
$M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \geq 2.20$

$$M_{CPT} = 0.03 \cdot (q_t - \sigma_v) \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho} \right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 \cdot + 7 \cdot \log(F_r))} \right]^{1.25}$$ or user defined

$OCR = k_{OCR} \cdot Q_{tn}$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_O = (1 - \sin\varphi') \cdot OCR^{\sin\varphi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Peak Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10 < B_q < 1.00$)

References

• Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012

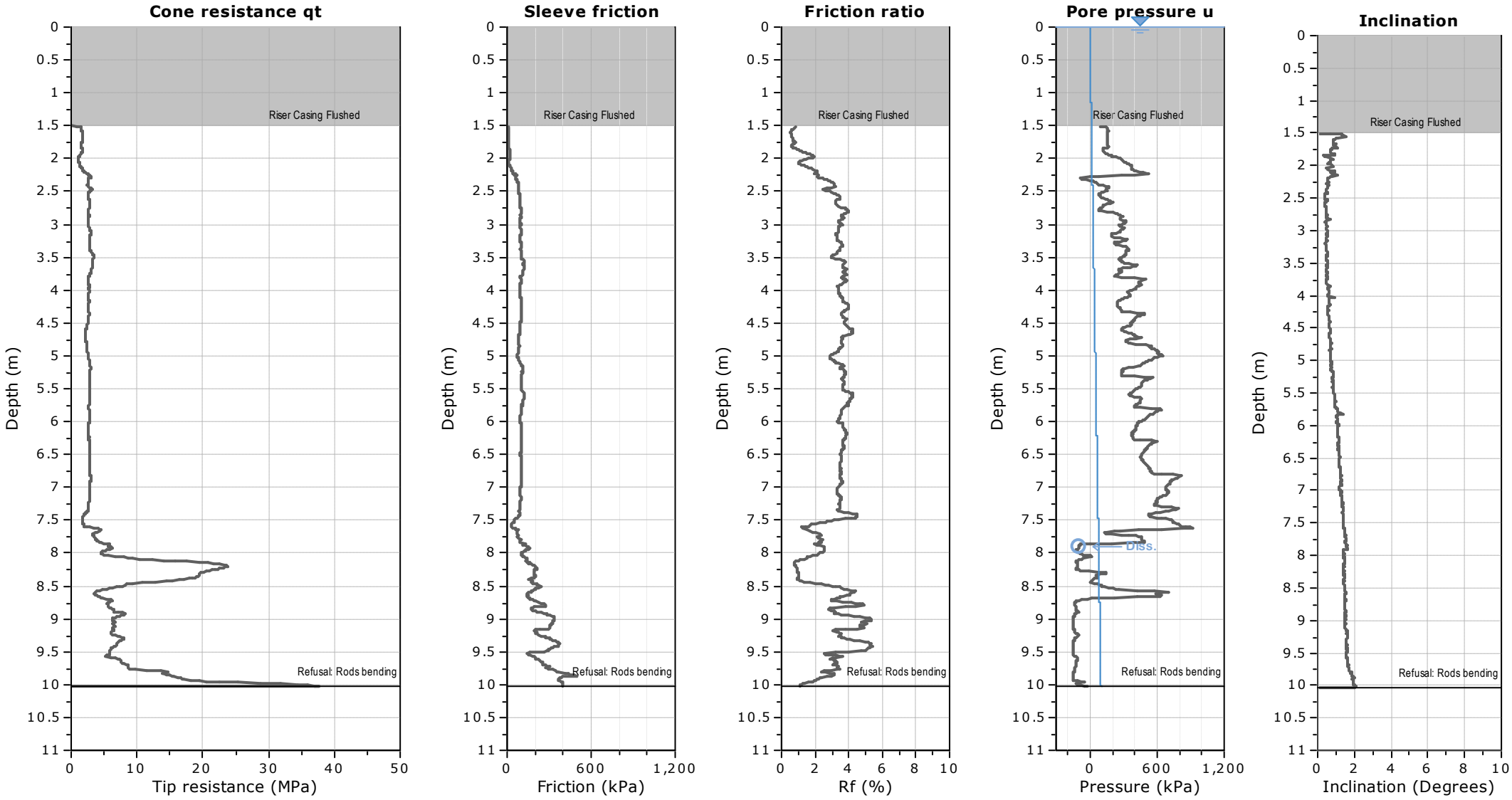
• Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

• N Barounis, J Philpot, Estimation of in-situ water content, void ratio, dry unit weight and porosity using CPT for saturated sands, Proc. 20th NZGS Geotechnical Symposium

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www.causewaygeotech.com

CPT: M-CPT01_BH
Total Depth: 10.03 m, Date: 01/12/2023
Surface Elevation (mCD): -4.90 m
Coords: X:712929.97, Y:613014.48
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/DJ

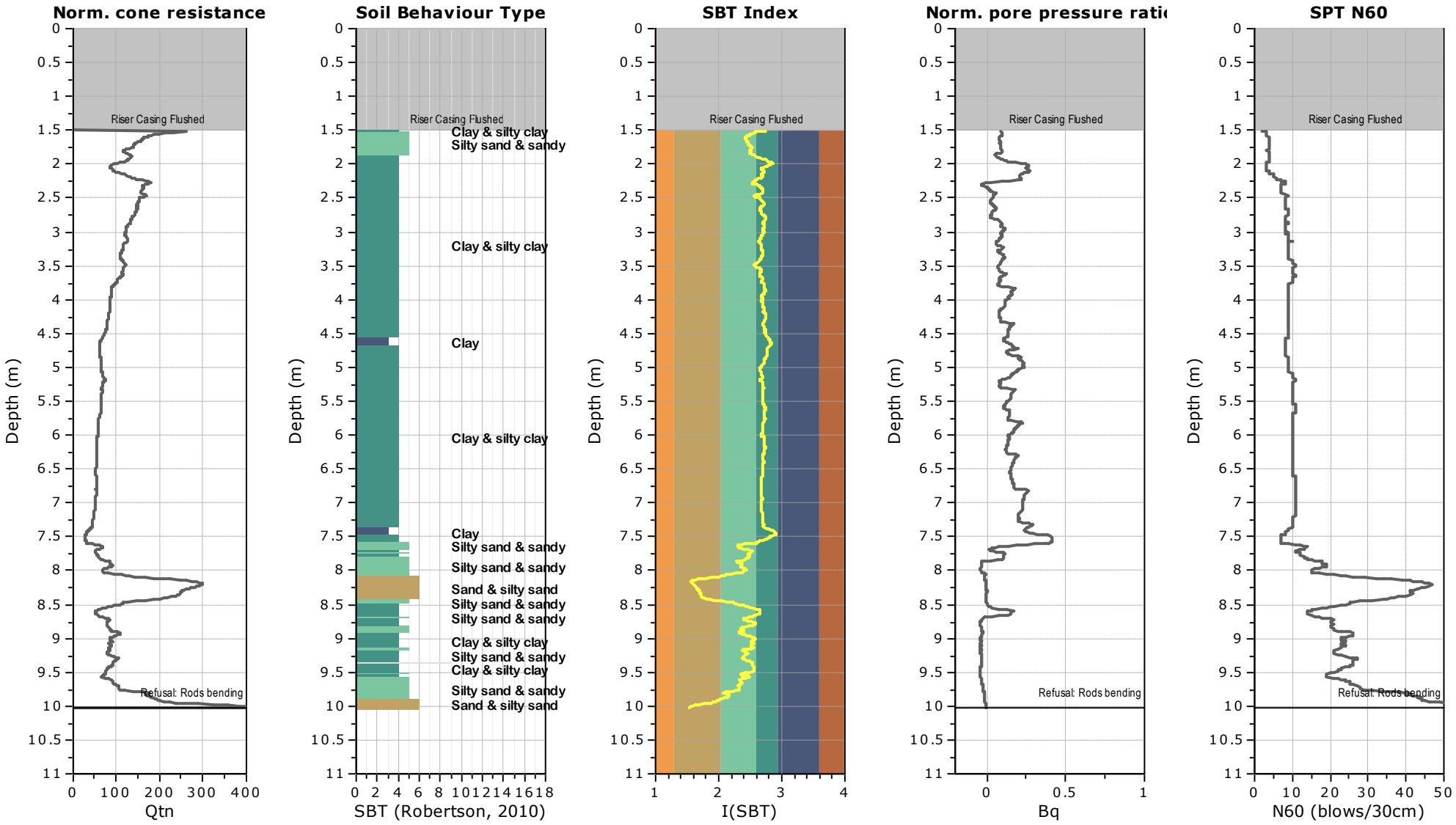
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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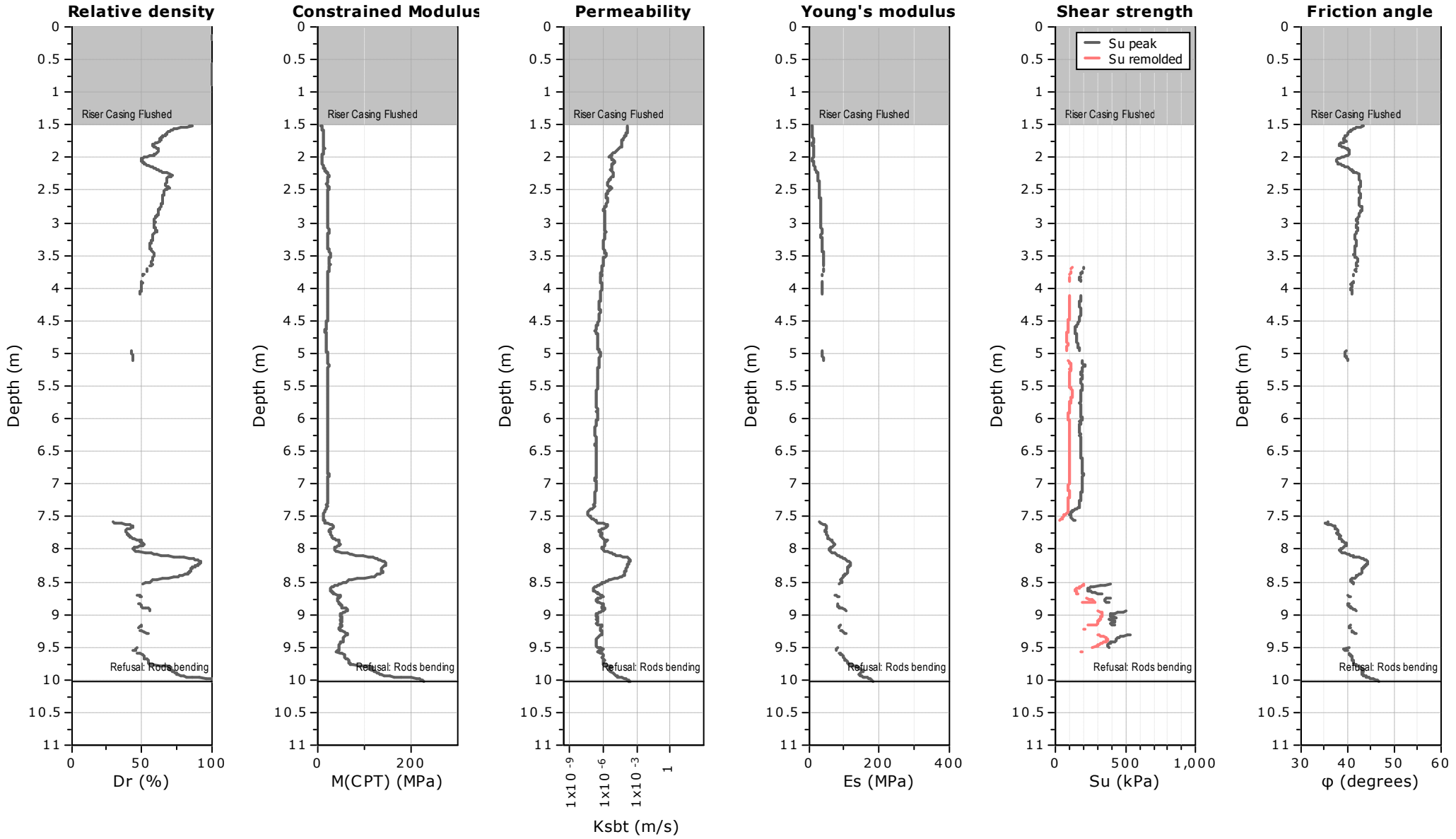
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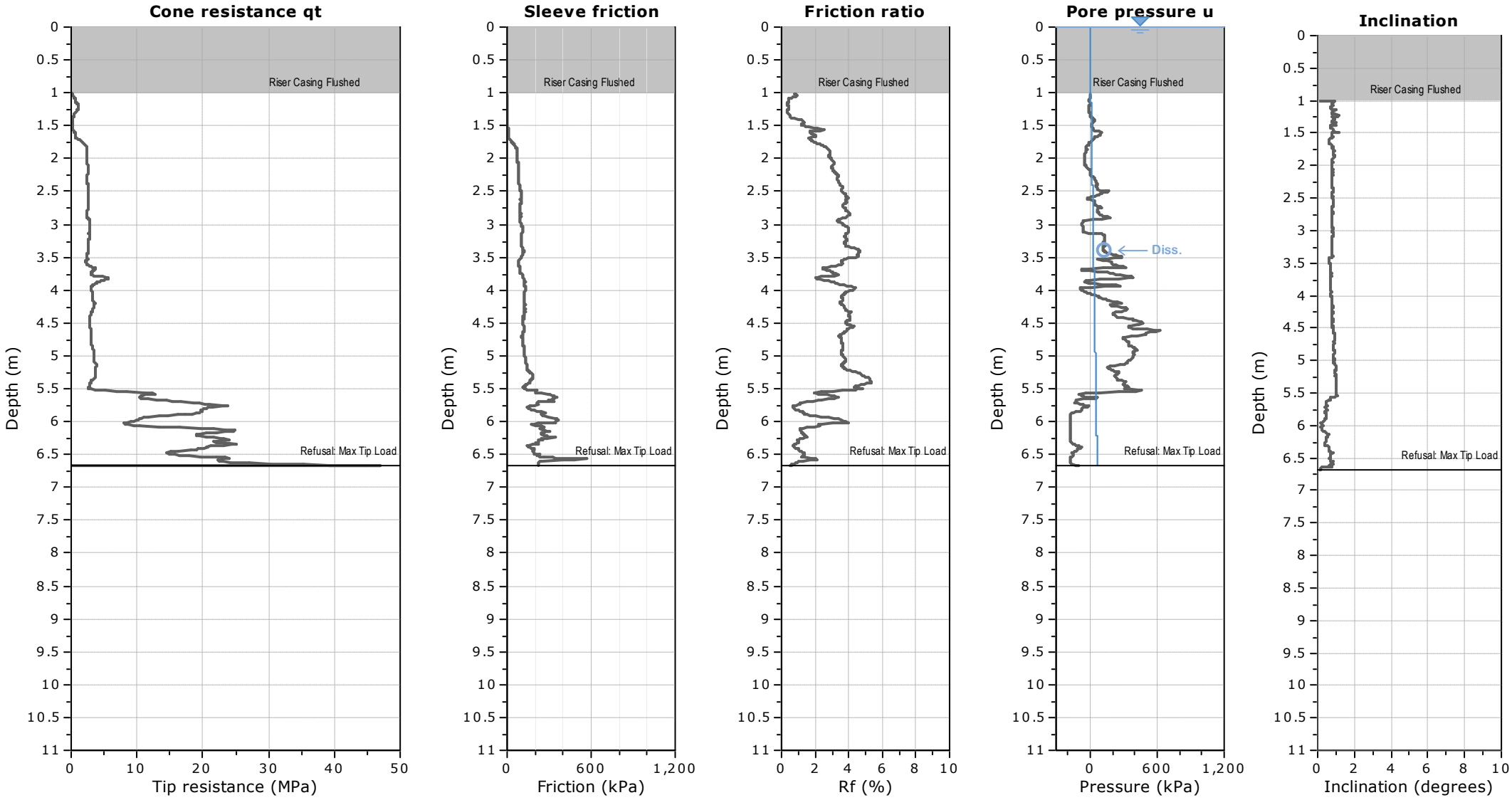
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CPT: M-CPT02
Total Depth: 6.68 m, Date: 01/02/2024
Surface Elevation (mCD): -4.53 m
Coords: X:712894.35, Y:612954.27
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

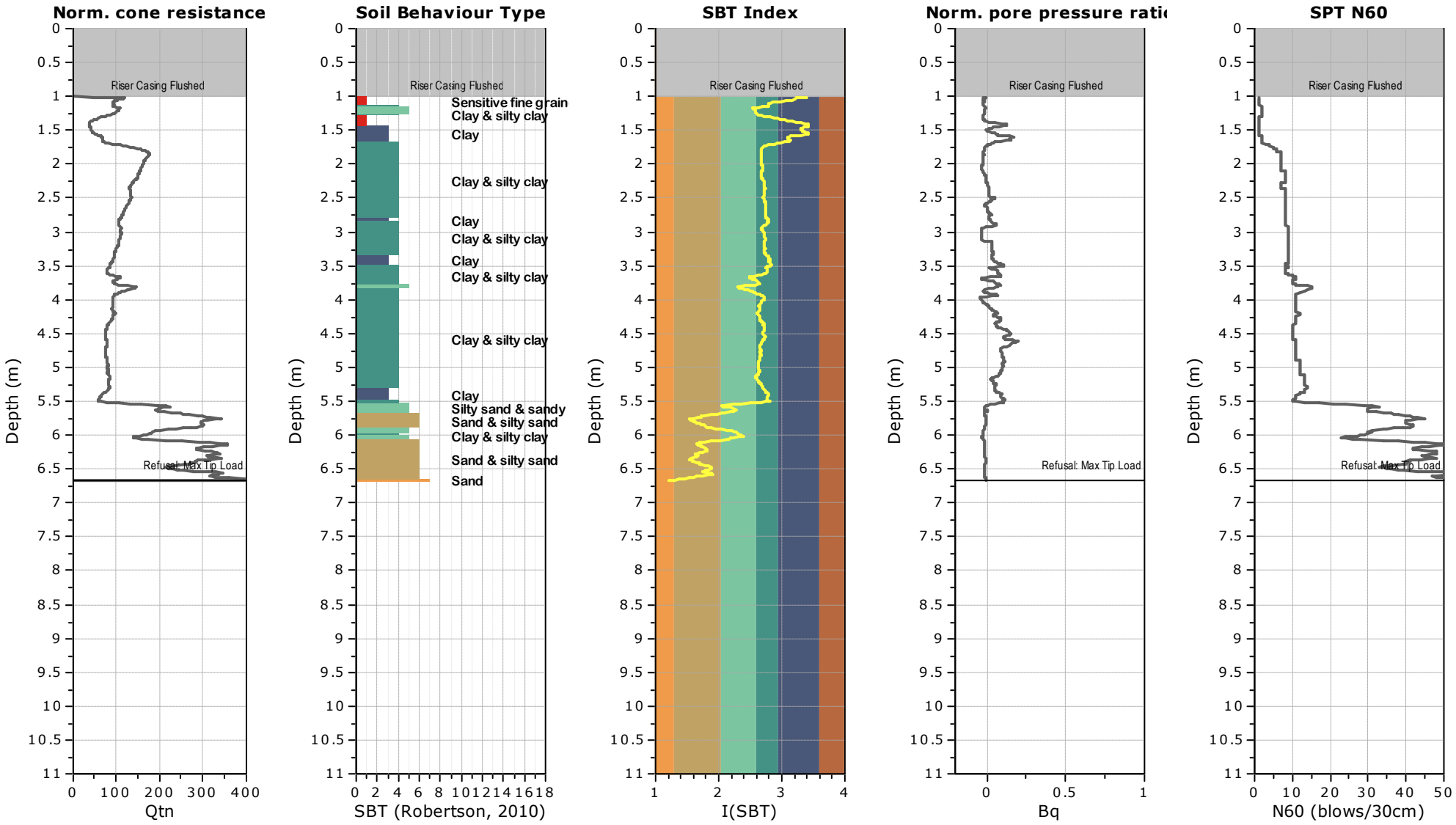
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Location: Rosslare, Ireland



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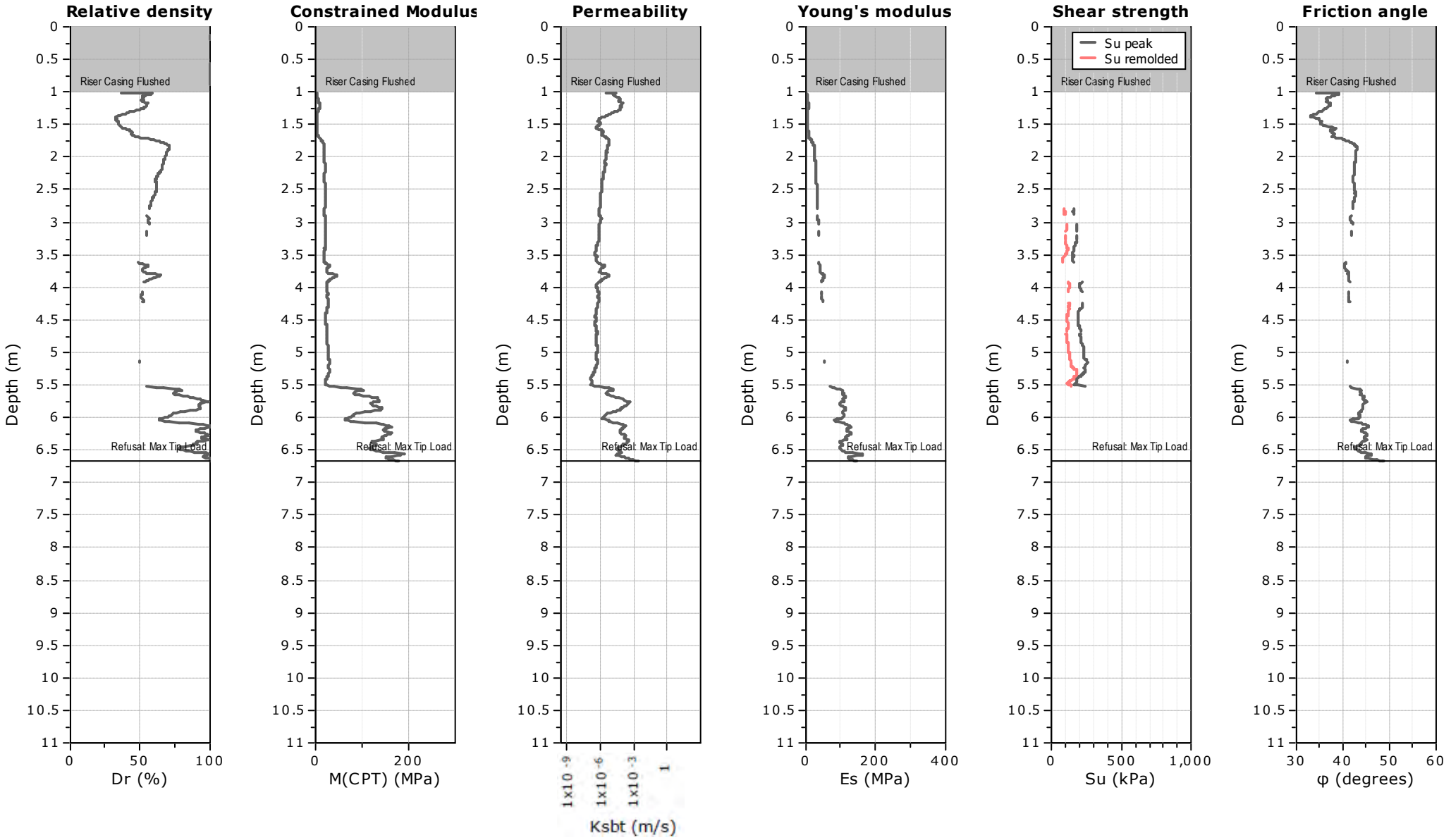
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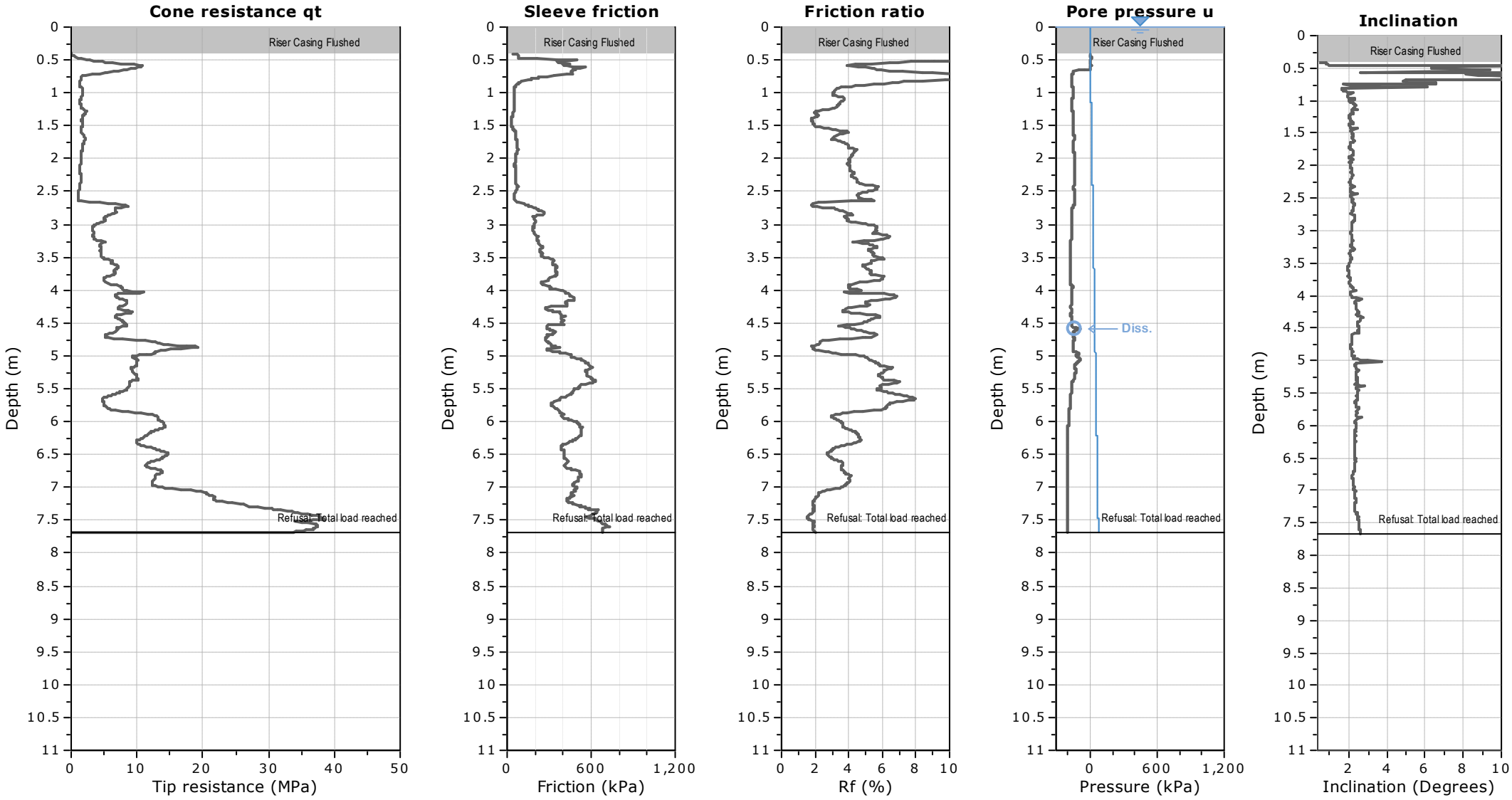
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CPT: M-CPT03_BH
Total Depth: 7.68 m, Date: 15/12/2023
Surface Elevation (mCD): -4.71 m
Coords: X:712892.46, Y:612852.30
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

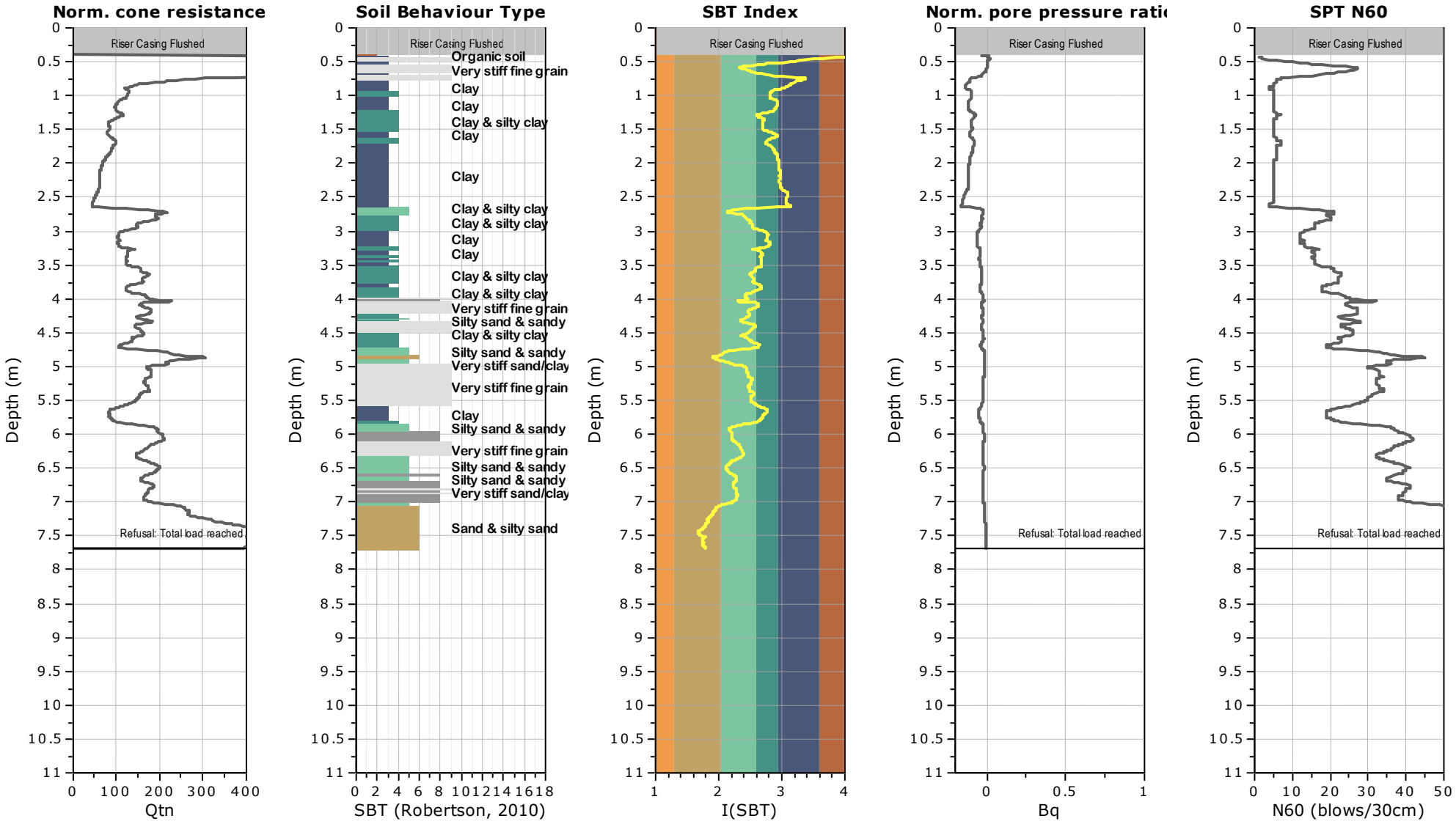
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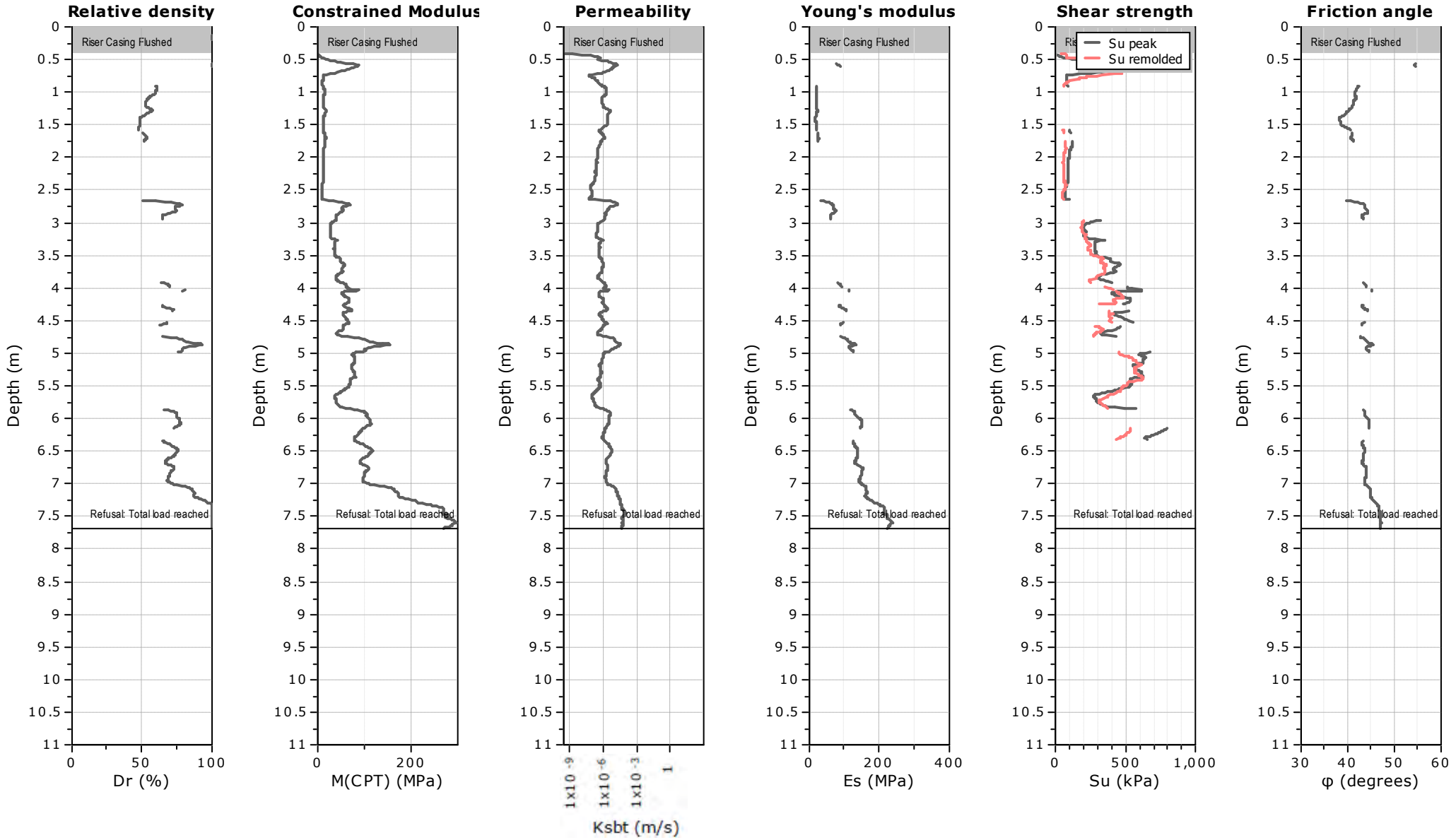
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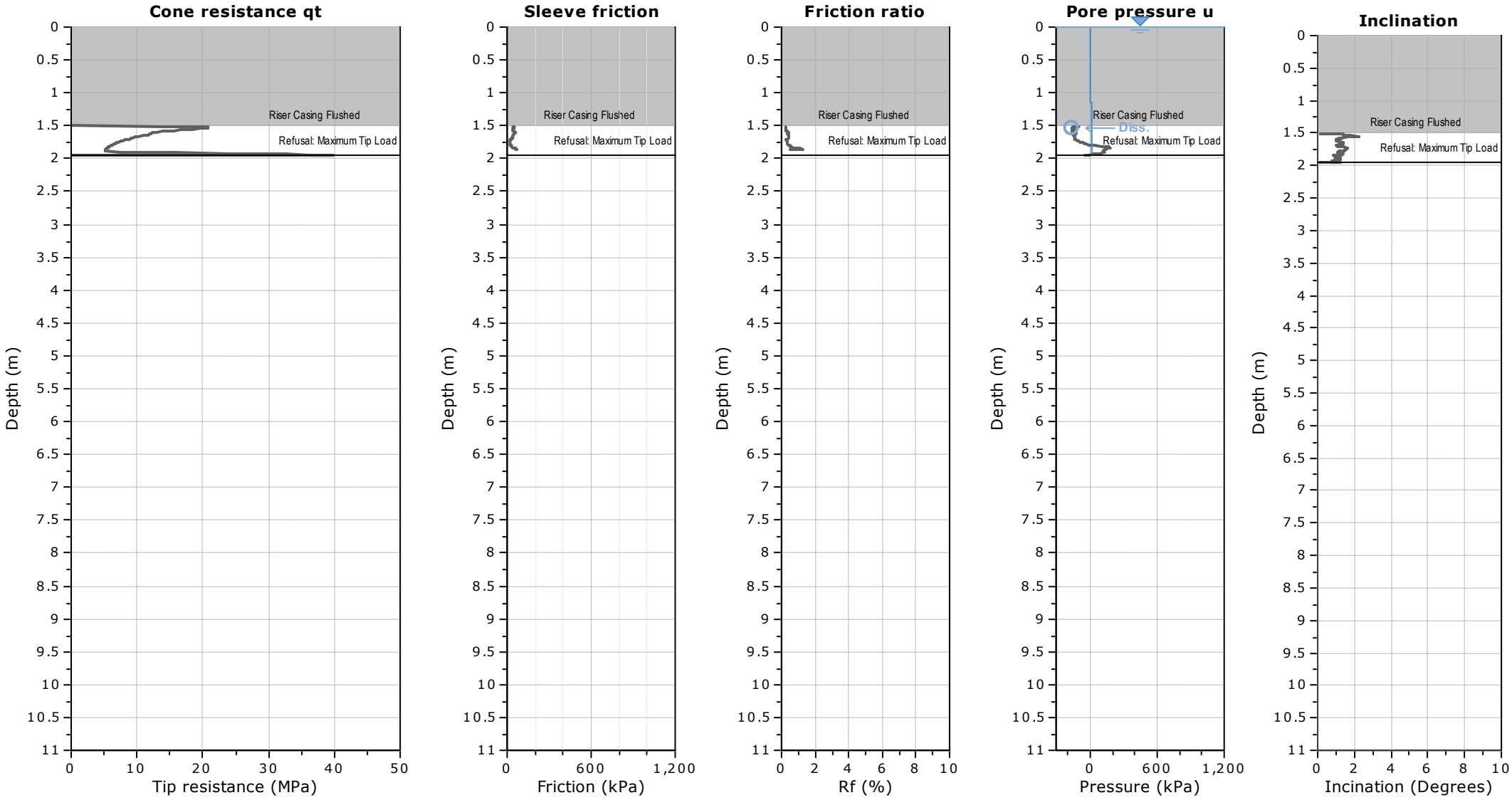
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CPT: M-CPT04_BH
Total Depth: 1.95 m, Date: 02/12/2023
Surface Elevation (mCD): -3.78 m
Coords: X:712869.32, Y:612776.87
Cone Type: S15-CFIP2273
App Class: 1 Cone Operator: MJ/DJ

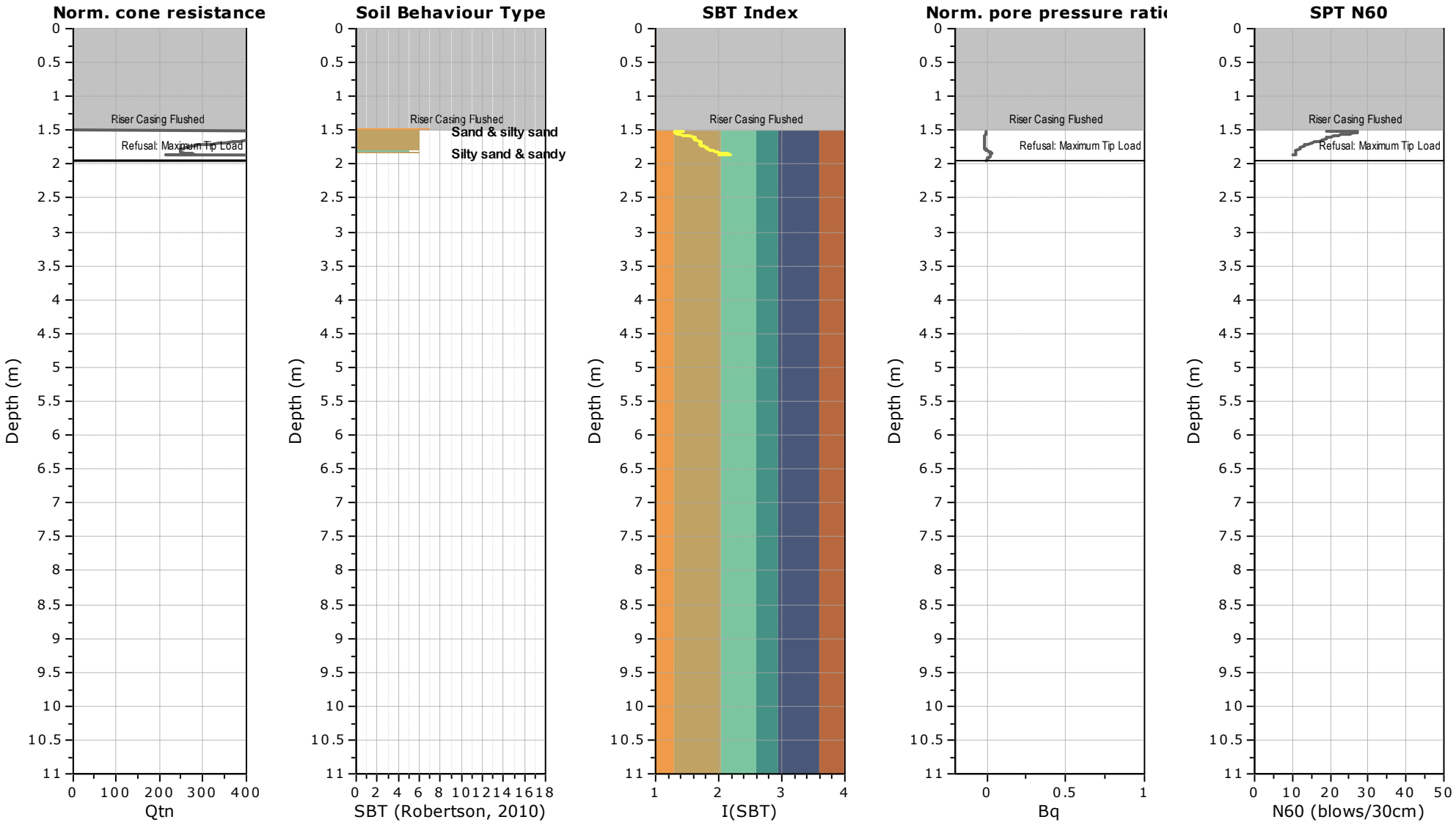
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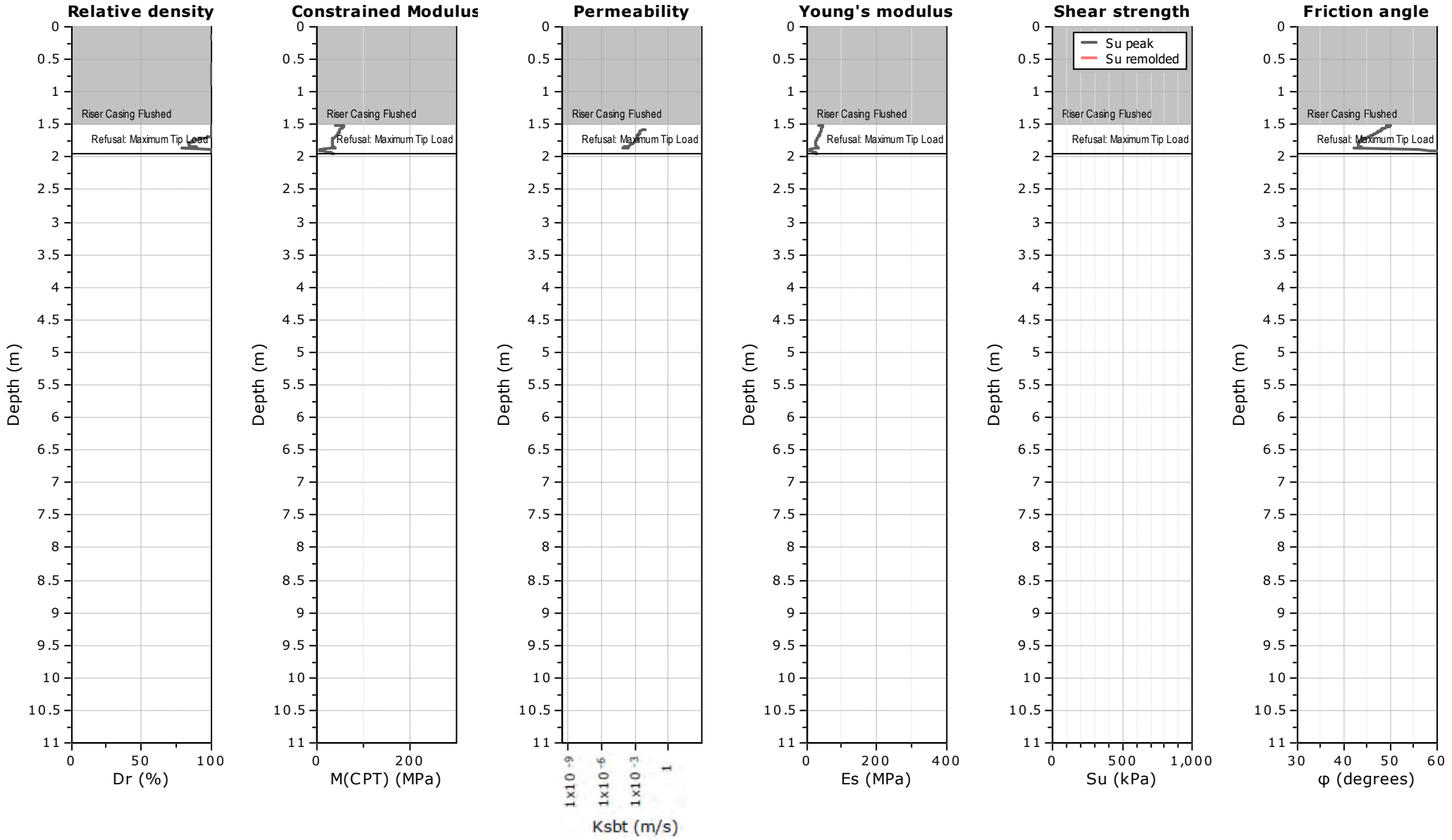
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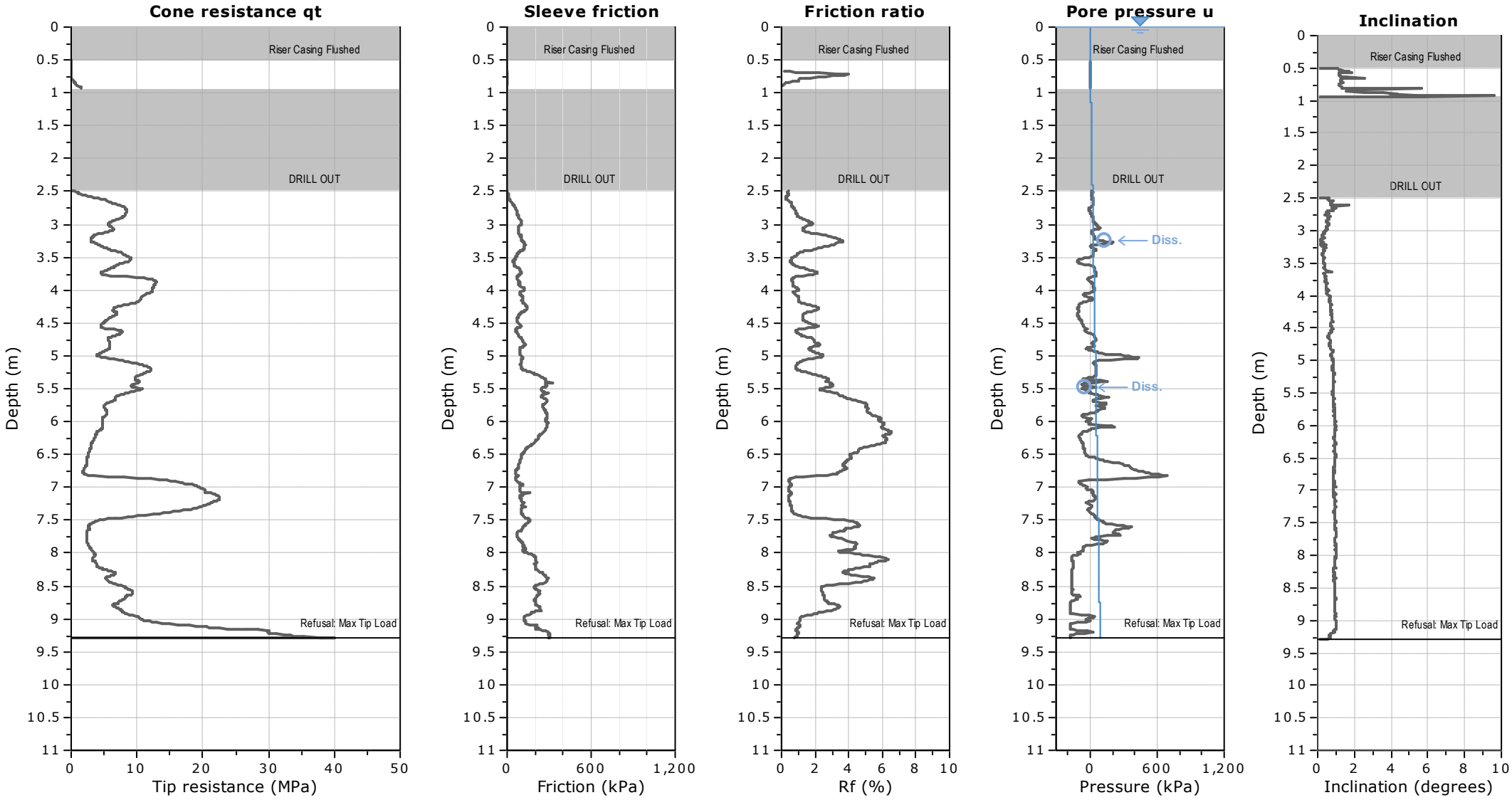
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Location: Rosslare, Ireland



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CPT: M-CPT05_BH
Total Depth: 9.29 m, Date: 03/01/2024
Surface Elevation (mCD): -5.48 m
Coords: X:712988.94, Y:613078.71
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

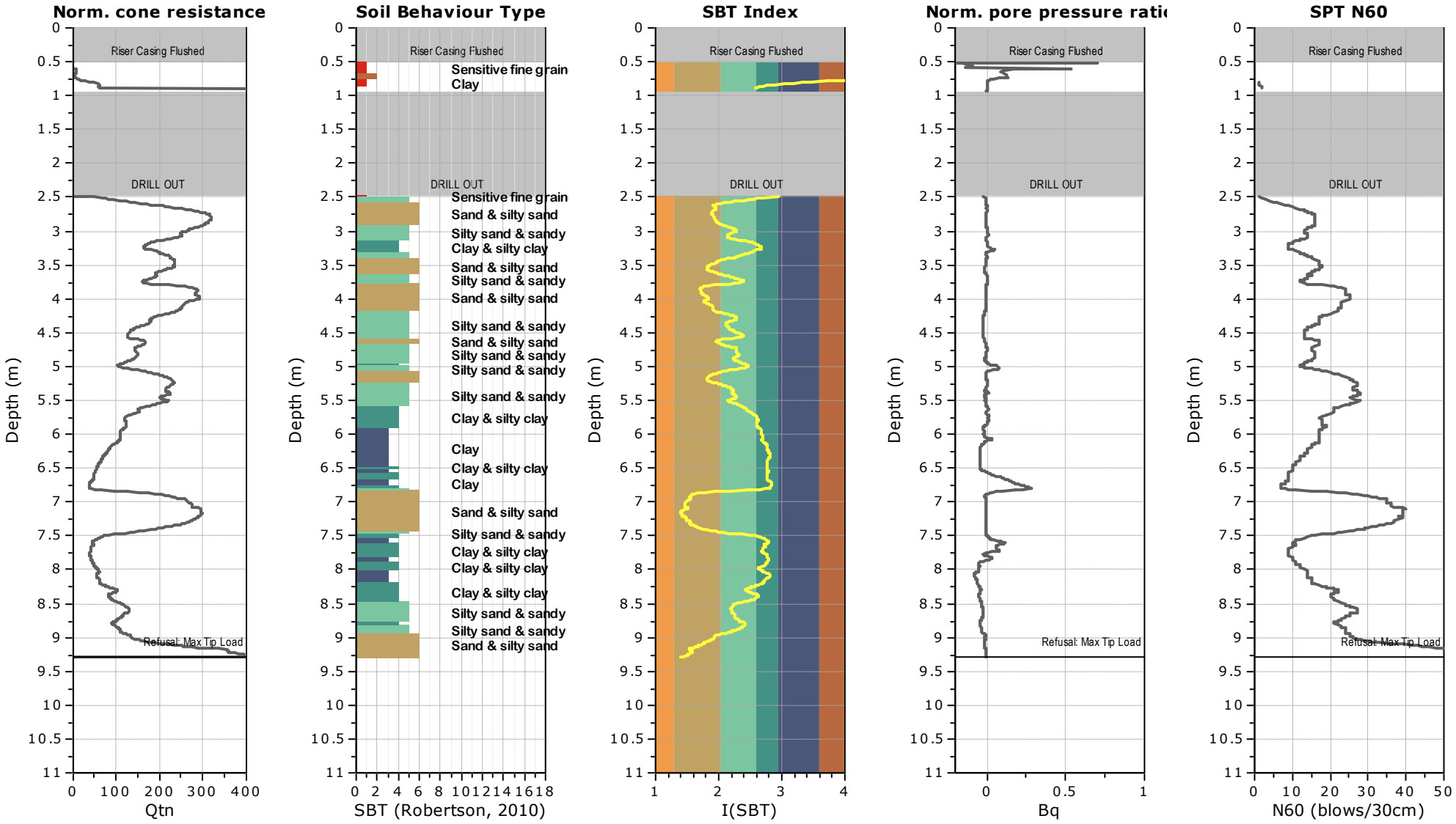
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Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

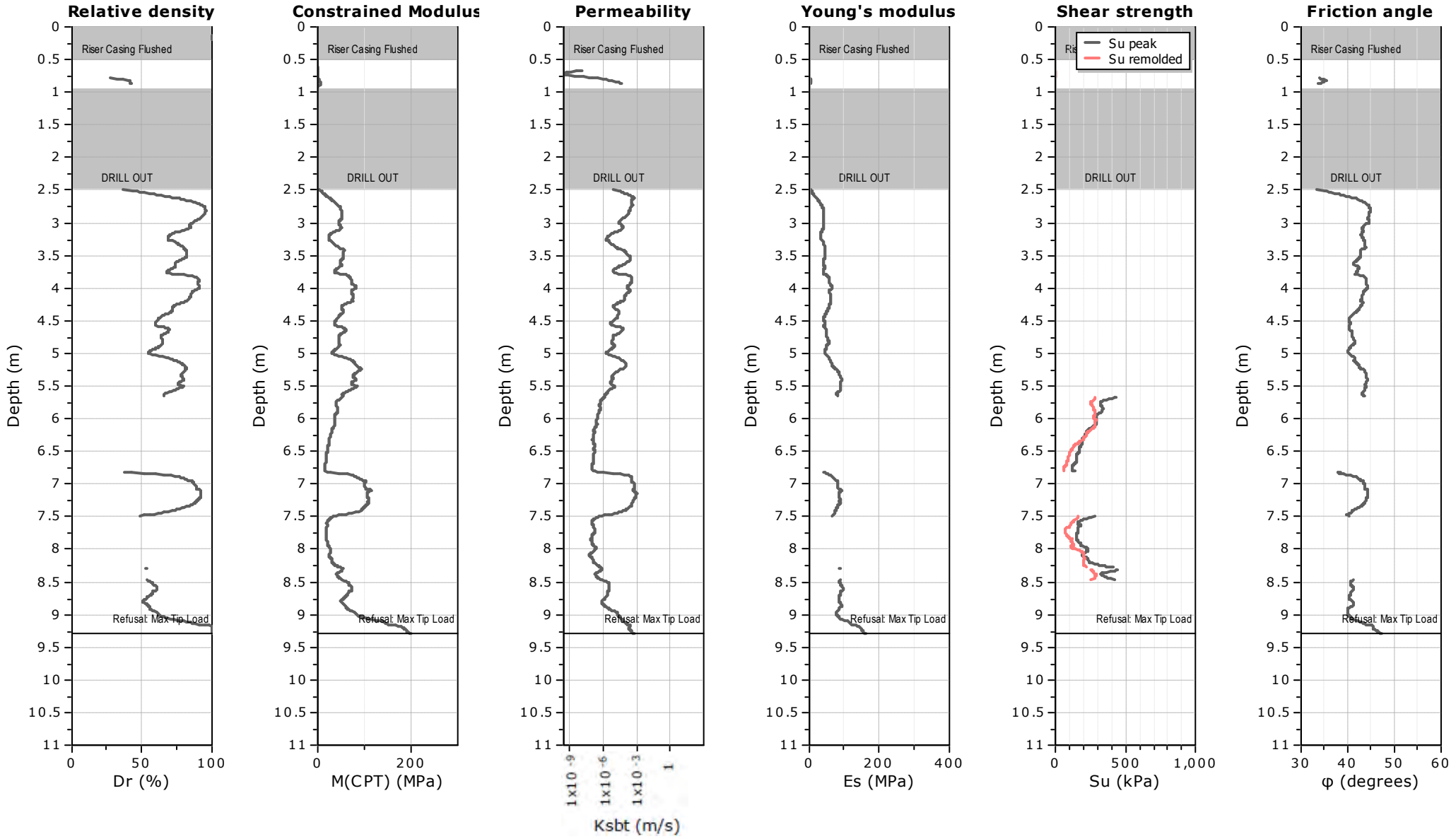
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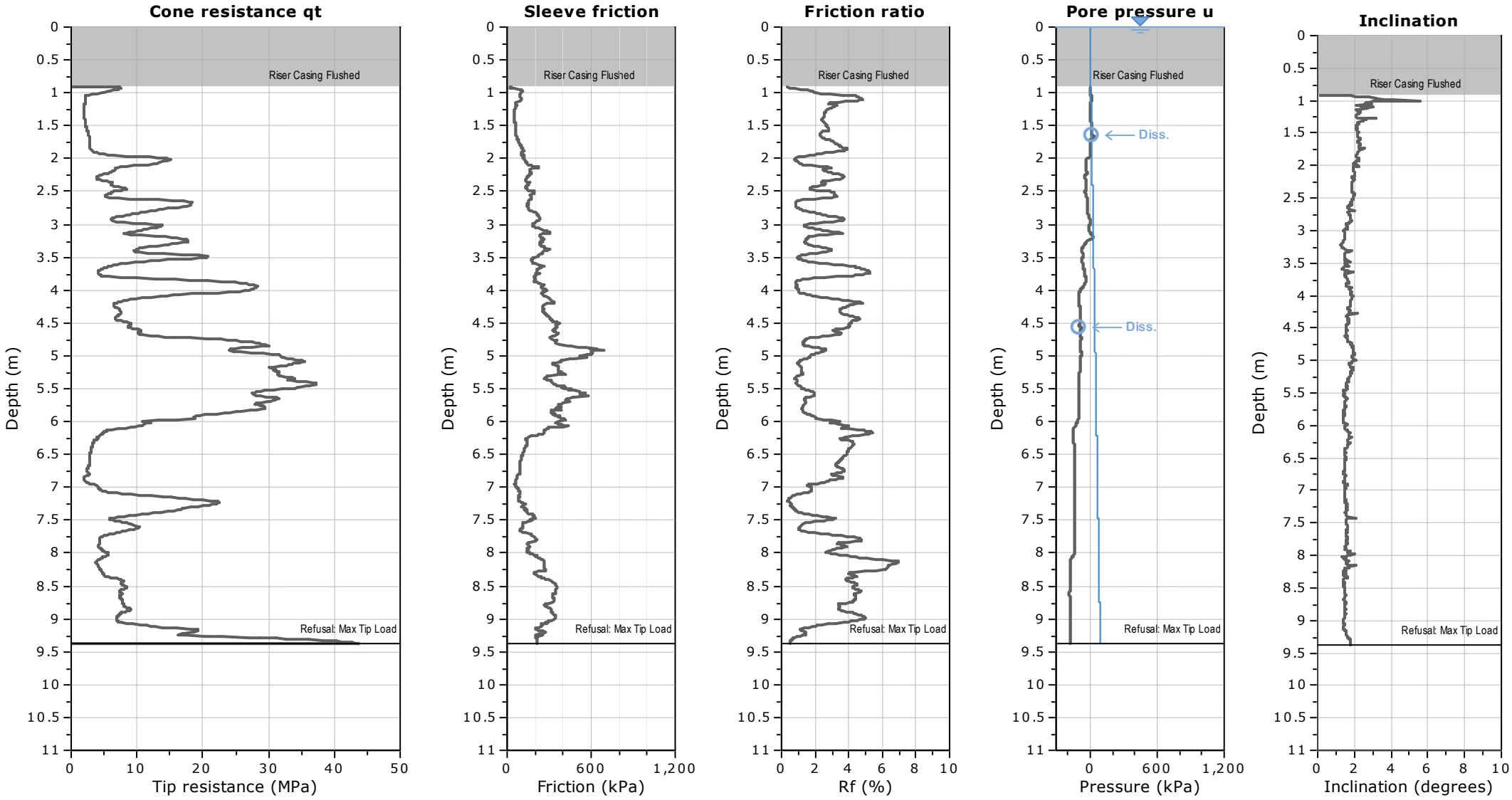
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Causeway Geotech Ltd
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Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT07_BH
Total Depth: 9.38 m, Date: 16/01/2024
Surface Elevation (mCD): -4.82 m
Coords: X:712932.38, Y:613052.65
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

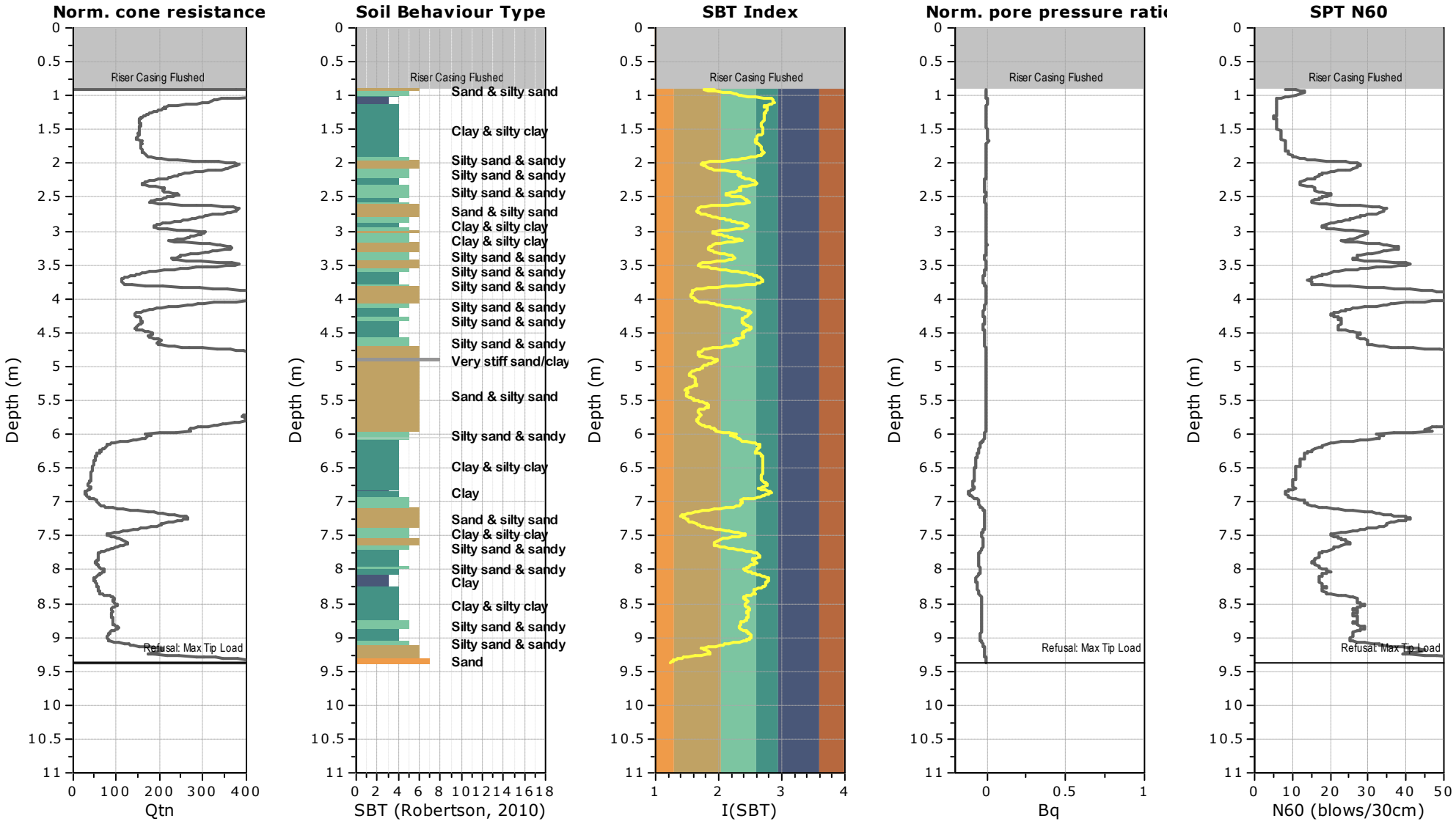
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

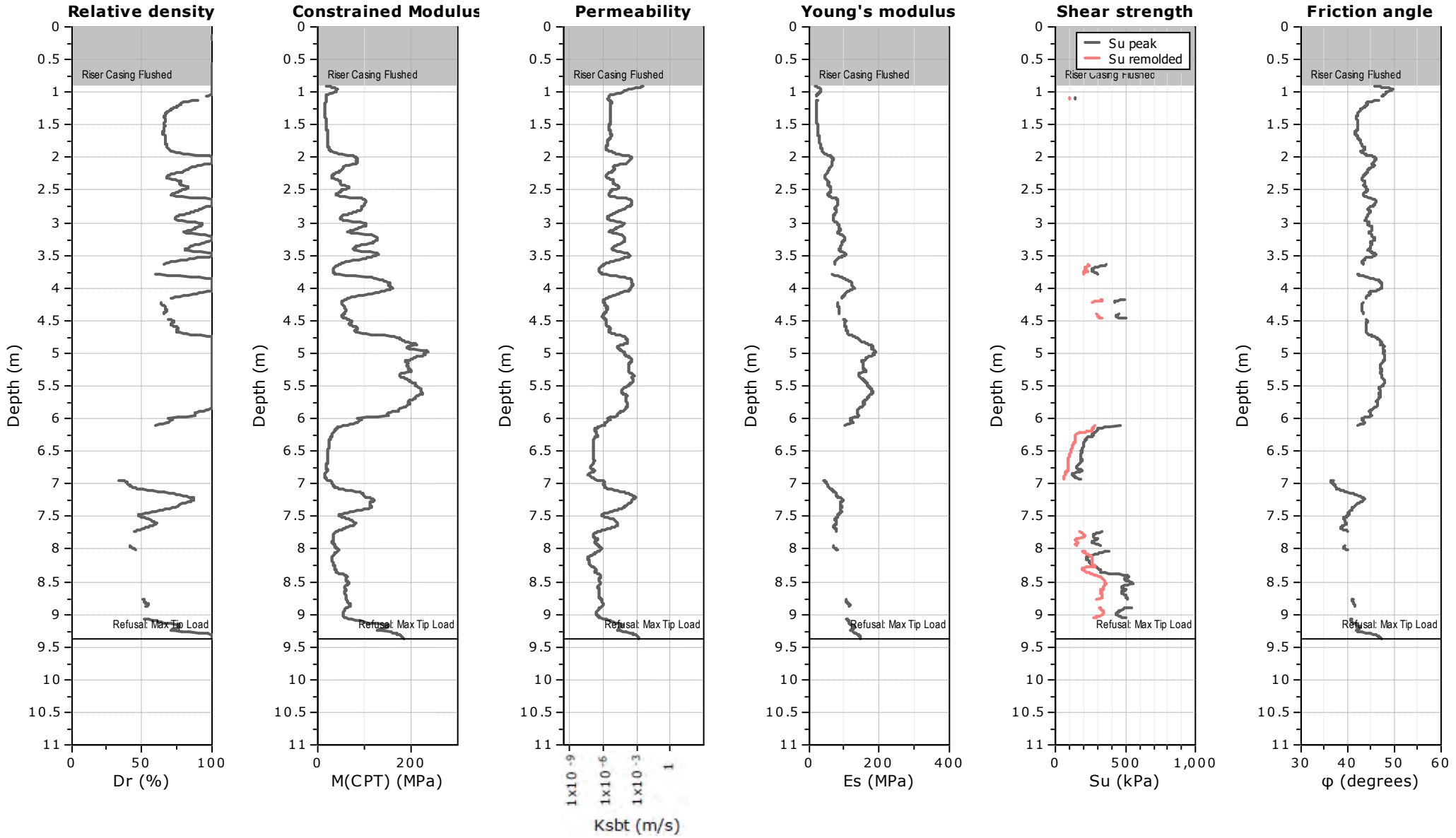
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: MK

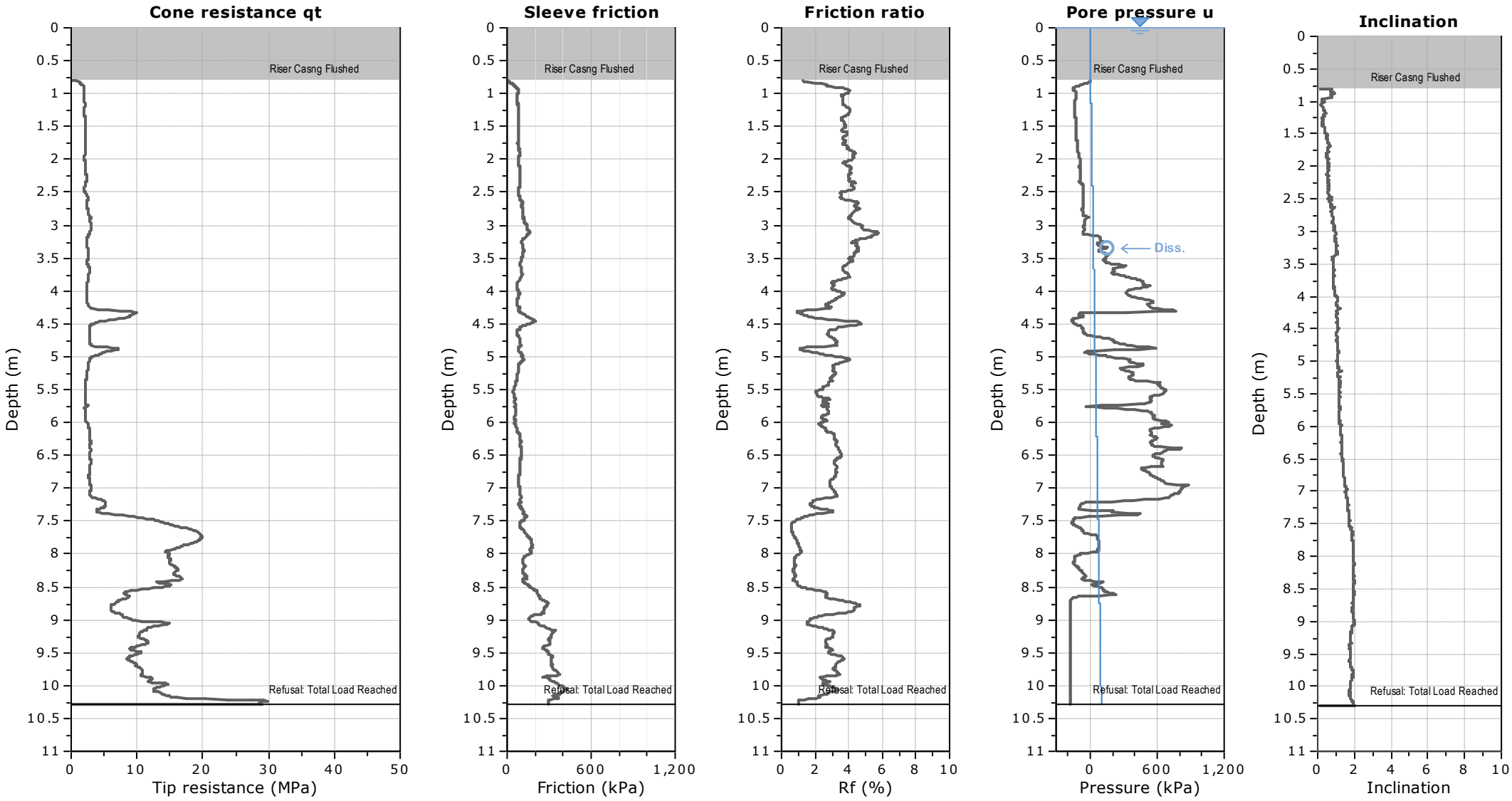
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT08
Total Depth: 10.29 m, Date: 03/02/2024
Surface Elevation (mCD): -4.72 m
Coords: X:712733.76, Y:612952.91
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: KW/AG

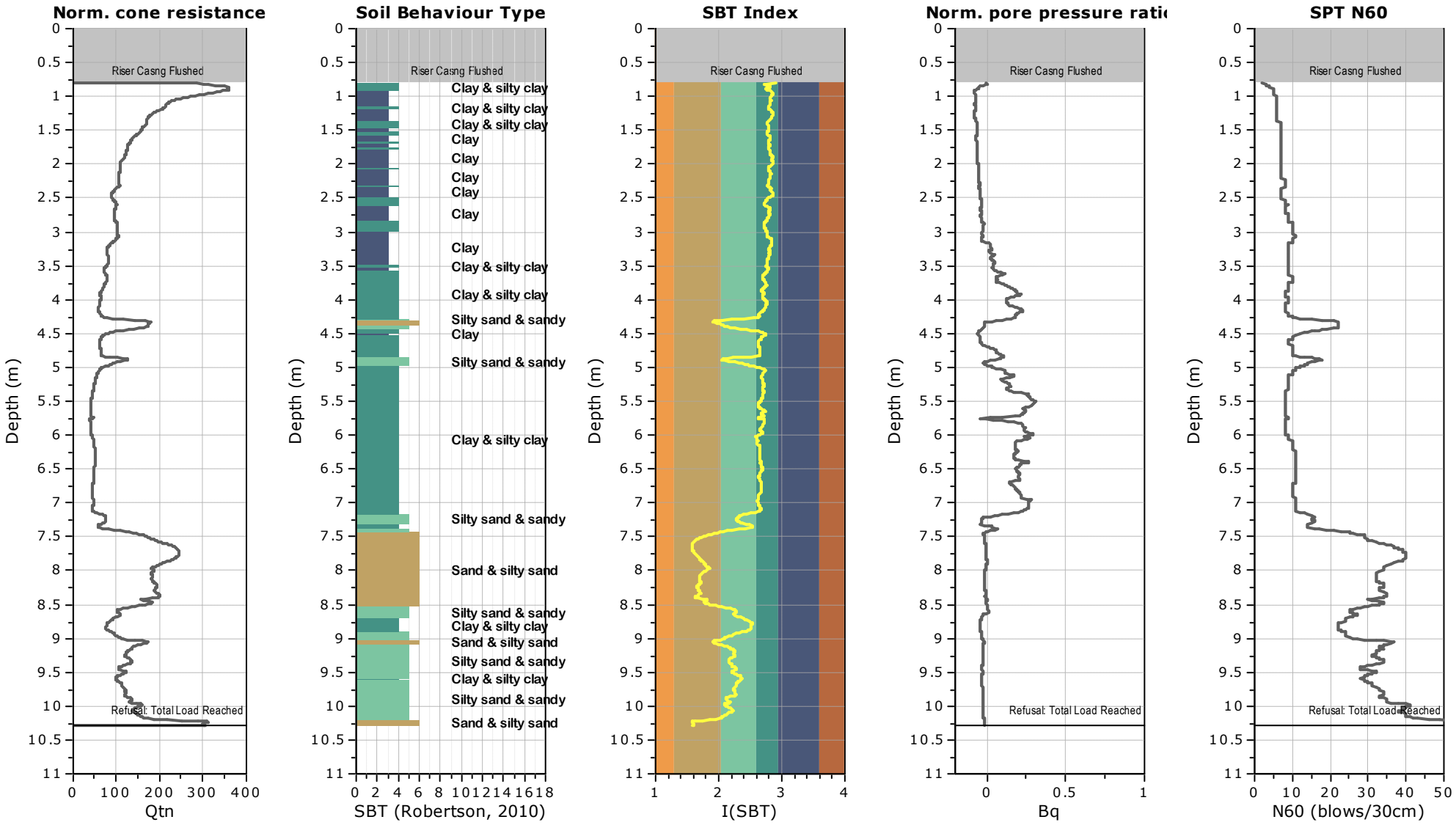
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT08
Total Depth: 10.29 m, Date: 03/02/2024
Surface Elevation (mCD): -4.72 m
Coords: X:712733.76, Y:612952.91
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: KW/AG

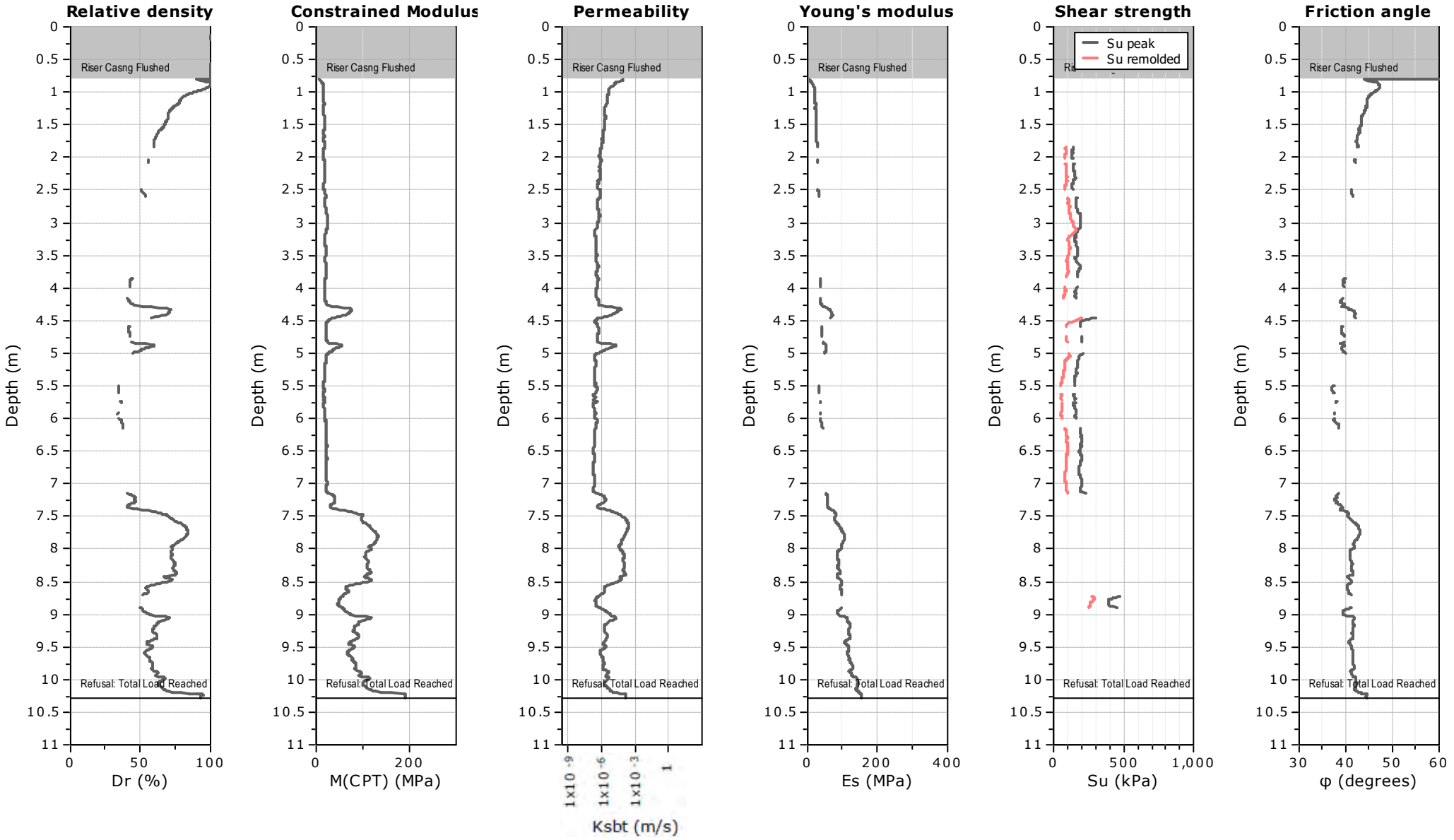
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: KW/AG

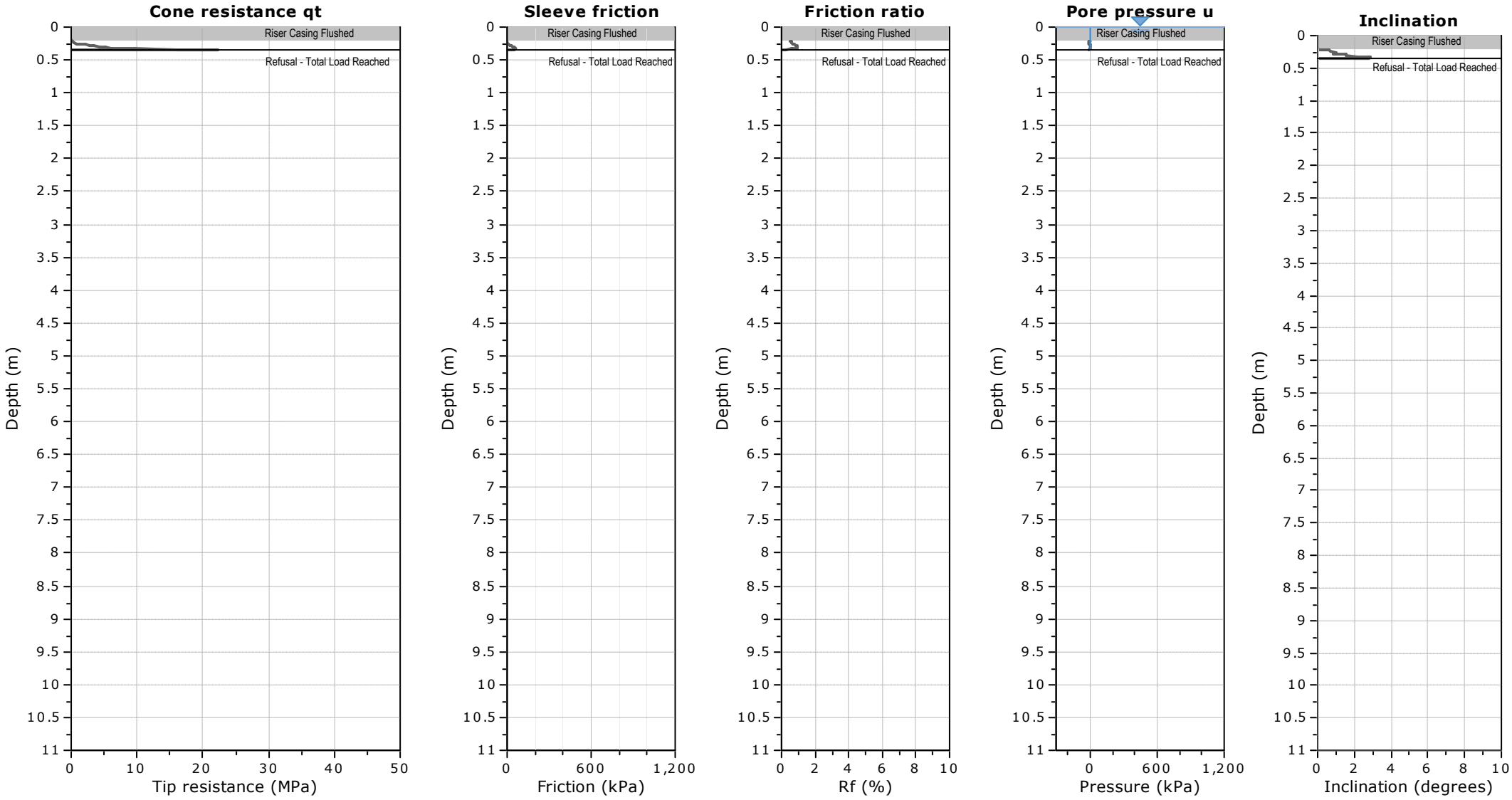
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT09_BH
Total Depth: 0.35 m, Date: 15/12/2023
Surface Elevation (mCD): -3.80 m
Coords: X:712825.48, Y:612739.91
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

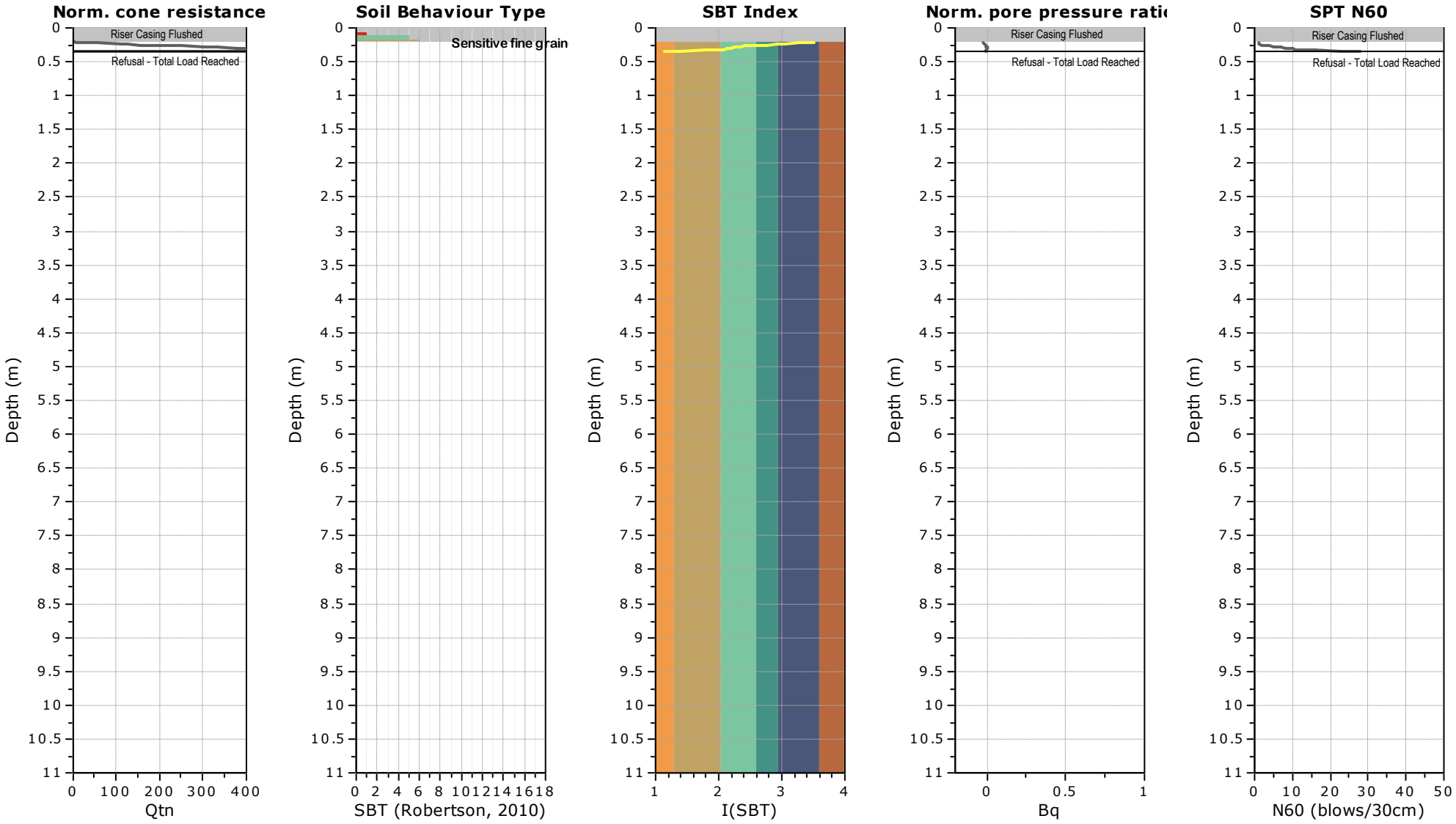
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Coords: X:712825.48, Y:612739.91
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

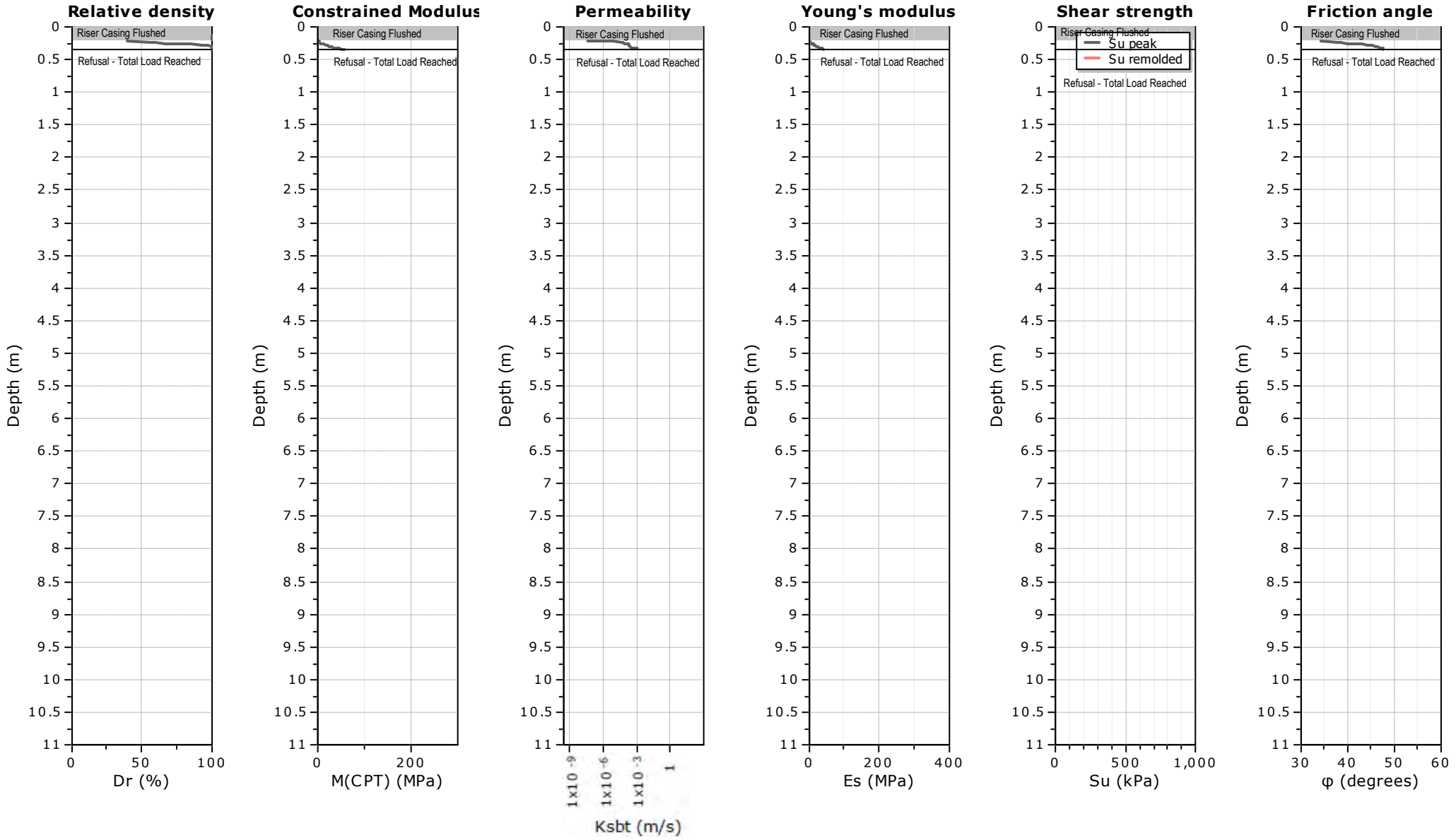
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: MK

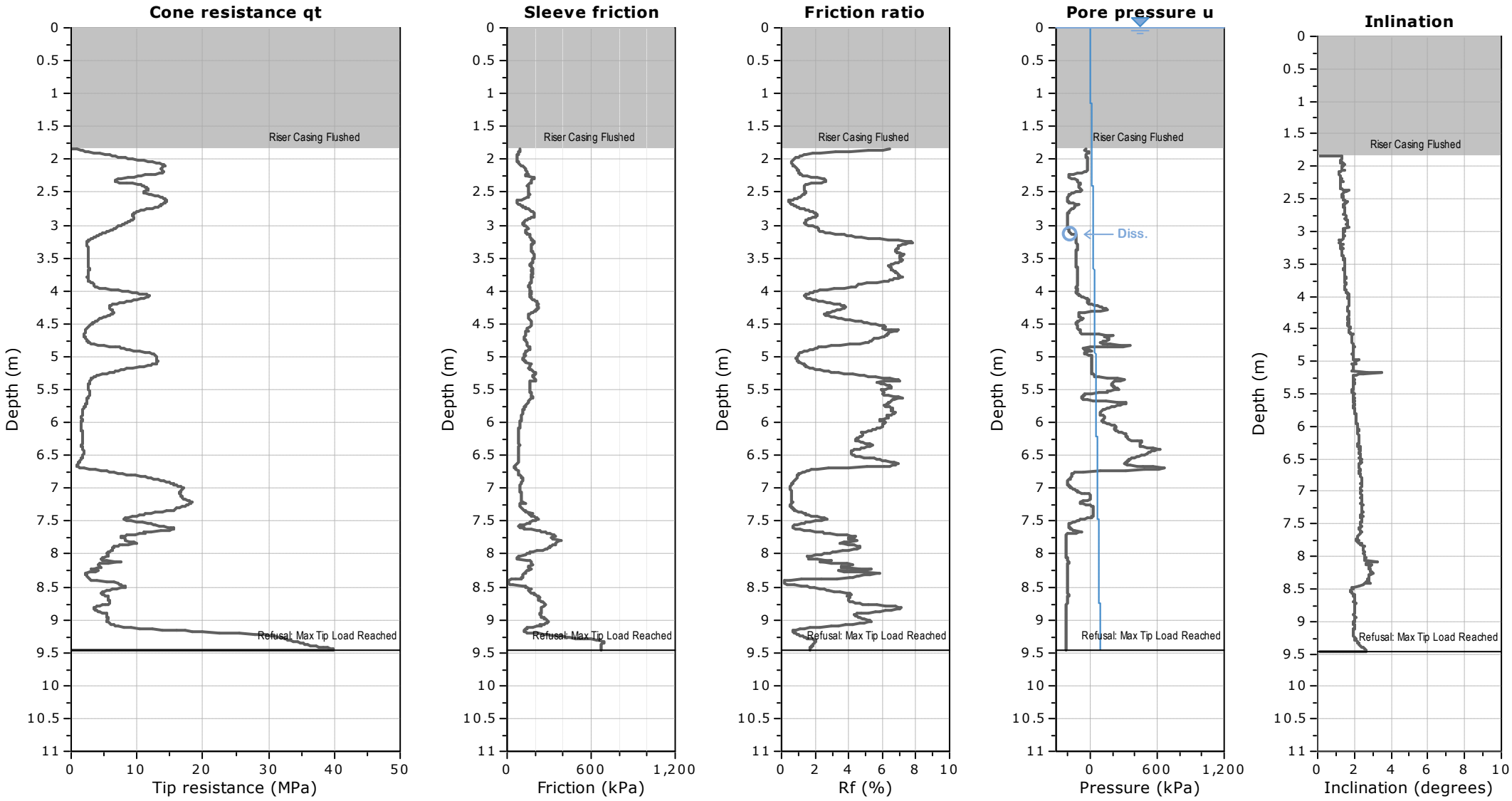
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT10_BH
Total Depth: 9.46 m, Date: 14/01/2024
Surface Elevation (mCD): -5.39 m
Coords: X:713029.97, Y:613014.81
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MMcK

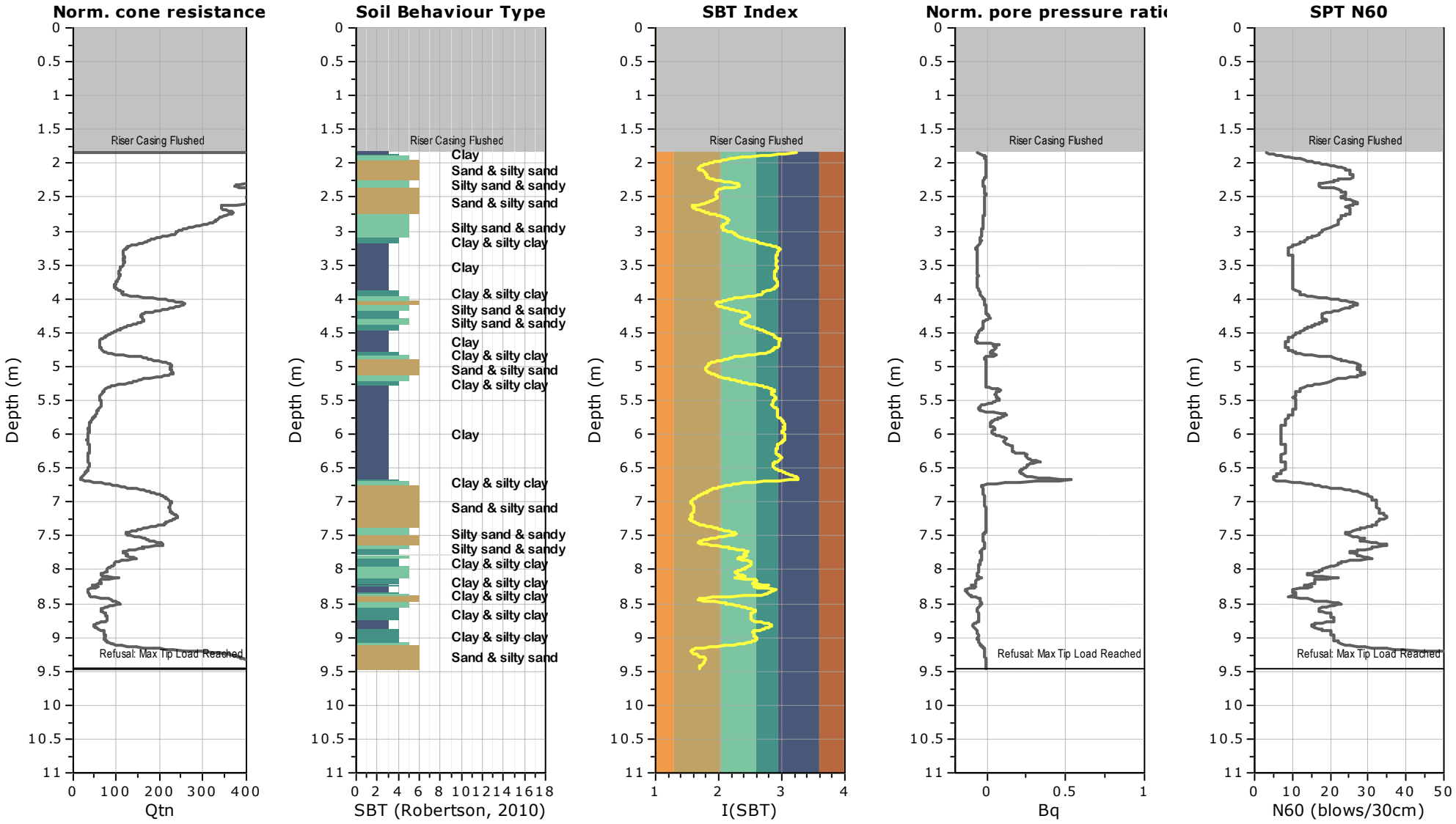
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: MMcK

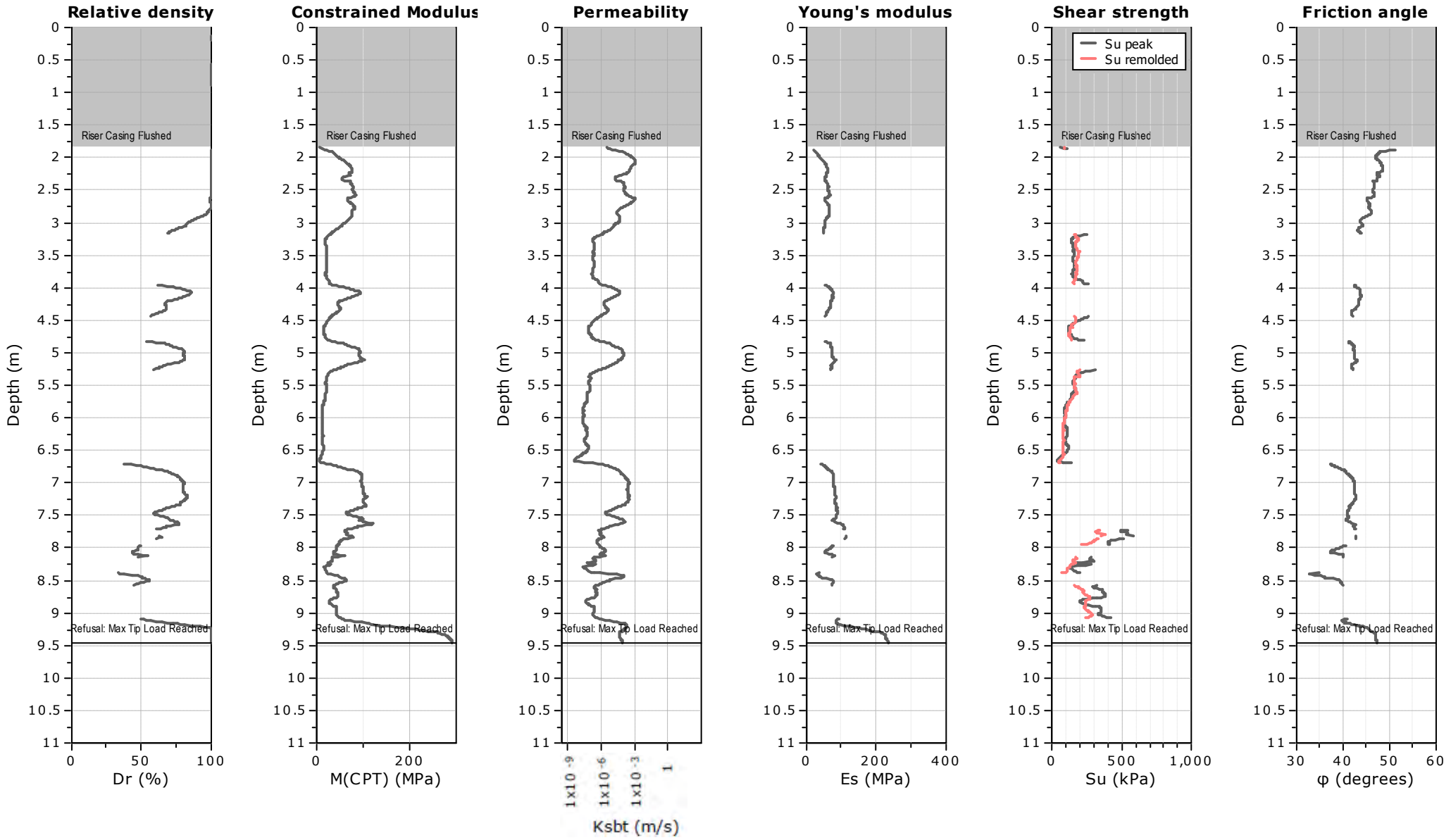
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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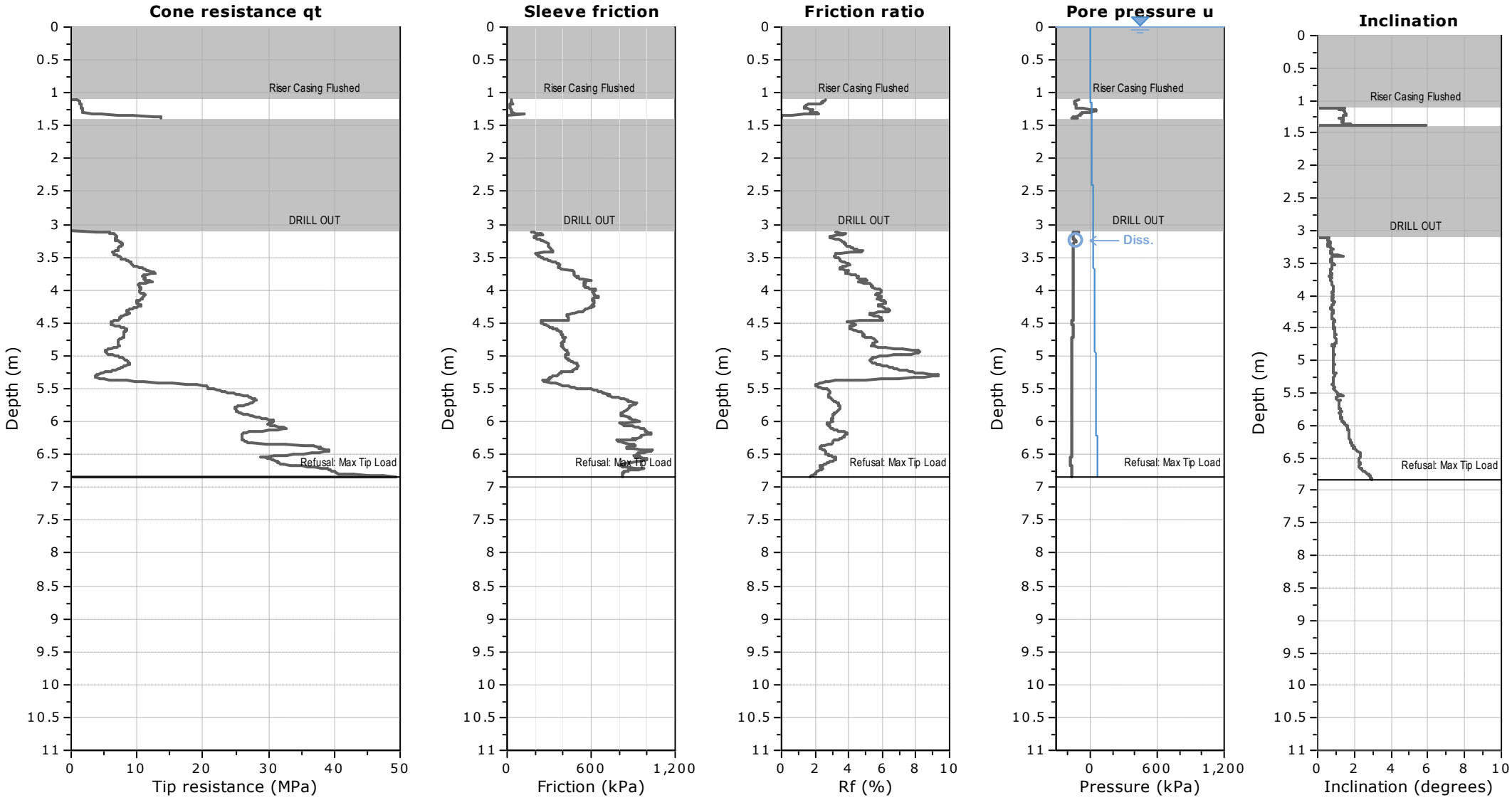
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT11
Total Depth: 6.84 m, Date: 10/02/2024
Surface Elevation (mCD): -4.40 m
Coords: X:712752.04, Y:612867.82
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: SJ/ RW

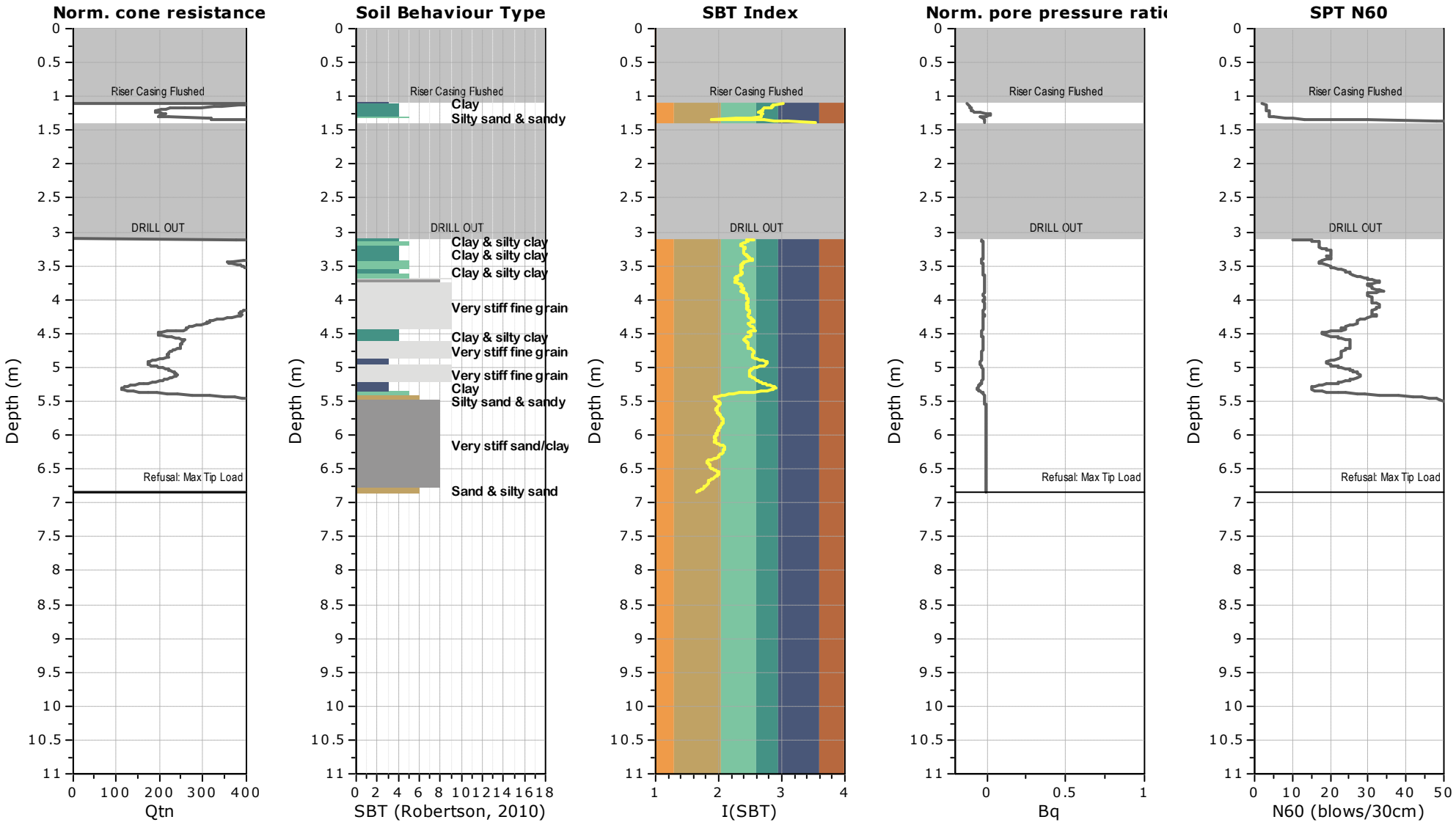
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: SJ/ RW

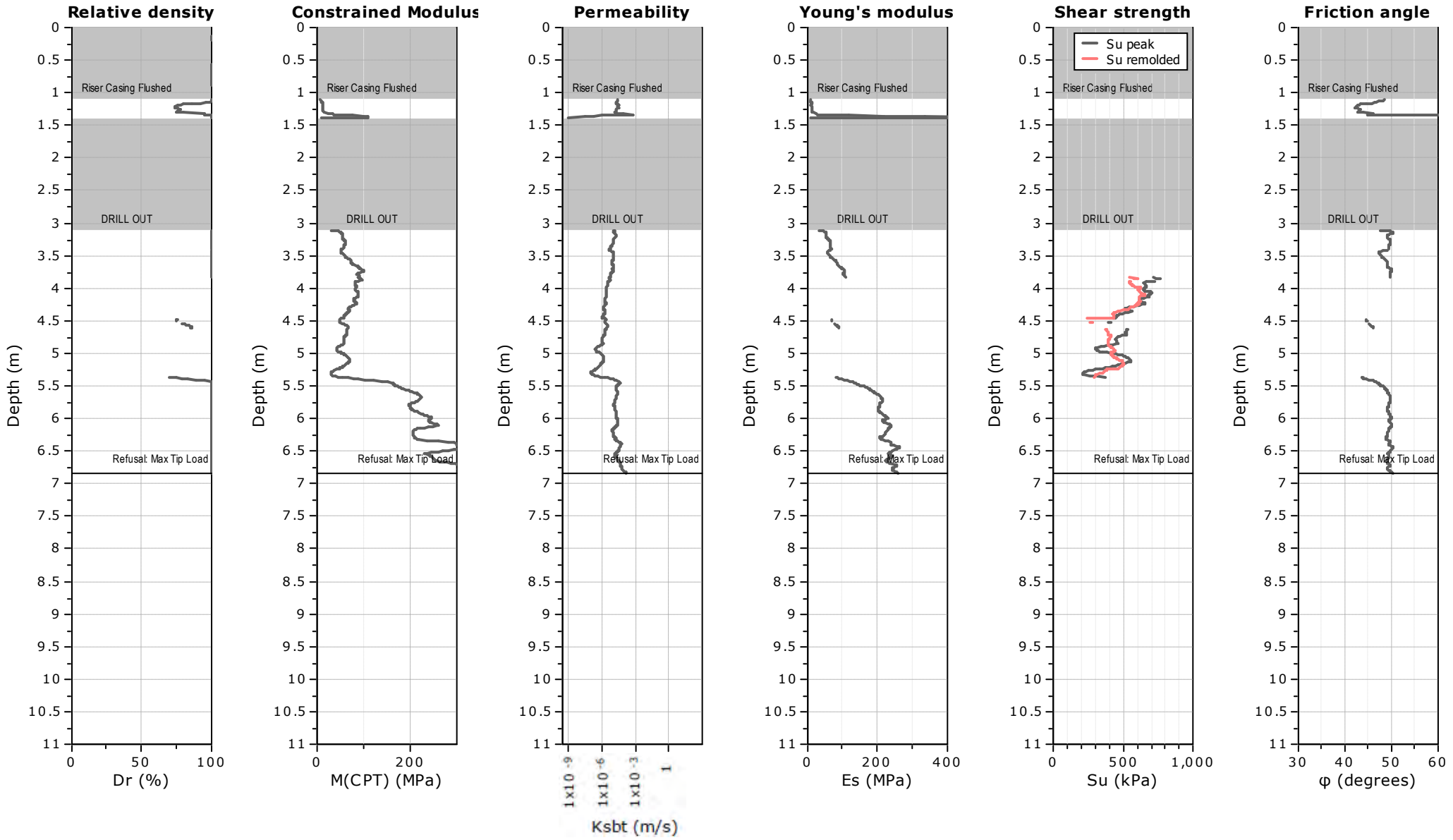
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: SJ/ RW

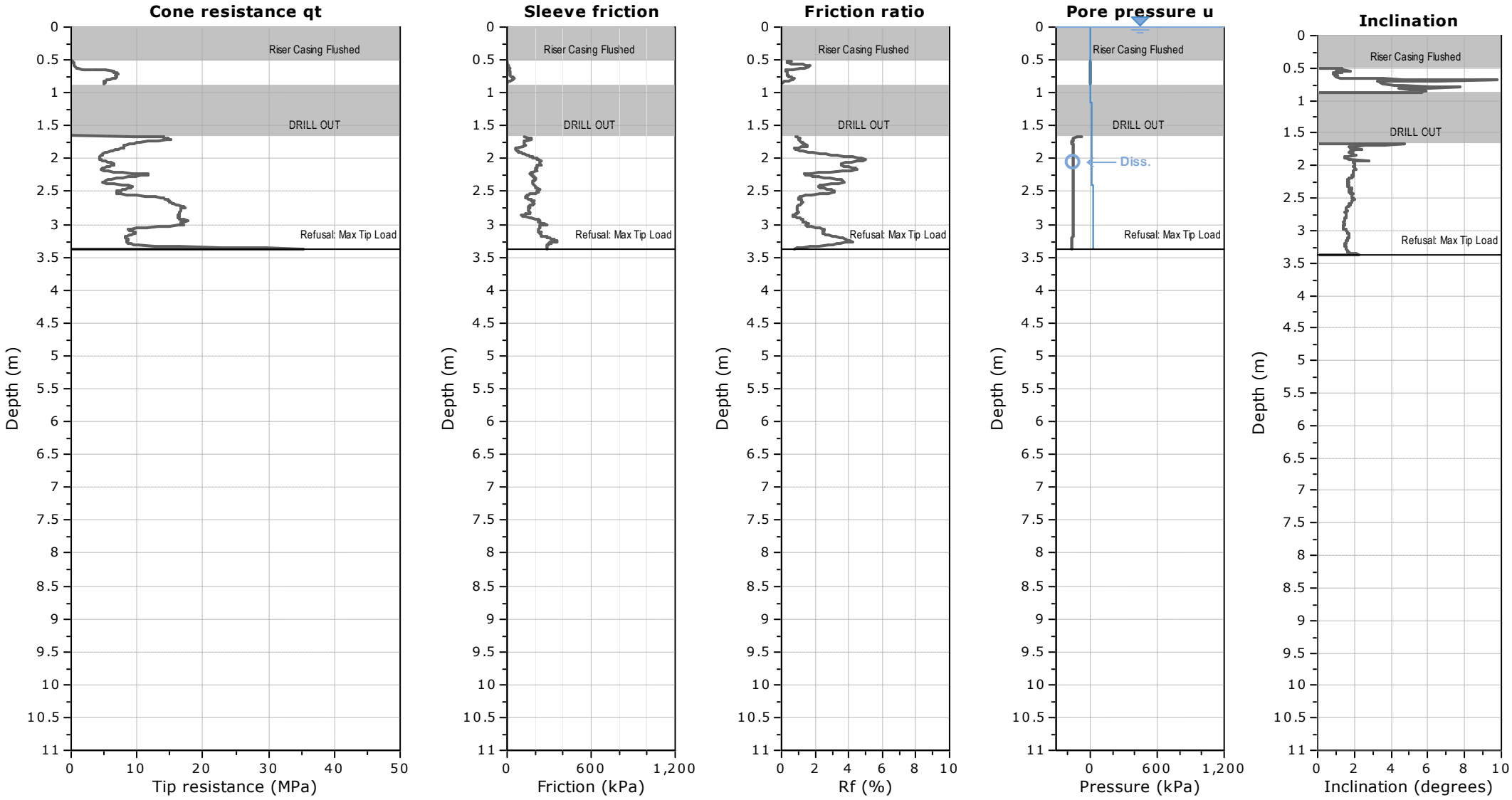
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT12
Total Depth: 3.37 m, Date: 27/01/2024
Surface Elevation (mCD): -3.55 m
Coords: X:712974.59, Y:612773.71
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: OG

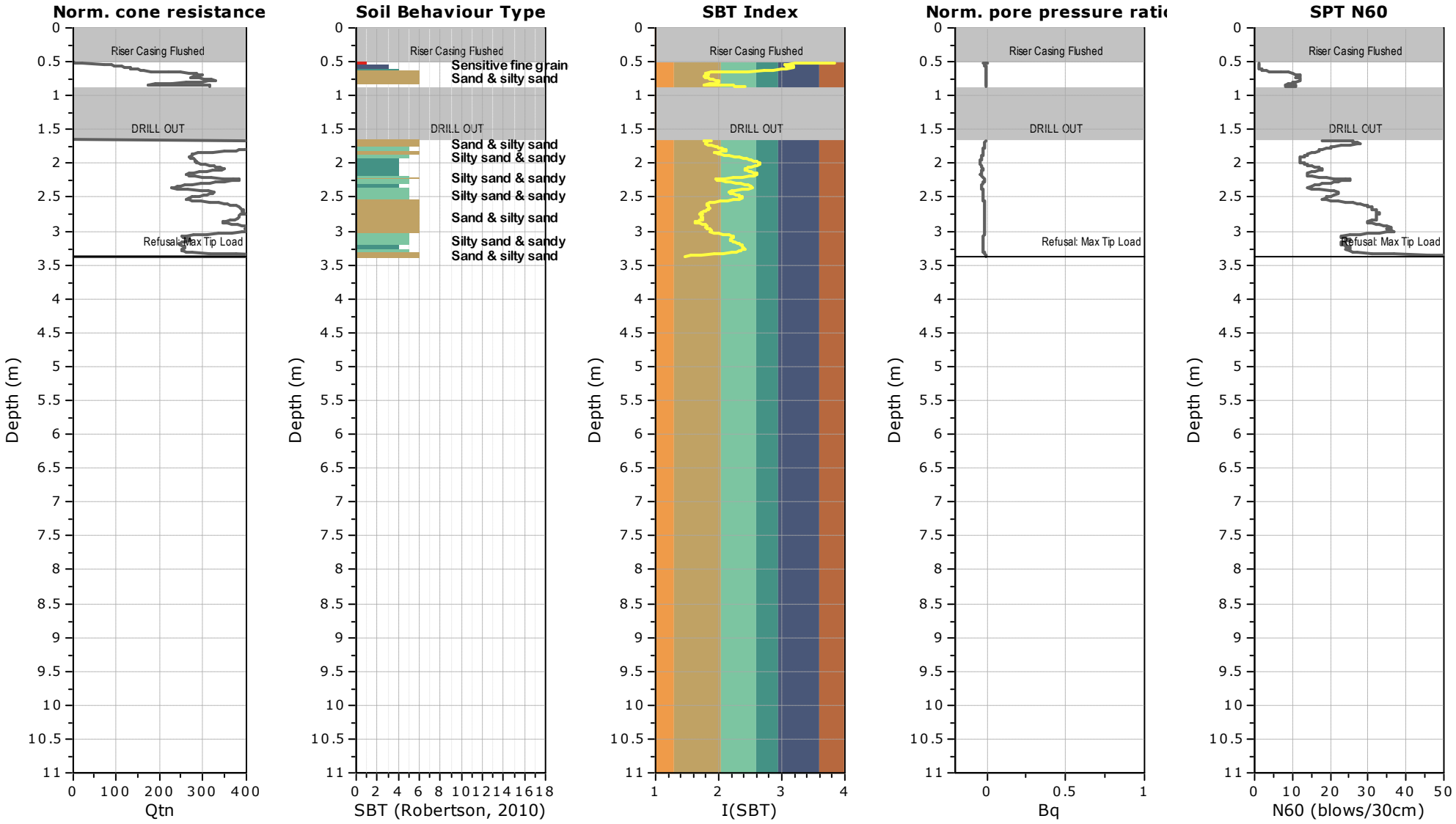
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Total Depth: 3.37 m, Date: 27/01/2024
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Coords: X:712974.59, Y:612773.71
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: OG

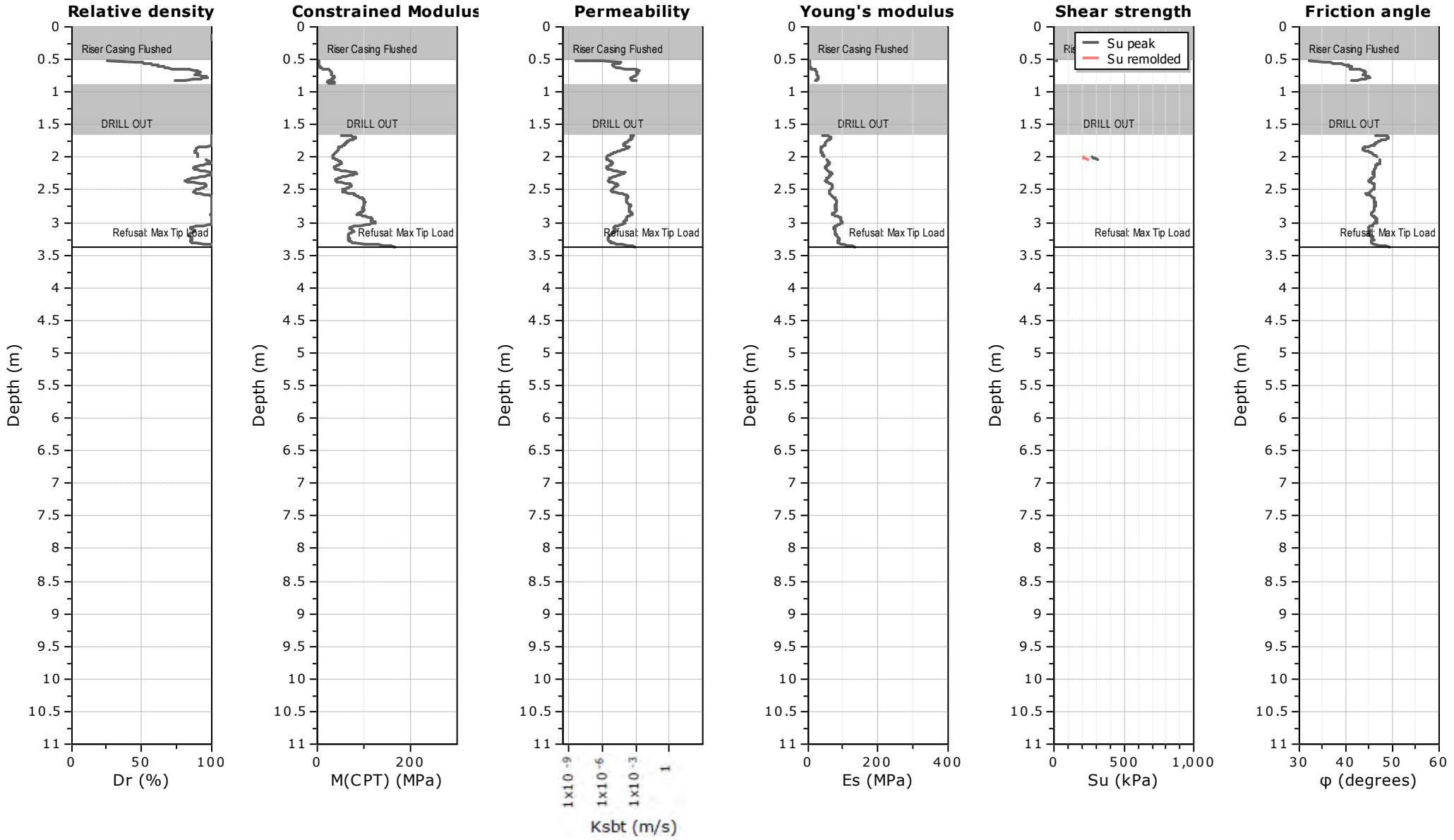
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: OG

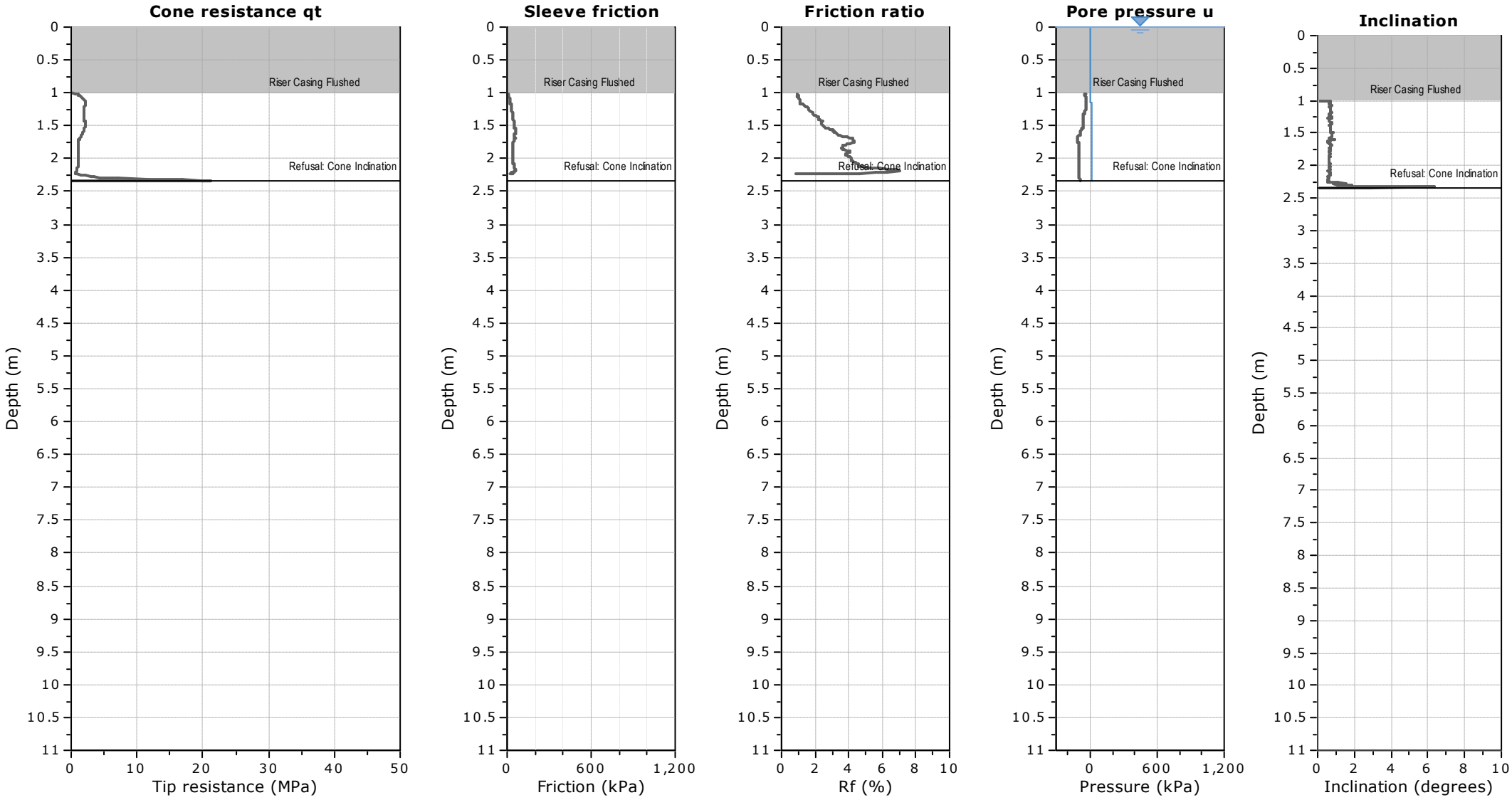
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT13
Total Depth: 2.34 m, Date: 05/02/2024
Surface Elevation (mCD): -4.22 m
Coords: X:712679.86, Y:612769.16
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: SJ

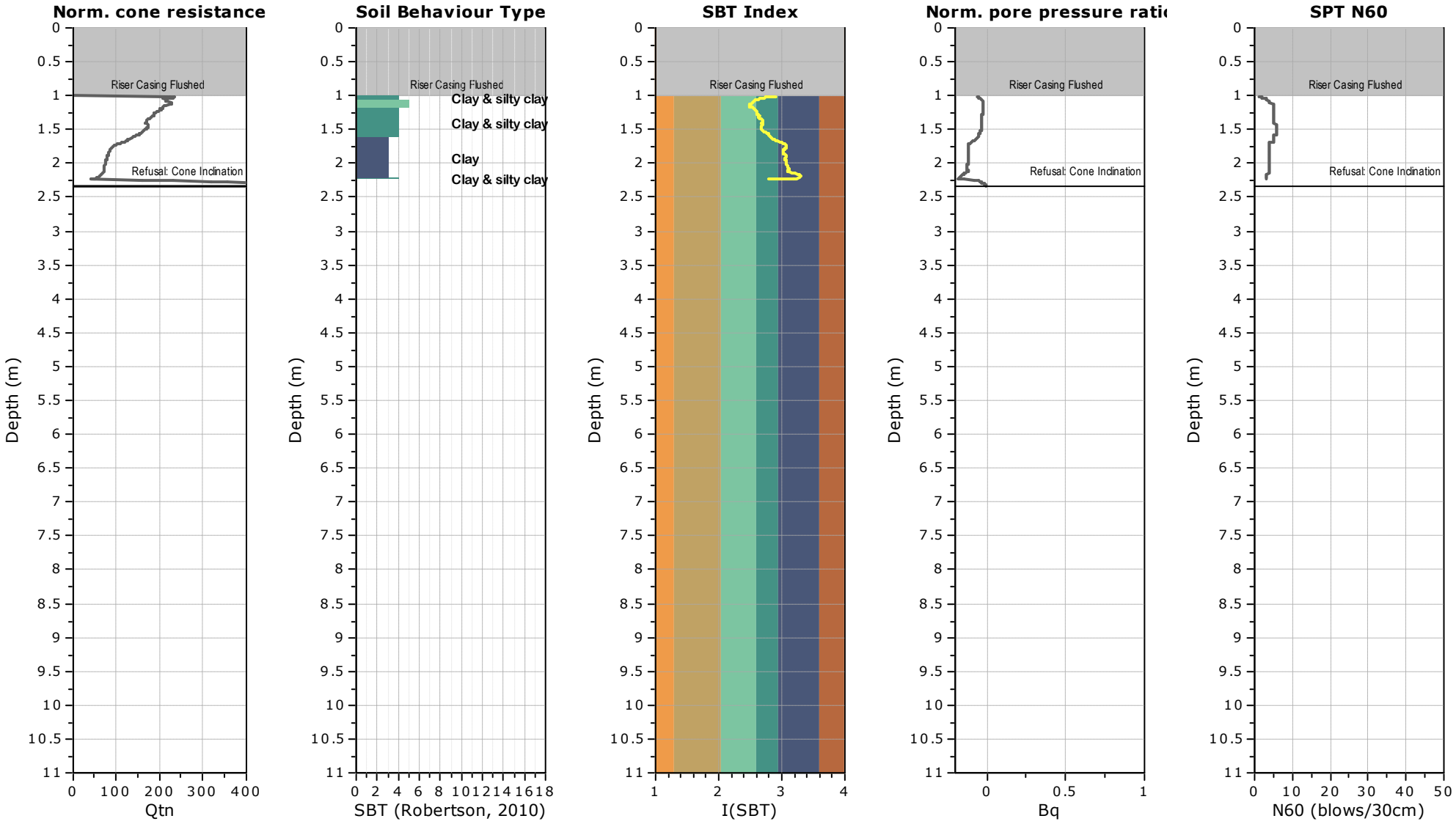
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
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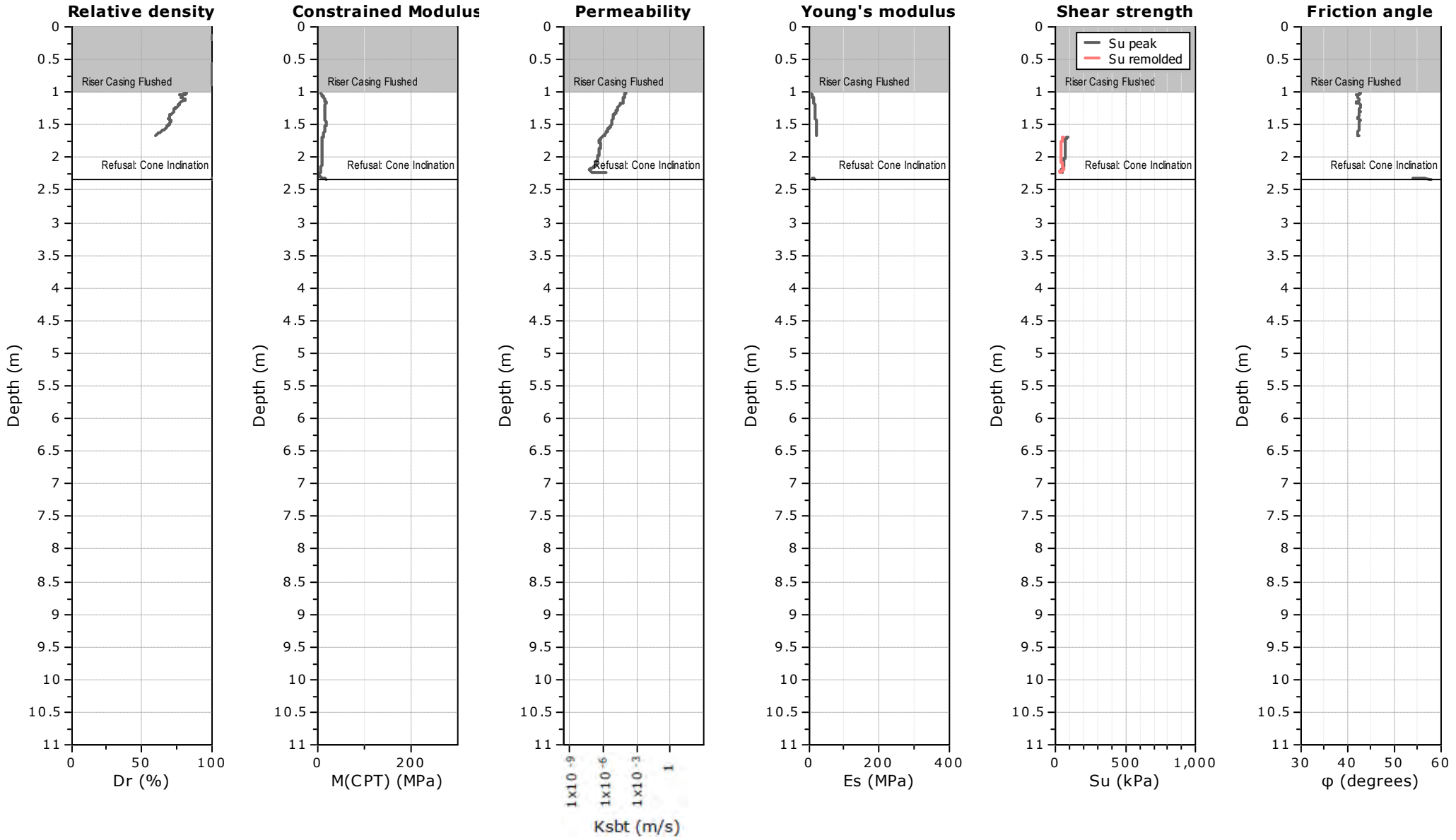
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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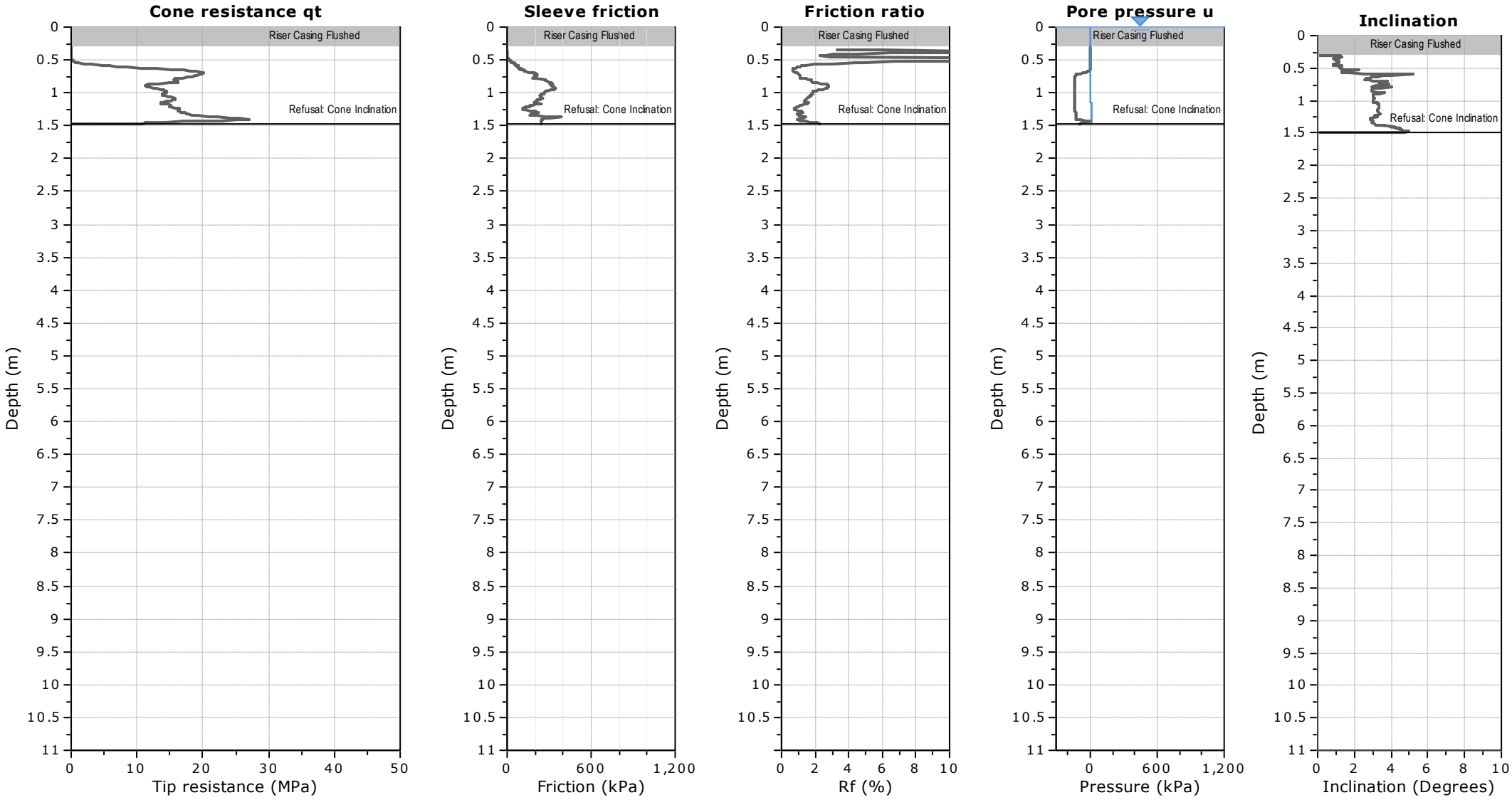
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT16_BH
Total Depth: 1.48 m, Date: 13/01/2024
Surface Elevation (mCD): -1.83 m
Coords: X:712982.74, Y:612669.45
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

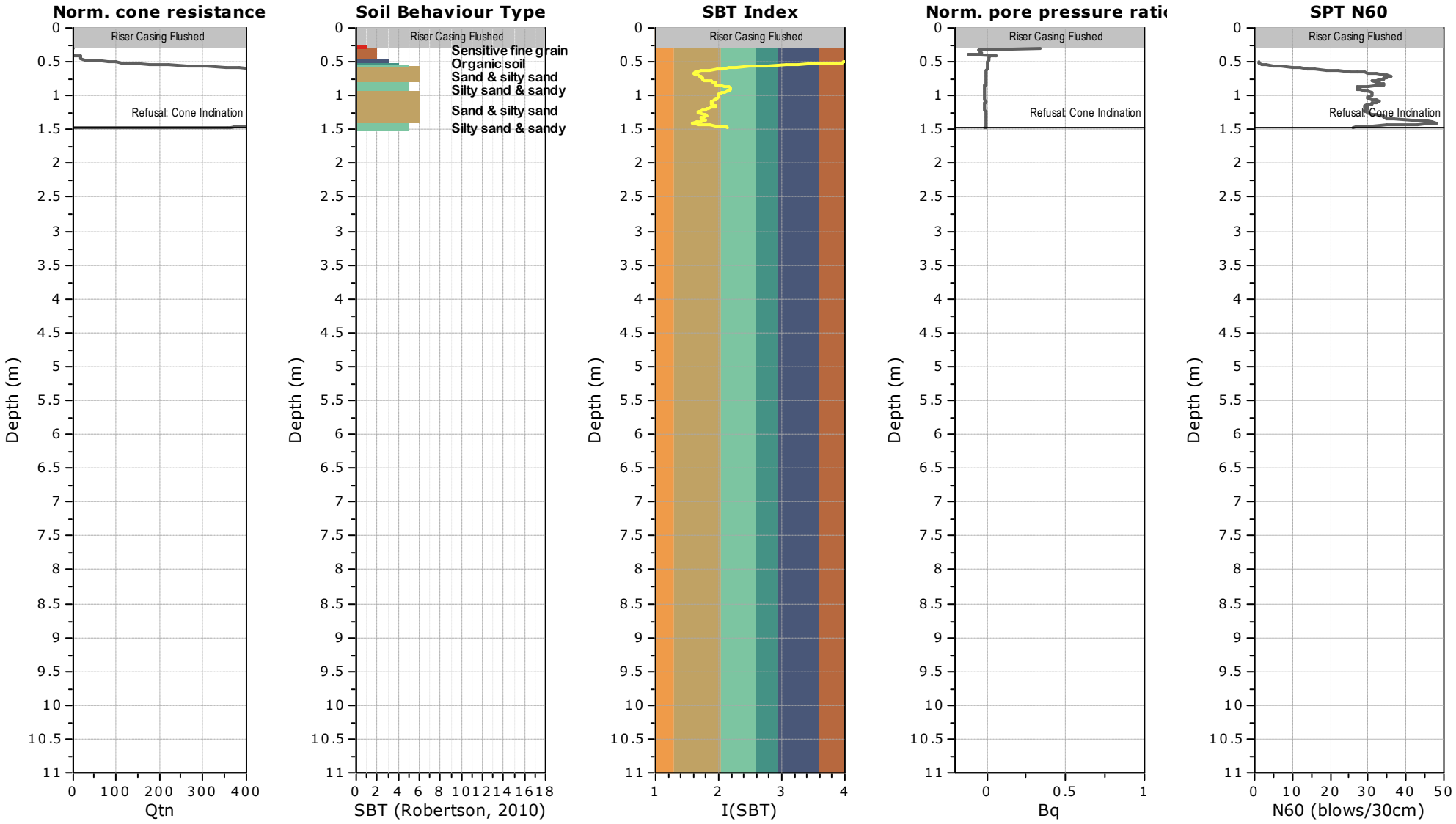
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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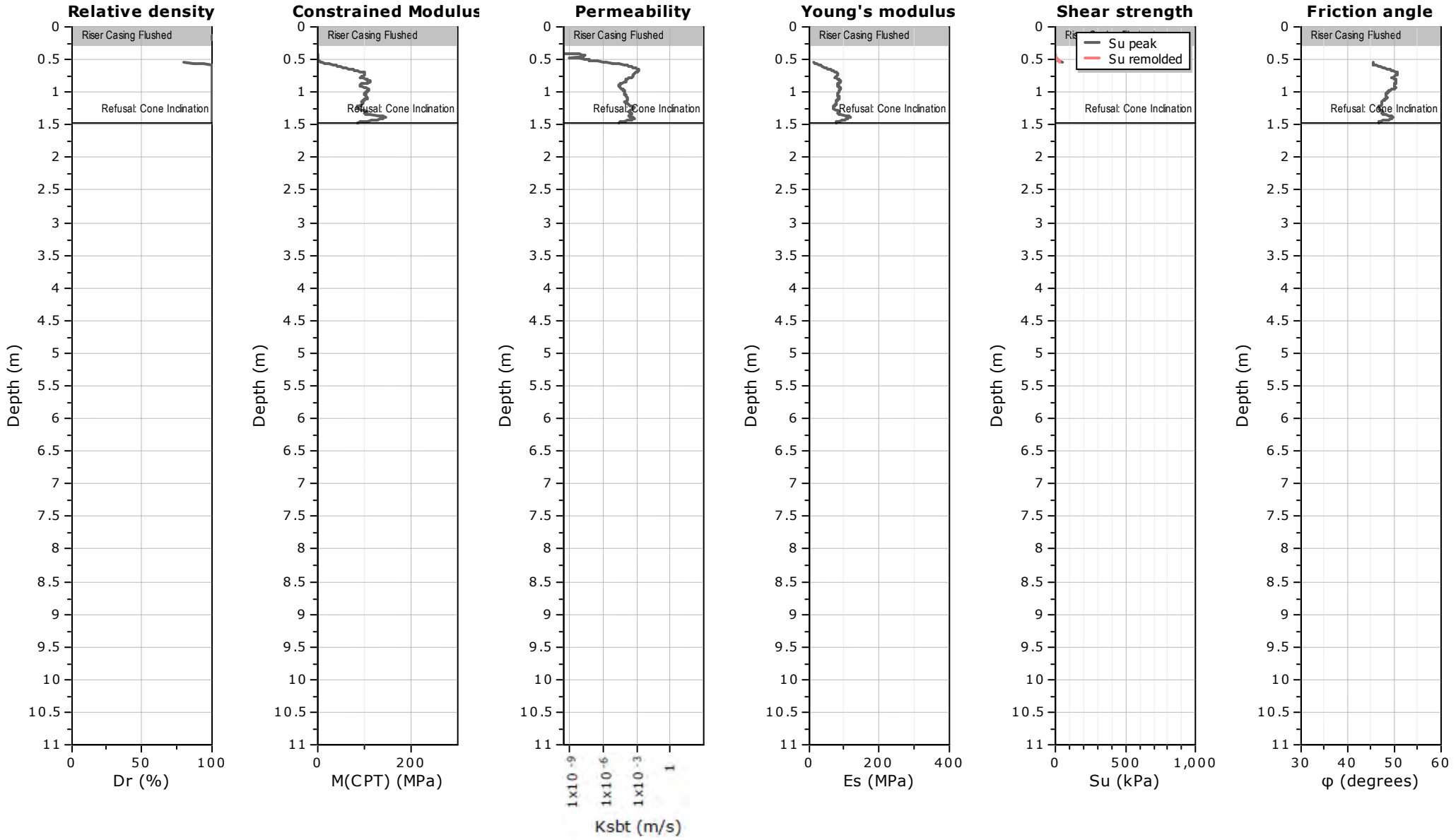
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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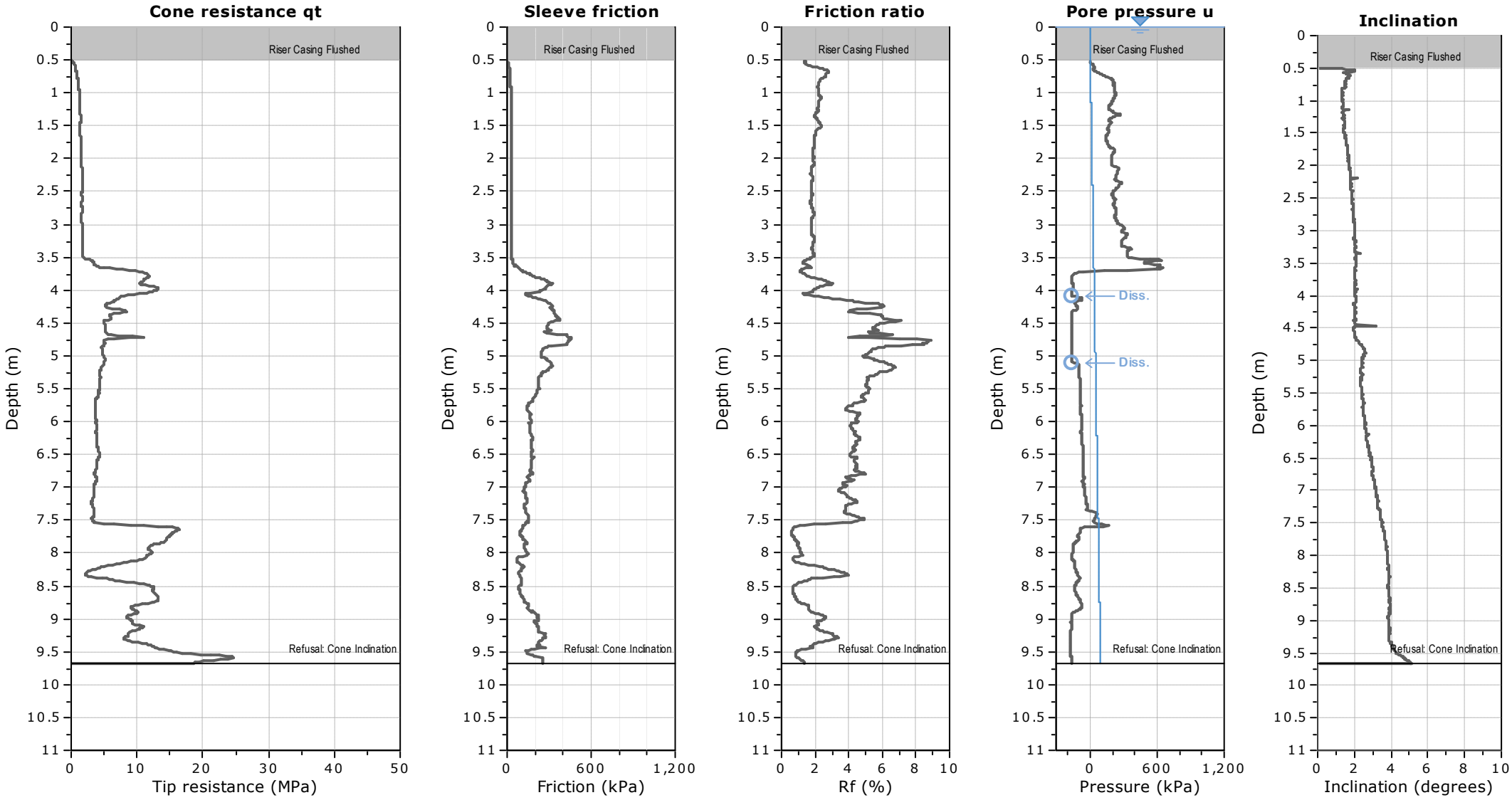
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT17
Total Depth: 9.67 m, Date: 16/02/2024
Surface Elevation (mCD): -5.02 m
Coords: X:712548.51, Y:613030.26
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: SJ/ RW

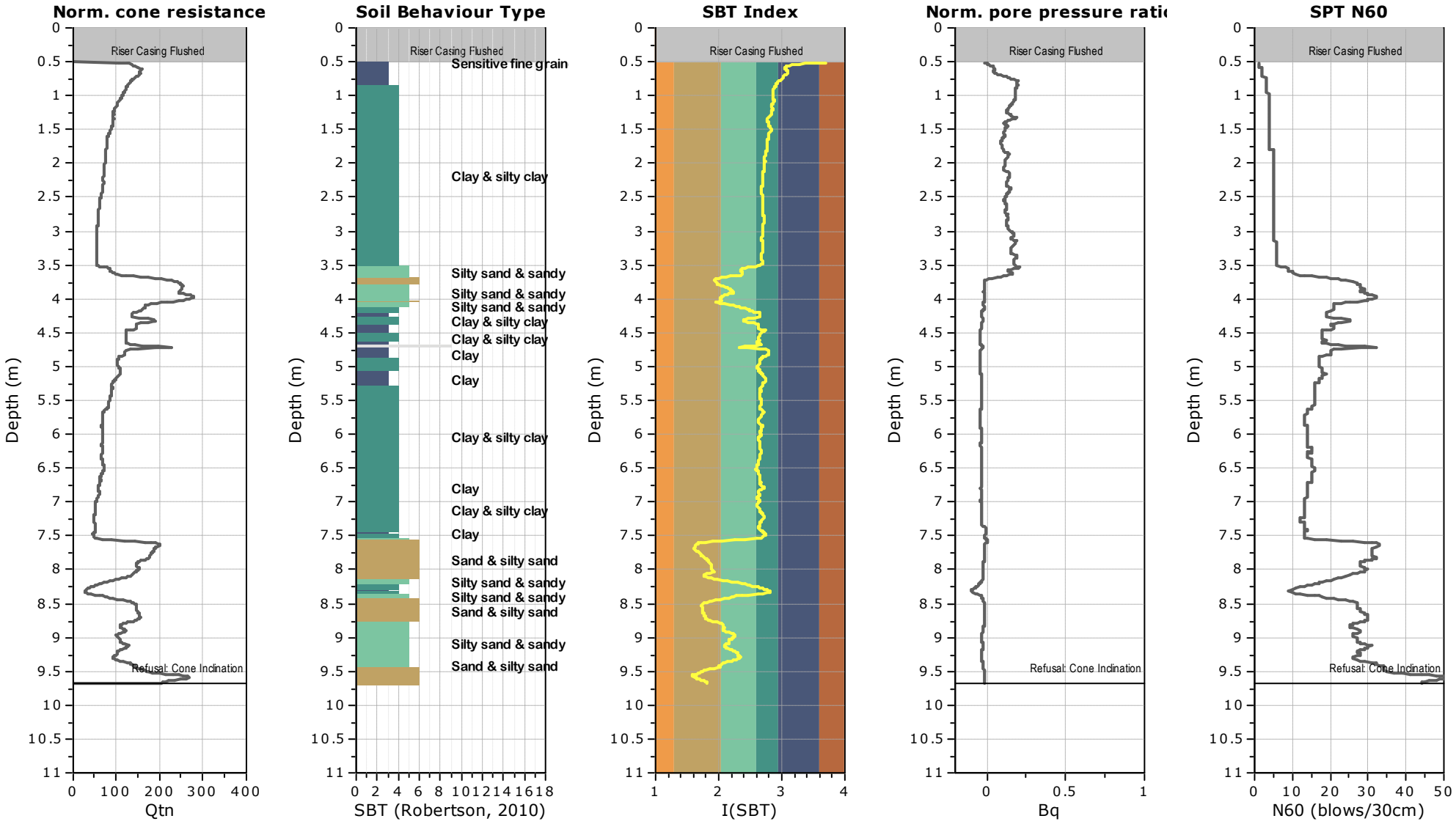
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: SJ/ RW

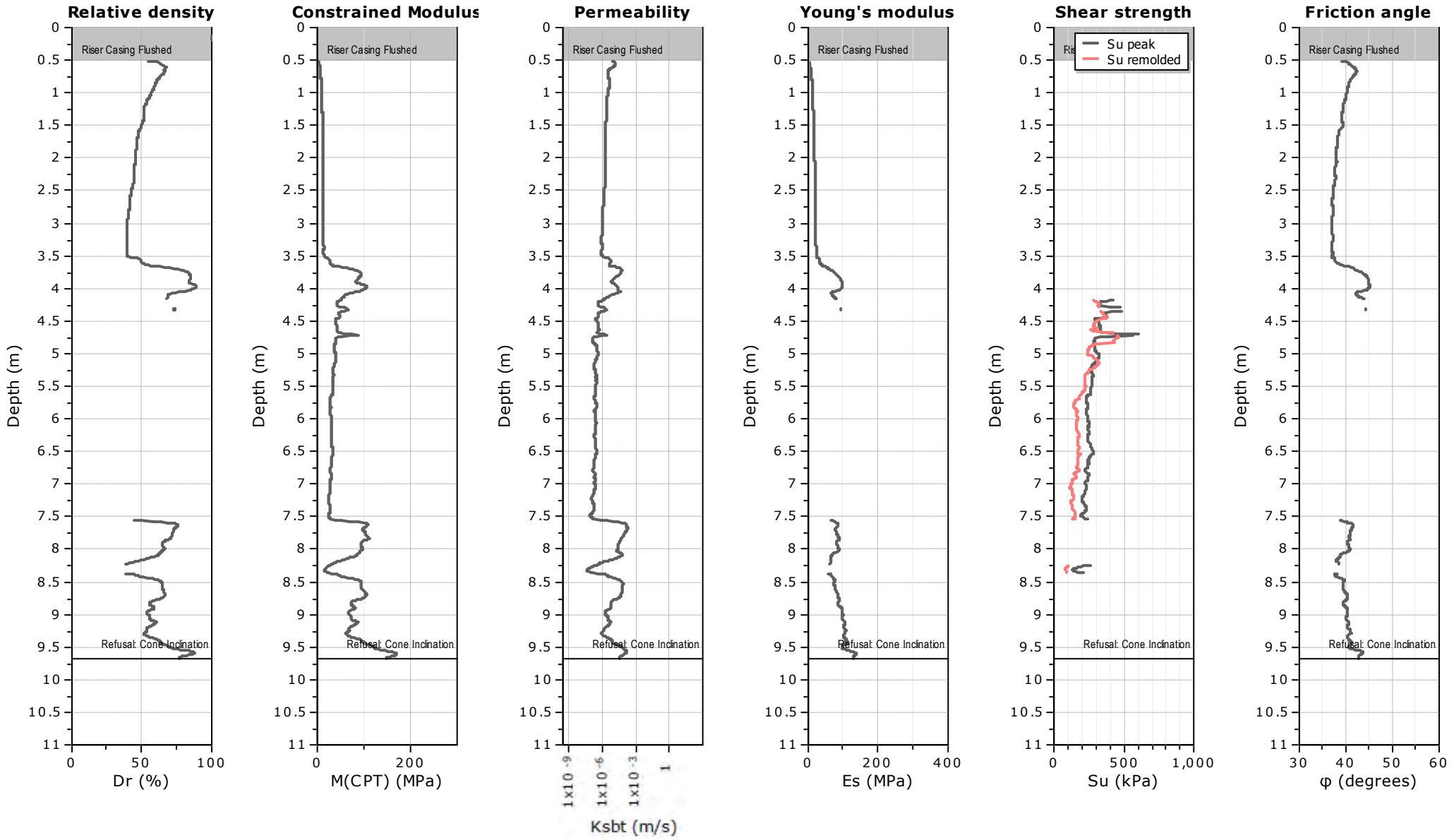
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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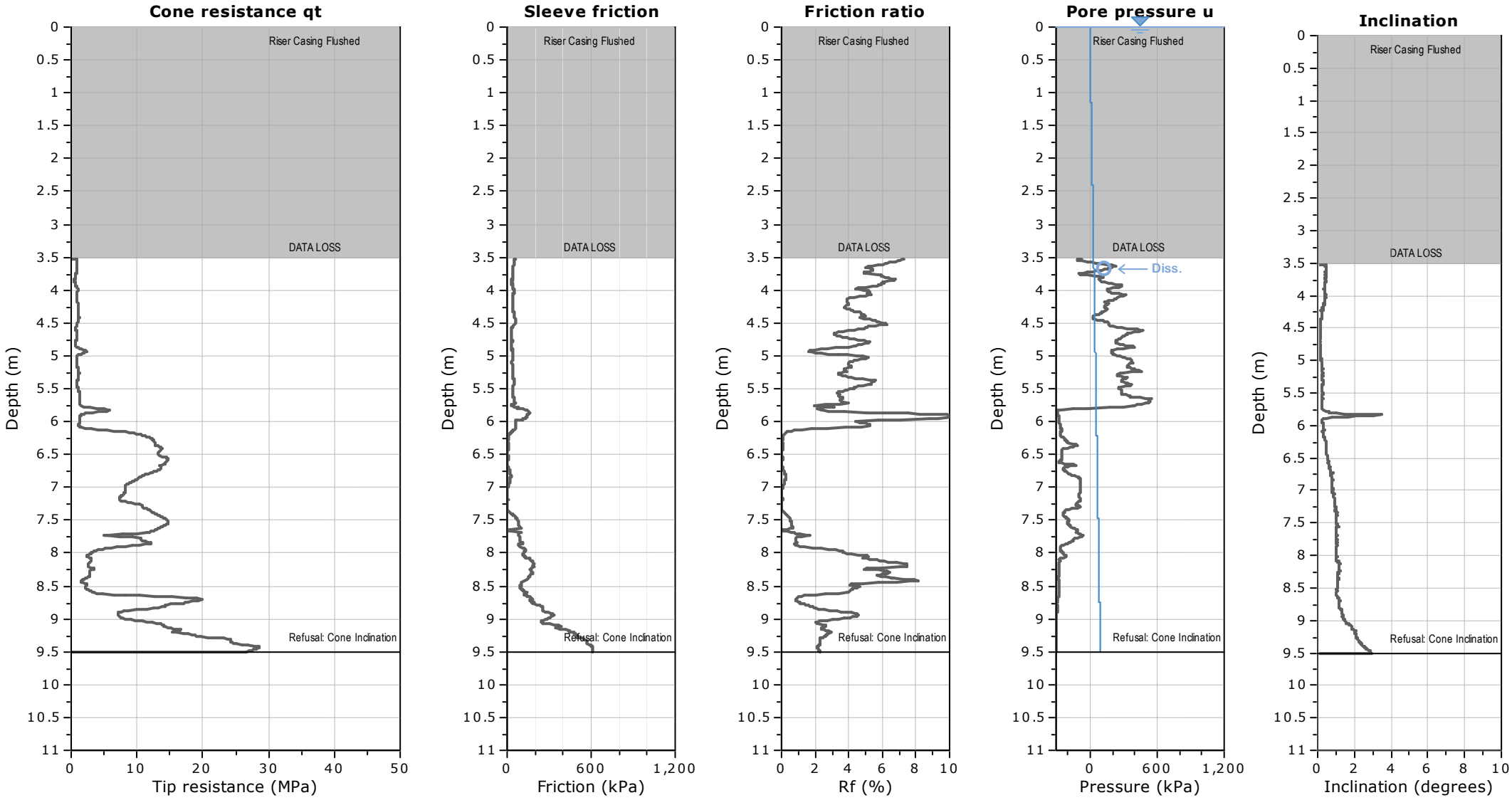
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



Causeway Geotech Ltd
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www.causewaygeotech.com

CPT: M-CPT18
Total Depth: 9.50 m, Date: 03/02/2024
Surface Elevation (mCD): -4.59 m
Coords: X:712531.80, Y:612955.54
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

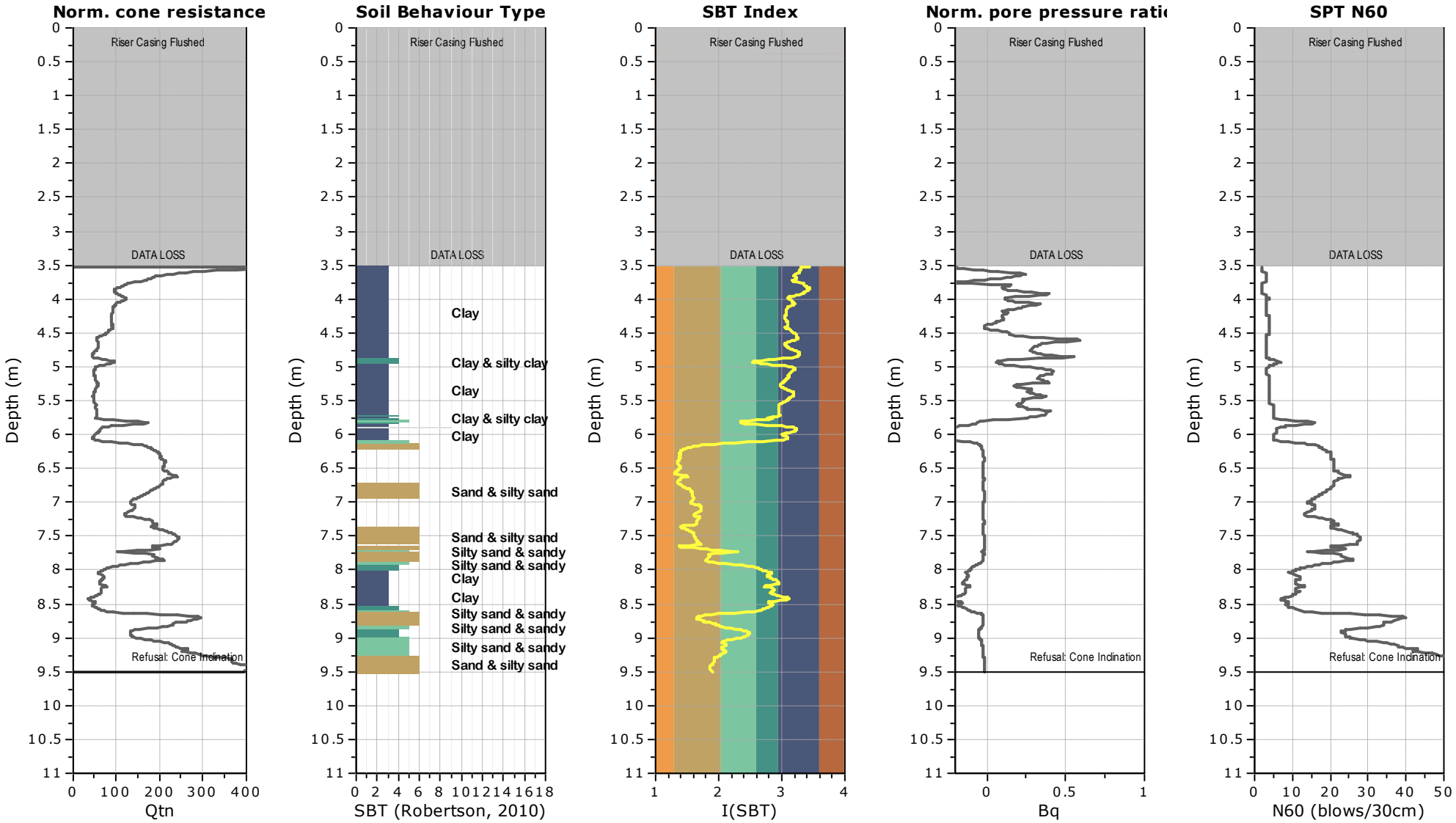
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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

Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland

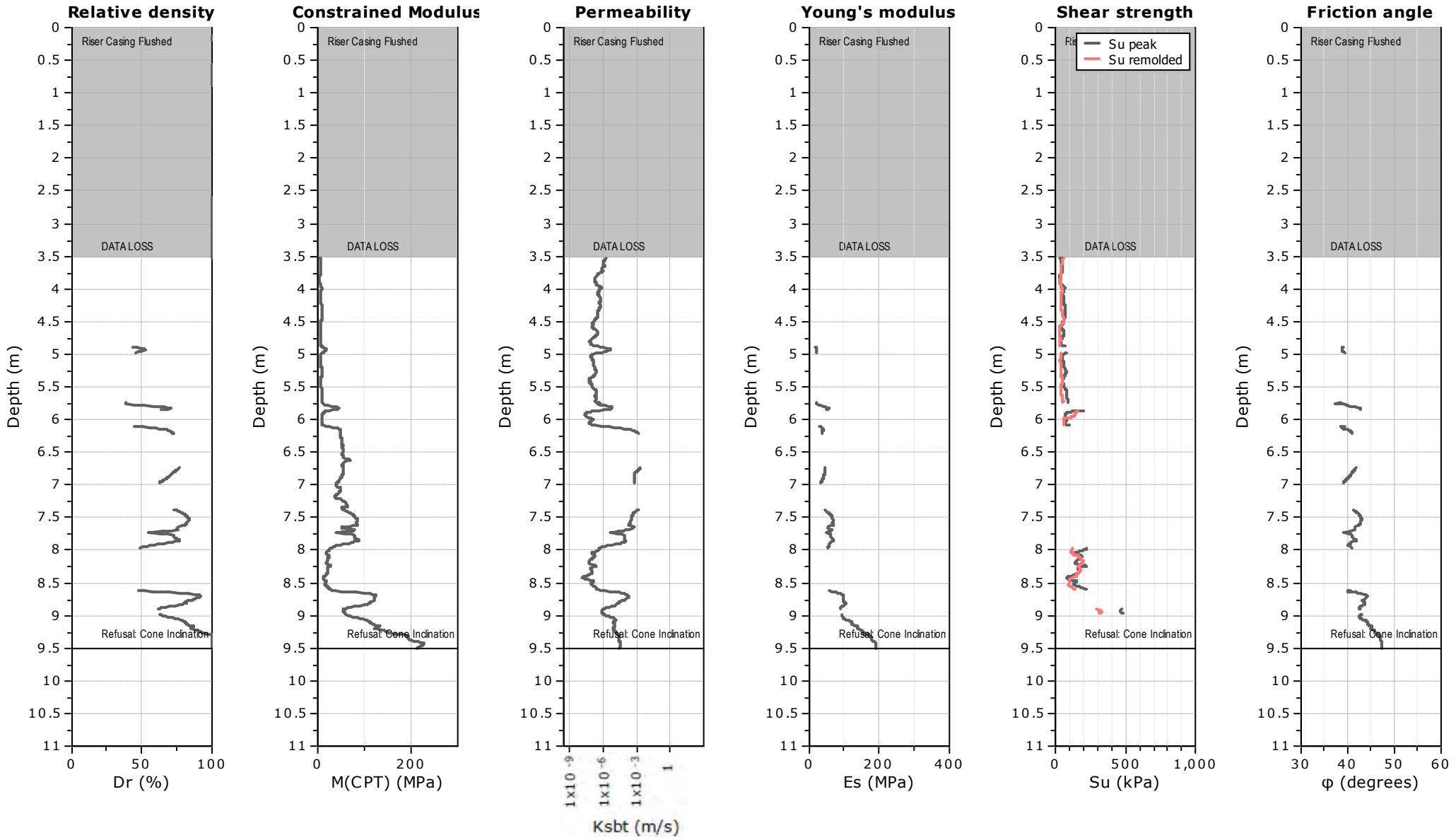
CPT: M-CPT18
Total Depth: 9.50 m, Date: 03/02/2024
Surface Elevation (mCD): -4.59 m
Coords: X:712531.80, Y:612955.54
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ



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CPT: M-CPT18
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Coords: X:712531.80, Y:612955.54
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

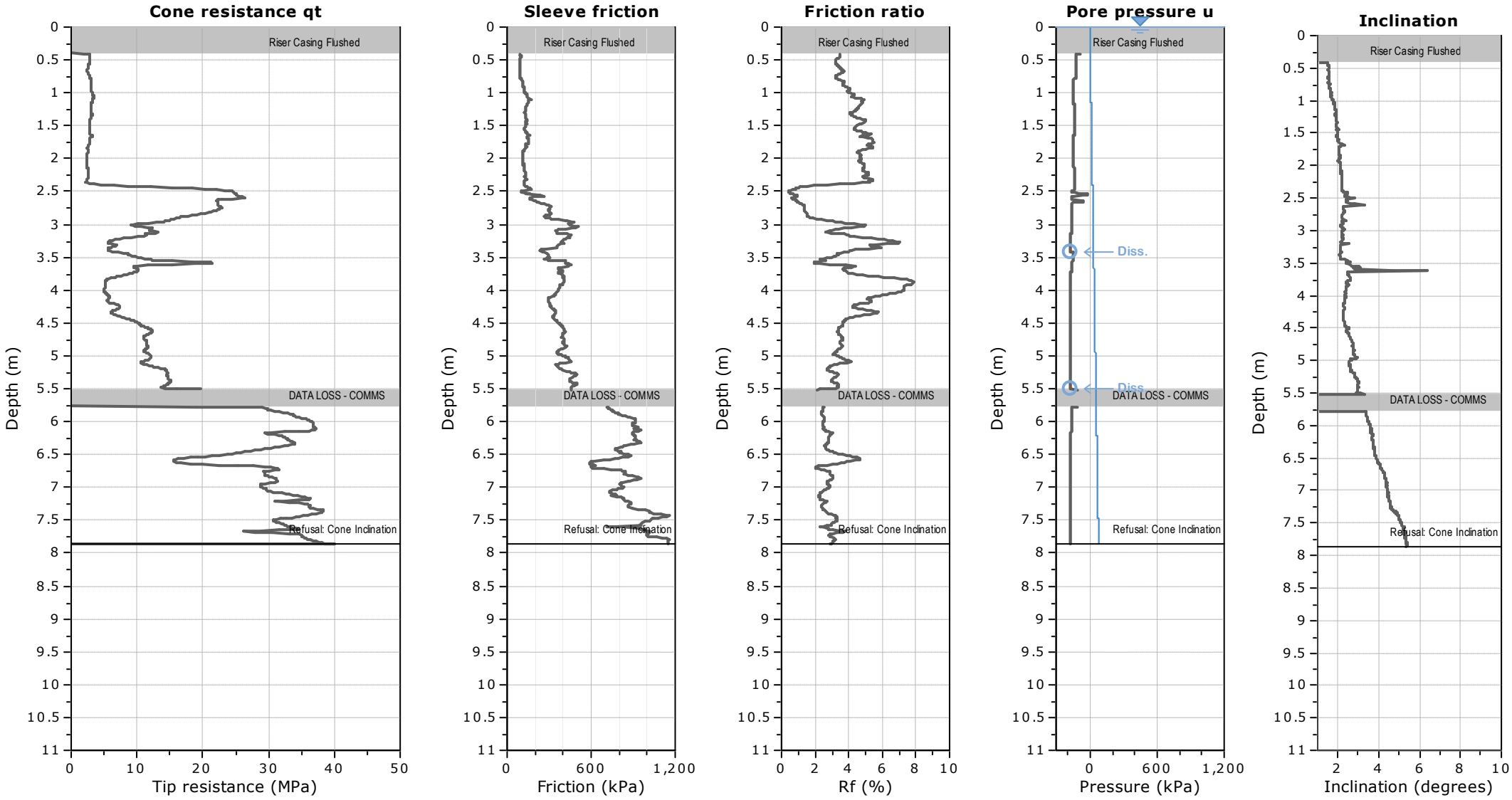
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT19
Total Depth: 7.87 m, Date: 04/02/2024
Surface Elevation (mCD): -4.18 m
Coords: X:712533.97, Y:612869.28
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: KW/AG

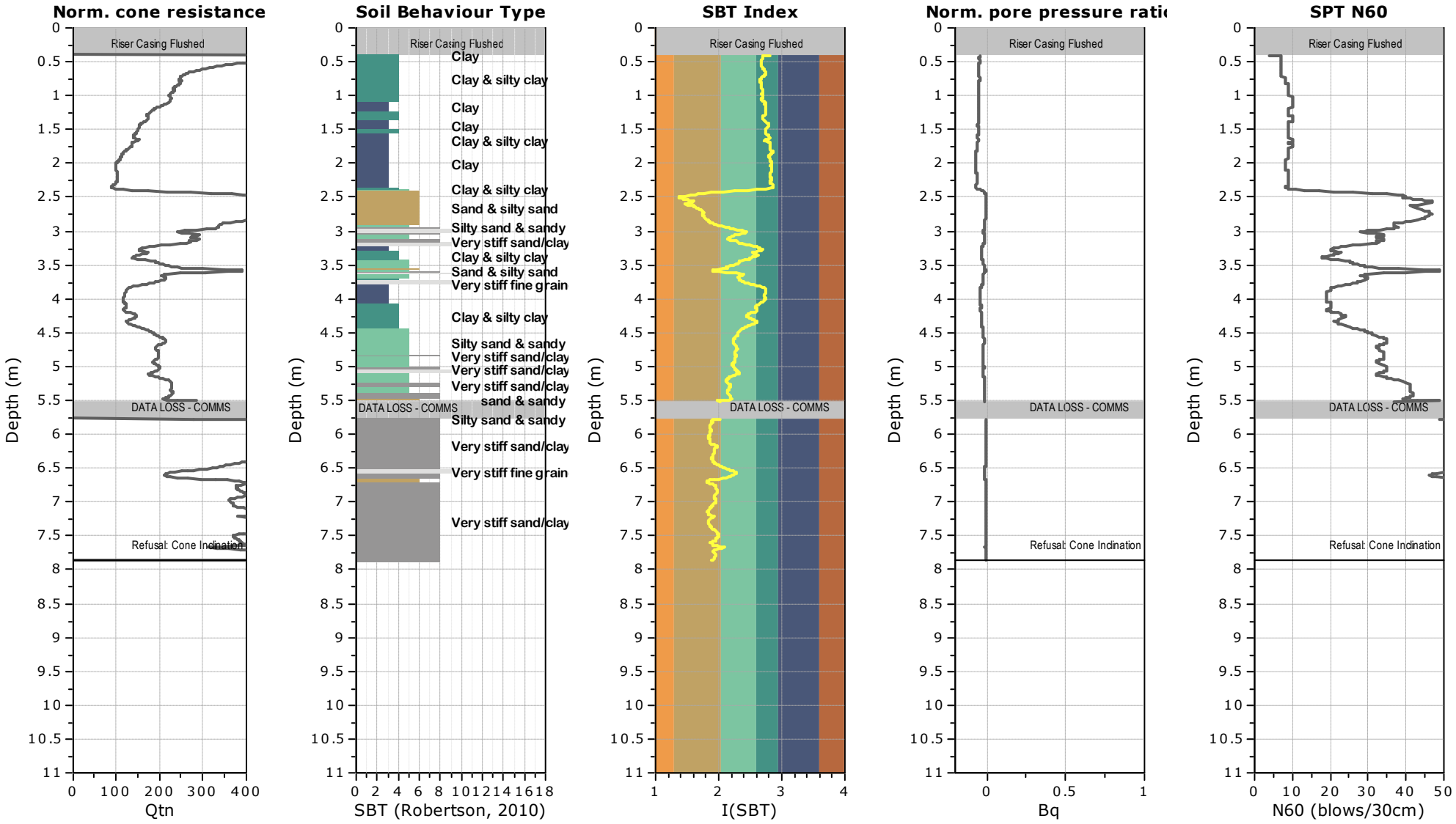
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Coords: X:712533.97, Y:612869.28
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: KW/AG

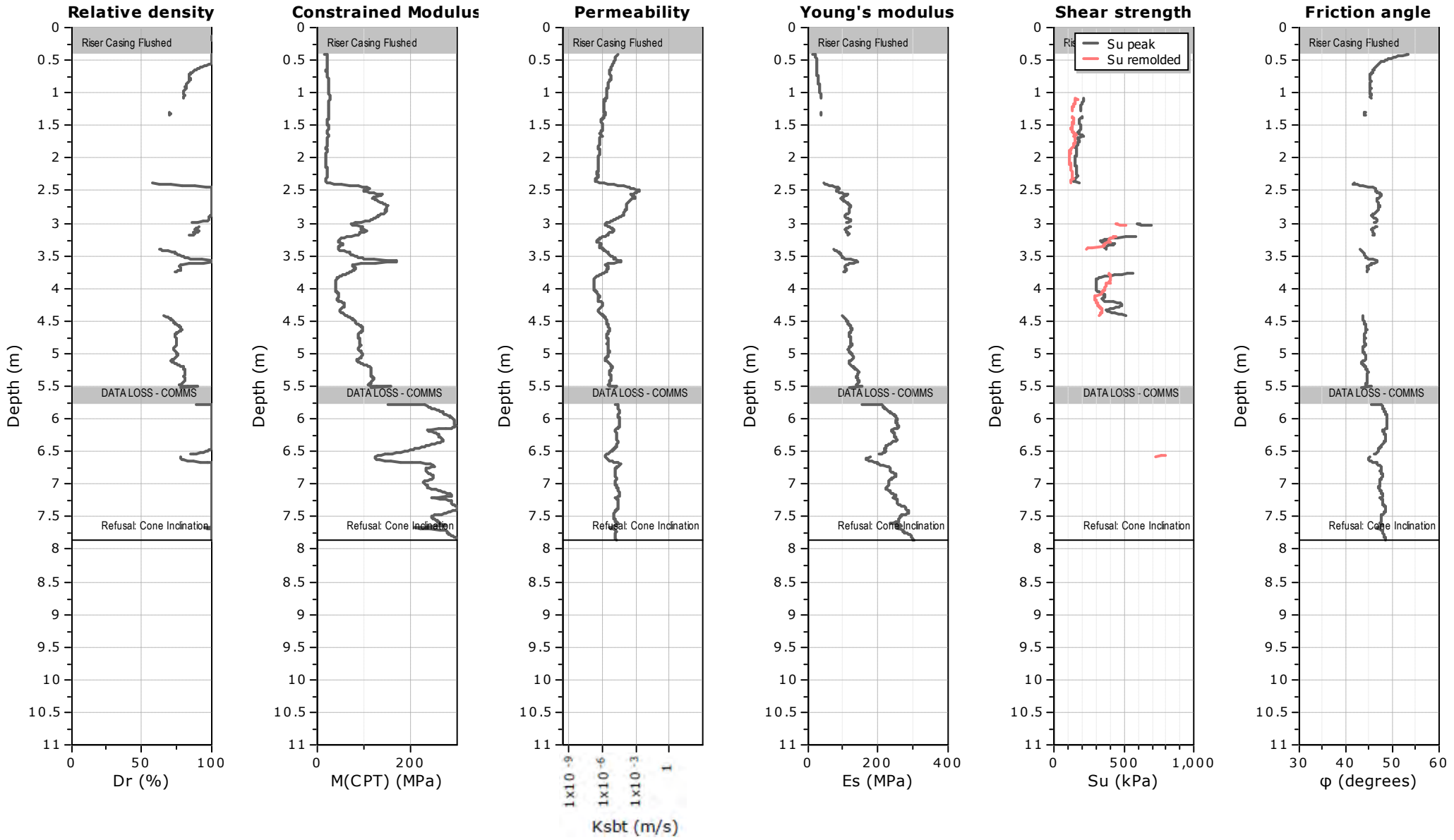
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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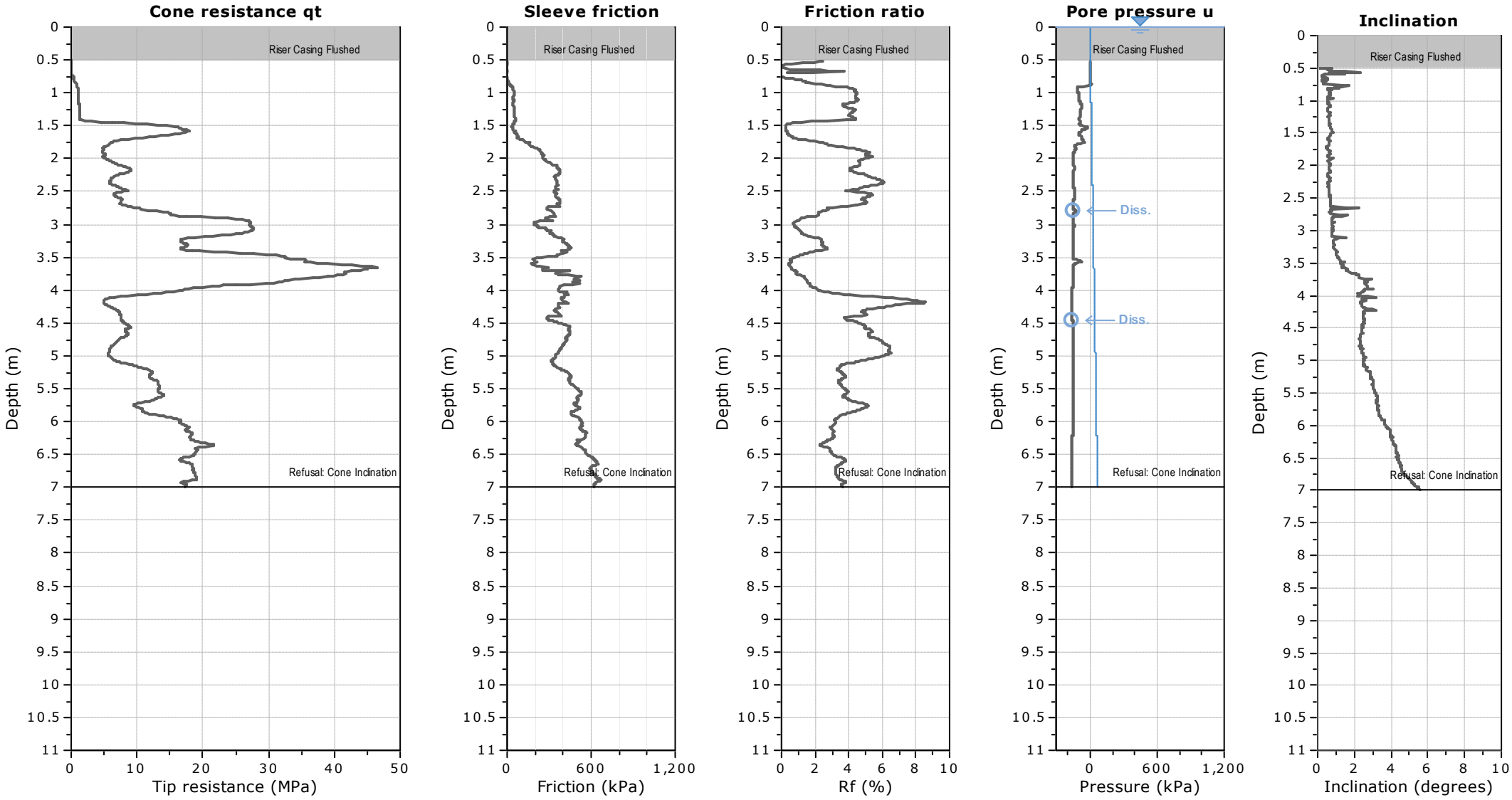
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT20
Total Depth: 7.00 m, Date: 04/02/2024
Surface Elevation (mCD): -3.62 m
Coords: X:712516.54, Y:612759.30
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/DJ

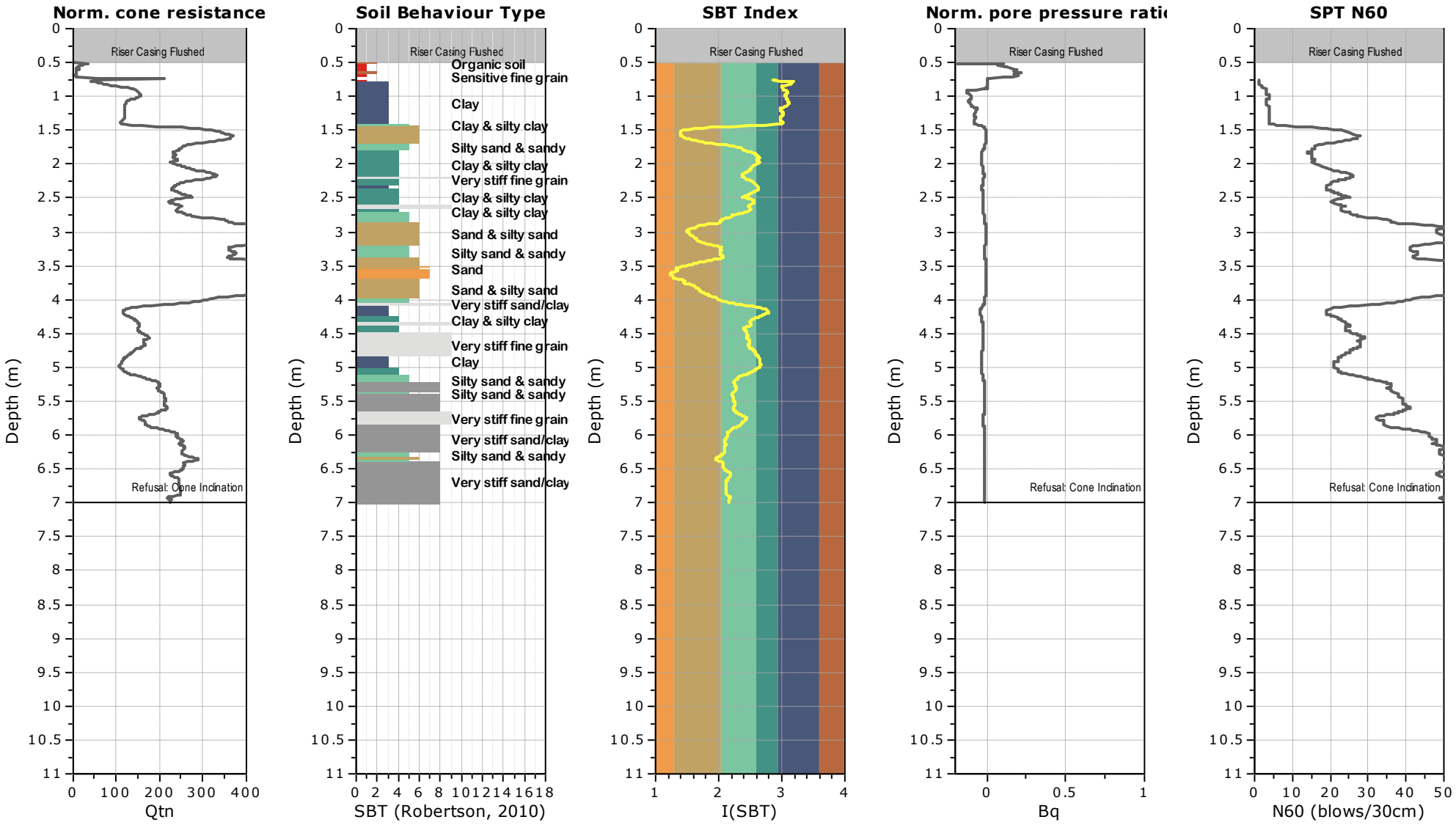
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Coords: X:712516.54, Y:612759.30
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/DJ

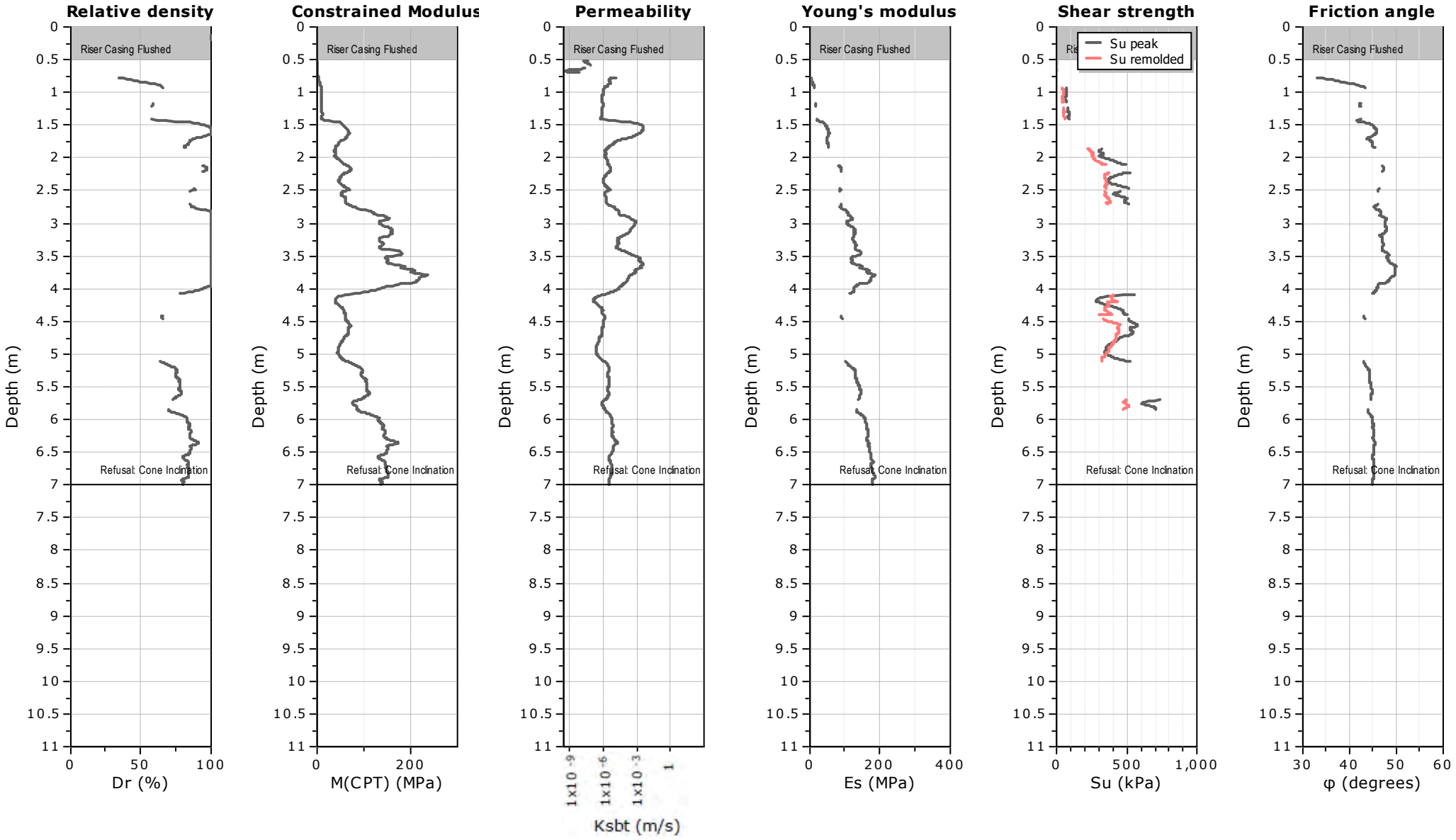
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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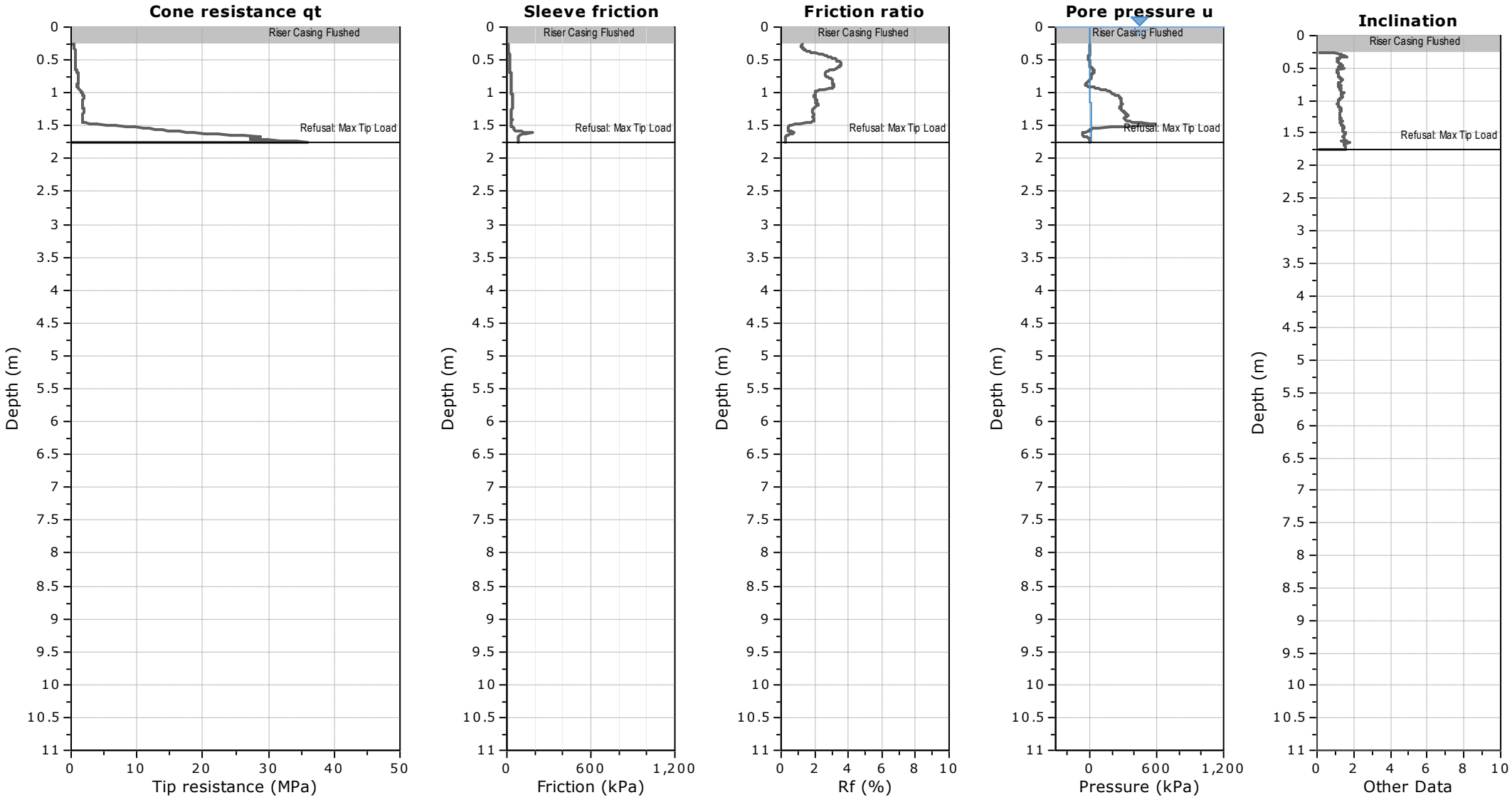
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT21_BH
Total Depth: 1.75 m, Date: 16/01/2024
Surface Elevation (mCD): -10.40 m
Coords: X:713316.31, Y:613156.31
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

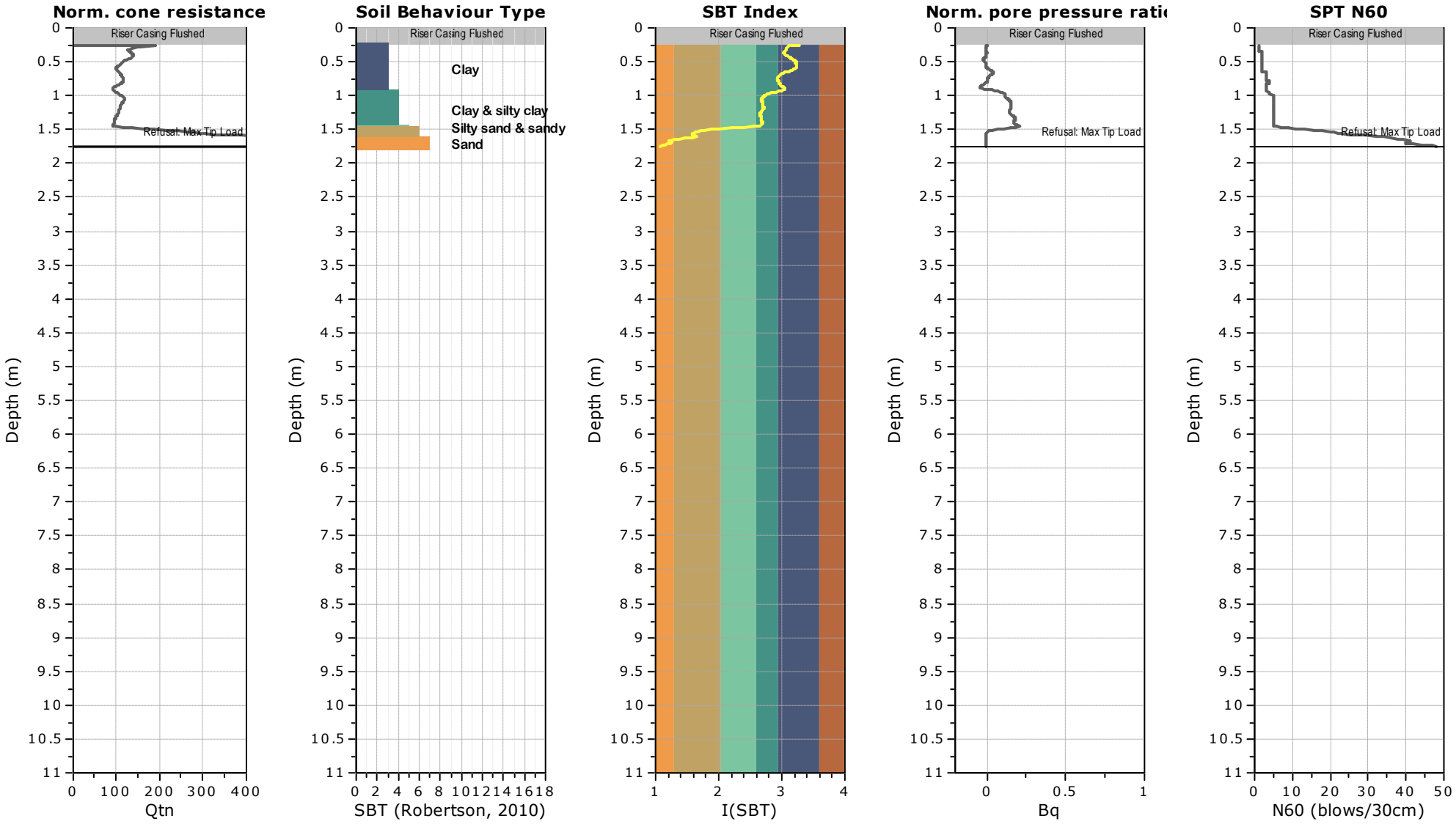
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: MJ

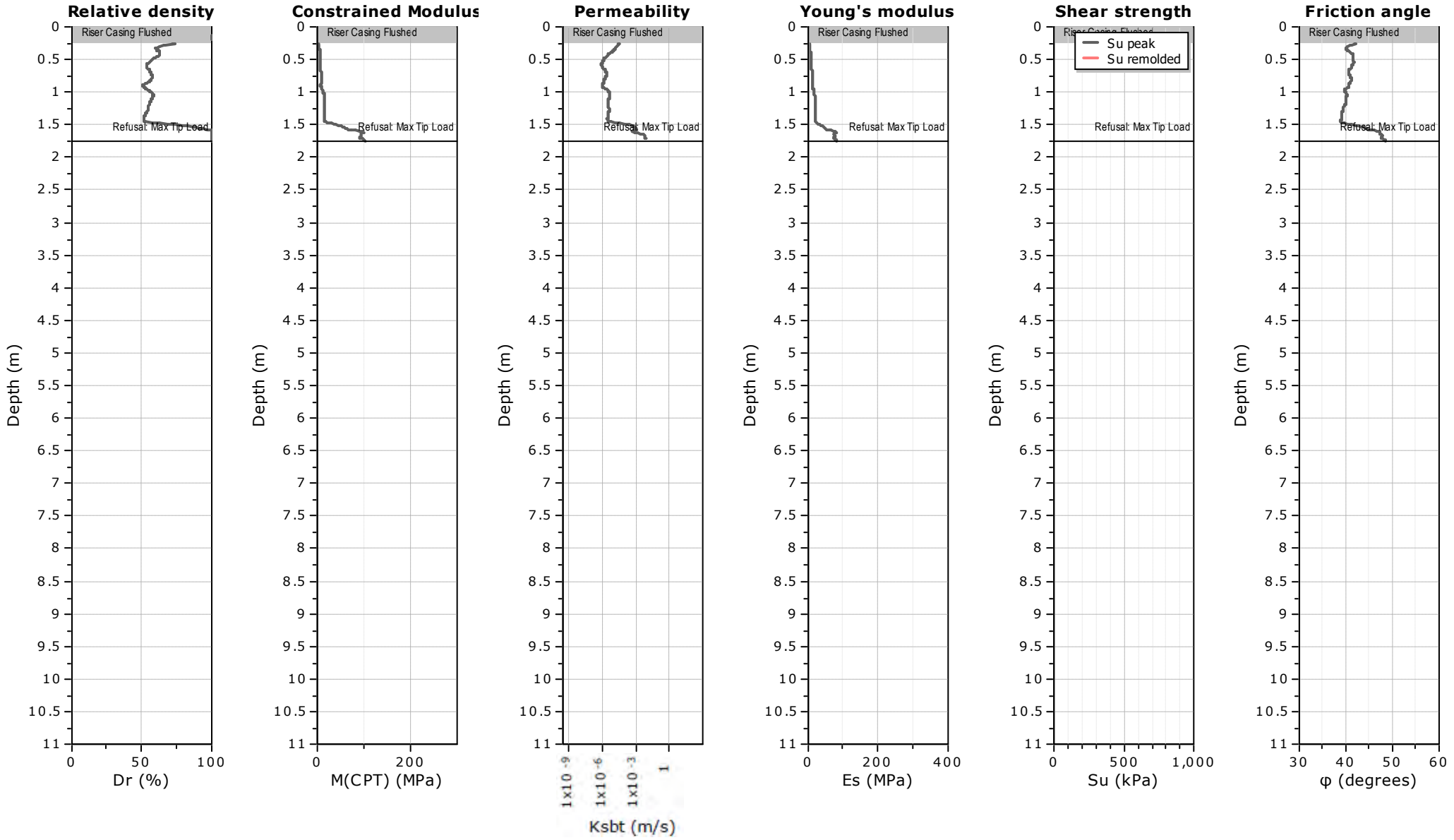
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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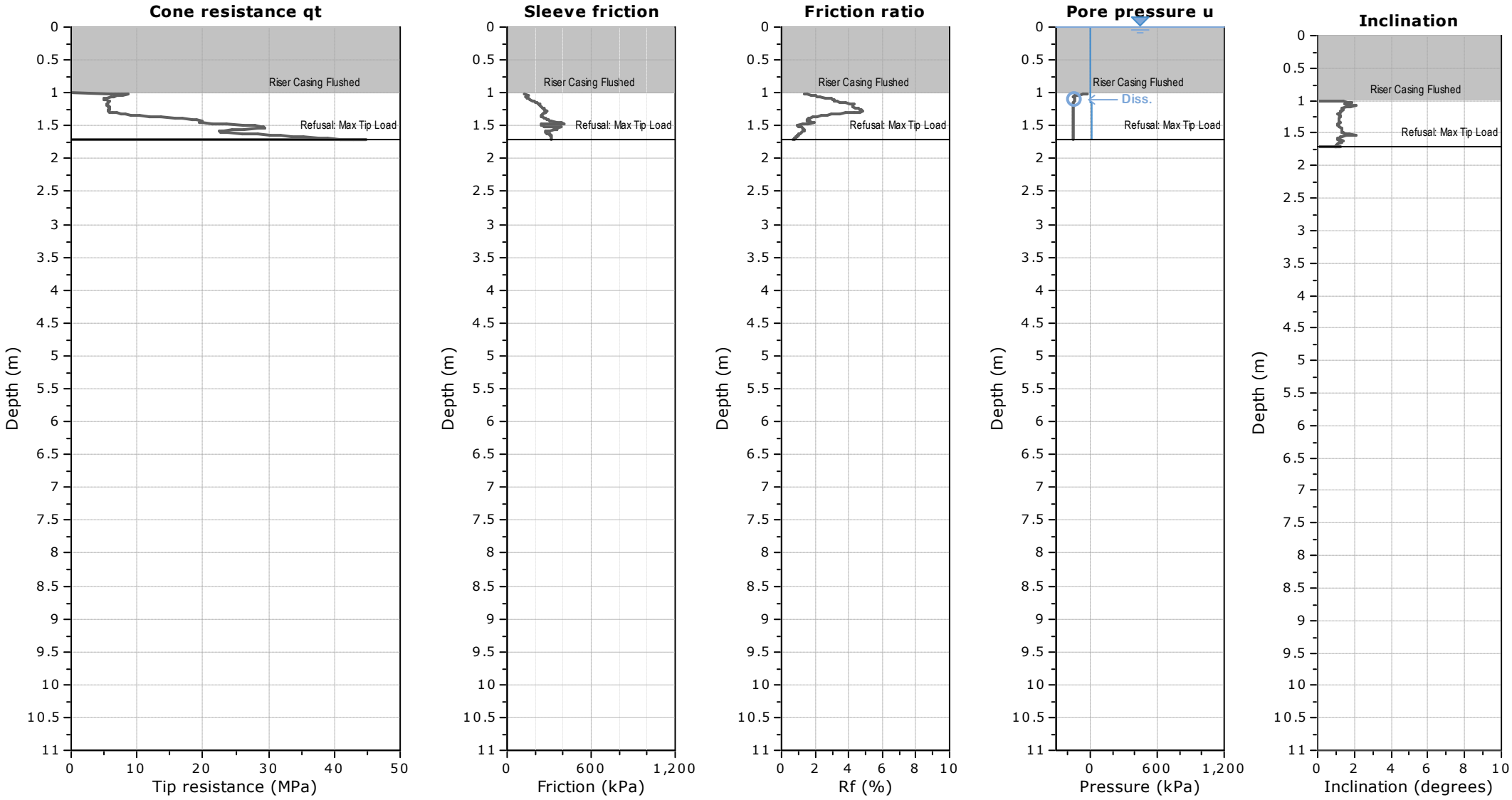
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT22
Total Depth: 1.72 m, Date: 18/02/2024
Surface Elevation (mCD): -3.32 m
Coords: X:712495.91, Y:612660.54
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ RW

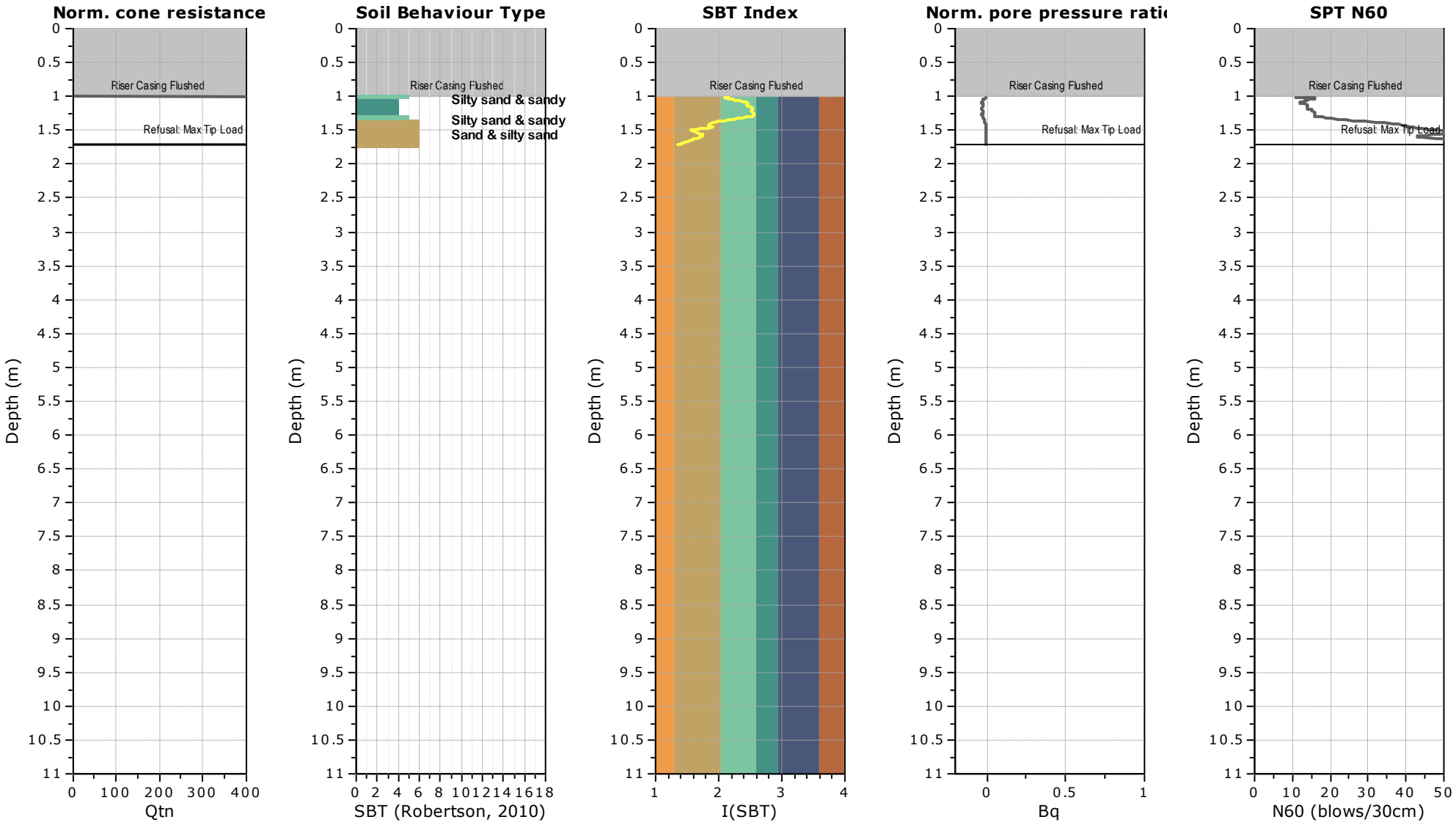
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ RW

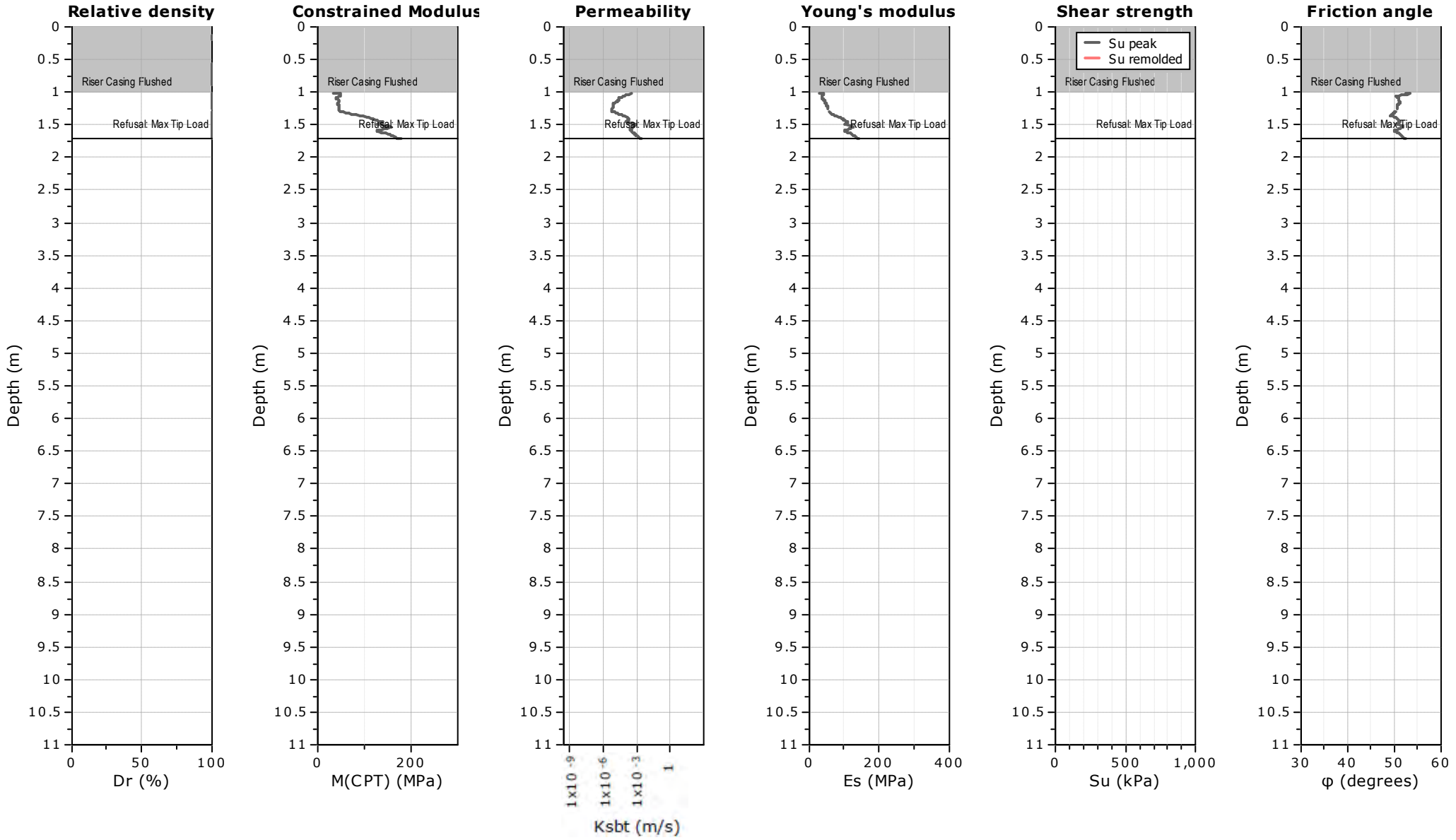
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ RW

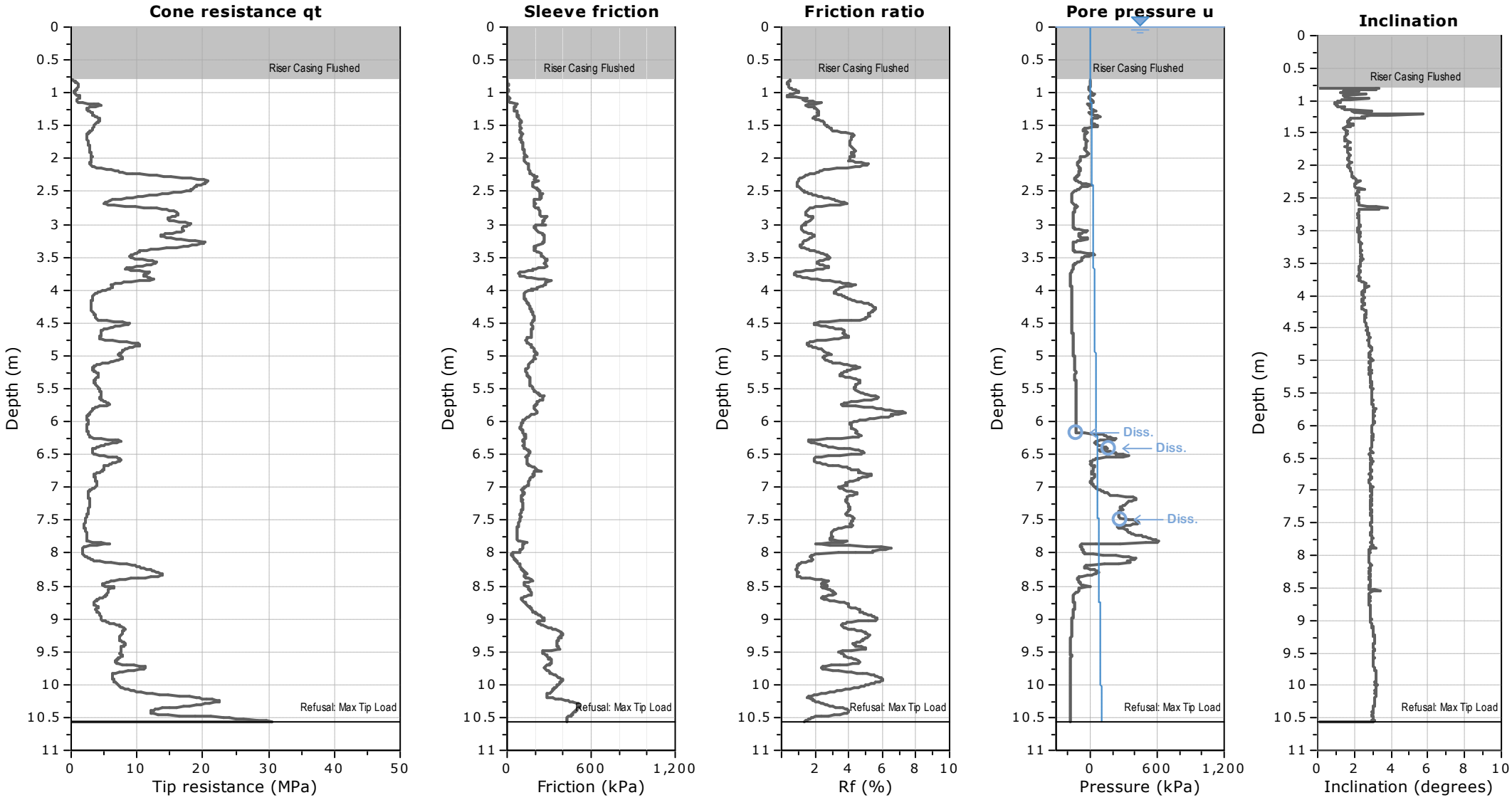
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT23_BH
Total Depth: 10.56 m, Date: 04/01/2024
Surface Elevation (mCD): -4.83 m
Coords: X:712881.55, Y:613051.61
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

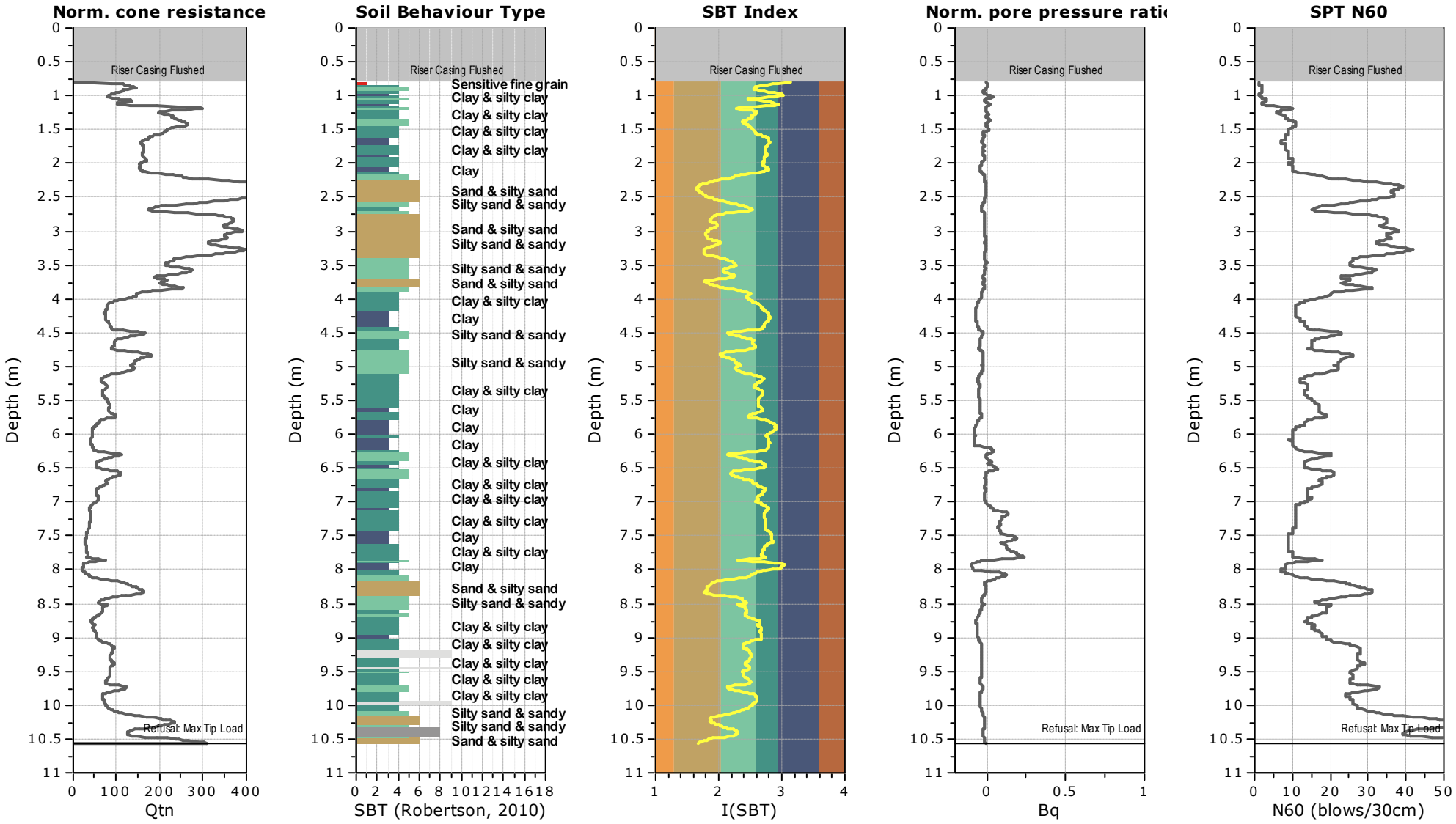
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
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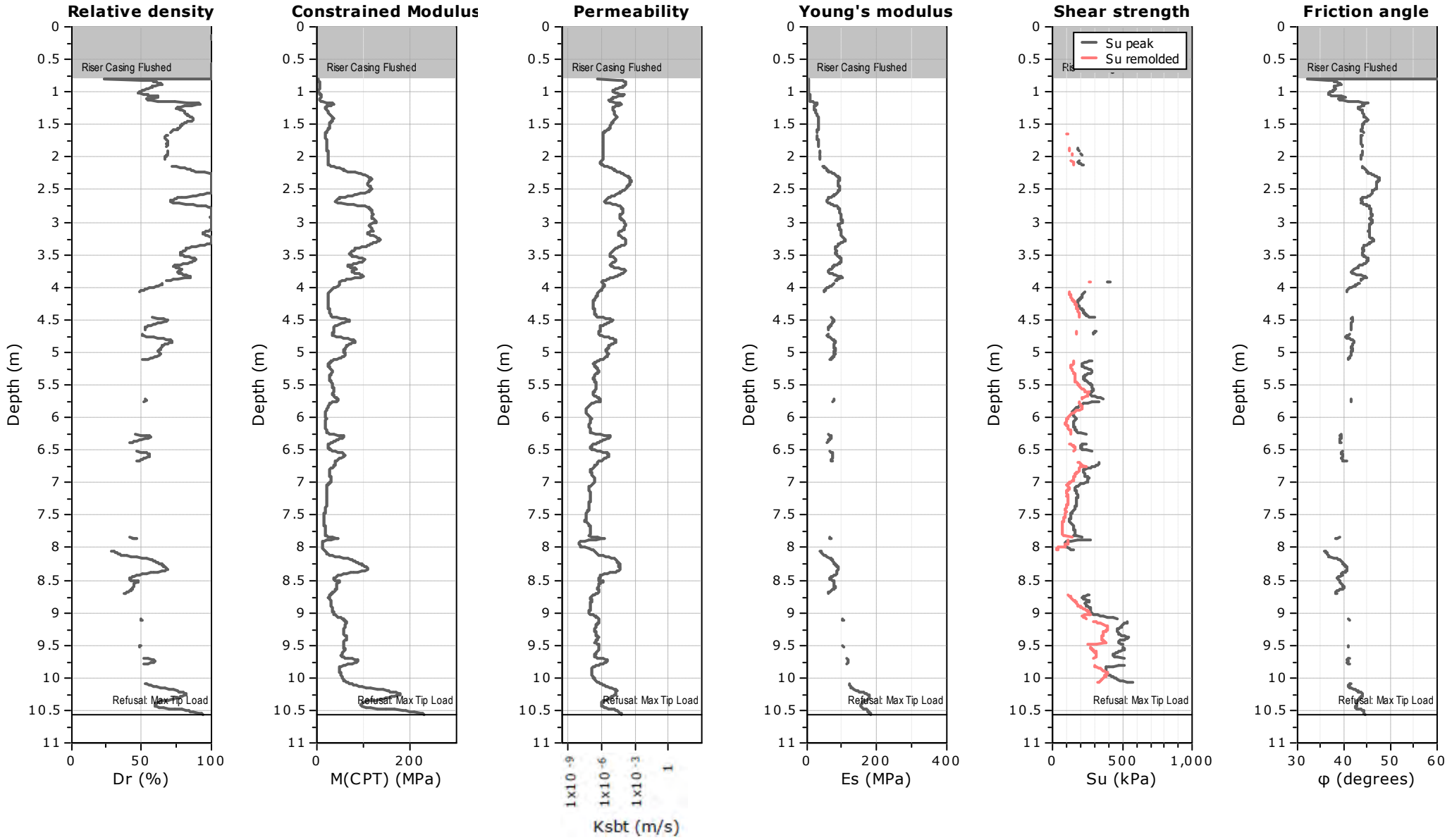
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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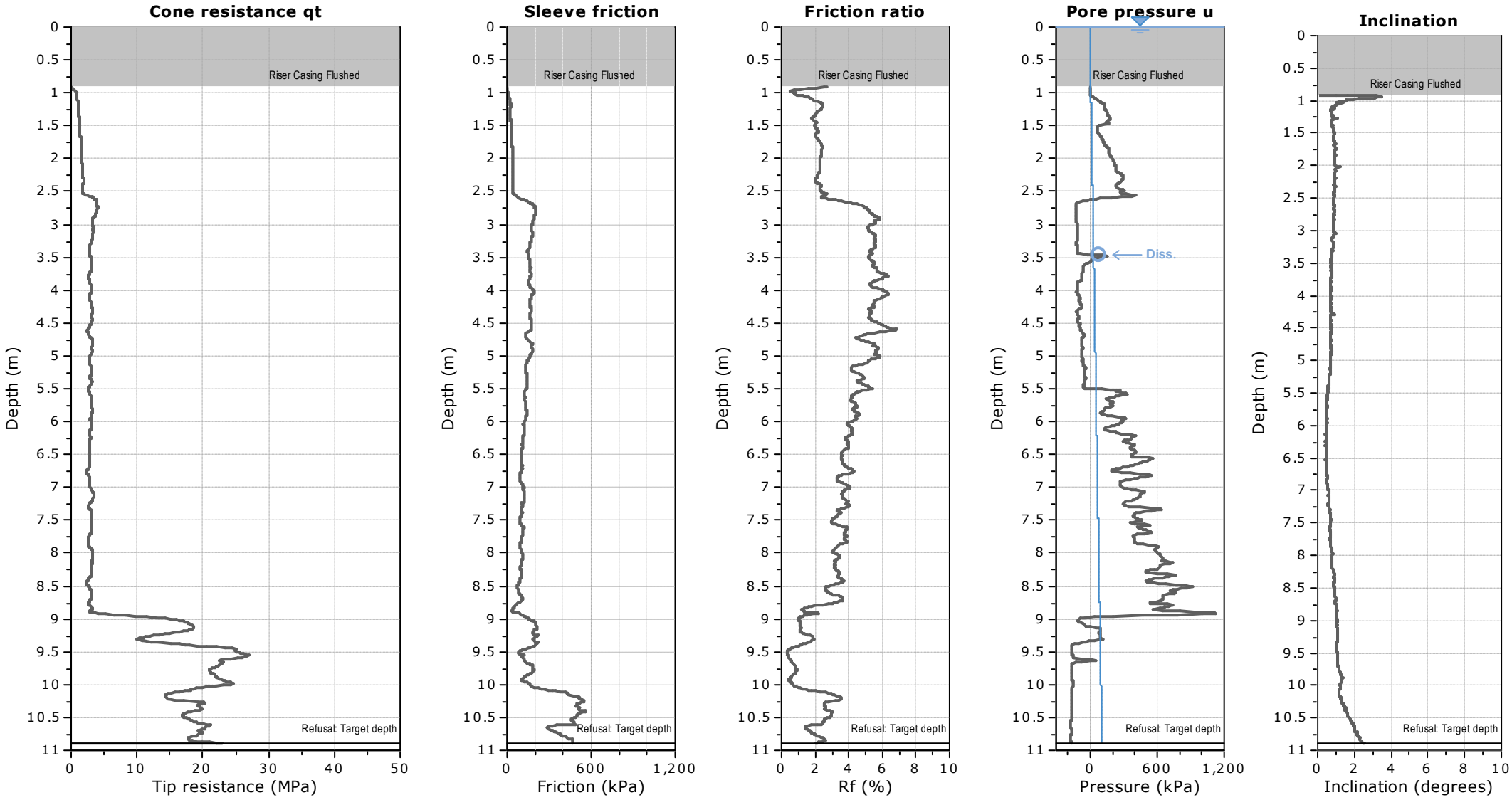
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT24_BH
Total Depth: 10.90 m, Date: 31/01/2024
Surface Elevation (mCD): -5.38 m
Coords: X:712730.03, Y:613038.13
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

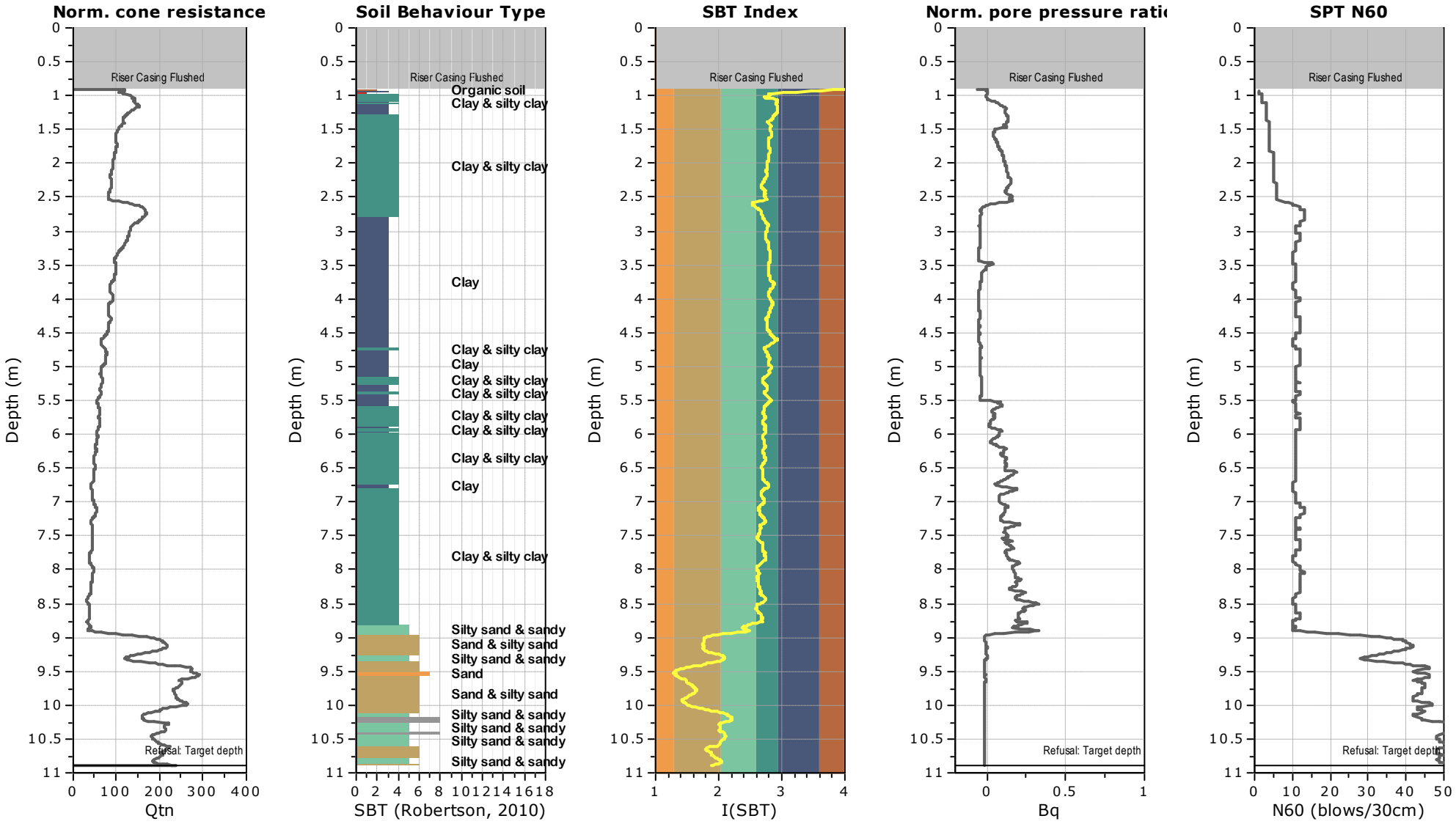
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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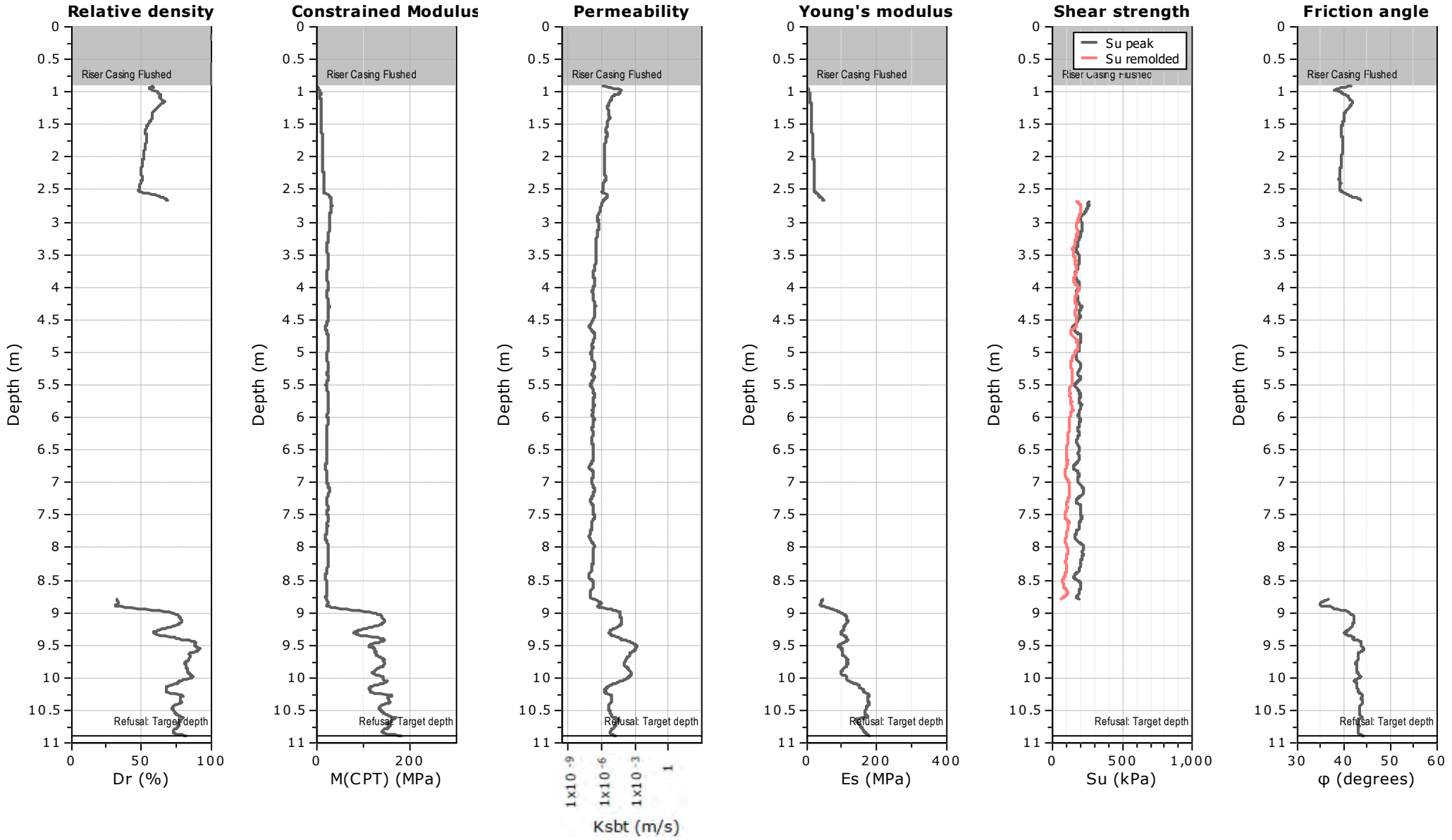
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ

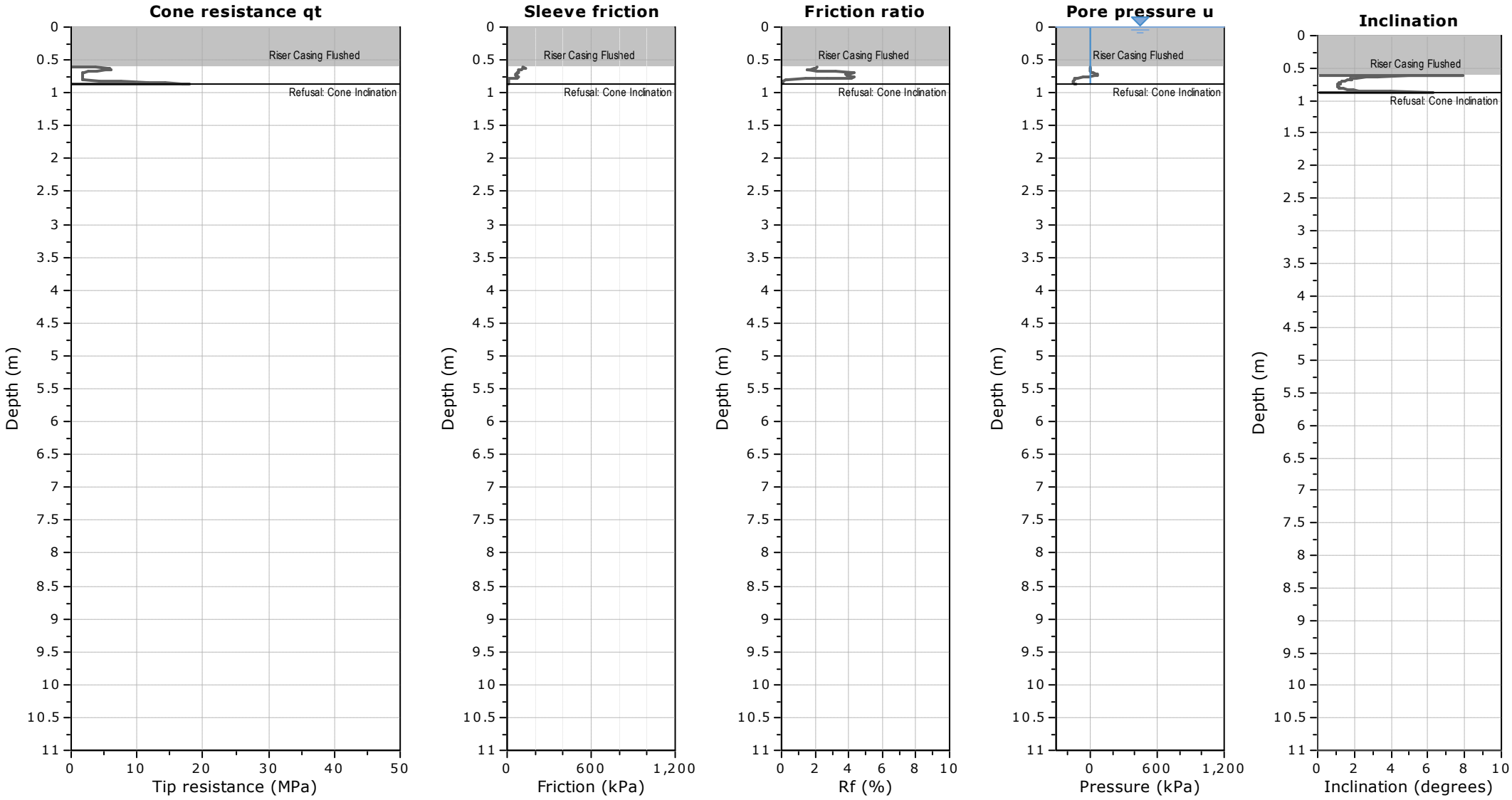
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT26_BH
Total Depth: 0.87 m, Date: 05/01/2024
Surface Elevation (mCD): -4.56 m
Coords: X:712435.00, Y:613029.14
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

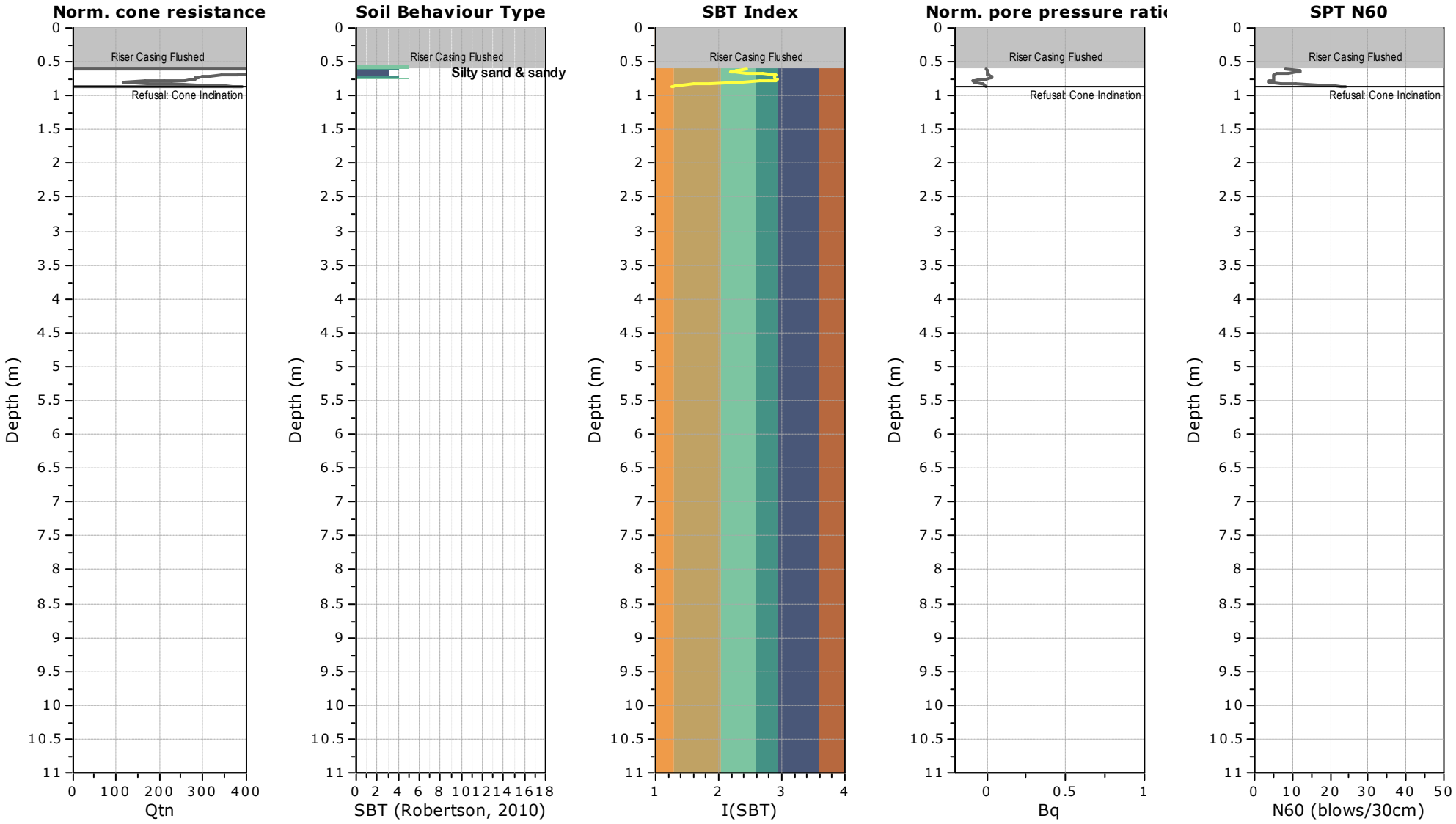
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
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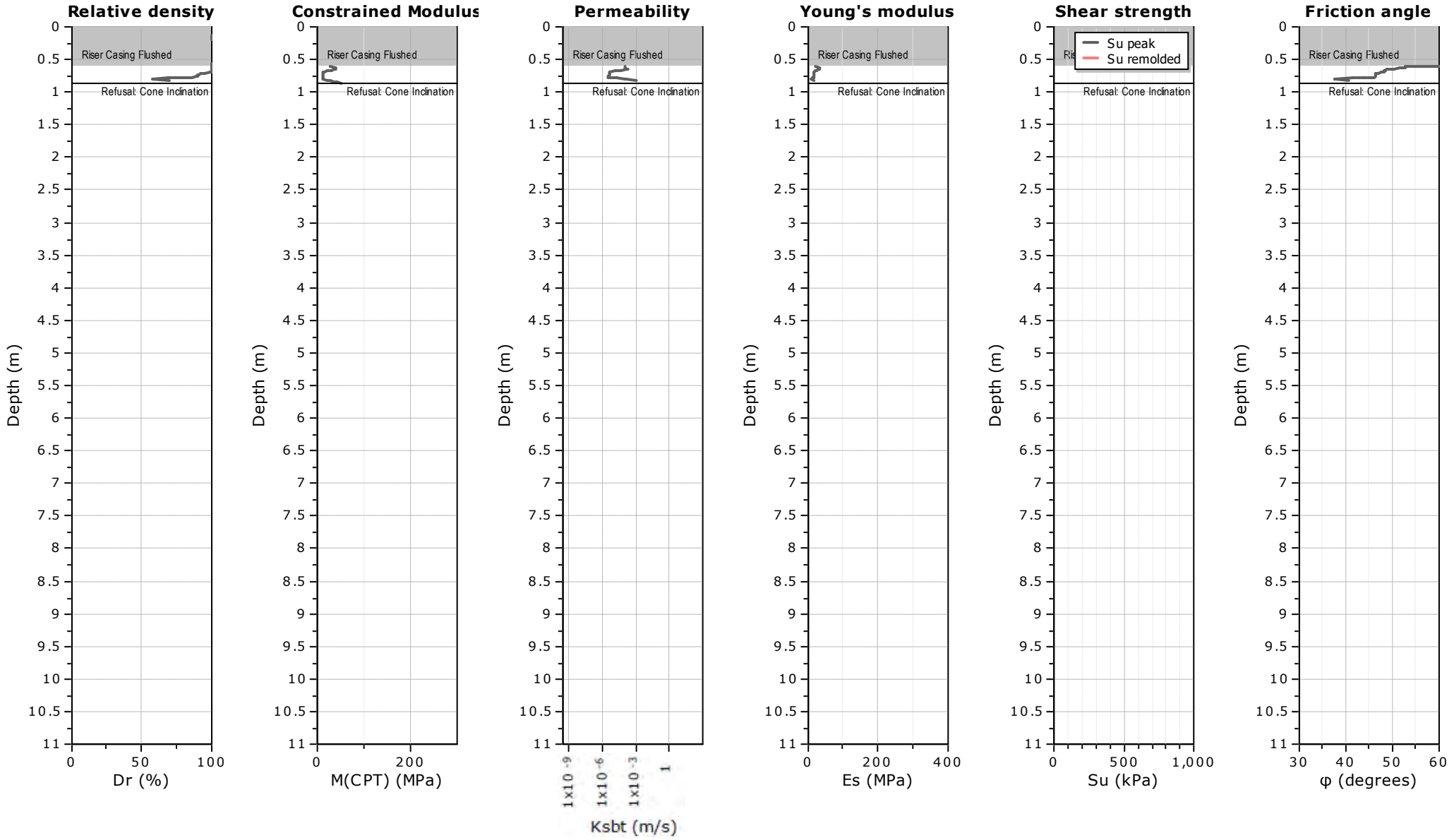
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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App Class: 1 Cone Operator: MK

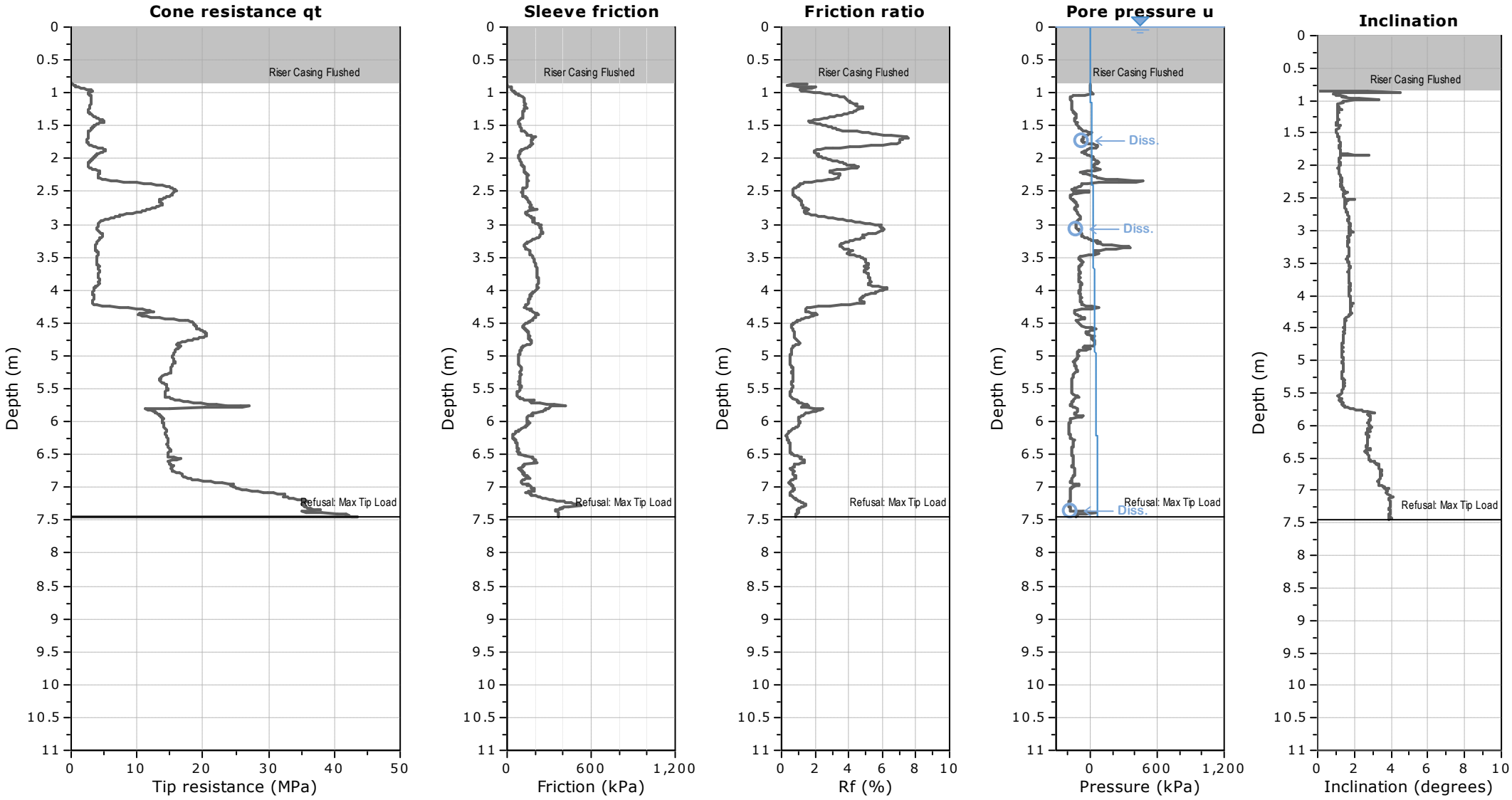
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT27
Total Depth: 7.45 m, Date: 14/02/2024
Surface Elevation (mCD): -6.47 m
Coords: X:713055.00, Y:613231.76
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ / DJ

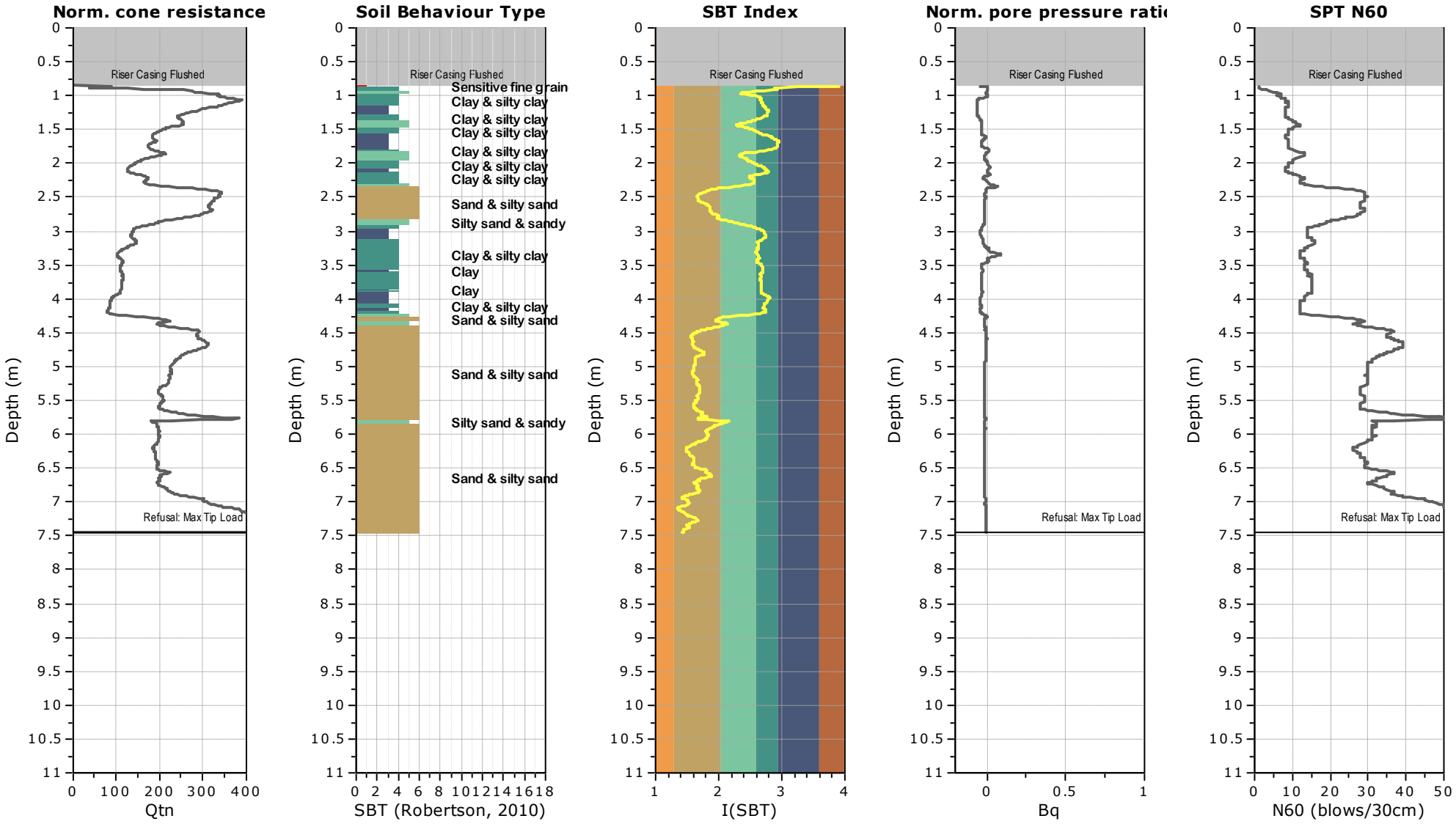
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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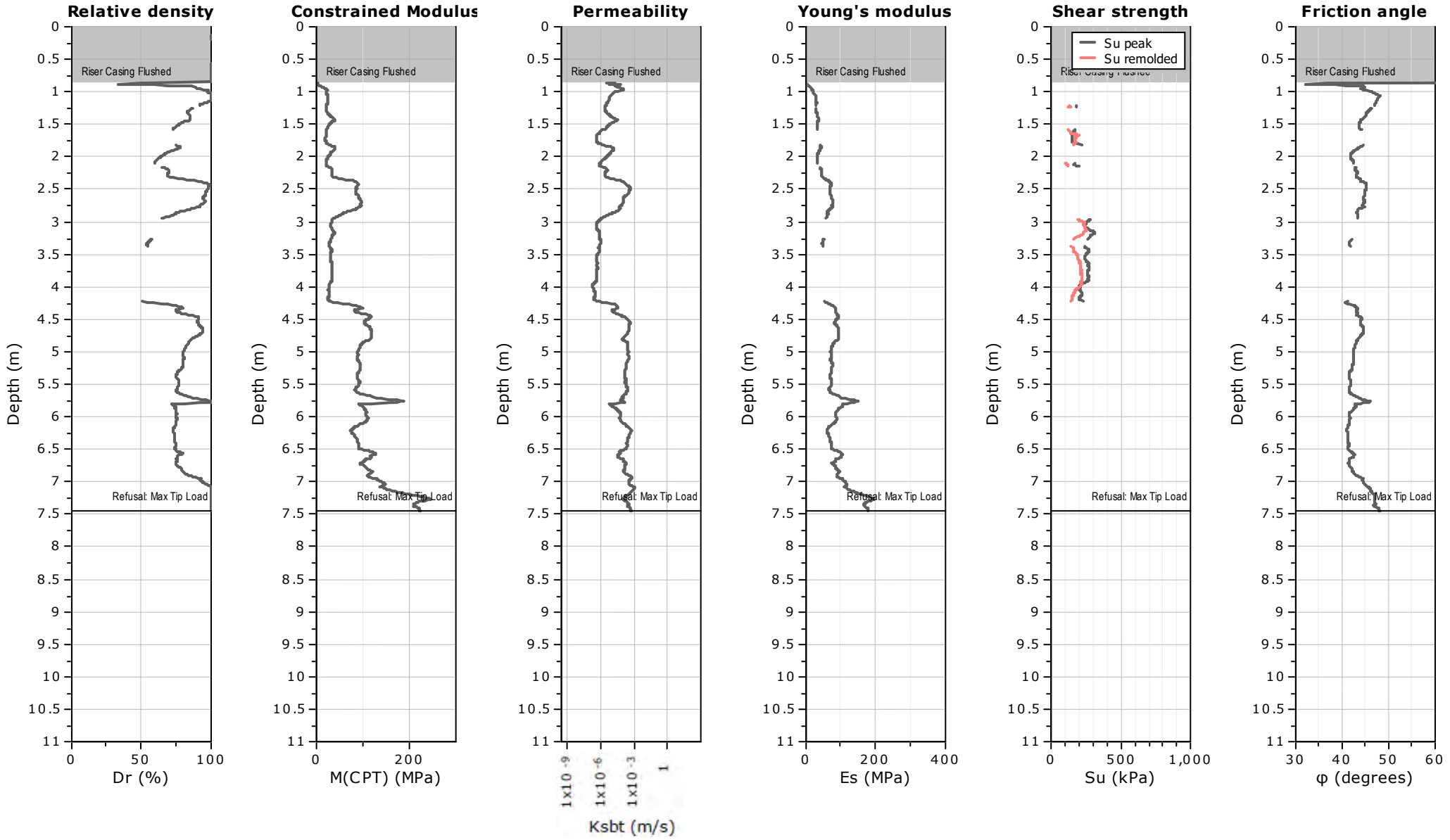
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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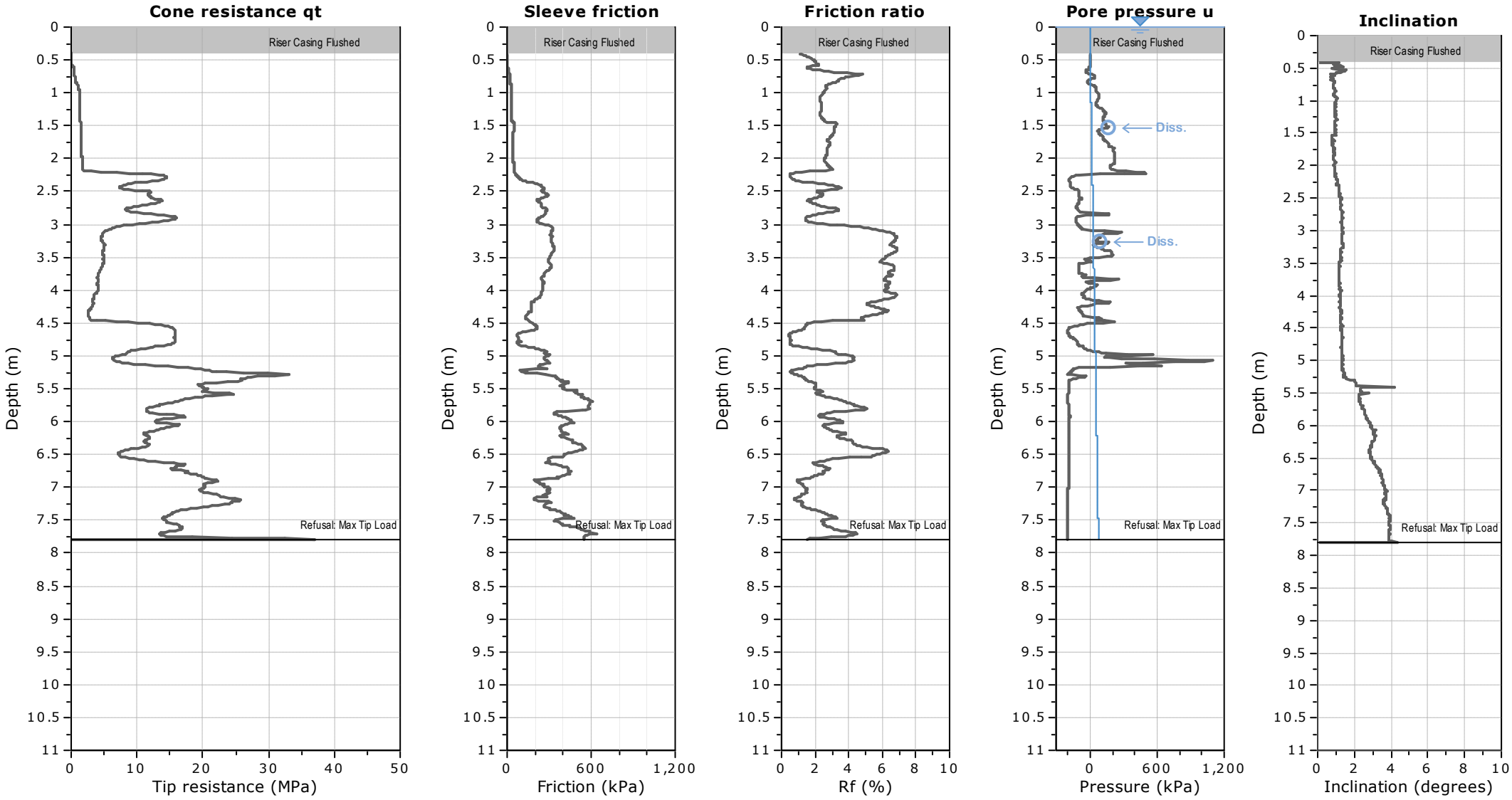
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT33_BH
Total Depth: 7.79 m, Date: 11/02/2024
Surface Elevation (mCD): -6.53 m
Coords: X:713024.22, Y:613163.55
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

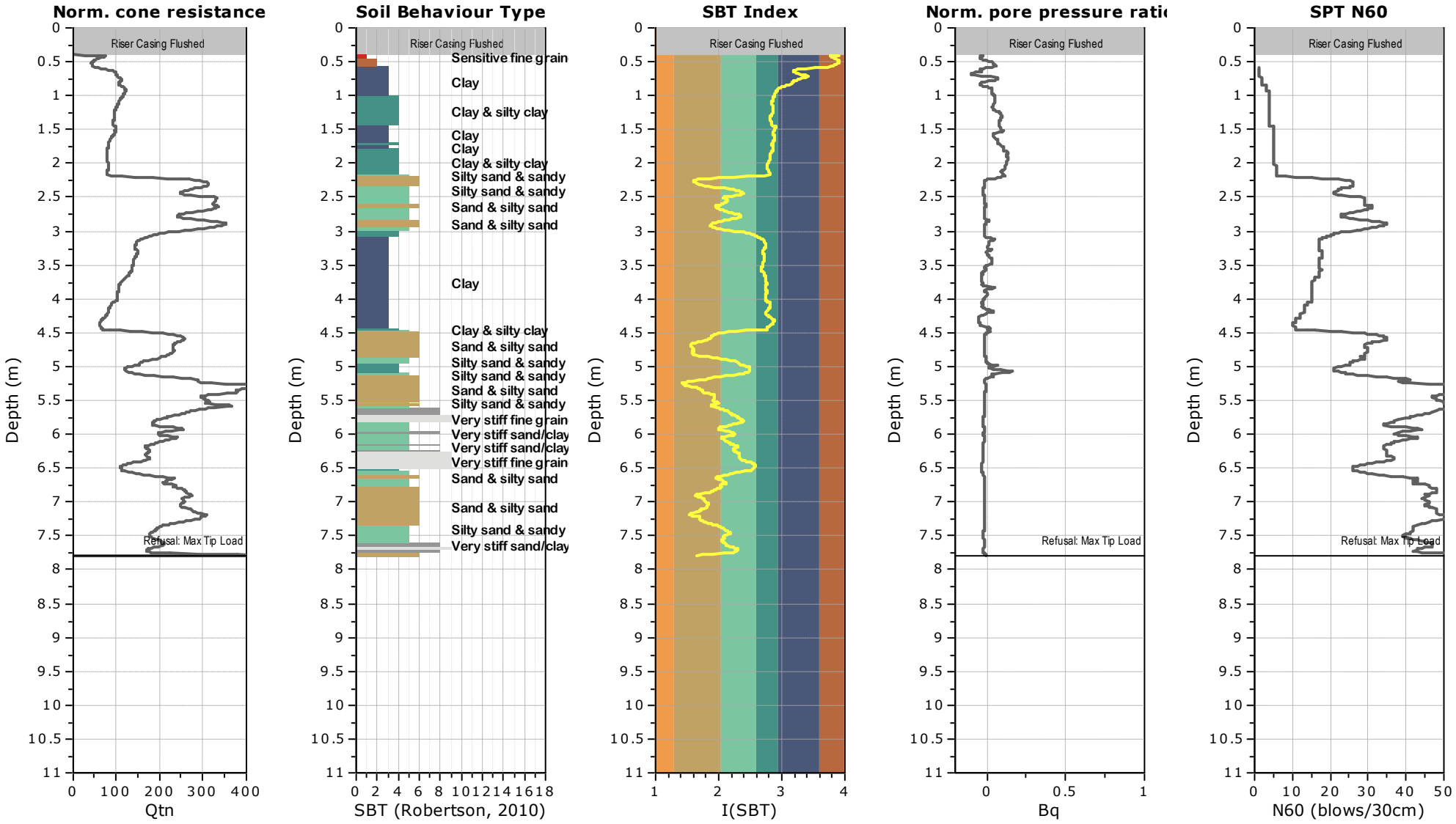
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT33_BH
Total Depth: 7.79 m, Date: 11/02/2024
Surface Elevation (mCD): -6.53 m
Coords: X:713024.22, Y:613163.55
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

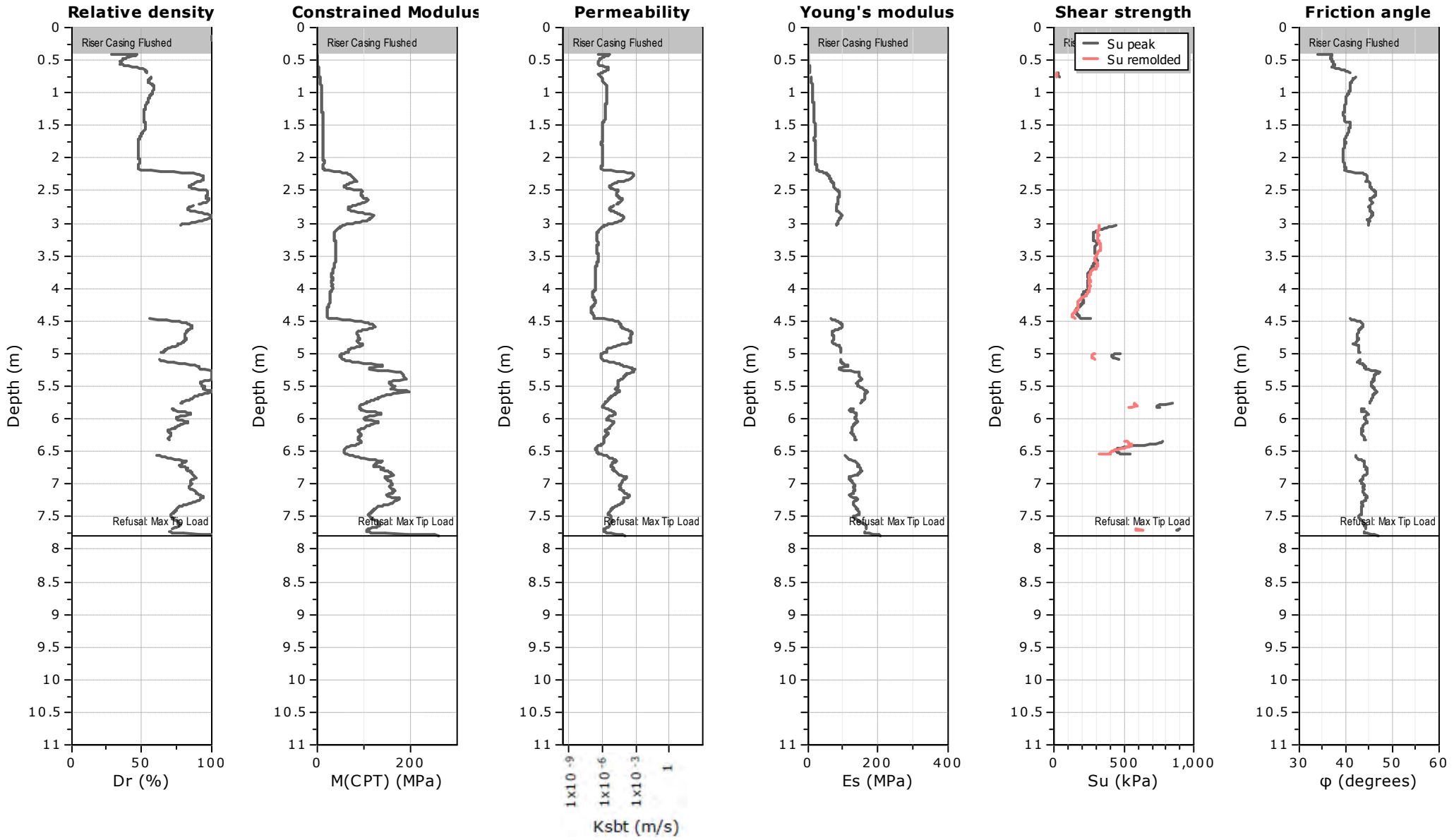
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT33_BH
Total Depth: 7.79 m, Date: 11/02/2024
Surface Elevation (mCD): -6.53 m
Coords: X:713024.22, Y:613163.55
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

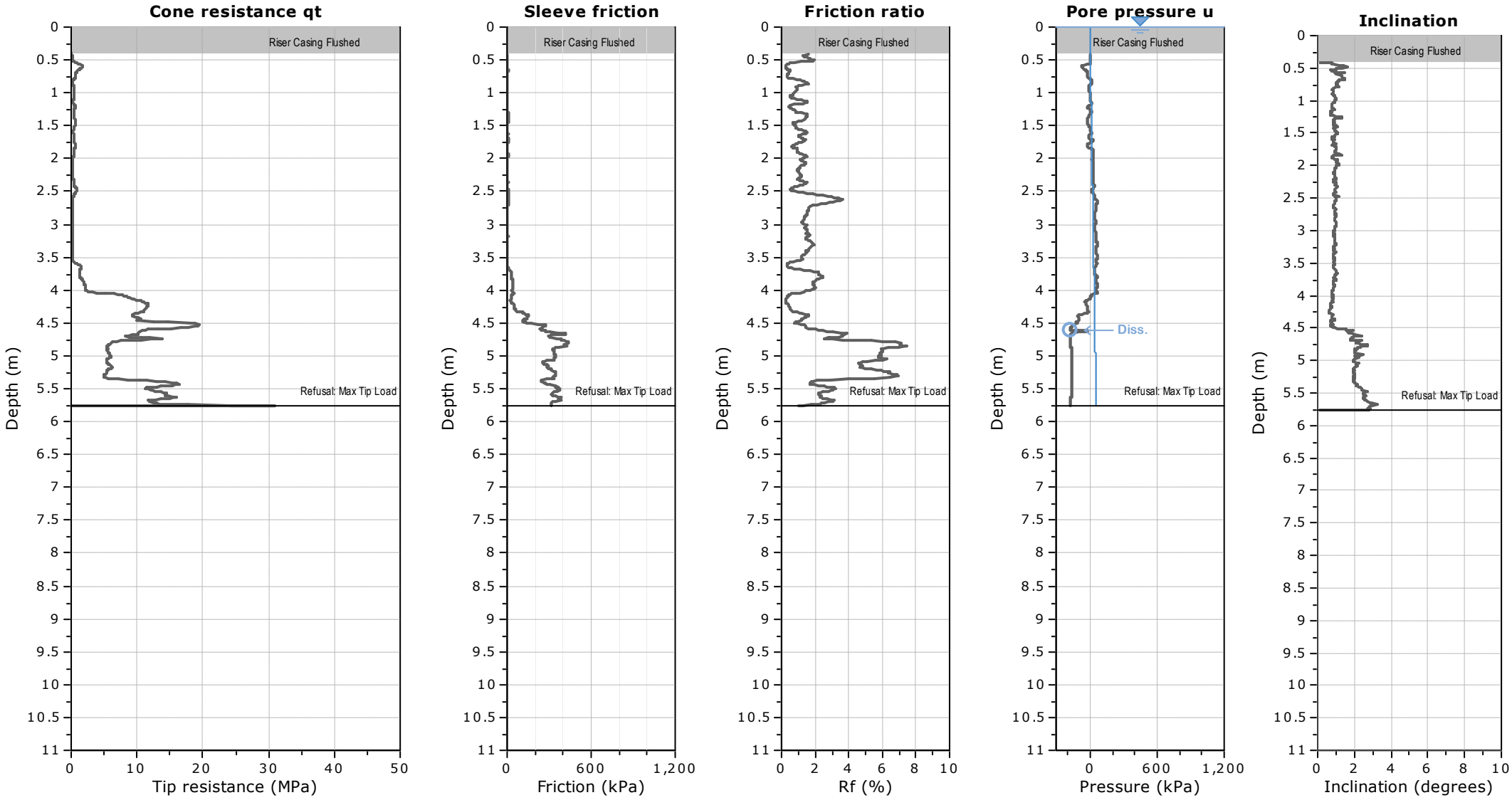
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT38_BH
Total Depth: 5.76 m, Date: 19/12/2023
Surface Elevation (mCD): -4.91 m
Coords: X:713071.21, Y:612910.67
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK/MJ

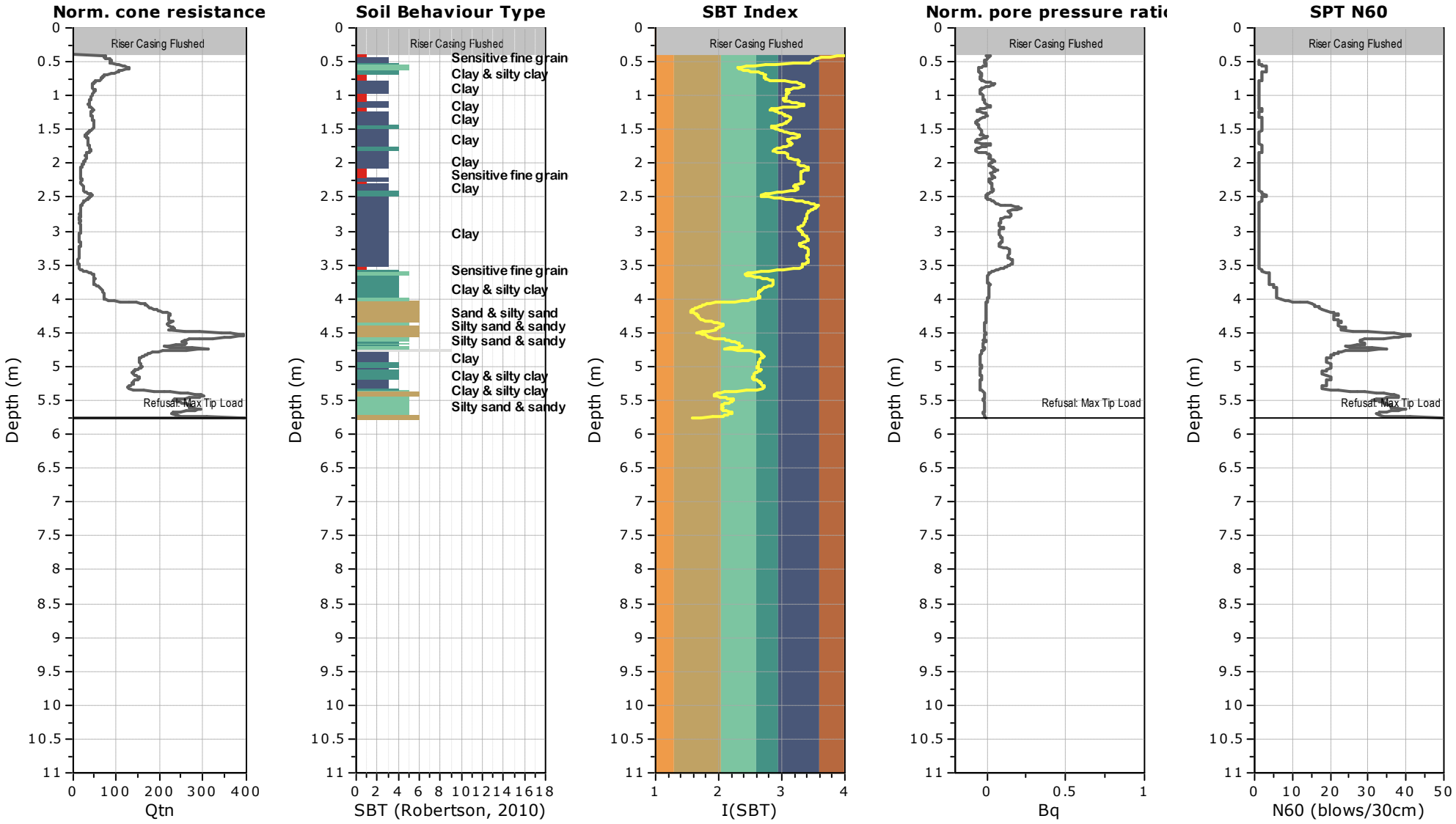
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT38_BH
Total Depth: 5.76 m, Date: 19/12/2023
Surface Elevation (mCD): -4.91 m
Coords: X:713071.21, Y:612910.67
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK/MJ

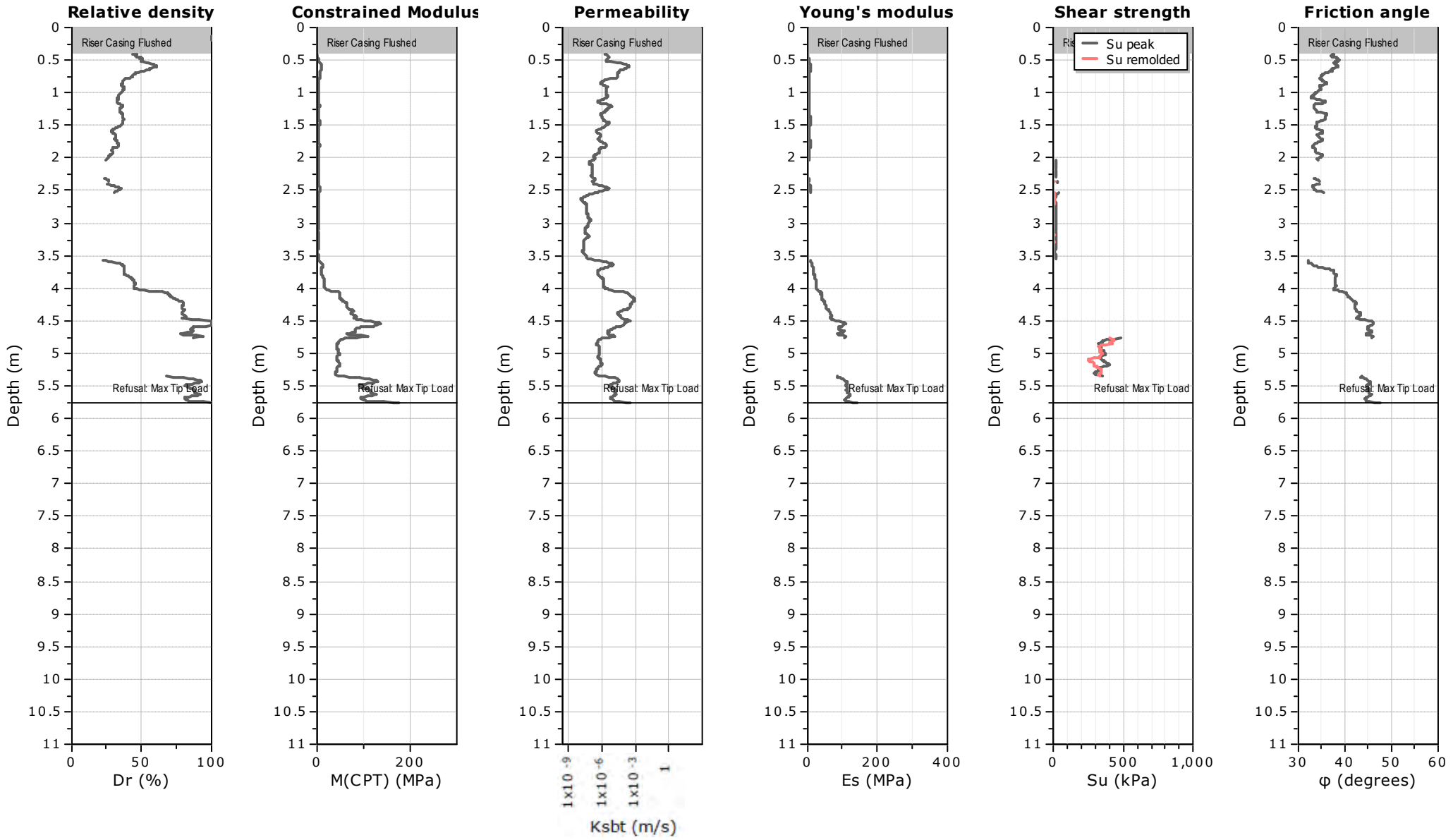
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Surface Elevation (mCD): -4.91 m
Coords: X:713071.21, Y:612910.67
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK/MJ

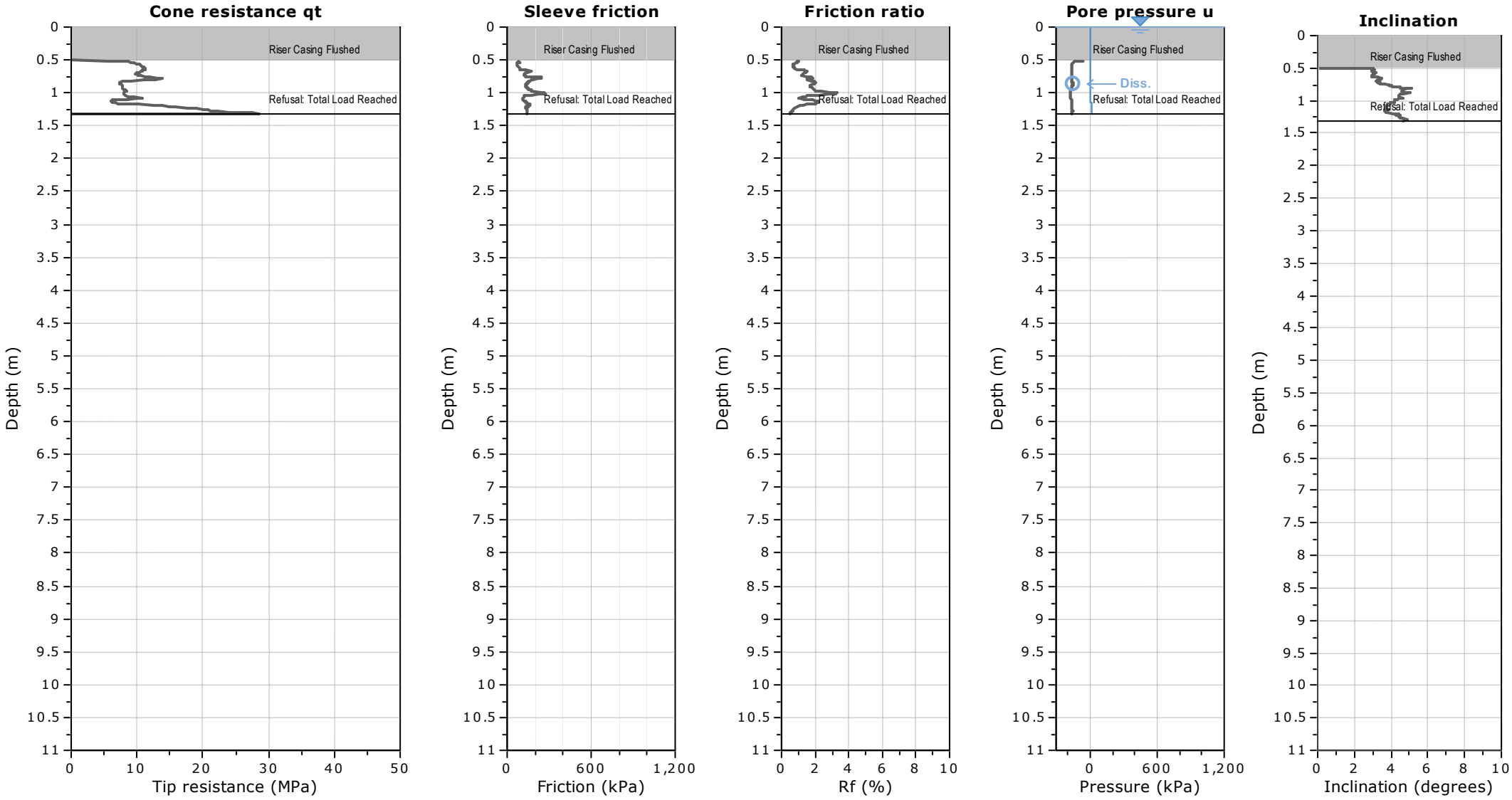
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT39_BH
Total Depth: 1.32 m, Date: 20/12/2023
Surface Elevation (mCD): -4.00 m
Coords: X:713101.66, Y:612785.82
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

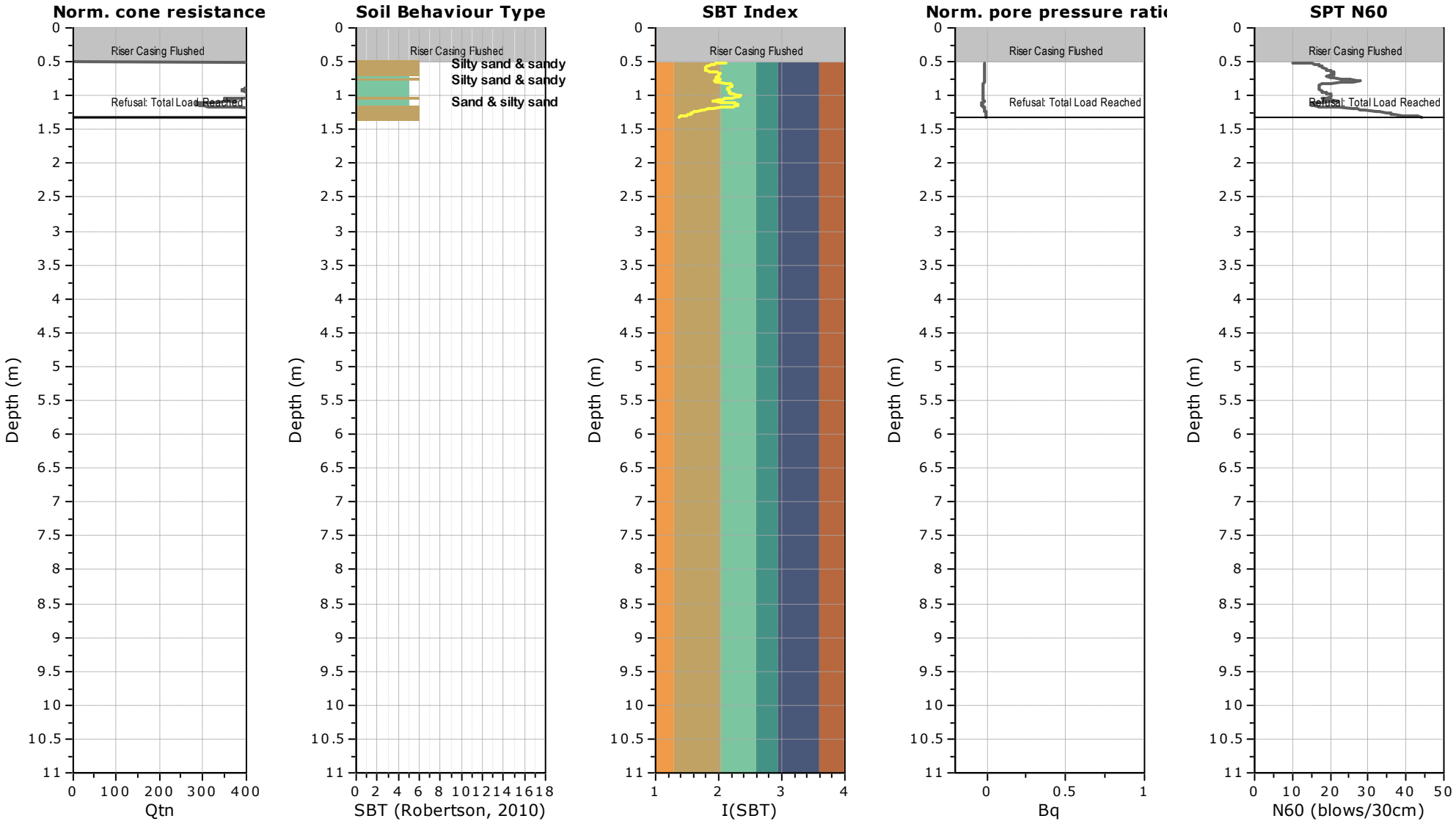
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland

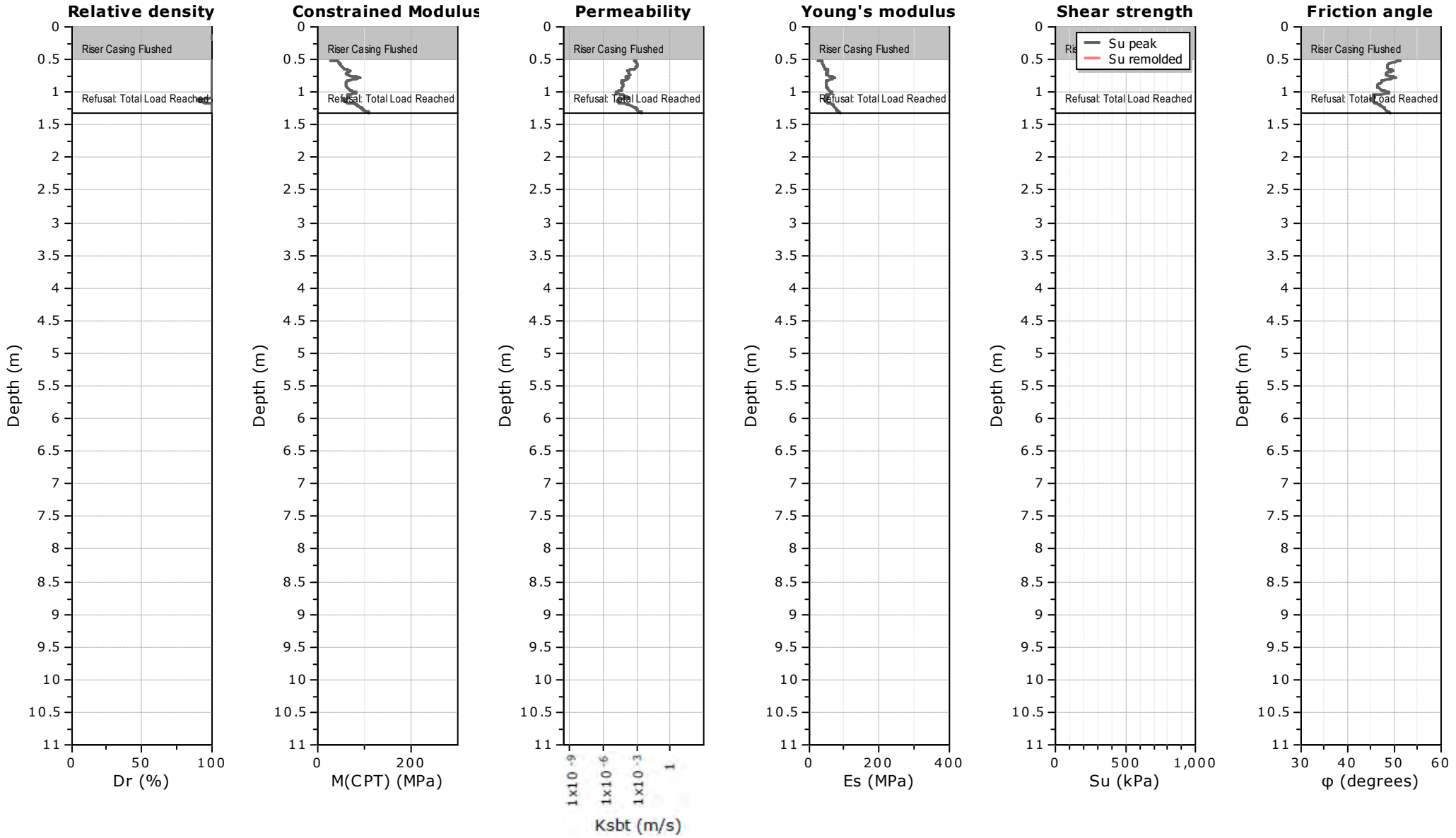
CPT: M-CPT39_BH
Total Depth: 1.32 m, Date: 20/12/2023
Surface Elevation (mCD): -4.00 m
Coords: X:713101.66, Y:612785.82
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK



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CPT: M-CPT39_BH
Total Depth: 1.32 m, Date: 20/12/2023
Surface Elevation (mCD): -4.00 m
Coords: X:713101.66, Y:612785.82
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MK

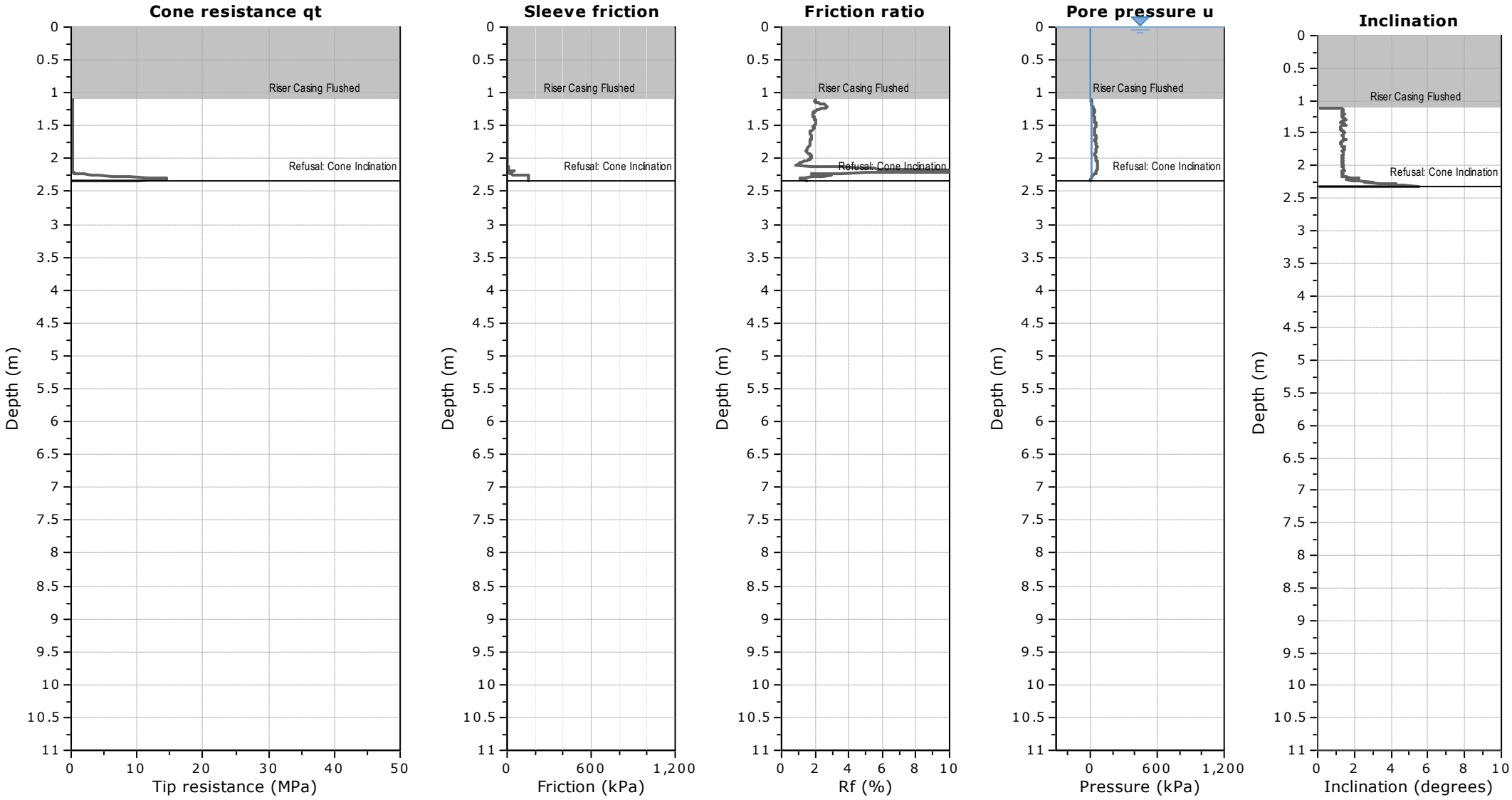
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT40
Total Depth: 2.33 m, Date: 14/02/2024
Surface Elevation (mCD): -5.36 m
Coords: X:713222.22, Y:612803.66
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

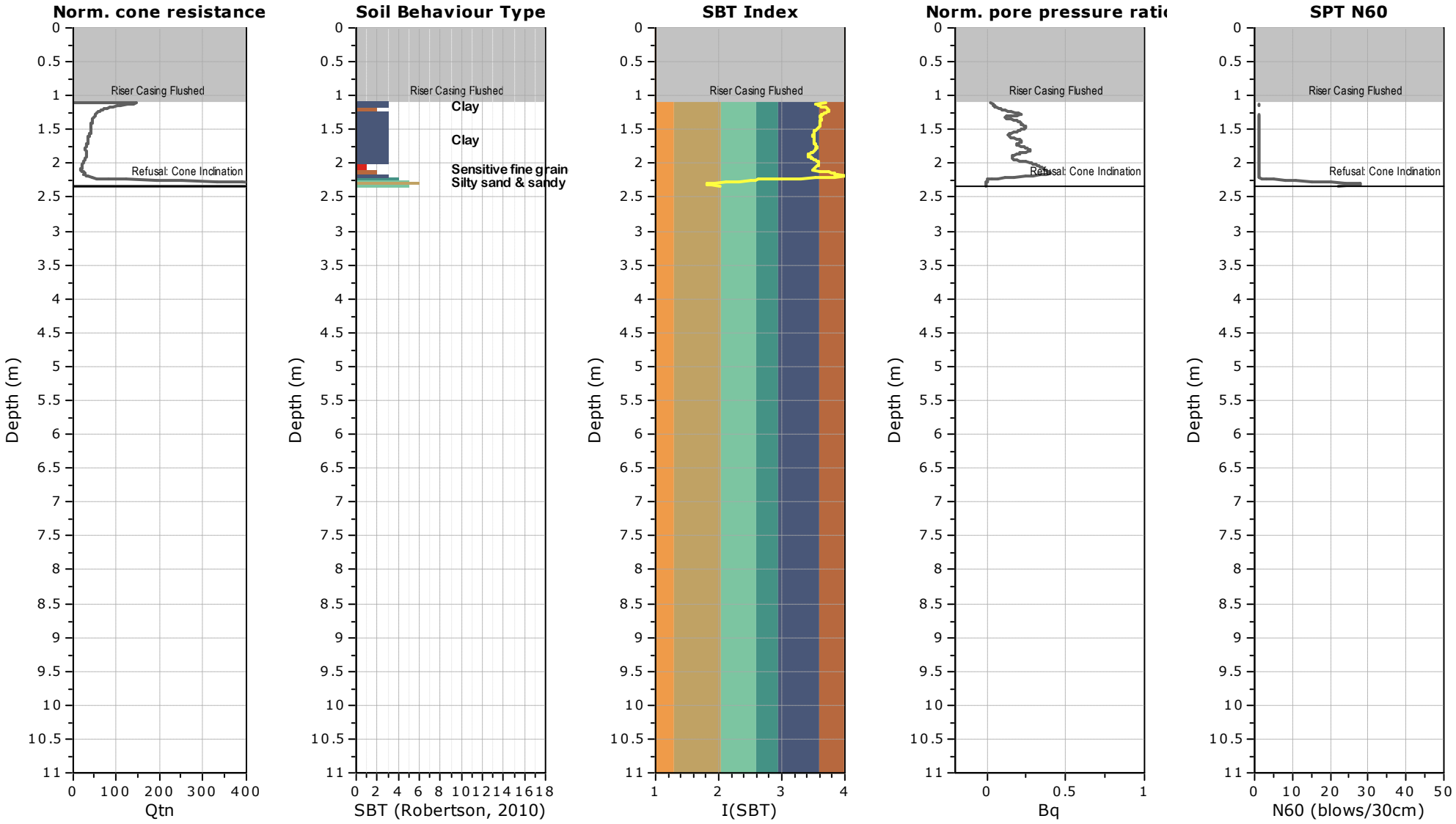
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Total Depth: 2.33 m, Date: 14/02/2024
Surface Elevation (mCD): -5.36 m
Coords: X:713222.22, Y:612803.66
Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

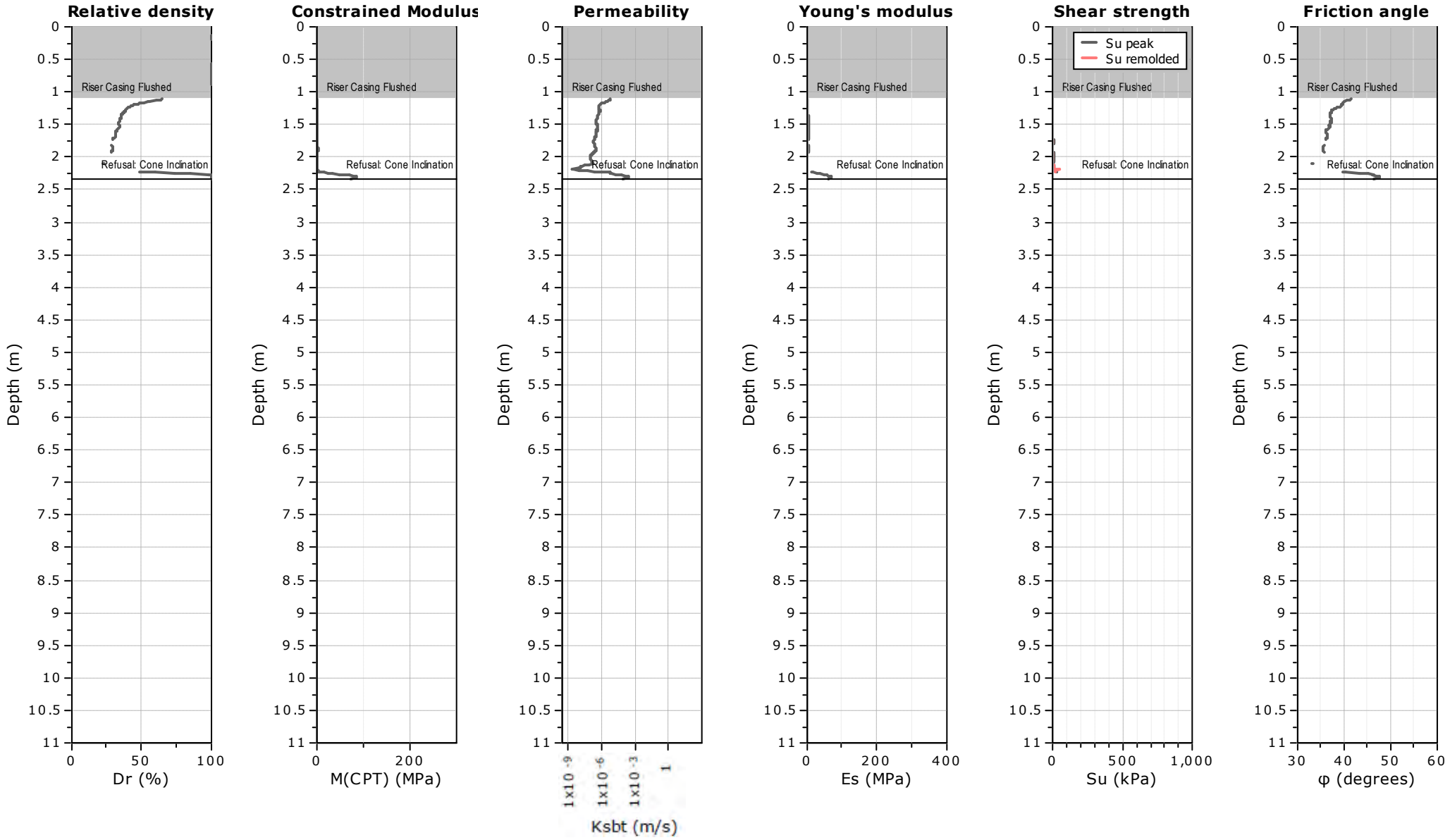
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Cone Type: S15-CFIP2272
App Class: 1 Cone Operator: MJ/ DJ

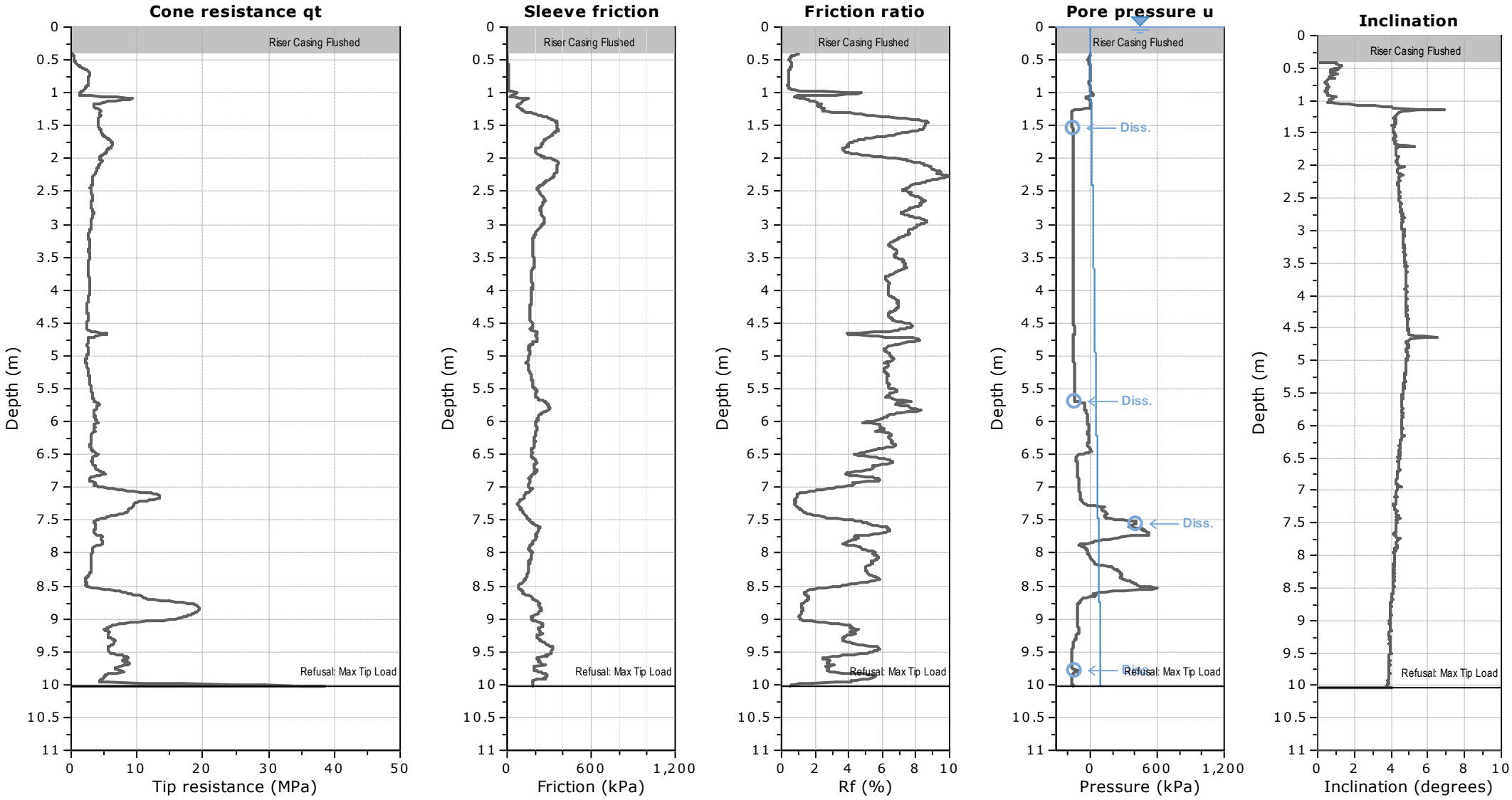
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT41_BH
Total Depth: 10.03 m, Date: 16/02/2024
Surface Elevation (mCD): -4.85 m
Coords: X:712918.05, Y:613005.92
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MJ/ DJ

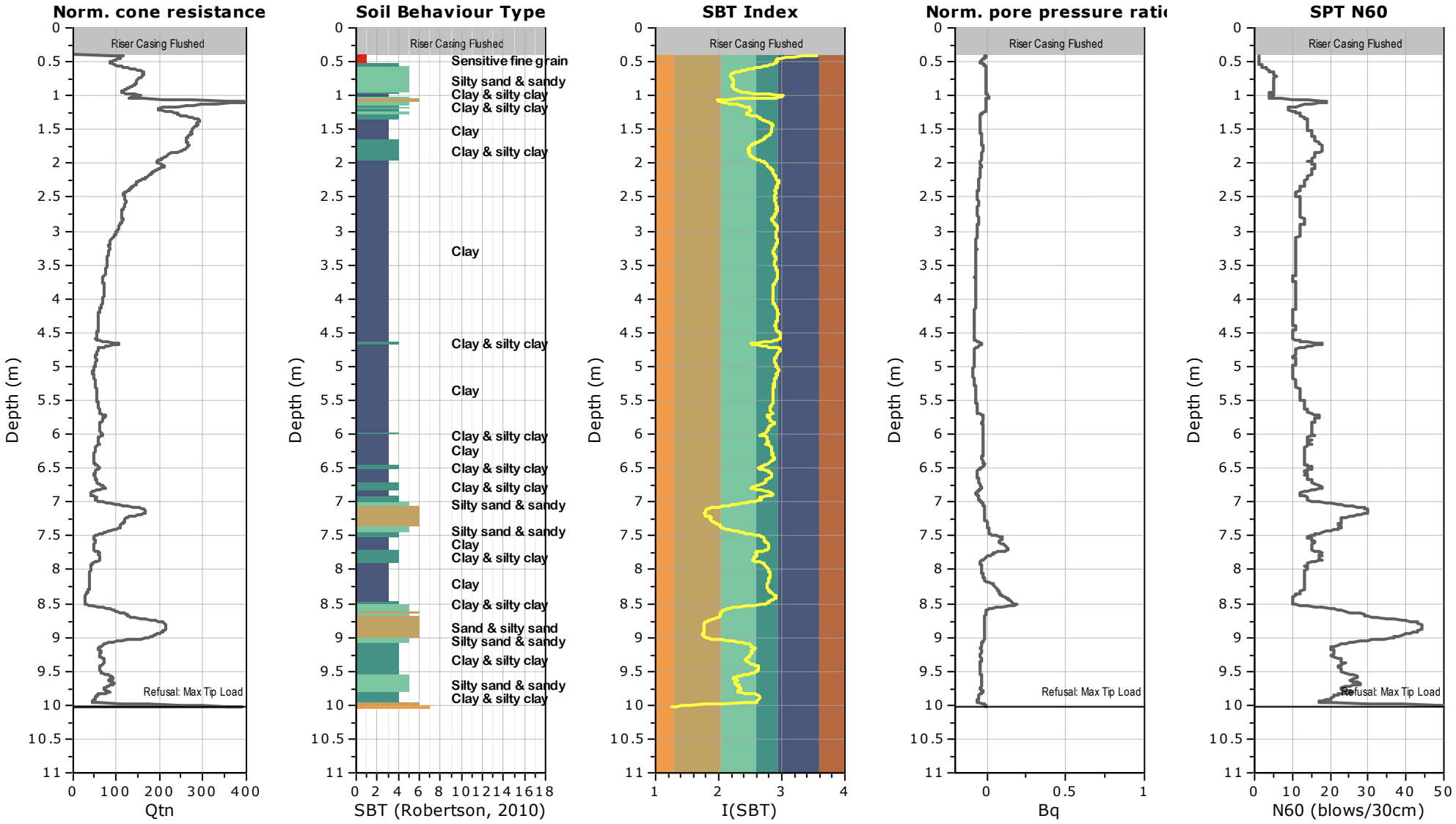
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Surface Elevation (mCD): -4.85 m
Coords: X:712918.05, Y:613005.92
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MJ/ DJ

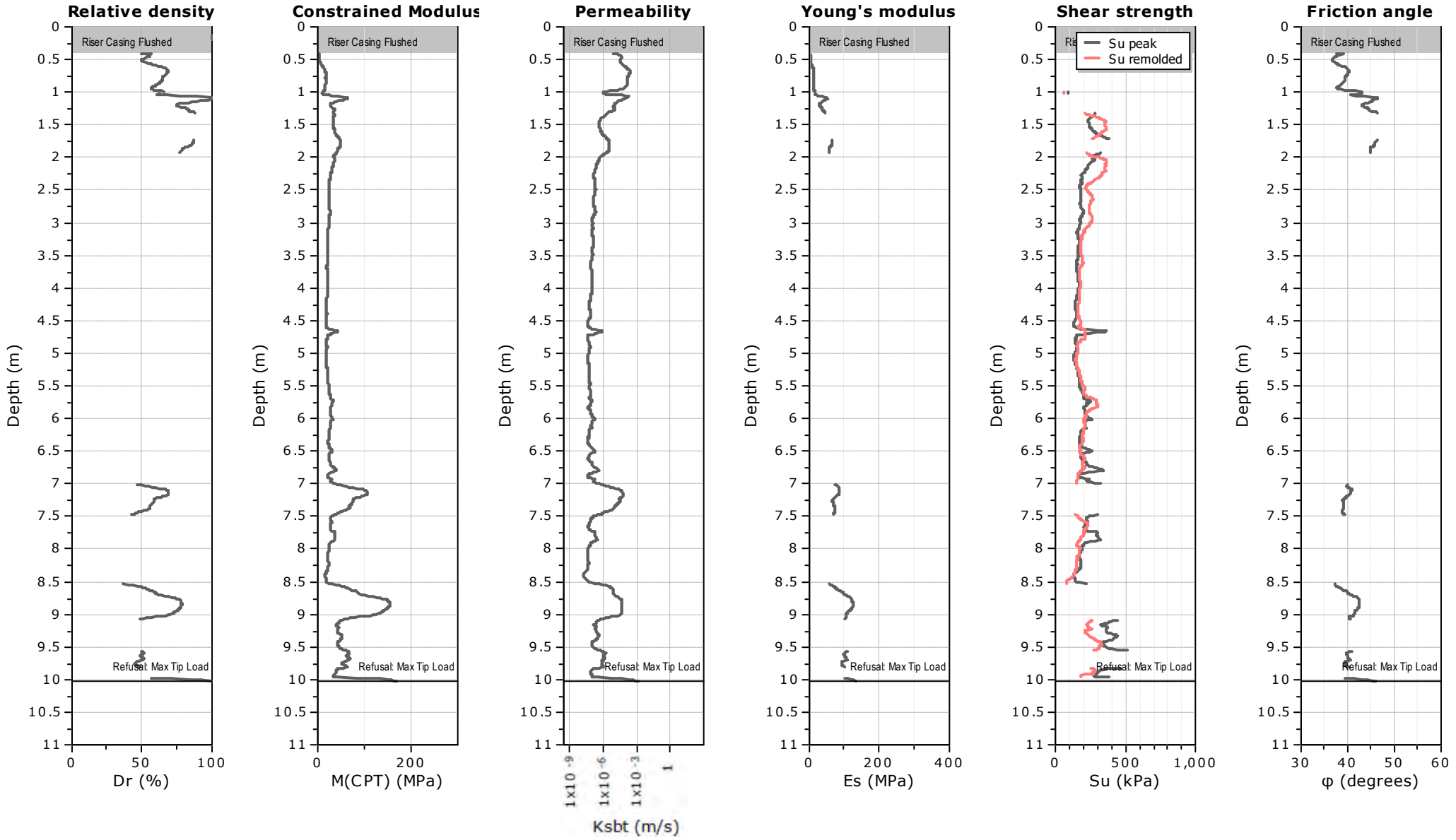
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Coords: X:712918.05, Y:613005.92
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MJ/ DJ

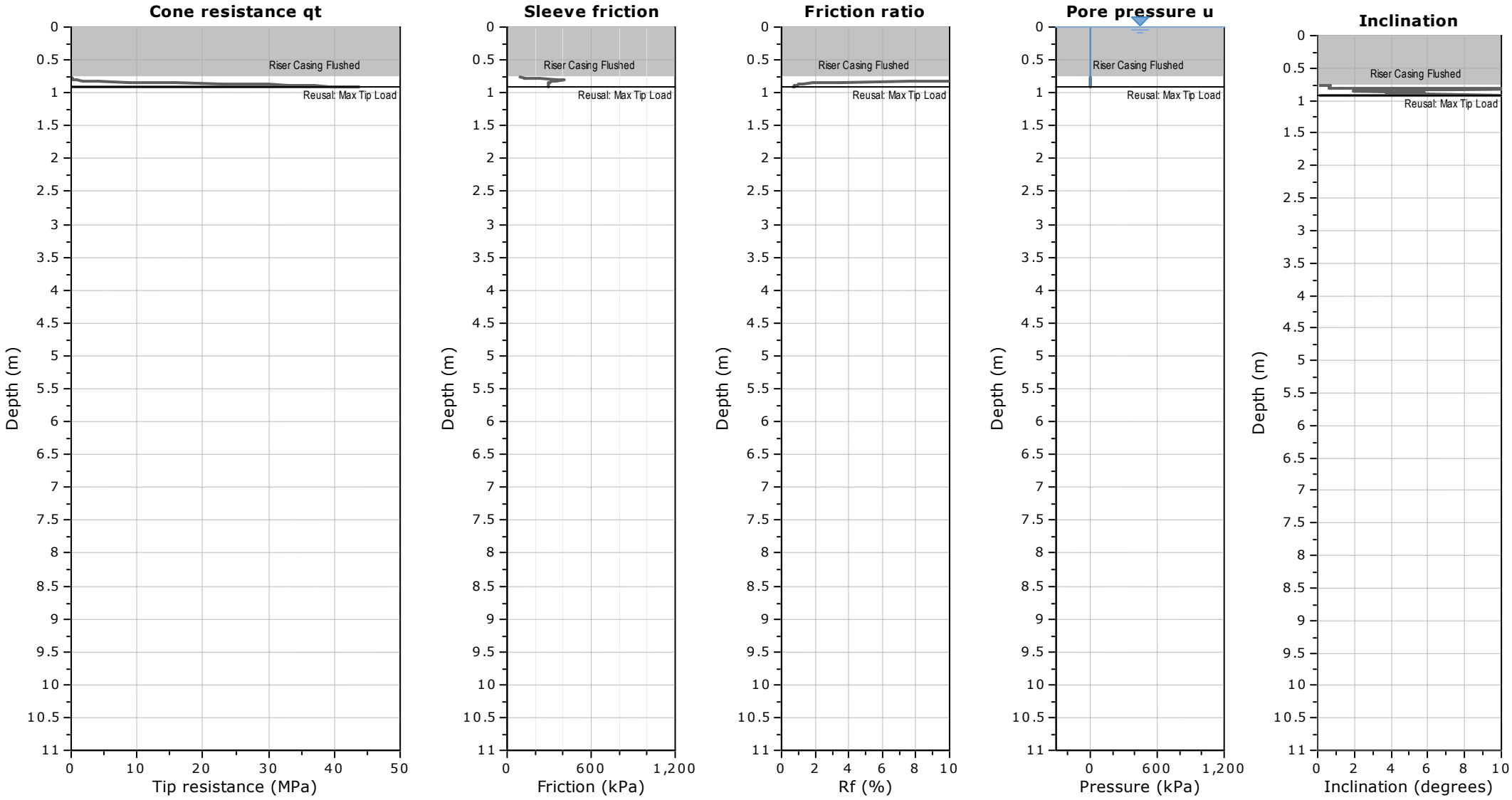
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT25a
Total Depth: 0.92 m, Date: 27/02/2024
Surface Elevation (mCD): 0.00 m
Coords: X:713285.97, Y:613318.82
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ SW

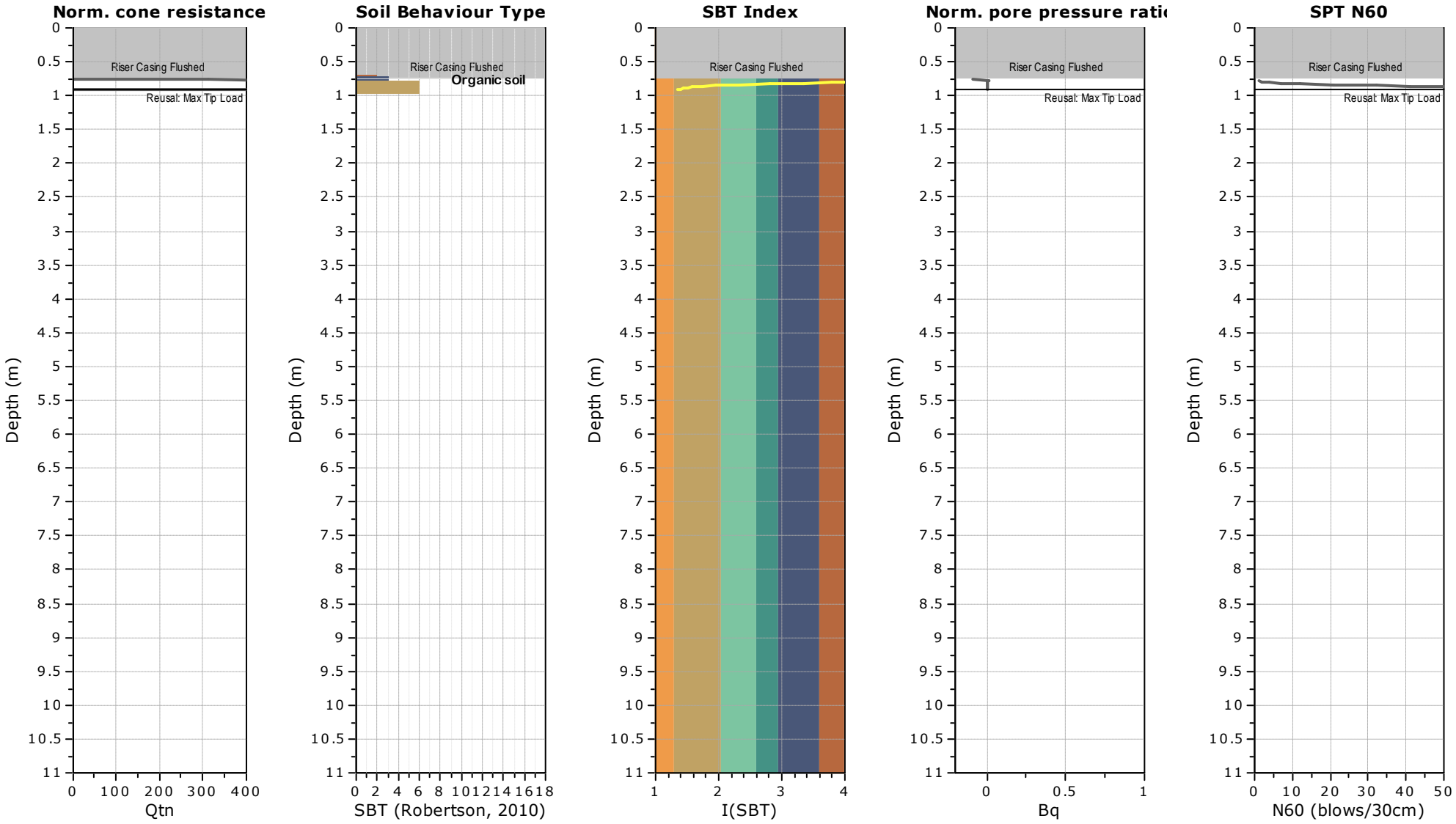
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT25a
Total Depth: 0.92 m, Date: 27/02/2024
Surface Elevation (mCD): 0.00 m
Coords: X:713285.97, Y:613318.82
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ SW

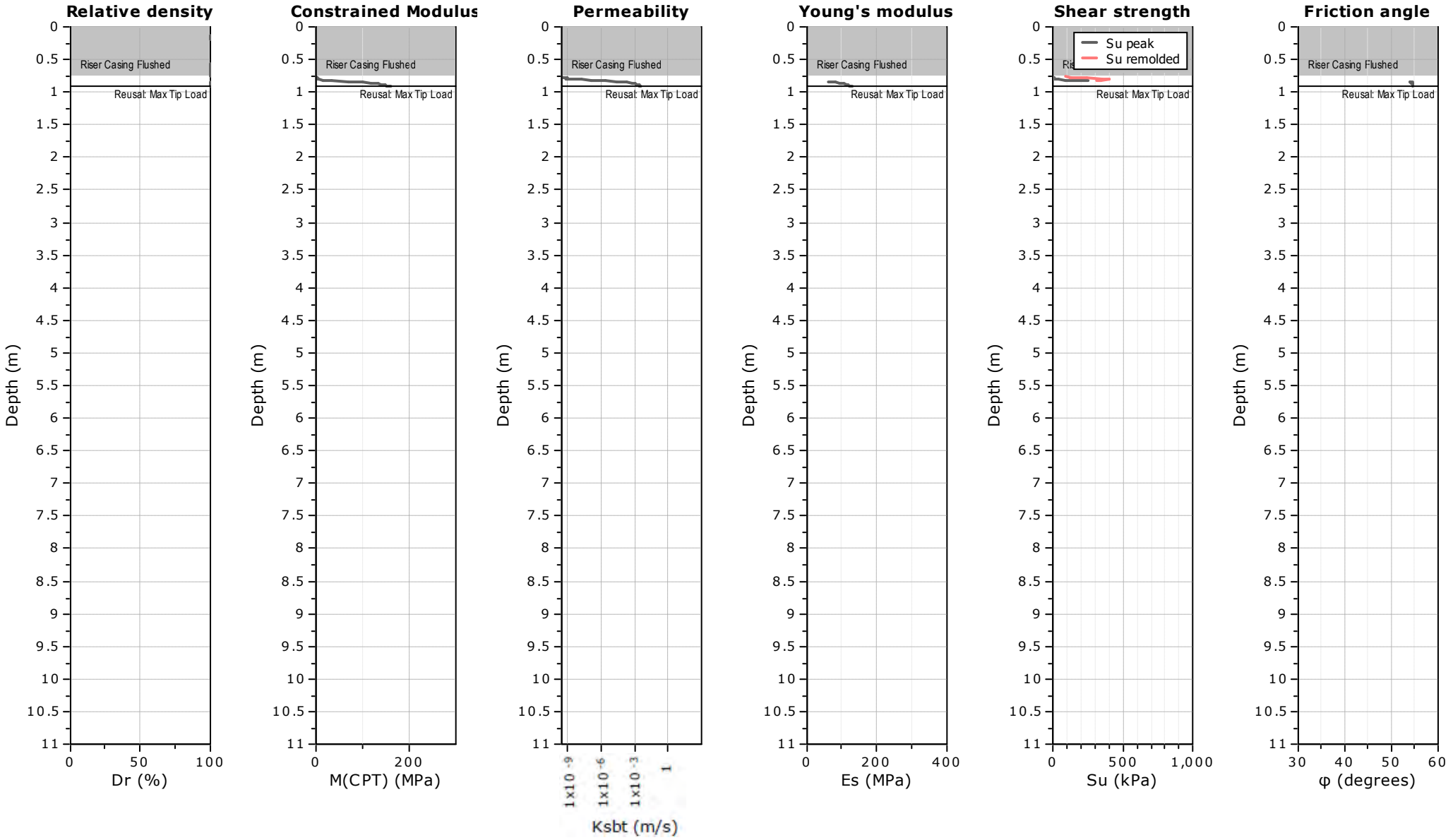
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT25a
Total Depth: 0.92 m, Date: 27/02/2024
Surface Elevation (mCD): 0.00 m
Coords: X:713285.97, Y:613318.82
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ SW

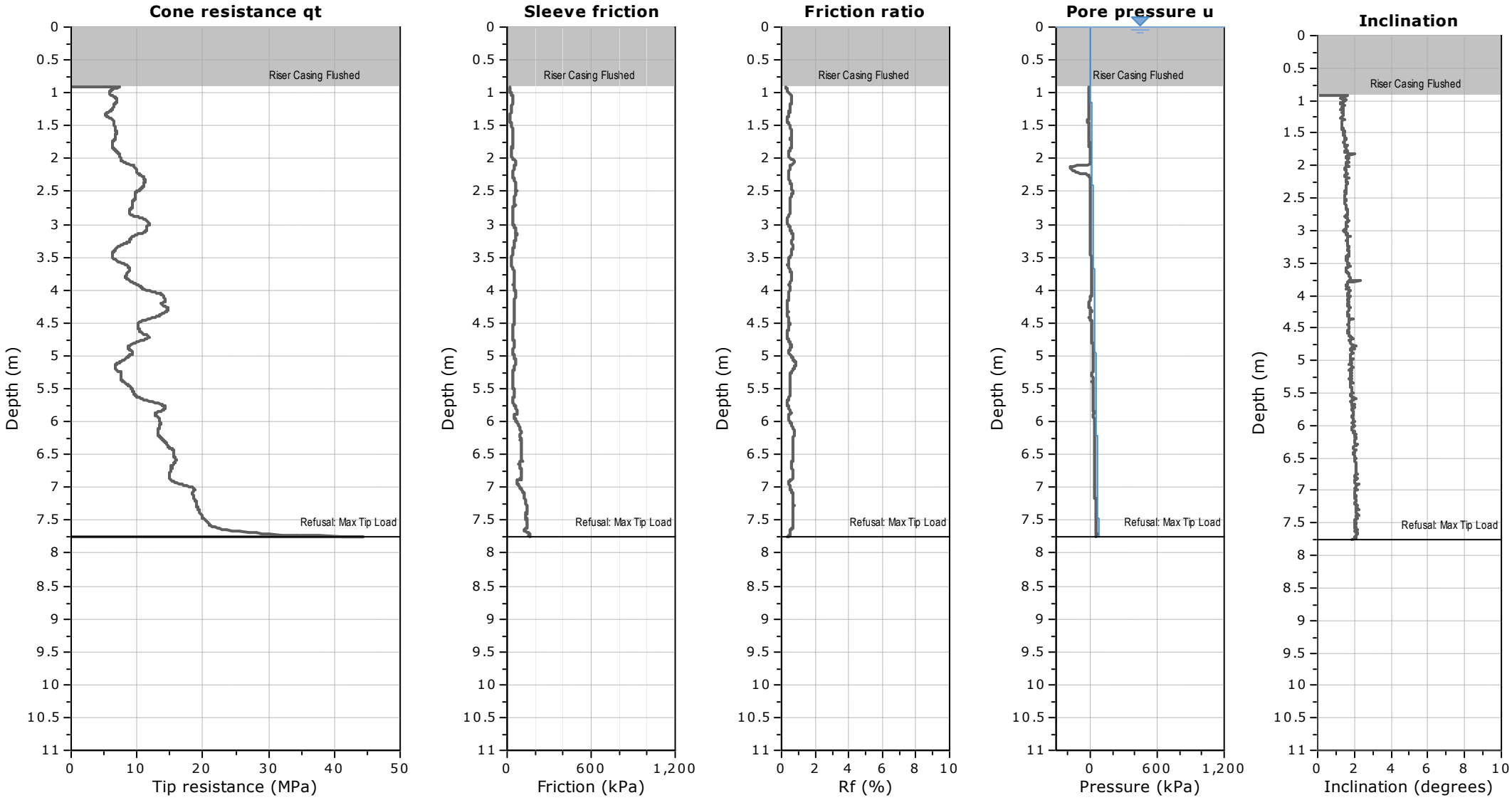
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

CPT: M-CPT06
Total Depth: 7.76 m, Date: 27/02/2024
Surface Elevation (mCD): -9.47 m
Coords: X:713435.10, Y:613372.32
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ SW

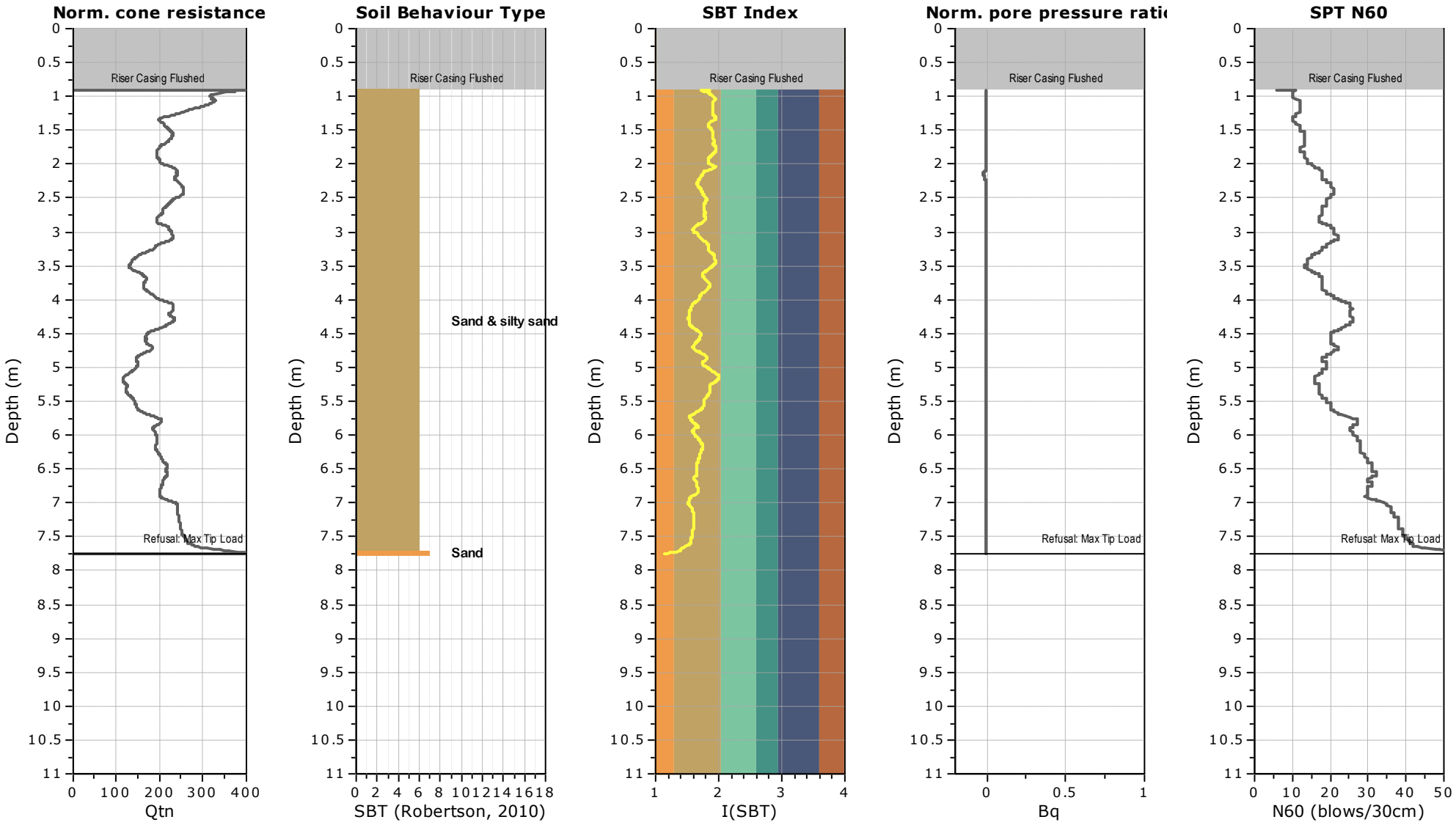
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland

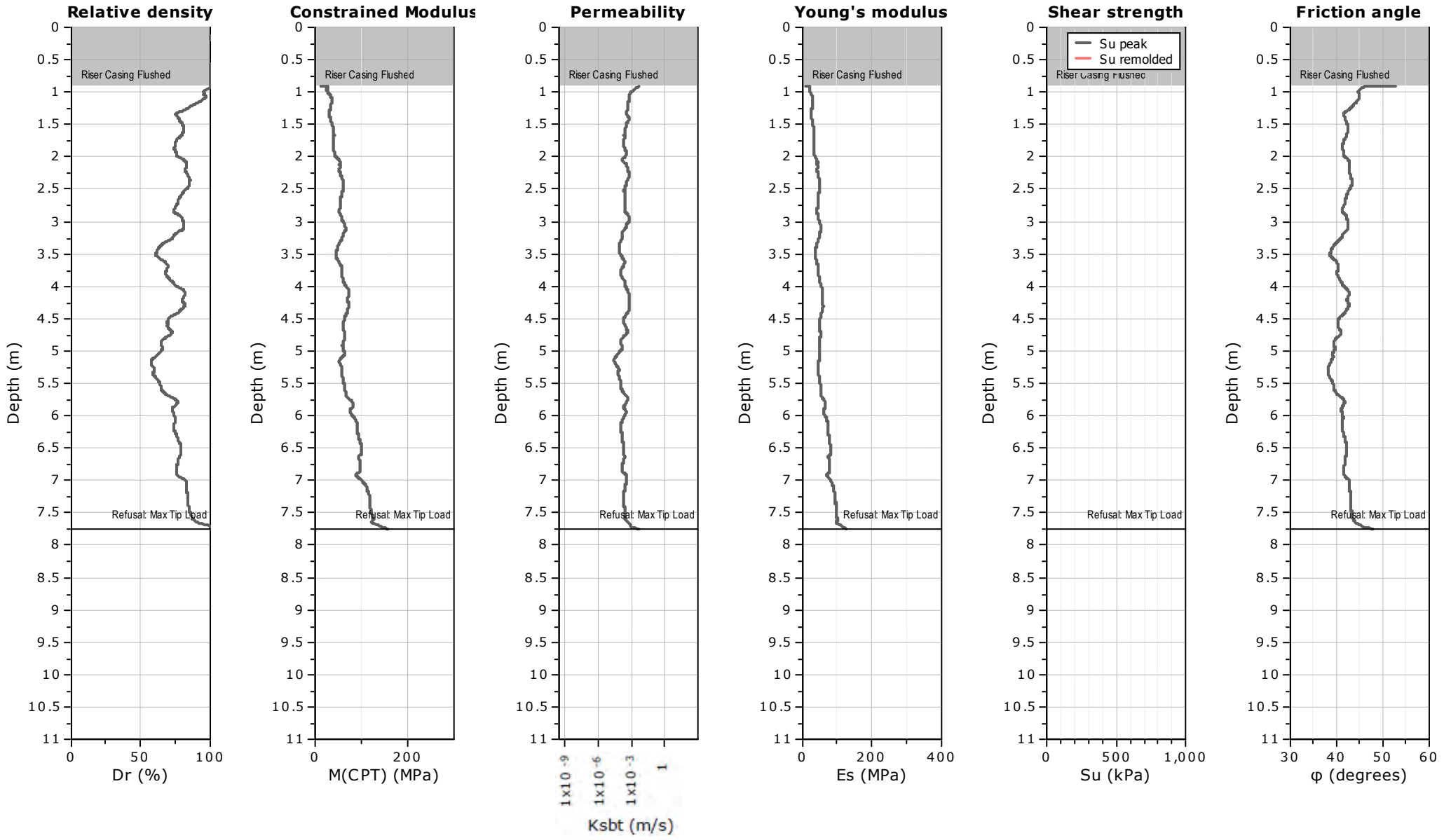
CPT: M-CPT06
Total Depth: 7.76 m, Date: 27/02/2024
Surface Elevation (mCD): -9.47 m
Coords: X:713435.10, Y:613372.32
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ SW



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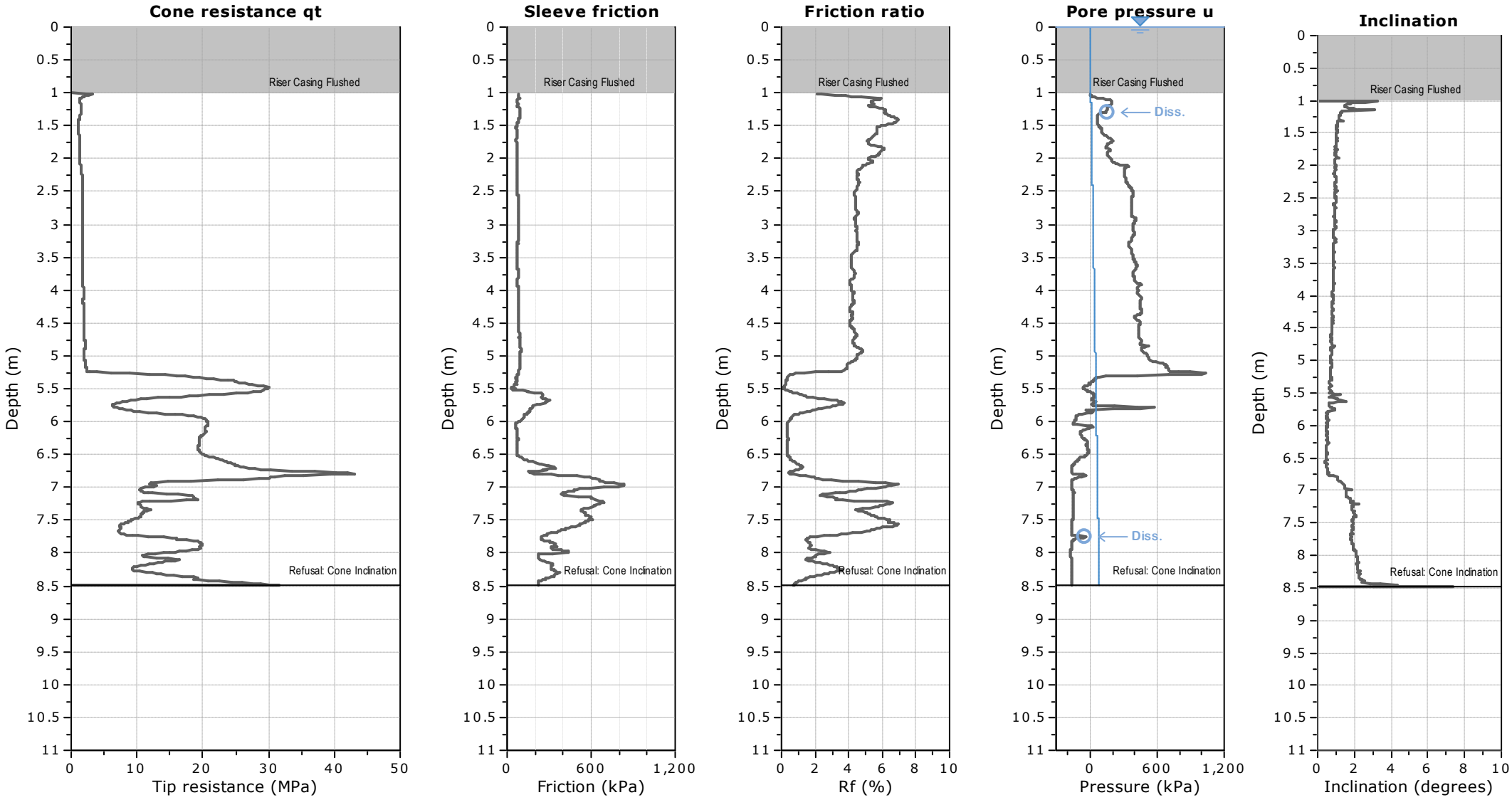
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT35
Total Depth: 8.49 m, Date: 20/02/2024
Surface Elevation (mCD): -5.53 m
Coords: X:712955.46, Y:613201.83
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ RW

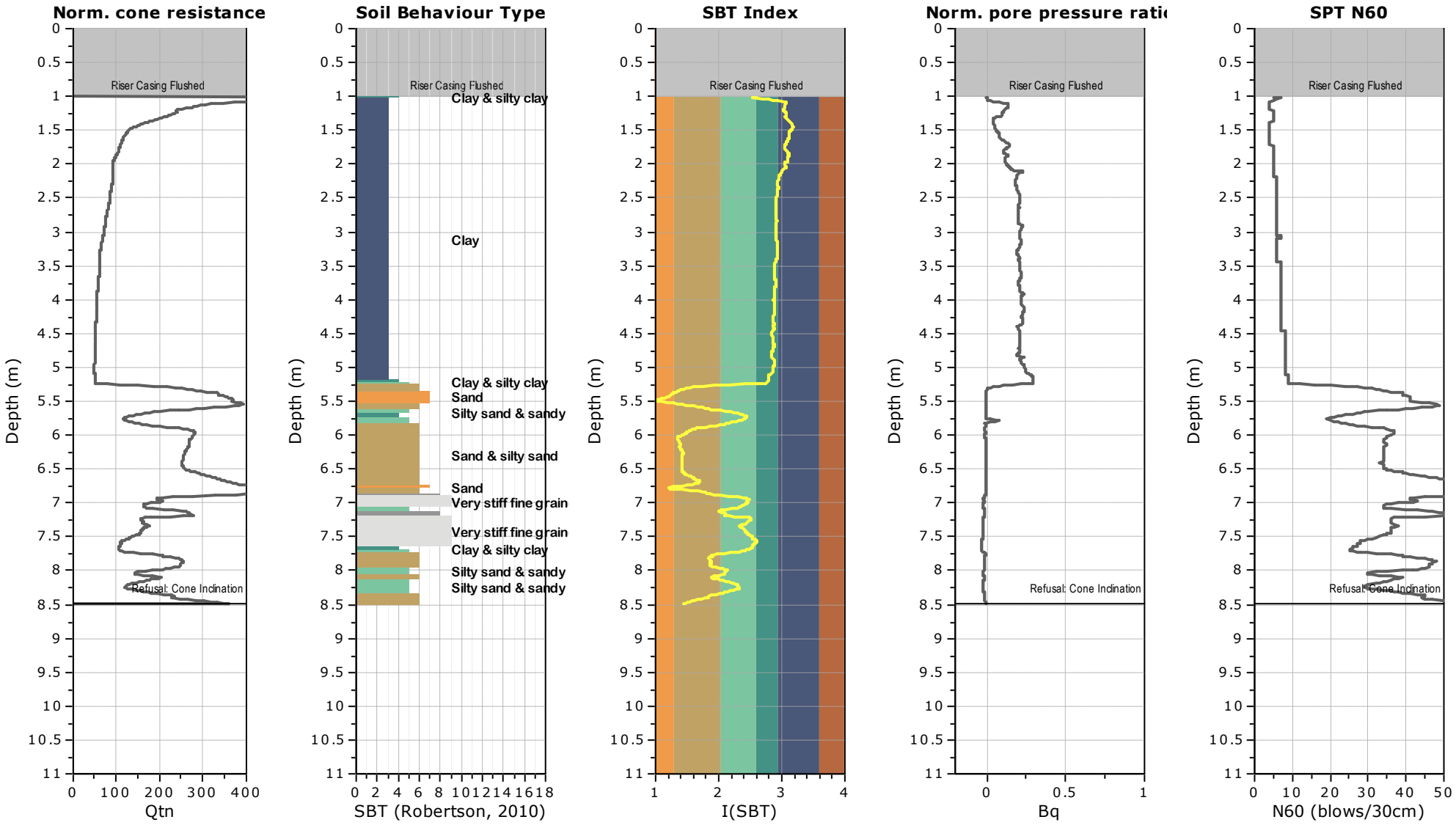
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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www.causewaygeotech.com

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Coords: X:712955.46, Y:613201.83
Cone Type: S15-CFIP2271
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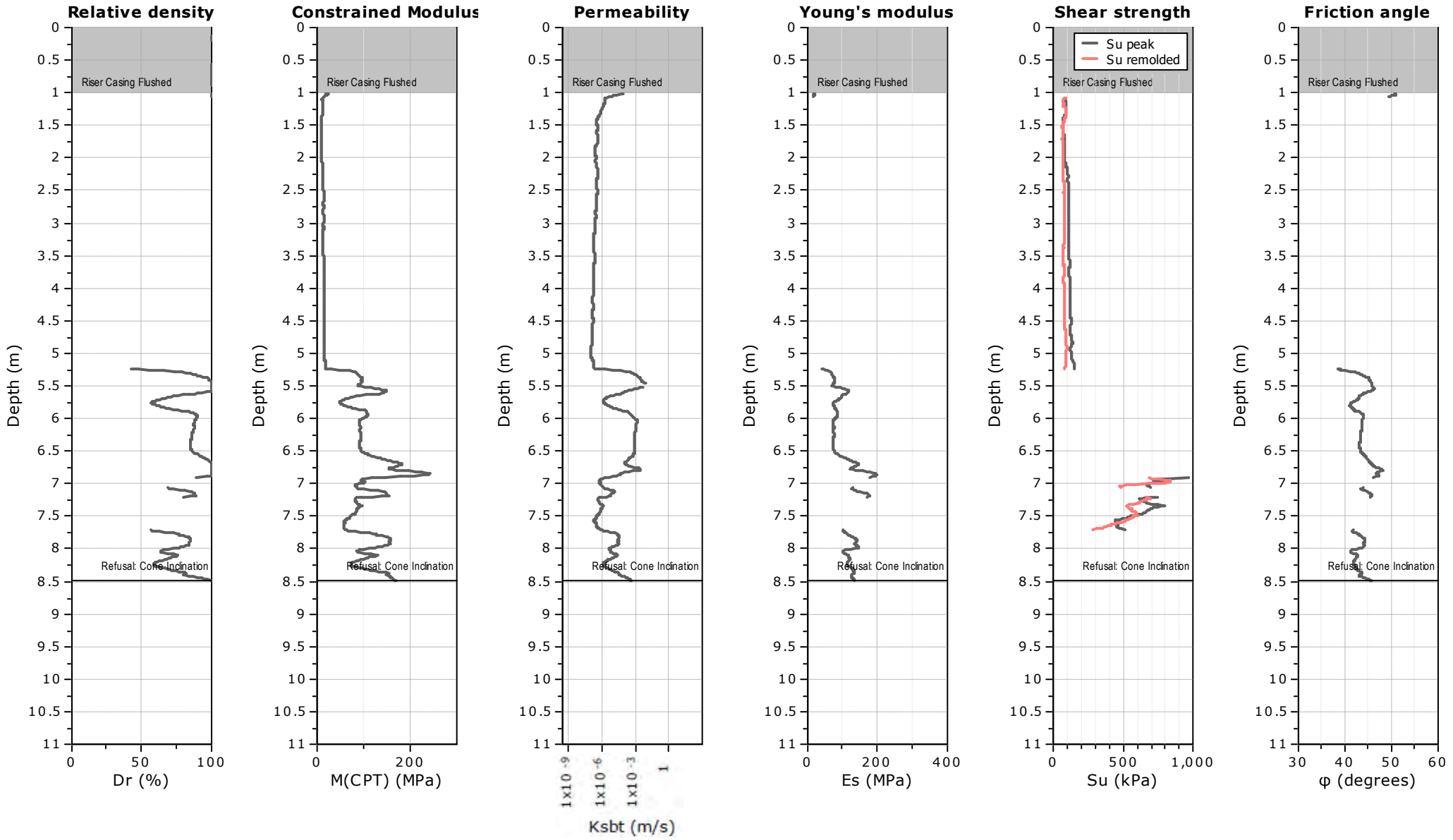
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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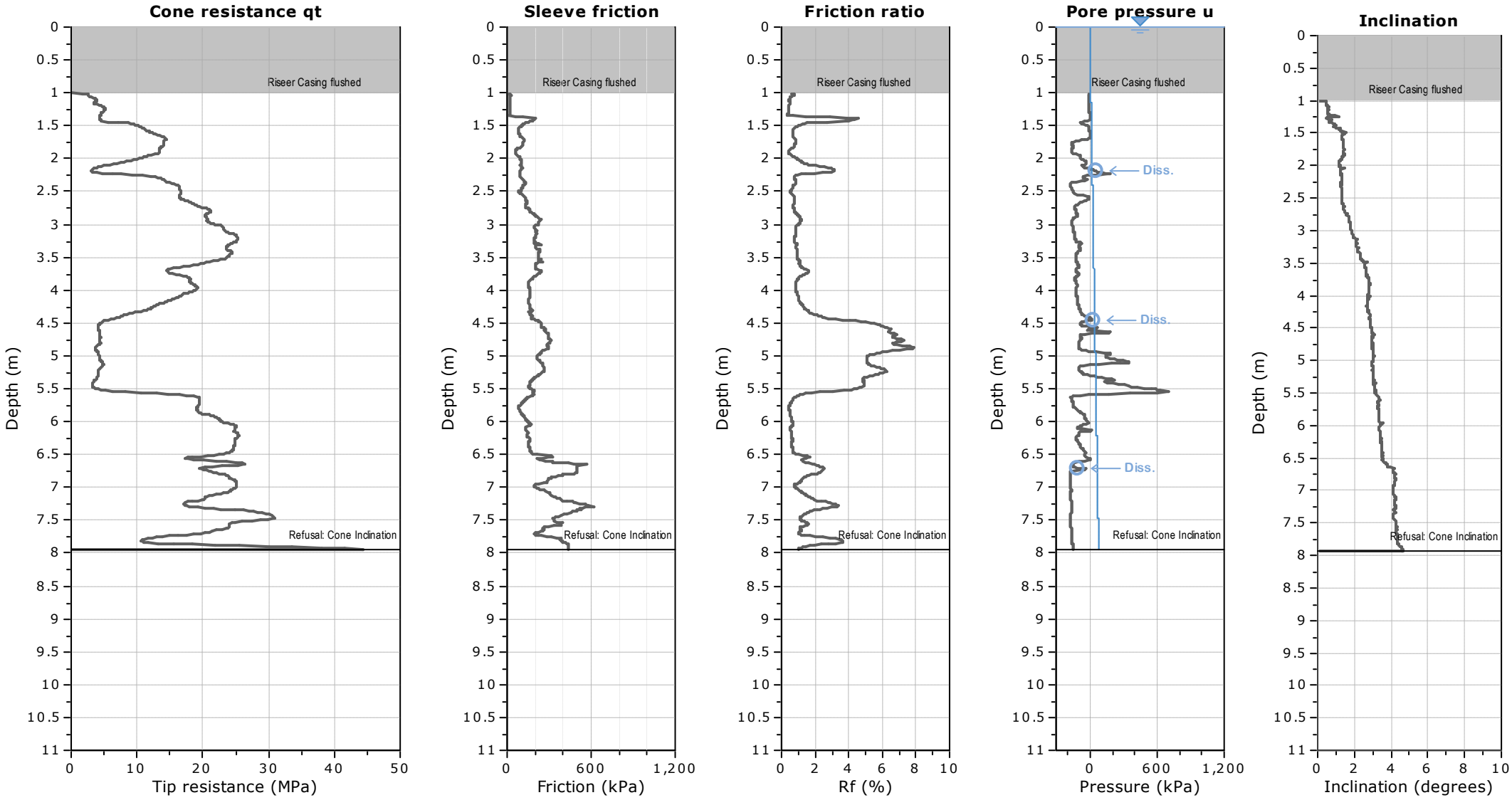
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT37
Total Depth: 7.94 m, Date: 21/02/2024
Surface Elevation (mCD): -5.23 m
Coords: X:712942.05, Y:6123133.56
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: SJ/ RW

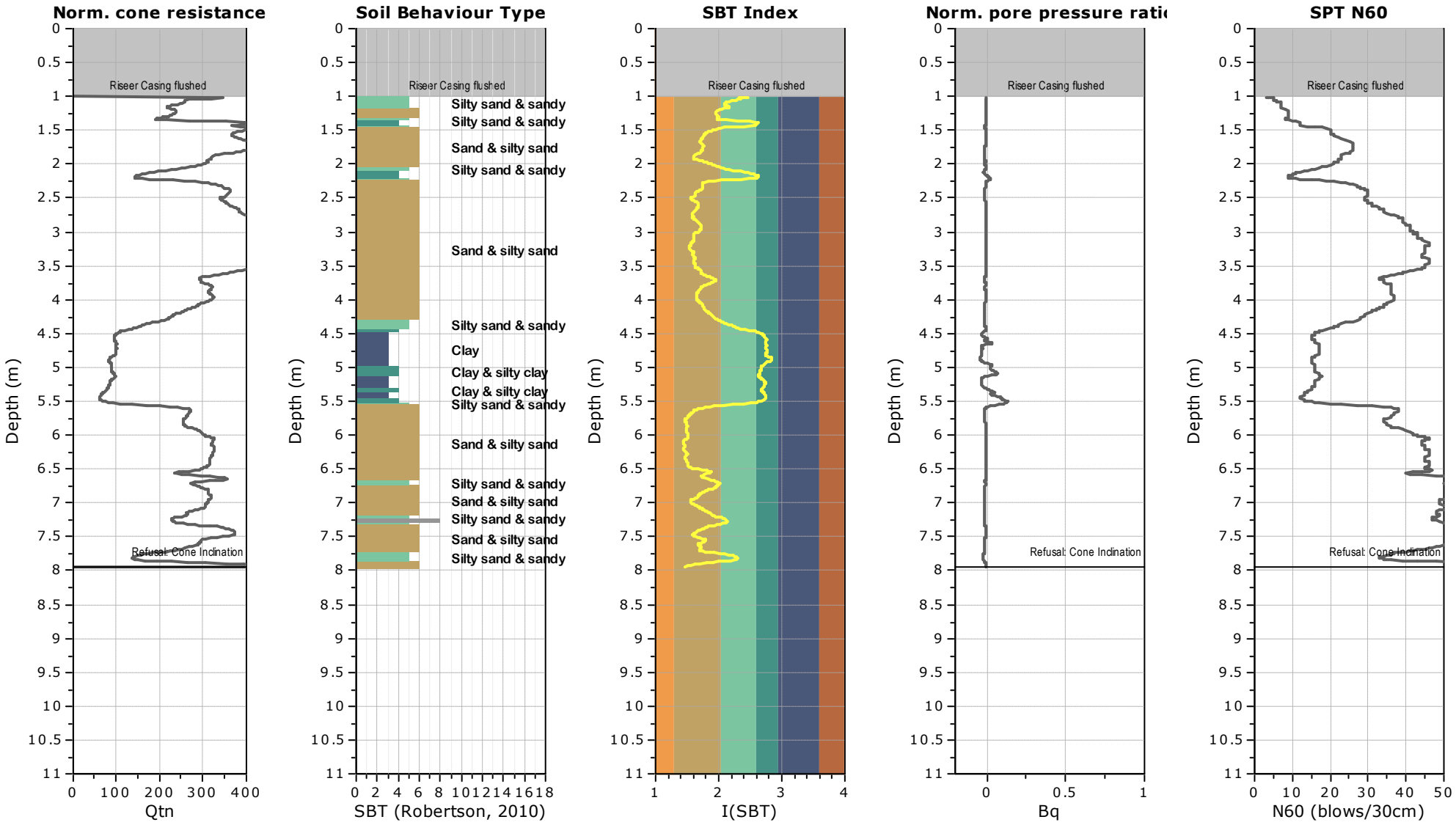
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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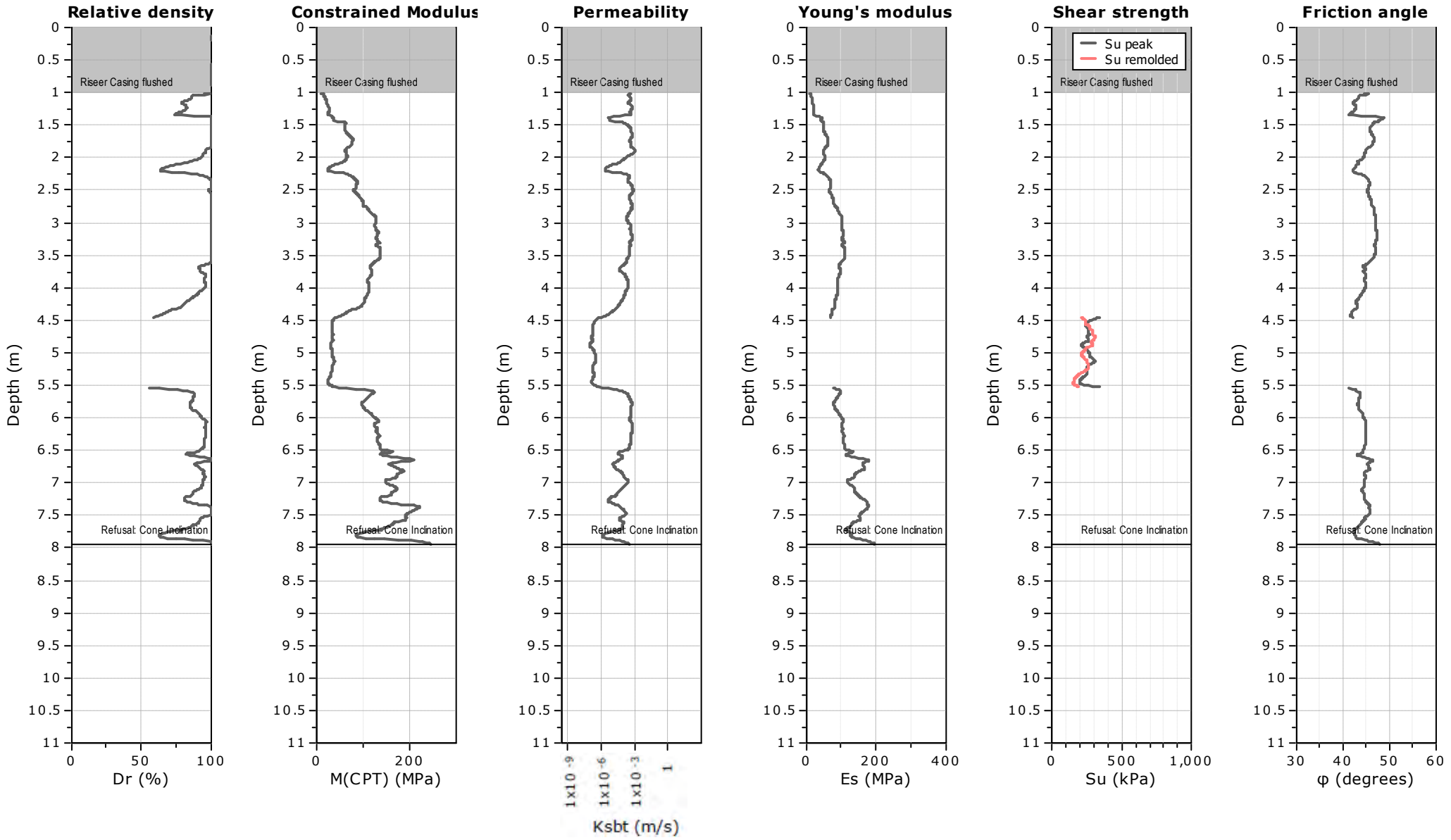
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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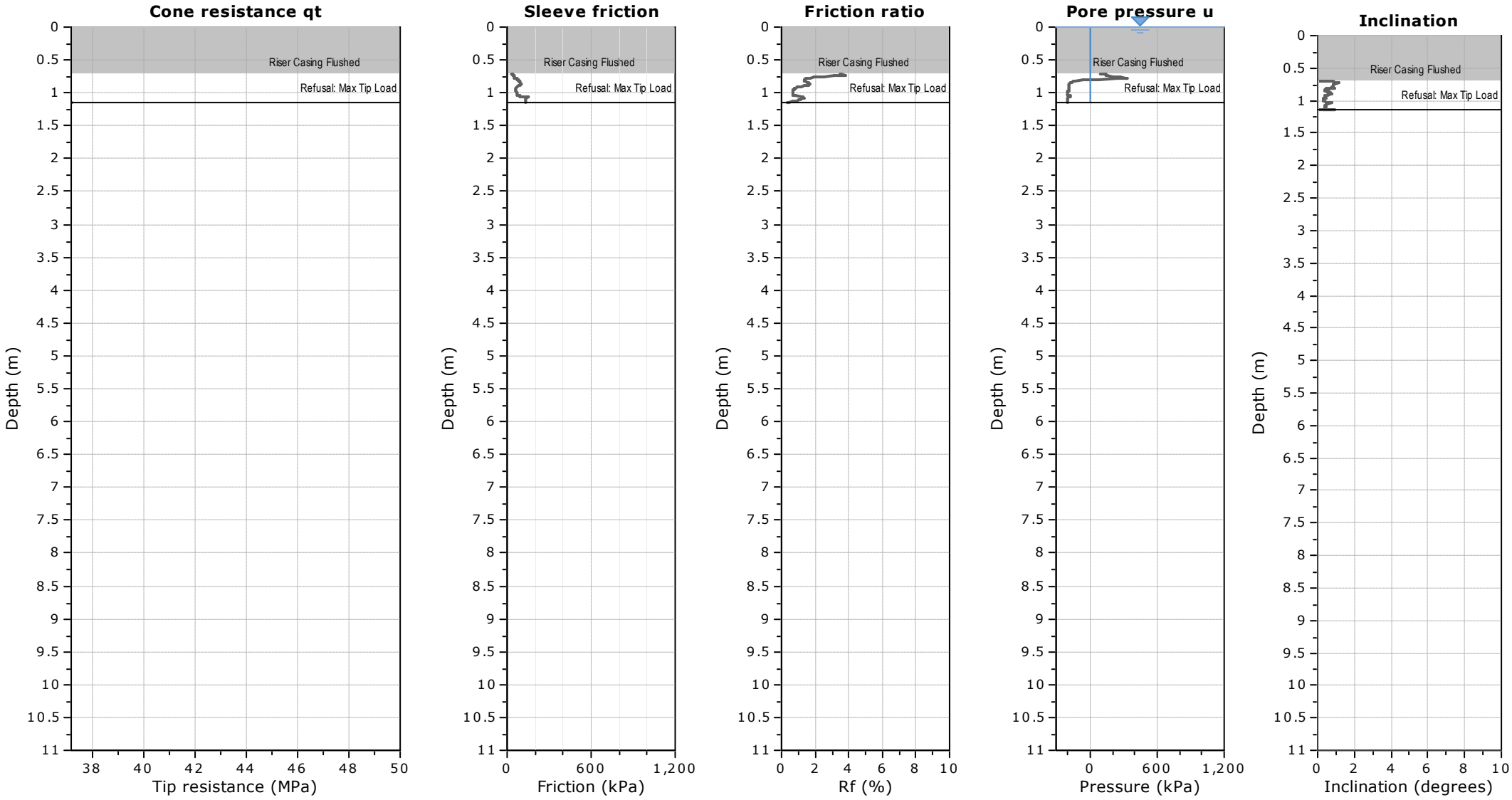
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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CPT: M-CPT31
Total Depth: 1.15 m, Date: 19/02/2024
Surface Elevation (mCD): -8.17 m
Coords: X:713591.25, Y:613130.63
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MK/ SW

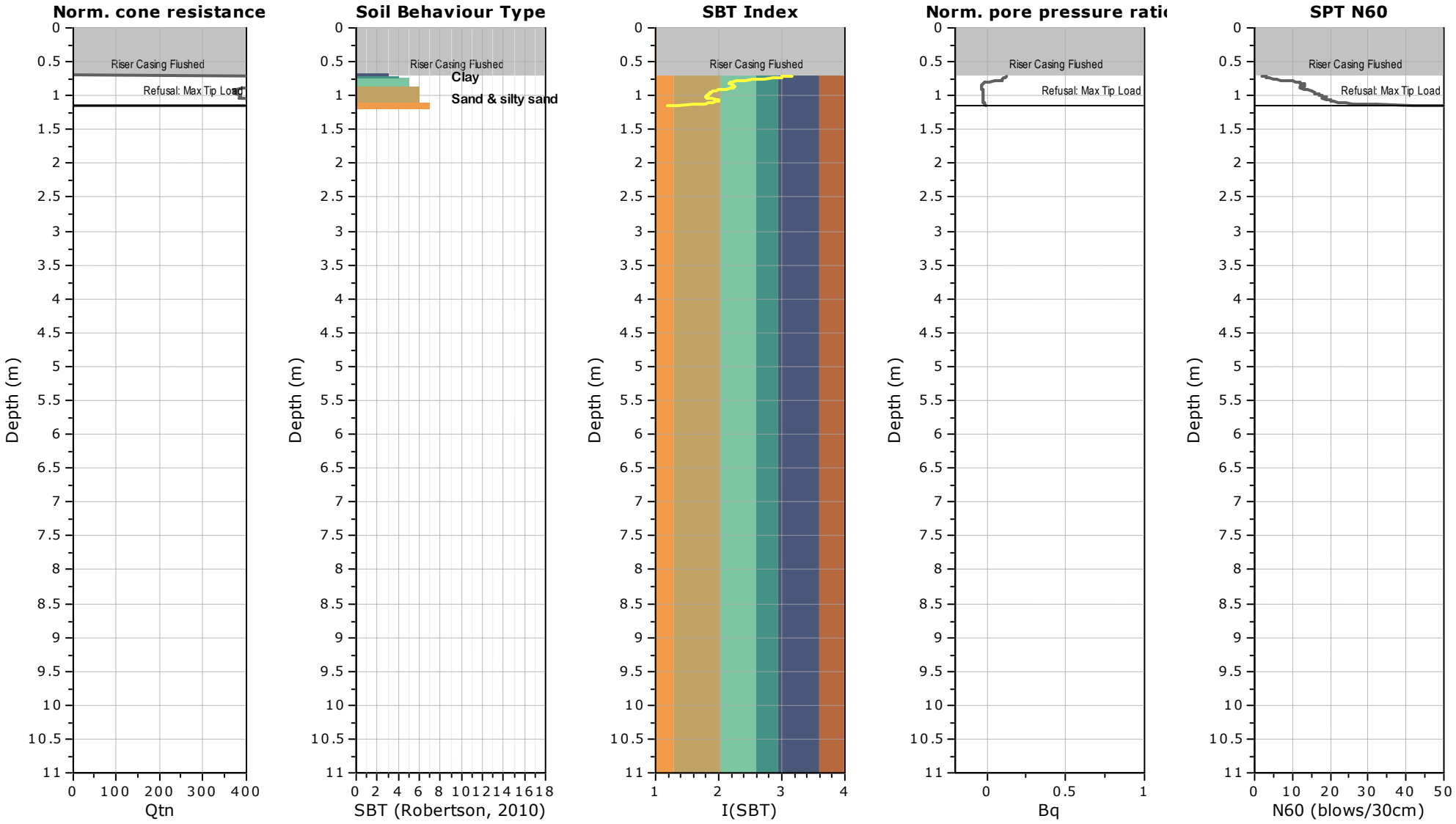
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Coords: X:713591.25, Y:613130.63
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MK/ SW

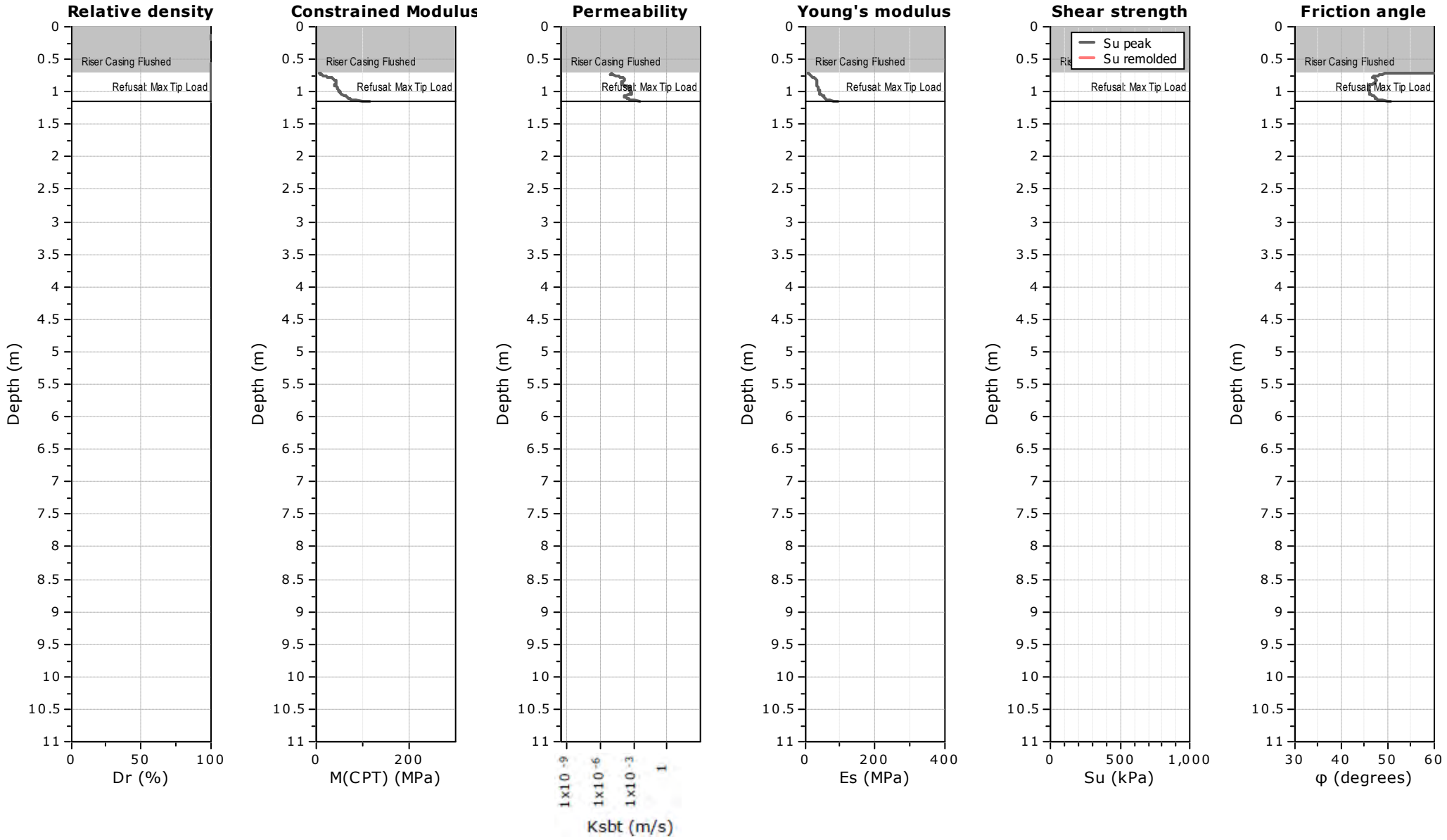
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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8 Drumahiskey Road, Ballymoney
Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT31
Total Depth: 1.15 m, Date: 19/02/2024
Surface Elevation (mCD): -8.17 m
Coords: X:713591.25, Y:613130.63
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MK/ SW

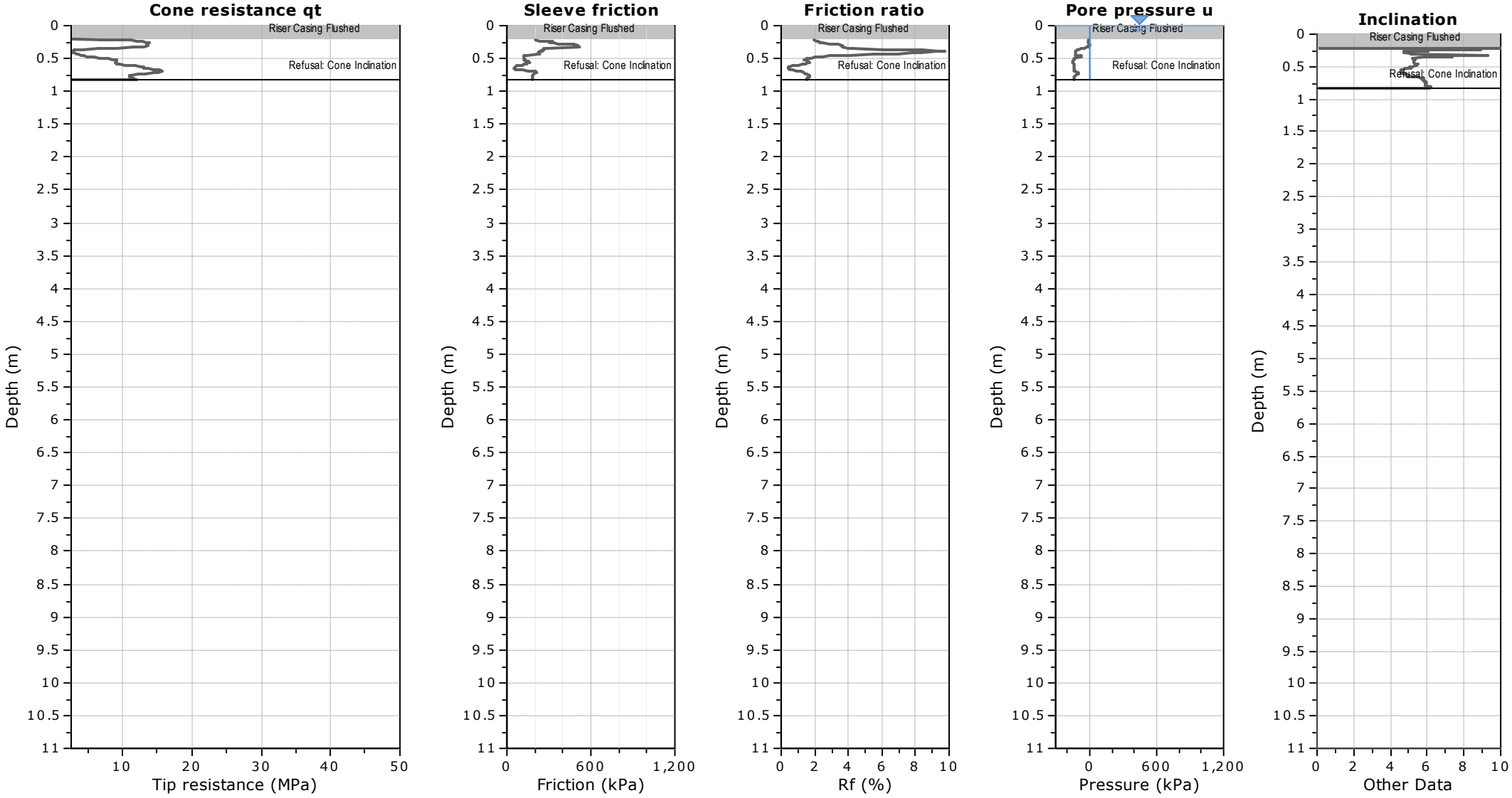
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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8 Drumahiskey Road, Ballymoney
Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT14
Total Depth: 0.83 m, Date: 21/02/2024
Surface Elevation (mCD): -2.93 m
Coords: X:712841.31, Y:612677.19
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MK/ SW

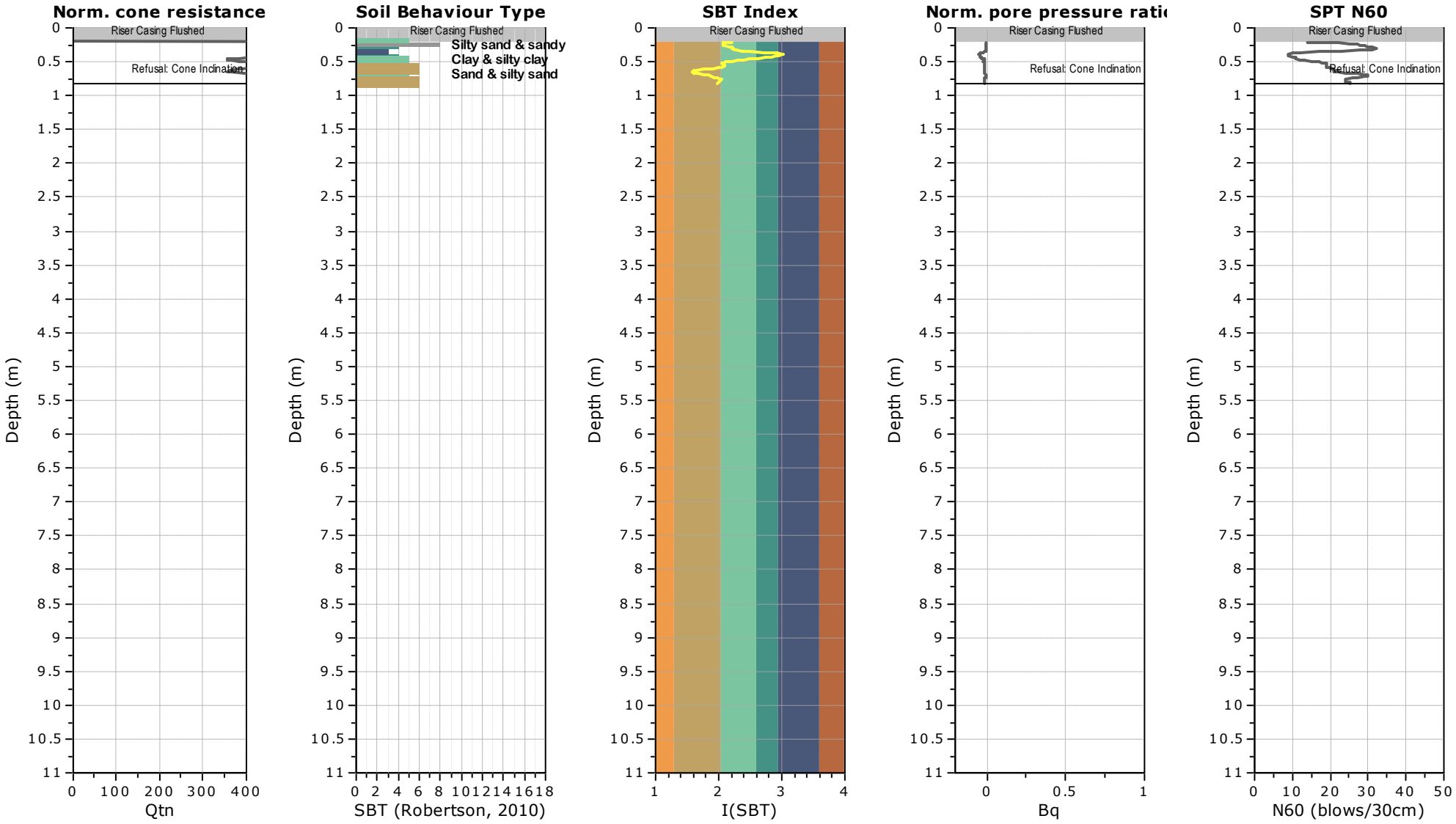
Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



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Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland

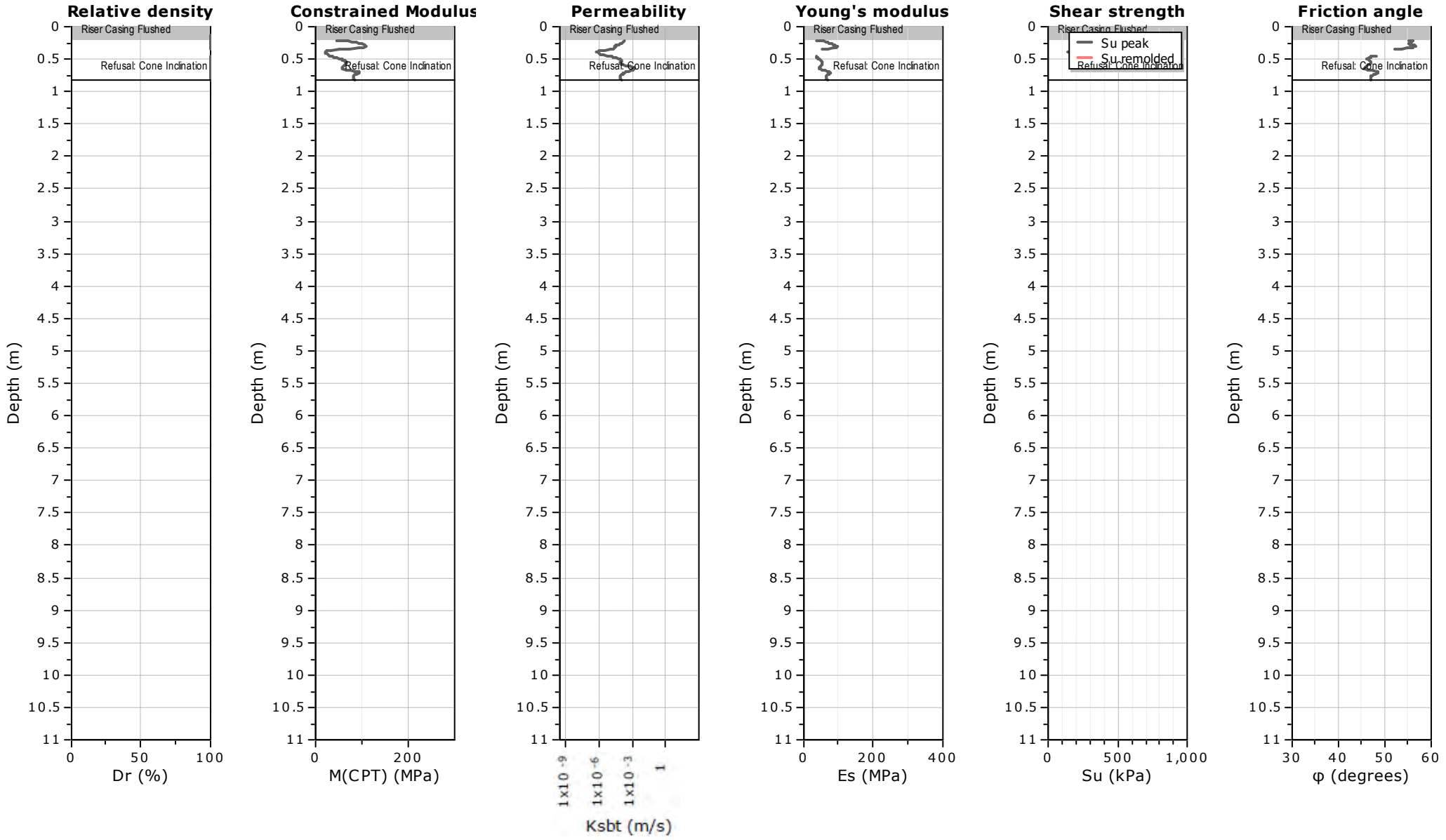
CPT: M-CPT14
Total Depth: 0.83 m, Date: 21/02/2024
Surface Elevation (mCD): -2.93 m
Coords: X:712841.31, Y:612677.19
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MK/ SW



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CPT: M-CPT14
Total Depth: 0.83 m, Date: 21/02/2024
Surface Elevation (mCD): -2.93 m
Coords: X:712841.31, Y:612677.19
Cone Type: S15-CFIP2271
App Class: 1 Cone Operator: MK/ SW

Project: Rosslare Europort OWH SI
Location: Rosslare, Ireland



APPENDIX C – DISSIPATION TEST RESULTS

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

CPT: M-CPT01_BH
Total depth: 10.03 m, Date: 01/12/2023
Surface Elevation (mCD): -4.90 m
Coords: X:712929.97, Y:613014.48
Cone Type: S15-CFIP2272
Cone Operator: MJ/DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

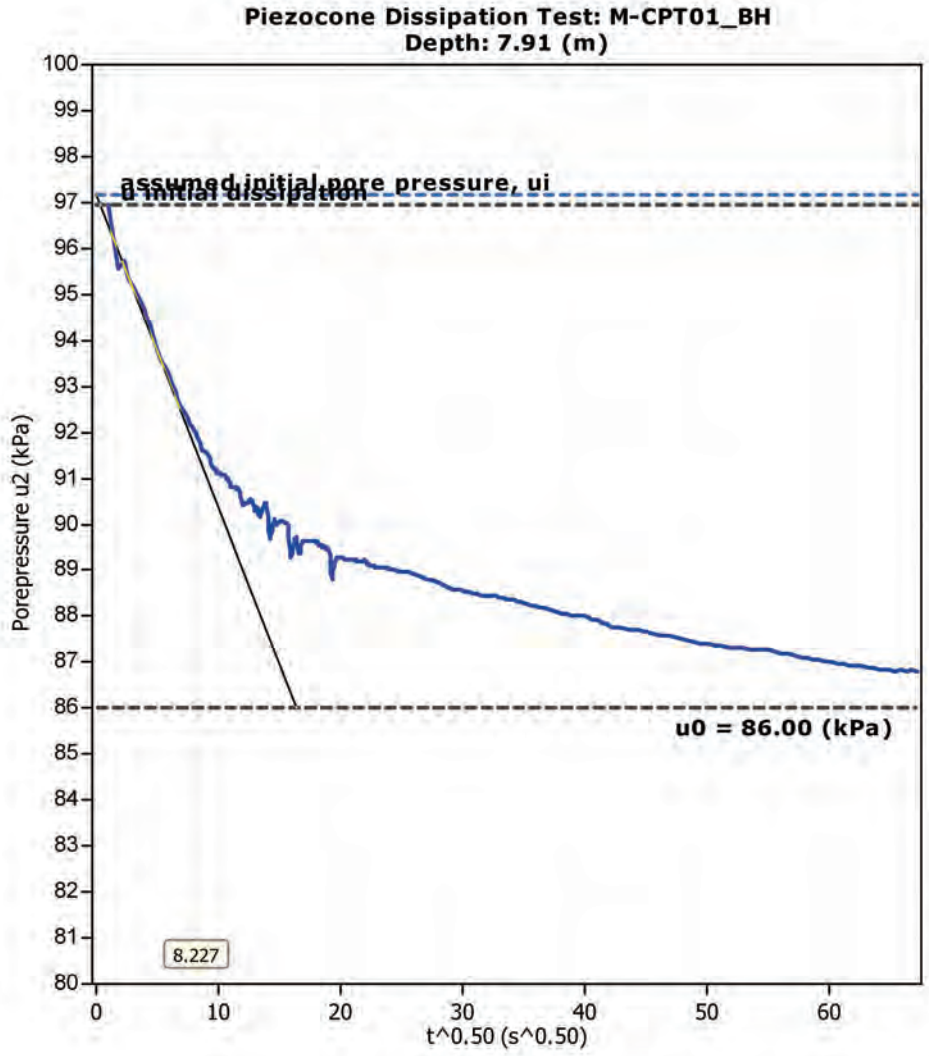
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

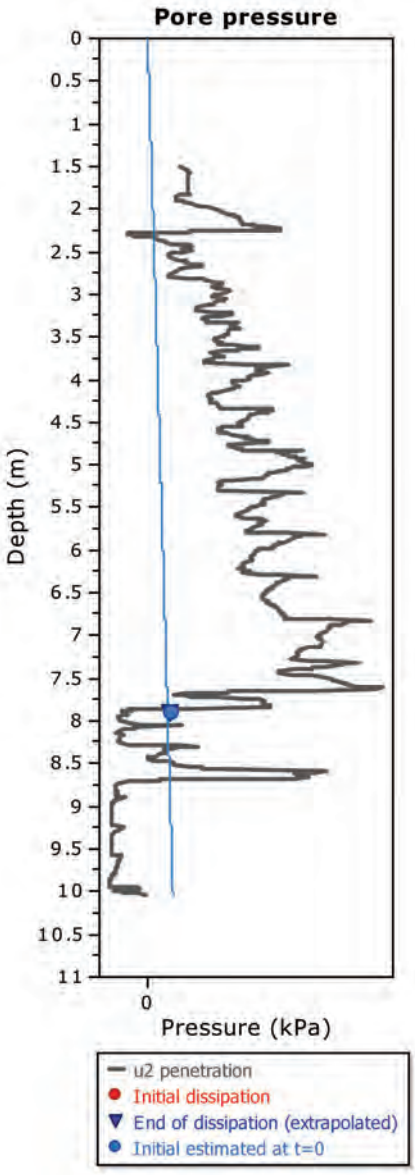
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT01_BH	7.91	8.2	68	2.15E-006	100.00	1.21E-005	382	39.28	3.10E-009


Piezocone Dissipation Test: M-CPT01_BH
Depth: 7.91 (m)
assumed initial pore pressure, ui
u initial dissipation
u0 = 86.00 (kPa)
8.227
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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CPT: M-CPT02
Total depth: 6.68 m, Date: 01/02/2024
Surface Elevation (mCD): -4.53 m
Coords: X:712894.35, Y:612954.27
Cone Type: S15-CFIP2272
Cone Operator: MJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

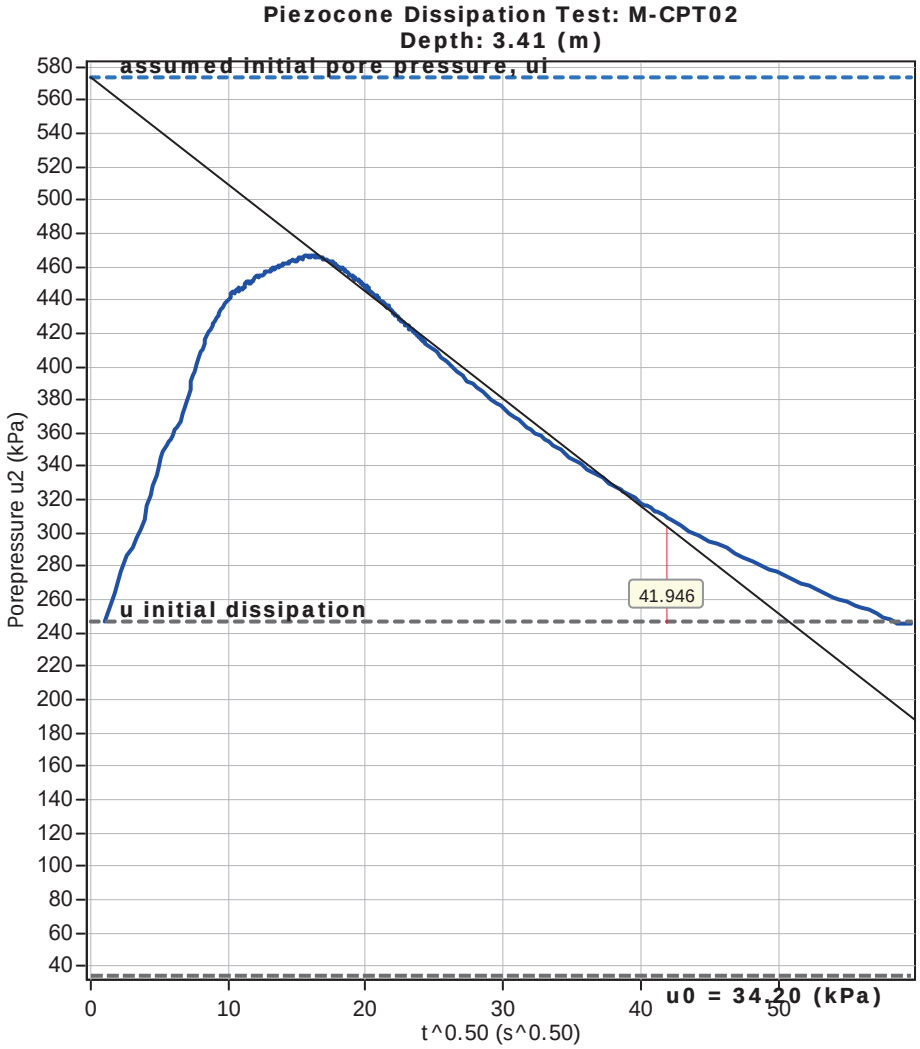
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

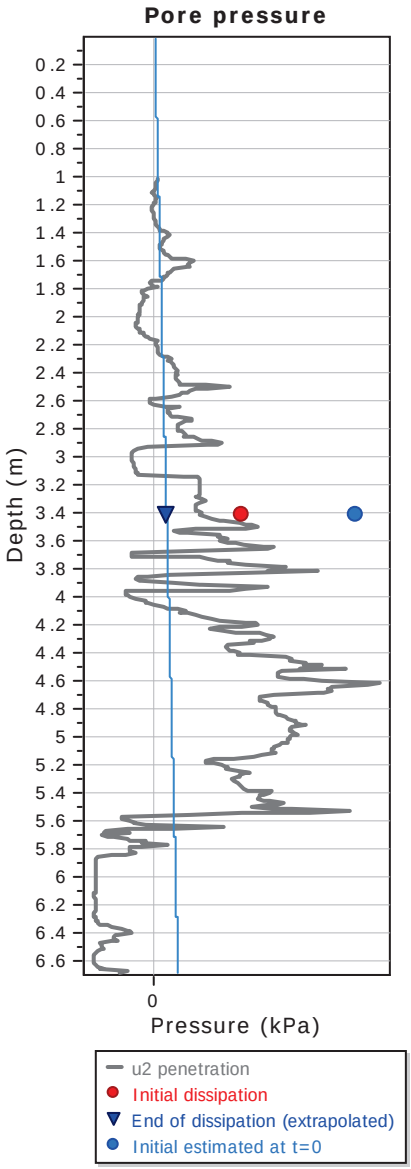
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT02	3.41	41.9	1759	5.58E-005	304.19	8.13E-007	26	19.65	4.15E-010


Piezocone Dissipation Test: M-CPT02
Depth: 3.41 (m)
assumed initial pore pressure, ui
u initial dissipation
41.946
u0 = 34.20 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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CPT: M-CPT03_BH
Total depth: 7.68 m, Date: 15/12/2023
Surface Elevation (mCD): -4.71 m
Coords: X:712892.46, Y:612852.30
Cone Type: S15-CFIP2272
Cone Operator: MJ

Project:
Location:

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

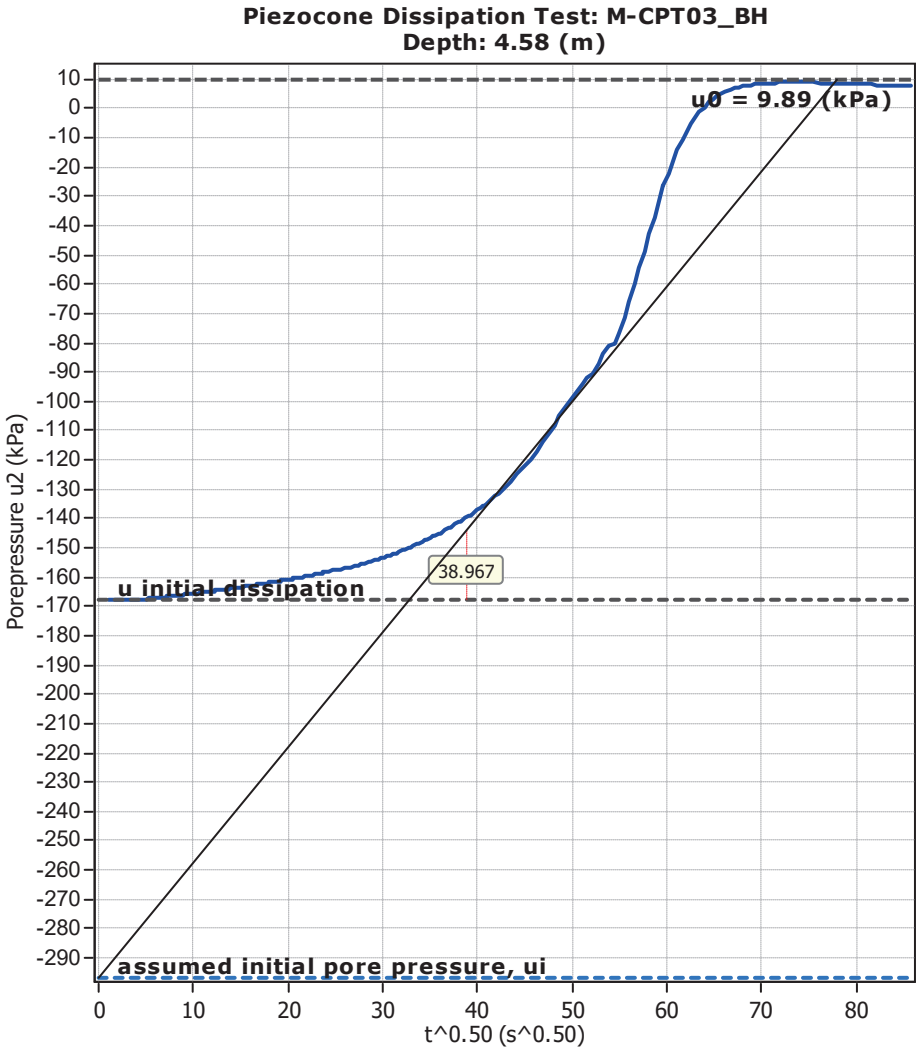
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

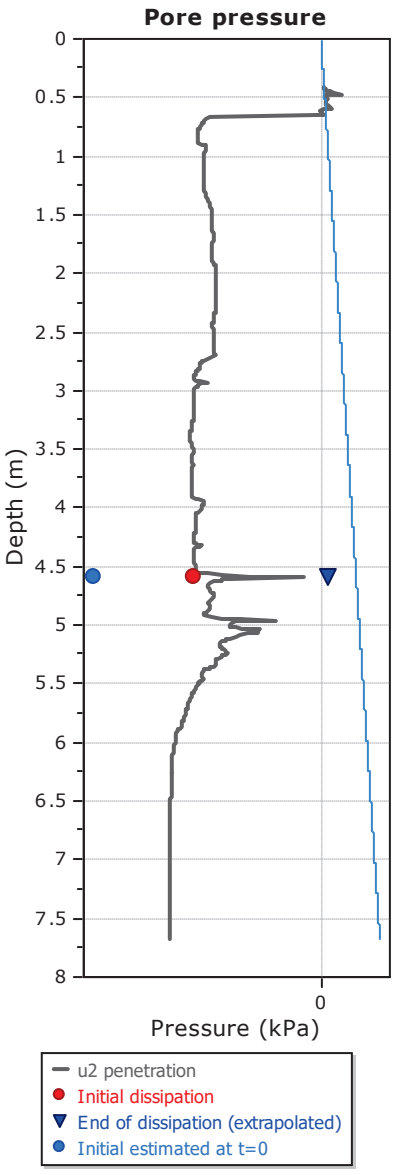
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT03_BH	4.58	39.0	1518	4.81E-005	285.54	9.13E-007	29	53.24	1.72E-010


Piezocone Dissipation Test: M-CPT03_BH
Depth: 4.58 (m)
u0 = 9.89 (kPa)
u initial dissipation
38.967
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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CPT: M-CPT04_BH
Total depth: 1.95 m, Date: 02/12/2023
Surface Elevation (mCD): -3.78 m
Coords: X:712869.32, Y:612776.87
Cone Type: S15-CFIP2273
Cone Operator: MJ/DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

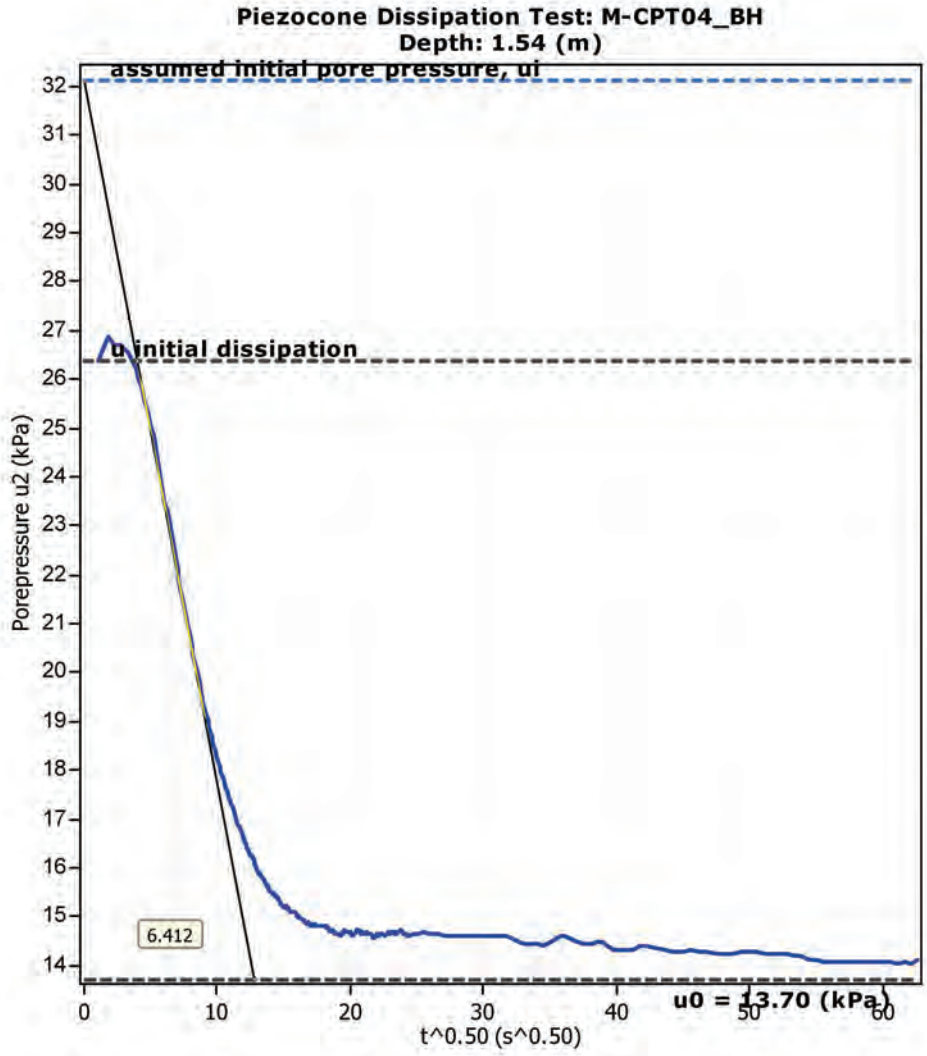
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

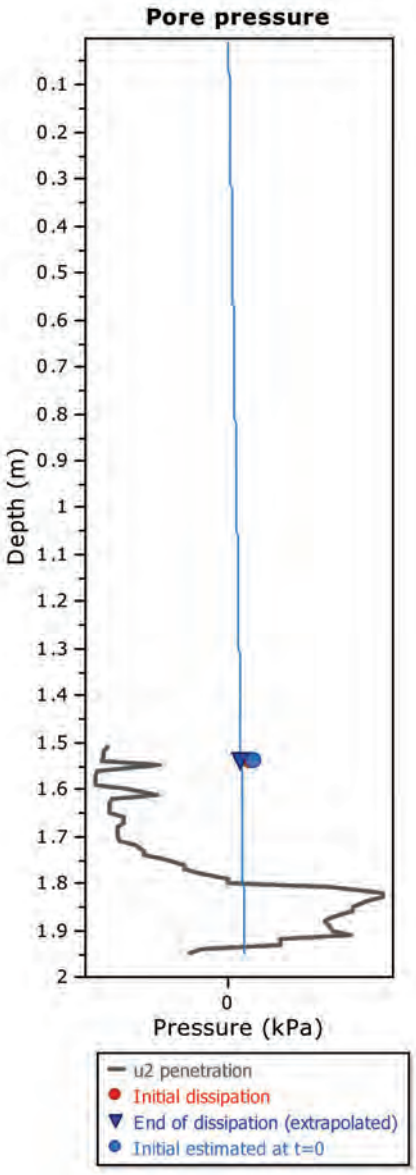
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT04_BH	1.54	6.4	41	1.30E-006	100.00	2.00E-005	629	70.78	2.83E-009


Piezocone Dissipation Test: M-CPT04_BH
Depth: 1.54 (m)
assumed initial pore pressure, ui
u initial dissipation
Porepressure u2 (kPa)
6.412
u0 = 13.70 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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CPT: M-CPT05_BH
Total depth: 9.29 m, Date: 03/01/2024
Surface Elevation (mCD): -5.48 m
Coords: X:712988.94, Y:613078.71
Cone Type: S15-CFIP2272
Cone Operator: MK

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

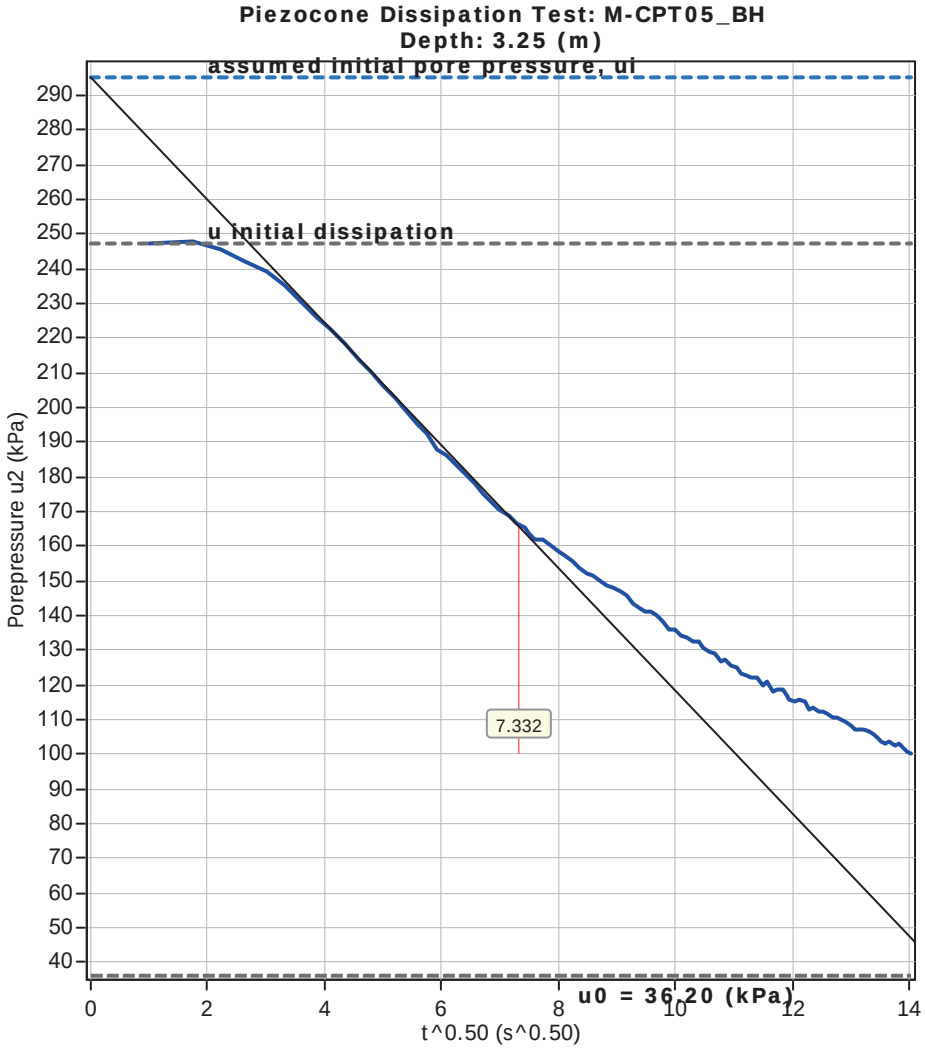
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

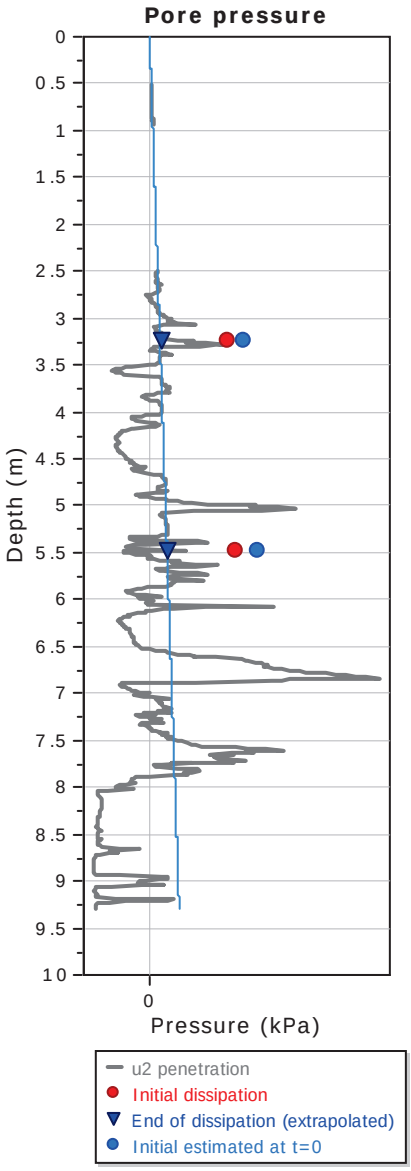
$$k_h = c_h \times \gamma_w / M$$

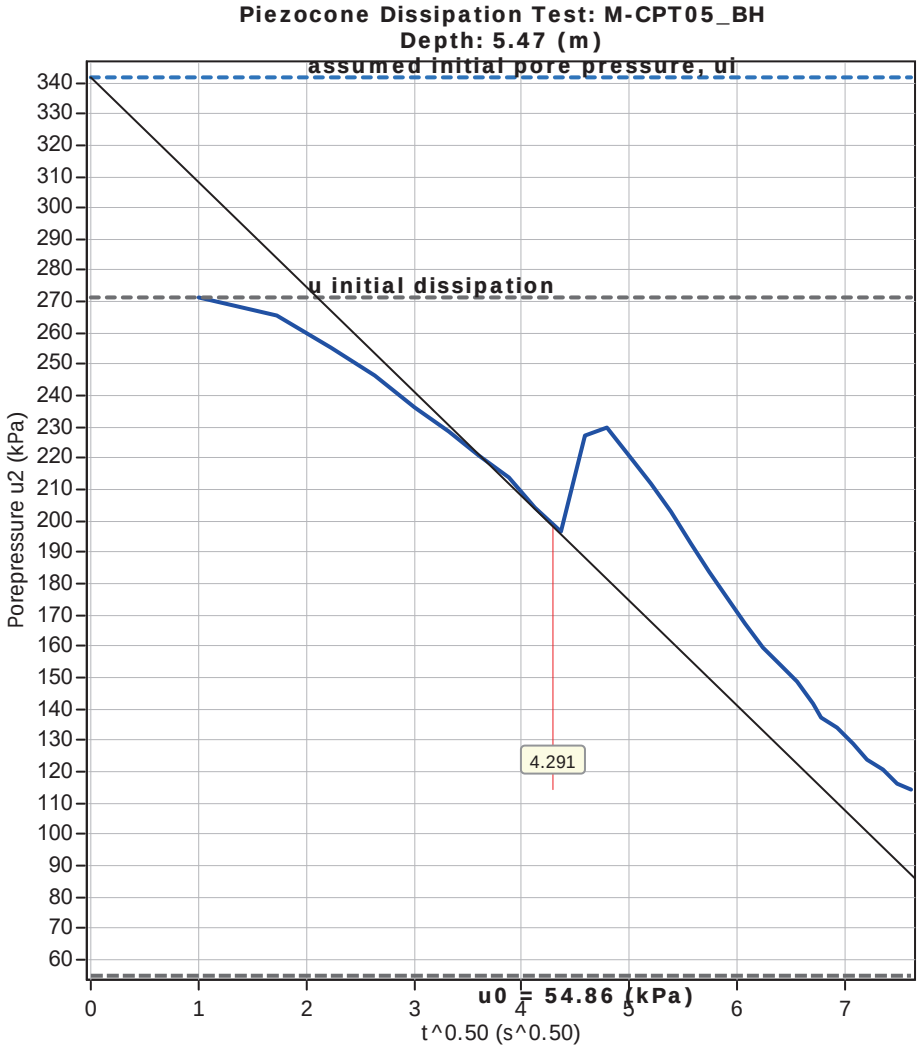
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

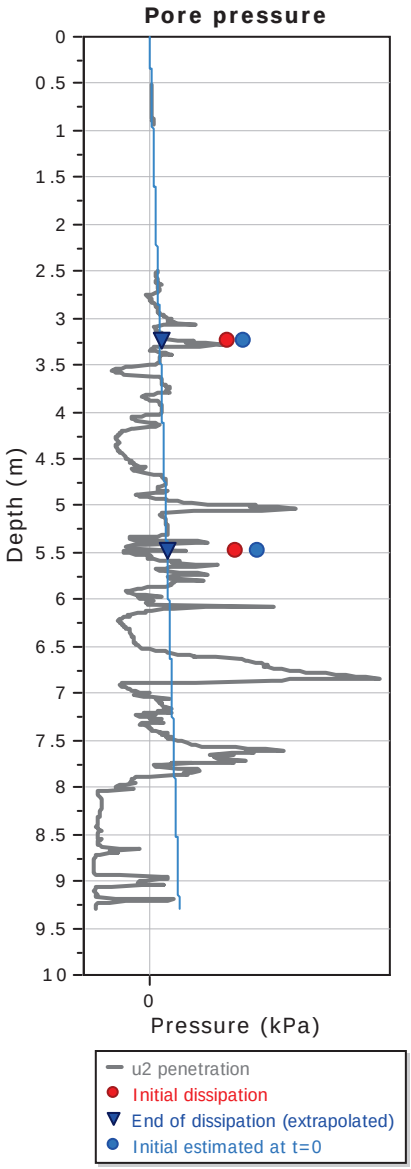
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT05_BH	3.25	7.3	54	1.70E-006	100.00	1.53E-005	481	23.59	6.49E-009
M-CPT05_BH	5.47	4.3	18	5.84E-007	100.00	4.46E-005	1405	71.36	6.26E-009


Piezocone Dissipation Test: M-CPT05_BH
Depth: 3.25 (m)
assumed initial pore pressure, ui
u initial dissipation
7.332
u0 = 36.20 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT05_BH
Depth: 5.47 (m)
assumed initial pore pressure, ui
u initial dissipation
4.291
u0 = 54.86 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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8 Drumahiskey Road, Ballymoney
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CPT: M-CPT07_BH
Total depth: 9.38 m, Date: 16/01/2024
Surface Elevation (mCD): -4.82 m
Coords: X:712932.38, Y:613052.65
Cone Type: S15-CFIP2272
Cone Operator: MK

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

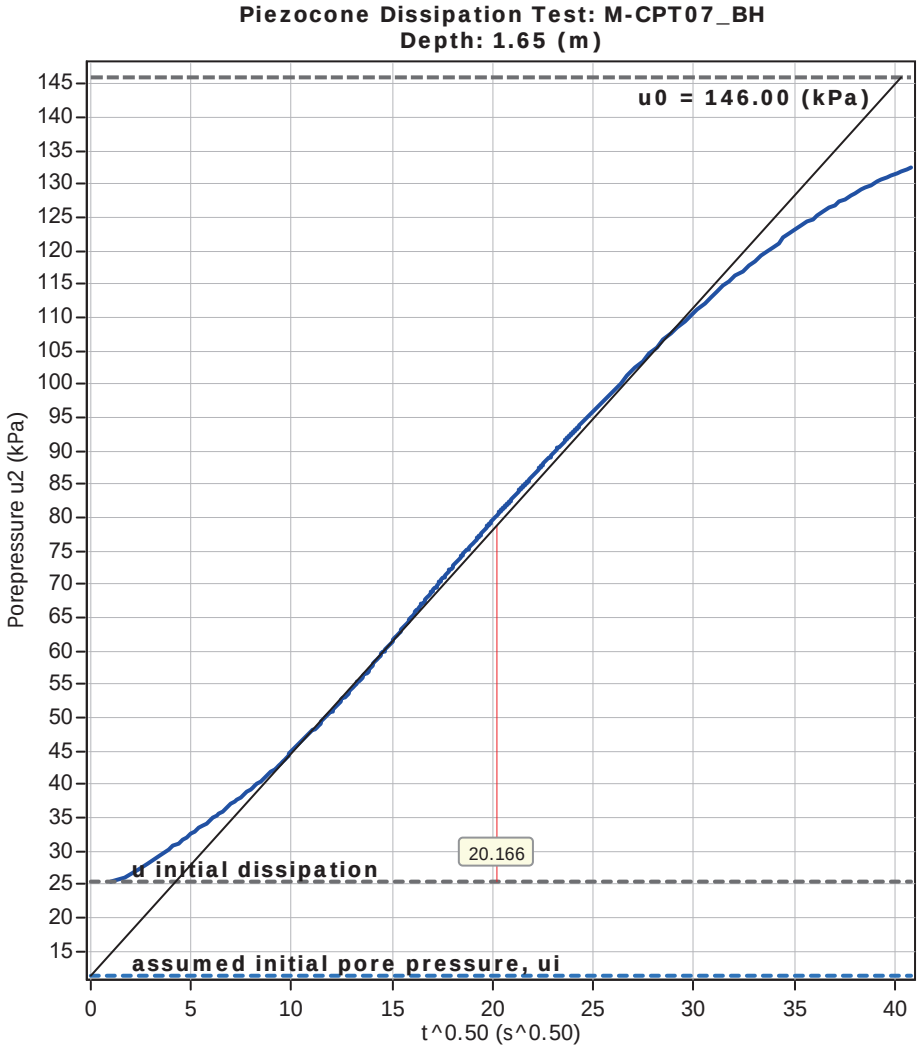
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

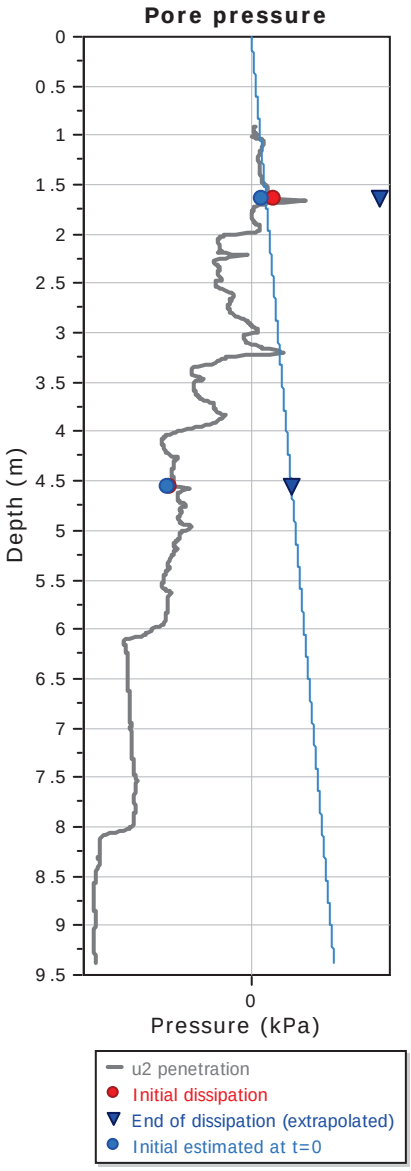
$$k_h = c_h \times \gamma_w / M$$

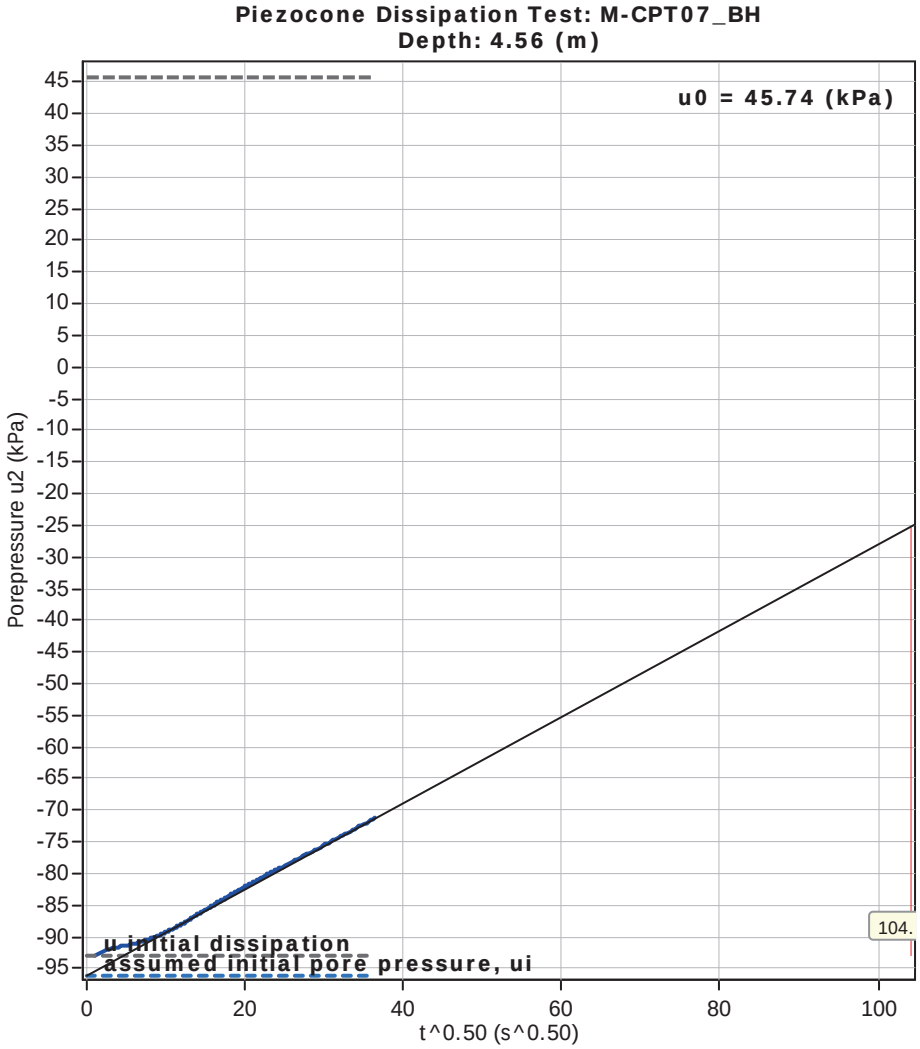
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

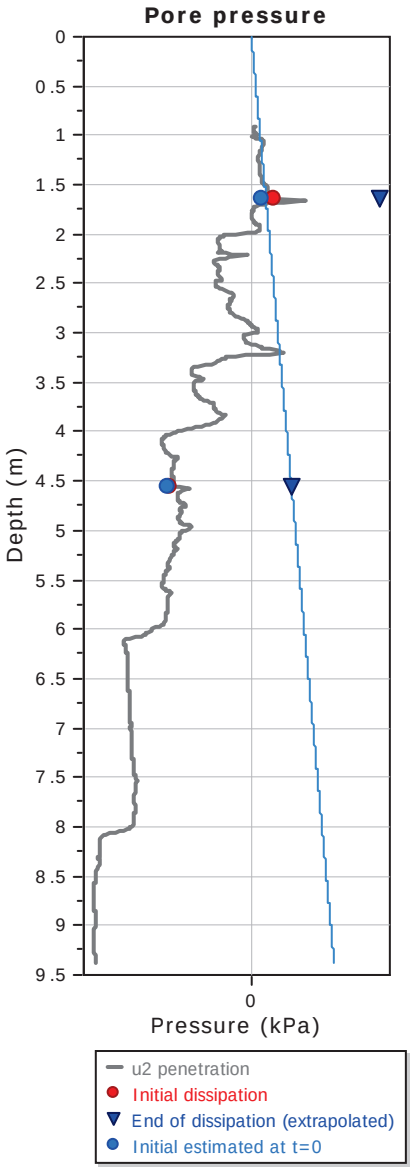
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT07_BH	1.65	20.2	407	1.29E-005	100.00	2.02E-006	64	20.17	1.00E-009
M-CPT07_BH	4.56	104.2	10847	3.44E-004	100.00	7.56E-008	2	67.97	1.12E-011


Piezocone Dissipation Test: M-CPT07_BH
Depth: 1.65 (m)
u0 = 146.00 (kPa)
u initial dissipation
20.166
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT07_BH
Depth: 4.56 (m)
u0 = 45.74 (kPa)
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT08
Total depth: 10.29 m, Date: 03/02/2024
Surface Elevation (mCD): -4.72 m
Coords: X:712733.76, Y:612952.91
Cone Type: S15-CFIP2272
Cone Operator: KW/AG

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

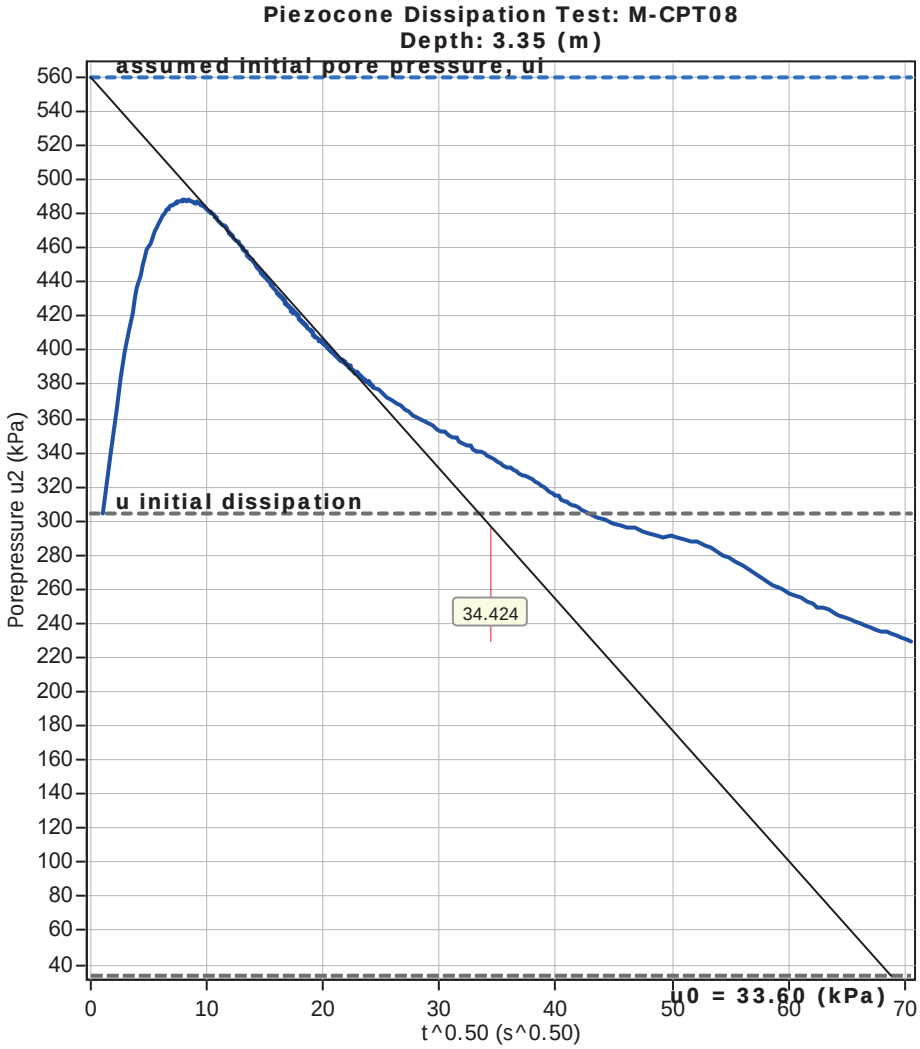
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

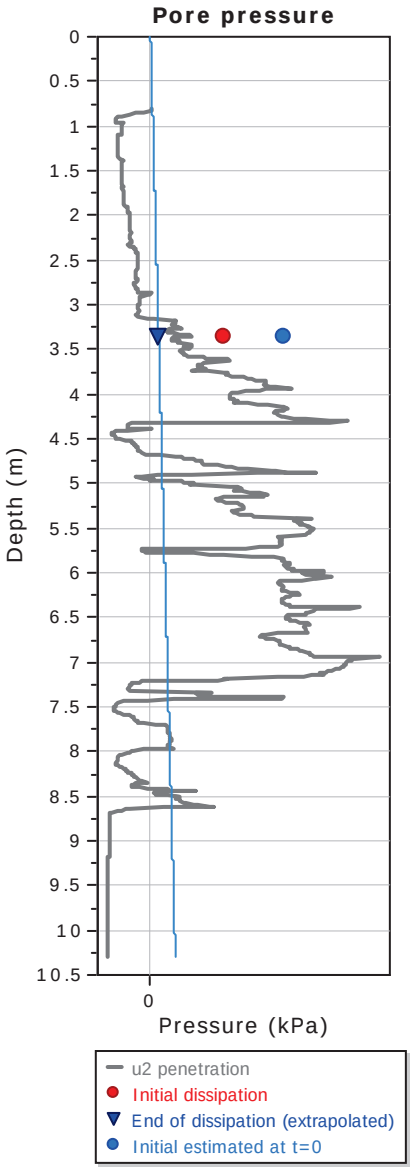
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT08	3.35	34.4	1185	3.76E-005	315.91	1.23E-006	39	19.19	6.43E-010


Piezocone Dissipation Test: M-CPT08
Depth: 3.35 (m)
assumed initial pore pressure, ui
u initial dissipation
34.424
u0 = 33.60 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT10_BH
Total depth: 9.46 m, Date: 14/01/2024
Surface Elevation (mCD): -5.39 m
Coords: X:713029.97, Y:613014.81
Cone Type: S15-CFIP2272
Cone Operator: MMcK

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

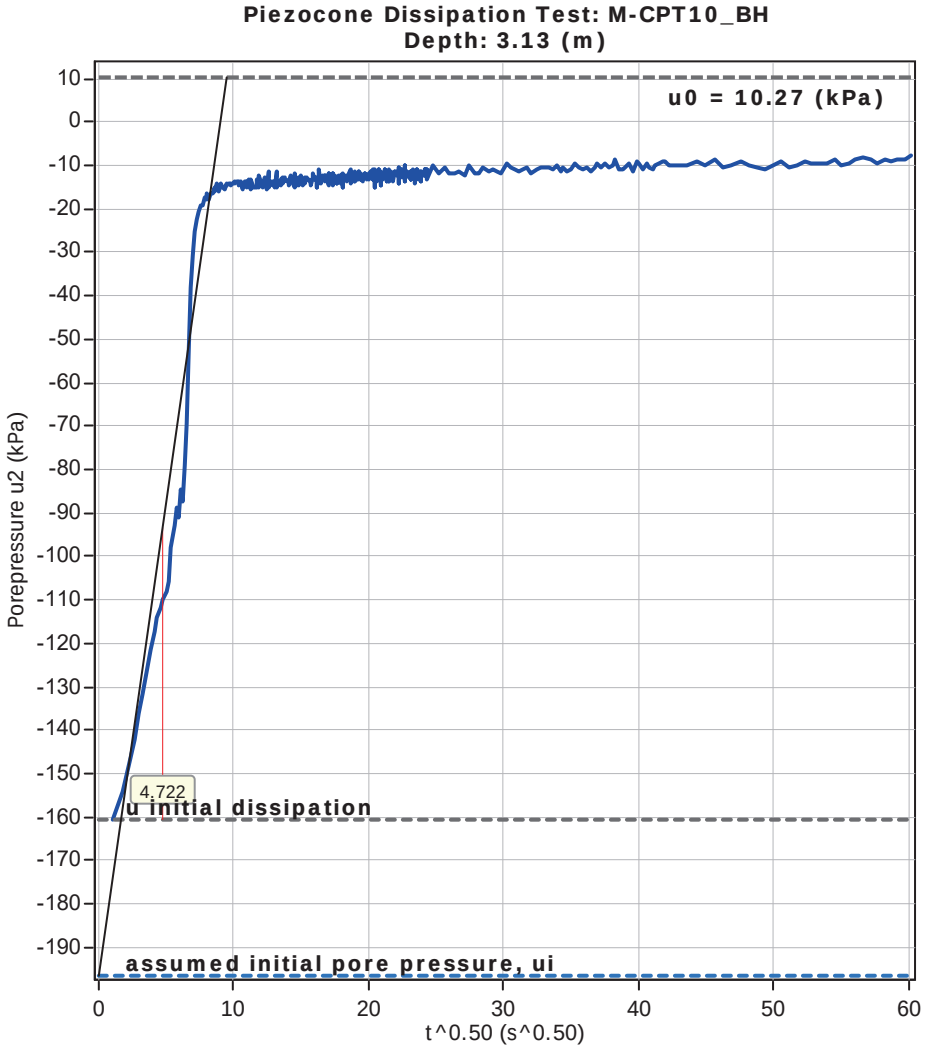
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

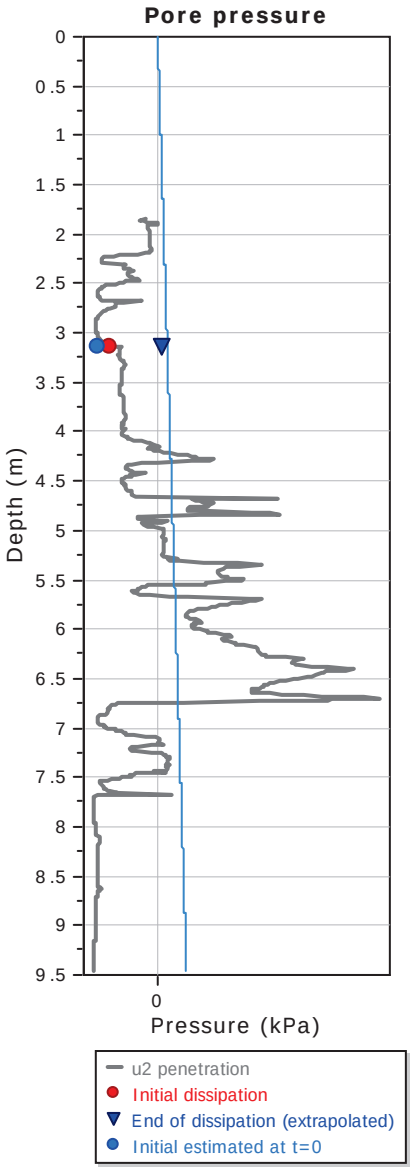
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT10_BH	3.13	4.7	22	7.07E-007	100.00	3.68E-005	1161	35.60	1.04E-008


Piezocone Dissipation Test: M-CPT10_BH
Depth: 3.13 (m)
u0 = 10.27 (kPa)
4.722
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT11
Total depth: 6.84 m, Date: 10/02/2024
Surface Elevation (mCD): -4.40 m
Coords: X:712752.04, Y:612867.82
Cone Type: S15-CFIP2272
Cone Operator: SJ/ RW

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

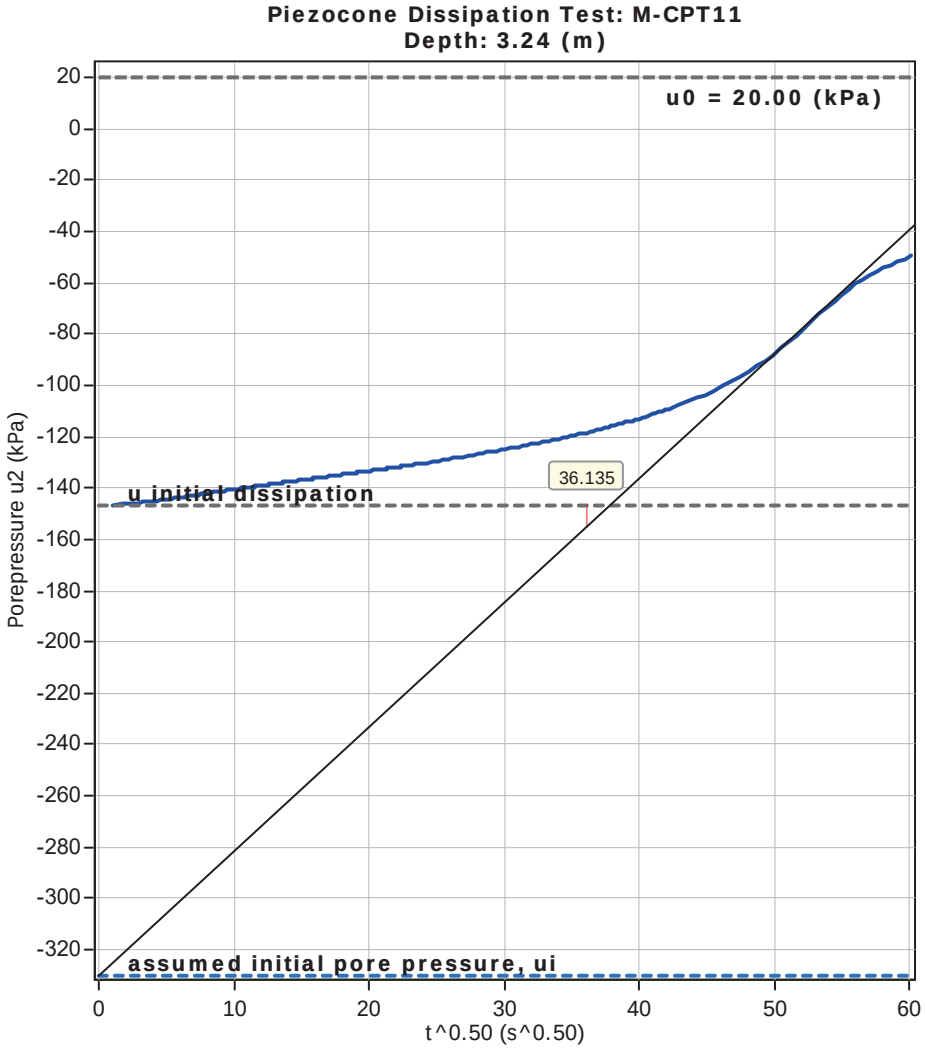
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

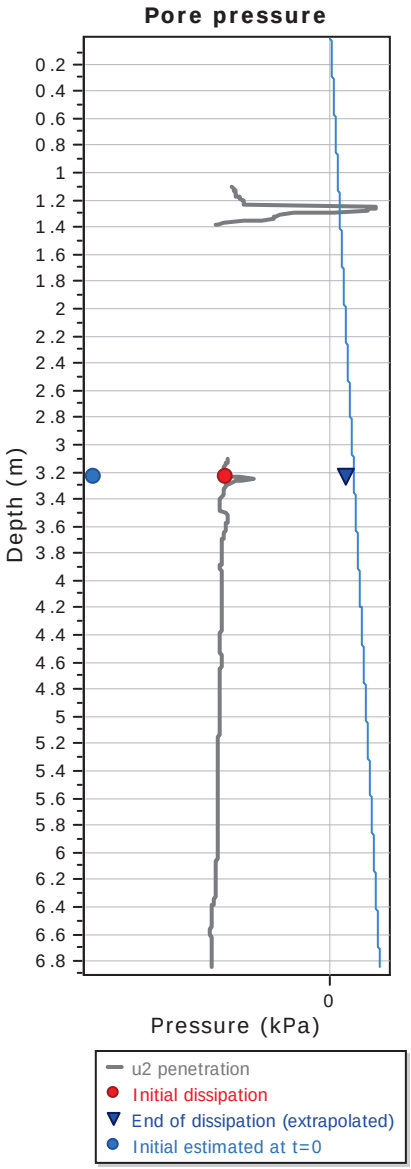
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT11	3.24	36.1	1306	4.14E-005	100.00	6.28E-007	20	55.20	1.14E-010


Piezocone Dissipation Test: M-CPT11
Depth: 3.24 (m)
u0 = 20.00 (kPa)
u initial dissipation
36.135
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT12
Total depth: 3.37 m, Date: 27/01/2024
Surface Elevation (mCD): -3.55 m
Coords: X:712974.59, Y:612773.71
Cone Type: S15-CFIP2272
Cone Operator: OG

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

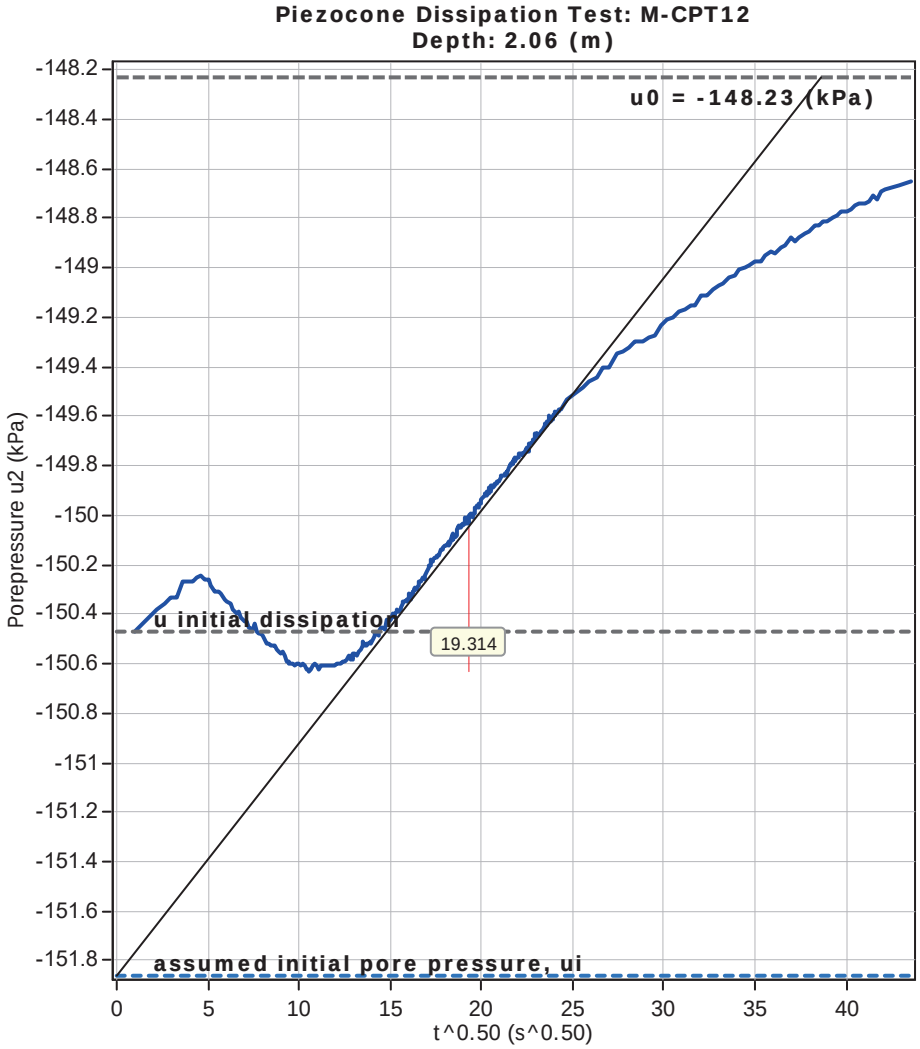
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

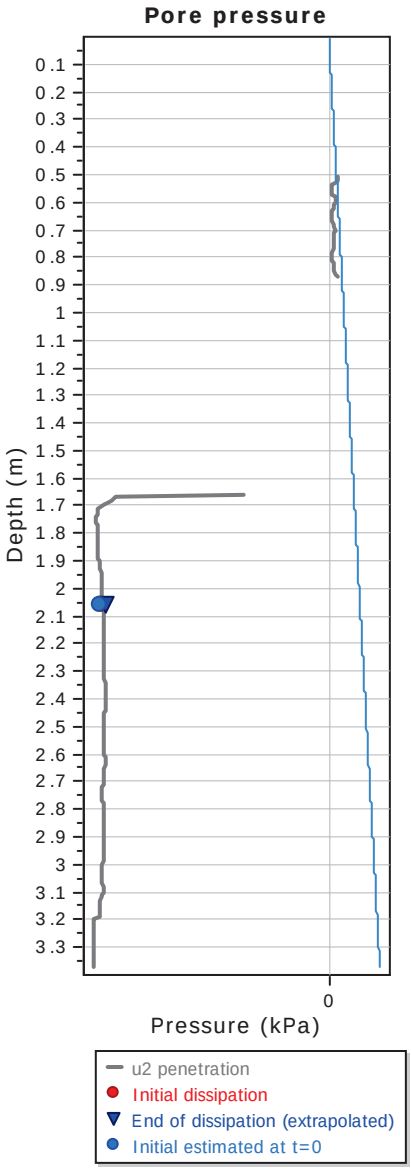
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT12	2.06	19.3	373	1.18E-005	100.00	2.20E-006	69	44.66	4.94E-010


Piezocone Dissipation Test: M-CPT12
Depth: 2.06 (m)
u0 = -148.23 (kPa)
u initial dissipation
19.314
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)
-148.2
-148.4
-148.6
-148.8
-149
-149.2
-149.4
-149.6
-149.8
-150
-150.2
-150.4
-150.6
-150.8
-151
-151.2
-151.4
-151.6
-151.8
0
5
10
15
20
25
30
35
40


Pore pressure
Depth (m)
Pressure (kPa)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
3.1
3.2
3.3
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT17
Total depth: 9.67 m, Date: 16/02/2024
Surface Elevation (mCD): -5.02 m
Coords: X:712548.51, Y:613030.26
Cone Type: S15-CFIP2272
Cone Operator: SJ/ RW

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

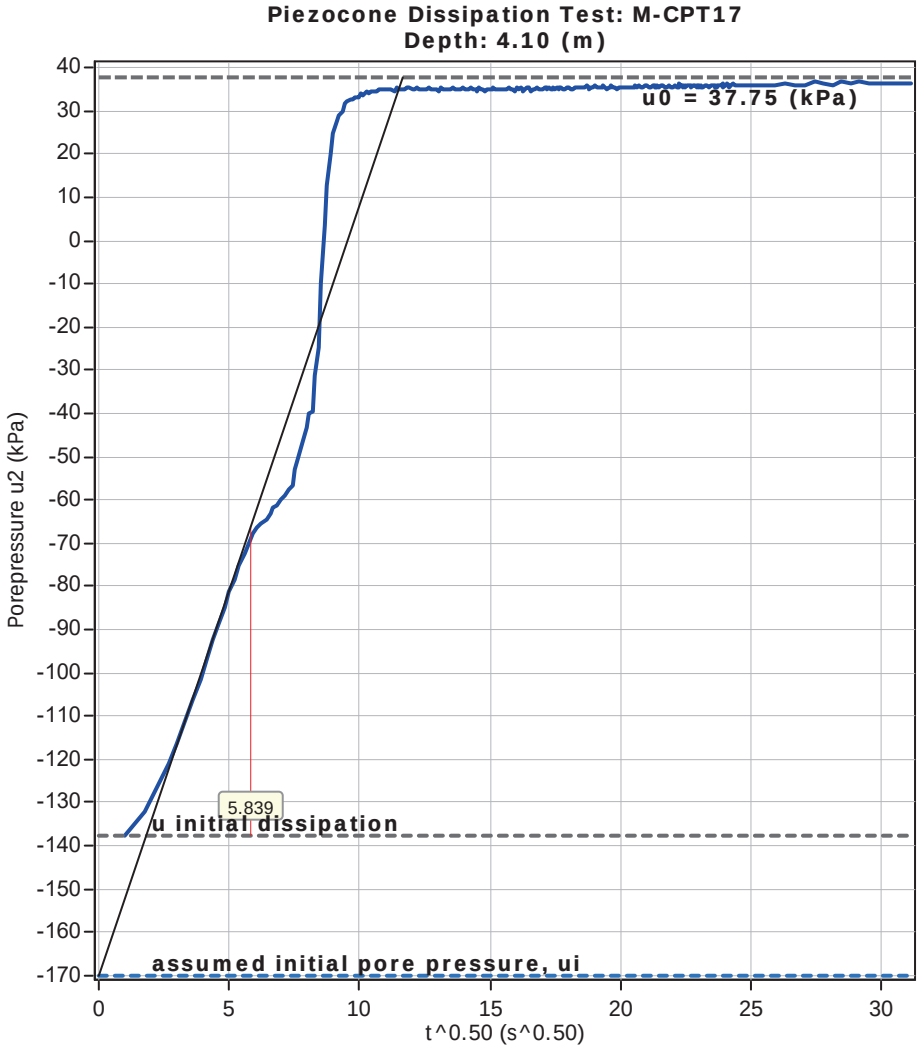
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

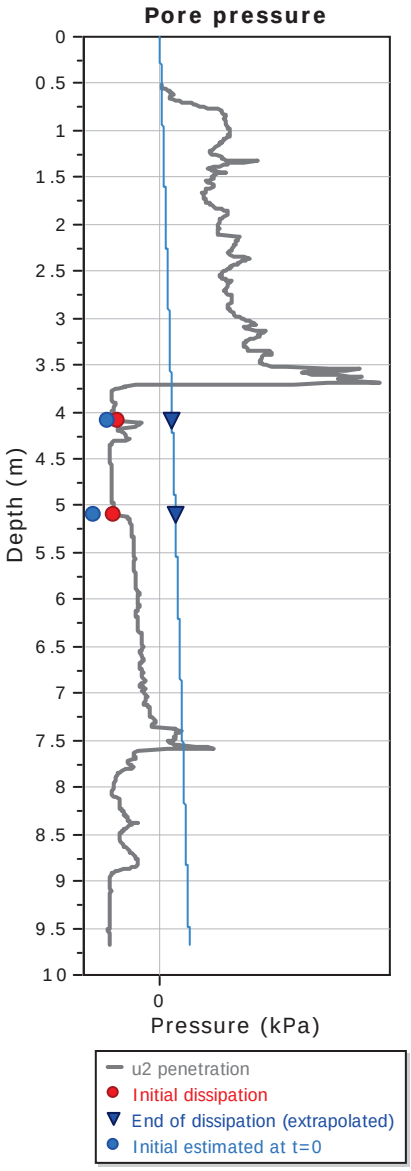
$$k_h = c_h \times \gamma_w / M$$

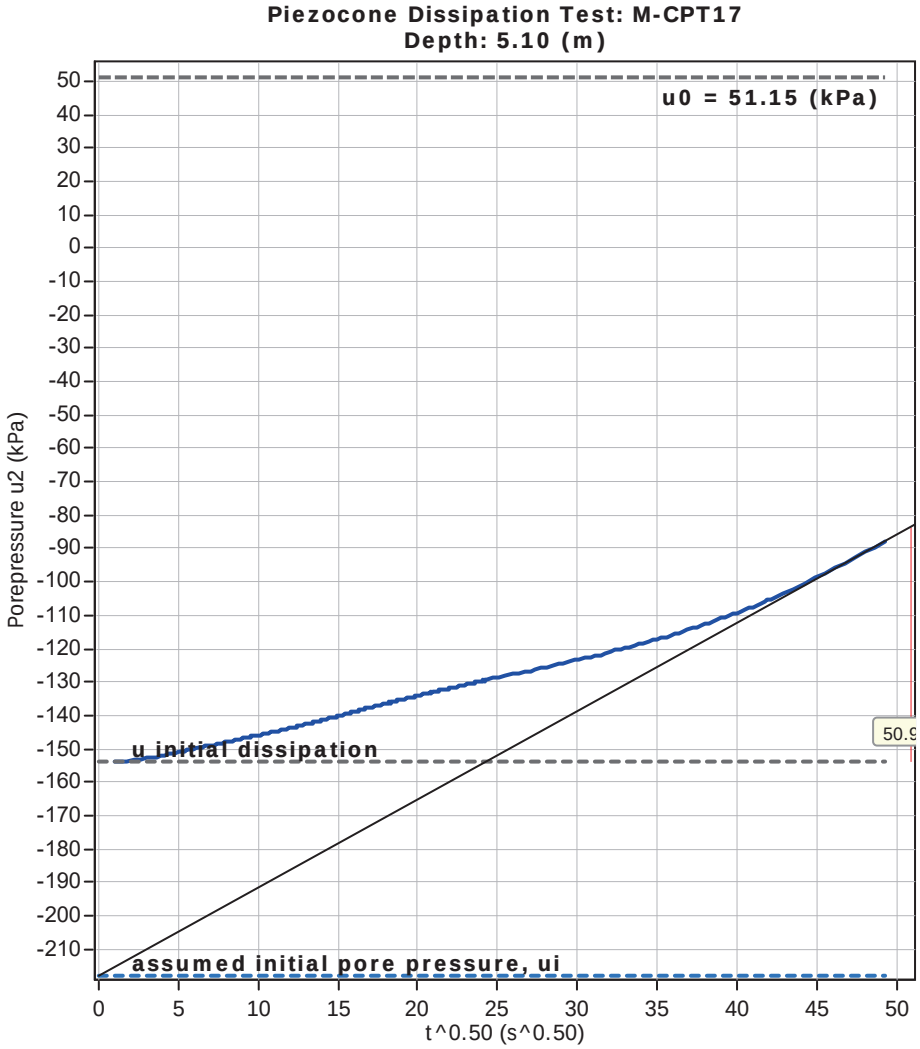
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

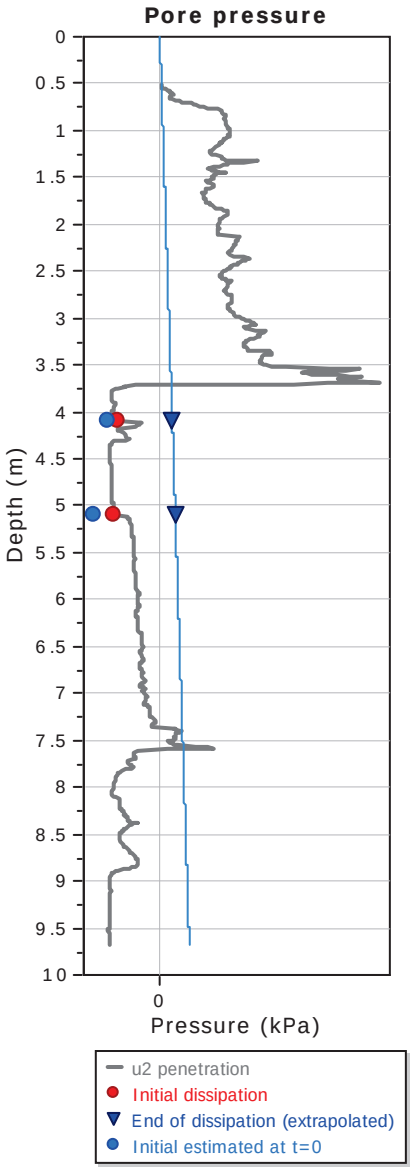
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT17	4.10	5.8	34	1.08E-006	100.00	2.41E-005	759	63.36	3.81E-009
M-CPT17	5.10	50.9	2592	8.22E-005	365.59	6.05E-007	19	39.64	1.53E-010


Piezocone Dissipation Test: M-CPT17
Depth: 4.10 (m)
u0 = 37.75 (kPa)
u initial dissipation
5.839
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT17
Depth: 5.10 (m)
u0 = 51.15 (kPa)
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT18
Total depth: 9.50 m, Date: 03/02/2024
Surface Elevation (mCD): -4.59 m
Coords: X:712531.80, Y:612955.54
Cone Type: S15-CFIP2272
Cone Operator: MJ/ DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

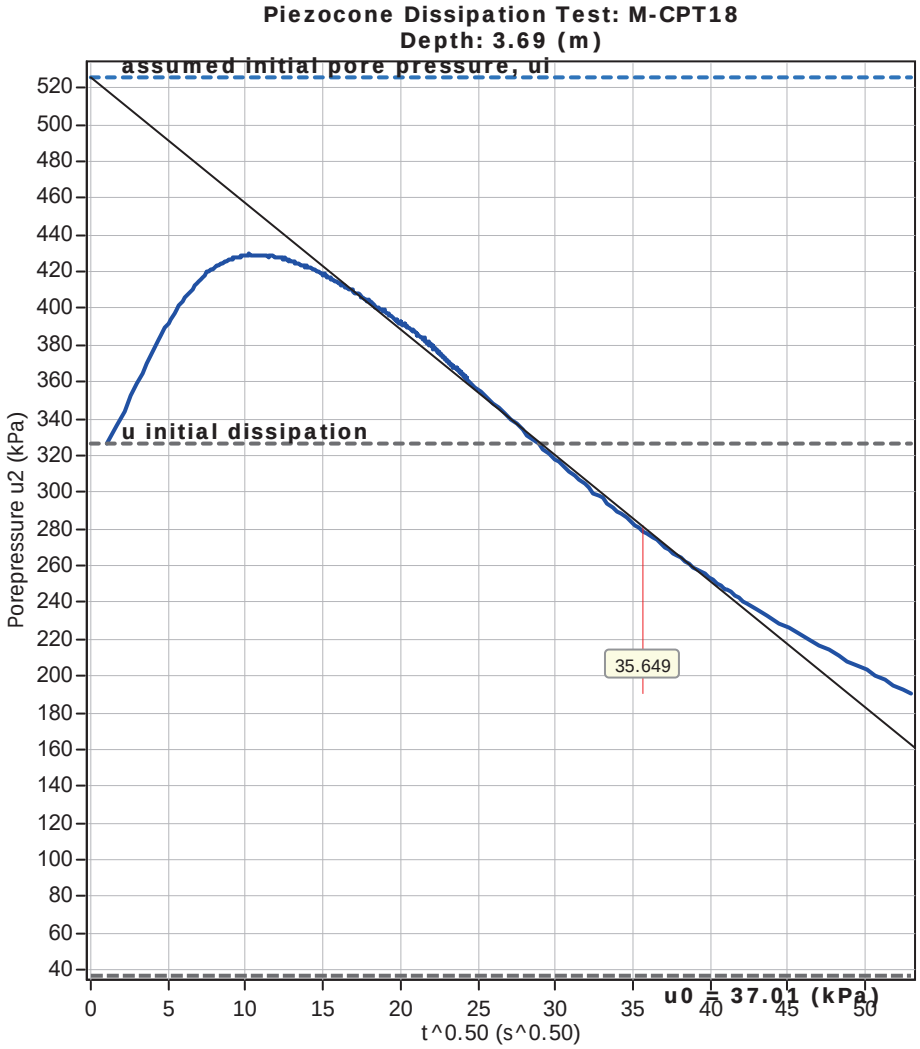
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

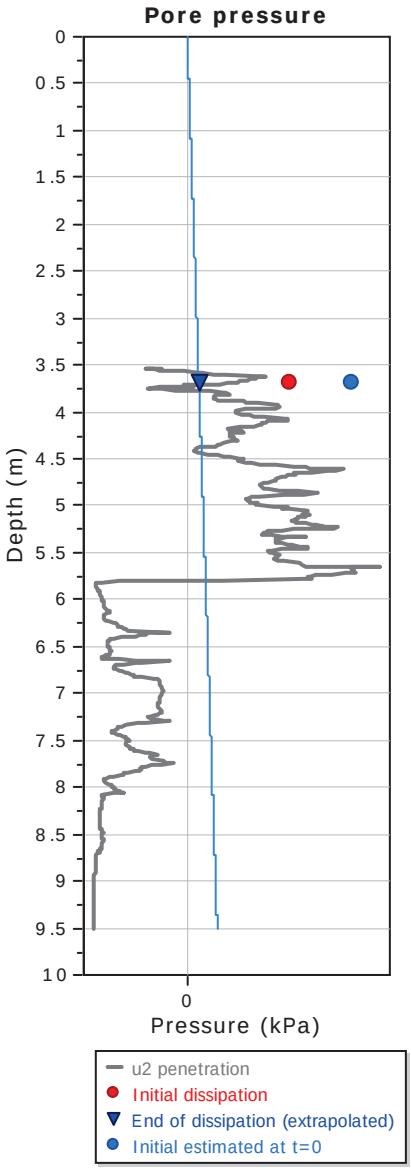
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT18	3.69	35.6	1271	4.03E-005	234.92	9.90E-007	31	6.13	1.62E-009


Piezocone Dissipation Test: M-CPT18
Depth: 3.69 (m)
assumed initial pore pressure, ui
u initial dissipation
35.649
u0 = 37.01 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT19
Total depth: 7.87 m, Date: 04/02/2024
Surface Elevation (mCD): -4.18 m
Coords: X:712533.97, Y:612869.28
Cone Type: S15-CFIP2272
Cone Operator: KW/AG

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

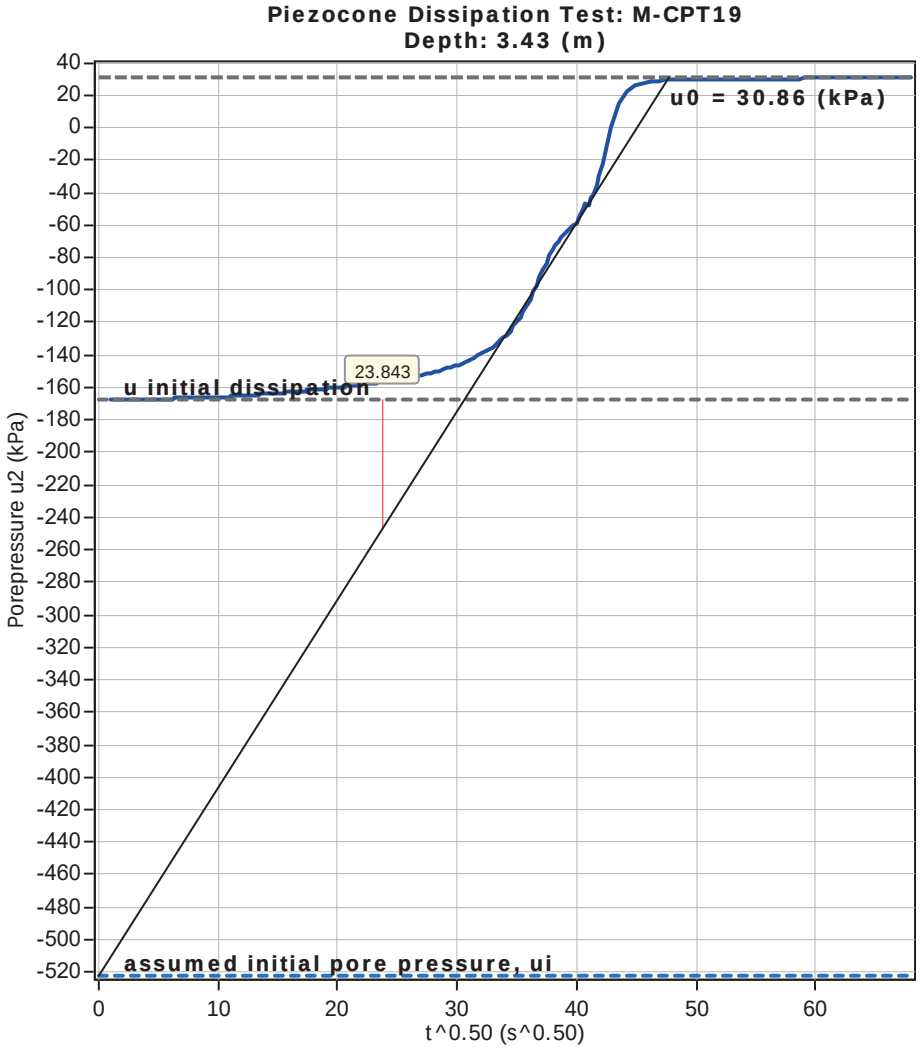
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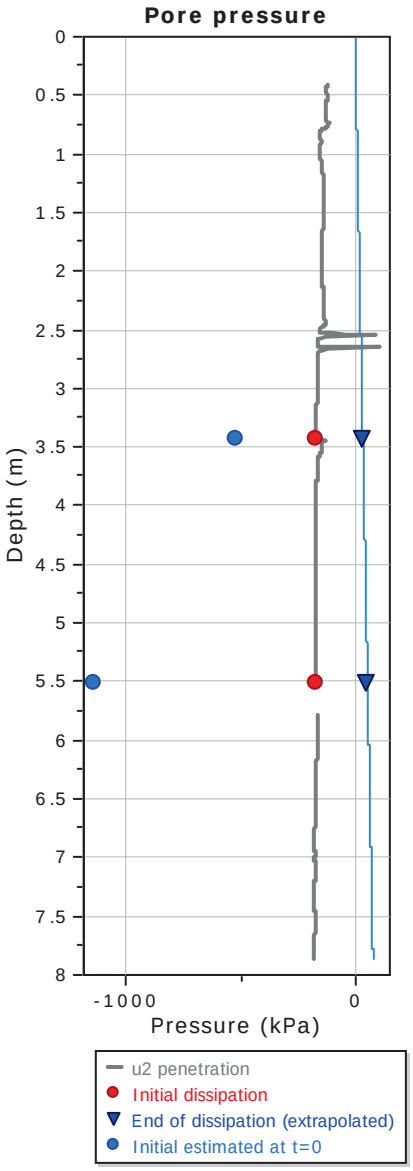
$$k_h = c_h \times \gamma_w / M$$

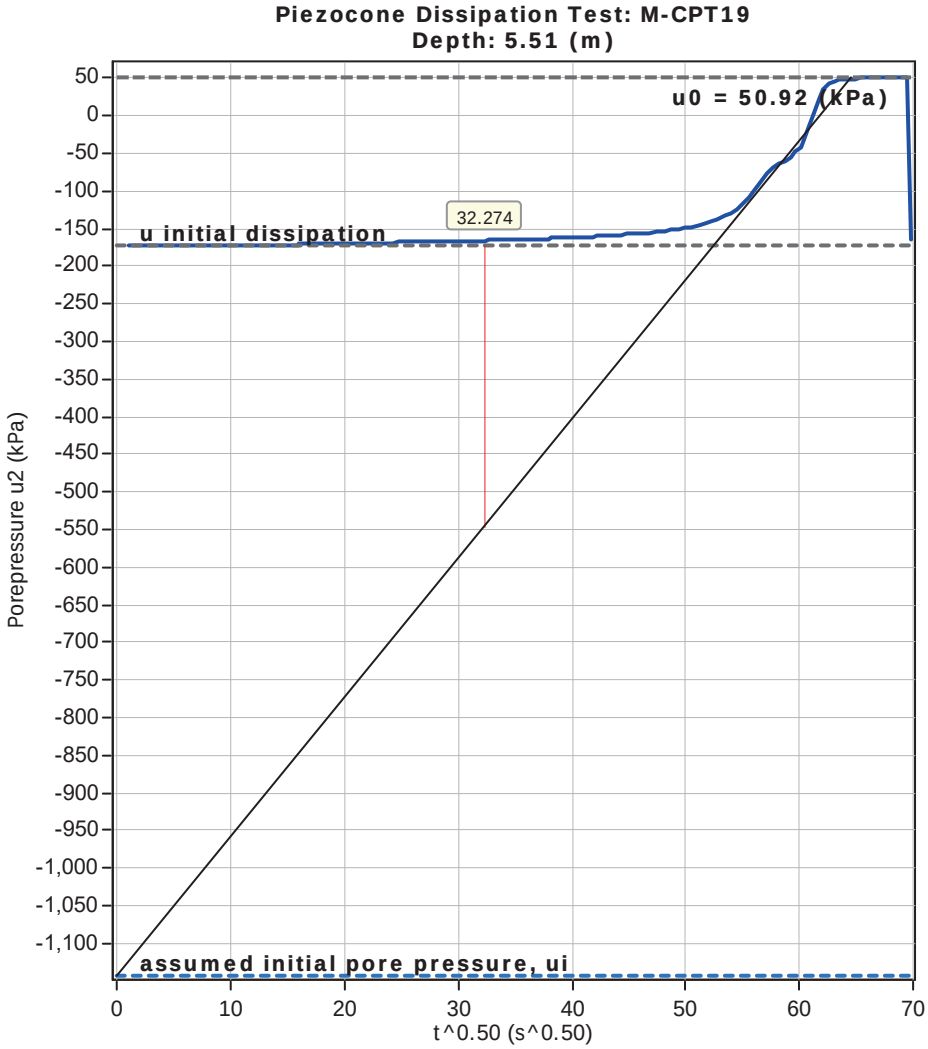
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

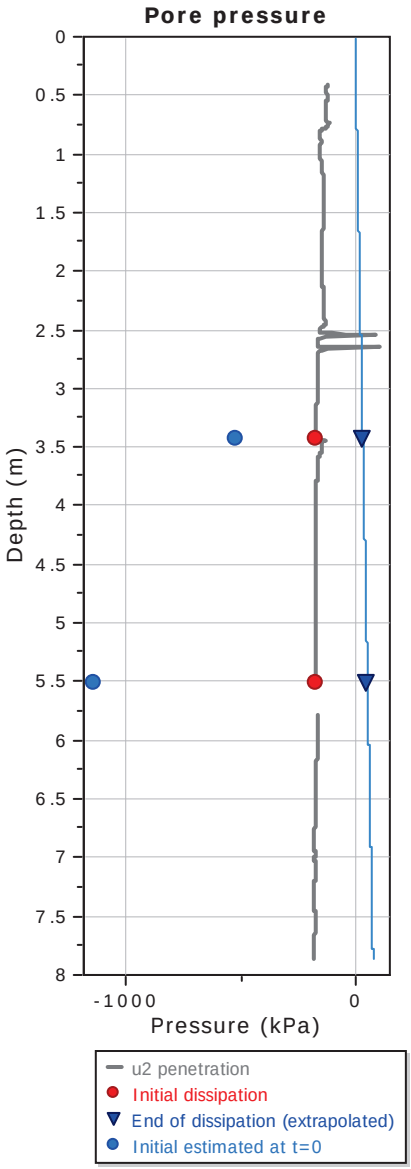
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT19	3.43	23.8	568	1.80E-005	100.00	1.44E-006	46	57.13	2.53E-010
M-CPT19	5.51	32.3	1042	3.30E-005	100.00	7.88E-007	25	157.38	5.02E-011


Piezocone Dissipation Test: M-CPT19
Depth: 3.43 (m)
u0 = 30.86 (kPa)
23.843
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT19
Depth: 5.51 (m)
u0 = 50.92 (kPa)
u initial dissipation
32.274
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT20
Total depth: 7.00 m, Date: 04/02/2024
Surface Elevation (mCD): -3.62 m
Coords: X:712516.54, Y:612759.30
Cone Type: S15-CFIP2272
Cone Operator: MJ/DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

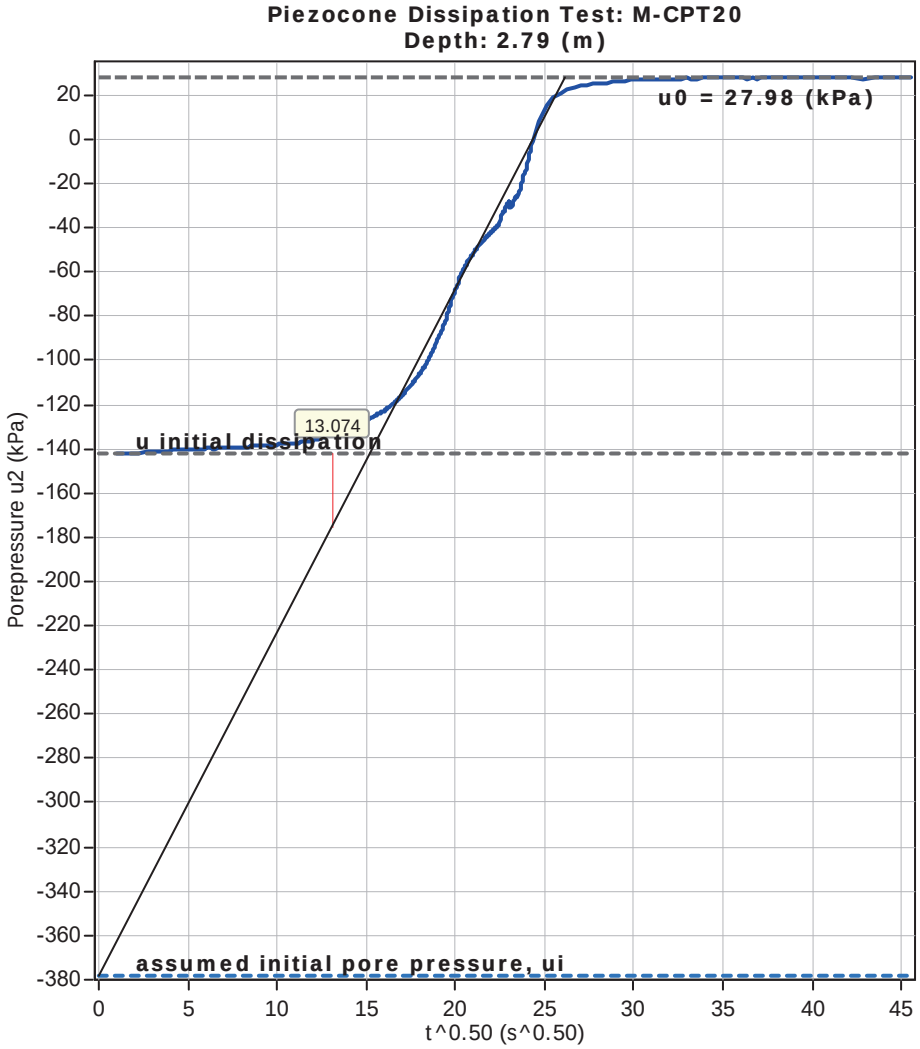
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

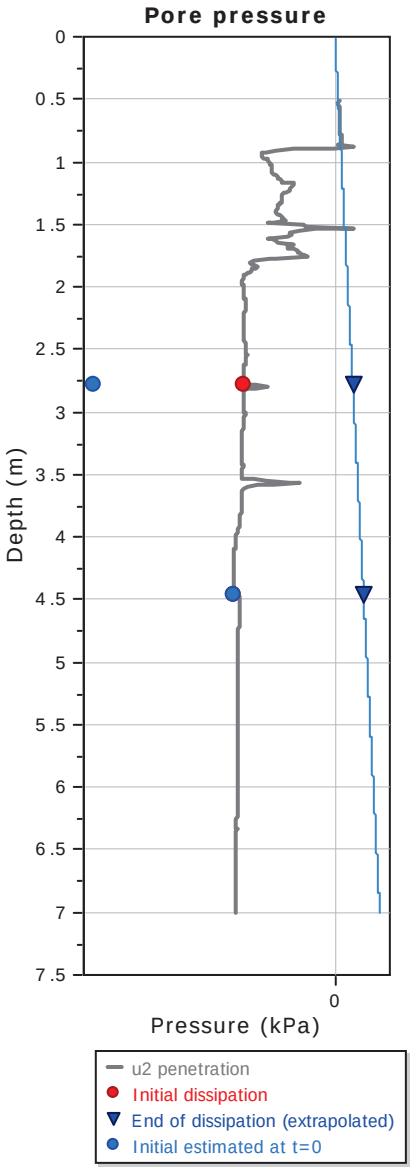
$$k_h = c_h \times \gamma_w / M$$

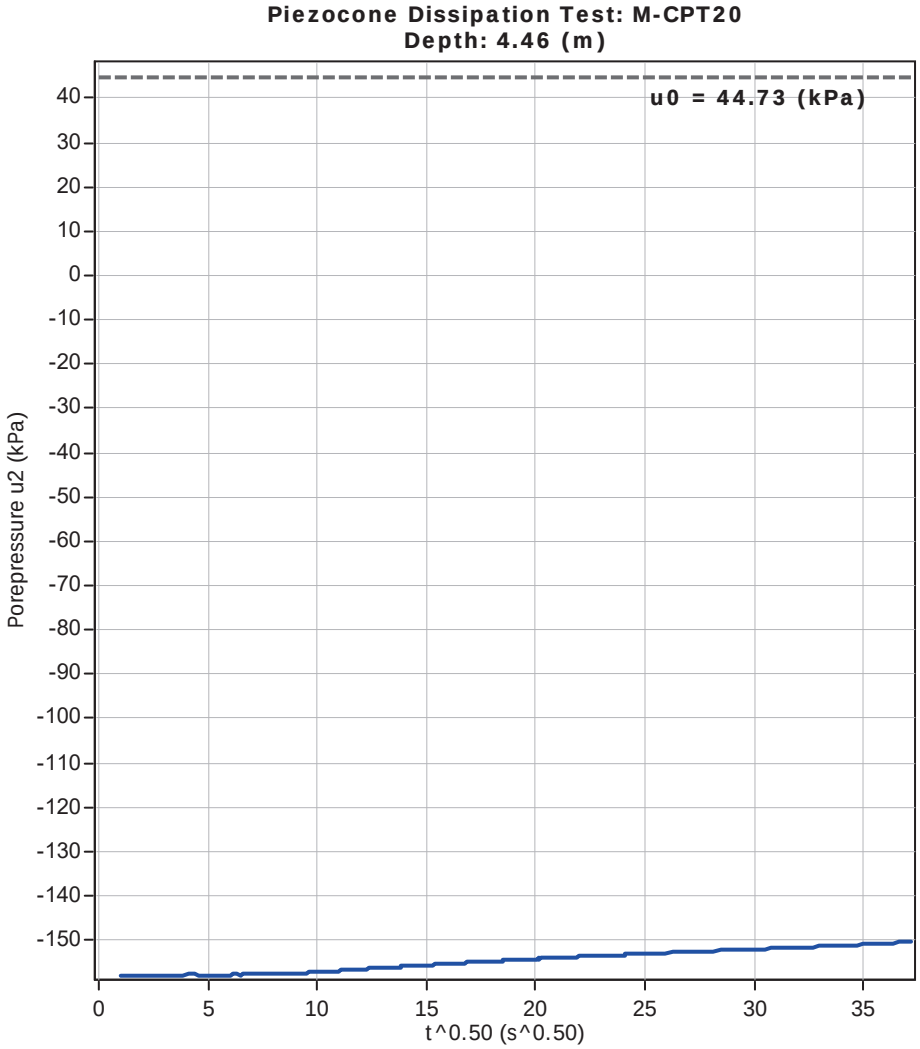
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

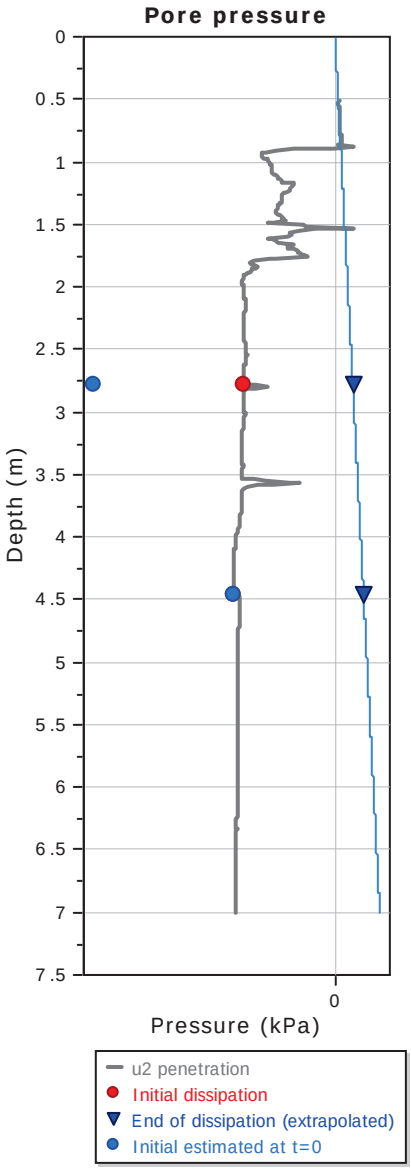
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT20	2.79	13.1	171	5.42E-006	100.00	4.80E-006	151	84.81	5.68E-010
M-CPT20	4.46	448.1	200823	6.37E-003	100.00	4.09E-009	0	60.58	6.76E-013


Piezocone Dissipation Test: M-CPT20
Depth: 2.79 (m)
u0 = 27.98 (kPa)
13.074
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT20
Depth: 4.46 (m)
u0 = 44.73 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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8 Drumahiskey Road, Ballymoney
Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT22
Total depth: 1.72 m, Date: 18/02/2024
Surface Elevation (mCD): -3.32 m
Coords: X:712495.91, Y:612660.54
Cone Type: S15-CFIP2271
Cone Operator: SJ/ RW

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

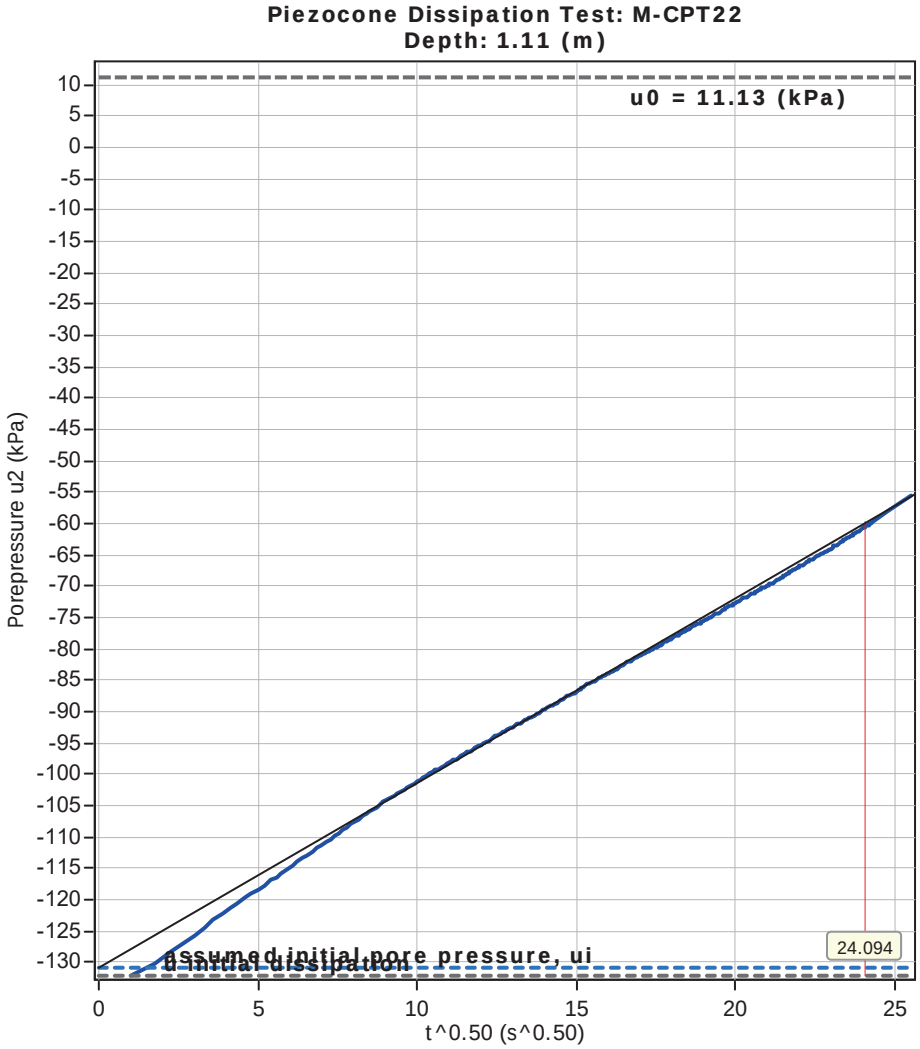
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

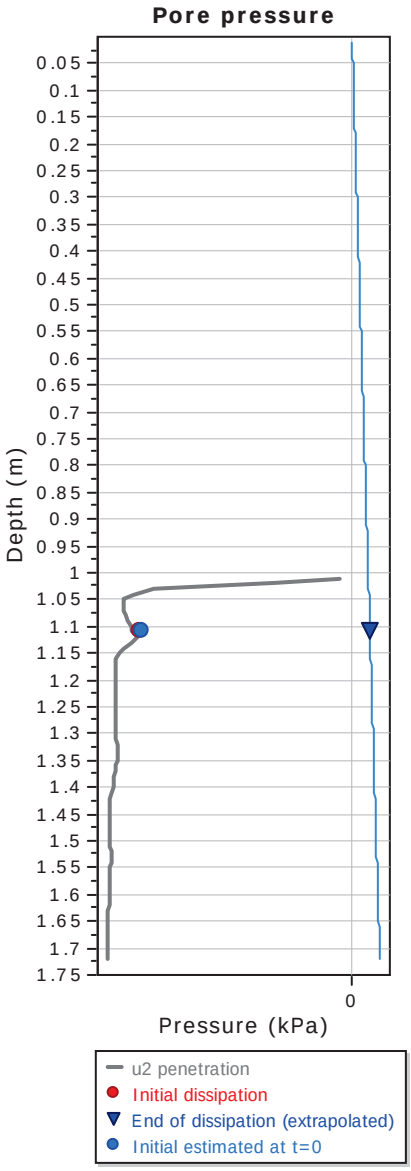
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT22	1.11	24.1	580	1.84E-005	100.00	1.41E-006	45	42.64	3.32E-010


Piezocone Dissipation Test: M-CPT22
Depth: 1.11 (m)
u0 = 11.13 (kPa)
assumed initial pore pressure, ui
d_initial dissipation
24.094
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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8 Drumahiskey Road, Ballymoney
Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT23_BH
Total depth: 10.56 m, Date: 04/01/2024
Surface Elevation (mCD): -4.83 m
Coords: X:712881.55, Y:613051.61
Cone Type: S15-CFIP2272
Cone Operator: MJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

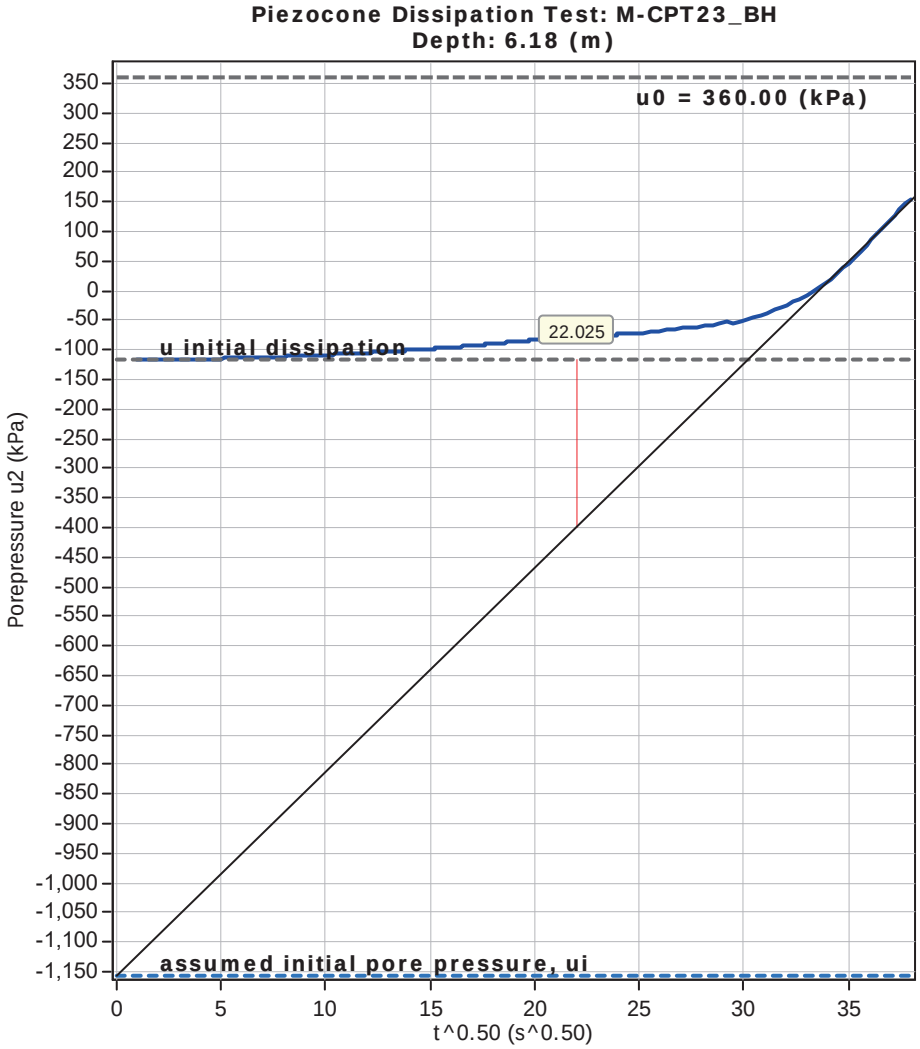
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

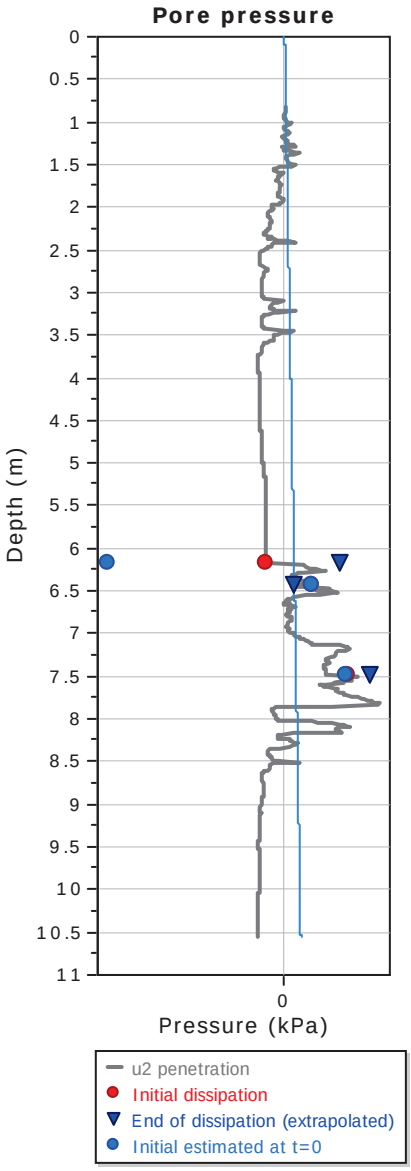
$$k_h = c_h \times \gamma_w / M$$

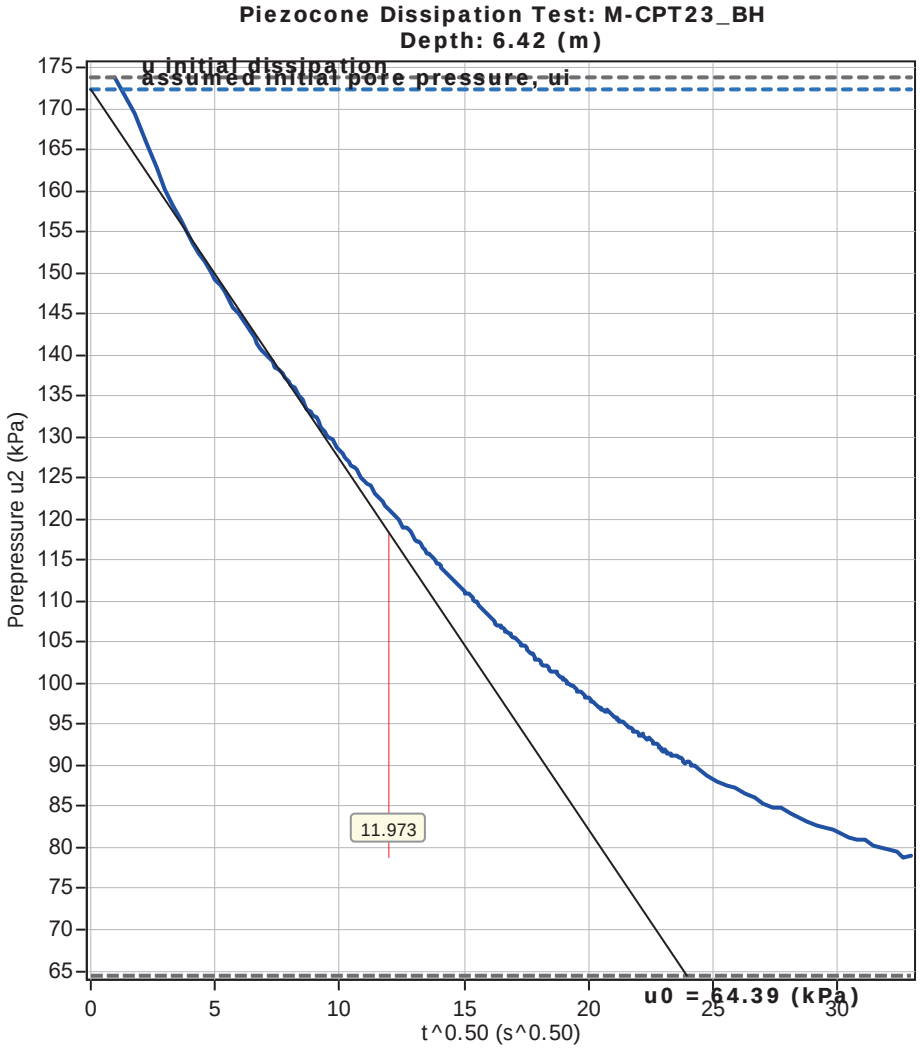
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

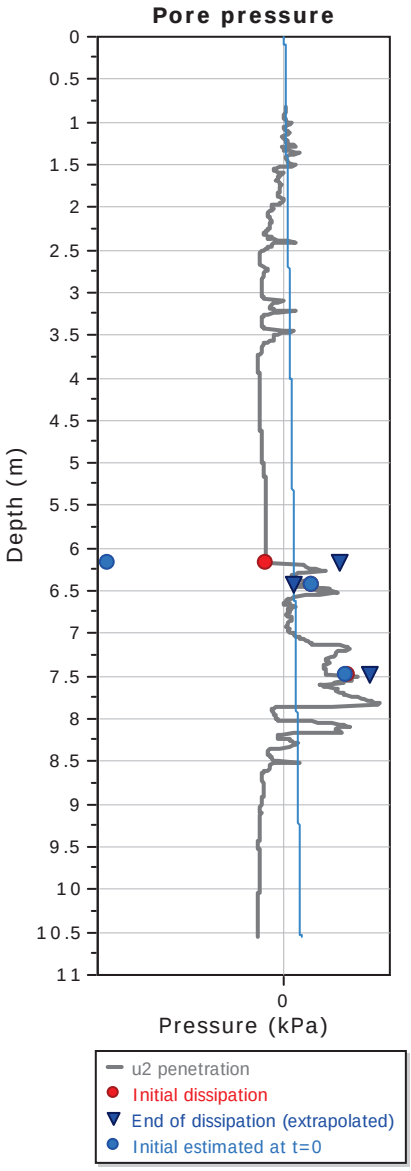
Tabular results

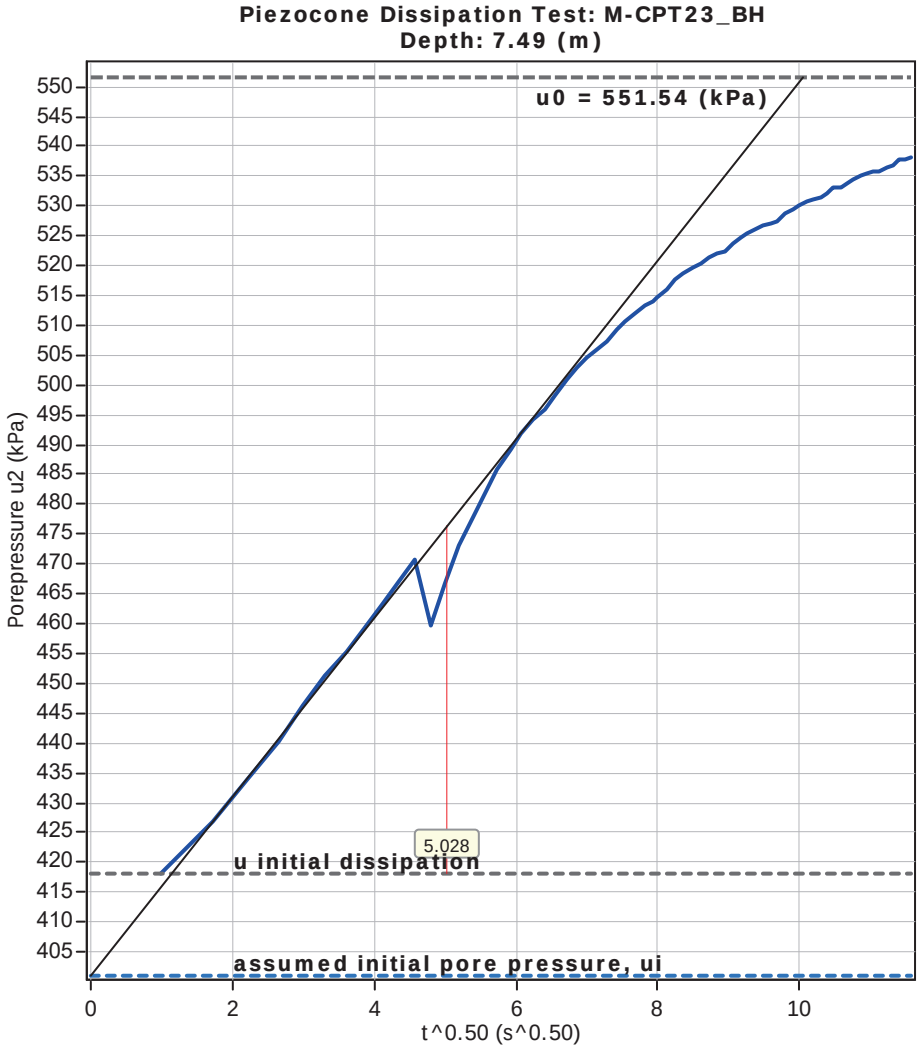
CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT23_BH	6.18	22.0	485	1.54E-005	393.91	3.36E-006	106	19.25	1.75E-009
M-CPT23_BH	6.42	12.0	143	4.55E-006	345.67	1.06E-005	336	25.64	4.16E-009
M-CPT23_BH	7.49	5.0	25	8.02E-007	440.12	6.81E-005	2147	16.22	4.21E-008

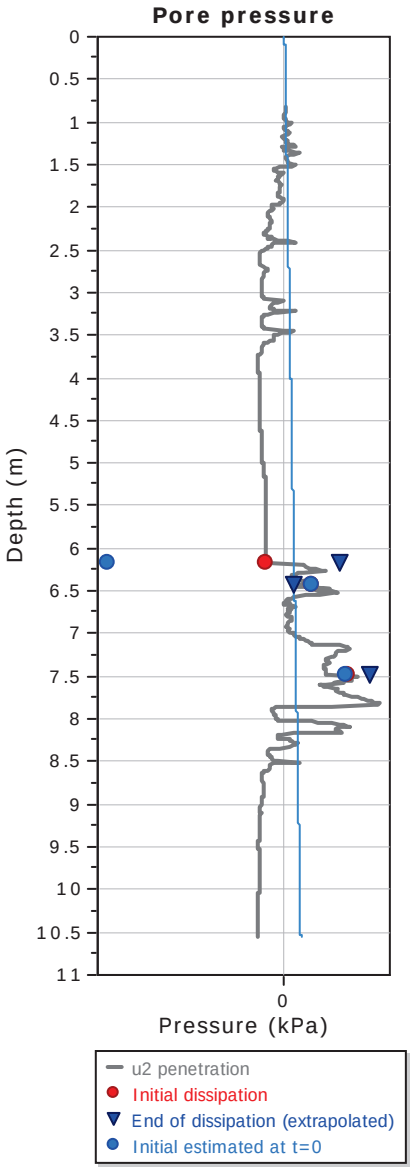

Piezocone Dissipation Test: M-CPT23_BH
Depth: 6.18 (m)
u0 = 360.00 (kPa)
u initial dissipation
22.025
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT23_BH
Depth: 6.42 (m)
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)
11.973
u0 = 64.39 (kPa)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT23_BH
Depth: 7.49 (m)
u0 = 551.54 (kPa)
u initial dissipation
assumed initial pore pressure, ui
5.028
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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8 Drumahiskey Road, Ballymoney
Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT24_BH
Total depth: 10.90 m, Date: 31/01/2024
Surface Elevation (mCD): -5.38 m
Coords: X:712730.03, Y:613038.13
Cone Type: S15-CFIP2272
Cone Operator: MJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

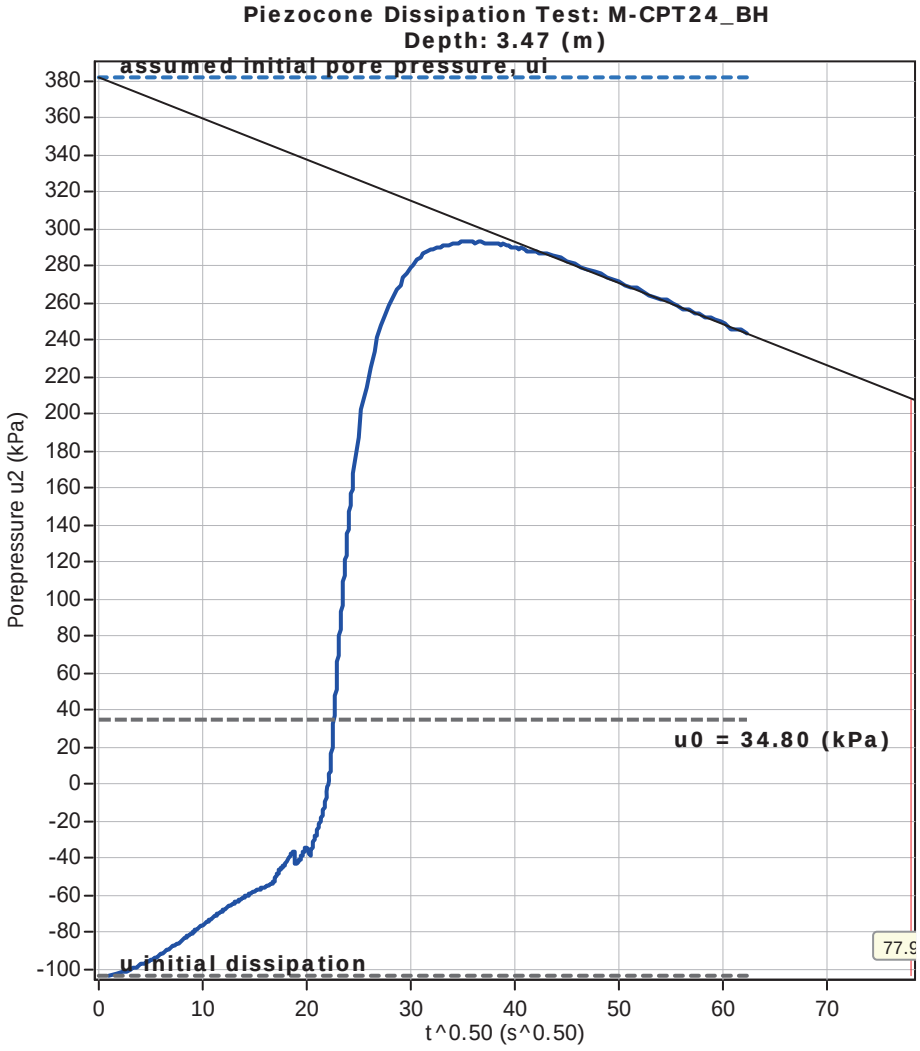
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

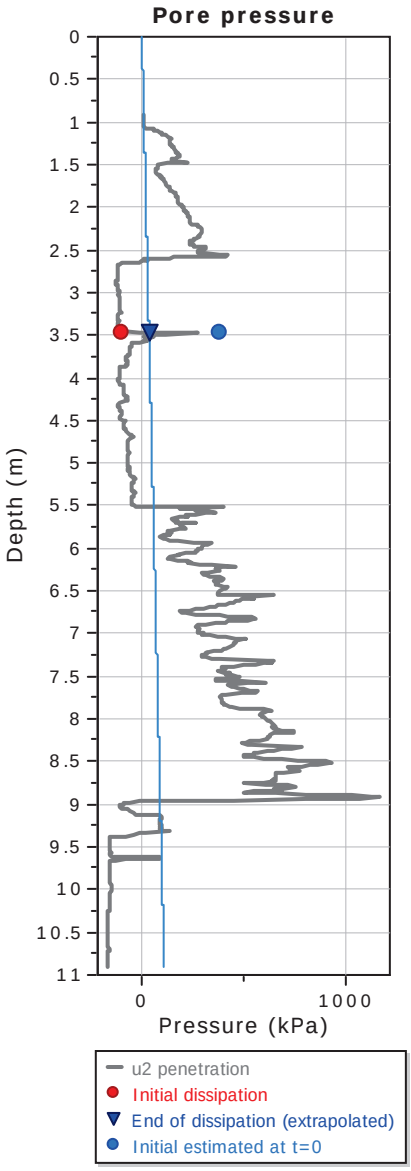
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT24_BH	3.47	78.0	6084	1.93E-004	337.88	2.48E-007	8	22.39	1.11E-010


Piezocone Dissipation Test: M-CPT24_BH
Depth: 3.47 (m)
assumed initial pore pressure, ui
u0 = 34.80 (kPa)
u initial dissipation
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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8 Drumahiskey Road, Ballymoney
Co. Antrim, BT53 7QL, N. Ireland
www.causewaygeotech.com

CPT: M-CPT27
Total depth: 7.45 m, Date: 14/02/2024
Surface Elevation (mCD): -6.47 m
Coords: X:713055.00, Y:613231.76
Cone Type: S15-CFIP2272
Cone Operator: MJ / DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

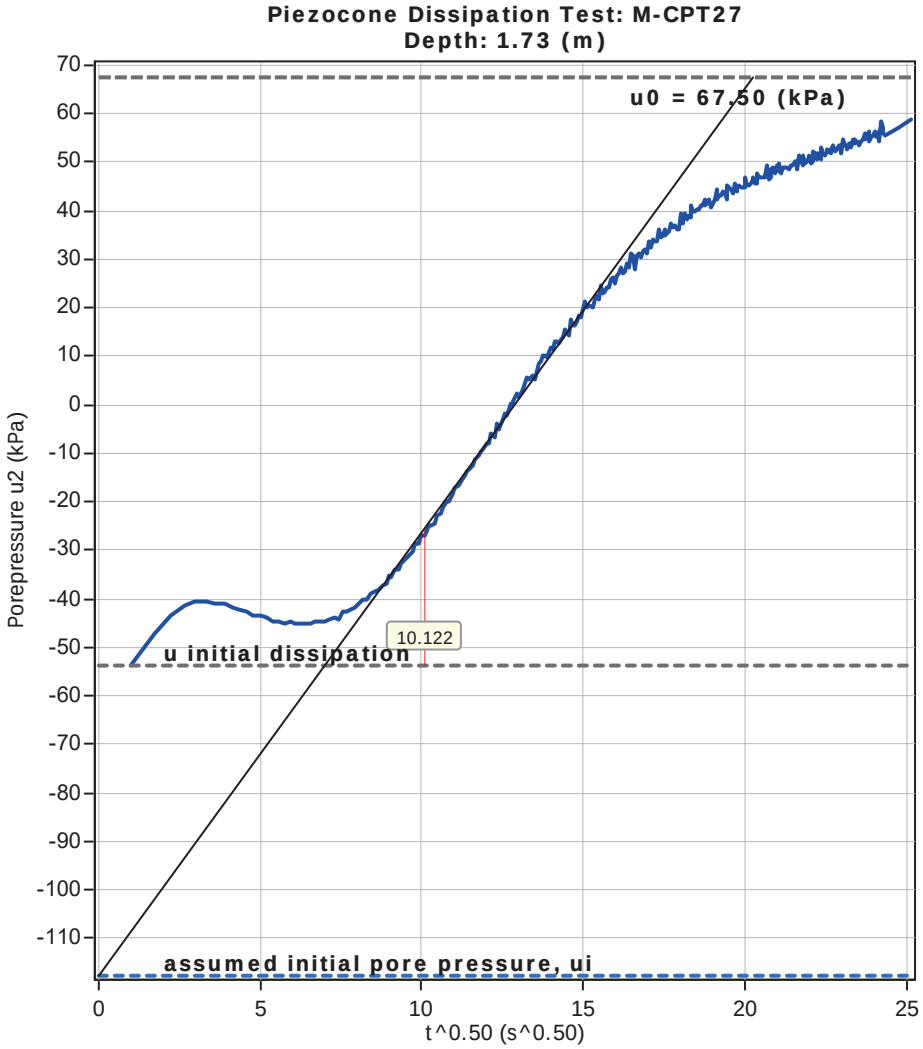
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

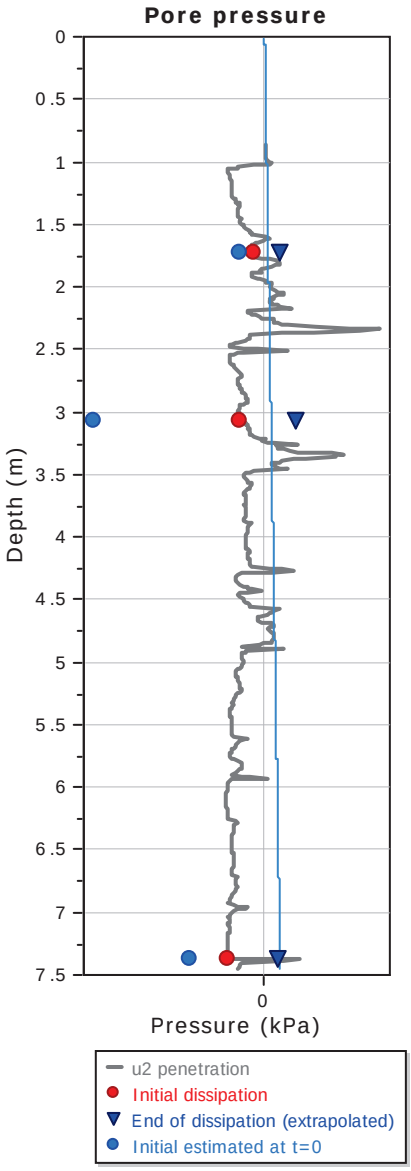
$$k_h = c_h \times \gamma_w / M$$

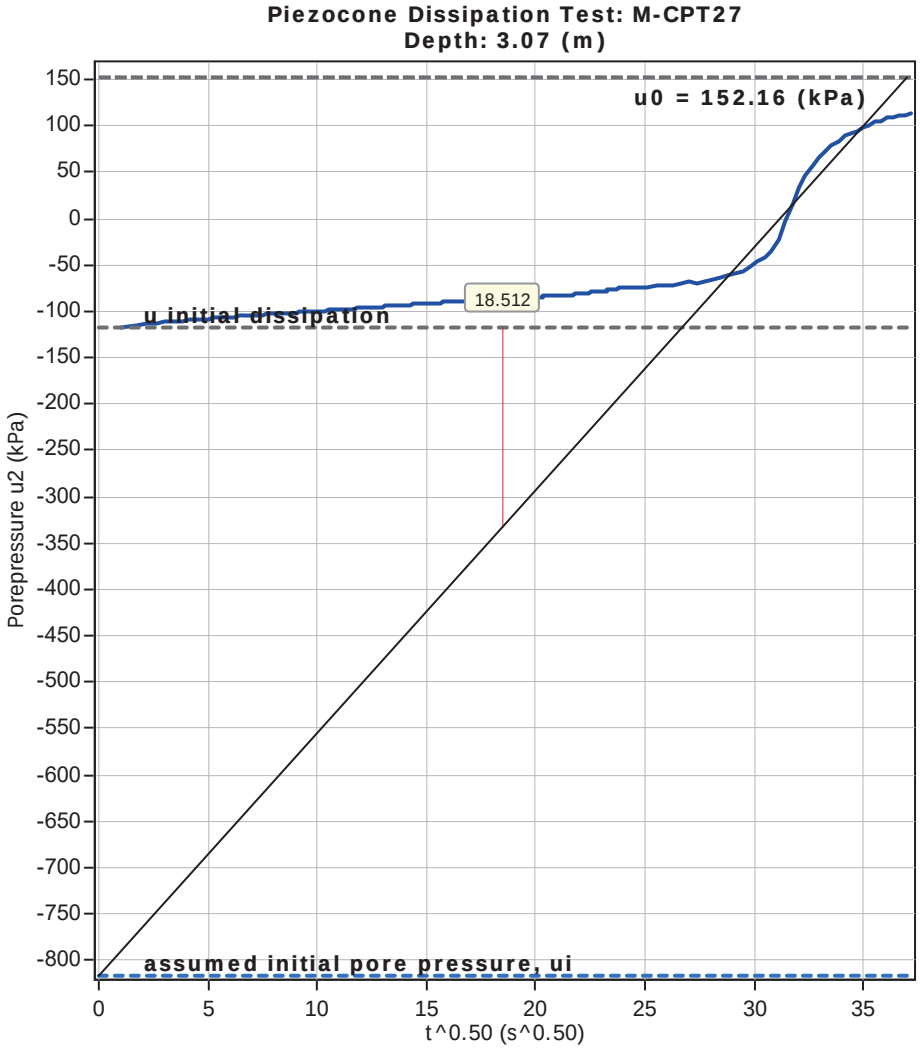
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

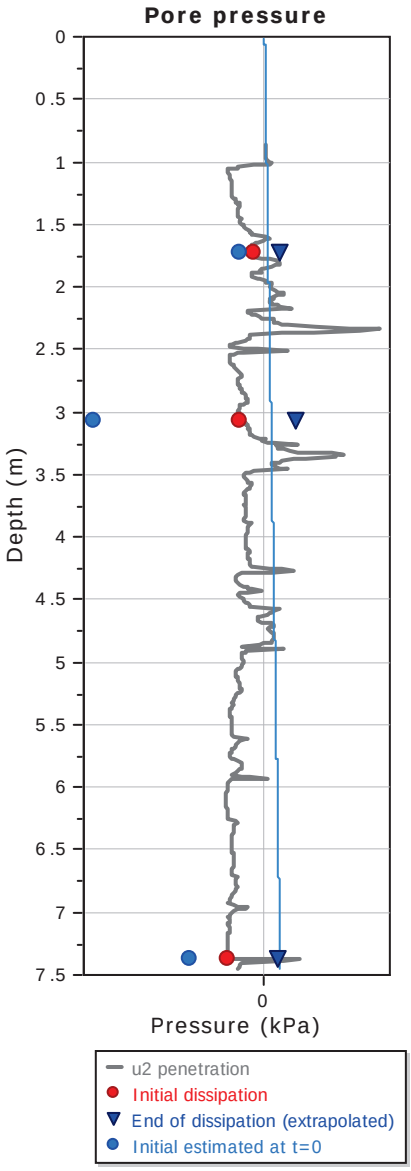
Tabular results

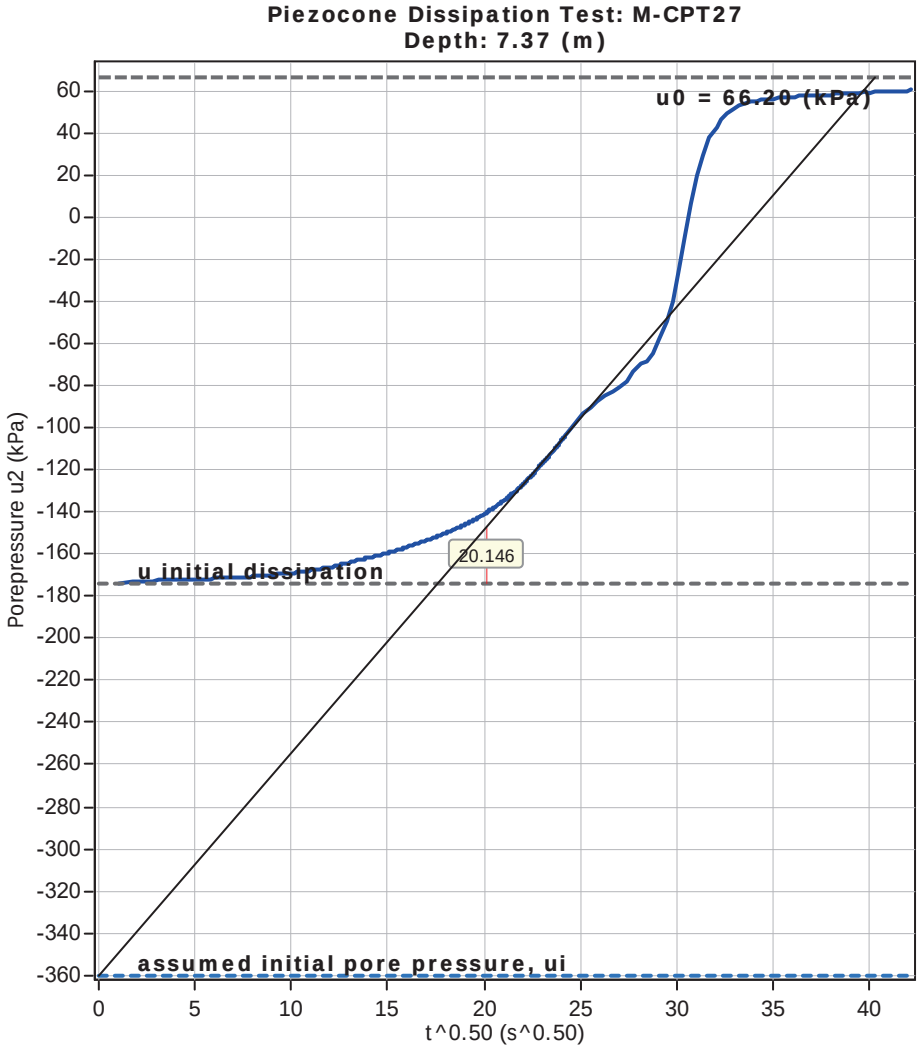
CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT27	1.73	10.1	102	3.25E-006	328.98	1.45E-005	458	19.41	7.51E-009
M-CPT27	3.07	18.5	343	1.09E-005	333.51	4.37E-006	138	31.35	1.40E-009
M-CPT27	7.37	20.1	406	1.29E-005	100.00	2.02E-006	64	207.63	9.77E-011

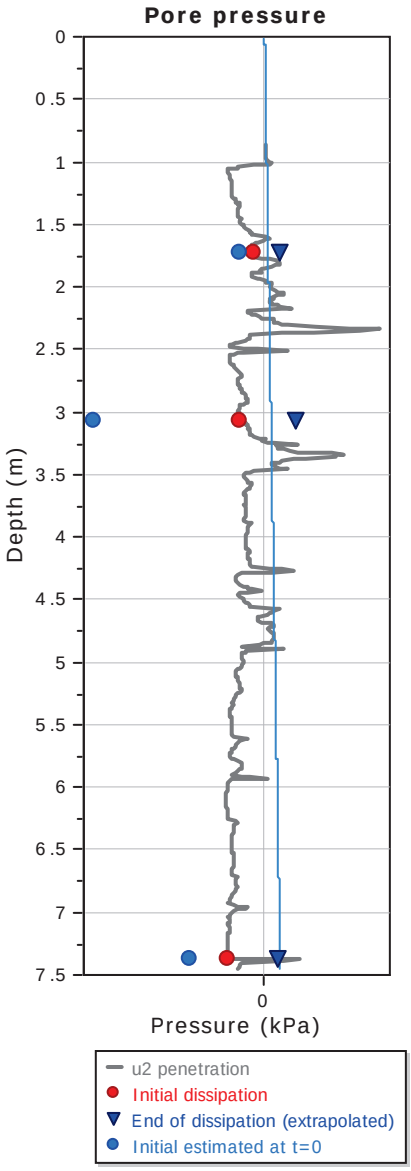

Piezocone Dissipation Test: M-CPT27
Depth: 1.73 (m)
u0 = 67.50 (kPa)
u initial dissipation
10.122
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT27
Depth: 3.07 (m)
u0 = 152.16 (kPa)
u initial dissipation
18.512
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT27
Depth: 7.37 (m)
u0 = 66.20 (kPa)
u initial dissipation
20.146
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT33_BH
Total depth: 7.79 m, Date: 11/02/2024
Surface Elevation (mCD): -6.53 m
Coords: X:713024.22, Y:613163.55
Cone Type: S15-CFIP2272
Cone Operator: MJ/ DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

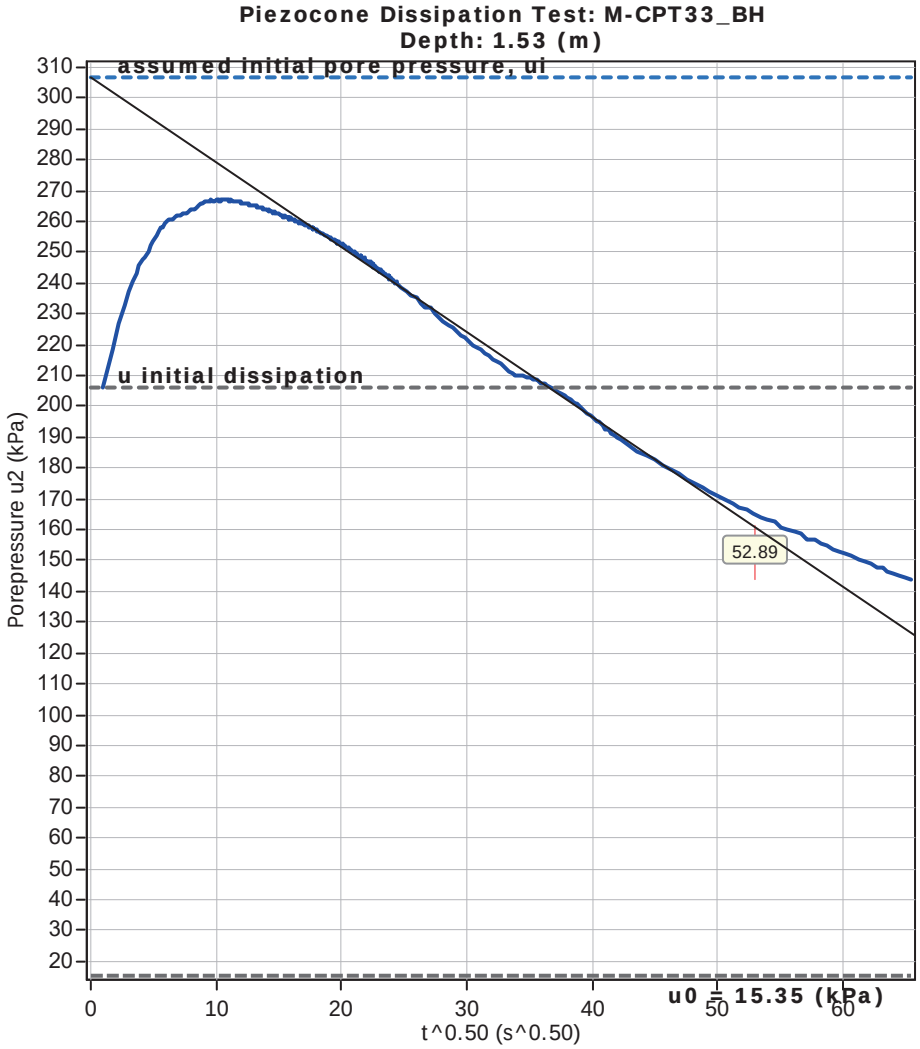
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

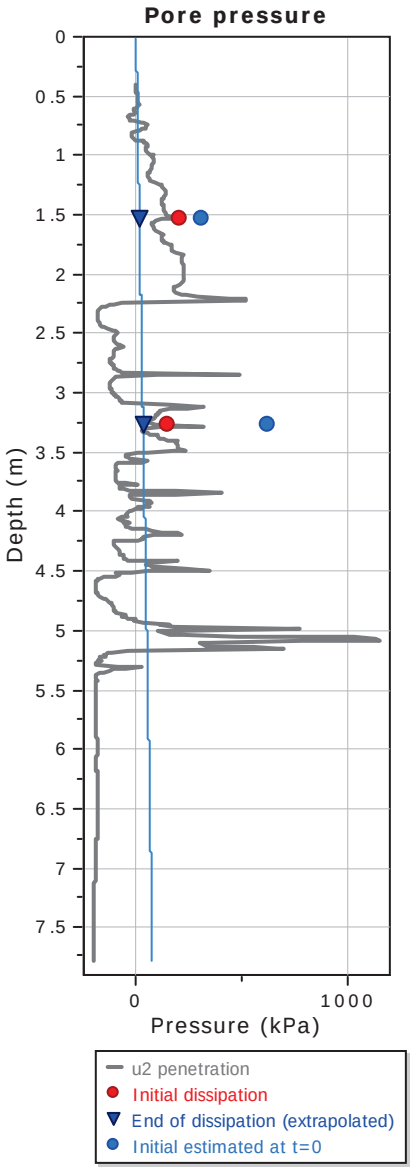
$$k_h = c_h \times \gamma_w / M$$

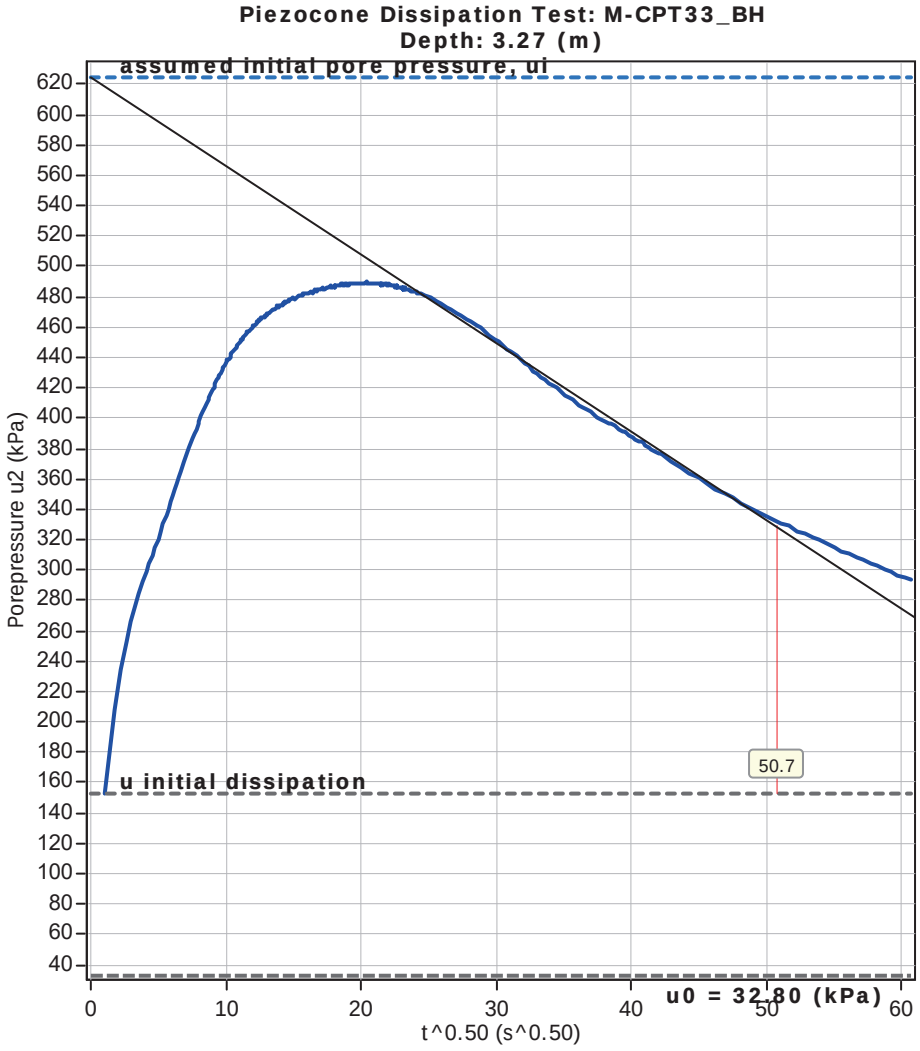
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

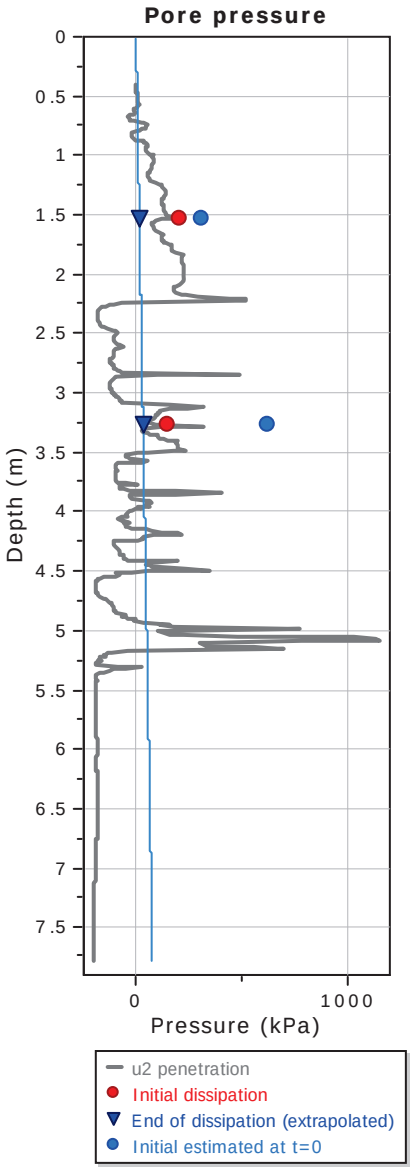
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT33_BH	1.53	52.9	2797	8.87E-005	100.00	2.93E-007	9	11.75	2.50E-010
M-CPT33_BH	3.27	50.7	2570	8.15E-005	353.97	6.01E-007	19	37.21	1.62E-010


Piezocone Dissipation Test: M-CPT33_BH
Depth: 1.53 (m)
assumed initial pore pressure, ui
u initial dissipation
52.89
u0 = 15.35 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT33_BH
Depth: 3.27 (m)
assumed initial pore pressure, ui
u initial dissipation
u0 = 32.80 (kPa)
50.7
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT35
Total depth: 8.49 m, Date: 20/02/2024
Surface Elevation (mCD): -5.53 m
Coords: X:712955.46, Y:613201.83
Cone Type: S15-CFIP2271
Cone Operator: SJ/ RW

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

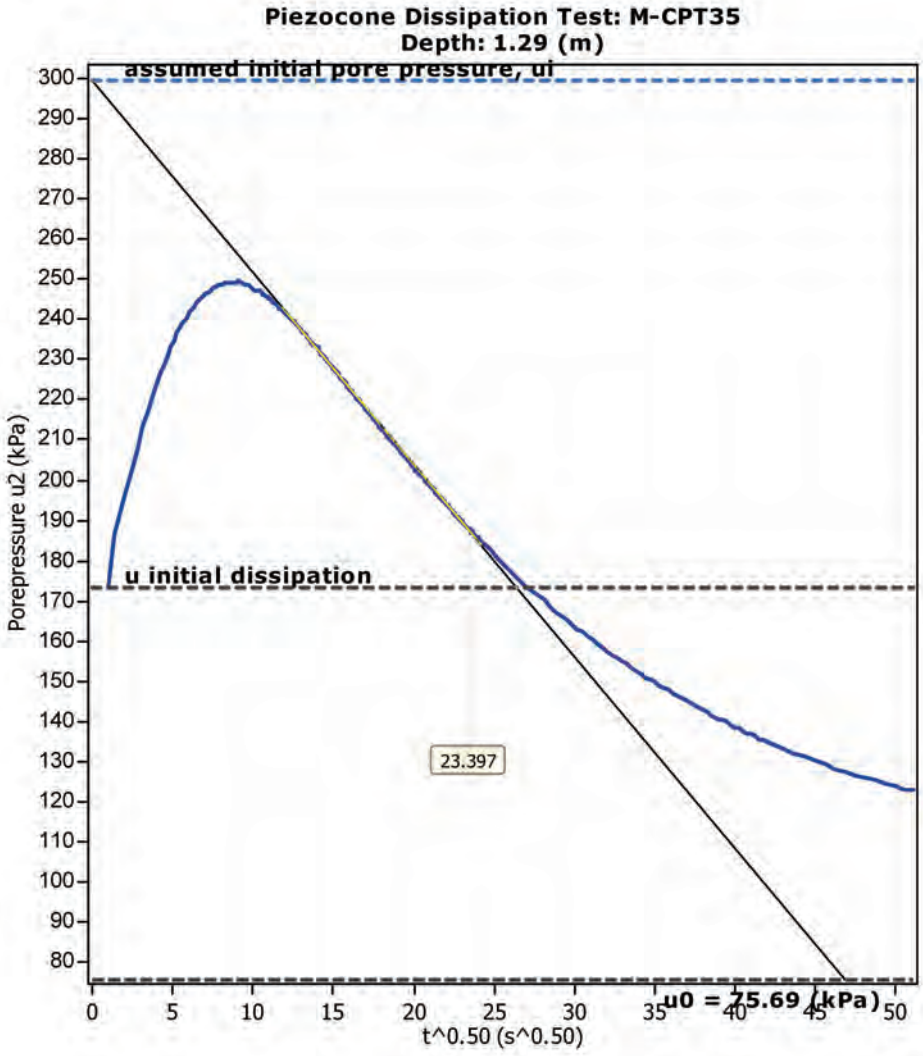
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

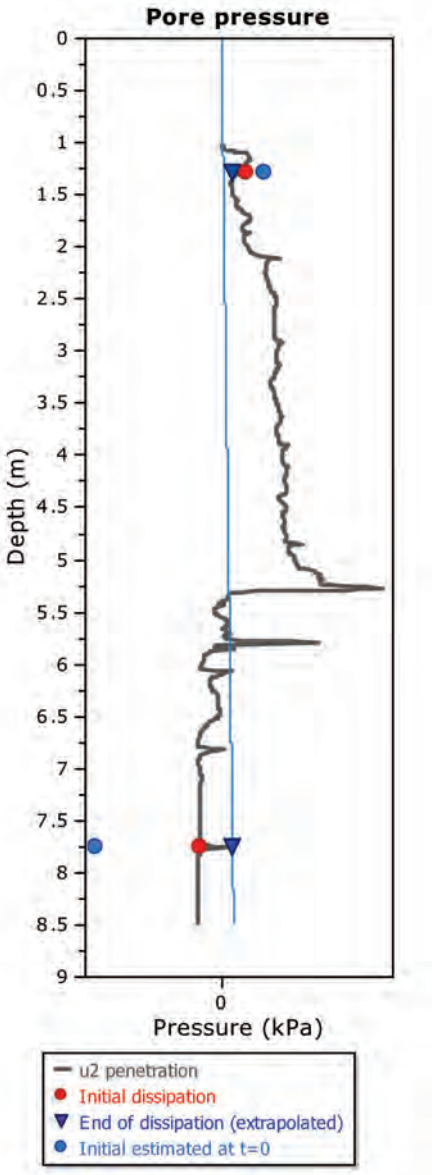
$$k_h = c_h \times \gamma_w / M$$

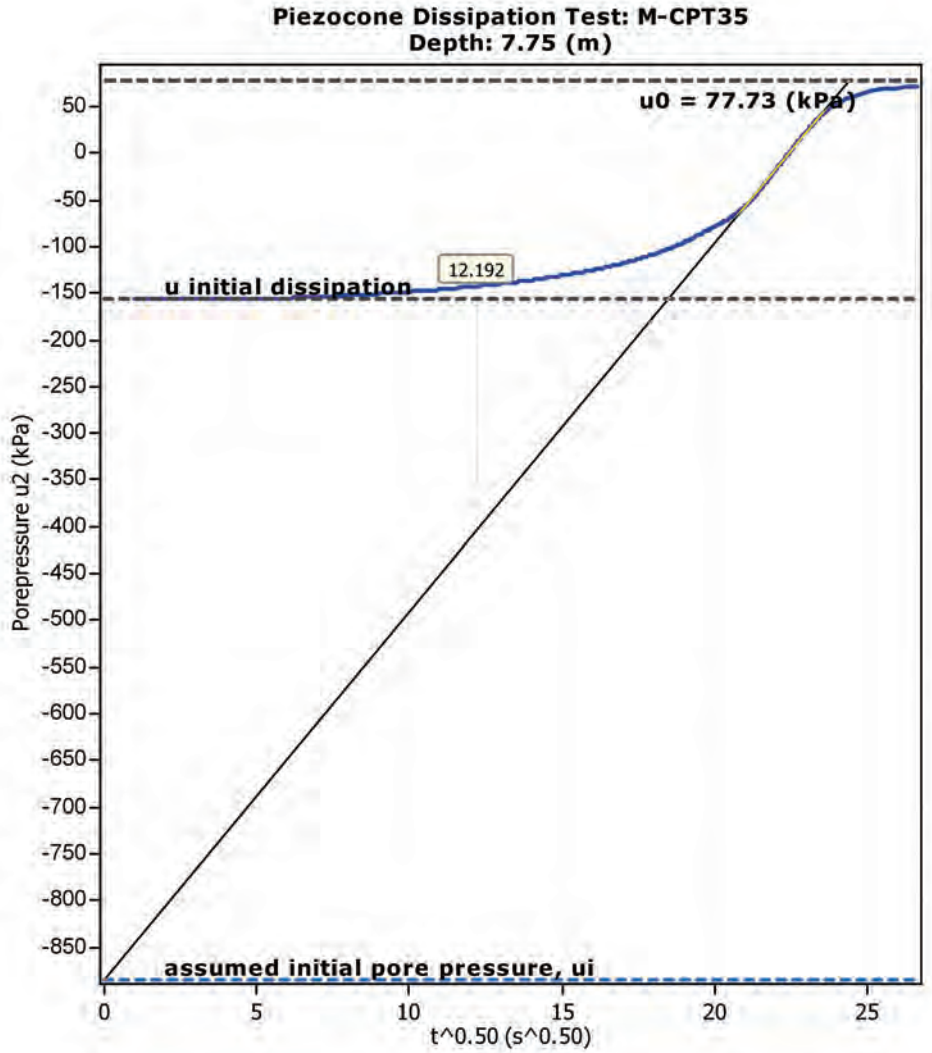
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

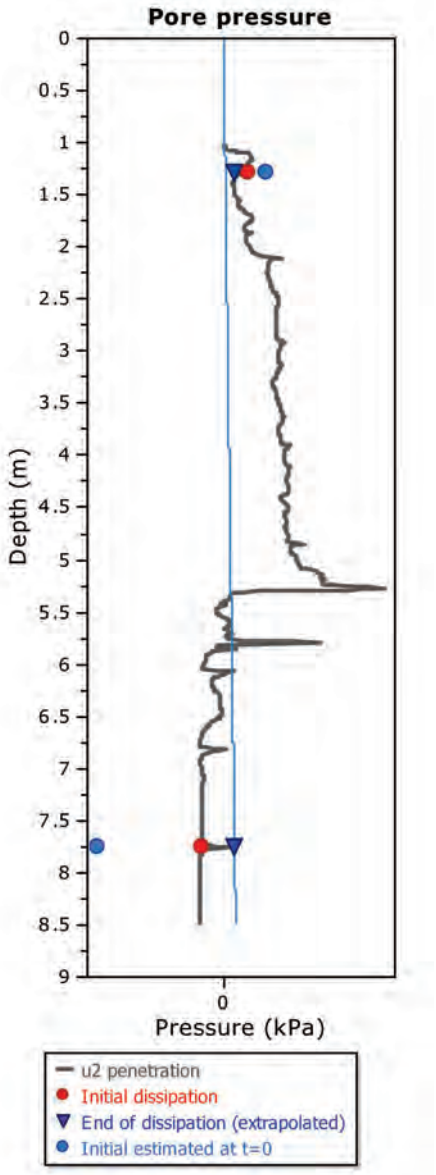
Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT35	1.29	23.4	547	1.74E-005	270.99	2.47E-006	78	11.44	2.16E-009
M-CPT35	7.75	12.2	149	4.71E-006	100.00	5.52E-006	174	92.83	5.96E-010


Piezocone Dissipation Test: M-CPT35
Depth: 1.29 (m)
assumed initial pore pressure, ui
u initial dissipation
23.397
u0 = 175.69 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT35
Depth: 7.75 (m)
u0 = 77.73 (kPa)
u initial dissipation
12.192
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT37
Total depth: 7.94 m, Date: 21/02/2024
Surface Elevation (mCD): -5.23 m
Coords: X:712942.05, Y:6123133.56
Cone Type: S15-CFIP2271
Cone Operator: SJ/ RW

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

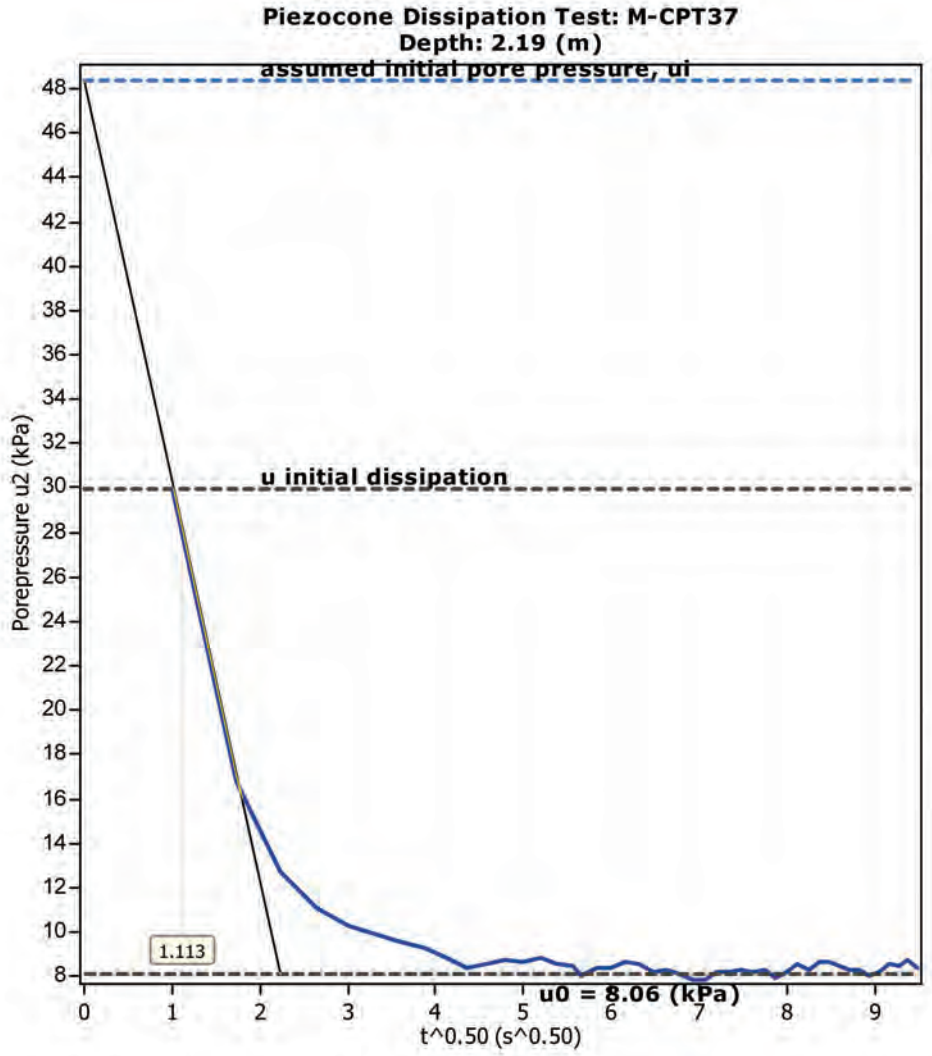
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

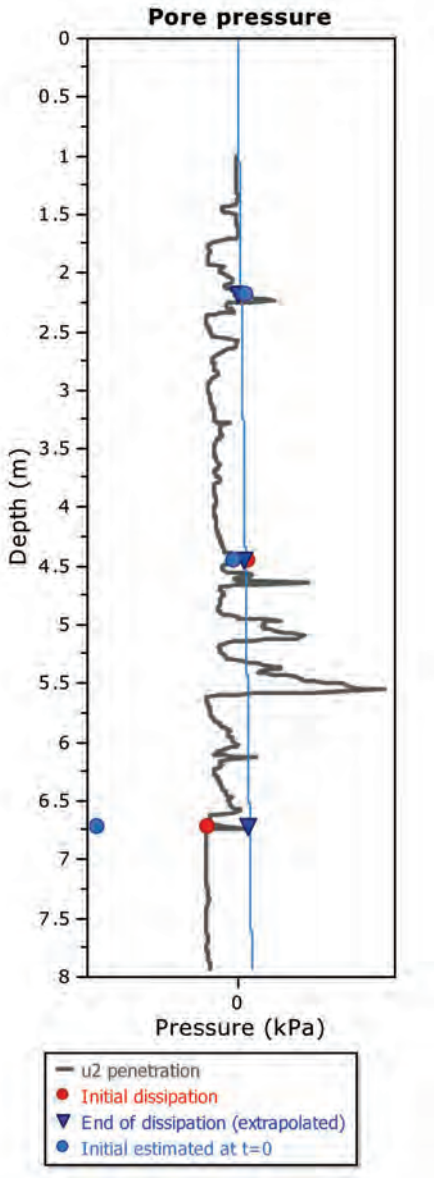
$$k_h = c_h \times \gamma_w / M$$

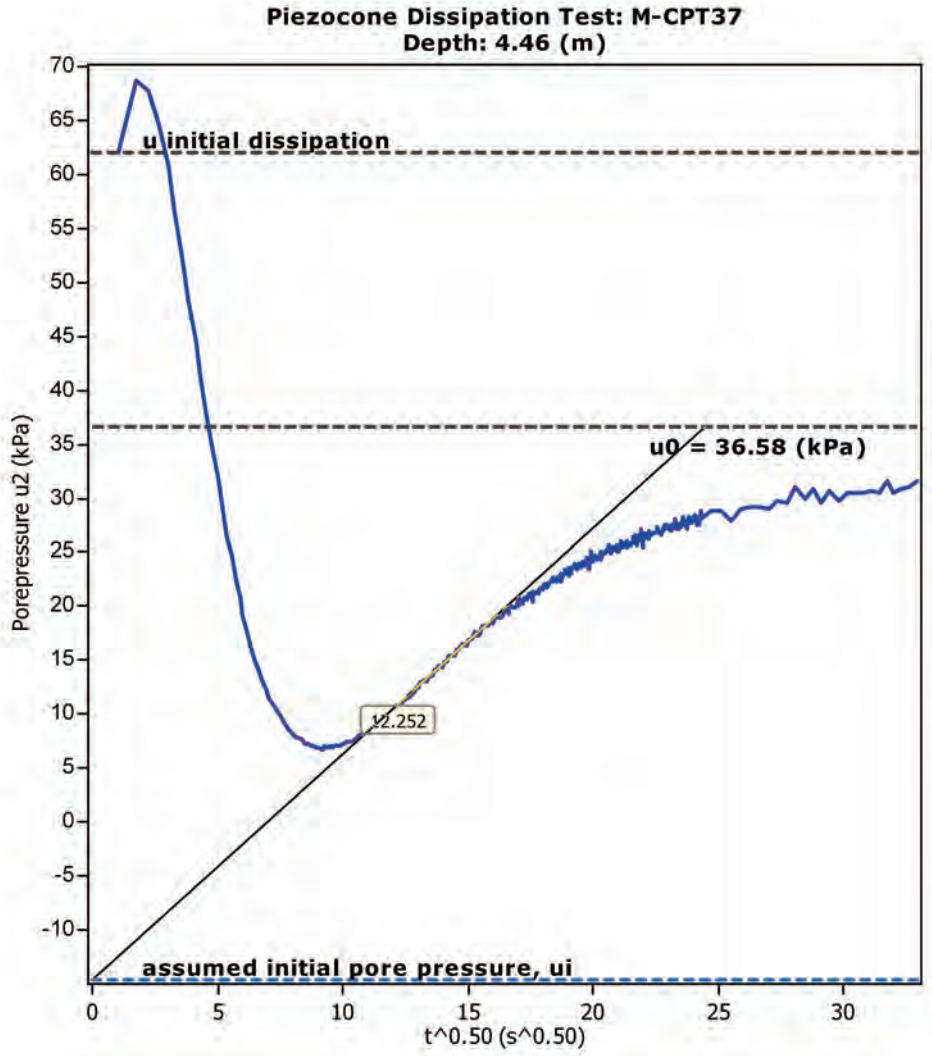
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

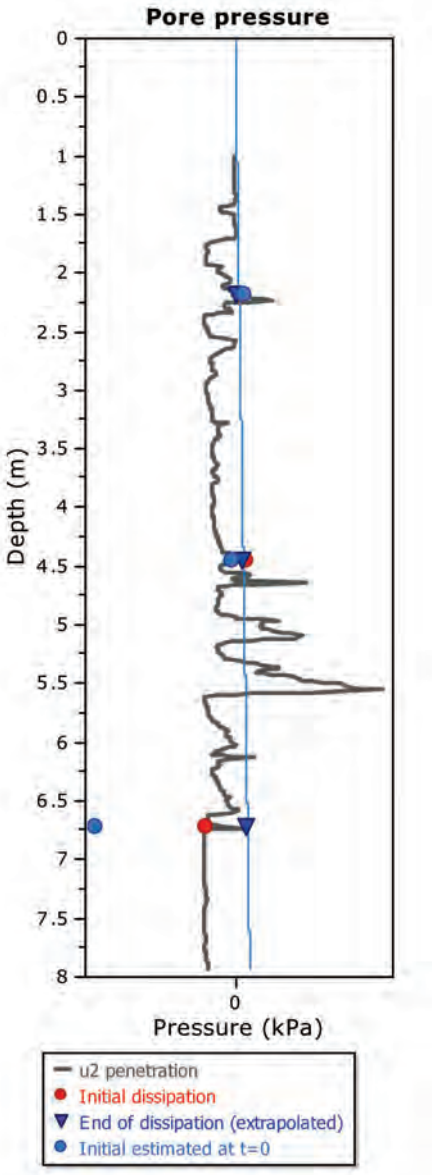
Tabular results

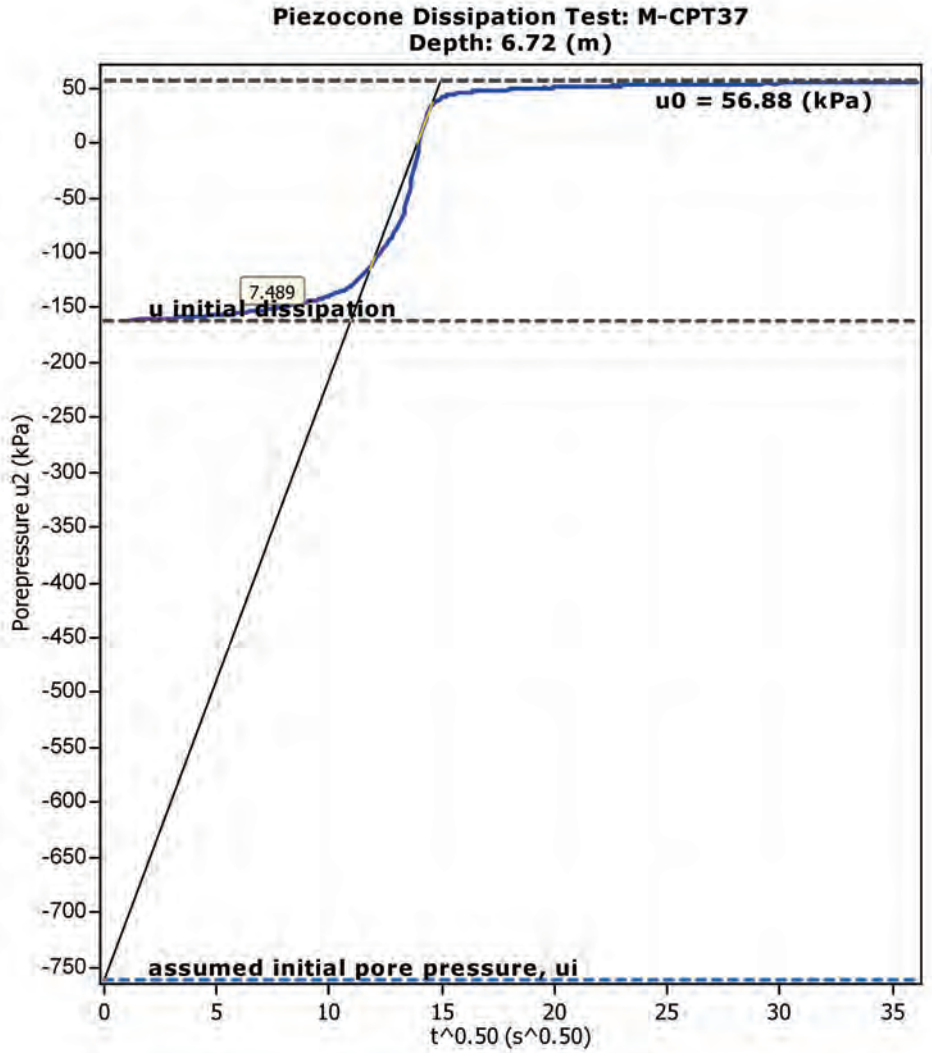
CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT37	2.19	1.1	1	3.93E-008	100.00	6.62E-004	20891	24.35	2.73E-007
M-CPT37	4.46	12.3	150	4.76E-006	273.80	9.04E-006	285	40.31	2.25E-009
M-CPT37	6.72	7.5	56	1.78E-006	100.00	1.46E-005	461	154.91	9.47E-010

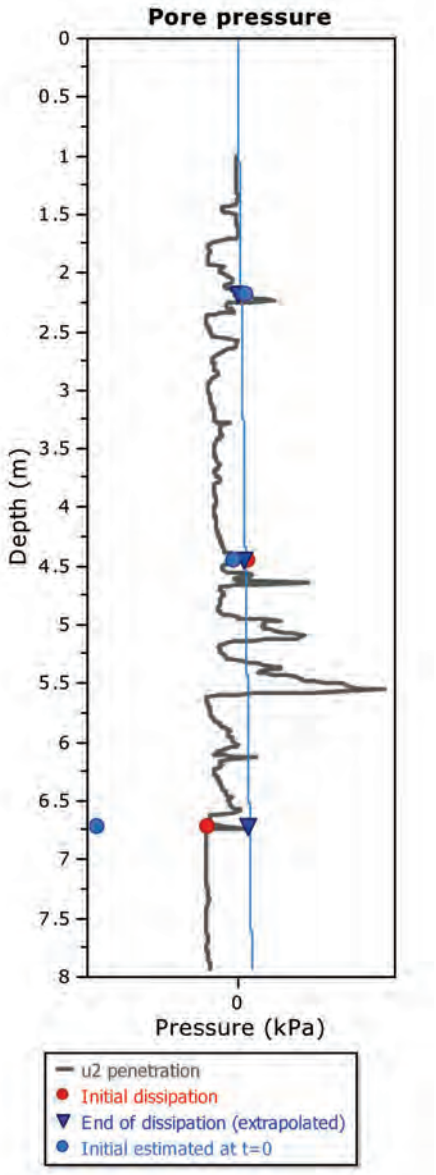

Piezocone Dissipation Test: M-CPT37
Depth: 2.19 (m)
assumed initial pore pressure, ui
u initial dissipation
1.113
u0 = 8.06 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT37
Depth: 4.46 (m)
u initial dissipation
u0 = 36.58 (kPa)
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT37
Depth: 6.72 (m)
u0 = 56.88 (kPa)
7.489
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT38_BH
Total depth: 5.76 m, Date: 19/12/2023
Surface Elevation (mCD): -4.91 m
Coords: X:713071.21, Y:612910.67
Cone Type: S15-CFIP2272
Cone Operator: MK/MJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

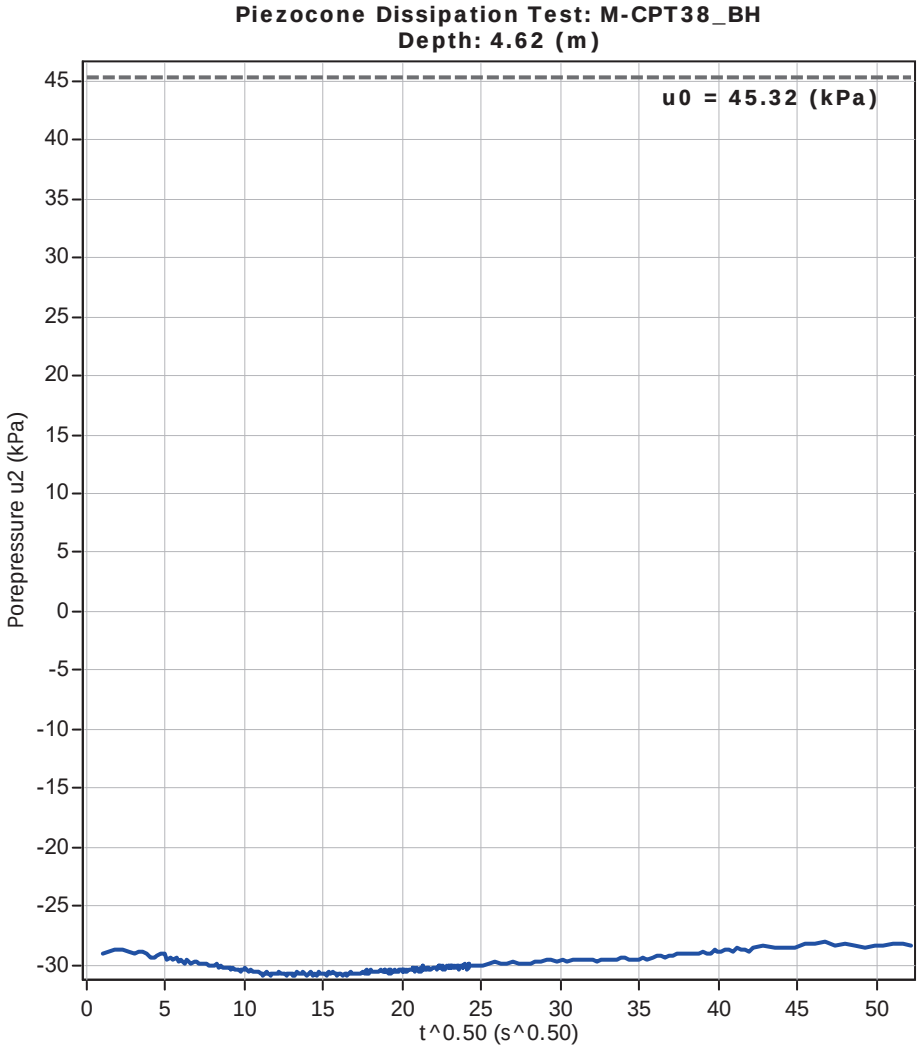
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

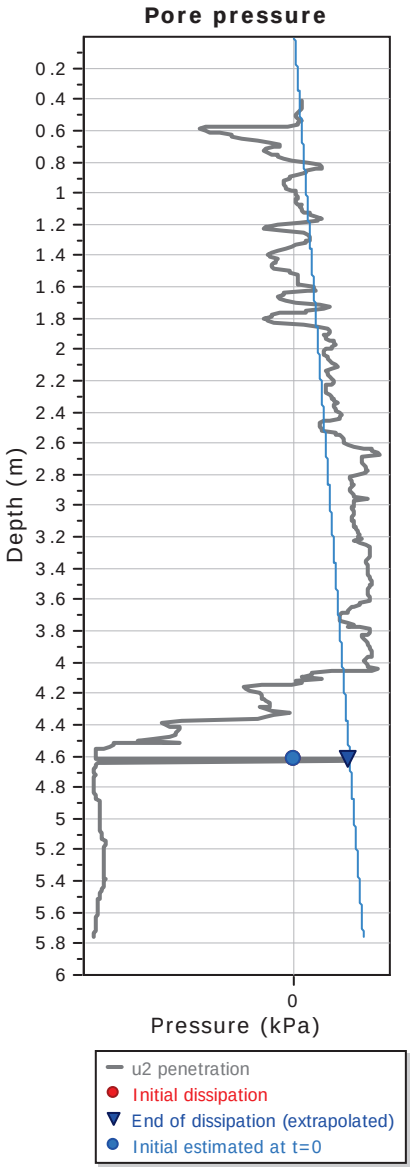
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT38_BH	4.62	0.0	0	0.00E+000	100.00	0.00E+000	0	87.48	-1.00E+004


Piezocone Dissipation Test: M-CPT38_BH
Depth: 4.62 (m)
u0 = 45.32 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT39_BH
Total depth: 1.32 m, Date: 20/12/2023
Surface Elevation (mCD): -4.00 m
Coords: X:713101.66, Y:612785.82
Cone Type: S15-CFIP2272
Cone Operator: MK

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

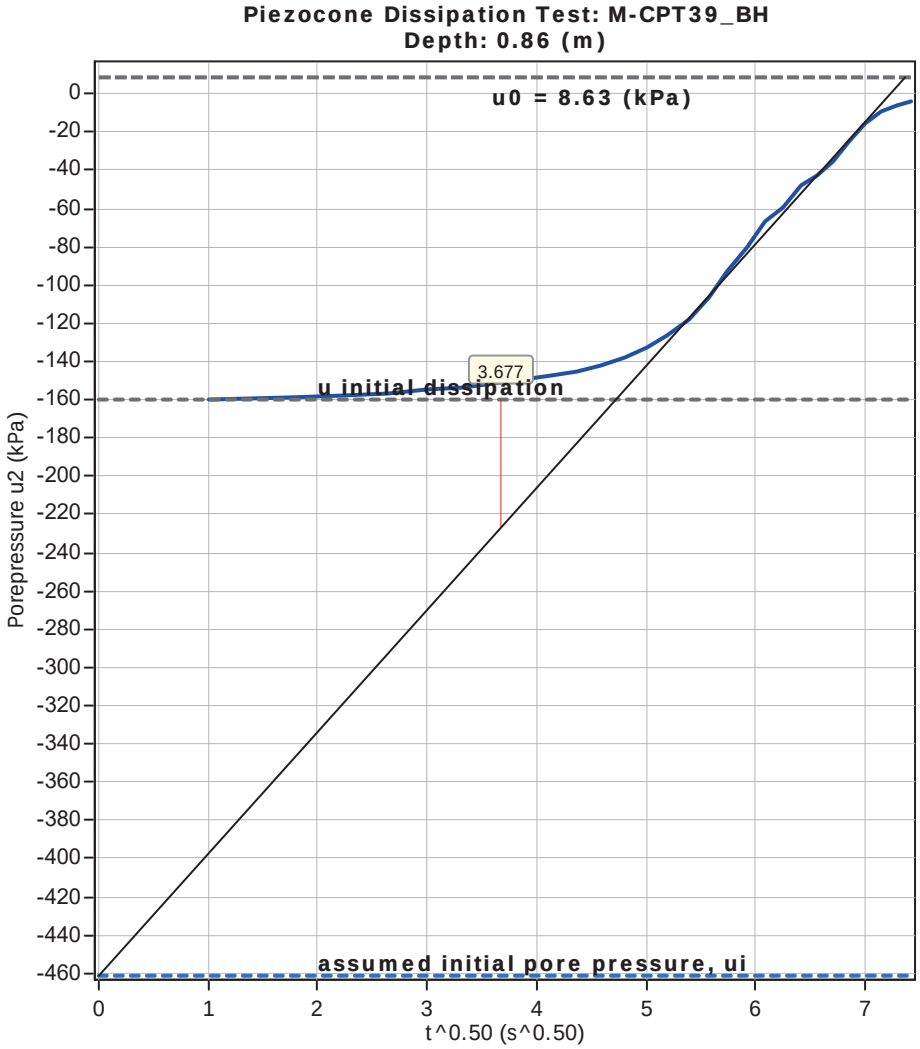
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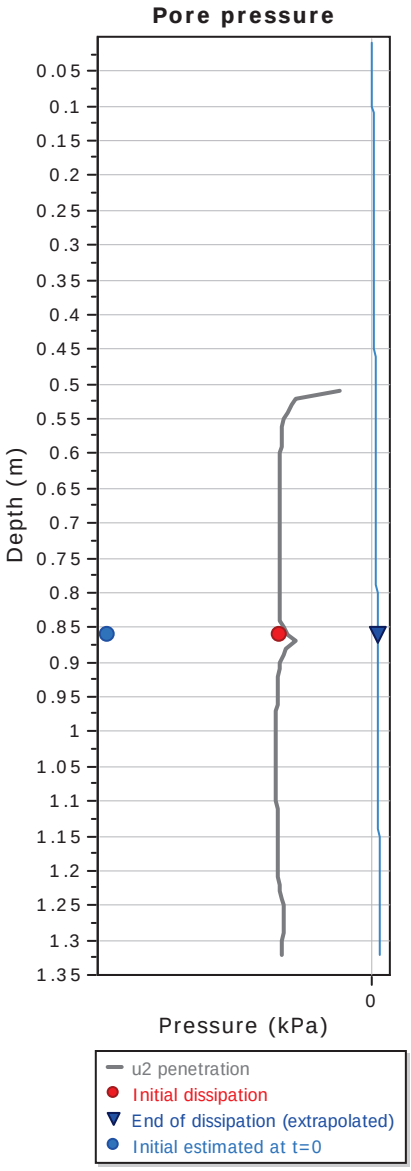
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT39_BH	0.86	3.7	14	4.29E-007	100.00	6.07E-005	1914	59.48	1.02E-008


Piezocone Dissipation Test: M-CPT39_BH
Depth: 0.86 (m)
u0 = 8.63 (kPa)
3.677
u initial dissipation
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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

CPT: M-CPT41_BH
Total depth: 10.03 m, Date: 16/02/2024
Surface Elevation (mCD): -4.85 m
Coords: X:712918.05, Y:613005.92
Cone Type: S15-CFIP2271
Cone Operator: MJ/ DJ

Project: **Rosslare Europort OWH SI**
Location: **Rosslare, Ireland**

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

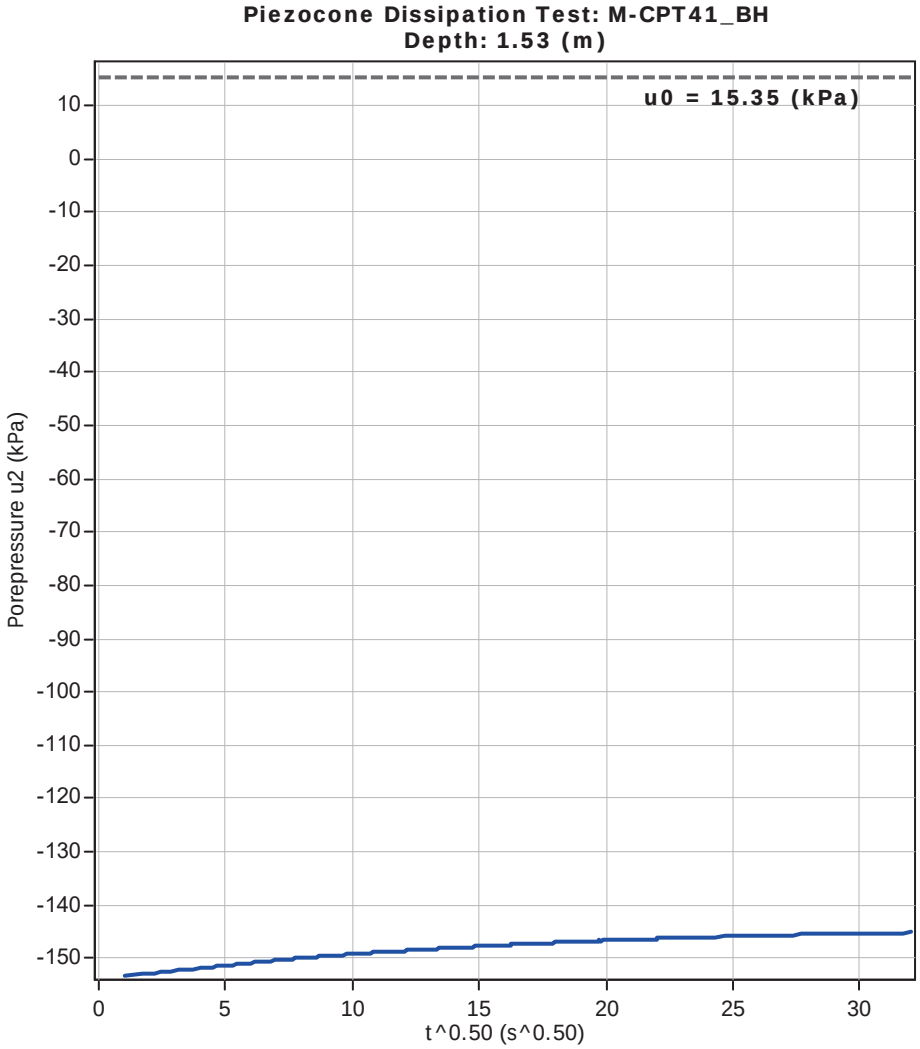
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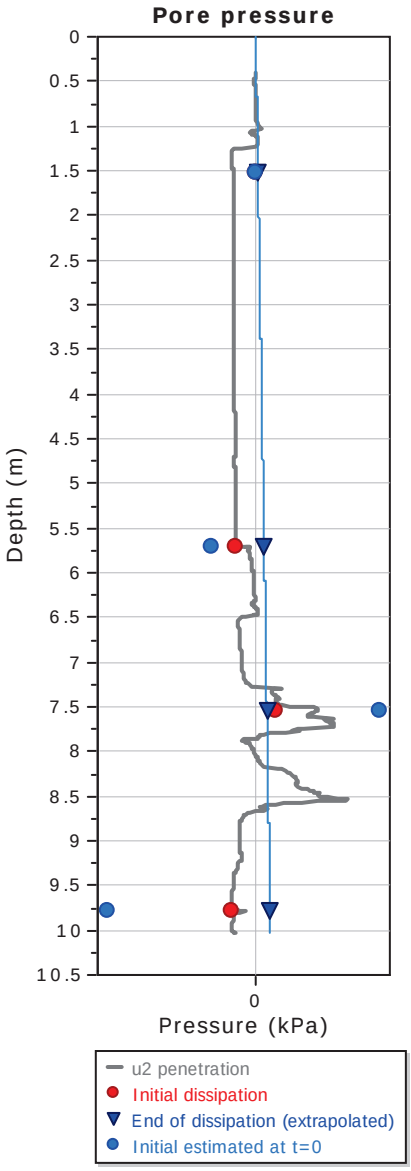
$$k_h = c_h \times \gamma_w / M$$

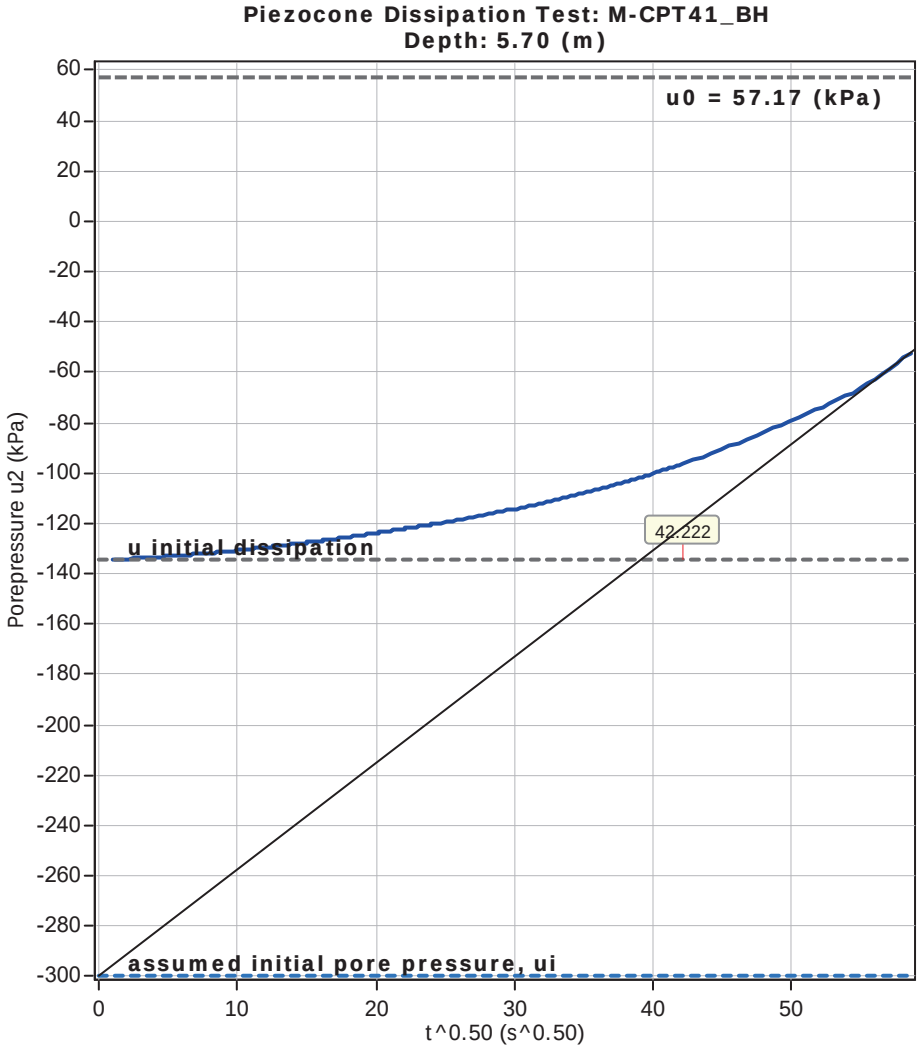
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

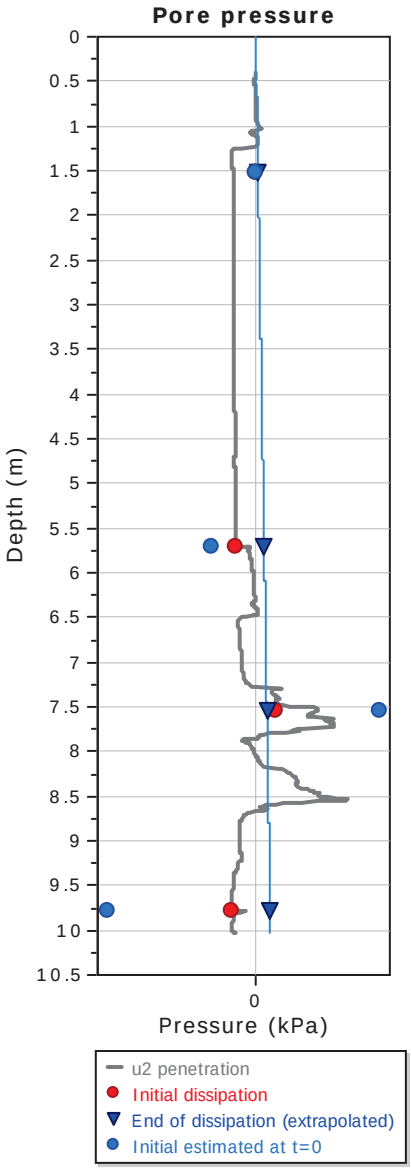
Tabular results

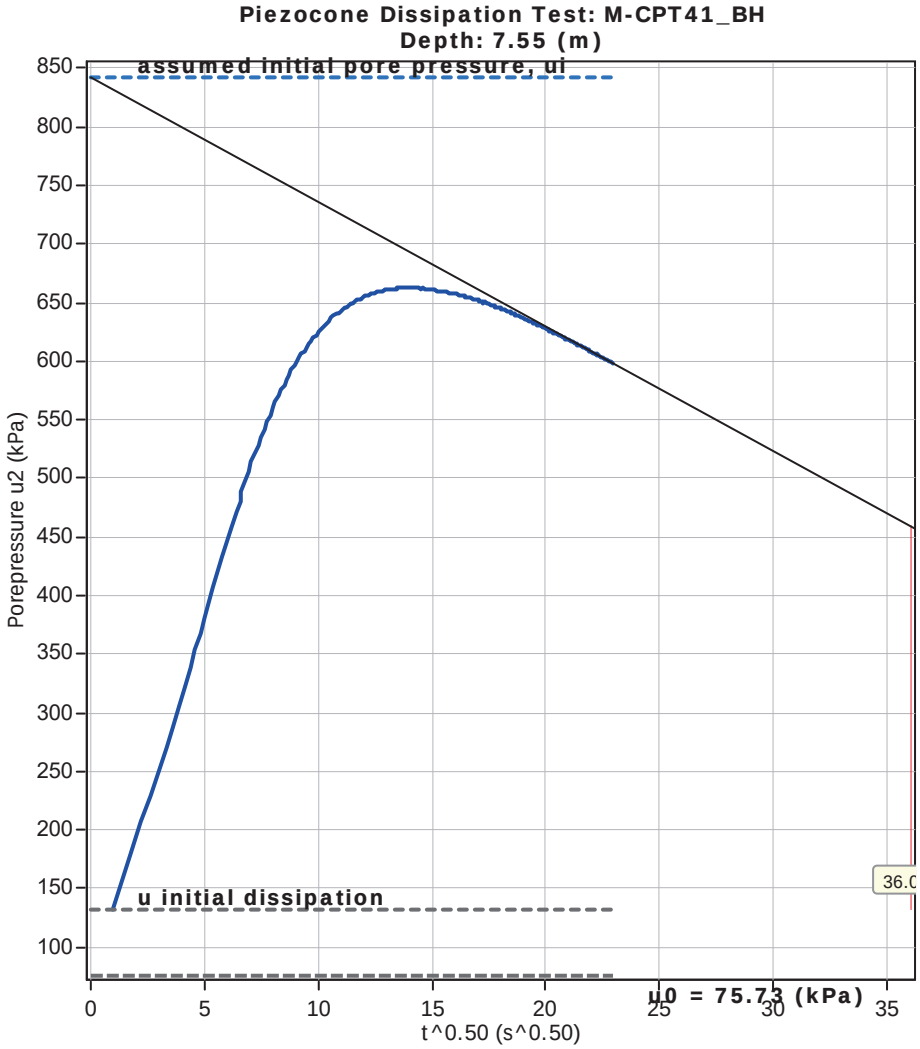
CPTU Borehole	Depth (m)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (m^2/s)	c_h (m^2/year)	M (MPa)	k_h (m/s)
M-CPT41_BH	1.53	0.0	0	0.00E+000	349.52	0.00E+000	0	33.48	-1.00E+004
M-CPT41_BH	5.70	42.2	1783	5.65E-005	504.70	1.03E-006	33	26.47	3.92E-010
M-CPT41_BH	7.55	36.0	1299	4.12E-005	425.71	1.30E-006	41	27.75	4.71E-010
M-CPT41_BH	9.78	11.5	133	4.21E-006	100.00	6.18E-006	195	53.33	1.16E-009

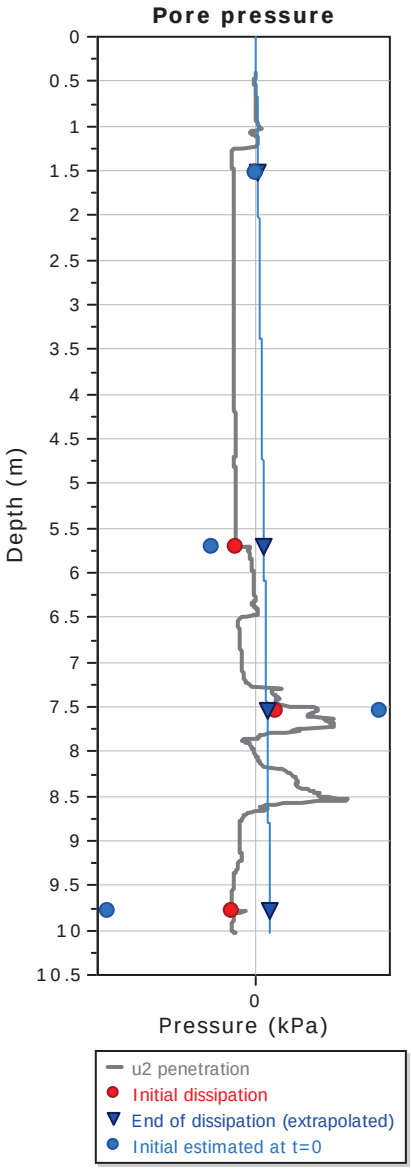

Piezocone Dissipation Test: M-CPT41_BH
Depth: 1.53 (m)
u0 = 15.35 (kPa)
Porepressure u2 (kPa)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
0
5
10
15
20
25
30
t^0.50 (s^0.50)

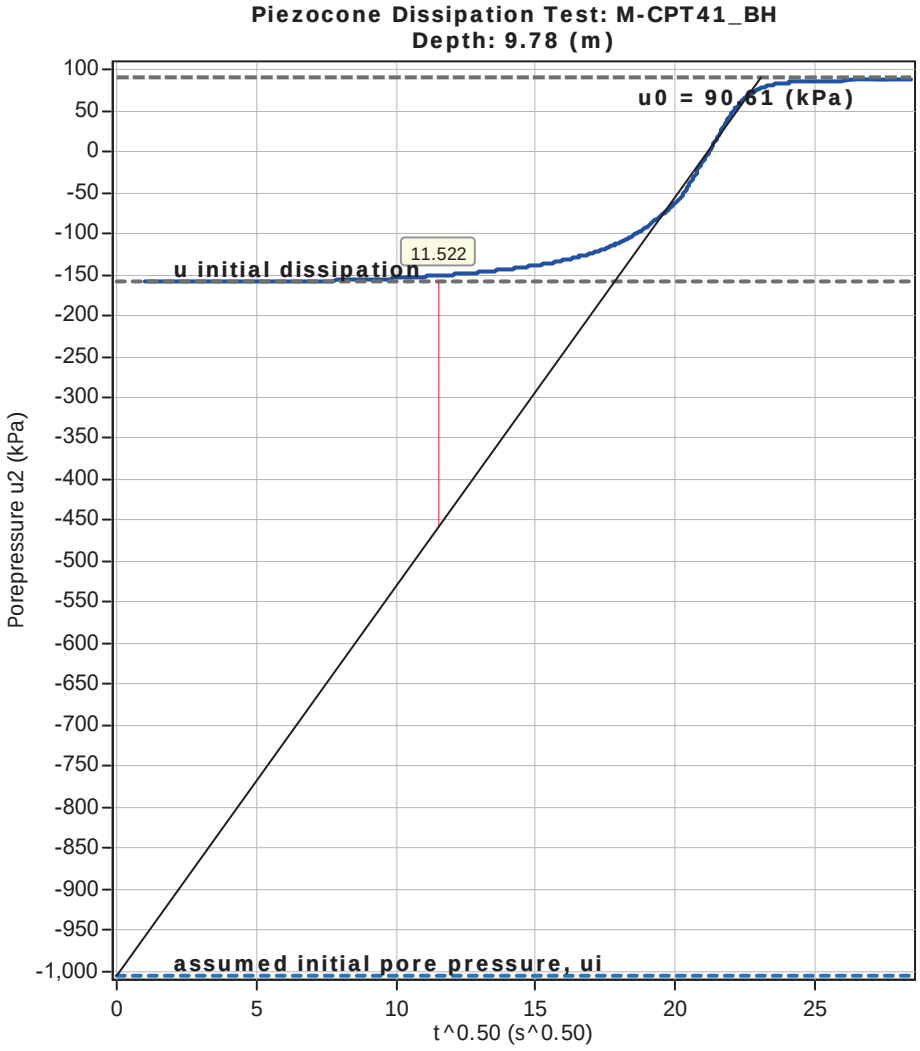

Pore pressure
Depth (m)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

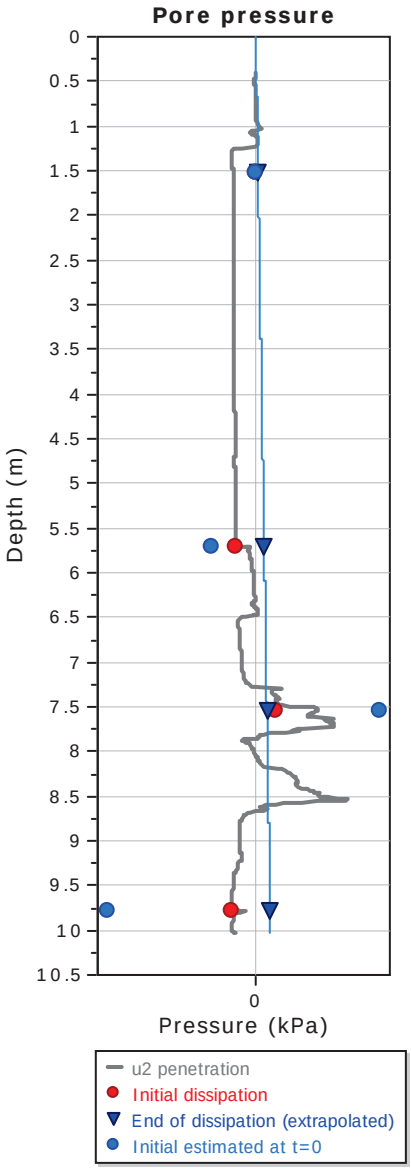

Piezocone Dissipation Test: M-CPT41_BH
Depth: 5.70 (m)
u0 = 57.17 (kPa)
u initial dissipation
42.222
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT41_BH
Depth: 7.55 (m)
assumed initial pore pressure, ui
u initial dissipation
u0 = 75.73 (kPa)
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: M-CPT41_BH
Depth: 9.78 (m)
u0 = 90.61 (kPa)
u initial dissipation
11.522
assumed initial pore pressure, ui
Porepressure u2 (kPa)
t^0.50 (s^0.50)


Pore pressure
Depth (m)
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

CAUSEWAY GEOTECH

APPENDIX K

TOWED GEOPHYSICS SURVEY REPORT



Rosslare Europort Offshore Wind Hub
Geophysical Survey
Survey Report

Survey date	26th, 27th, 29th October 2023 & 07th November 2023 20th and 21st May 2024
Report date	29th May 2024
Location	Rosslare Europort, County Wexford
Coordinate system	Irish Transverse Mercator
Report Revision	2 (02/08/2024)
Prepared by	MTAL
Checked by	BSMI

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Report date	Report revision	Prepared by
21/06/2024	Rev 0 - First Draft for Client Review	MTAL
26/07/2024	Rev 1 – Revision as per comment	MTAL & AGOU
02/08/2024	Rev 2 – Revision Final report	MTAL

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Glossary of Definitions

BU	Bow Up	**MF**	Medium Frequency
CRS	Coordinate Reference System	**MBES**	Multi Beam Echo Sounder
CD	Chart Datum	**NM**	Nautical Mile
ETRS89	European Terrestrial Reference System 1989	**OD**	Ordnance Datum
GAMS	GPS Azimuth Measurement SubSystem	**OSGM**	Ordance Survey Geoid Model
GNSS	Global Navigation Satellite System	**PU**	Port Up
HF	High Frequency	**SBP**	Sub-Bottom Profiler
HP	Horsepower	**SBP-HF**	Sub-Bottom Profiler High Frequency
IMU	Inertial Measurement Unit	**SBP-MF**	Sub-Bottom Profiler Medium Frequency
ITM	Irish Transverse Mercator	**SSS**	Sidescan-sonar
LAT	Lowest Astronomical Tide	**WGS84**	World Geodetic System 1984

1. Introduction

Hydromaster were contracted by Causeway Geotech to carry out a marine geophysical survey for the Rosslare Europort Offshore Wind Hub project. The following report details the mobilisation and calibration activities, the survey operations and the results.

The scope of work for this project was to acquire, process and interpret marine geophysical data within the Rosslare ORE Hub Area if interest up to 2m LAT.

The survey was carried on 27th and 28th of October, on the 07th of November 2023 and on the 21st May 2024. The survey area presented some access difficulties relating shipping traffic. Further challenges relating to fishing gear on site and from difficulty in manoeuvring around the quay and marine structures with towed sensors and the effect of ferrous structures on magnetometer data. Indeed, where there is sheet piles or iron building materials, the magnetic reading of the magnetometer is so high that the magnetic targets are not detectable.

2. Location

The survey area is located in the south-western area of the Irish Sea, in Rosslare Europort, County Wexford, as shown below with the red polygon. The white line represents the 2m LAT contours line.



Figure 1: Survey area (red polygon)

3. Survey methodology

3.1 General methodology

The geophysical survey was carried out to ensure a full seabed coverage up to 2m LAT when feasible, within the whole area (magenta polygon- figure 2).

The multibeam echosounder (MBES), the marine magnetometer, the sidescan sonar (SSS) and the sub-bottom profiler (SBP) surveys were conducted simultaneously at slow speed to ensure optimum quality data.

The boomer seismic survey was conducted within a specific area (cyan polygon – figure 2) and with a 50 meters line spacing.



Figure 2: Survey areas showing the boomer survey area in cyan.

The multibeam sonar transducer, IMU and Primary antenna were securely pole mounted. The sub-bottom profiler will also be pole mounted. The sidescan sonar was towed in water deeper than 6 m LAT, and a vessel mounted side-scan sonar was used in shallower water than 6m LAT. The sidescan sonar was towed at an altitude of about 10-15% of the range. The magnetometer was flown on the other side of the vessel, at an altitude of approximately 3-5 meters above the seabed.

A surface-towed Applied Acoustics AA200 Boomer with an 8-channel mini-streamer hydrophone system that acquires full waveform seismic data was mobilised. The boomer was towed from the stern of the vessel.

3.2 Survey tracklines

Figure 3 shows the geophysical survey tracklines. Some of the towed magnetometer survey lines were missed due to difficulty to manoeuvre around jetties and ships and due to fishing gears (figure 3) present on the shallow part of the site (SW).



Figure 3: Picture of some of the fishing gear present on site

Figure 4 shows the survey vessels tracklines per sensor.

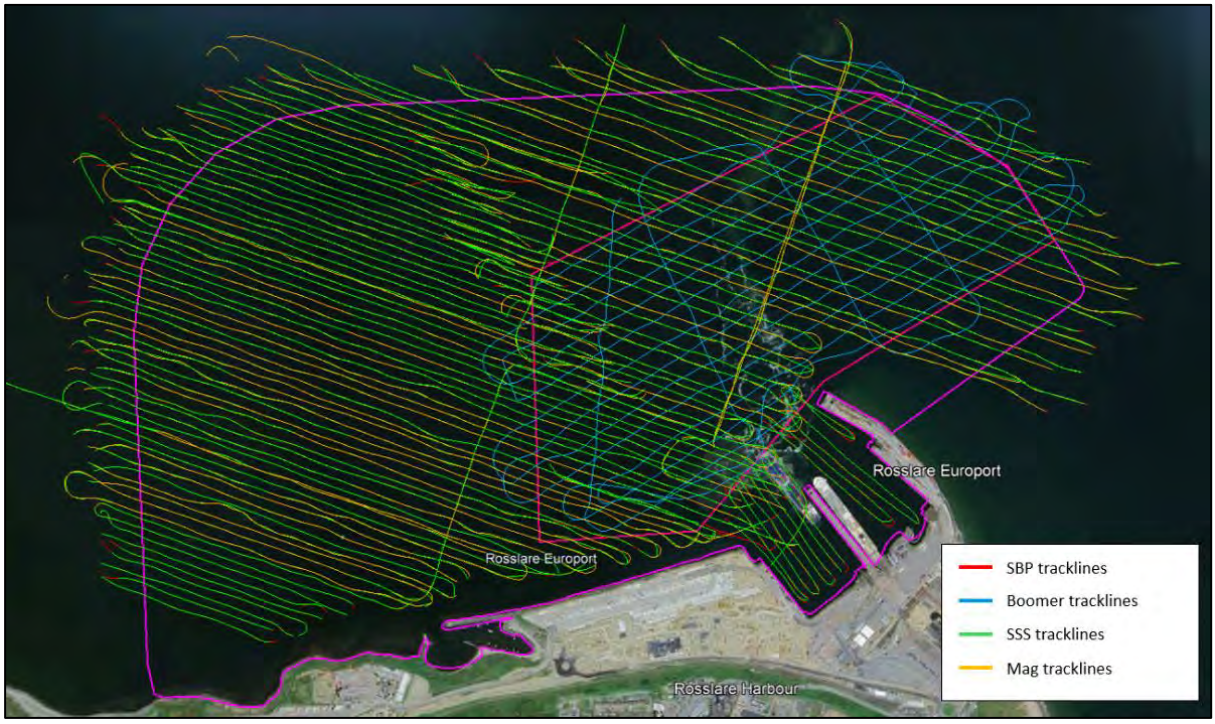


Figure 4: Geophysic and boomer survey tracklines

3.3 Geodetic parameters and vertical datum

All data were acquired in the Irish Transverse Mercator coordinate reference system.

Table 1. Project CRS parameters.

Local Datum Geodetic Parameters	
Datum:	ETRS89
Spheroid:	GRS80
Semi-Major Axis, a:	6,378,137 m
Inverse Flattening, 1/f:	298.257,222,101
Projection	
Projection Zone:	Irish Transverse Mercator
Central Meridian:	8°00’00.00”W
Latitude Of Origin:	53°30’00.00”N
False Easting:	600000 m
False Northing:	750000 m
Scale Factor:	0.99982
Units:	m
EPSG:	2157

Depth soundings values were reduced to Lowest Astronomical Tide (LAT) datum using the Vertical Offshore Reference Frame (VORF) model (LAT/WGS84 separation).

Table 2 presents the separation offsets between Ordnance Datum (OD) Malin Head and Chart Datum (CD) and between OD Malin Head and LAT. Computations made with the VORF model.

Table 2: CD and LAT offsets in Rosslare Harbour (VORF model)

	Offsets computed with VORF
OD Malin Head – CD Separation	-1.61 m
OD Malin Head – LAT separation	-1.55 m

Note that the difference between CD and LAT in Rosslare is 0.06 m, CD level being 0.06m shallower than the LAT level in Rosslare Harbour.

3.4 Survey Vessels

The vessel used for the geophysical survey was the Ros Aine (Figure 5). Summary specifications are listed in Table 3.



Figure 5: Ros Aine, survey vessel.

Table 3. Ros Aine specifications summary.

Vessel Specifications	
Length	13m
Beam	4m
Draft	0.8m
Coding	Irish P5 license 30NM offshore
Propulsion	2 x OXE 200HP outboards
Max Speed	25 knots

For the MF seismic survey, the Manannan vessel was used (figure 6). Summary specifications are listed in Table 4.



Figure 6: Manannan survey vessel

Table 4. Manannan specifications summary.

Vessel Specifications	
Length	11.4m
Beam	4.4m
Draft	0.8m
Coding	Irish P5 license 30NM offshore
Propulsion	2 x 420hp Iveco FPT NEF67 engines
Max Speed	28 knots

3.5 Survey equipment

Hydromaster Ltd. equipment mobilised on the vessel is detailed table 5.

Table 5. Equipment list.

Equipment list	
Sensor	**Make/Model**
GNSS positioning	Applanix Oceanmaster PosMV
Motion Reference Unit	Applanix Oceanmaster PosMV
Multibeam Echosounder	Teledyne T51
Sound Velocity Probe	Teledyne SVP 70
Sound Velocity Profiler	Valeport SWIFT
GNSS Rover	Carlson Brx6
Side Scan Sonar	Edgetech 4125
Magnetometer	Geometrics G882
Sub-bottom Profiler (SBP)	Innomar SES-2000
Boomer (BOOMER)	Applied Acoustic CSP-D 1200

The following frequencies were used during the survey:

Table 6. Sensor frequencies

System	Acquisition settings
MBES	Frequency: 800 kHz
SSS	Frequency 400/900 kHz
SBP	Frequency 12kHz/5 kHz
Boomer	Sample Frequency: 10 kHZ

3.6 Personnel

The following personnel were deployed on the project.

Table 7. Personnel on site

Name	Function
Thomas Devaux	Surveyor
Laura Fitzgerald	Geophysicist
Brian Smith	Senior Surveyor
Alyson Le Quilleuc	Surveyor
Adam Gould	Geophysicist

4. Vessel Geometry and Lever Arms

4.1 Ros Aine vessel geometry

All survey sensors were mounted according to the images shown below. The multibeam sonar, the sub-bottom profiler and one of the side-scan sonars were pole-mounted on the port side of the vessel. Offsets from primary GNSS antenna, sub-bottom profiler and side-scan sonar pole and suitable tow points for the side-scan sonar and magnetometer were measured from the central reference point using a steel tape measure. The central reference point is identified as the reference point on the top of the IMU.

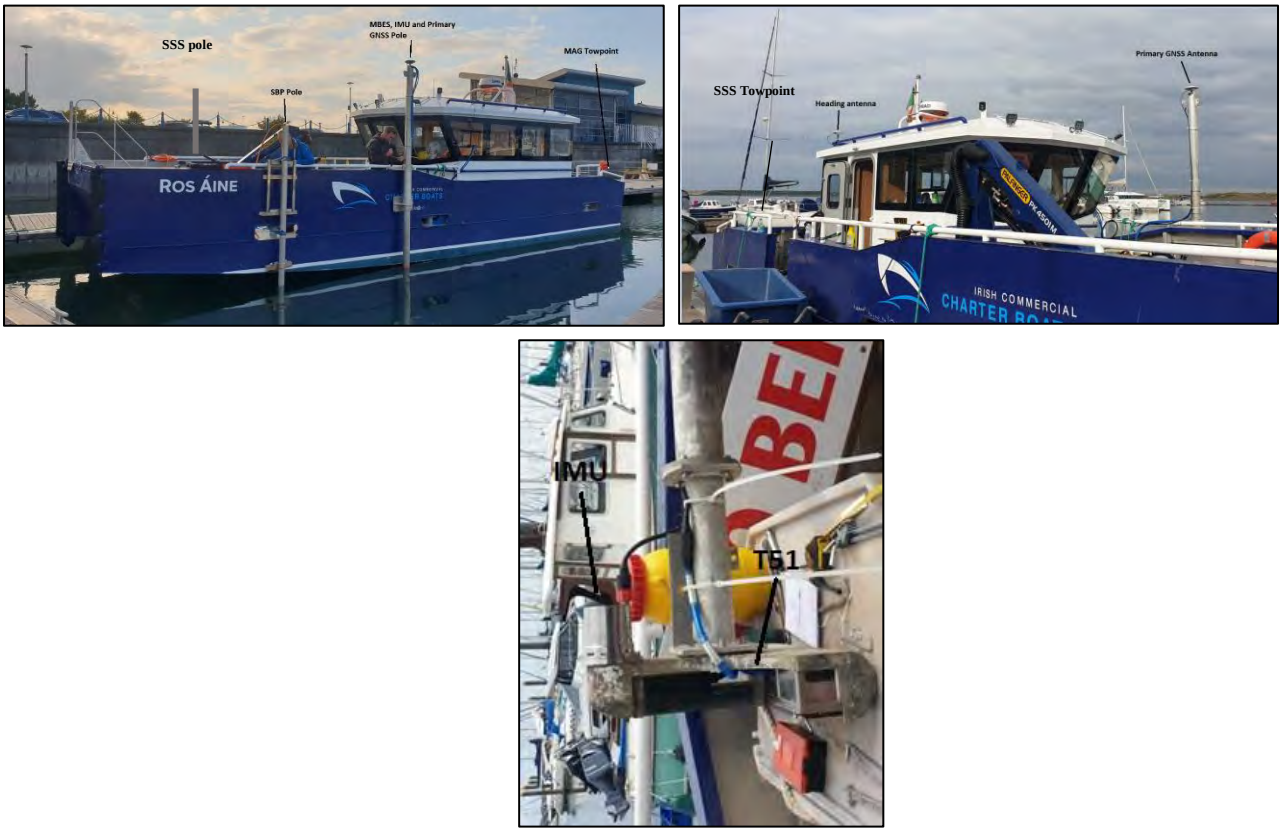


Figure 7: SBP and MBES poles (top left), primary and heading GNSS antennas (top right) and mounting for IMU and MBES (bottom).

The multibeam sonar and IMU are mounted securely together on the same mounting bracket which is fixed to the same pole as the primary GNSS antenna. In essence, the pole becomes the traditional survey vessel in all aspects except for heading. This removes the need for a gyro calibration for the MBES. The remaining heading antenna offsets are determined with a “GAMS” calibration. Note that the heading offsets are related to the primary GNSS antenna and not the IMU reference point in the GAMS calibration.

The local grid is defined as follows:

- X-axis is positive forward and parallel to the ship centreline
- Y-axis is positive starboard and perpendicular to the ship centreline
- Z-axis is positive down

All offset measurements are shown in Table 8 below.

Table 8. Ros Aine sensor offsets.

Reference	X (m)	Y (m)	Z (m)
IMU reference point	0.000	0.000	0.000
Primary GNSS	0.154	0.000	-4.184
Secondary/heading GNSS antenna*	-4.879	2.855	0.147
MBES echosounder	0.105	0.000	0.232
Sub-bottom Profiler	2.27	0.000	- 0.36
Sidescan sonar (pole-mounted)	2.27	4.1	
Sidescan sonar tow point	-6.6	4.1	
Magnetometer tow point	-6.6	1.3	

*reference IMU reference point.

4.2 Manannan survey vessel geometry

A surface-towed Applied Acoustics AA200 Boomer with an 8-channel mini-streamer hydrophone system that acquires full waveform seismic data was mobilised to meet the requirement of greater depth of penetration. This system was interfaced to SonarWiz acquisition software which combines the seismic data with a ZDA time stamp from the vessels ZDA source, survey information and positional data from the PDS navigation software. The boomer was towed from the stern of the vessel.
The positional data were coming from the GNSS system Hemisphere RS330, which is the central reference point of the survey vessel.

The local grid is defined as follows:

- X-axis is positive forward and parallel to the ship centreline
- Y-axis is positive starboard and perpendicular to the ship centreline
- Z-axis is positive down

All offset measurements are shown in Table 9.

Table 9: Manannan survey vessel offsets

Reference	X (m)	Y (m)
RS330 Primary GNSS	0.0	0.0
Streamer tow point (Stern)	-4.1	0.0
Layback	21 m	

5. Sensor Mobilisation and Calibrations

5.1 Mobilisation and Calibration Summary

The Ros Aine survey vessel mobilisation took place in Malahide on 26th October 2024. The Manannan survey vessel mobilisation took place on 20th May 2024 in Rosslare harbour.
The mobilisation and calibration consisted of the following activities:

- Installation and calibration of:
  - GNSS, heading and motion sensors
  - Multibeam sonar
  - Sub-bottom profiler
  - Side-scan sonar
  - Magnetometer
  - Boomer

Sensor calibrations and checks are detailed below.

5.2 GNSS Verification

A position check of the vessel survey system was completed on 26th October 2023 with the vessel alongside the quay wall in Malahide marina, using a GNSS rover connected to RTK corrections. For the verifications, Trimble VRSNow network RTK corrections were used.
The GNSS rover was positioned 0.17m aft of the primary GNSS antenna as shown in Figure 8 and position of both antennas was logged for 300 seconds. The results are shown in table 10.



Figure 8: GNSS Rover location (left picture) and offset from primary GNSS antenna and average results (right picture).

Table 10: GNSS position check results.

System	Easting (m)	Northing (m)	
ROVER position calculated from position offset and heading	722615.41	746615.82	1.02
Primary GNSS Antenna	722615.43	746615.79	1.04
Difference	**0.02**	**0.03**	**0.02**

5.3 Vessel Gyro Calibration

GNSS Azimuth Measurement System (GAMS) is a system that determines the geographic vector between two GNSS antennas fixed to the vessel. The GAMS use two GNSS receivers to determine a GNSS-based heading that is accurate to ±0.02° when blended with the inertial navigation solution. POS MV (navigation software) uses this heading information as aiding data together with the position, velocity and raw observations information supplied by the primary GNSS receiver. During a GAMS calibration, the vessel executes a series of dynamic manoeuvres (commonly called the figure of eight), during which an accurate GAMS solution is computed.

The local grid is defined as follows:

- X-axis is positive forward and parallel to the vessel centreline.
- Y-axis is positive starboard and perpendicular to the vessel centreline.
- Z-axis is positive down.

The GAMS calibration took place on 26th October 2023. Computed values are shown in Table 11.

Table 11. Results of GAMS calibration.

GAMS computed results	
X	-2.081m
Y	0.259m
Z	0.206m

5.4 MBES Patch Test

A patch test was completed before the survey. The patch test was conducted in a suitable area of similar water depths expected on site, north-east of Port Oriel, Ireland (figure 9).



Figure 9: MBES Patch Test Location.

A sound velocity profile was taken on the deepest part of the patch test area prior to run the calibration lines. Following that, the patch test lines were surveyed as follows:

- **Roll:** Two lines over a flat deep area in opposite direction, at the same speed and with 100% overlap
- **Pitch:** Two lines over an area with slope in opposite direction, at the same speed and with 100% overlap
- **Yaw:** Two lines over an area with slope or feature in the same direction, at the same speed and with 50% overlap

The patch test calibration was computed in PDS, and the results are shown below in Figure 10 and in Table 12.

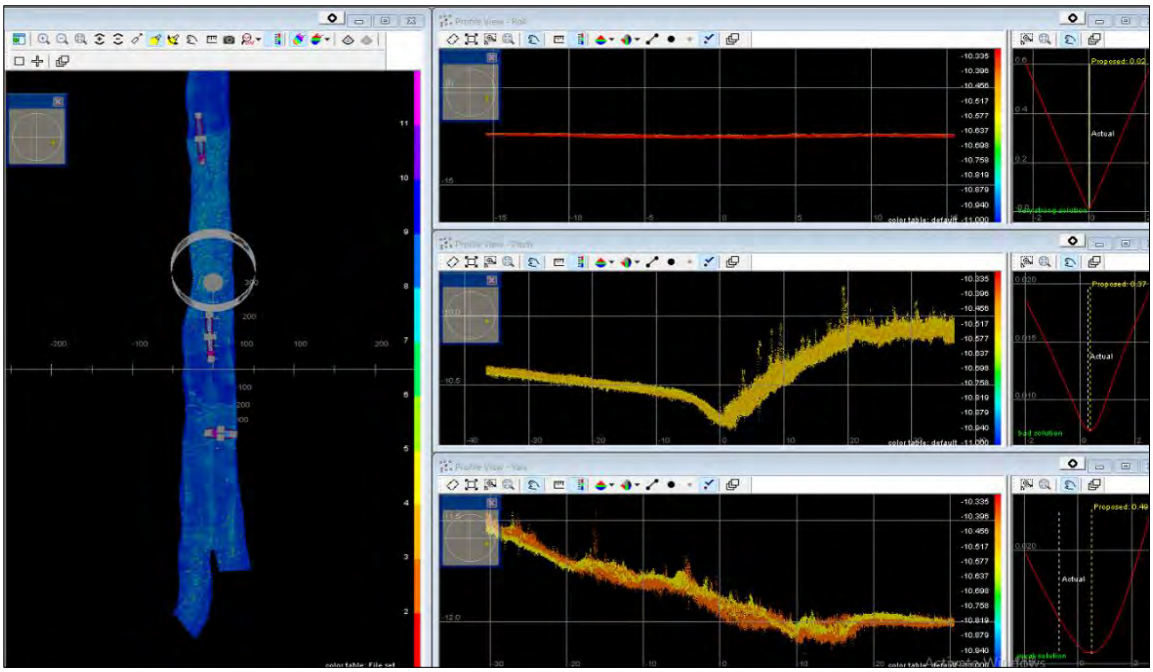


Figure 10: Patch Test calibration in Teledyne PDS software for Ros Aine Survey Vessel

The resulting mounting offsets from the patch test are shown in the table 12.

Table 12. Patch test results.

Patch Test Results	
Roll	0.01° PU+
Pitch	0.28° BU+
Yaw	-0.69°

5.5 Magnetometer Position Verification

The magnetometer system was verified using two metallic seabed objects. The data were recorded simultaneously by the multibeam echosounder and the magnetometer in order to verify that the target is identified at the same location by the two systems.
A fishing pots has been identified and used for this purpose (figure 11), and has been marked as AT_07 in the multibeam target list, and as MT_253 (detected with an amplitude of 39 nT) in the Magnetometer anomalies list.

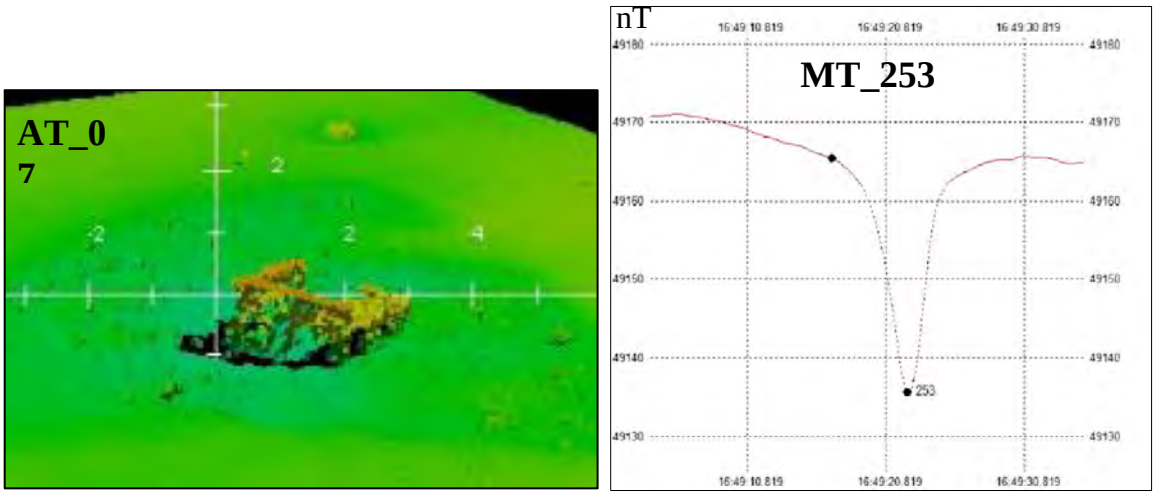


Figure 11: Fishing pot identified in the MBES data (left) and Magnetometer data (right).

Table 13 gives the position of the object identified in the multibeam echosounder and magnetometer data.

Table 13: Fishing pot target position detected by the MBES and the Magnetometer

Target label	Device type	Easting	Northing
AT_07	Multibeam Echosounder	712351.3 E	612812.9 N
MT_253	Magnetometer	712349.0 E	612815.4 N
Difference (m)		2.3	2.5

A mooring block with a chain has been identified at 10 m LAT and used for this purpose (figure 12), and has been marked as AT_18 in the multibeam sonar target list, and as MT_101 (detected with an amplitude of 7 nT) in the Magnetometer anomalies list.

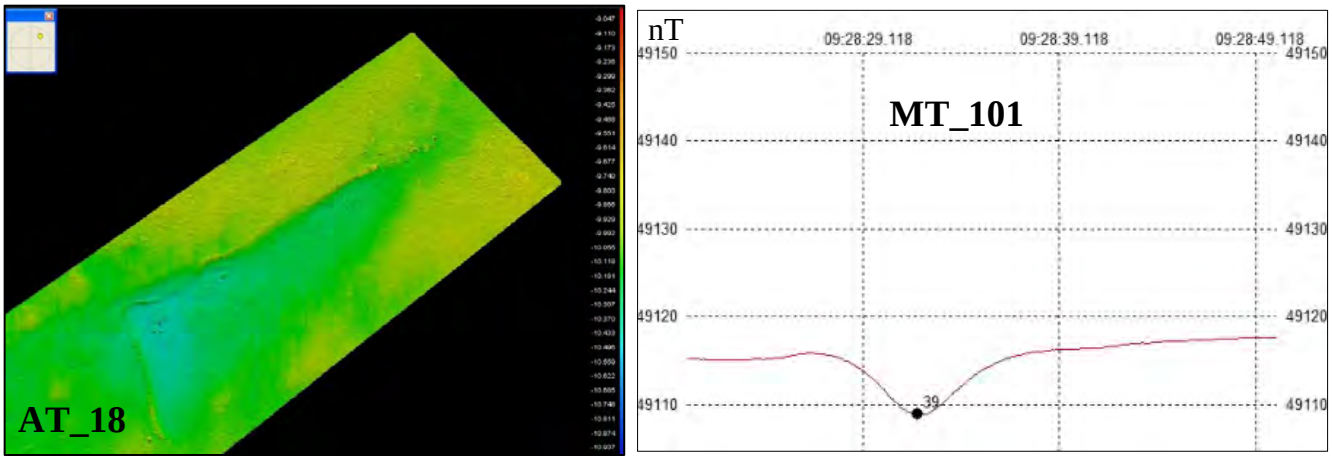


Figure 12: A mooring block with a chain identified in the MBES data (left) and Magnetometer data (right).

Table 14 gives the position of the mooring identified in the multibeam echosounder and magnetometer data.

Table 14: Mooring target position detected by the MBES and the Magnetometer

Target label	Device type	Easting	Northing
AT_18	Multibeam Echosounder	713554.7	613478.4
MT_101	Magnetometer	713554.4	613475.7
Difference (m)		0.3	2.7

5.6 Side-scan Sonar Position Verification and Acceptance Line

The Side-scan Sonar system was verified using objects on the seabed within the survey area. A line was run over the objects, which was simultaneously surveyed with the multibeam echosounder. The position of the objects was checked in the sidescan-sonar data and compared with the position from the multibeam echosounder data. The results are shown table 15.

The objects picked for the magnetometer position verification have been detected by the sidescan-sonar and labelled as SSS_139 for the fishing pots, and as SSS_11 for the mooring (figure 13).

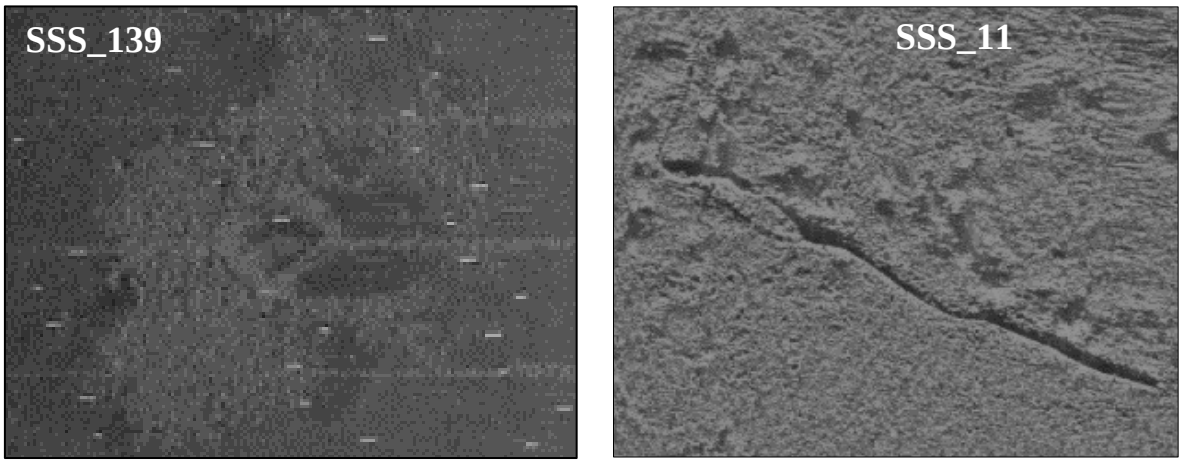


Figure 13: Sidescan data showing the fishing pots on the left, and the mooring on the right .

Table 15: Mooring target position detected by the MBES and the Sidescan-sonar

Target label	Device type	Easting	Northing
AT_07	Multibeam Echosounder	712351.3	612812.9
SSS_139	Sidescan-sonar	712352.5	612815.0
Difference (m)		1.2	2.1
Target label	**Device type**	**Easting**	**Northing**
AT_18	Multibeam Echosounder	713554.7	613478.4
SSS_11	Sidescan-sonar	713555.8	613476.4
Difference (m)		1.1	2.0

5.1 Sub-Bottom Profiler Position Verification

The Sub-bottom profiling system was verified on over an area of rocky reef to provide a clear feature for comparison with MBES data.

The position of the start (A) and end (B) of the rocky area was checked in the SBP data and compared with the position from the MBES data.

Figure 14 (top part) shows the SBP profile of the survey line 20231028_110052 with a rock on the seabed (yellow circle), with the starting position of the rock (coordinates of 1: 52.26205°N, 6.33665 °W) and the ending position of the rock (coordinates of 2: 52.2619°N, 6.3363 °W).

A rock can been clearly identified for those exact coordinates in the MBES data, between Point 1 and 2, as shown figure 14 (bottom part).

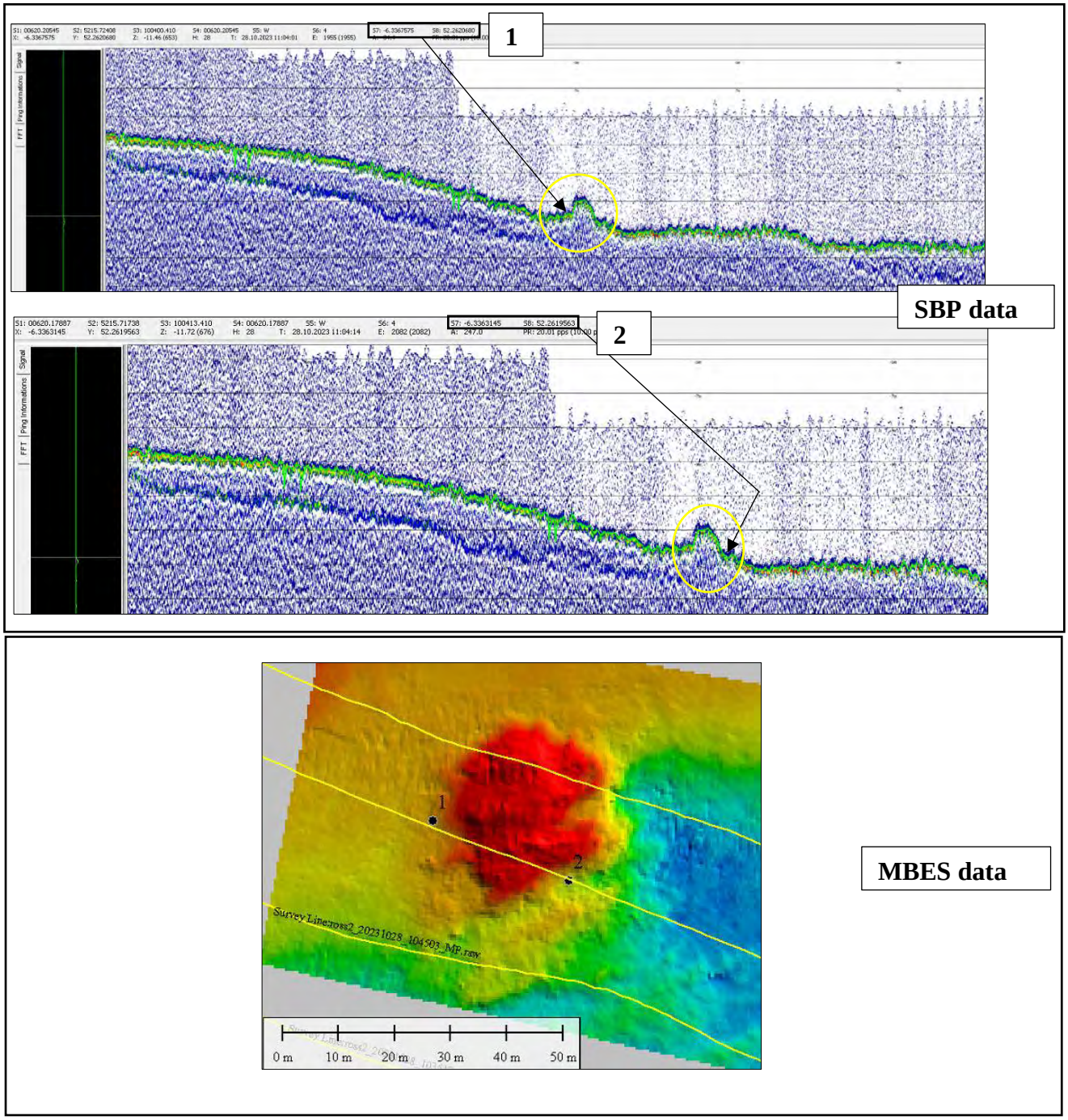


Figure 14: SBP position verification showing SBP data (top) and the MBES data with location of Point 1 and Point 2.

6. Survey operations

The Ros Aine vessel mobilisation was completed in Malahide Marina, County Dublin on 26th October 2023. Survey operations commenced on 27th October 2023. The Sidescan-sonar, the HF Sub Bottom Profiler and the marine magnetometer surveys were completed on 28th October 2023. The MBES survey was completed on 07th November 2023.

The Manannan vessel mobilisation was completed in Rosslare Harbour, County Wexford on 20th May 2024. The seismic survey operations commenced on 21st May 2024 and were completed on the same day.

No HSE incidents, near misses or non-conformities were noted during the survey. A summary of operations per day is found in table 17.

Table 16: Survey operations summary

Date	Description
26/10/2023	Ros Aine Mobilisation, Malahide Marina. Installation and interfacing of all survey sensors. Equipment calibrations.
26/10/2023	Transit to site, commence survey with MBES, SSS, SBP and magnetometer.
27/10/2023	Continue survey operations with MBES, SSS, SBP and magnetometer.
28/10/2023	Continue survey operations with MBES, SSS, SBP and magnetometer. SSS, SBP and magnetometer demobilisation
07/11/2023	Complete MBES survey operations MBES demobilisation
20/05/2024	Manannan Mobilisation, Rosslare Harbour. Installation and interfacing of all boomer survey sensors. Equipment calibrations.
21/05/2024	Complete seismic survey operations. Vessel demobilisation.

The Ros Aine survey vessel followed the planned survey lines, with a spacing of 20 or 40 m with lines running parallel to the shore. Crosslines were acquired approximately every 500 m. The Boomer was utilised on all planned survey lines. Boomer lines spacing was 50 m with lines running parallel to the shore. Boomer crosslines were acquired approximately every 250 m.

7. Data processing

All data was quality checked during operations and samples of data quality were sent to our office to ensure preliminary agreement on coverage and quality prior to vessel demobilisation.
Following data acquisition, data was processed according to Hydromaster's internal standards.
Table 18 shows software used to process data from each sensor.

Table 17: Data processing software used.

System	Software
MBES	Teledyne PDS
SSS	Sonarwiz 7
SBP	ISE, Sonarwiz 7
Marine Magnetometer	Magpick
Boomer	SonarWiz and CodaOctopus Survey Engine
Navigation data	POSPac MMS

7.1.1 Multibeam echosounder

A total of 138 survey lines were acquire including crosslines.
Data was acquired and processed using Teledyne PDS. Coverage and quality statistics were monitored in real-time during the surveys and prior to demobilisation to ensure the data was sufficient to satisfy requirements for both.
Data was processed using cleaned and processed using Teledyne PDS 3D editor, where obvious spike are first removed from the data after which data is analysed in a swath profile viewer to strip out less obvious noise and fully clean the 3D surface. The processed 3D surface was then exported in the required format.

7.1.2 Sidescan-Sonar

A total of 118 survey lines were acquired including crosslines.
SSS data were loaded into SonarWiz for post-processing and interpretation. The data were bottom tracked and gains applied. Corrected navigation was applied to ensure contacts were within positional accuracy specifications.
After processing, merged mosaic was exported along with identified seabed contacts, which were analysed against the MBES and magnetometer data.

7.1.3 Marine Magnetometer

A total of 136 survey lines were acquired including crosslines.
Data were replayed and interpreted using Magpick software. Magnetic anomalies were manually picked from the analytical signal grid. Targets were attributed a unique ID, position (Easting and Northing), and as grid value at the target position.
Targets were exported to provide a list of significant targets, which were analysed against MBES and SSS data.

7.1.4 Sub Bottom Profiler HF-SBP

A total of 120 survey lines were acquired including crosslines.
Penetration achieved was according to requirements. The SBP data were acquired as .raw files and processed using ISE software. Data were bottom tracked. The seabed was picked allowing for accurate application of gain filters and removal of the water column. Relevant reflectors were exported as ASCII XYZ files and as depth below seabed to provide an isopach dataset for charting.

7.1.5 Boomer MF-SBP

A total of 18 survey lines and 4 crosslines were acquired.

The boomer was recorded within the SonarWiz acquisition system and exported to SEG-Y which was then imported into CodaOctopus Survey Engine for processing.

The first processing step consists of a thorough analysis of the seismic data quality, the seabeds were hand-picked on each line. The navigation was then assessed, and any required corrections were applied. A Bandpass filter with a low cut of 500Hz and a high cut of 1500Hz was applied to remove some of the lower frequency noise typically outside of the dominant frequency range. A Digital Base Gain of 6.12dB was also applied to the data.

Horizons below the seabed are picked by identifying strong reflectors and tracing them along each survey line. These reflectors indicate changes in the geology, allowing us to identify the

different layers within the substrata. For this project, the Top of Mudstone was tracked across the site and the depth of this horizon was measured.

8. Survey results

Survey results are described below, based on the interpretation of the multibeam echosounder, the sidecan-sonar, the Magnetometer, Sub bottom profiler and boomer datasets.

8.1 Multibeam echosounder (MBES)

8.1.1 Bathymetry and seabed type

Water depths range from 0 m LAT to 11 m LAT, with deeper water depths within the harbour and on the west part of the site.

A few boulders and outcrops/reefs can be identified. The harbour seabed is dominated by scours created by prop wash from large vessels, and with some sediment deposition.

Figure 15 shows the shaded bathymetry of the site.

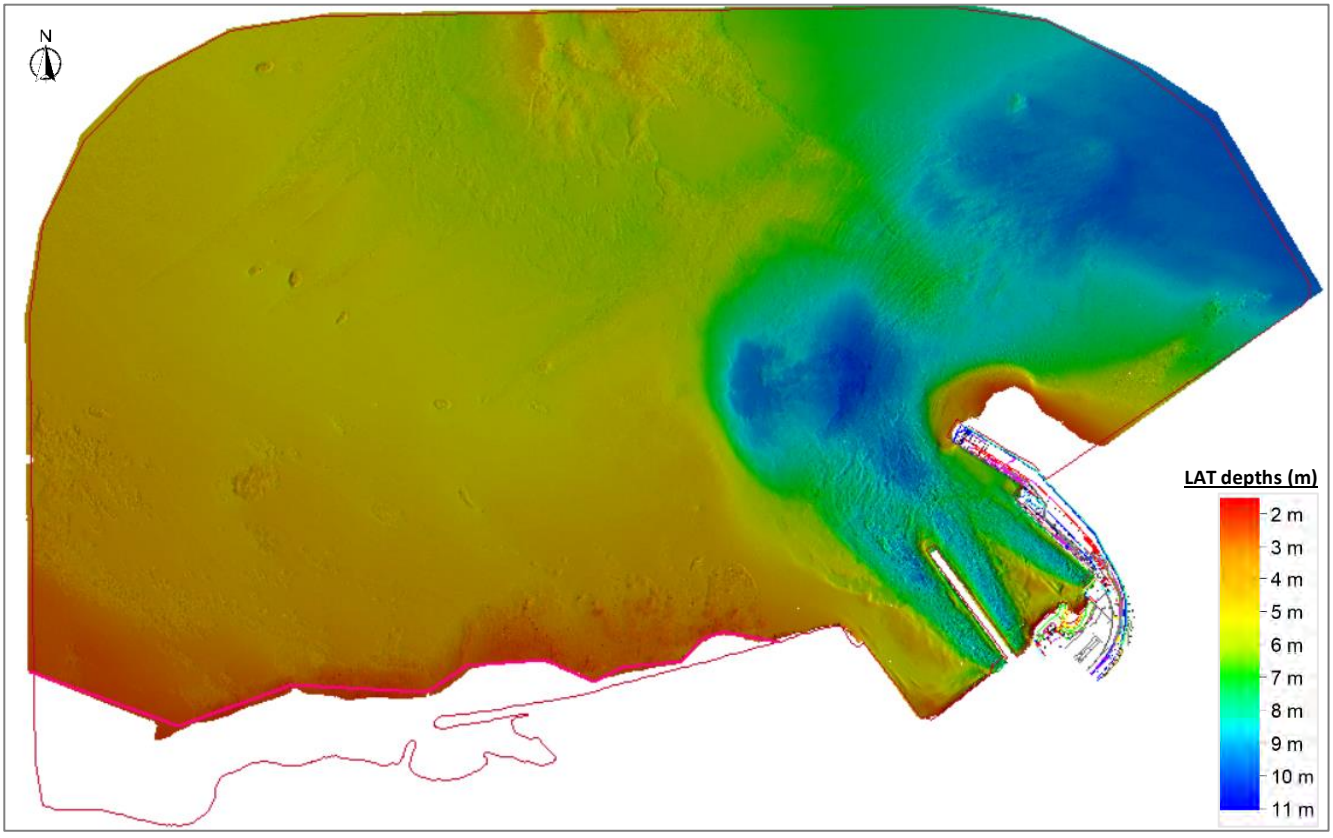


Figure 15: shaded bathymetric data from MBES (Depths in LAT, unit: metres)

Figure 16 shows examples of the multibeam data corresponding to different type of seabed present onsite.

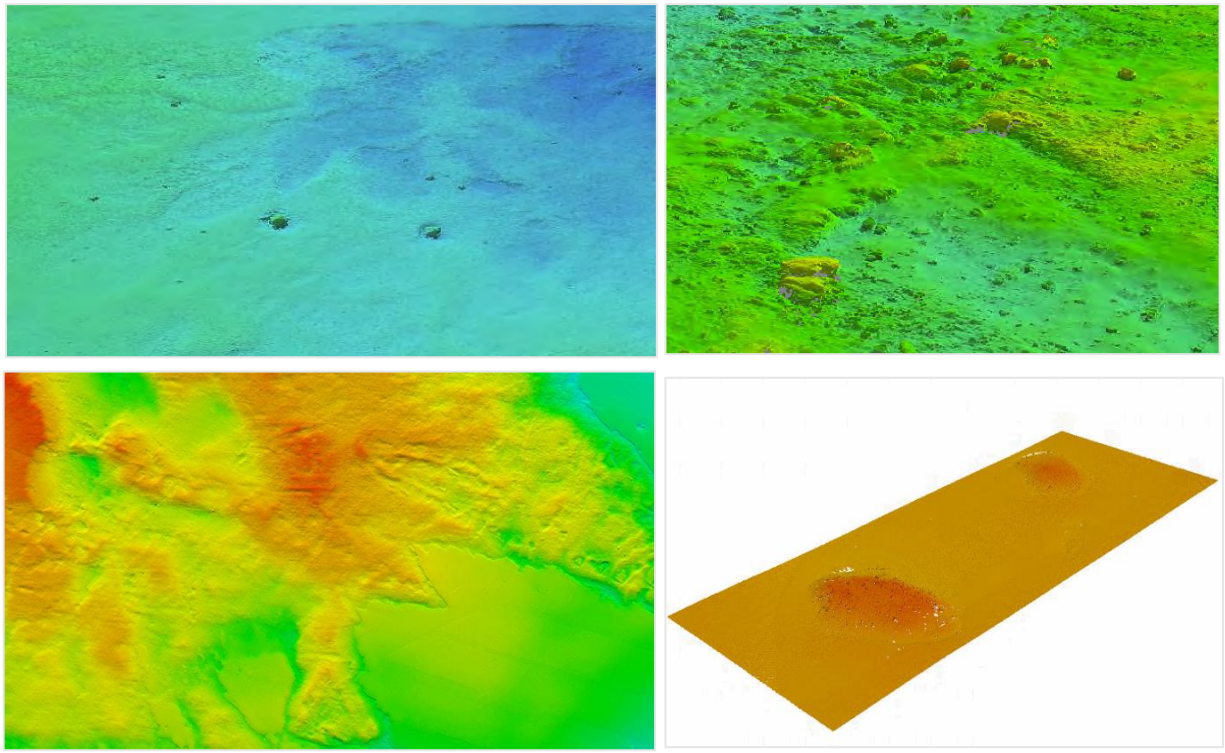


Figure 16: MBES data example showing different seabed type

8.1.2 Debris list

76 debris were located on the MBES data as shown in figure 17 and table 19. More detailed in Appendix 3.

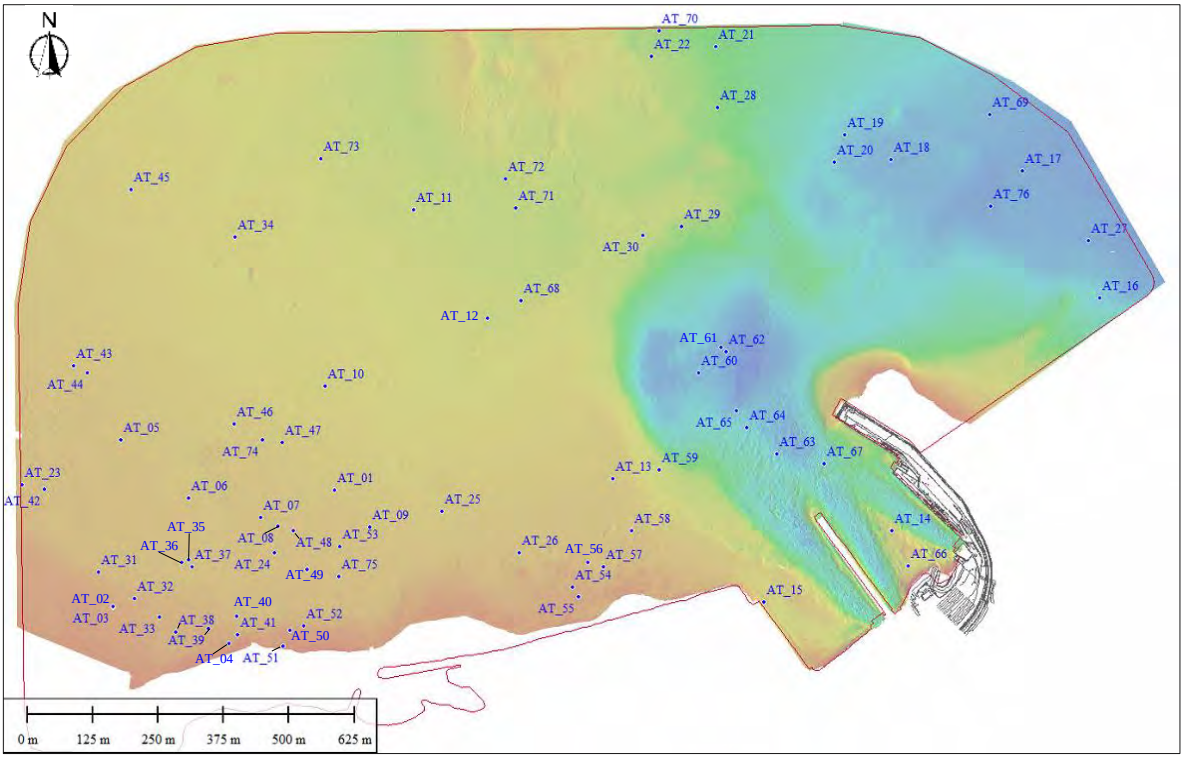


Figure 17: MBES Debris location

Figure 18 shows examples of debris, showing possible wrecks (AT_05 and AT_06), a fishing pots (AT_07), and an anchor block (AT_10). Appendix 1 detailed all the MBES debris pictures.

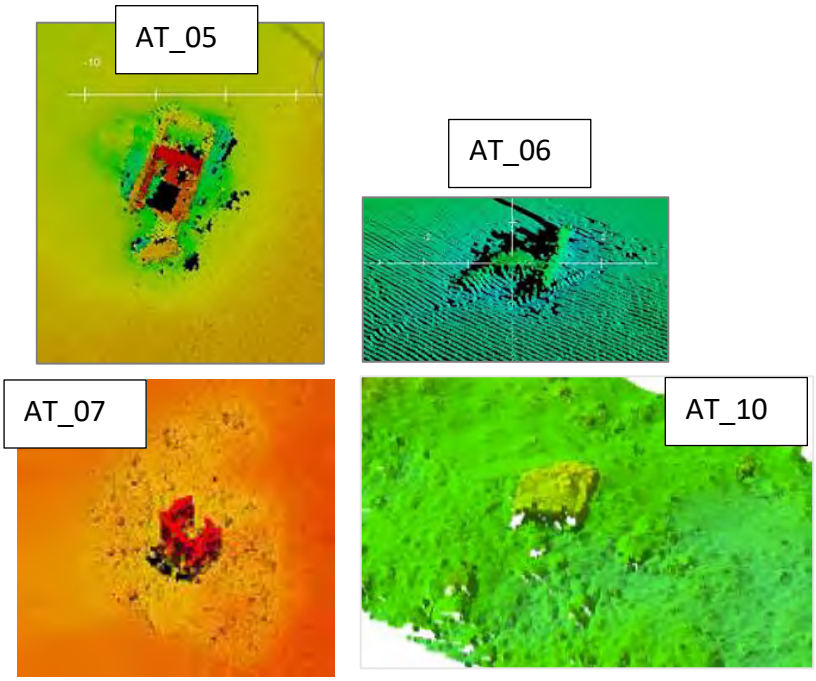


Figure 18: MBES data showing debris located in the Harbour.

76 targets have been listed from the MBES dataset, see table 19.

Table 18: MBES Target list (ITM coordinates)

Target ID	Easting*	Northing*	Description
AT_01	712492.5	612864.3	2 blocks
AT_02	712070.0	612646.3	2 boulders or blocks
AT_04	712290.9	612578.5	1 block and boulders
AT_05	712084.1	612956.3	NI** debris - possible wreck
AT_06	712214.0	612848.5	NI** debris possible buried wreck
AT_07	712351.3	612812.9	Fishing pot
AT_08	712384.2	612796.1	NI** debris
AT_09	712560.0	612794.5	Mooring with rope
AT_10	712474.8	613057.2	Mooring block
AT_11	712642.8	613384.4	Possible Boulder
AT_12	712784.3	613182.6	Tyre
AT_13	713023.3	612885.1	Mooring and rope
AT_14	713557.1	612788.8	NI** long debris
AT_15	713313.1	612655.8	NI** debris
AT_16	713953.2	613220.5	Long thin scour
AT_17	713805.2	613456.5	Little boulder

AT_18	713554.7	613478.4	Mooring with rope or chain
AT_19	713467.3	613524.4	Possible mooring with a block and a chain
AT_20	713446.1	613473.1	NI** debris - possible mooring with rope or chain
AT_21	713221.2	613688.5	Tyre
AT_22	713097.5	613669.6	Possible mooring block or boulder
AT_23	711895.8	612874.0	NI** debris - possible boulder
AT_24	712377.3	612746.7	Mooring block with scours
AT_25	712697.5	612825.0	NI** debris - possible buried mooring with rope
AT_26	712845.4	612746.5	Mooring with chain or rope
AT_27	713932.6	613327.3	Possible scours on the seabed
AT_28	713223.1	613575.9	NI** debris
AT_29	713155.5	613353.4	Block - possible former mooring
AT_30	713080.8	613336.9	Block
AT_31	712303.6	613331.7	NI** debris
AT_32	712213.2	612734.9	NI** possible mooring with chain
AT_33	712158.6	612627.9	NI** debris
AT_34	712301.8	613333.4	NI** debris
AT_35	712214.3	612733.8	Possible rope with block
AT_36	712200.3	612728.7	NI** debris
AT_37	712219.9	612720.9	NI** debris
AT_38	712188.6	612599.2	NI** debris
AT_39	712252.1	612606.5	NI** debris
AT_40	712305.8	612628.9	NI** debris
AT_41	712307.5	612594.4	Possible boulders
AT_42	711938.8	612864.5	Possible boulders
AT_43	711993.8	613094.2	NI** debris
AT_44	712021.2	613081.3	NI** debris
AT_45	712103.4	613422.6	NI** possible boulders
AT_46	712300.7	612986.4	NI** debris
AT_47	712391.8	612951.7	NI** possible block
AT_48	712414.6	612787.9	NI** possible block
AT_49	712440.2	612715.4	Possible boulder
AT_50	712407.1	612602.2	Possible rope with block anchor
AT_51	712395.1	612573.4	NI** possible boulder
AT_52	712433.8	612610.5	Possible block
AT_53	712503.1	612758.8	Possible block anchor with chain
AT_54	712947.3	612682.6	NI** debris
AT_55	712959	612664.7	NI** debris
AT_56	712976.2	612729.4	NI** debris
AT_57	713006.6	612720.5	NI** possible block
AT_58	713060.5	612788.9	NI** debris
AT_59	713111.8	612901.2	Possible tyre
AT_60	713187	613081.8	NI** debris
AT_61	713230.3	613129.3	NI** possible boulder
AT_62	713240.7	613121.6	NI** possible boulder
AT_63	713337.7	612931.4	NI** debris

AT_64	713279.8	612980	NI** possible boulder
AT_65	713260.5	613010.9	NI** debris
AT_66	713587.7	612723.4	Possible tyre
AT_67	713426.7	612913.1	NI** debris
AT_68	712848.3	613216.9	Possible block anchor with rope
AT_69	713743.1	613561.6	NI** debris
AT_70	713112.3	613718.1	NI** debris
AT_71	712838	613388.9	NI** debris
AT_72	712819	613442.7	NI** possible boulder
AT_73	712465.8	613480.1	NI** debris
AT_74	712355.2	612956.5	NI** debris
AT_75	712501.3	612703.1	NI** debris
AT_76	713744.5	613391.2	Possible mooring with chain

**Coordinates in Irish Transverse Mercator (ITM)*
*** NI: Not Identified*

8.2 Sidescan-sonar (SSS)

8.2.1 Seabed contacts

In total, 222 contacts were identified in the side-scan sonar within the survey site. The sonar contacts are listed in table 20 and figure 19 & 20 show their location.

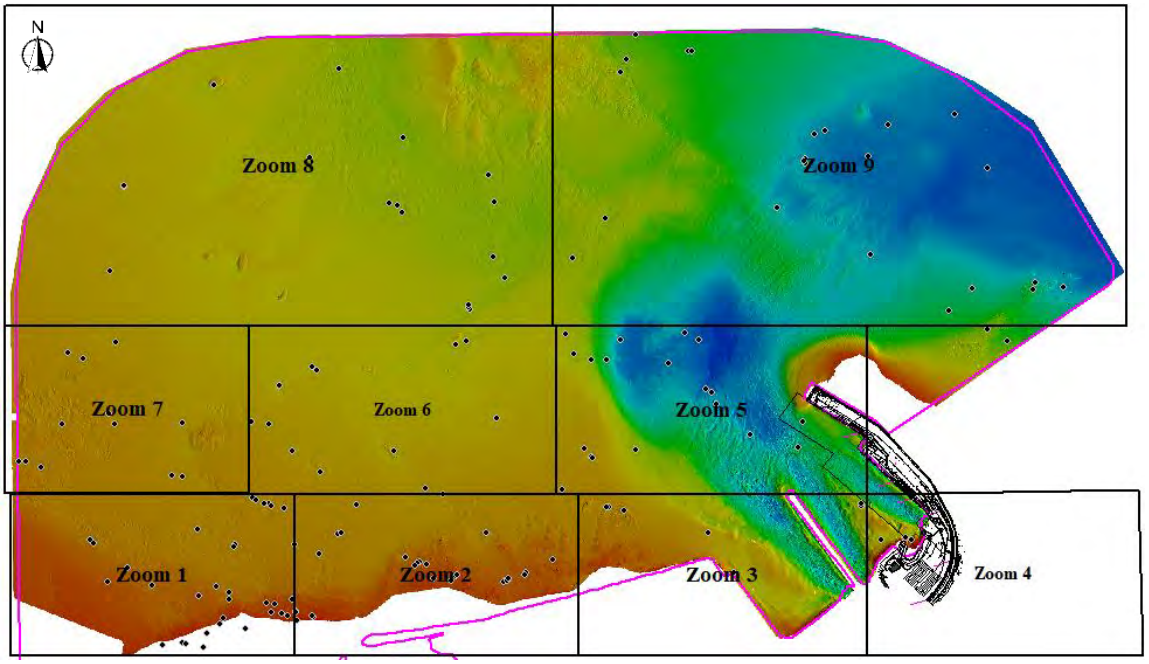
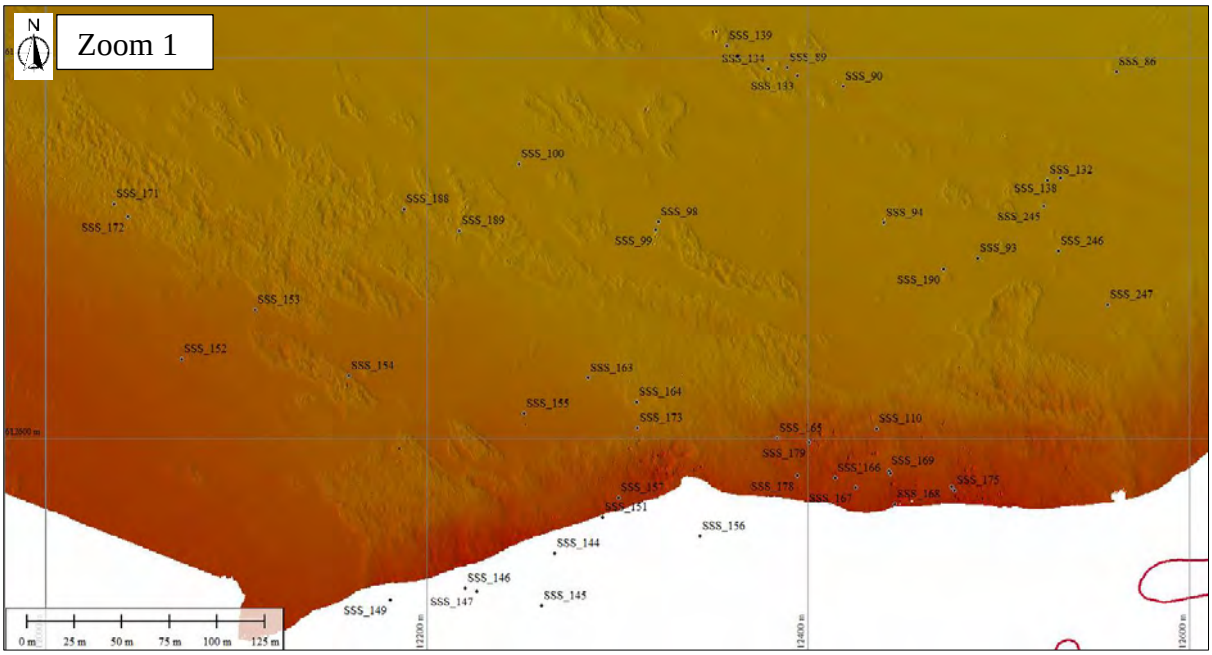
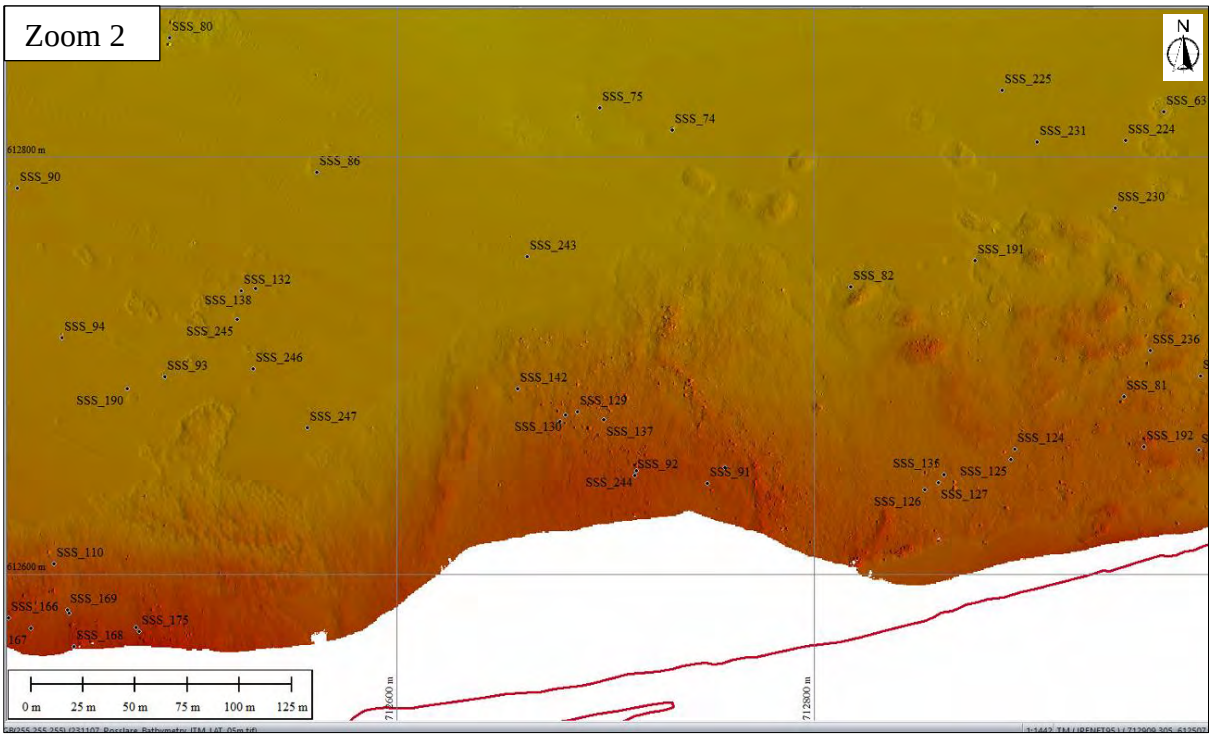
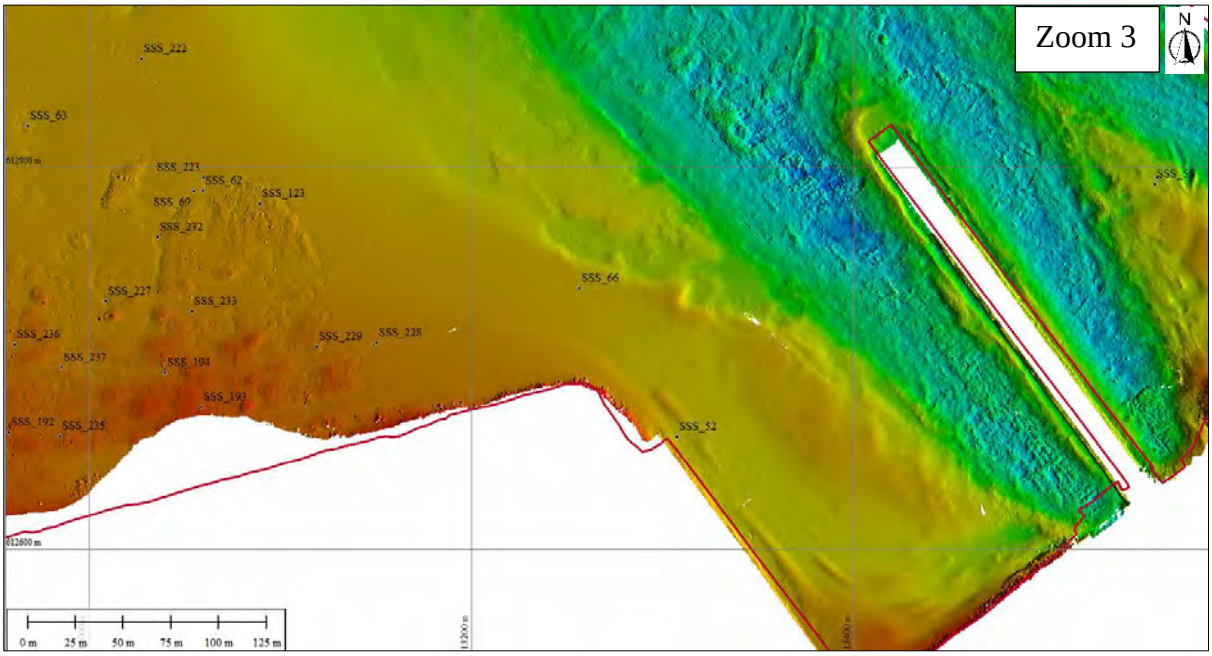
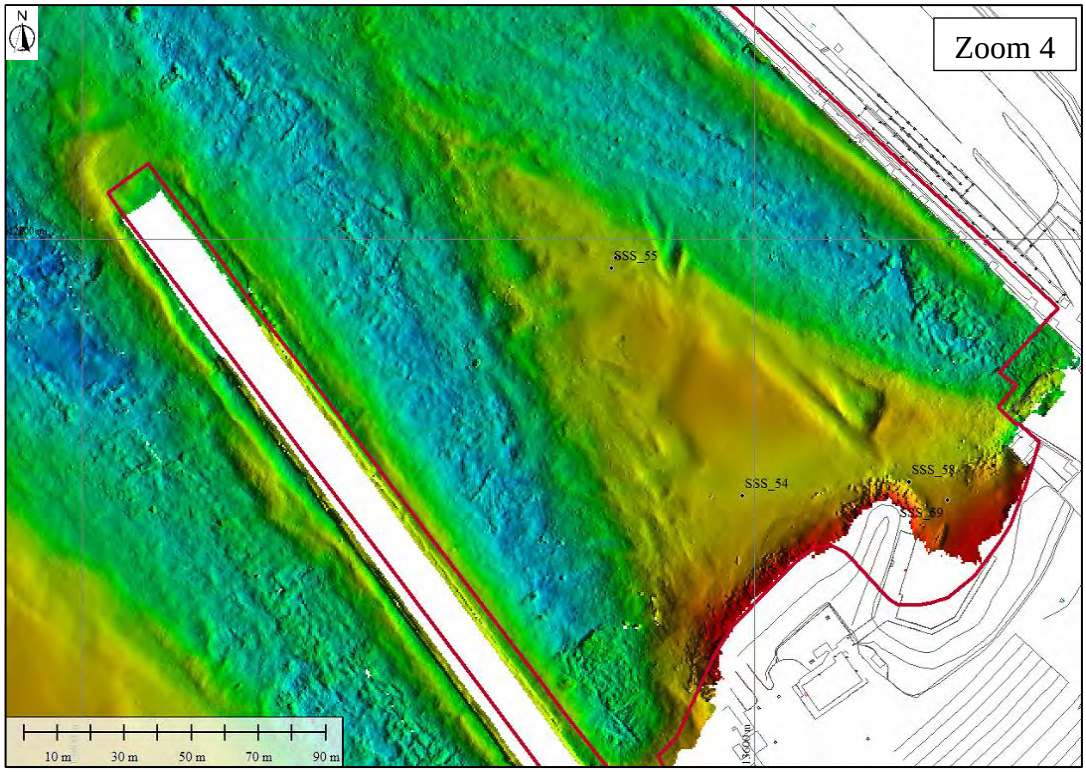


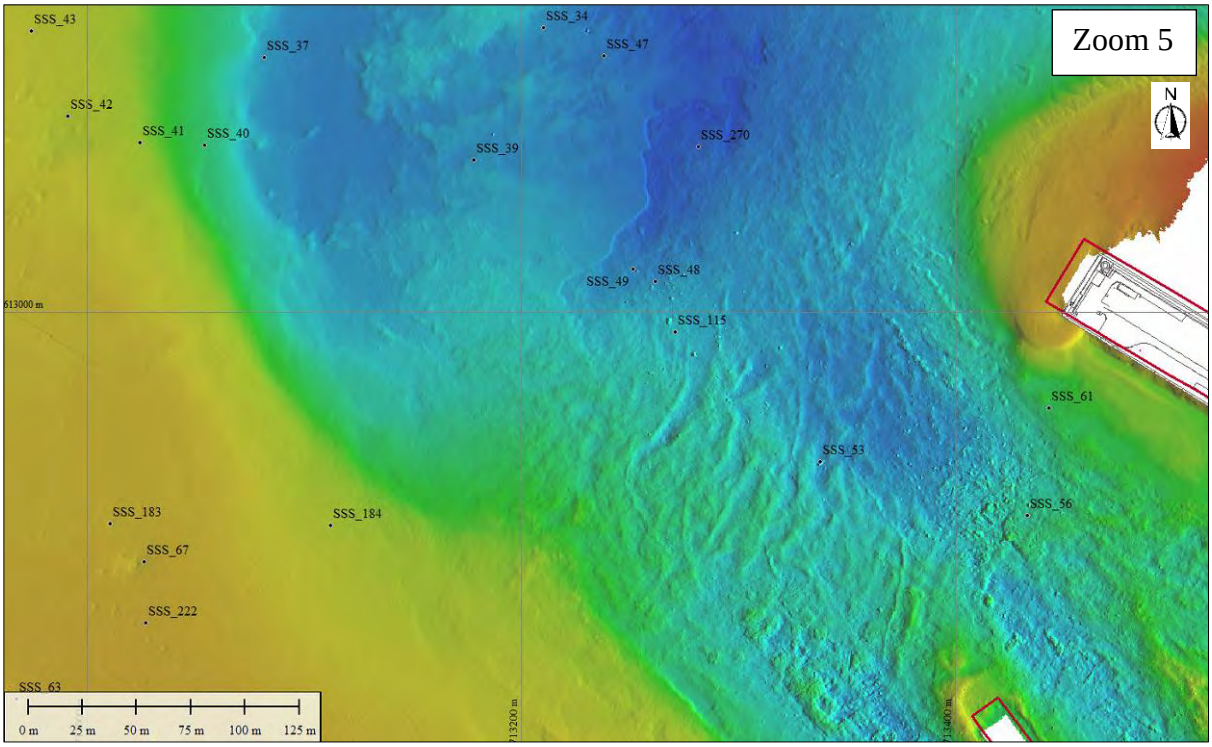
Figure 19: Sidescan sonar contacts location Keyplan and zoomed view

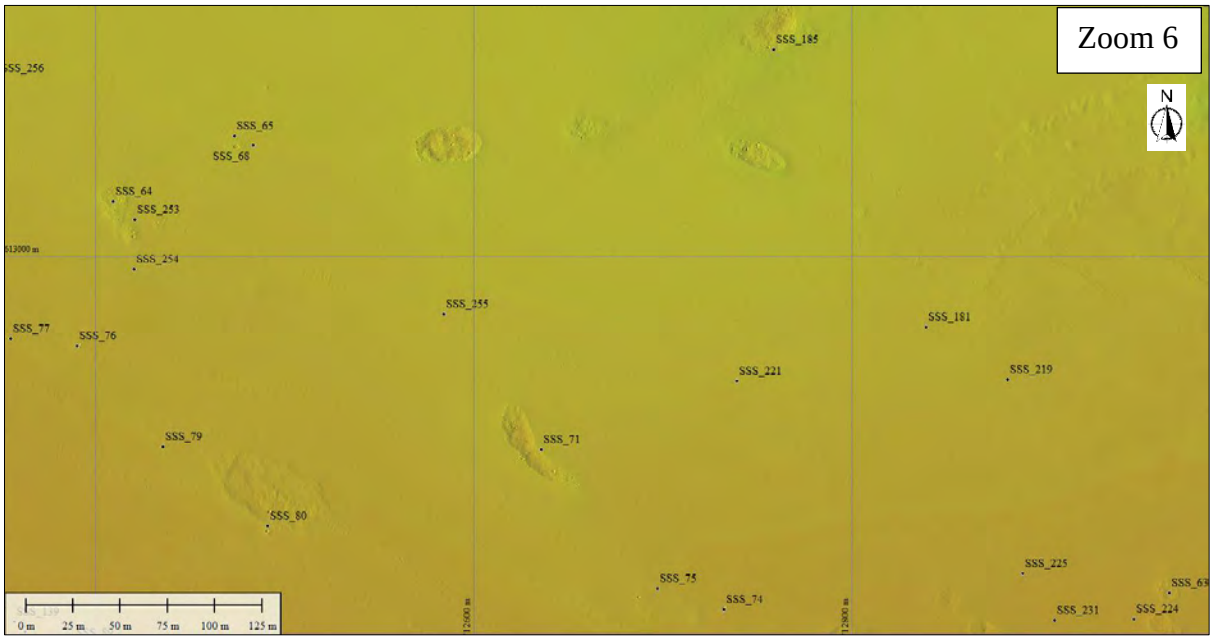

Zoom 1
N
SSS_139
SSS_134
SSS_89
SSS_90
SSS_133
SSS_86
SSS_100
SSS_132
SSS_138
SSS_171
SSS_188
SSS_98
SSS_94
SSS_245
SSS_172
SSS_189
SSS_99
SSS_93
SSS_246
SSS_190
SSS_153
SSS_247
SSS_152
SSS_154
SSS_163
SSS_164
SSS_155
SSS_173
SSS_110
SSS_65
SSS_179
SSS_166
SSS_169
SSS_175
SSS_178
SSS_167
SSS_168
SSS_151
SSS_156
SSS_144
SSS_146
SSS_147
SSS_145
SSS_149
612800 m
12200 m
12400 m
12600 m
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25 m
50 m
75 m
100 m
125 m

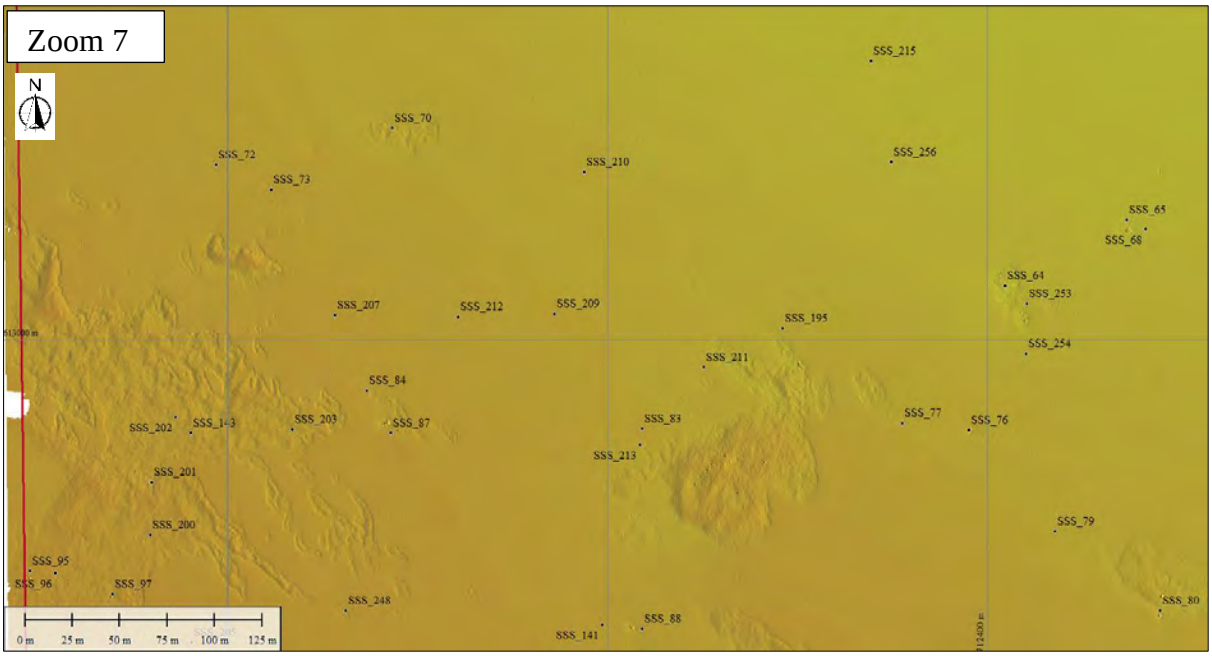

Zoom 2
N
SSS_80
SSS_225
SSS_75
SSS_63
SSS_74
SSS_231
SSS_224
612800 m
SSS_86
SSS_90
SSS_230
SSS_243
SSS_191
SSS_82
SSS_132
SSS_138
SSS_94
SSS_245
SSS_236
SSS_93
SSS_246
SSS_81
SSS_142
SSS_190
SSS_129
SSS_247
SSS_130
SSS_137
SSS_124
SSS_192
SSS_92
SSS_91
SSS_136
SSS_125
SSS_244
SSS_127
SSS_126
SSS_110
612600 m
SSS_156
SSS_169
SSS_175
167
SSS_168
0 m
25 m
50 m
75 m
100 m
125 m
712600 m
712800 m

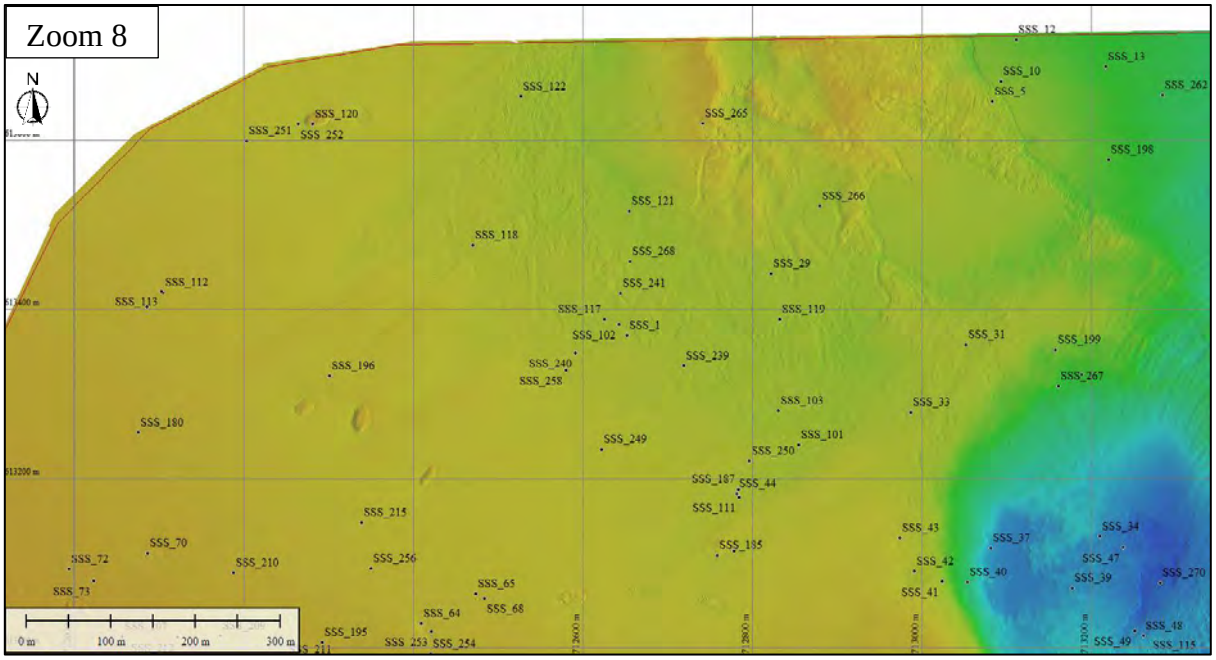

Zoom 3
N
SSS_222
SSS_63
SSS_223
SSS_62
SSS_123
SSS_69
SSS_232
SSS_66
SSS_227
SSS_233
SSS_236
SSS_229
SSS_228
SSS_237
SSS_194
SSS_193
SSS_192
SSS_235
SSS_52
0 m
25 m
50 m
75 m
100 m
125 m


Zoom 4
N
SSS_55
SSS_54
SSS_58
SSS_59
10 m
30 m
50 m
70 m
90 m


Zoom 5
N
SSS_43
SSS_34
SSS_37
SSS_47
SSS_42
SSS_41
SSS_40
SSS_39
SSS_270
SSS_49
SSS_48
613000 m
SSS_115
SSS_61
SSS_53
SSS_56
SSS_183
SSS_184
SSS_67
SSS_222
SSS_63
0 m
25 m
50 m
75 m
100 m
125 m


Zoom 6
N
SSS_185
SSS_256
SSS_65
SSS_68
SSS_64
SSS_253
613000 m
SSS_254
SSS_255
SSS_181
SSS_77
SSS_76
SSS_221
SSS_219
SSS_79
SSS_71
SSS_80
SSS_225
SSS_75
SSS_74
SSS_231
SSS_224
0 m
25 m
50 m
75 m
100 m
125 m


Zoom 7
N
SSS_215
SSS_70
SSS_72
SSS_73
SSS_210
SSS_256
SSS_65
SSS_68
SSS_64
SSS_253
SSS_207
SSS_212
SSS_209
SSS_195
SSS_254
SSS_211
SSS_84
SSS_202
SSS_1-3
SSS_203
SSS_87
SSS_83
SSS_77
SSS_76
SSS_213
SSS_201
SSS_200
SSS_79
SSS_95
SSS_96
SSS_97
SSS_248
SSS_80
SSS_88
SSS_141
0 m
25 m
50 m
75 m
100 m
125 m


Zoom 8
N
SSS_12
SSS_13
SSS_10
SSS_5
SSS_262
SSS_122
SSS_120
SSS_251
SSS_252
SSS_265
SSS_198
SSS_121
SSS_266
SSS_118
SSS_268
SSS_29
SSS_112
SSS_113
SSS_241
SSS_117
SSS_119
SSS_102
SSS_1
SSS_31
SSS_199
SSS_196
SSS_240
SSS_258
SSS_239
SSS_267
SSS_103
SSS_33
SSS_180
SSS_249
SSS_101
SSS_250
SSS_187
SSS_44
SSS_111
SSS_215
SSS_43
SSS_37
SSS_34
SSS_70
SSS_72
SSS_210
SSS_256
SSS_185
SSS_42
SSS_47
SSS_73
SSS_65
SSS_40
SSS_39
SSS_270
SSS_41
SSS_64
SSS_68
SSS_48
SSS_195
SSS_253
SSS_254
SSS_49
SSS_115
0 m
100 m
200 m
300 m

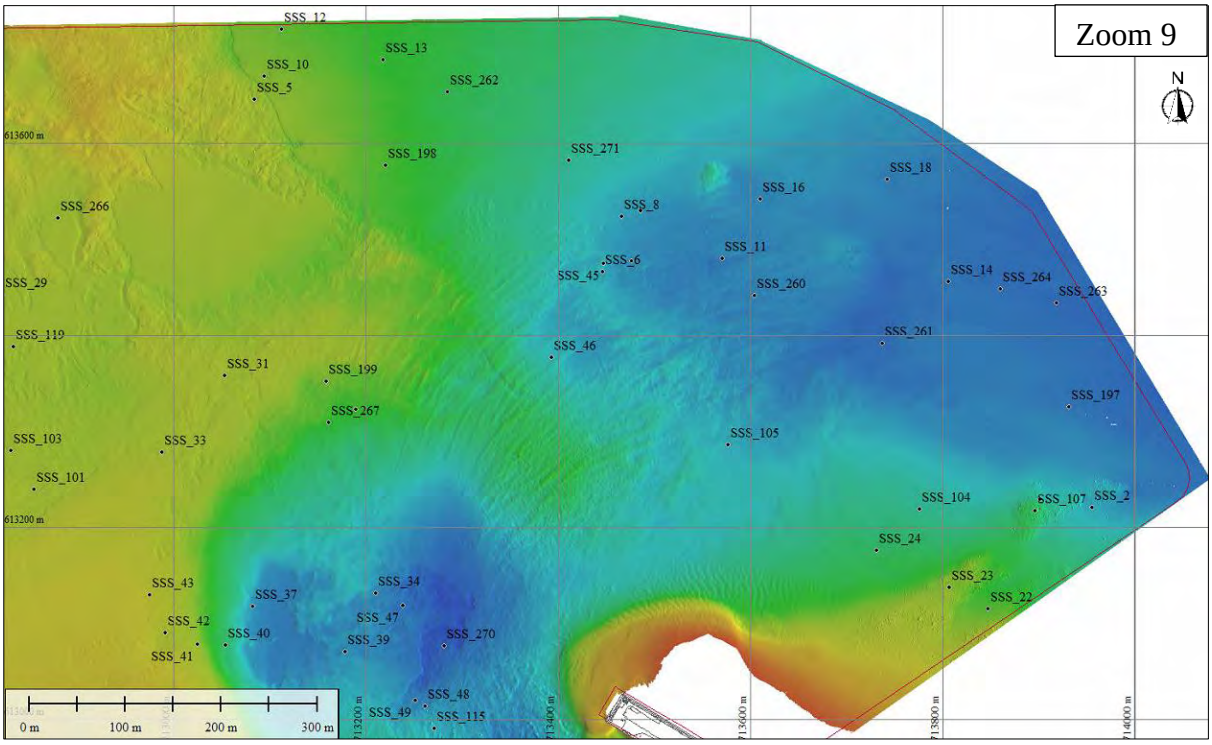


Figure 20: Zoomed views of SSS target location

Table 19: Sidescan sonar contact list (unit in metre)

Target ID	Easting*	Northing*	Height	Length	Width	Description
SSS_1	712652.1	613369.3	0.2	13.0	1.0	NI** debris
SSS_2	713955.7	613220.5	0.4	6.4	0.3	NI** linear debris
SSS_5	713083.8	613646.0	0.0	8.4	0.8	NI** linear debris
SSS_6	713446.2	613466.1	0.2	3.6	0.6	NI** debris - possible mooring with rope or chain
SSS_8	713465.6	613524.1	0.2	2.9	0.5	NI** debris
SSS_9	713485.6	613530.1	0.4	1.3	1.1	boulders
SSS_10	713094.0	613670.0	0.5	1.7	1.0	boulders
SSS_11	713571.1	613480.4	0.2	36.1	0.2	Possible mooring rope/chain
SSS_12	713112.1	613718.6	0.6	1.7	0.5	boulders
SSS_13	713217.8	613687.4	0.2	1.2	1.1	tyre
SSS_14	713806.2	613456.3	0.1	4.0	0.6	NI** debris
SSS_16	713610.1	613542.2	0.5	1.1	0.5	boulders
SSS_18	713742.6	613562.3	0.4	1.3	0.5	boulders
SSS_22	713846.8	613115.5	0.3	6.7	1.8	Possible mooring block or boulder
SSS_23	713806.7	613137.6	0.0	51.5	37.9	boulder patch
SSS_24	713731.4	613175.8	0.2	3.4	0.8	boulders
SSS_29	712822.4	613442.6	0.8	1.5	1.2	boulders
SSS_31	713052.7	613358.2	0.2	27.0	2.9	sand waves/ripples

SSS_33	712987.7	613278.2	0.3	1.8	0.8	boulders
SSS_34	713210.3	613131.6	0.8	2.5	1.0	boulders
SSS_37	713081.9	613117.9	0.9	1.4	0.8	boulders
SSS_39	713178.2	613070.3	0.6	2.9	2.1	boulders
SSS_40	713054.2	613077.2	0.5	2.5	0.7	boulders
SSS_41	713024.5	613078.4	0.5	3.5	0.6	boulders
SSS_42	712991.3	613090.7	0.0	54.3	41.9	outcropping
SSS_43	712974.6	613130.1	0.5	2.3	0.8	boulders
SSS_44	712782.4	613182.0	0.3	1.6	1.1	tyre
SSS_45	713446.9	613475.3	0.2	16.7	0.4	NI** debris - possible mooring with rope or chain
SSS_46	713392.7	613377.5	0.3	0.8	0.6	boulders
SSS_47	713238.2	613118.6	0.5	1.6	0.7	boulders
SSS_48	713261.8	613014.3	0.0	47.9	29.0	boulder patch
SSS_49	713251.7	613020.1	1.0	1.9	0.9	boulders
SSS_52	713307.5	612658.7	1.9	27.7	1.4	NI** debris
SSS_53	713337.7	612931.0	1.2	2.4	1.8	boulders
SSS_54	713596.5	612723.9	0.8	1.3	0.6	boulders
SSS_55	713557.6	612791.3	1.1	8.2	1.9	linear NI** debris
SSS_56	713433.2	612906.3	1.6	1.6	1.3	boulders
SSS_57	713558.8	612794.6	0.3	7.1	0.3	linear NI** debris
SSS_58	713646.0	612728.0	0.0	22.6	7.3	Boulders from rockarmour
SSS_59	713657.6	612722.8	0.1	13.7	0.2	rope
SSS_61	713443.3	612956.0	0.7	1.1	0.7	boulders
SSS_62	713059.5	612787.9	0.0	2.3	0.2	boulders
SSS_63	712967.9	612821.6	1.9	12.0	8.3	outcrop
SSS_64	712409.7	613028.7	1.5	14.6	17.4	outcrop
SSS_65	712473.6	613063.7	1.1	3.1	2.6	block
SSS_66	713256.5	612736.6	0.2	2.8	0.3	linear NI** debris
SSS_67	713026.6	612885.0	0.1	7.5	0.2	rope
SSS_68	712483.7	613058.7	0.1	2.7	0.3	NI** debris
SSS_69	713054.8	612787.3	0.5	2.1	0.6	boulders
SSS_70	712086.5	613112.0	2.1	28.6	12.0	outcrop
SSS_71	712635.7	612897.7	1.6	47.4	16.7	outcrop
SSS_72	711993.8	613092.6	0.8	1.4	1.1	boulders
SSS_73	712023.1	613079.5	0.3	1.3	0.7	boulders
SSS_74	712732.4	612812.8	1.5	2.5	2.0	boulders
SSS_75	712697.4	612823.8	0.8	1.8	0.5	Possible mooring
SSS_76	712390.3	612952.3	0.5	1.9	1.2	boulders
SSS_77	712355.6	612956.4	0.6	1.0	0.9	boulders
SSS_79	712435.7	612899.0	1.2	1.2	0.7	boulders
SSS_80	712491.3	612857.1	0.6	1.6	1.7	block
SSS_81	712948.8	612685.1	0.9	1.3	0.9	boulders
SSS_82	712817.6	612737.7	0.9	1.5	0.8	boulders
SSS_83	712218.3	612953.2	1.8	1.9	0.9	boulders

SSS_84	712073.3	612973.4	0.7	2.8	0.9	NI** debris
SSS_86	712562.1	612792.6	1.2	2.6	2.5	Mooring with rope/chain
SSS_87	712085.7	612950.8	0.5	5.9	2.7	NI** debris
SSS_88	712218.3	612847.7	1.0	4.0	0.4	NI* debris - possible wreck
SSS_89	712389.0	612795.1	0.4	1.2	1.0	boulders
SSS_90	712418.6	612785.2	0.5	1.2	0.7	boulders
SSS_91	712749.2	612643.6	0.6	2.1	0.8	boulders
SSS_92	712714.5	612647.2	0.7	2.3	1.6	boulders
SSS_93	712489.0	612694.7	0.3	1.3	0.6	boulders
SSS_94	712440.0	612713.5	0.3	1.4	1.0	boulders
SSS_95	711895.8	612878.2	0.5	1.6	0.9	boulders
SSS_96	711909.2	612876.9	0.3	1.1	1.1	boulders
SSS_97	711939.2	612865.8	0.6	1.4	1.2	boulders
SSS_98	712321.5	612713.7	0.8	1.4	0.9	boulders
SSS_99	712320.2	612709.5	0.4	1.2	0.8	boulders
SSS_100	712248.2	612744.4	0.7	1.0	0.7	boulders
SSS_101	712854.6	613239.5	0.2	39.1	5.9	sand waves/ripples
SSS_102	712643.2	613382.4	0.4	0.9	0.4	boulders
SSS_103	712830.7	613280.2	0.2	1.1	0.6	boulders
SSS_104	713776.0	613219.6	0.6	2.7	0.5	boulders
SSS_105	713577.1	613286.2	0.2	2.1	1.5	boulders
SSS_107	713896.5	613217.4	2.5	3.4	1.5	boulders
SSS_108	713901.4	613229.7	0.0	47.4	36.9	boulder patch
SSS_110	712436.2	612604.8	0.5	2.0	1.3	boulders
SSS_111	712784.9	613178.2	0.2	1.2	1.1	Tyre
SSS_112	712104.6	613419.7	0.4	1.4	0.6	boulders
SSS_113	712102.4	613421.9	0.6	1.1	0.7	boulders
SSS_115	713271.0	612990.9	1.3	2.3	0.9	boulders
SSS_117	712626.0	613388.3	0.5	1.6	0.6	boulders
SSS_118	712470.3	613476.2	0.4	1.1	0.4	boulders
SSS_119	712833.1	613388.6	0.4	0.9	0.5	boulders
SSS_120	712281.2	613619.5	0.0	35.0	20.2	Possible outcrop
SSS_121	712655.2	613516.2	0.5	3.9	0.2	linear NI** debris
SSS_122	712527.3	613652.3	0.4	0.9	0.4	boulders
SSS_123	713089.4	612781.1	0.0	22.8	11.3	boulder patch
SSS_124	712896.4	612659.9	0.9	1.2	0.2	boulders
SSS_125	712894.6	612654.9	1.5	0.8	0.9	boulders
SSS_126	712853.3	612640.3	0.6	1.3	0.8	boulders
SSS_127	712859.5	612643.8	0.9	0.9	0.5	boulders
SSS_128	712757.3	612651.1	0.0	21.2	10.6	boulder patch
SSS_129	712686.9	612677.7	0.4	1.6	0.6	boulders
SSS_130	712681.2	612676.4	0.6	1.8	0.7	boulders
SSS_131	712678.3	612673.3	1.2	2.0	0.8	boulders
SSS_132	712525.9	612735.8	0.3	0.7	0.5	boulders

SSS_133	712394.4	612790.8	0.3	2.8	0.5	mooring and rope
SSS_134	712379.2	612794.4	0.3	0.8	0.8	boulders
SSS_135	712862.5	612647.7	0.8	1.3	0.8	boulders
SSS_137	712699.6	612674.0	0.0	13.3	8.7	boulder patch
SSS_138	712532.6	612736.9	0.3	0.6	0.5	boulders
SSS_139	712357.4	612806.3	0.9	2.3	2.7	Fishing pot
SSS_140	712363.1	612800.8	0.3	0.8	0.6	boulders
SSS_141	712197.4	612849.8	1.0	1.7	0.0	NI** debris
SSS_142	712658.4	612689.1	0.5	1.9	1.0	boulders
SSS_143	711980.7	612950.8	0.4	0.6	0.5	boulders
SSS_144	712267.0	612539.4	0.5	1.4	0.4	boulders
SSS_145	712260.3	612511.9	0.0	22.8	24.7	boulder patch
SSS_146	712219.9	612521.1	0.4	1.4	1.5	boulders
SSS_147	712226.1	612519.3	0.8	0.7	1.3	boulders
SSS_149	712180.7	612515.1	0.0	19.8	19.2	boulder patch
SSS_151	712292.3	612558.3	0.4	1.2	0.5	boulders
SSS_152	712071.4	612641.6	0.1	0.7	0.2	two boulders or blocks
SSS_153	712109.6	612667.5	0.4	0.8	0.3	boulders
SSS_154	712158.9	612632.8	0.6	2.1	0.9	boulders
SSS_155	712251.1	612612.9	0.3	1.0	0.3	boulders
SSS_156	712343.5	612548.5	0.0	26.0	24.5	boulder patch
SSS_157	712300.4	612568.6	0.1	16.1	0.2	long linear NI* debris - possible rope or chain
SSS_163	712284.6	612631.8	0.3	1.3	1.0	boulders
SSS_164	712310.0	612619.0	0.4	1.5	0.6	boulders
SSS_165	712383.9	612600.0	1.4	2.4	1.6	boulders
SSS_166	712414.2	612579.0	0.1	1.2	0.3	boulders
SSS_167	712425.1	612573.9	0.2	1.4	0.7	boulders
SSS_168	712445.7	612565.5	0.4	0.9	0.5	boulders
SSS_169	712442.5	612582.7	0.3	0.6	0.2	boulders
SSS_171	712035.7	612723.4	0.3	0.7	0.4	boulders
SSS_172	712043.2	612716.3	0.4	0.7	0.4	boulders
SSS_173	712310.6	612605.3	0.6	1.8	1.8	boulders
SSS_174	712443.3	612581.4	0.7	1.8	1.6	boulders
SSS_175	712476.8	612572.5	0.7	1.2	0.7	boulders
SSS_176	712475.5	612574.5	0.2	1.4	1.1	boulders
SSS_178	712394.7	612580.0	0.5	1.2	1.0	boulders
SSS_179	712400.5	612597.6	0.4	0.7	0.5	boulders
SSS_180	712075.5	613254.3	0.4	1.8	1.2	boulders
SSS_181	712839.1	612962.5	0.1	0.6	0.6	boulders
SSS_183	713010.7	612902.3	0.5	0.9	0.4	boulders
SSS_184	713112.5	612901.6	0.4	0.9	0.5	boulders
SSS_185	712758.7	613109.2	0.8	1.2	0.7	boulders
SSS_186	712778.4	613114.7	0.5	0.7	0.2	boulders
SSS_187	712783.5	613187.7	0.5	1.1	1.2	tyre

SSS_188	712188.1	612720.6	0.5	4.1	0.7	Possible bloc anchor with chain
SSS_189	712217.1	612709.0	0.0	2.7		NI** debris
SSS_190	712471.3	612688.8	0.0	1.8	2.3	Mooring block with scours
SSS_191	712877.3	612750.2	0.0	2.4	2.0	Mooring and rope
SSS_192	712958.1	612661.0	0.7	2.5	1.3	NI** debris
SSS_193	713058.7	612674.4	1.0	2.0	2.0	possible block
SSS_194	713039.7	612692.4	1.0	3.9	2.0	NI** debris
SSS_195	712292.6	613006.2				NI** debris
SSS_196	712300.8	613321.6	0.0	4.3		NI** debris
SSS_197	713931.4	613325.7	0.0			NI** debris
SSS_198	713220.5	613577.3	0.0			NI** debris
SSS_199	713158.2	613352.6	0.0			possible block
SSS_200	711959.4	612897.3	0.0			possible boulders
SSS_201	711959.8	612925.0	0.0	1.1	1.2	NI** debris
SSS_202	711972.7	612959.3	0.0	1.2	1.1	MI, possible block anchor with chain
SSS_203	712034.0	612952.9	0.0	2.2	1.6	possible block anchor with chain
SSS_205	711981.1	612840.2	0.0	2.0	2.1	NI** debris
SSS_207	712056.7	613013.2	0.0	1.2	1.5	NI** debris
SSS_209	712172.2	613014.0	0.0	1.6	1.1	NI** debris
SSS_210	712187.7	613088.7	0.0	1.5	0.9	NI** debris, possible tyre
SSS_211	712250.6	612985.8	0.0	9.0	2.8	NI** debris
SSS_212	712121.5	613012.6	0.0	1.4	1.0	NI** debris
SSS_213	712217.1	612944.7	0.0	2.0	1.7	NI** debris, possible boulder
SSS_215	712338.9	613147.5	0.0	5.0	0.0	NI** debris
SSS_217	712085.9	613402.6	0.0	1.0	0.8	NI** debris, possible tyre
SSS_219	712882.4	612934.5	0.0	0.8	0.8	NI** object, possible tyre
SSS_221	712739.2	612933.8	0.0	10.8	1.6	NI** debris, possible block and rope
SSS_222	713027.4	612856.8	0.0	1.0	0.9	NI** debriss, possible tyres
SSS_223	713059.8	612794.6	0.0	2.4	1.3	NI** debris
SSS_224	712949.2	612807.9	0.0	3.1	0.6	NI** debris
SSS_225	712890.3	612831.9	0.0	4.3	0.0	NI** debris, possible rope
SSS_227	713008.8	612730.0	0.0	1.6	1.6	NI** debris
SSS_228	713150.5	612708.2	0.0	0.0	0.0	
SSS_229	713119.1	612706.1	0.0	0.0	0.0	NI** debris
SSS_230	712944.6	612775.5	0.0	0.6	0.7	NI** debris
SSS_231	712907.1	612807.1	0.0	0.5	0.5	NI** debris
SSS_232	713035.7	612763.5	0.0	9.8	0.0	NI** debris
SSS_233	713053.9	612724.5	0.0	12.8	0.0	NI** debris
SSS_235	712984.5	612659.4	0.0	3.3	1.6	NI** debris
SSS_236	712961.1	612707.2	0.0	0.0	0.0	NI** debris, large shadow
SSS_237	712985.3	612695.1	0.0	5.7	2.1	NI** debris, possible rocks
SSS_239	712719.3	613333.2	0.0	0.5	0.5	NI** debris

SSS_240	712591.2	613348.8	0.0	1.0	0.8	NI** debris
SSS_241	712644.8	613419.3	0.0	0.5	0.5	NI** debris
SSS_243	712662.8	612752.1	0.0	15.4	1.5	NI, possible rope
SSS_244	712714.9	612649.6	0.0	2.5	1.9	NI** possible block
SSS_245	712523.8	612722.0	0.0	1.1	0.6	NI** debris
SSS_246	712531.6	612698.6	0.0	5.5	1.1	NI** debris
SSS_247	712557.4	612670.1	0.0	1.4	1.2	NI** debris
SSS_248	712062.3	612857.1	0.0	7.5	1.3	NI** debris
SSS_249	712622.0	613234.2	0.0	1.6	1.4	NI** debris
SSS_250	712796.6	613220.7	0.0	0.9	0.6	NI** debris
SSS_251	712202.9	613599.2	0.0	0.6	0.3	NI
SSS_252	712264.6	613619.2	0.0	1.6	1.2	NI
SSS_253	712421.2	613019.3	0.0	1.0	1.2	NI** debris
SSS_254	712420.6	612992.8	0.0	1.1	1.2	NI** debris
SSS_255	712584.3	612969.3	0.0	2.8	1.1	Possible block anchor with chain
SSS_256	712349.7	613094.0	0.0	2.0	1.2	NI** debris
SSS_258	712579.9	613328.1	0.3	6.0	1.5	NI**debris
SSS_259	713475.9	613477.3	0.3	5.8	1.9	NI** debris
SSS_260	713604.2	613441.9	0.1	0.5	0.2	NI** field of small debris
SSS_261	713736.9	613391.9	0.3	3.0	2.5	Mooring block with chain or rope
SSS_262	713284.7	613654.0	0.3	7.0	0.4	NI** linear debris
SSS_263	713918.3	613433.4	0.2	1.5	0.7	NI**debris possible boulder
SSS_264	713859.7	613448.3	0.0	1.7	1.7	NI** linear debris possible rope or chain with a possible block
SSS_265	712741.9	613619.8	0.0	13.0	2.0	NI** debris
SSS_266	712879.8	613521.9	0.3	2.8	0.8	NI** debris
SSS_267	713161.3	613309.4	0.2	3.1	1.9	NI** debris possible block
SSS_268	712655.5	613456.6	0.1	1.0	0.8	NI**debris
SSS_269	713189.4	613322.9	0.2	1.5	1.0	NI**debris
SSS_270	713281.6	613076.6	0.1	0.8	0.5	NI**debris
SSS_271	713411.2	613582.6	0.2	8.0	2.0	Long linear features, possible seabed feature and/or trawler marks

**Coordinates in Irish Transverse Mercator (ITM); ** NI: Not Identified*

Figure 21 below is showing a few of the identified contacts: a linear debris (SSS_57), a rope (SSS_59), a mooring block (SSS_65) and a mooring with a rope (SSS_182). Appendix 2 shows all the sonar contacts.

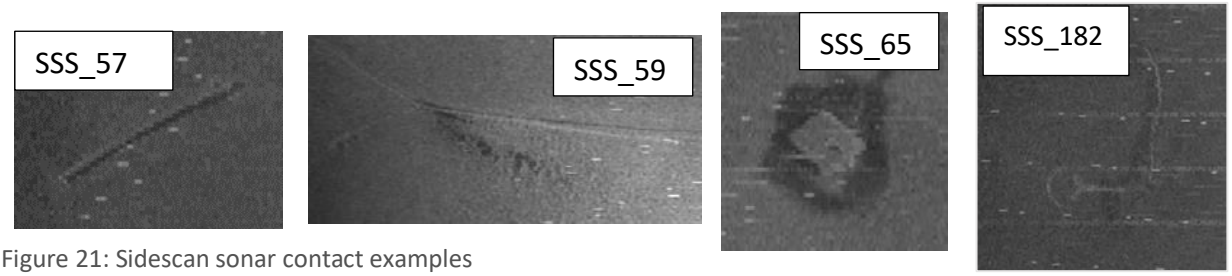


Figure 21: Sidescan sonar contact examples

8.3 Marine Magnetometer targets

In total, 265 magnetometer anomalies were identified. The magnetic anomalies are listed in table 21 and figure 22 and 23 show their location.

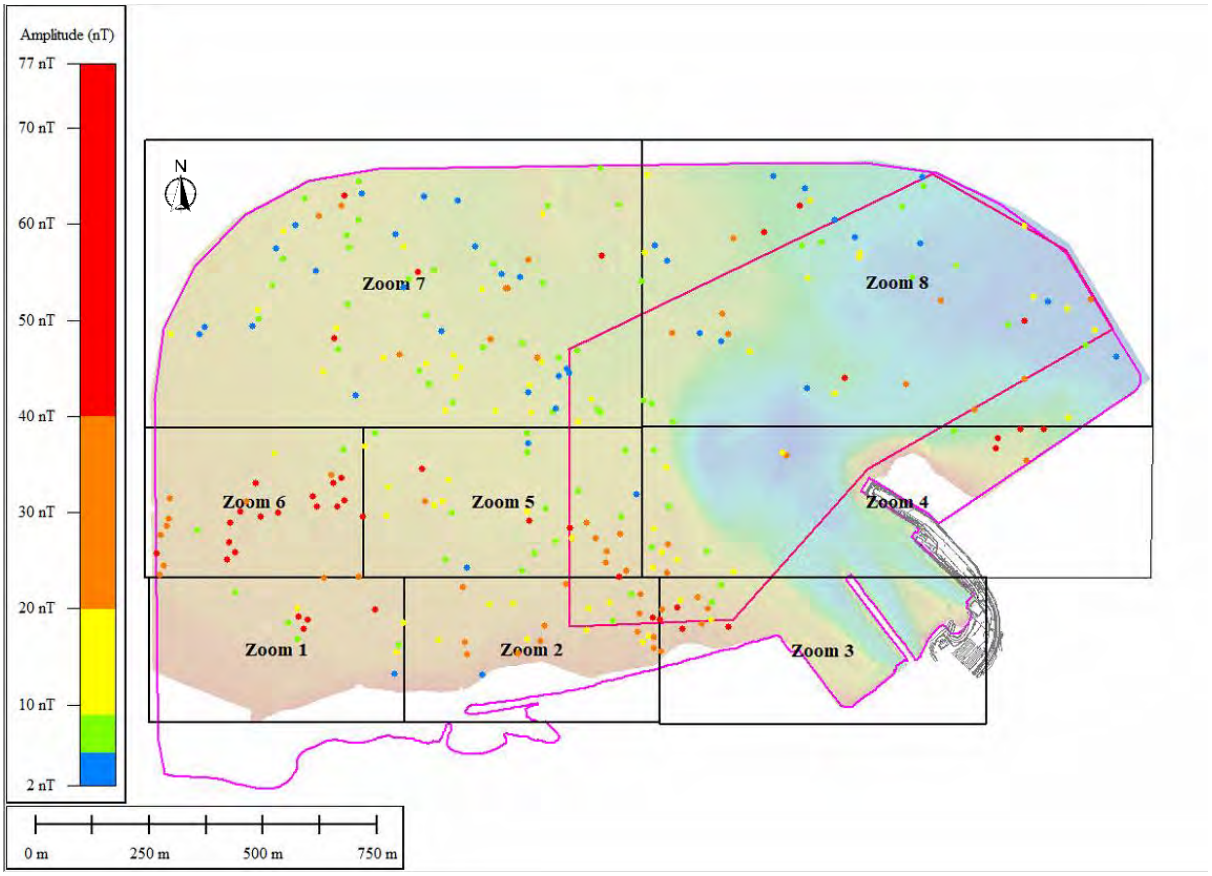
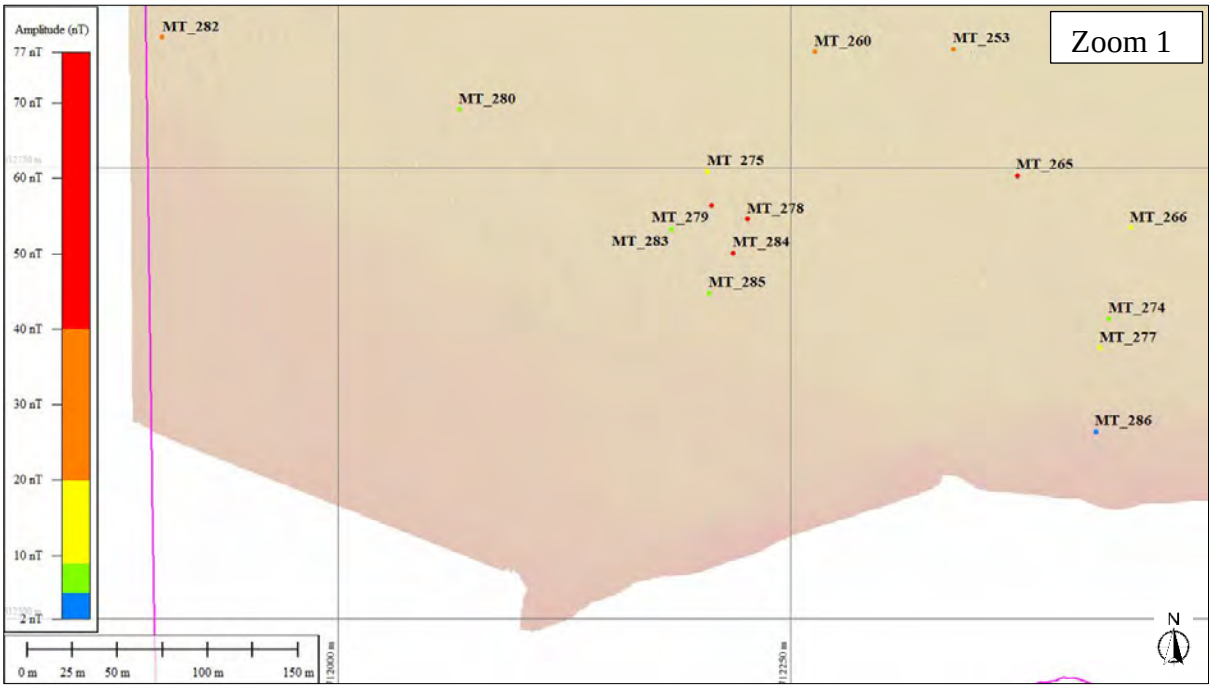
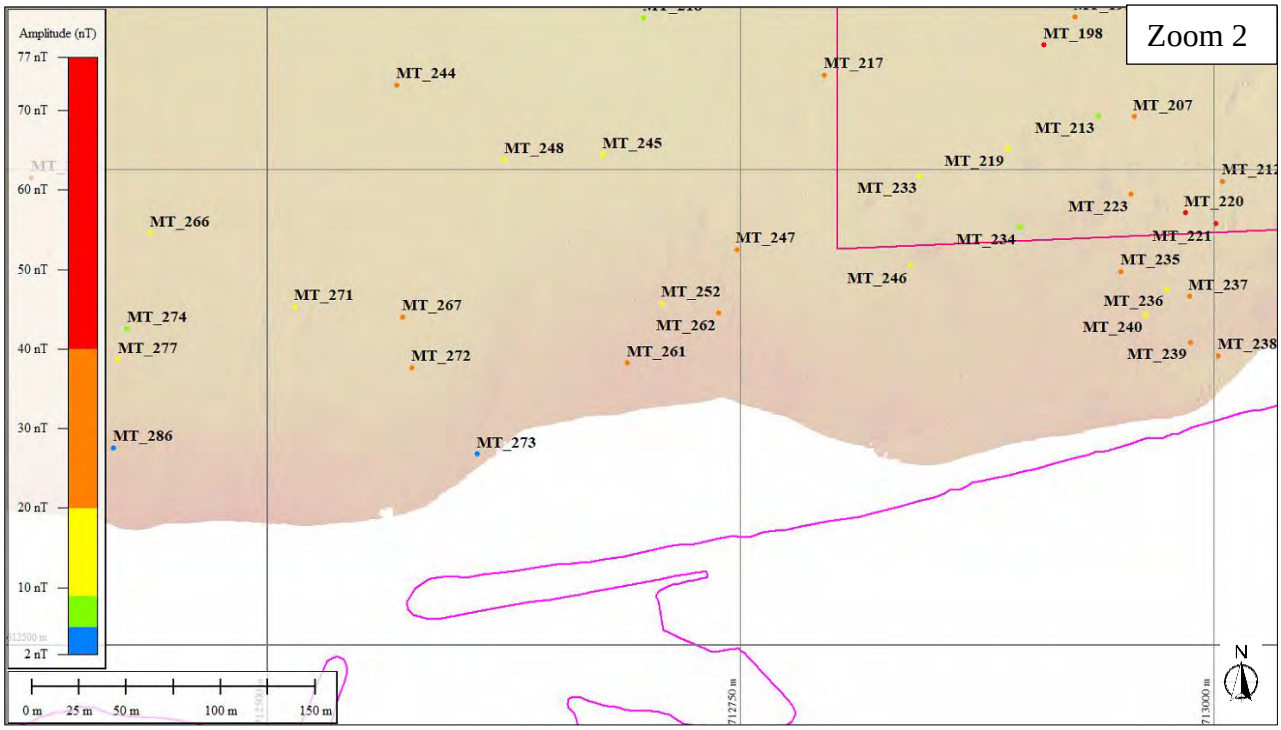
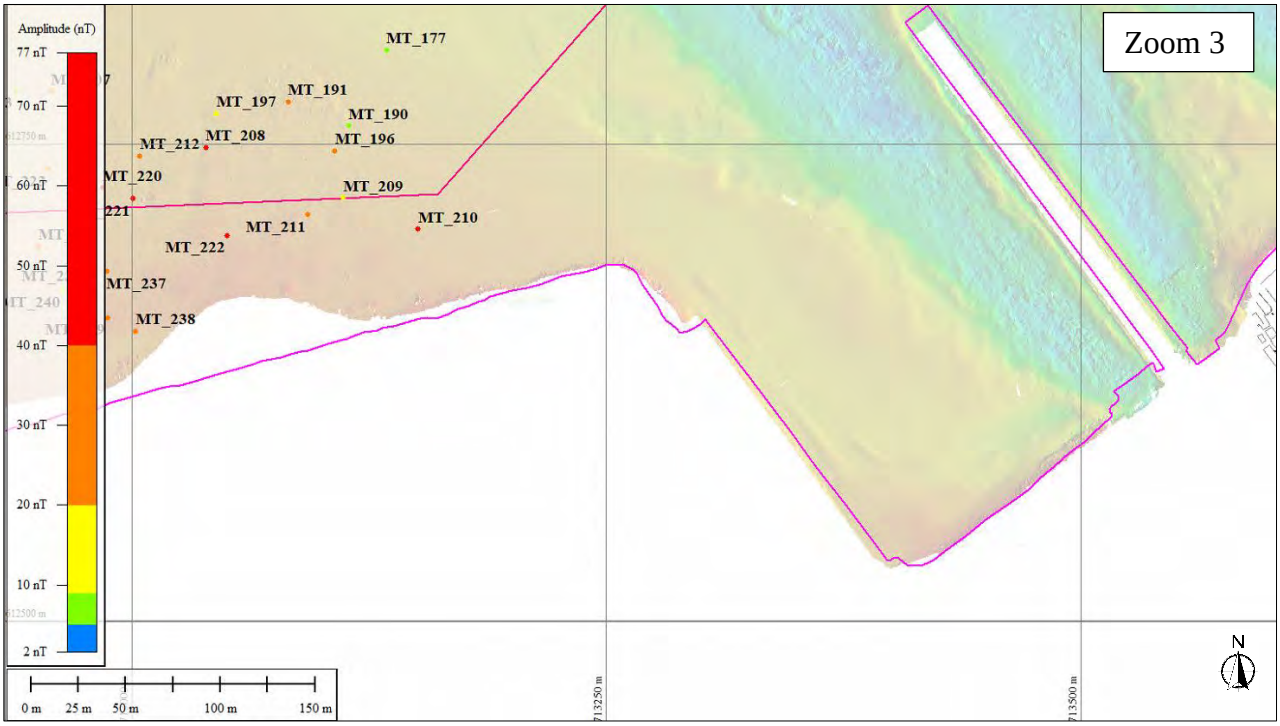
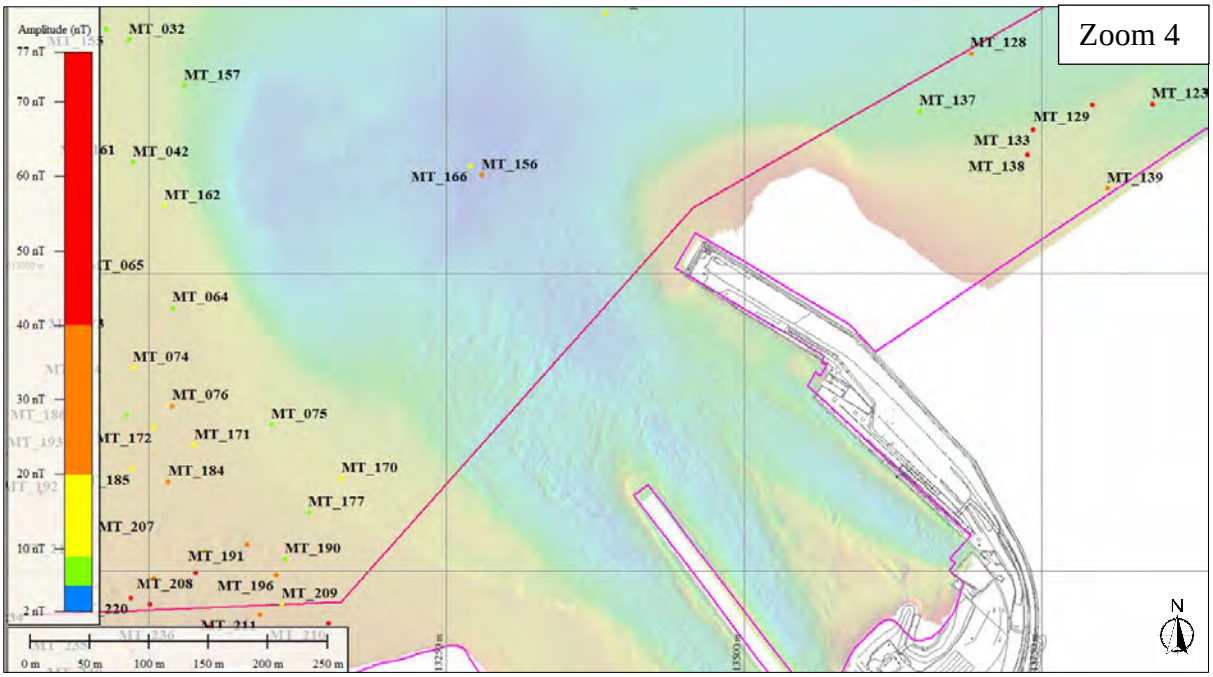


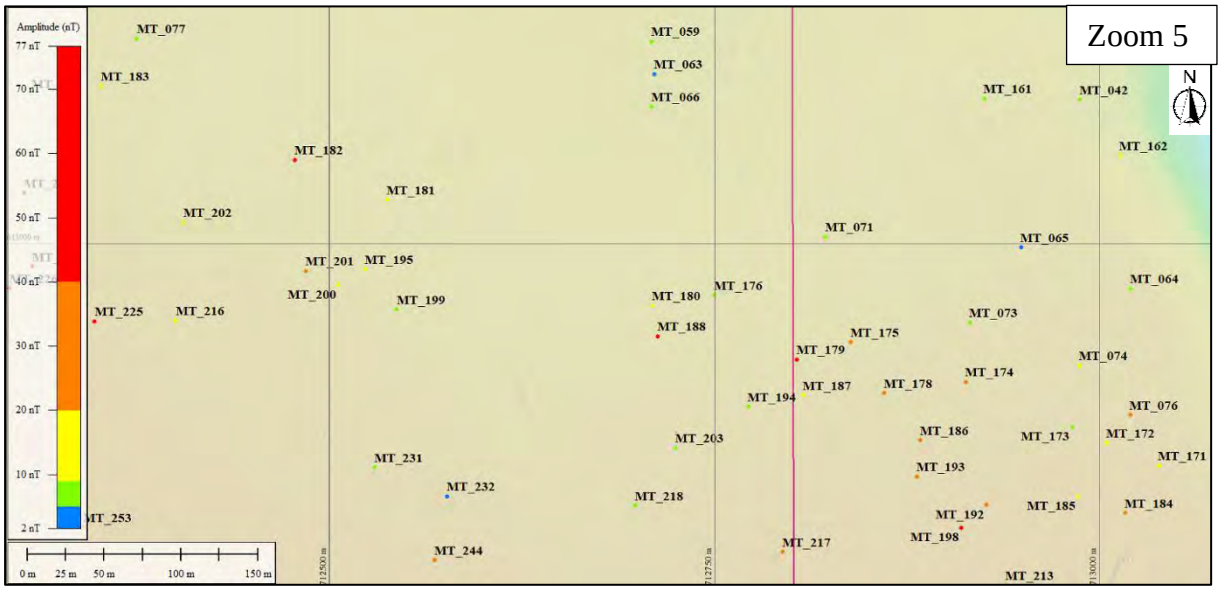
Figure 22: Magnetometer anomalies (Colored by amplitude) location and key plan and zoomed view.



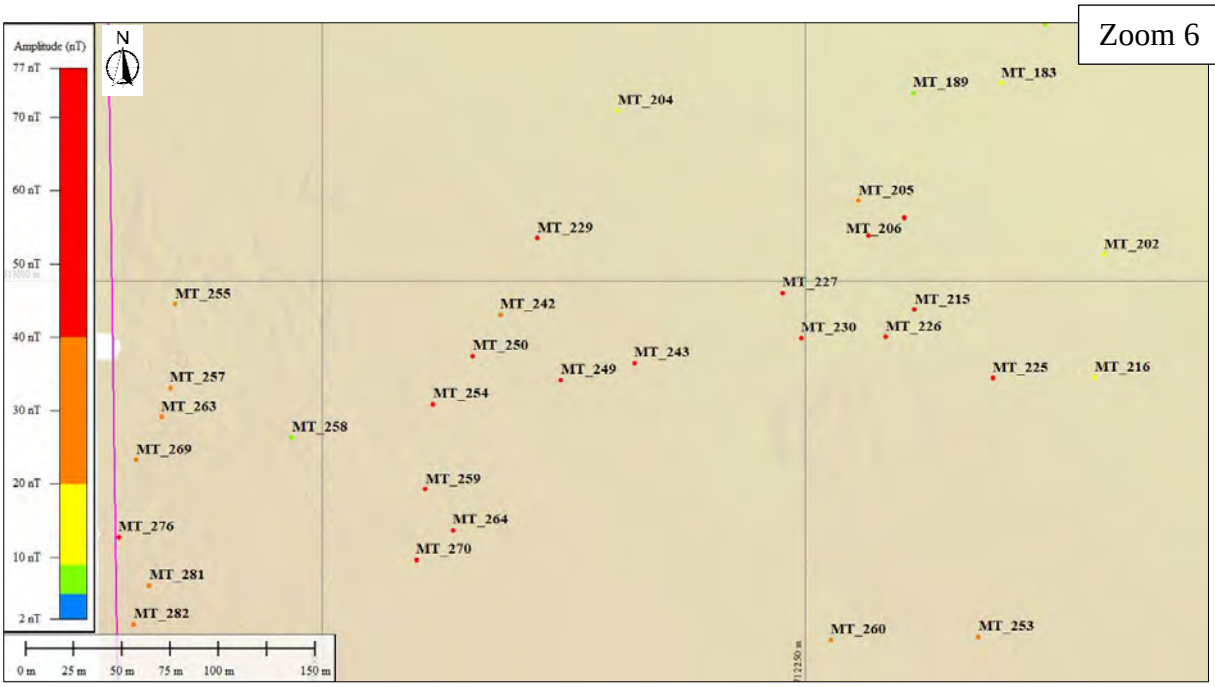

Zoom 2
Amplitude (nT)
77 nT
70 nT
60 nT
50 nT
40 nT
30 nT
20 nT
10 nT
2 nT
0 m
25 m
50 m
100 m
150 m
N
MT_198
MT_217
MT_244
MT_207
MT_213
MT_248
MT_245
MT_219
MT_233
MT_223
MT_220
MT_266
MT_247
MT_234
MT_221
MT_235
MT_246
MT_237
MT_271
MT_252
MT_236
MT_267
MT_274
MT_262
MT_240
MT_277
MT_272
MT_261
MT_239
MT_238
MT_286
MT_273


Zoom 3
Amplitude (nT)
77 nT
70 nT
60 nT
50 nT
40 nT
30 nT
20 nT
10 nT
2 nT
0 m
25 m
50 m
100 m
150 m
N
MT_177
MT_191
MT_197
MT_190
MT_208
MT_212
MT_196
MT_220
MT_209
MT_210
MT_211
MT_222
MT_237
MT_238

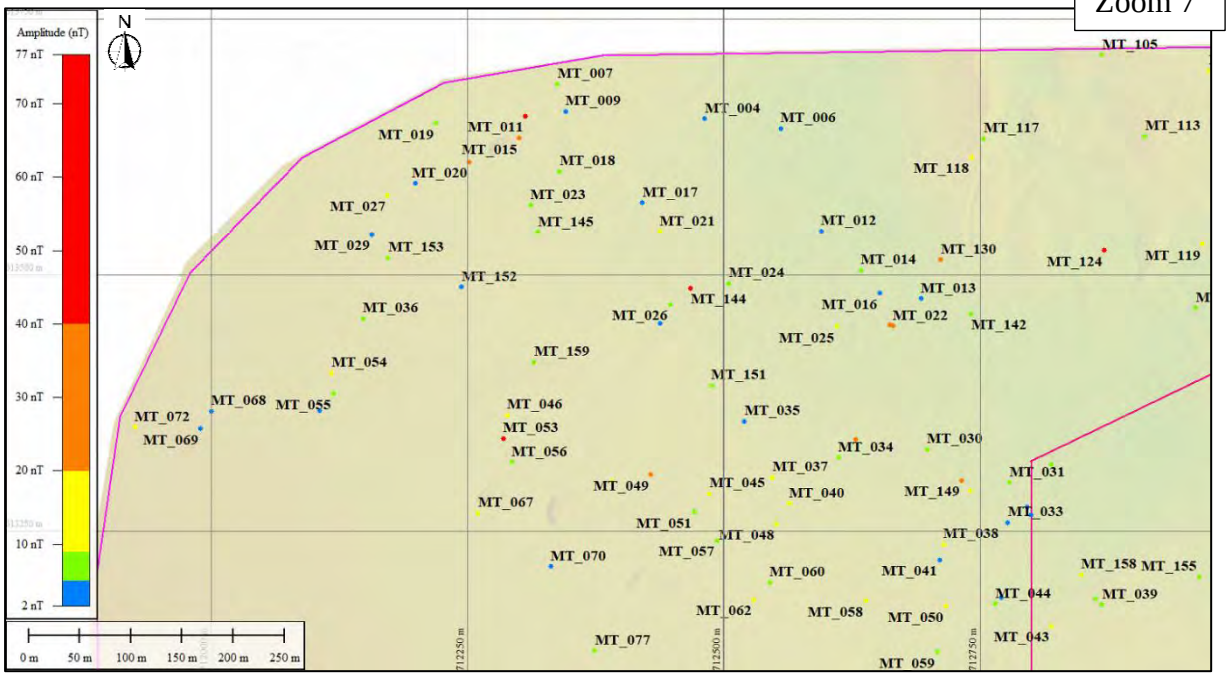

Zoom 4
Amplitude (nT)
77 nT
70 nT
60 nT
50 nT
40 nT
30 nT
20 nT
10 nT
2 nT
MT_032
MT_157
MT_042
MT_162
MT_166
MT_156
MT_128
MT_137
MT_123
MT_129
MT_133
MT_138
MT_139
MT_065
MT_064
MT_074
MT_076
MT_075
MT_172
MT_171
MT_184
MT_170
MT_185
MT_177
MT_207
MT_191
MT_190
MT_208
MT_196
MT_209
MT_211
0 m
50 m
100 m
150 m
200 m
250 m
N


Zoom 5
Amplitude (nT)
77 nT
70 nT
60 nT
50 nT
40 nT
30 nT
20 nT
10 nT
2 nT
MT_077
MT_183
MT_182
MT_181
MT_202
MT_201
MT_195
MT_200
MT_199
MT_225
MT_216
MT_253
MT_231
MT_232
MT_244
MT_059
MT_063
MT_066
MT_161
MT_042
MT_162
MT_071
MT_065
MT_064
MT_180
MT_176
MT_188
MT_073
MT_175
MT_179
MT_074
MT_187
MT_178
MT_174
MT_194
MT_076
MT_203
MT_186
MT_173
MT_172
MT_171
MT_193
MT_218
MT_192
MT_185
MT_184
MT_198
MT_217
MT_213
0 m
25 m
50 m
100 m
150 m
N

Zoom 6


Amplitude (nT)
77 nT
70 nT
60 nT
50 nT
40 nT
30 nT
20 nT
10 nT
2 nT
N
0 m
25 m
50 m
75 m
100 m
150 m
MT_204
MT_189
MT_183
MT_205
MT_229
MT_206
MT_202
MT_227
MT_255
MT_242
MT_215
MT_230
MT_226
MT_250
MT_243
MT_249
MT_225
MT_216
MT_257
MT_254
MT_263
MT_258
MT_269
MT_259
MT_264
MT_276
MT_270
MT_281
MT_282
MT_260
MT_253

Zoom 7


Amplitude (nT)
77 nT
70 nT
60 nT
50 nT
40 nT
30 nT
20 nT
10 nT
2 nT
N
0 m
50 m
100 m
150 m
200 m
250 m
MT_105
MT_007
MT_009
MT_004
MT_006
MT_019
MT_011
MT_117
MT_113
MT_015
MT_018
MT_118
MT_020
MT_023
MT_017
MT_027
MT_145
MT_021
MT_012
MT_029
MT_153
MT_014
MT_130
MT_124
MT_119
MT_152
MT_024
MT_144
MT_013
MT_036
MT_016
MT_026
MT_022
MT_142
MT_025
MT_159
MT_054
MT_151
MT_068
MT_055
MT_046
MT_035
MT_072
MT_053
MT_069
MT_056
MT_034
MT_030
MT_037
MT_031
MT_049
MT_045
MT_149
MT_067
MT_040
MT_033
MT_051
MT_048
MT_038
MT_070
MT_057
MT_158
MT_155
MT_060
MT_041
MT_044
MT_039
MT_062
MT_058
MT_050
MT_043
MT_077
MT_059

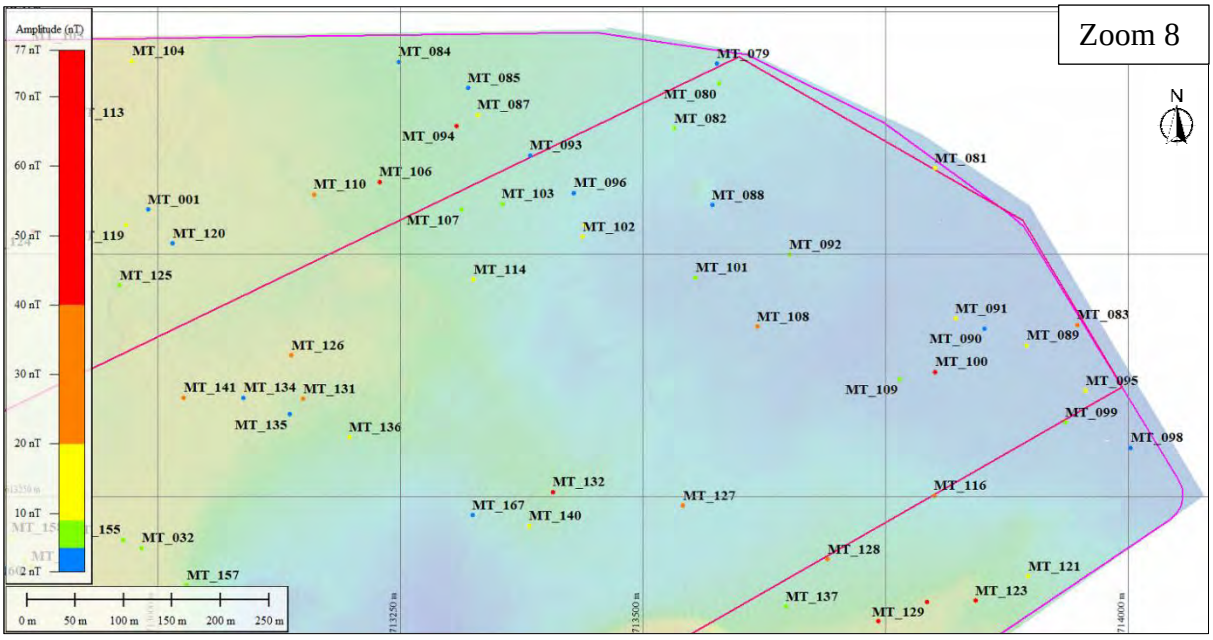


Figure 23: Zoomed views of Magnetic anomalies (colored by amplitude) location

Table 21 is listing the 286 magnetic anomalies identified within the survey site.

Table 20: Magnetic anomalies (nT)

ID	Easting *	Northing*	Amplitude (nT)
MT_001	712989.9	613546.0	2.3
MT_004	712481.9	613652.2	4.0
MT_006	712555.9	613642.9	3.0
MT_007	712338.1	613686.1	6.3
MT_009	712346.1	613659.4	2.3
MT_011	712307.0	613655.0	107.5
MT_012	712595.3	613542.4	1.9
MT_013	712692.7	613476.6	1.6
MT_014	712634.1	613504.5	5.2
MT_015	712300.8	613633.4	21.6
MT_016	712652.4	613482.0	2.3
MT_017	712420.9	613570.2	3.9
MT_018	712340.2	613601.1	6.7
MT_019	712219.7	613647.6	6.3
MT_020	712252.2	613609.9	23.7
MT_021	712438.1	613542.2	17.0
MT_022	712665.5	613450.2	24.3
MT_023	712311.7	613568.1	6.0
MT_024	712505.3	613491.6	6.4
MT_025	712610.6	613449.4	9.1
MT_026	712448.1	613471.0	8.1

MT_027	712172.2	613577.4	9.8
MT_029	712157.3	613539.4	4.6
MT_030	712698.8	613329.4	7.7
MT_031	712778.9	613297.4	5.4
MT_032	712983.4	613196.5	5.7
MT_033	712777.6	613258.1	2.2
MT_034	712612.1	613321.8	5.5
MT_035	712520.4	613357.0	3.4
MT_036	712148.3	613457.3	7.4
MT_037	712547.8	613302.1	13.6
MT_038	712714.7	613236.9	12.7
MT_039	712869.6	613177.8	5.6
MT_040	712564.4	613276.9	16.4
MT_041	712710.8	613221.8	2.2
MT_042	712987.0	613093.6	6.9
MT_043	712820.1	613157.1	10.6
MT_044	712765.4	613178.7	6.8
MT_045	712486.4	613286.1	16.4
MT_046	712288.9	613362.9	14.1
MT_048	712551.7	613256.6	13.1
MT_049	712429.1	613304.9	23.3
MT_050	712717.1	613176.3	17.0
MT_051	712471.6	613268.4	5.2
MT_052	712391.9	613298.4	13.3
MT_053	712285.1	613340.4	151.5
MT_054	712117.8	613404.1	12.4
MT_055	712119.6	613384.1	6.0
MT_056	712293.7	613317.1	6.2
MT_057	712493.5	613240.5	8.0
MT_058	712638.8	613181.8	12.2
MT_059	712708.8	613131.4	8.3
MT_060	712545.1	613199.6	5.1
MT_061	712105.9	613367.4	4.6
MT_062	712529.5	613182.8	9.6
MT_063	712710.9	613110.3	4.4
MT_064	713019.8	612970.8	7.4
MT_065	712948.8	612997.6	4.9
MT_066	712708.9	613089.1	6.0
MT_067	712260.4	613267.3	11.0
MT_068	712000.0	613366.9	3.6
MT_069	711989.8	613349.7	3.6
MT_070	712331.7	613215.2	3.5
MT_071	712821.9	613004.3	6.4

MT_072	711925.6	613351.1	17.5
MT_073	712915.6	612948.6	5.2
MT_074	712986.7	612920.7	11.8
MT_075	713102.9	612872.9	6.5
MT_076	713019.6	612888.5	32.9
MT_077	712374.8	613133.2	7.8
MT_079	713576.4	613696.4	3.5
MT_080	713578.4	613675.9	8.8
MT_081	713801.3	613588.3	10.4
MT_082	713532.2	613629.3	5.7
MT_083	713947.6	613426.8	26.4
MT_084	713248.5	613698.3	4.0
MT_085	713319.8	613671.1	3.2
MT_087	713329.8	613643.4	9.3
MT_088	713571.6	613550.6	2.5
MT_089	713895.9	613405.7	9.9
MT_090	713852.1	613422.9	3.9
MT_091	713822.4	613433.3	9.3
MT_092	713651.4	613499.5	5.0
MT_093	713383.6	613601.9	3.8
MT_094	713308.3	613632.1	74.6
MT_095	713956.5	613358.8	11.7
MT_096	713429.1	613562.9	1.9
MT_098	714002.8	613300.1	3.2
MT_099	713935.7	613326.1	6.7
MT_100	713801.6	613378.3	47.8
MT_101	713554.4	613475.7	6.9
MT_102	713438.1	613517.6	12.2
MT_103	713354.7	613551.4	5.7
MT_104	712973.7	613698.9	12.4
MT_105	712869.5	613714.5	7.9
MT_106	713228.6	613574.4	40.4
MT_107	713313.1	613546.0	5.3
MT_108	713617.9	613425.0	34.0
MT_109	713764.9	613370.8	8.2
MT_110	713161.1	613561.5	20.6
MT_113	712911.4	613635.3	7.1
MT_114	713325.7	613473.8	10.4
MT_116	713800.5	613250.6	21.2
MT_117	712753.9	613632.9	7.8
MT_118	712742.3	613614.8	11.1
MT_119	712967.6	613529.8	10.6
MT_120	713015.3	613510.9	4.1

MT_121	713897.1	613167.1	9.7
MT_123	713842.9	613142.4	64.9
MT_124	712871.8	613523.8	59.2
MT_125	712960.8	613467.4	6.0
MT_126	713137.8	613395.2	25.7
MT_127	713541.6	613240.2	24.3
MT_128	713690.5	613184.9	21.2
MT_129	713792.6	613141.2	47.0
MT_130	712712.3	613514.6	24.5
MT_131	713150.0	613350.4	25.8
MT_132	713407.5	613254.4	58.1
MT_133	713742.6	613120.9	92.9
MT_134	713088.5	613351.6	4.3
MT_135	713136.1	613334.6	4.7
MT_136	713197.6	613311.0	16.7
MT_137	713647.6	613136.2	5.5
MT_138	713738.1	613099.3	83.7
MT_139	713805.0	613071.4	35.2
MT_140	713383.1	613219.4	11.1
MT_141	713026.8	613351.8	35.3
MT_142	712741.6	613461.8	6.8
MT_143	712662.6	613451.1	28.3
MT_144	712468.2	613487.0	57.1
MT_145	712319.1	613541.2	5.8
MT_146	712199.2	613589.8	3.8
MT_147	712437.9	613452.8	4.6
MT_148	712796.6	613273.3	3.0
MT_149	712732.5	613299.2	27.4
MT_150	712629.3	613339.4	23.8
MT_151	712488.2	613391.9	5.7
MT_152	712244.7	613488.2	4.1
MT_153	712173.3	613516.4	6.4
MT_154	712741.1	613288.8	14.8
MT_155	712964.1	613205.1	5.4
MT_156	713279.6	613082.8	21.5
MT_157	713029.8	613158.1	6.4
MT_158	712849.3	613207.1	11.1
MT_159	712315.3	613414.8	6.4
MT_160	712862.9	613183.6	5.0
MT_161	712924.8	613094.3	5.6
MT_162	713013.0	613057.0	14.6
MT_163	712770.9	613185.3	4.0
MT_164	712800.1	613265.7	3.0

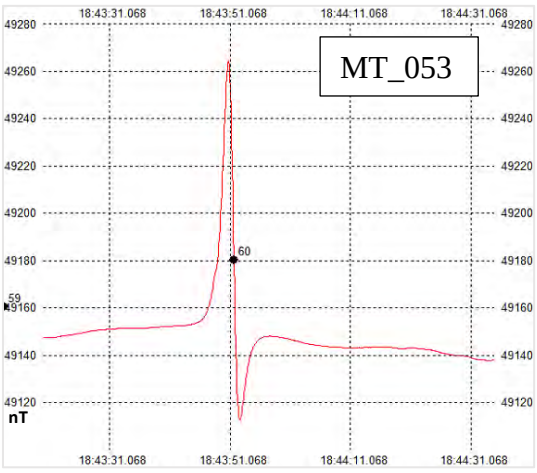
MT_165	712819.6	613315.1	6.2
MT_166	713269.9	613090.5	11.6
MT_167	713324.4	613230.4	4.9
MT_169	713440.1	613530.0	13.8
MT_170	713161.9	612827.4	14.4
MT_171	713038.2	612855.4	16.6
MT_172	713004.4	612870.4	16.3
MT_173	712981.9	612880.8	7.2
MT_174	712912.9	612909.9	25.9
MT_175	712838.1	612935.9	21.6
MT_176	712749.5	612966.6	5.7
MT_177	713134.5	612799.1	5.8
MT_178	712859.8	612902.7	26.1
MT_179	712803.4	612924.6	68.4
MT_180	712709.3	612959.6	16.9
MT_181	712537.1	613028.4	9.1
MT_182	712477.5	613054.4	44.3
MT_183	712351.7	613102.3	11.0
MT_184	713016.3	612824.7	25.4
MT_185	712985.8	612835.7	10.6
MT_186	712883.4	612872.1	36.6
MT_187	712807.2	612901.4	11.3
MT_188	712713.1	612939.6	58.5
MT_189	712306.3	613097.3	6.1
MT_190	713114.4	612759.5	8.8
MT_191	713082.6	612772.0	23.1
MT_192	712926.3	612830.0	29.2
MT_193	712881.3	612848.4	34.9
MT_194	712771.6	612893.8	6.3
MT_195	712522.8	612983.4	10.2
MT_196	713107.1	612746.3	37.0
MT_197	713044.8	612765.9	9.6
MT_198	712910.1	612815.3	44.9
MT_199	712543.6	612957.1	8.2
MT_200	712505.7	612973.2	18.8
MT_201	712484.3	612982.2	34.9
MT_202	712404.9	613013.6	12.8
MT_203	712724.3	612866.9	8.4
MT_204	712153.3	613088.4	19.7
MT_205	712277.8	613041.5	38.4
MT_206	712301.4	613032.9	57.8
MT_207	712957.8	612777.6	31.1
MT_208	713039.3	612748.2	65.1

MT_209	713111.6	612721.8	12.5
MT_210	713151.0	612705.4	56.3
MT_211	713093.1	612712.9	26.1
MT_212	713004.4	612743.7	27.8
MT_213	712938.6	612777.7	6.8
MT_214	712282.9	613023.3	63.1
MT_215	712306.9	612985.0	83.6
MT_216	712400.1	612949.9	18.3
MT_217	712794.0	612799.6	22.0
MT_218	712698.3	612829.6	7.2
MT_219	712890.9	612760.8	12.7
MT_220	712984.7	612727.0	55.6
MT_221	713000.6	612721.3	53.3
MT_222	713050.5	612702.1	107.3
MT_223	712956.1	612736.8	20.2
MT_225	712347.4	612949.4	81.2
MT_226	712292.0	612970.9	60.7
MT_227	712238.6	612993.6	46.5
MT_229	712111.7	613022.2	65.5
MT_230	712248.1	612970.3	77.6
MT_231	712529.2	612854.5	8.7
MT_232	712576.3	612835.6	4.5
MT_233	712844.4	612746.3	13.7
MT_234	712897.0	612719.6	8.9
MT_235	712950.9	612696.4	30.9
MT_236	712974.9	612686.9	16.0
MT_237	712987.0	612683.2	39.7
MT_238	713002.1	612652.0	20.5
MT_239	712987.3	612659.1	28.6
MT_240	712963.6	612673.4	18.4
MT_242	712092.6	612982.5	27.6
MT_243	712162.0	612957.4	71.4
MT_244	712568.3	612794.2	26.2
MT_245	712677.3	612757.6	9.6
MT_246	712839.5	612699.3	16.5
MT_247	712747.8	612707.9	21.2
MT_248	712625.1	612754.9	10.2
MT_249	712123.9	612948.4	40.9
MT_250	712078.2	612961.0	71.6
MT_252	712708.0	612679.5	15.7
MT_253	712340.0	612815.4	39.3
MT_254	712057.6	612936.0	45.7
MT_255	711924.2	612987.9	34.0

MT_257	711921.6	612944.4	28.1
MT_258	711984.7	612918.8	5.4
MT_259	712053.6	612891.8	77.3
MT_260	712263.5	612813.8	29.5
MT_261	712690.0	612648.3	21.2
MT_262	712738.3	612674.4	21.0
MT_263	711917.1	612929.3	21.3
MT_264	712067.9	612870.6	55.5
MT_265	712375.3	612745.5	40.1
MT_266	712438.1	612716.5	19.8
MT_267	712571.3	612672.4	40.0
MT_269	711904.0	612907.3	27.4
MT_270	712048.9	612855.3	62.6
MT_271	712514.4	612677.6	19.7
MT_272	712576.1	612645.8	23.2
MT_273	712610.9	612600.4	4.6
MT_274	712425.9	612666.2	5.0
MT_275	712204.0	612747.7	12.1
MT_276	711894.9	612867.0	52.6
MT_277	712421.0	612650.1	10.5
MT_278	712226.4	612721.3	63.3
MT_279	712206.3	612728.9	282.9
MT_280	712066.9	612782.0	7.6
MT_281	711910.8	612842.1	26.7
MT_282	711902.8	612821.9	34.4
MT_283	712184.2	612715.6	6.8
MT_284	712218.1	612702.4	40.2
MT_285	712204.8	612680.4	6.4
MT_286	712418.6	612603.8	3.4

**Coordinates in Geographic WGS84 and Irish Transverse Mercator (ITM)*

Figure 24 shows two magnetic anomalies MT_53 (amplitude of 151 nT) and MT_279 (amplitude of 283 nT). The vertical axis corresponds to the magnetic Amplitude in nT.



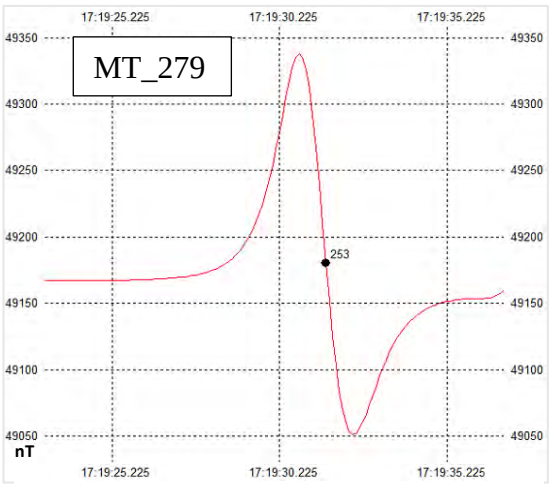


Figure 24: Magnetic anomalies of 151 nT (MT_53)

Magnetic anomalies of 283 nT (MT_279)

The magnetic anomalies MT_053 corresponds to the multibeam sonar target AT_34, and the magnetic anomalies MT_279 corresponds to the multibeam sonar target AT_35 (figure 25).

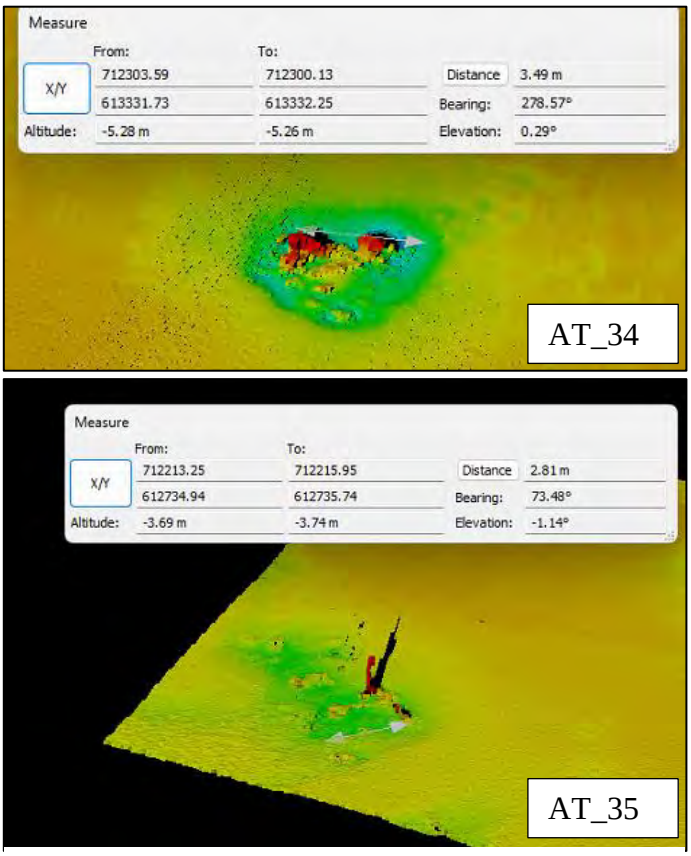


Figure 25: Multibeam sonar targets AT_34 and AT_35 corresponding to the magnetic targets MT_053 and MT_279.

8.4 Target correlation

Table 22 shows if the MBES targets are possibly related to a SSS contacts and/or to a magnetic anomalies.

Table 21: MBES target correlations with SSS and magnetic targets

Target ID	Easting*	Northing*	Description	SSS targets ID	Magnetometer target ID
AT_01	712492.5	612864.3	2 blocks	SSS_80	MT_231
AT_02	712070.0	612646.3	2 boulders or blocks	SSS_152	NA
AT_04	712290.9	612578.5	1 block and boulders	SSS_157	NA
AT_05	712084.1	612956.3	**NI** debris - possible wreck**	SSS_087	MT_250
AT_06	712214.0	612848.5	**NI** debris possible buried wreck**	SSS_088, SSS_141	NA
AT_07	712351.3	612812.9	Fishing pot	SSS_139	MT_253
AT_08	712384.2	612796.1	NI** debris possible mooring block	SSS_133, SSS_089, SSS_134	NA
AT_09	712560.0	612794.5	Mooring with rope	SSS_086	MT_244
AT_10	712474.8	613057.2	Mooring block	SSS_065 & SSS_068	MT_182
AT_11	712642.8	613384.4	Possible Boulder	SSS_001, SSS_117, SSS_102	NA
AT_12	712784.3	613182.6	Tyre	SSS_044, SSS_111, SSS_187	MT_163, MT_044
AT_13	713023.3	612885.1	Mooring and rope	SSS_067, SSS_182	MT_076
AT_14	713557.1	612788.8	NI** long debris	SSS_055, SSS_057	NA
AT_15	713313.1	612655.8	NI** debris	SSS_052	NA
AT_16	713953.2	613220.5	Long thin scour	SSS_002	NA
AT_17	713805.2	613456.5	Little boulder	SSS_014	MT_091
AT_18	713554.7	613478.4	Mooring with rope or chain	SSS_011	MT_101
AT_19	713467.3	613524.4	Possible mooring with a block and a chain	SSS_008	MT_102, MT_169
AT_20	713446.1	613473.1	NI** debris - possible mooring with rope or chain	SSS_006, SSS_045	NA
AT_21	713221.2	613688.5	Tyre	SSS_013, SSS_015	MT_084
AT_22	713097.5	613669.6	Possible mooring block or boulder	SSS_010	NA
AT_23	711895.8	612874.0	NI** debris - possible boulder	SSS_095	MT_276
AT_24	712377.3	612746.7	Mooring block with scours	NA	MT_265
AT_25	712697.5	612825.0	NI** debris - possible buried mooring with rope	SSS_075	MT_218
AT_26	712845.4	612746.5	Mooring with chain or rope	NA	MT_233
AT_27	713932.6	613327.3	Possible scours on the seabed	SSS_197	MT_099
AT_28	713223.1	613575.9	NI** debris	SSS_198	MT_106
AT_29	713155.5	613353.4	Block - possible former mooring	SSS_199	MT_131, MT_135
AT_30	713080.8	613336.9	Block	NA	MT_134
AT_31	712303.6	613331.7	NI** debris	SSS_172, SSS_171	NA
AT_32	712213.2	612734.9	NI** possible mooring with chain	SSS_153	NA
AT_33	712158.6	612627.9	NI** debris	SSS_154	NA
AT_34	712301.8	613333.4	NI** debris	SSS_196	MT_053, MT_056
AT_35	712214.3	612733.8	Possible rope with block	NA	MT_279
AT_36	712200.3	612728.7	NI** debris	SSS_188	NA

AT_37	712219.9	612720.9	NI** debris	SSS_189	MT_278, MT_284
AT_39	712252.1	612606.5	NI** debris	SSS_155	NA
AT_40	712305.8	612628.9	NI** debris	SSS_163	NA
AT_41	712307.5	612594.4	Possible boulders	SSS_173	NA
AT_42	711938.8	612864.5	Possible boulders	SSS_097	NA
AT_43	711993.8	613094.2	NI** debris	SSS_072	NA
AT_44	712021.2	613081.3	NI** debris	SSS_073	NA
AT_45	712103.4	613422.6	NI** possible boulders	SSS_113, SSS_112	MT_054
AT_46	712300.7	612986.4	NI** debris	SSS_195	MT_215
AT_47	712391.8	612951.7	NI** possible block	SSS_76	MT_216
AT_48	712414.6	612787.9	NI** possible block	SSS_090	NA
AT_49	712440.2	612715.4	Possible boulder	SSS_94	MT_266
AT_50	712407.1	612602.2	Possible rope with block anchor	SSS_179	MT_286
AT_51	712395.1	612573.4	NI** possible boulder	SSS_178	NA
AT_52	712433.8	612610.5	Possible block	SSS_110	MT_286
AT_54	712947.3	612682.6	NI** debris	SSS_081	MT_235, MT_240
AT_55	712959	612664.7	NI** debris	SSS_192	MT_240
AT_56	712976.2	612729.4	NI** debris	SSS_227	MT_221, MT_212
AT_57	713006.6	612720.5	NI** possible block	SSS_227	MT_221
AT_58	713060.5	612788.9	NI** debris	SSS_62, SSS_69, SSS_223	MT_191, MT_197
AT_59	713111.8	612901.2	Possible tyre	SSS_184	MT_075
AT_60	713187	613081.8	NI** debris	SSS_039	NA
AT_61	713230.3	613129.3	NI** possible boulder	SSS_034	NA
AT_62	713240.7	613121.6	NI** possible boulder	SSS_047	NA
AT_63	713337.7	612931.4	NI** debris	SSS_053	NA
AT_64	713279.8	612980	NI** possible boulder	SSS_115	NA
AT_65	713260.5	613010.9	NI** debris	SSS_048	NA
AT_67	713426.7	612913.1	NI** debris	SSS_056	NA
AT_68	712848.3	613216.9	Possible block anchor with rope	SSS_101	MT_158
AT_69	713743.1	613561.6	NI** debris	SSS_018	NA
AT_70	713112.3	613718.1	NI** debris	SSS_12	NA
AT_71	712838	613388.9	NI** debris	SSS_119	NA
AT_72	712819	613442.7	NI** possible boulder	SSS_29	NA
AT_73	712465.8	613480.1	NI** debris	SSS_118	MT_144
AT_74	712355.2	612956.5	NI** debris	SSS_77	MT_225
AT_75	712501.3	612703.1	NI** debris	SSS_93	MT_271
AT_76	713744.5	613391.2	Possible mooring with chain	SSS_261	MT_109, MT_100

** Coordinates in ITM, ** NI: Non-identified*

Table 23 shows if the SSS contacts are possibly related to a MBES targets and/or to a magnetic anomalies.

Table 22: SSS Targets correlation with MBES and Magnetic targets

Target ID	Easting*	Northing*	Description	Magnetometer target ID	MBES target ID
SSS_1	712652.1	613369.3	NI** debris	NA	AT_11
SSS_2	713955.7	613220.5	NI** linear debris	NA	AT_16
SSS_6&45	713446.2	613466.1	NI** debris - possible mooring with rope or chain	NA	AT_20
SSS_8	713465.6	613524.1	NI** debris	MT_102, MT_169	AT_19
SSS_10	713094.0	613670.0	boulders	NA	AT_22
SSS_11	713555.8	613476.4	Possible mooring rope/chain	MT_101	AT_18
SSS_12	713112.1	613718.6	boulders	NA	AT_70
SSS_13	713217.8	613687.4	tyre	NA	AT_21
SSS_14	713806.2	613456.3	NI** debris	NA	AT_17
SSS_18	713742.6	613562.3	boulders	NA	AT_69
SSS_22&23	713846.8	613115.5	Possible mooring block or boulder	MT_123	NA
SSS_24	713731.4	613175.8	boulders	MT_128	NA
SSS_29	712822.4	613442.6	boulders	NA	AT_72
SSS_31	713052.7	613358.2	sand waves/ripples	MT_141	NA
SSS_34	713210.3	613131.6	boulders	NA	AT_61
SSS_39	713178.2	613070.3	boulders	NA	AT_60
SSS_41	713024.5	613078.4	boulders	MT_162	NA
SSS_42	712991.3	613090.7	outcropping	MT_042	NA
SSS_44&111&187	712782.4	613182.0	tyre	NA	AT_12
SSS_45	713054.2	613077.2	boulders	NA	AT_20
SSS_47	713238.2	613118.6	boulders	NA	AT_62
SSS_48	713261.8	613014.3	boulder patch	NA	AT_65
SSS_52	713307.5	612658.7	NI** debris	NA	AT_15
SSS_53	713337.7	612931.0	boulders	NA	AT_63
SSS_55&57	713557.6	612791.3	linear NI** debris	NA	AT_14
SSS_56	713433.2	612906.3	boulders	NA	AT_67
SSS_62	713059.5	612787.9	boulders	MT_191, MT_197	AT_58
SSS_63	712967.9	612821.6	outcrop	MT_185	NA
SSS_64	712409.7	613028.7	outcrop	MT_202	NA
SSS_65&68	712473.6	613063.7	Mooring block	MT_182	AT_10
SSS_67	713026.6	612885.0	Mooring with rope/chain	MT_076	AT_13
SSS_69	713054.8	612787.3	boulders	MT_191, MT_197	AT_58
SSS_72	711993.8	613092.6	boulders	NA	AT_43
SSS_73	712023.1	613079.5	boulders	NA	AT_44
SSS_75	712697.4	612823.8	Possible mooring	MT_218	AT_25
SSS_76	712390.3	612952.3	boulders	MT_216	AT_47
SSS_77	712355.6	612956.4	boulders	MT_225	AT_74
SSS_80	712491.3	612857.1	block	MT_231	AT_01

SSS_81	712948.8	612685.1	boulders	MT_235, MT_240	AT_254
SSS_84&87	712073.3	612973.4	NI* debris	MT_250, MT_242	AT_05
SSS_86	712562.1	612792.6	Mooring with rope/chain	MT_244	AT_09
SSS_88	712218.3	612847.7	NI* debris - possible wreck	MT_260	AT_06
SSS_89	712389.0	612795.1	boulders	NA	AT_08
SSS_90	712418.6	612785.2	boulders	NA	AT_48
SSS_93	712489.0	612694.7	boulders	MT_271	AT_75
SSS_94	712440.0	612713.5	boulders	MT_266	AT_49
SSS_95	711895.8	612878.2	boulders	MT_276	AT_23
SSS_97	712991.3	613090.7	outcropping	NA	AT_42
SSS_102	712643.2	613382.4	boulders	NA	AT_11
SSS_103	712830.7	613280.2	boulders	MT_148, MT_164	NA
SSS_104	713776.0	613219.6	boulders	MT_116	NA
SSS_110	712436.2	612604.8	boulders	MT_286	AT_52
SSS_112&113	712104.6	613419.7	boulders	MT_054	AT_45
SSS_115	713271.0	612990.9	boulders	NA	AT_64
SSS_118	712470.3	613476.2	boulders	MT_144	AT_73
SSS_119	712833.1	613388.6	boulders	NA	AT_71
SSS_120	712281.2	613619.5	Possible outcrop	MT_020, MT_015	NA
SSS_121	712655.2	613516.2	linear NI* debris	MT_014	NA
SSS_122	712527.3	613652.3	boulders	MT_004, MT_006	NA
SSS_123	713089.4	612781.1	boulder patch	MT_191	NA
SSS_133	712394.4	612790.8	mooring with rope	NA	AT_08
SSS_137	712699.6	612674.0	boulder patch	MT_252	NA
SSS_139	712357.4	612806.3	Fishing pot	MT_253	AT_07
SSS_141	712197.4	612849.8	NI** debris	NA	AT_06
SSS_152	712071.4	612641.6	two boulders or blocks	NA	AT_02
SSS_153	712109.6	612667.5	boulders	NA	AT_32
SSS_154	712158.9	612632.8	boulders	NA	AT_33
SSS_155	712251.1	612612.9	boulders	NA	AT_39
SSS_157	712300.4	612568.6	long linear NI* debris - possible rope or chain	NA	AT_04
SSS_163	712284.6	612631.8	boulders	NA	AT_40
SSS_171 **SSS_172**	712035.7	612723.4	boulders	NA	AT_31
SSS_173	712310.6	612605.3	boulders	NA	AT_41
SSS_178	712394.7	612580.0	boulders	NA	AT_51
AT_179				MT_286	AT_50
SSS_181	712839.1	612962.5	boulders	MT_175	NA
SSS_183	713010.7	612902.3	boulders	MT_076	NA
SSS_184	713112.5	612901.6	boulders	MT_075	AT_59
SSS_187	712783.5	613187.7	tyre	Mt_163	AT_12
SSS_188	712217.3	612708.9	Possible block anchor with chain	MT_279, MT_283	AT_36
SSS_189	712217.1	612709	NI**debris	MT_284, MT_278	AT_37
SSS_191	712471.3	612688.8	Mooring and rope	MT_219	NA
SSS_192	712877.3	612750.2	NI**debris	MT_240	AT_55

SSS_194	713039.7	612692.4	NI**debris	MT_222	NA
SSS_195	713058.7	612674.4	NI**debris	MT_215	AT_46
SSS_196	712292.6	613006.2	NI**debris	MT_056	AT_34
SSS_197	712300.8	613321.6	NI**debris	MT_099	AT_27
SSS_198	712870.2	613242.5	NI**debris	MT_106	AT_28
SSS_199	712555.7	612798	possible block	MT_131	AT_29
SSS_201	711959.8	612925	NI** debris	MT_258	NA
SSS_203	712034	612952.9	possible block anchor with chain	MT_254	NA
SSS_210	712187.7	613088.7	NI**debris, possible tyre	MT_204	NA
SSS_211	712250.6	612985.8	NI**debris	MT_227, MT_230	NA
SSS_212	712121.5	613012.6	NI**debris	MT_229	NA
SSS_215	712338.9	613147.5	NI**linear debris	MT_077	NA
SSS_217	712085.9	613402.6	NI**debris, possible tyre	MT_054, MT_055	NA
SSS_221	712739.2	612933.8	NI**debris, possible block and rope	MT_188	NA
SSS_222	713027.4	612856.8	NI**debris, possible tyres	MT_171, MT_172	NA
SSS_223	713059.8	612794.6	NI** debris possible boulder	MT_191, MT_197	AT_58
SSS_224	712949.2	612807.9	NI**debris	MT_207, MT_213, MT_198, MT_192	NA
SSS_225	712890.3	612831.9	NI**debris, possible rope	MT_192, MT_198_MT_193	NA
SSS_227	713008.8	612730	NI**debris	MT_221, MT_212	AT_57
SSS_228	713150.5	612708.2	NI**debris	MT_210	NA
SSS_229	713119.1	612706.1	NI**debris	MT_209	NA
SSS_230	712944.6	612775.5	NI** debris	MT_213, MT_207	NA
SSS_231	712907.1	612807.1	NI**debris	MT_198	NA
SSS_232	713035.7	612763.5	NI**debris	MT_197, MT_208	NA
SSS_235	712984.5	612659.4	NI**debris	MT_239	NA
SSS_236	712961.1	612707.2	NI**debris	MT_235	NA
SSS_237	712985.3	612695.1	NI**debris, possible rocks	MT_236	NA
SSS_239	712719.3	613333.2	NI**debris	MT_030	NA
SSS_240	712591.2	613348.8	NI**debris	MT_150, MT_034	NA
SSS_241	712644.8	613419.3	NI**debris	MT_143, MT_022,MT_025	NA
SSS_243	712662.8	612752.1	NI**debris, possible rope	MT_248, MT_245	NA
SSS_244	712714.9	612649.6	NI** possible block	MT_261	NA
SSS_246	712531.6	612698.6	NI**linear debris	MT_271	NA
SSS_247	712557.4	612670.1	NI**debris	MT_267	NA
SSS_248	712062.3	612857.1	NI**linear debris	MT_270, MT_264	NA
SSS_251	712202.9	613599.2	NI**debris	MT_146	NA
SSS_252	712264.6	613619.2	NI**debris	MT_020	NA
SSS_253	712421.2	613019.3	NI**debris	MT_202	NA
SSS_254	712420.6	612992.8	NI**debris	MT_202	NA
SSS_255	712584.3	612969.3	Possible anchor with chain	MT_199	NA
SSS_256	712349.7	613094	NI**debris	MT_183	NA
SSS_258	712579.9	613328.1	NI**debris	MT_034	NA

SSS_260	713604.2	613441.9	NI** field of small debris	MT_108	NA
SSS_261	713736.9	613391.9	Mooring block with chain or rope	MT_109, MT_100	AT_76
SSS_262	713284.7	613654	NI** linear debris	MT_094, MT_087, MT_085	NA
SSS_263	713918.3	613433.4	NI**debris possible boulder	MT_083, MT_089	NA
SSS_264	713859.7	613448.3	NI** linear debris possible rope or chain with a possible block	MT_090, MT_091	NA
SSS_265	712741.9	613619.8	NI** debris	MT_117, MT_118	NA
SSS_266	712879.8	613521.9	NI** debris	MT_124	NA
SSS_267	713161.3	613309.4	NI** debris possible block	MT_135, MT_136	NA
SSS_268	712655.5	613456.6	NI**debris	MT_143, MT_022	NA
SSS_269	713189.4	613322.9	NI**debris	MT_136	NA
SSS_270	713281.6	613076.6	NI**debris	MT_156, MT_166	NA
SSS_271	713411.2	613582.6	Long linear features, possible seabed feature and/or trawler marks	MT_093 and MT_096	NA

** Coordinates in ITM; ** NI: Non-identified*

Figures 26 to 29 shows the multibeam echosounder, the sidescan sonar and the magnetometer target location. A1 detailed charts are included in Appendix 3.

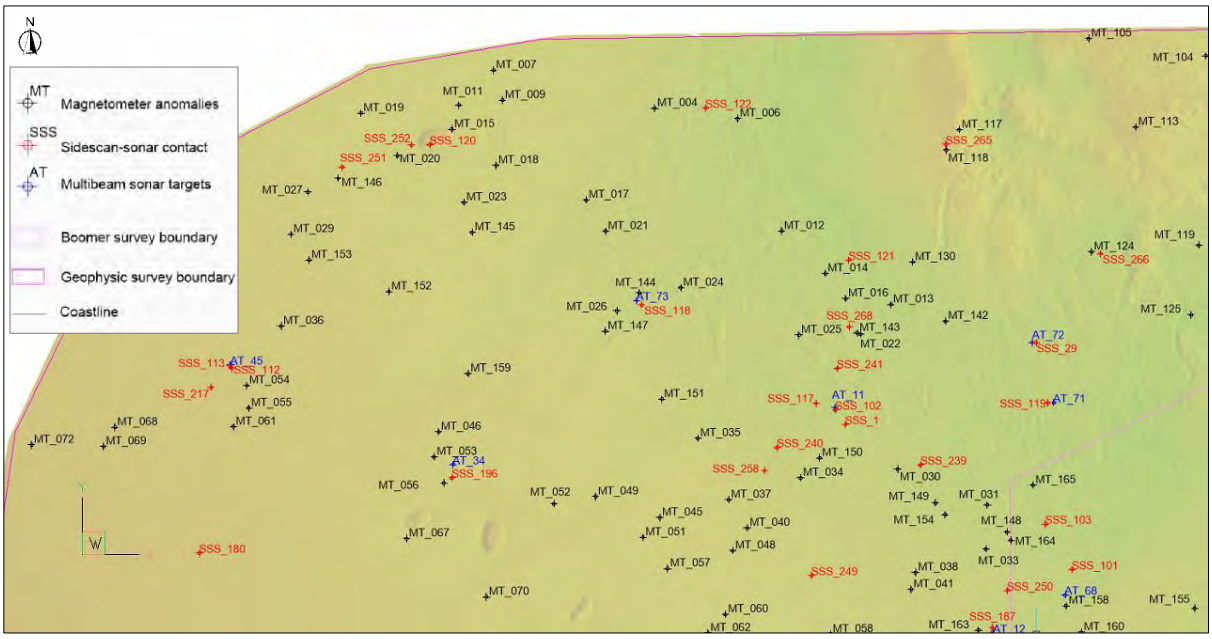


Figure 26: MBES, SSS and Magnetic target location - Chart 01

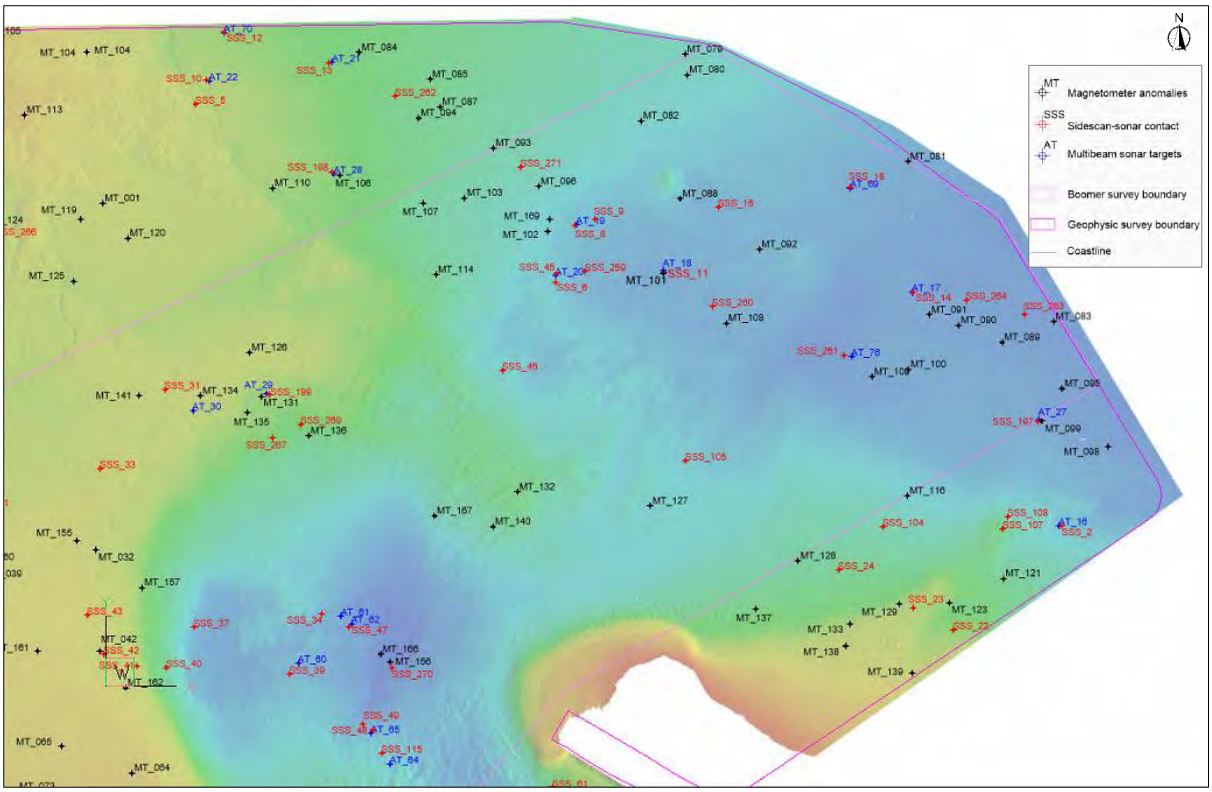


Figure 28: MBES, SSS and Magnetic target location - Chart 02

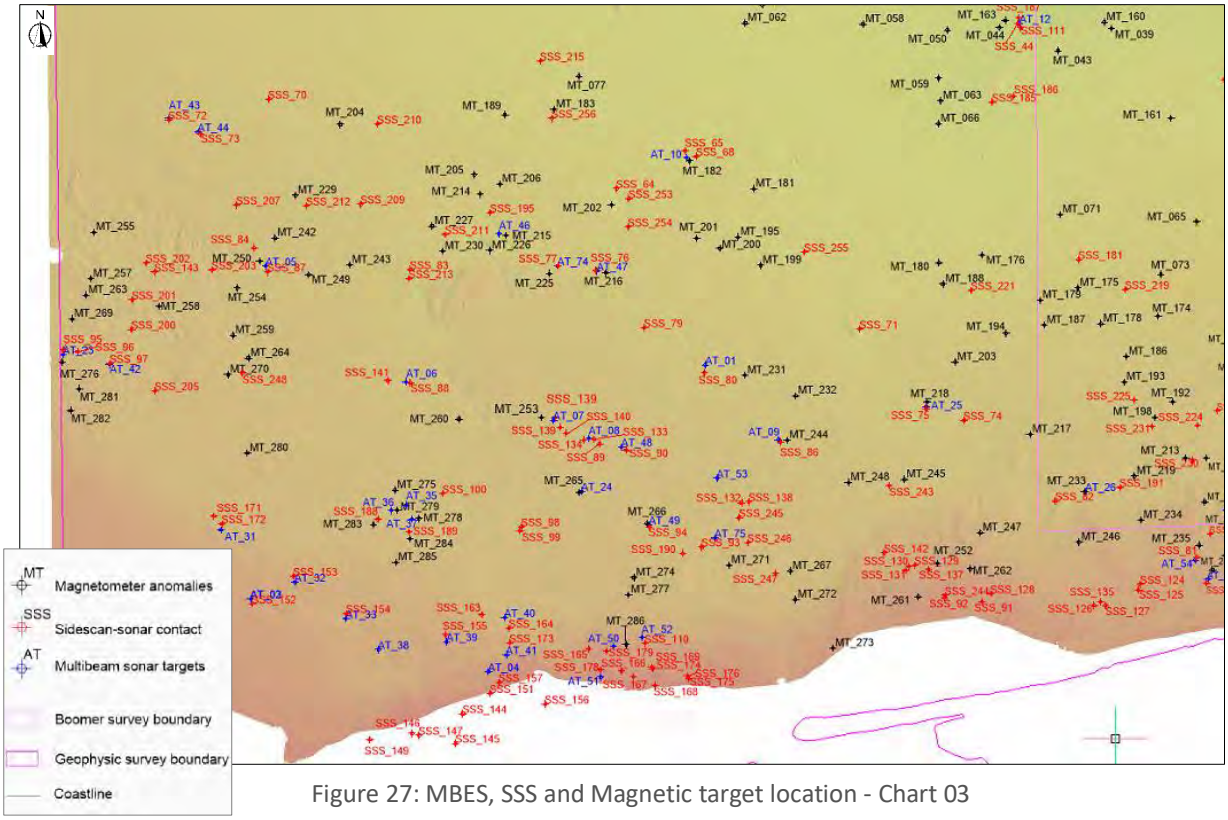


Figure 27: MBES, SSS and Magnetic target location - Chart 03

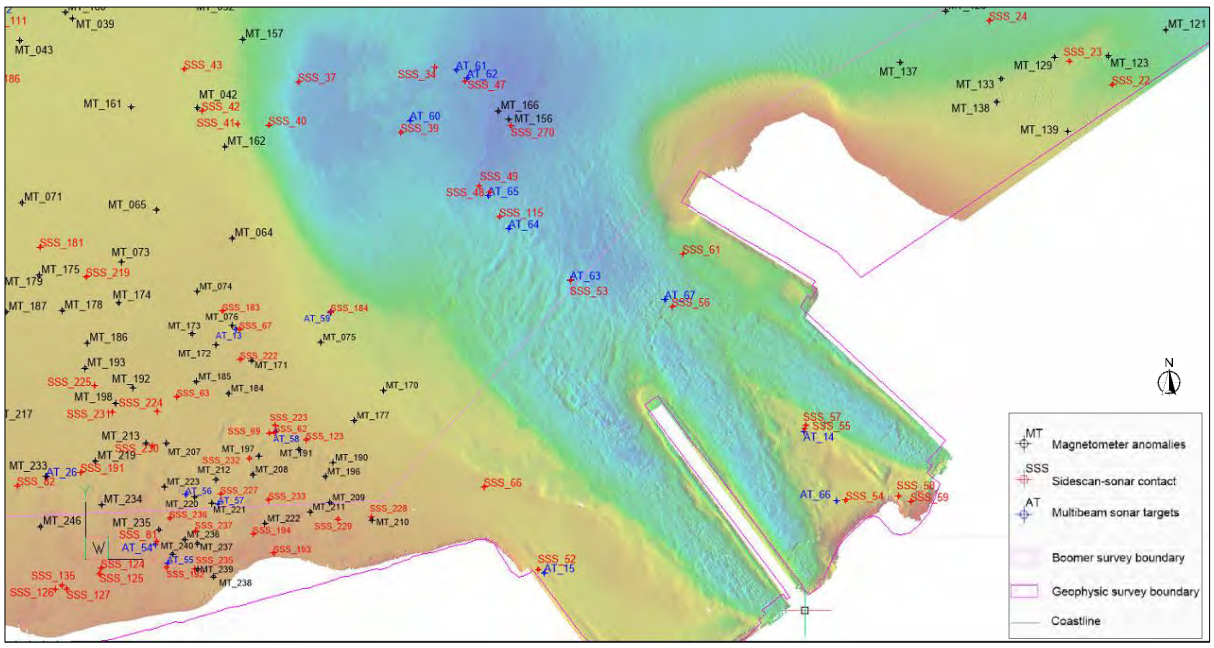


Figure 29: MBES, SSS and Magnetic target location - Chart 04

8.5 High Frequency Sub-Bottom-Profiler (HF-SBP)

A total of 120 raw data files were interpreted across the worksite to generate isopaches. Data quality is good overall. Signal penetration was limited by sediment type below the seabed but overall achieving good penetration on most areas. Figure 30 shows an example of one the seismic profile.

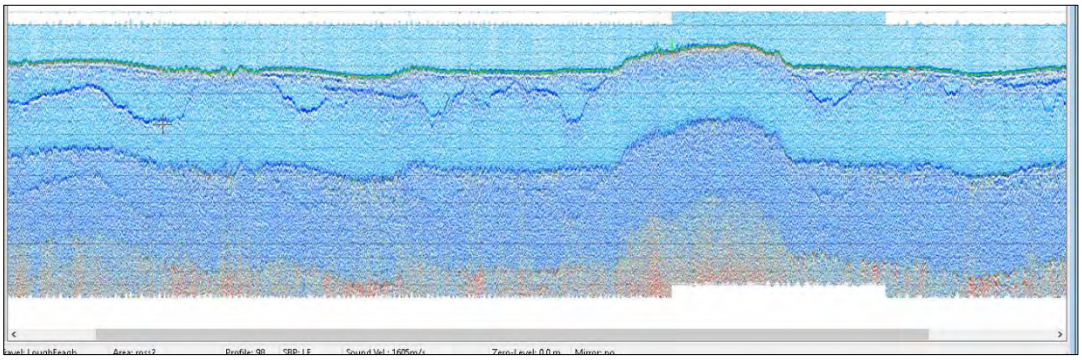


Figure 30: HF-SBP seismic profile example

The isopach (figure 31) is contoured at 1 metre intervals and detailed in charts supplied in Appendix 3. Relevant reflectors were exported as ASCII XYZ files and as depth below seabed to provide an isopach dataset for charting.

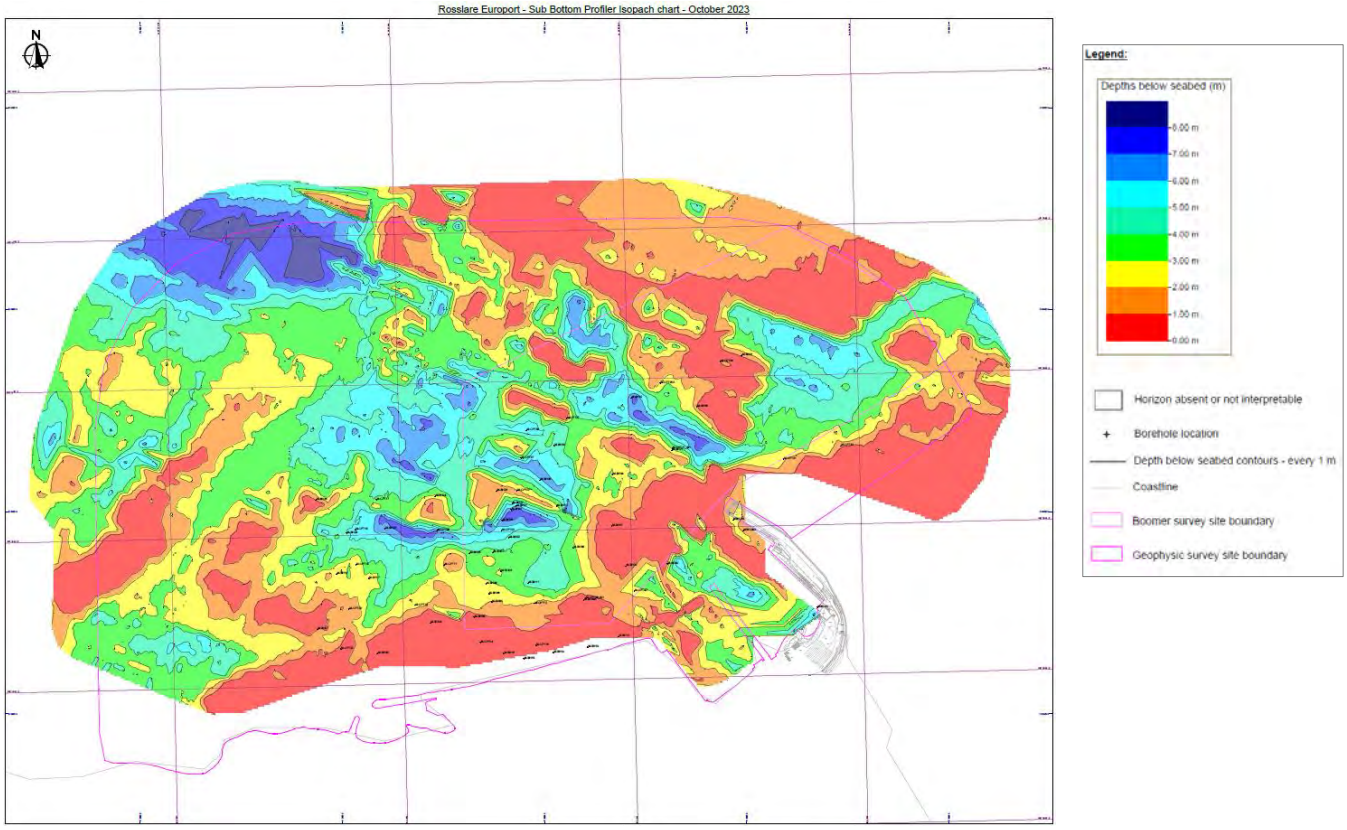


Figure 31: HF-SBP Isopach map

8.6 Medium Frequency Sub-Bottom Profiler (MF-SBP)

The Boomer data was of good quality throughout the survey and achieved >10m penetration over the majority of the survey area. Penetration was limited in the shallow water areas due to the reverberation from the seabed masking the sub bottom data. Due to the limitations of the system, the deep penetration comes at the cost of lower resolution. This lower resolution is apparent in the top 10 m of the data, where it is difficult to distinguish between different horizons which are known to be present, such as the top of clay. However, the data from the Innomar was used to interpret the areas of shallow sediment and bedrock as the Innomar is a high-resolution system.

Horizons below the seabed are picked by identifying strong reflectors and tracing them along each survey line. These reflectors indicate changes in the geology, allowing us to identify the different layers within the substrata.

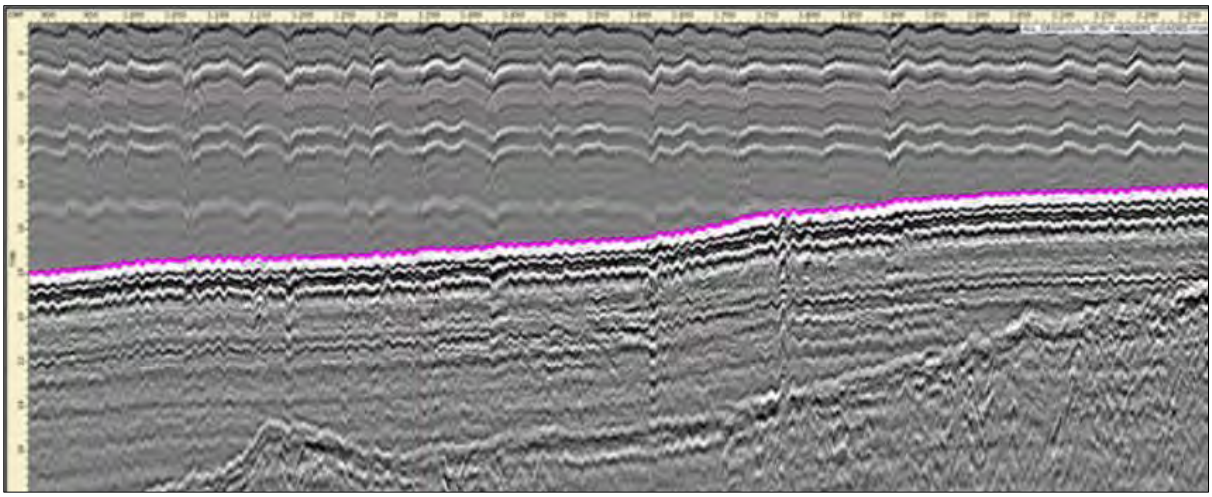


Figure 32: Subsection example of seabed picks.

Relevant reflectors were exported as ASCII XYZ files and as depth below seabed to provide an isopach dataset for charting.

For this project, the top of rock was tracked across the site and the depth of this horizon was measured. The isopach representing the depths of the rock below seabed is shown figure 33 (detailed A1 chart in Appendix 3).
Based on the supporting borehole data, this horizon is most likely to represent the top of mudstone, however gneiss and amphibolite are also known to be present in the area.

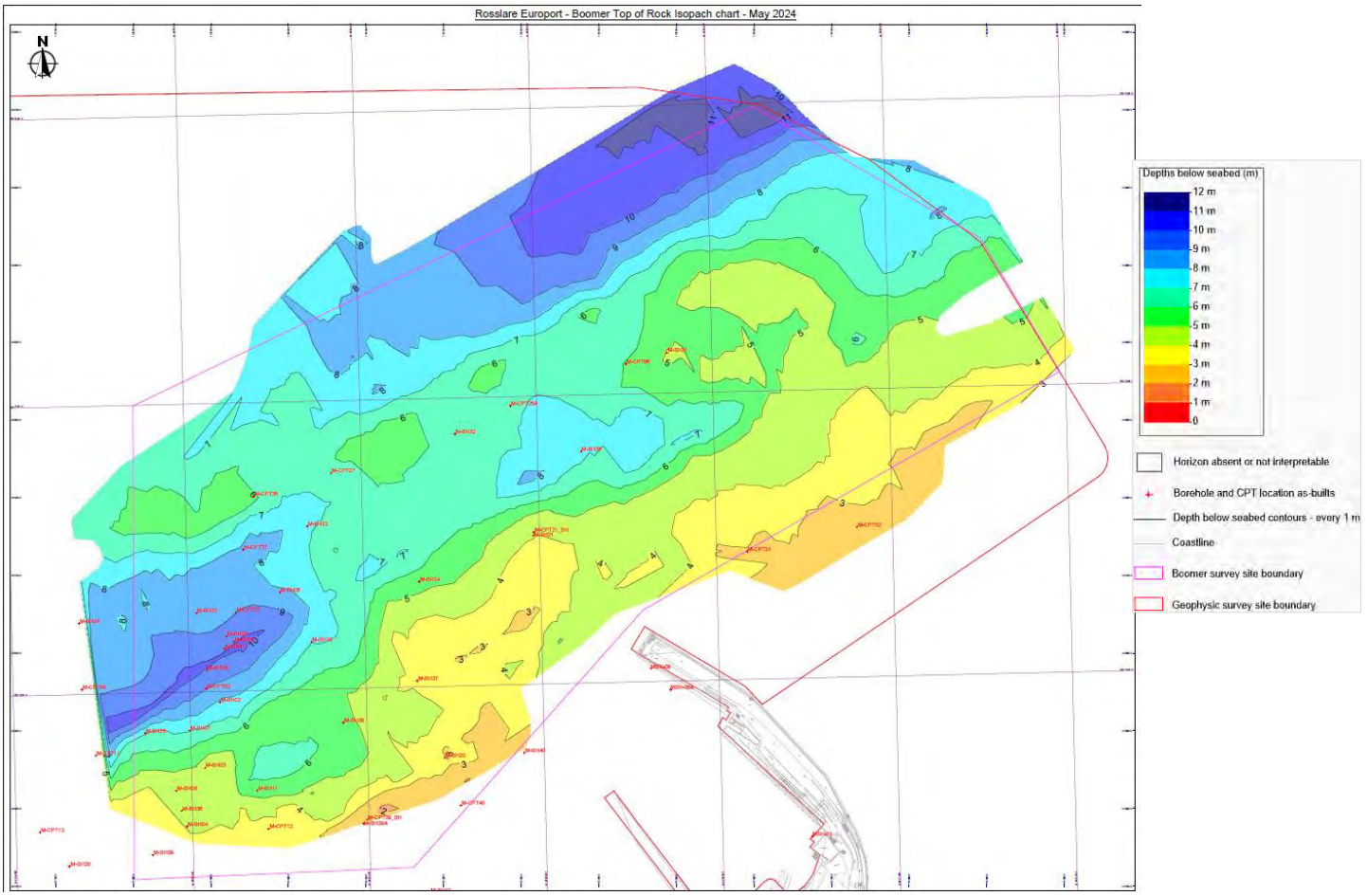


Figure 33: Boomer Top of Rock Layer- Isopach Chart - May 2024

The Paleo Channels were tracked across the site and the depth of this horizon was measured as well. These channels are likely to contain younger sediment than the surrounding geology. Based on the supporting borehole logs these paleo channels are embedded in the surrounding clays and most likely compiled of coarse sand and gravel.

The isopach representing the depths of the paleo channels below seabed is shown figure 34 (detailed A1 chart in Appendix 3).

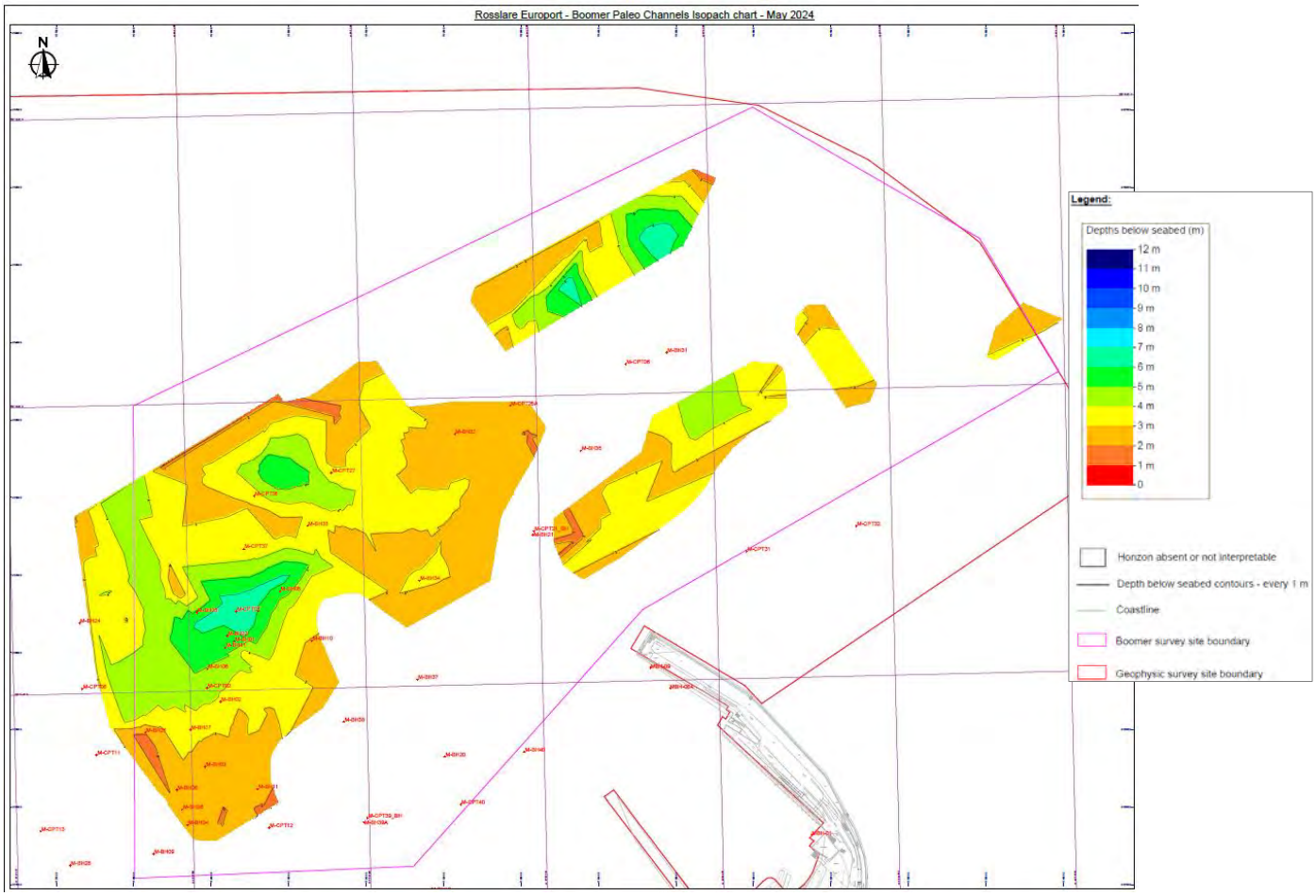


Figure 34: Boomer Paleo Channels Isopach Chart - May 2024