



CAUSEWAY
GEOTECH



24-0430

**LISSINAGROAGH, LEITRIM
GROUND INVESTIGATION REPORT**

Client:
FUTURE ENERGY IRELAND

Client's Representative:
TOBIN

Date:
FEBRUARY 2025

Status:
FINAL

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DOCUMENT CONTROL SHEET

REPORT NO:		24-0430			
PROJECT TITLE:		LISSINAGROAGH, LEITRIM			
CLIENT:		FUTURE ENERGY IRELAND			
CLIENT'S REPRESENTATIVE:		TOBIN			
REVISION	A01	STATUS	FINAL	ISSUE DATE	19 FEB 2025
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This report presents a factual account of the ground investigation in accordance with the Specification and Related Documents for Ground Investigation in Ireland 2nd Edition, published by Engineers Ireland (2016).



METHODS OF DESCRIBING SOILS AND ROCKS

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

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
SB	Sonic bulk disturbed sample.
D	Small disturbed sample.
C	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V	Shear vane test (borehole). Shear strength stated in kPa.
VR	V: undisturbed vane shear strength VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of $N \times 5 = C_u$ is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015+A1:2020	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.



1 AUTHORITY

On the instructions of TOBIN, (“the Client’s Representative”), acting on the behalf of Future Energy Ireland (“the Client”), a ground investigation was undertaken at the site to provide geotechnical and environmental information for input to the design and construction of a proposed wind farm development.

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

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

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

2 PURPOSE, RATIONALE & SCOPE OF THE INVESTIGATION

The purpose of this investigation is to assess the ground conditions and to allow an evaluation of the geotechnical with the current site and proposed development. The rationale has been determined by the Client’s Representative, with the extent of the investigation including boreholes, trial pits, peat augering, soil and rock core sampling, in-situ and laboratory testing, and the preparation of a factual account of the ground investigation findings.

3 DESCRIPTION OF SITE

The site is located at Irish Transverse Mercator 592179 842835 on predominantly forestry and agricultural land in Lissinagroagh, Co. Leitrim. The site location is presented in Appendix A.

4 SITE OPERATIONS

4.1 SUMMARY OF SITE WORKS

Site operations, which were conducted between 16/09/2024 and 13/11/2024, comprised:

- one rotary drilled borehole
- thirty-nine peat augers with follow-on peat probes
- three machine-dug trial pits
- Standard Penetration Tests
- GPS survey of all completed locations
- geophysical surveying



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

4.2 ROTARY DRILLED BOREHOLE

One rotary drilled borehole was put to completion by rotary drilling techniques only to a depth of 10.20 metres. The borehole was completed using a Comacchio 405 tracked rotary drilling rig.

A hand dug inspection pit was carried out between ground level and 1.00m depth to ensure the borehole was put down at a location clear of services or subsurface obstructions.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes to bedrock, after which rotary coring was employed to recover core samples of the bedrock. SPTs were carried out at standard intervals throughout the overburden, with small and bulk disturbed samples obtained where possible through the soil strata.

The core was extracted in up to 1.5m lengths using a metric T2-101 core barrel, which produced core of nominal 84mm diameter, and was placed in triple channel wooden core boxes.

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

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

4.3 STANDARD PENETRATION TESTS

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 (BSI, 2011) at standard depth intervals using the split spoon sampler (SPT_(s)) or solid cone attachment (SPT_(c)). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible.

The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix I.

4.4 PEAT AUGERS

Thirty-nine peat augers were conducted at locations shown in Appendix A using an Edelman auger to a target depth of 2.00 metres or until refusal. A follow-on peat probe was carried out if peat extended past 2.00 metres.

Probing was conducted by manually driving a series of interconnecting probe rods into the ground and pushing until a noticeable change in resistance was encountered within the subsoil. The depth to this refusal was nominally taken as the thickness of peat at that location.

The results of the peat thickness assessment are included in Appendix F.



4.5 TRIAL PITS

Three trial pits (TP244-246) were excavated using a 13t tracked excavator fitted with a 600mm wide bucket, to depths of 3.50m.

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

Stability of the trial pit walls was noted on completion.

Appendix D presents the trial pit logs with photographs of the pits and arisings provided in Appendix E.

4.6 GEOPHYSICAL SURVEY

A geophysical survey was completed by Apex Geophysics at the location shown in Adjacent to BH001.

The geophysical investigation consisted of 2D Electrical Resistivity Tomography and 2D Seismic Refraction profiling. The full geophysical survey report can be found in Appendix H.

4.7 SURVEYING

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

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

5 LABORATORY WORK

Laboratory testing was carried out between 15/10/2024 and 03/02/2025.

5.1 GEOTECHNICAL LABORATORY TESTING OF SOILS

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **compaction related:** particle density by Gas jar method
- **soil chemistry:** organic matter content

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

The test results are presented in Appendix G.



5.2 GEOTECHNICAL LABORATORY TESTING OF ROCK

Laboratory testing of rock sub-samples comprised:

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

Laboratory testing of rock sub-samples was carried out in accordance with the testing standards presented below in Table 1.

Table 1: Rock testing standards

Test	Test carried out in accordance with
Point load index	International Society for Rock Mechanics (IRSM). (1985) ISRM Suggested Methods: Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60
Uniaxial compression strength tests	International Society for Rock Mechanics (IRSM). (1981) ISRM Suggested Methods: Suggested method for determining deformability of rock materials in uniaxial compression, Part 2 International Society for Rock Mechanics (IRSM). (2007) The complete ISRM suggested methods for rock characterization, testing and monitoring.

The test results are presented in Appendix G.

6 GROUND CONDITIONS

6.1 GENERAL GEOLOGY OF THE AREA

Published geological mapping from the online Geological Survey Ireland spatial resources database indicate the superficial deposits underlying the site comprise glacial till. These deposits are shown to be underlain by limestones of the Dartry Formation and sandstones of the Glenade Foundation.

6.2 GROUND TYPES ENCOUNTERED DURING INVESTIGATION OF THE SITE

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

- **Topsoil:** encountered typically in 20-30mm thickness across the site.
- **Recent deposits (peat):** encountered in thicknesses from 0.20m to 2.30m of spongy pseudo-fibrous peat.
- **Glacial Till:** sandy gravelly clay, frequently with medium cobble and boulder content, typically firm in upper horizons, becoming stiff with increasing depth with occasional beds of sands and gravels.
- **Limestone Bedrock:** Rockhead was encountered at 4.0m in BH001.



6.3 GROUNDWATER

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

Seasonal variation in groundwater levels should also be factored into design considerations.

7 REFERENCES

British Standards Institute (BSI). (1990) *BS 1377:1990: Methods of test for soils for civil engineering purposes – Parts 2-9.*

British Standards Institute (BSI). (2007) *BS EN 1997-2:2007: Eurocode 7 – Geotechnical Design – Part 2: Ground investigation and testing.*

British Standards Institute (BSI). (2011) *BS EN ISO 22476-3:2006+A1:2011 Geotechnical investigation and testing. Field testing – Standard penetration test.*

British Standards Institute (BSI). (2014) *PAS 128: Specification for underground utility detection, verification and location.*

British Standards Institute (BSI). (2016) *BS 1377-1:2016: Methods of test for soils for civil engineering purposes – Part 1: General requirements and sample preparation.*

British Standards Institute (BSI). (2015) *BS 8004:2015 Code of practice for foundations.*

British Standards Institute (BSI). (2018a) *BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.*

British Standards Institute (BSI). (2018b) *BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.*

British Standards Institute (BSI). (2018c) *BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.*

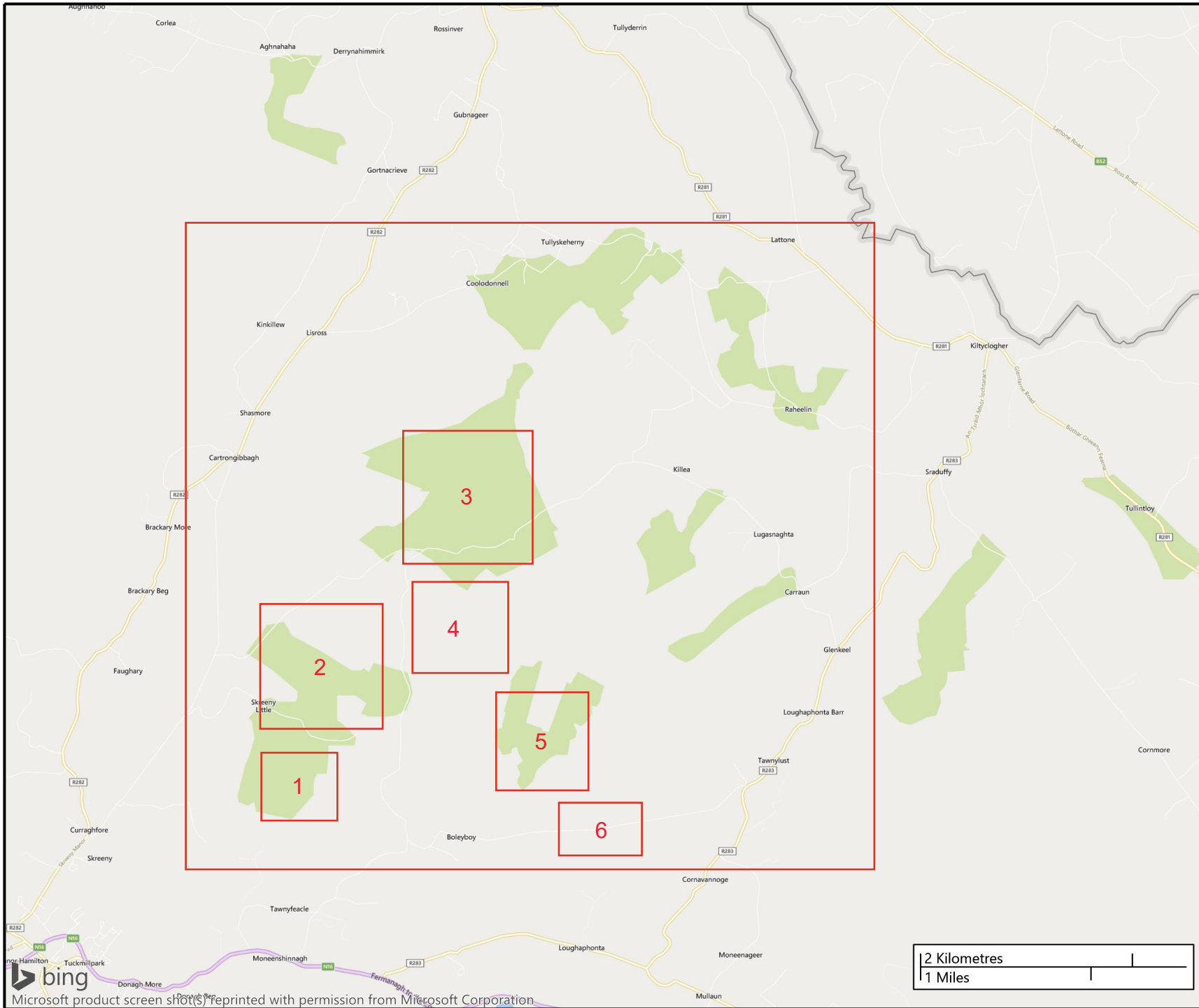
British Standards Institute (BSI). (2020) *BS5930:2015+A1:2020: Code of practice for ground investigations.*

Geotechnical Society of Ireland. (2016) *Specification and Related Documents for Ground Investigation in Ireland.* 2nd Edition. Engineers Ireland.

Geological Survey Ireland (GSI). Geological Survey Ireland spatial resources database. Available at: <https://dcnr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228>

APPENDIX A – SITE AND EXPLORATORY HOLE LOCATION PLANS





Legend Key

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Site Location Plan

Lissinagroagh, Leitrim



Last Revision	29/11/2024
Scale	1:50000



Legend Key

- Locations By Type - HA
- Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 1

Lissinagroagh, Leitrim



Last Revision	29/11/2024
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Scale	1:1500
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Legend Key
 ○ Locations By Type - HA
 ■ Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 2

Lissinagroagh, Leitrim



Last Revision	29/11/2024
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Scale	1:6000
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Legend Key
 ○ Locations By Type - HA
 ■ Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

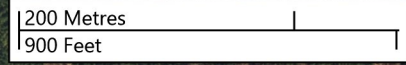
Exploratory Hole Plan Area 3

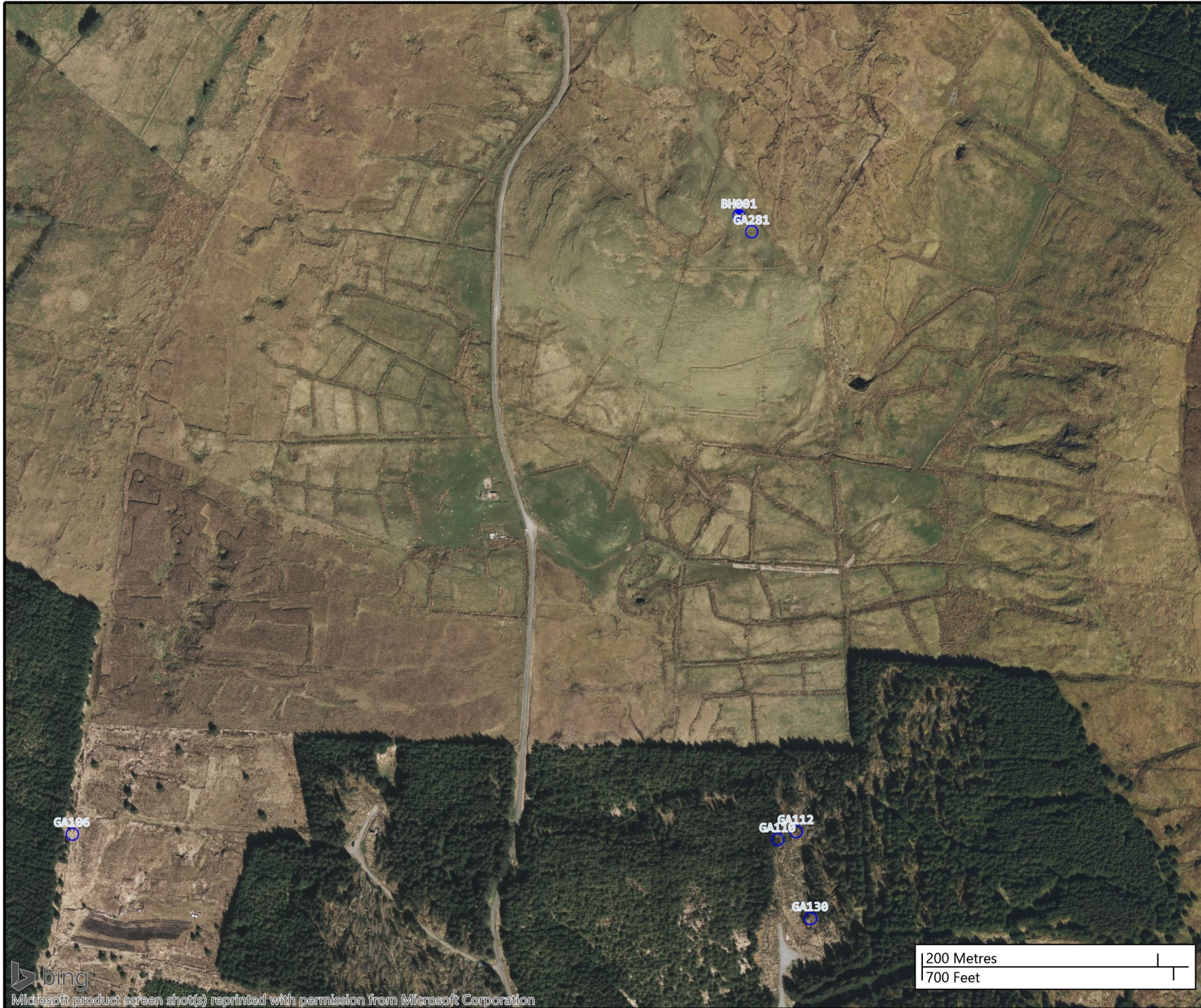
Lissinagroagh, Leitrim



Last Revision	29/11/2024
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Scale	1:5500
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Legend Key
 ○ Locations By Type - HA
 ● Locations By Type - RC

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 4

Lissinagroagh, Leitrim



Last Revision	06/12/2024
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Scale	1:4500
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Legend Key
 ○ Locations By Type - HA
 ■ Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 5

Lissinagroagh, Leitrim



Last Revision	29/11/2024
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Scale	1:4500
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Legend Key

- Locations By Type - HA
- Locations By Type - TP

Project No.	24-0430
Client	Tobin
Client's Rep	N/A

Exploratory Hole Plan Area 6

Lissinagroagh, Leitrim

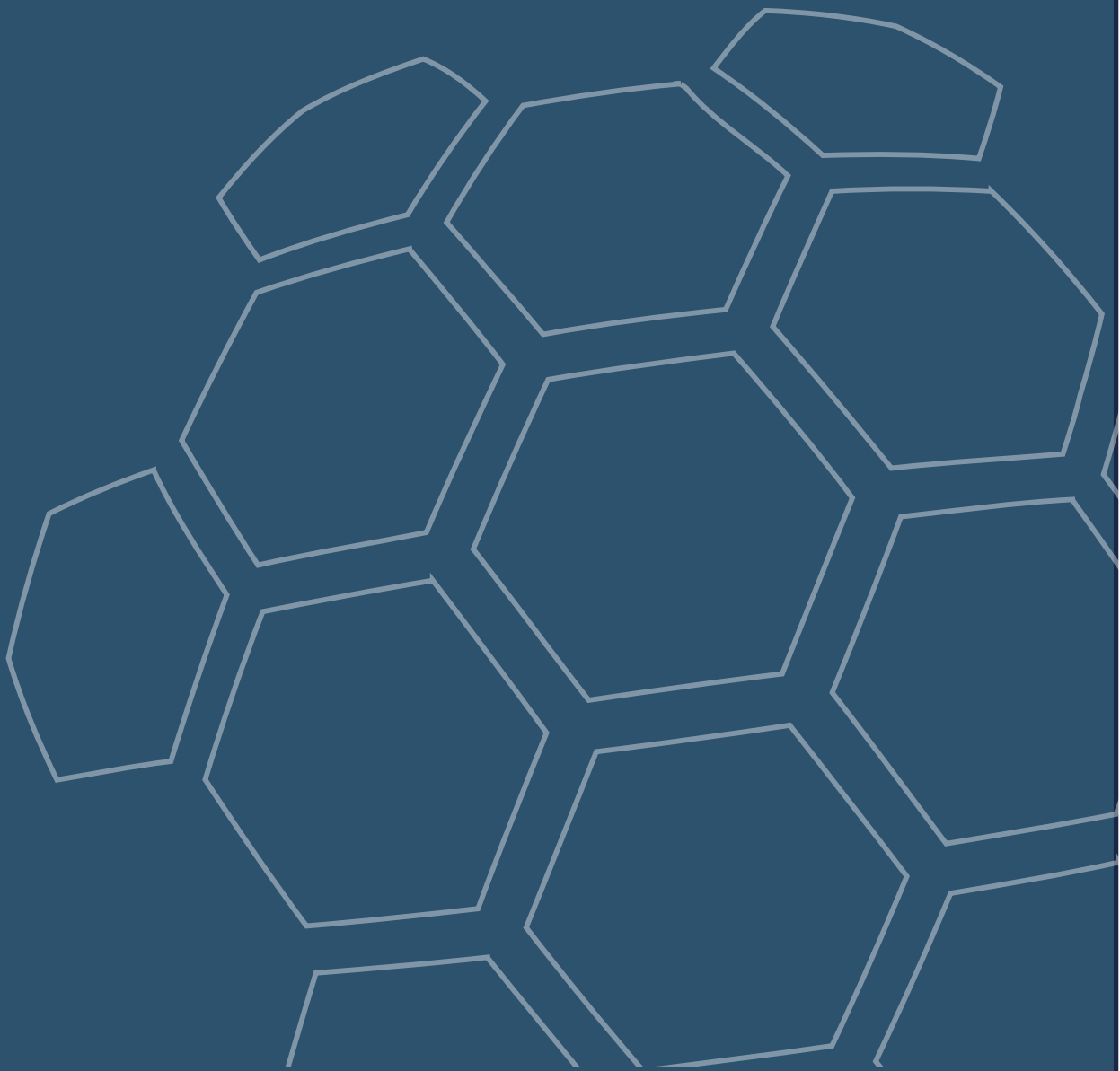


Last Revision	29/11/2024
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Scale	1:4000
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200 Metres
600 Feet

APPENDIX B – BOREHOLE LOGS





Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 2
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 4.00	4.00 10.20	592170.88 E 842883.75 N	10.20 m	12/11/2024	TA	Scale: 1:40
					Elevation: 341.94 mOD	End Date: 13/11/2024	Logger: EL	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.40	B1							341.54	0.40		Spongy dark brown pseudo-fibrous PEAT with with fine roots (0.5-2.0mm).		
1.00 - 1.04	SPT(S) 50 (25 for 20mm/50 for 25mm) Hammer SN = 1377 D11					1.00					Dense brown sandy very clayey subangular fine to coarse GRAVEL with low cobble and boulder content and occasional fine rootlets. Sand is fine to coarse. Cobbles and boulders are subangular.		
1.20													
2.00 - 2.50	B2										Dense brown sandy clayey subangular fine to coarse GRAVEL with high cobble and boulder content. Sand is fine to coarse. (Possibly highly weathered bedrock.)		
2.50 - 2.54	SPT(C) 50 (25 for 20mm/50 for 20mm) Hammer SN = 1377							339.34	2.60				
3.50 - 4.00	B3										Strong medium bedded grey LIMESTONE. Moderately weathered: closer fracture spacing and strong orangish brown discolouration on fracture surfaces.		
4.00 - 4.05	SPT(C) 50 (25 for 25mm/50 for 25mm) Hammer SN = 1377							337.94	4.00				
4.50 - 4.62	C4	80	73	60	7						Discontinuities: 1. 0-15 degree bedding fractures, medium spaced (75/205/260), planar, rough, with strong orangish brown staining on most fracture surfaces. 2. 50 degree joint at 5.30-5.35m, planar, rough, with patchy orangish brown staining on joint surfaces.		
4.85 - 4.98	C5												
5.40 - 5.52	C6							336.59	5.35		Strong medium bedded grey LIMESTONE. Slightly weathered: patchy orangish brown staining on some fracture surfaces.		
5.40		100	100	100									
6.60					1						Discontinuities: 1. 0-20 degree bedding fractures, widely spaced (170/950/1350), planar, rough, with patchy orangish brown staining on some fracture surfaces. 2. 75 degree joint at 9.55-9.90m, planar, rough, with patchy orangish brown staining on joint surfaces. 3. >85 degree joint at 7.95-8.60m, undulating, rough, with strong orangish brown staining on joint surfaces.		
7.05 - 7.20	C7												
7.20 - 7.50	C8												
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated to 1.00m. Coordinates approximate.
Casing Details		Core Barrel		
To (m)	Diam (mm)	T2-101		
4.00	151			
Flush Type		Termination Reason		
Water		Terminated at scheduled depth.		
				Last Updated
				18/02/2025



CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

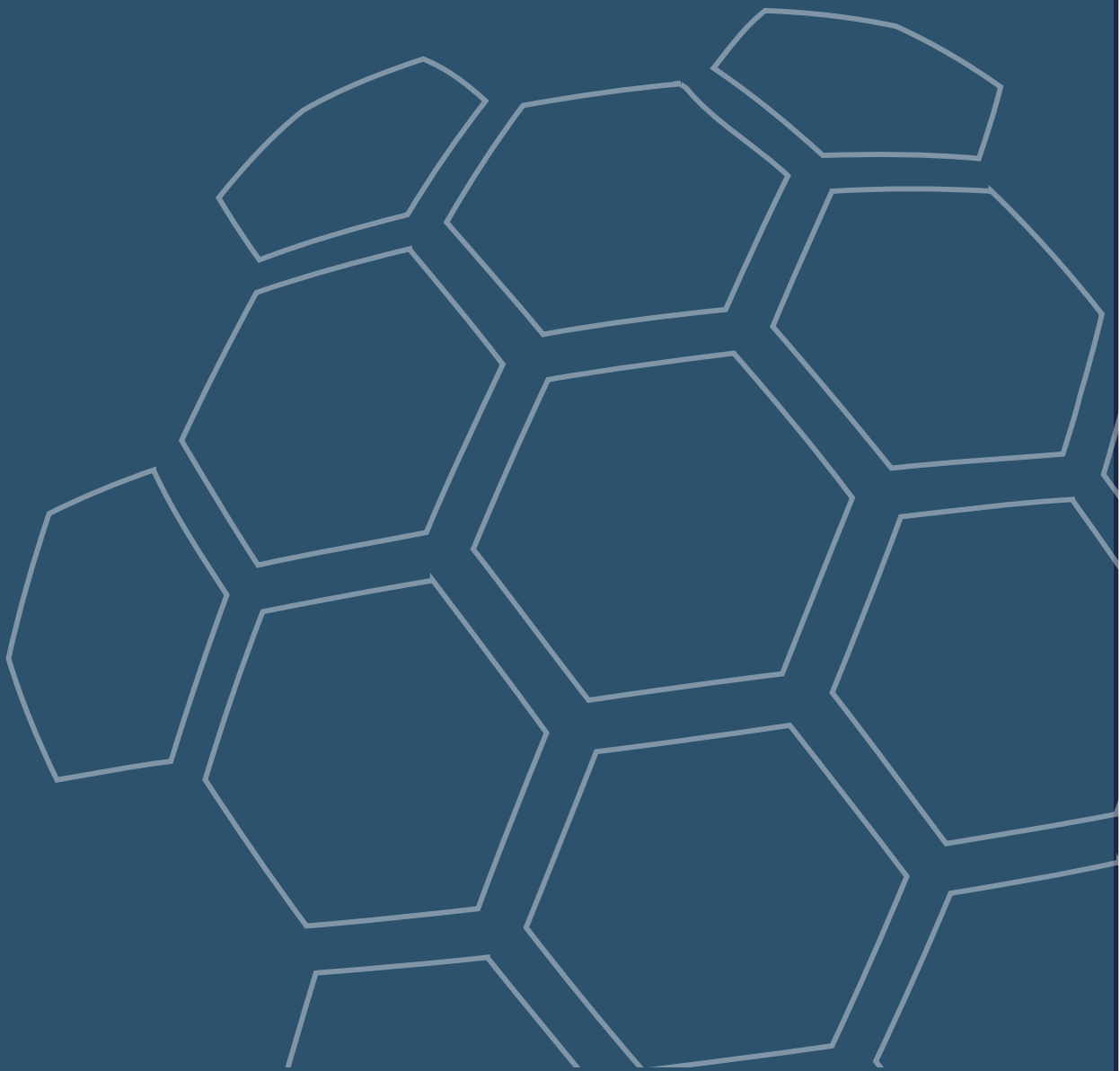
Borehole ID
BH001

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 10.20 m	Start Date: 12/11/2024	Driller: TA	Sheet 2 of 2 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 4.00	4.00 10.20	592170.88 E 842883.75 N	Elevation: 341.94 mOD	End Date: 13/11/2024	Logger: EL	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
7.65 - 7.80	C9	100	81	81									
8.10				5									
9.40 - 9.59 9.50	C10	100	80	74									
10.20		100	86	86	1			331.74	10.20				
End of Borehole at 10.20m													

Water Strikes				Remarks									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated to 1.00m. Coordinates approximate.									
Casing Details		Core Barrel											
To (m)	Diam (mm)	T2-101											
4.00	151	Flush Type		Termination Reason						Last Updated			
		Water		Terminated at scheduled depth.						18/02/2025			

APPENDIX C – CORE PHOTOGRAPHS



BH001



APPENDIX D – TRIAL PIT LOGS





TP244



TP244



TP244



TP245



TP245



TP245



TP245



TP246



TP246

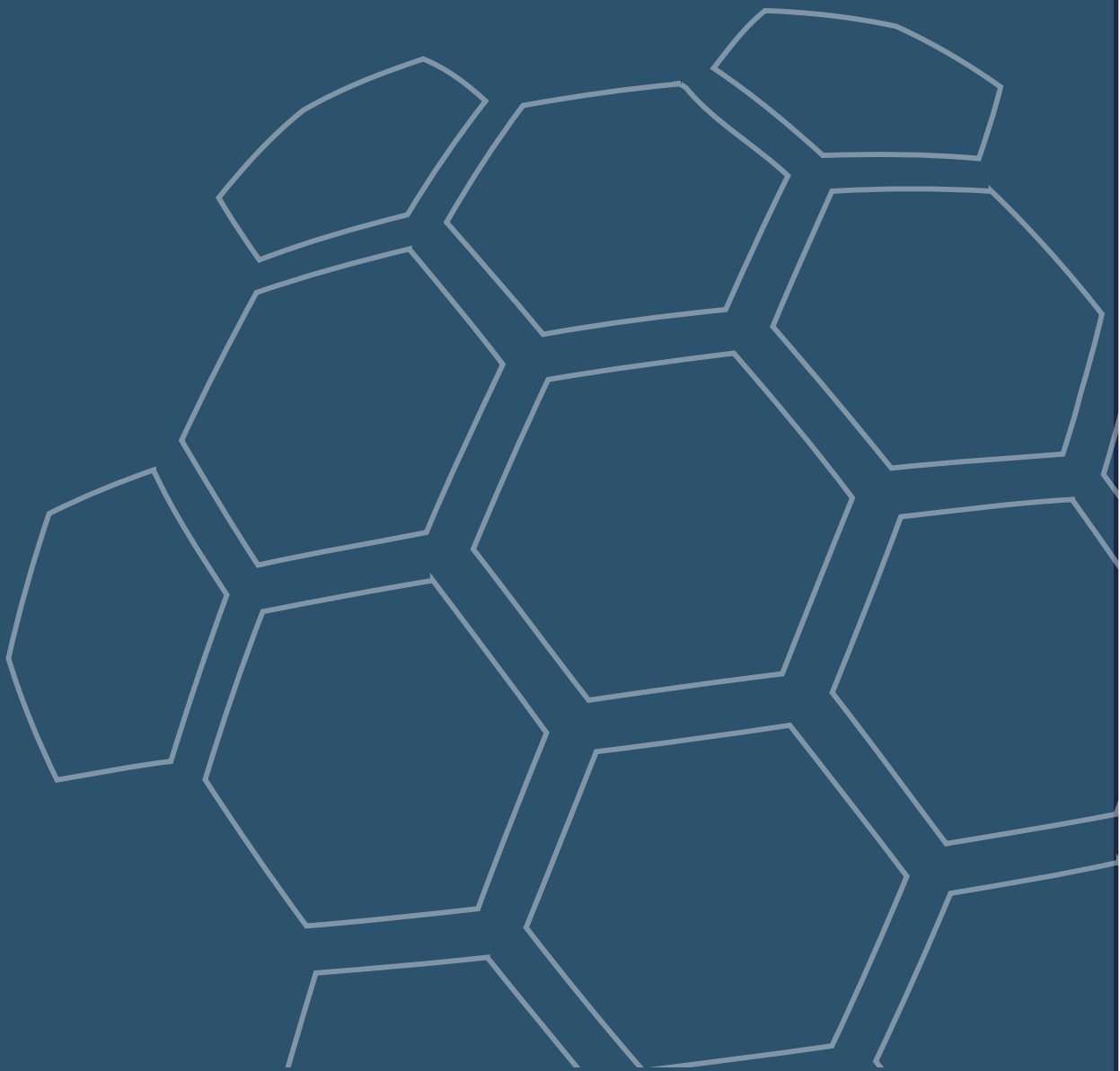


TP246



TP246

APPENDIX E – TRIAL PIT PHOTOGRAPHS





CAUSEWAY
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Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA101

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.30	Coordinates 592588.31 E 843793.61 N	Final Depth: 0.30 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 329.81 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				329.71	0.10		TOPSOIL: dense moss and roots		
					329.51	0.30		Firm dark brown fibrous PEAT with coarse roots (>5mm). End of Borehole at 0.30m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger on dense roots. Peat probe unable to push.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA102

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 592668.53 E 843275.85 N	Final Depth: 1.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 345.83 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1				345.73	0.10		TOPSOIL Very stiff greyish brown sandy CLAY. Sand is fine to coarse.		
1.00	D2				344.83	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole. Moved several metres adjacent but same result.						
						Last Updated 06/12/2024





Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA103

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.60	Coordinates 590996.89 E 842807.81 N	Final Depth: 0.60 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.10 0.60	 TOPSOIL Stiff brown slightly sandy slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.			
								End of Borehole at 0.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 224.5m.
						Termination Reason Terminated at refusal of auger.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA104

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.10	Coordinates 591032.32 E 841816.36 N	Final Depth: 1.10 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 177.18 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				176.98	0.20		TOPSOIL: dense roots		
1.00	D2				176.08	1.10		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
								End of Borehole at 1.10m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA106

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.60	Coordinates 591600.09 E 842357.53 N	Final Depth: 1.60 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 253.92 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				253.82	0.10		TOPSOIL Spongy dark greyish brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.50	D2				252.32	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Possible very stiff clay at base of hole.
Termination Reason Terminated at refusal of auger. Attempted peat probe but probe would not push.						
						Last Updated 06/12/2024





Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA107

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.70	Coordinates 590794.13 E 842532.91 N	Final Depth: 0.70 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10 0.70	 TOPSOIL Firm becoming stiff light brown slightly sandy organic CLAY. Sand is fine to coarse.			
								End of Borehole at 0.70m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 192m.
						Termination Reason Terminated at refusal of auger.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA108

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 593333.68 E 840647.09 N	Final Depth: 1.00 m	Start Date: 17/09/2024	Driller: EL	Sheet 1 of 1 Scale: 1:50
					Elevation: 213.23 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1				213.13	0.10		TOPSOIL Very stiff dark brown slightly sandy CLAY. Sand is fine to coarse.		
					212.63	0.60		Very stiff light brown CLAY.		
1.00	D2				212.23	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA109

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.70	Coordinates 593131.47 E 841625.64 N	Final Depth: 0.70 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 290.66 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.25	D2				290.56	0.10		TOPSOIL Stiff dark brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.54	D1									
0.70	D3				289.96	0.70		End of Borehole at 0.70m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole. Tried location several metres adjacent but same refusal depth.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA110

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592202.78 E 842351.88 N	Final Depth: 2.00 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 306.43 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1				306.33	0.10		TOPSOIL: dense sphagnum.		
1.00	D2				305.63	0.80		Firm light brown organic CLAY.		
1.90	D3				304.63	1.80		Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
					304.43	2.00		Stiff grey slightly silty CLAY.		
								End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at scheduled depth.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA111

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592611.16 E 844231.39 N	Final Depth: 2.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 275.10 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				275.00	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
2.00	D2				273.10	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe pushed to 2.20m.
Termination Reason Continued by peat probe to 2.20m.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA112

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.50	Coordinates 592218.48 E 842358.62 N	Final Depth: 1.50 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 308.24 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				308.04	0.20		TOPSOIL		
1.40	D2				306.74	1.50		Firm dark brown fibrous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 1.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe refused at 1.50m.
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA113

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592712.60 E 843867.30 N	Final Depth: 2.00 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 321.02 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				320.92	0.10		TOPSOIL Spongy reddish brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.90	D2				319.02	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Continued by peat probe. Probe refused on possible rock at 2.10m.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA114

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.50	Coordinates 590857.25 E 842010.87 N	Final Depth: 0.50 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1					0.10		TOPSOIL		
						0.50		Stiff grey very sandy CLAY. Sand is fine to coarse.		
								End of Borehole at 0.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 157.5m.
Termination Reason						Last Updated
Terminated at refusal of auger.						06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA115

Client: Tobin

Client's Rep: N/A

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 0.90 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
Hand Augering	Hand Auger	0.00	0.90	590797.91 E 842592.43 N	Elevation: mOD	End Date: 18/09/2024	Logger: EL	


Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10 0.90	 TOPSOIL Firm becoming stiff greyish brown slightly sandy organic CLAY with rootlets. Sand is fine to coarse.			
								End of Borehole at 0.90m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 194m.
Termination Reason						Last Updated
Terminated at refusal of auger.						06/12/2024





Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 591003.94 E 841040.74 N	Final Depth: 1.00 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.80	D2					0.10 1.00	 TOPSOIL Stiff light greyish brown very sandy CLAY. Sand is fine to coarse.			
								End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 130m.
						Termination Reason Terminated at refusal of auger. Audible grinding sound from hole.
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA117

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.40	Coordinates 593524.37 E 840803.66 N	Final Depth: 0.40 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 230.86 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				230.76	0.10		TOPSOIL		
					230.46	0.40		Stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse.		
								End of Borehole at 0.40m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound from base of hole.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA118

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593198.35 E 841038.21 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1					0.10		TOPSOIL Stiff greyish brown CLAY.		
1.00	D2									
2.00	D3					2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 240m.
Termination Reason						Last Updated
Terminated at scheduled depth.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA119

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593189.00 E 841078.03 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.78 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				239.68	0.10		TOPSOIL		
								Stiff dark brown CLAY.		
2.00	D2				237.78	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at scheduled depth.						
Last Updated 06/12/2024						



CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA120

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 590958.93 E 841012.70 N	Final Depth: 1.00 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 133.32 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1				133.22	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					132.32	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
Last Updated 06/12/2024						



CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA121

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.60	Coordinates 590943.63 E 841015.76 N	Final Depth: 0.60 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1					0.10		TOPSOIL		
0.50	D2					0.40		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
						0.60		Grey clayey SAND.		
								End of Borehole at 0.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 130m.
						Termination Reason Terminated at refusal of auger.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA123

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592638.14 E 844252.47 N	Final Depth: 2.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 273.28 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				273.18	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.50	D2									
1.80	D3				271.48	1.80		Spongy dark brown slightly sandy pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					271.28	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe pushed to 2.40m
Termination Reason Continued by peat probe to 2.40m.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA125

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.30	Coordinates 593850.26 E 840677.31 N	Final Depth: 0.30 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.35 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.25	0.10	TOPSOIL	Spongy dark brown fibrous PEAT with medium roots (2.0-5.0mm). End of Borehole at 0.30m		
					239.05	0.30				

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA126

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.50	Coordinates 590812.27 E 842034.16 N	Final Depth: 0.50 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 161.36 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1				161.26	0.10		TOPSOIL		
						160.86		Firm dark brown fibrous PEAT with coarse roots (>5mm).		
								End of Borehole at 0.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Peat probe unable to be pushed.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA128

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592122.51 E 843419.16 N	Final Depth: 2.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.20		TOPSOIL		
1.00	D2							Spongy dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
1.80	D3					1.60		Stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
						2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 305m.
Termination Reason						Last Updated
Terminated at scheduled depth.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA129

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593592.76 E 841574.74 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 326.39 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				326.29	0.10		TOPSOIL: dense sphagnum moss		
								Plastic dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
					324.39	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe refusal at 2.15m due to roots.
Termination Reason						
Continued by peat probe. Probe refused on dense tree roots at 2.15m.						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA130

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.50	Coordinates 592230.72 E 842284.47 N	Final Depth: 1.50 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 302.85 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				302.75	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.40	D2				301.35	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe refused at 1.50m.
Termination Reason Terminated at refusal of auger. Followed on with peat probe to same refusal depth.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA131

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.40	Coordinates 591168.14 E 842860.16 N	Final Depth: 1.60 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 226.77 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				226.57	0.20	TOPSOIL	Soft brown organic SILT with rootlets and leaves.		
1.40	D2				225.37	1.40		Stiff brown gravelly organic SILT with rootlets.		
					225.17	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of sampler.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA132

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.10	Coordinates 594070.43 E 840724.61 N	Final Depth: 1.10 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 234.24 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				234.14	0.10		TOPSOIL Spongy light orangish brown fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D2				233.34	0.90		Stiff dark brown organic CLAY with rootlets.		
					233.14	1.10		End of Borehole at 1.10m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA134

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.40	Coordinates 593872.07 E 840655.03 N	Final Depth: 0.40 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.37 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.27	0.10		TOPSOIL		
						238.97		Spongy dark brown amorphous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 0.40m		

Water Strikes				Casing Details		Remarks Peat probe refused at 0.40m.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Probe refused 0.40m.						
Last Updated 06/12/2024						



CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA135

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.60	Coordinates 592678.53 E 843264.41 N	Final Depth: 0.60 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 348.05 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				347.95	0.10		TOPSOIL		
0.50	D2				347.45	0.60		Stiff grey sandy CLAY with rootlets. Sand is fine to coarse.		
								End of Borehole at 0.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal on dense roots.						
						Last Updated 06/12/2024





CAUSEWAY
— GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA136

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.20	Coordinates 593883.47 E 840672.73 N	Final Depth: 0.20 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 240.65 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					240.45	0.20		TOPSOIL		
								End of Borehole at 0.20m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA137

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.80	Coordinates 593042.37 E 841598.34 N	Final Depth: 0.80 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 280.06 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1				279.96	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.80	D2				279.56	0.50		Very stiff dark grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
					279.26	0.80		End of Borehole at 0.80m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole. Tried alternate location with no success.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA138

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.80	Coordinates 593333.13 E 841482.97 N	Final Depth: 0.80 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 283.77 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1				283.67	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
0.70	D2				283.07 282.97	0.70 0.80		Light brown slightly clayey fine to coarse SAND. End of Borehole at 0.80m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Difficult access due to very steep boggy ground and thick brush.
Termination Reason						Last Updated
Terminated at refusal on possible cobbles. Moved few metres for same result.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA139

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.50	Coordinates 593005.62 E 841546.52 N	Final Depth: 1.50 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 272.07 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				271.97	0.10		TOPSOIL Firm dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.50	D2				270.57	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Couldn't push auger further at 1.5m. Followed on with peat probe to 2.20m.
Termination Reason						
Continued by peat probe to 2.20m.						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA140

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 593560.84 E 841537.02 N	Final Depth: 1.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 317.33 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				317.23	0.10		TOPSOIL Firm dark brown slightly sandy organic CLAY. Sand is fine to coarse.		
					316.33	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Slow access due to steep boggy ground and fallen trees.
						Termination Reason Terminated at refusal of sampler on possible dense roots. Tried adjacent site with same result.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA141

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593724.80 E 841587.66 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 338.95 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				338.85	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
2.00	D2				336.95	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe pushed to 2.30m
Termination Reason Continued by peat probe to 2.30m.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA142

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.10	Coordinates 592132.43 E 843420.49 N	Final Depth: 1.10 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.10		TOPSOIL Firm light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.90	D2					0.60		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.10	D3					1.00 1.10		Very stiff dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. End of Borehole at 1.10m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 303m.
Termination Reason						Last Updated
Terminated at refusal of sampler.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA143

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.40	Coordinates 593156.13 E 841485.36 N	Final Depth: 1.40 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10		TOPSOIL Stiff dark greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
1.00	D2					1.00		Stiff dark grey slightly sandy CLAY with rootlets. Sand is fine to coarse.		
1.40	D3					1.40		End of Borehole at 1.40m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 260m.
Termination Reason						Last Updated
Terminated at refusal of auger. Tried adjacent position with no success.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA281

Client: Tobin

Client's Rep: N/A

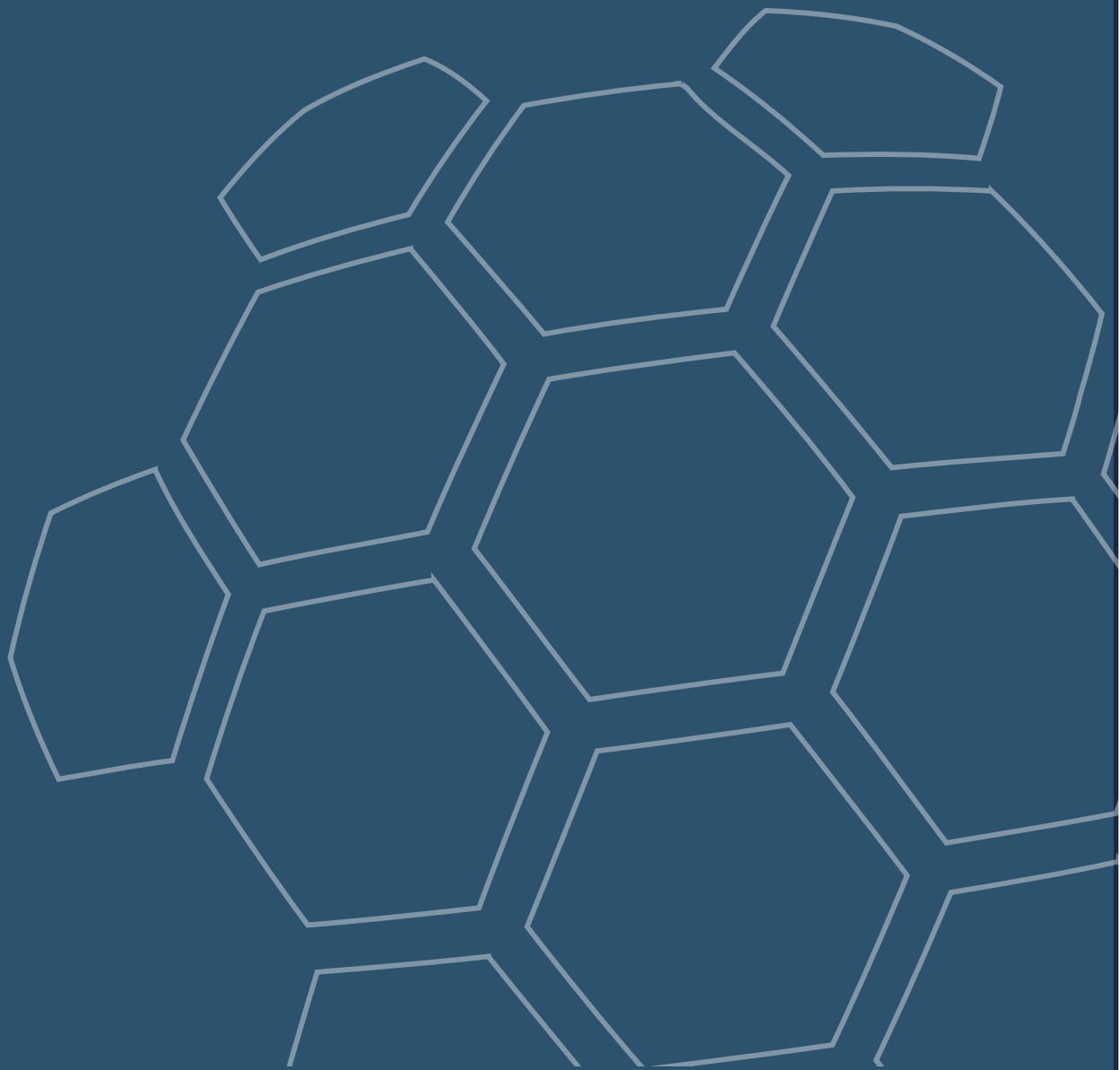
Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.30	Coordinates 592181.61 E 842869.99 N	Final Depth: 0.30 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 344.66 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				344.46 344.36	0.20 0.30		TOPSOIL Soft brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. End of Borehole at 0.30m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal on possible shallow rock/cobbles.						
						Last Updated 06/12/2024



APPENDIX F – PEAT AUGER LOGS





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA101

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.30	Coordinates 592588.31 E 843793.61 N	Final Depth: 0.30 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 329.81 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				329.71	0.10		TOPSOIL: dense moss and roots		
					329.51	0.30		Firm dark brown fibrous PEAT with coarse roots (>5mm). End of Borehole at 0.30m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger on dense roots. Peat probe unable to push.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA102

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 592668.53 E 843275.85 N	Final Depth: 1.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 345.83 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1				345.73	0.10		TOPSOIL Very stiff greyish brown sandy CLAY. Sand is fine to coarse.		
1.00	D2				344.83	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole. Moved several metres adjacent but same result.						
						Last Updated 06/12/2024





Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA103

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.60	Coordinates 590996.89 E 842807.81 N	Final Depth: 0.60 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.10 0.60	 TOPSOIL Stiff brown slightly sandy slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.			
								End of Borehole at 0.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 224.5m.
						Termination Reason Terminated at refusal of auger.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA104

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.10	Coordinates 591032.32 E 841816.36 N	Final Depth: 1.10 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 177.18 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				176.98	0.20		TOPSOIL: dense roots		
1.00	D2				176.08	1.10		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
								End of Borehole at 1.10m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





CAUSEWAY
— GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA106

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.60	Coordinates 591600.09 E 842357.53 N	Final Depth: 1.60 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 253.92 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				253.82	0.10		TOPSOIL Spongy dark greyish brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.50	D2				252.32	1.60		End of Borehole at 1.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Possible very stiff clay at base of hole.
Termination Reason Terminated at refusal of auger. Attempted peat probe but probe would not push.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA107

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.70	Coordinates 590794.13 E 842532.91 N	Final Depth: 0.70 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10 0.70	 TOPSOIL Firm becoming stiff light brown slightly sandy organic CLAY. Sand is fine to coarse.			
								End of Borehole at 0.70m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 192m.
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA108

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 593333.68 E 840647.09 N	Final Depth: 1.00 m	Start Date: 17/09/2024	Driller: EL	Sheet 1 of 1 Scale: 1:50
					Elevation: 213.23 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1				213.13	0.10		TOPSOIL Very stiff dark brown slightly sandy CLAY. Sand is fine to coarse.		
					212.63	0.60		Very stiff light brown CLAY.		
1.00	D2				212.23	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA109

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.70	Coordinates 593131.47 E 841625.64 N	Final Depth: 0.70 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 290.66 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.25	D2				290.56	0.10		TOPSOIL Stiff dark brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.54	D1									
0.70	D3				289.96	0.70		End of Borehole at 0.70m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole. Tried location several metres adjacent but same refusal depth.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA110

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592202.78 E 842351.88 N	Final Depth: 2.00 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 306.43 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1				306.33	0.10		TOPSOIL: dense sphagnum.		
1.00	D2				305.63	0.80		Firm light brown organic CLAY.		
1.90	D3				304.63	1.80		Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
					304.43	2.00		Stiff grey slightly silty CLAY.		
								End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at scheduled depth.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA111

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592611.16 E 844231.39 N	Final Depth: 2.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 275.10 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				275.00	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
2.00	D2				273.10	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe pushed to 2.20m.
Termination Reason Continued by peat probe to 2.20m.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA112

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.50	Coordinates 592218.48 E 842358.62 N	Final Depth: 1.50 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 308.24 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				308.04	0.20		TOPSOIL		
1.40	D2				306.74	1.50		Firm dark brown fibrous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 1.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe refused at 1.50m.
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA113

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592712.60 E 843867.30 N	Final Depth: 2.00 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 321.02 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				320.92	0.10		TOPSOIL Spongy reddish brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.90	D2				319.02	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Continued by peat probe. Probe refused on possible rock at 2.10m.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA114

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.50	Coordinates 590857.25 E 842010.87 N	Final Depth: 0.50 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1					0.10		TOPSOIL		
						0.50		Stiff grey very sandy CLAY. Sand is fine to coarse.		
								End of Borehole at 0.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 157.5m.
Termination Reason						Last Updated
Terminated at refusal of auger.						06/12/2024





Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA115

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.90	Coordinates 590797.91 E 842592.43 N	Final Depth: 0.90 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10 0.90	 TOPSOIL Firm becoming stiff greyish brown slightly sandy organic CLAY with rootlets. Sand is fine to coarse.			
								End of Borehole at 0.90m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 194m.
						Termination Reason Terminated at refusal of auger.
						Last Updated 06/12/2024





Project No.
24-0430


Project Name: Lissinagroagh, Leitrim

Borehole ID
GA116

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 591003.94 E 841040.74 N	Final Depth: 1.00 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.80	D2					0.10 1.00	 TOPSOIL Stiff light greyish brown very sandy CLAY. Sand is fine to coarse.			
								End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 130m.
						Termination Reason Terminated at refusal of auger. Audible grinding sound from hole.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA117

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.40	Coordinates 593524.37 E 840803.66 N	Final Depth: 0.40 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 230.86 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				230.76	0.10		TOPSOIL		
					230.46	0.40		Stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse. End of Borehole at 0.40m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound from base of hole.						
						Last Updated 06/12/2024





Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593198.35 E 841038.21 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1					0.10		TOPSOIL Stiff greyish brown CLAY.		
1.00	D2									
2.00	D3					2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 240m.
						Termination Reason Terminated at scheduled depth.
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA119

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593189.00 E 841078.03 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.78 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				239.68	0.10		TOPSOIL		
2.00	D2				237.78	2.00		Stiff dark brown CLAY.		
								End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at scheduled depth.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA120

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 590958.93 E 841012.70 N	Final Depth: 1.00 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 133.32 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1				133.22	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					132.32	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





CAUSEWAY
— GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA121

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.60	Coordinates 590943.63 E 841015.76 N	Final Depth: 0.60 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1					0.10		TOPSOIL		
0.50	D2					0.40		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
						0.60		Grey clayey SAND.		
								End of Borehole at 0.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 130m.
						Termination Reason Terminated at refusal of auger.
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA123

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592638.14 E 844252.47 N	Final Depth: 2.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 273.28 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				273.18	0.10		TOPSOIL		
1.50	D2							Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.80	D3				271.48	1.80		Spongy dark brown slightly sandy pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
					271.28	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe pushed to 2.40m
Termination Reason						Last Updated
Continued by peat probe to 2.40m.						06/12/2024





CAUSEWAY
— GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA125

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.30	Coordinates 593850.26 E 840677.31 N	Final Depth: 0.30 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.35 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.25	0.10		TOPSOIL		
					239.05	0.30		Spongy dark brown fibrous PEAT with medium roots (2.0-5.0mm). End of Borehole at 0.30m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA126

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.50	Coordinates 590812.27 E 842034.16 N	Final Depth: 0.50 m	Start Date: 19/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 161.36 mOD	End Date: 19/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.40	D1				161.26	0.10		TOPSOIL Firm dark brown fibrous PEAT with coarse roots (>5mm).		
					160.86	0.50		End of Borehole at 0.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Peat probe unable to be pushed.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA128

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 592122.51 E 843419.16 N	Final Depth: 2.00 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.20		TOPSOIL		
1.00	D2							Spongy dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
1.80	D3					1.60		Stiff light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
						2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 305m.
Termination Reason						Last Updated
Terminated at scheduled depth.						06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA129

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593592.76 E 841574.74 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 326.39 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				326.29	0.10		TOPSOIL: dense sphagnum moss		
								Plastic dark brown pseudo-fibrous PEAT with very fine roots (<0.5mm).		
					324.39	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe refusal at 2.15m due to roots.
Termination Reason						Last Updated
Continued by peat probe. Probe refused on dense tree roots at 2.15m.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA130

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.50	Coordinates 592230.72 E 842284.47 N	Final Depth: 1.50 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 302.85 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				302.75	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
1.40	D2				301.35	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe refused at 1.50m.
Termination Reason Terminated at refusal of auger. Followed on with peat probe to same refusal depth.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA131

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.40	Coordinates 591168.14 E 842860.16 N	Final Depth: 1.60 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 226.77 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				226.57	0.20	TOPSOIL	Soft brown organic SILT with rootlets and leaves.		
1.40	D2				225.37	1.40	Stiff brown gravelly organic SILT with rootlets.			
					225.17	1.60	End of Borehole at 1.60m			

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of sampler.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA132

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.10	Coordinates 594070.43 E 840724.61 N	Final Depth: 1.10 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 234.24 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				234.14	0.10		TOPSOIL Spongy light orangish brown fibrous PEAT with medium roots (2.0-5.0mm).		
1.00	D2				233.34	0.90		Stiff dark brown organic CLAY with rootlets.		
					233.14	1.10		End of Borehole at 1.10m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA134

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.40	Coordinates 593872.07 E 840655.03 N	Final Depth: 0.40 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 239.37 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				239.27	0.10		TOPSOIL		
						238.97		Spongy dark brown amorphous PEAT with medium roots (2.0-5.0mm).		
								End of Borehole at 0.40m		

Water Strikes				Casing Details		Remarks Peat probe refused at 0.40m.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Probe refused 0.40m.						
Last Updated 06/12/2024						



CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA135

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.60	Coordinates 592678.53 E 843264.41 N	Final Depth: 0.60 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 348.05 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20	D1				347.95	0.10		TOPSOIL		
0.50	D2				347.45	0.60		Stiff grey sandy CLAY with rootlets. Sand is fine to coarse.		
								End of Borehole at 0.60m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal on dense roots.						
						Last Updated 06/12/2024





CAUSEWAY
— GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Client: Tobin

Client's Rep: N/A

Borehole ID
GA136

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.20	Coordinates 593883.47 E 840672.73 N	Final Depth: 0.20 m	Start Date: 18/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 240.65 mOD	End Date: 18/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					240.45	0.20		TOPSOIL		
								End of Borehole at 0.20m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA137

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.80	Coordinates 593042.37 E 841598.34 N	Final Depth: 0.80 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 280.06 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1				279.96	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
0.80	D2				279.56	0.50		Very stiff dark grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
					279.26	0.80		End of Borehole at 0.80m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal of auger. Heard grinding sound at base of hole. Tried alternate location with no success.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA138

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.80	Coordinates 593333.13 E 841482.97 N	Final Depth: 0.80 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 283.77 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1				283.67	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with medium roots (2.0-5.0mm).		
0.70	D2				283.07 282.97	0.70 0.80		Light brown slightly clayey fine to coarse SAND. End of Borehole at 0.80m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Difficult access due to very steep boggy ground and thick brush.
Termination Reason						Last Updated
Terminated at refusal on possible cobbles. Moved few metres for same result.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA139

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.50	Coordinates 593005.62 E 841546.52 N	Final Depth: 1.50 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 272.07 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				271.97	0.10		TOPSOIL Firm dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.50	D2				270.57	1.50		End of Borehole at 1.50m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Couldn't push auger further at 1.5m. Followed on with peat probe to 2.20m.
Termination Reason						
Continued by peat probe to 2.20m.						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA140

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.00	Coordinates 593560.84 E 841537.02 N	Final Depth: 1.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 317.33 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				317.23	0.10		TOPSOIL Firm dark brown slightly sandy organic CLAY. Sand is fine to coarse.		
					316.33	1.00		End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Slow access due to steep boggy ground and fallen trees.
						Termination Reason Terminated at refusal of sampler on possible dense roots. Tried adjacent site with same result.
						Last Updated 06/12/2024





CAUSEWAY
GEOTECH

Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA141

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 2.00	Coordinates 593724.80 E 841587.66 N	Final Depth: 2.00 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 338.95 mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.00	D1				338.85	0.10		TOPSOIL Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
2.00	D2				336.95	2.00		End of Borehole at 2.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Peat probe pushed to 2.30m
Termination Reason Continued by peat probe to 2.30m.						
						Last Updated 06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA142

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.10	Coordinates 592132.43 E 843420.49 N	Final Depth: 1.10 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.50	D1					0.10		TOPSOIL Firm light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.90	D2					0.60		Spongy dark brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm).		
1.10	D3					1.00 1.10		Very stiff dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. End of Borehole at 1.10m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 303m.
Termination Reason						Last Updated
Terminated at refusal of sampler.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA143

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 1.40	Coordinates 593156.13 E 841485.36 N	Final Depth: 1.40 m	Start Date: 17/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: mOD	End Date: 17/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.60	D1					0.10		TOPSOIL Stiff dark greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
1.00	D2					1.00		Stiff dark grey slightly sandy CLAY with rootlets. Sand is fine to coarse.		
1.40	D3					1.40		End of Borehole at 1.40m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
						Coordinates approximate. Elevation approx 260m.
Termination Reason						Last Updated
Terminated at refusal of auger. Tried adjacent position with no success.						06/12/2024





Project No.
24-0430

Project Name: Lissinagroagh, Leitrim

Borehole ID
GA281

Client: Tobin

Client's Rep: N/A

Method Hand Augering	Plant Used Hand Auger	Top (m) 0.00	Base (m) 0.30	Coordinates 592181.61 E 842869.99 N	Final Depth: 0.30 m	Start Date: 16/09/2024	Driller: IC	Sheet 1 of 1 Scale: 1:50
					Elevation: 344.66 mOD	End Date: 16/09/2024	Logger: EL	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				344.46 344.36	0.20 0.30		TOPSOIL Soft brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. End of Borehole at 0.30m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	
Termination Reason Terminated at refusal on possible shallow rock/cobbles.						
						Last Updated 06/12/2024



APPENDIX G – GEOTECHNICAL LABORATORY TEST RESULTS





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— GEOTECH

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Company Number: 633786

www.causewaygeotech.com

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

12 November
2024

Project Name:	Lissinagroagh, Leitrim
Project No.:	24-0430
Client:	Tobin

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 15/10/2024 and 12/11/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



Project Name: Lissinagroagh, Leitrim

Report Reference: Schedule 1

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	<i>BS 1377-2: 2022: Cl 4</i>	29

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 (<i>UKAS 2139</i>)	Organic Matter Content	<i>Documented In-House Method No DETSC 2002 based on BS 1377: Part 3:1990</i>	2


Summary of Classification Test Results

Project No. 24-0430	Project Name Lissinagroagh, Leitrim
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Hole No.	Sample				Specimen Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
GA101	1	0.20		D	Dark brown fibrous PEAT.			259						
GA102	2	1.00		D	Greyish brown sandy clayey SILT.			52						
GA103	1	0.50		D	Greyish brown sandy clayey SILT.			70						
GA104	2	1.00		D	Dark brown fibrous PEAT.			228						
GA106	2	1.50		D	Greyish brown sandy clayey SILT.			49						
GA110	1	0.50		D	Dark brown fibrous PEAT.			171						
GA110	2	1.00		D	Dark brown pseudo fibrous PEAT.			247						
GA110	3	1.90		D	Grey slightly sandy clayey SILT.			78						
GA111	2	2.00		D	Dark brown pseudo fibrous PEAT.			550						
GA112	1	1.00		D	Dark brown fibrous PEAT.			389						
GA113	2	1.90		D	Brown pseudo fibrous PEAT.			665						
GA116	2	0.80		D	Brown sandy clayey SILT.			26						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 1

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 11/12/2024 00:00	Approved By Stephen Watson	 10122
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Summary of Classification Test Results

Project No. 24-0430	Project Name Lissinagroagh, Leitrim
------------------------	--

Hole No.	Sample				Specimen Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
GA118	2	1.00		D	Brown sandy clayey SILT.			81						
GA118	3	2.00		D	Brown sandy clayey SILT.			73						
GA121	2	0.50		D	Greyish brown sandy clayey SILT.			38						
GA123	1	1.00		D	Dark brown pseudo fibrous PEAT.			331						
GA123	3	1.80		D	Dark brown pseudo fibrous PEAT.			401						
GA128	2	1.00		D	Dark brown pseudo fibrous PEAT.			147						
GA128	3	1.80		D	Bronsih grey sandy clayey SILT.			46						
GA129	1	1.00		D	Dark brown pseudo fibrous PEAT.			339						
GA131	1	1.00		D	Brown sandy clayey SILT.			43						
GA131	2	1.40		D	Brown sandy clayey SILT.			54						
GA135	2	0.50		D	Grey slightly sandy clayey SILT.			47						
GA138	1	0.50		D	Dark brown fibous PEAT.			264						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 1


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 11/12/2024 00:00	Approved By Stephen Watson	 10122
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Summary of Classification Test Results

Project No. 24-0430	Project Name Lissinagroagh, Leitrim
------------------------	--

Hole No.	Sample				Specimen Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
GA139	2	1.50		D	Dark brown pseudo fibrous PEAT.			265						
GA141	2	2.00		D	Dark brown pseudo fibrous PEAT.			93						
GA142	3	1.10		D	Dark brown sandy clayey SILT.			49						
GA143	2	1.00		D	Dark brown sandy clayey SILT.			43						
GA143	3	1.40		D	Dark brown sandy clayey SILT.			41						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise LAB 26R - Version 1

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 11/12/2024 00:00	Approved By Stephen Watson	 10122
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DETS

Certificate of Analysis

Certificate Number 24-23929

Issued: 11-Nov-24

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

Our Reference 24-23929

Client Reference ~ 24-0430

Order No ~ (not supplied)

Contract Title ~ Lissinagroagh, Leitrim

Description 2 Soil samples.

Date Received 06-Nov-24

Date Started 06-Nov-24

Date Completed 11-Nov-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

Normec DETS Limited

Unit 2, Park Road Industrial Estate South, Consett, Co Durham, DH8 5PY

Symbol key at end of report Tel: 01207 582333 • email: info@dets.co.uk • www.dets.co.uk

Page 1 of 3

Summary of Chemical Analysis

Soil Samples

Our Ref 24-23929

Client Ref ~ 24-0430

Contract Title ~ Lissinagroagh, Leitrim

Lab No	2419682	2419683
Sample ID ~	GA110	GA131
Depth ~	0.50	1.00
Other ID ~	1	1
Sample Type ~	D	D
Sampling Date ~	05/11/2024	05/11/2024
Sampling Time ~	n/s	n/s

Test	Method	LOD	Units		
Inorganics					
Organic matter	DETSC 2002#	0.1	%	15	1.3

Information in Support of the Analytical Results

Our Ref 24-23929
 Client Ref ~ 24-0430
 Contract ~ Lissinagroagh, Leitrim

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2419682	GA110 0.50 SOIL	05/11/24	PT 500ml		
2419683	GA131 1.00 SOIL	05/11/24	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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**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

3 February 2025

Project Name:	Lissinagroagh, Leitrim
Project No.:	24-0430
Client:	Tobin

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 17/01/2025 and 03/02/2025.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



Project Name: Lissinagroagh, Leitrim

Report Reference: Schedule 1

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	<i>BS 1377-2: 2022: Cl 4</i>	9
SOIL	Liquid and Plastic Limits of soil-4-point cone penetrometer method	<i>BS 1377-2: 2022: Cl 5.2</i>	6
SOIL	Particle density by Gas jar method	<i>BS 1377-2: 2022: Cl 9.2</i>	1
SOIL	Particle size distribution - wet sieving	<i>BS 1377-2: 2022: Cl 10</i>	5
SOIL	Particle size distribution - sedimentation hydrometer method	<i>BS 1377-2: 2022: Cl 10</i>	4


Summary of Classification Test Results

Project No. 24-0430	Project Name Lissinagroagh, Leitrim
------------------------	--

Hole No.	Sample				Specimen Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
BH001	11	1.20		D	Grey slightly sandy clayey subangular fine to coarse GRAVEL.			10.4						
BH001	2	2.00	2.50	B	Brown slightly sandy very clayey subangular fine to coarse GRAVEL.			11.6	54	30	16	14	2.65-gj	CL
TP244	2	0.30		B	Brownish black fibrous PEAT.			618						
TP245	4	0.70		B	Brown sandy slightly gravelly clayey SILT.			26.2	70	24	19	5		ML
TP245	6	1.40		B	Brown sandy slightly gravelly silty CLAY.			13.6	71	27	15	12		CL
TP246	1	0.40		D	Grey sandy slightly gravelly silty CLAY.			11.2	77	30	4	26		CL
TP246	3	1.00		B	Grey sandy slightly gravelly silty CLAY.			14.7						
TP246	4	1.80		B	Grey sandy slightly gravelly silty CLAY.			14.8	75	29	15	14		CL
TP246	7	3.10		D	Brown sandy slightly gravelly silty CLAY.			11	74	32	17	15		CL

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 2

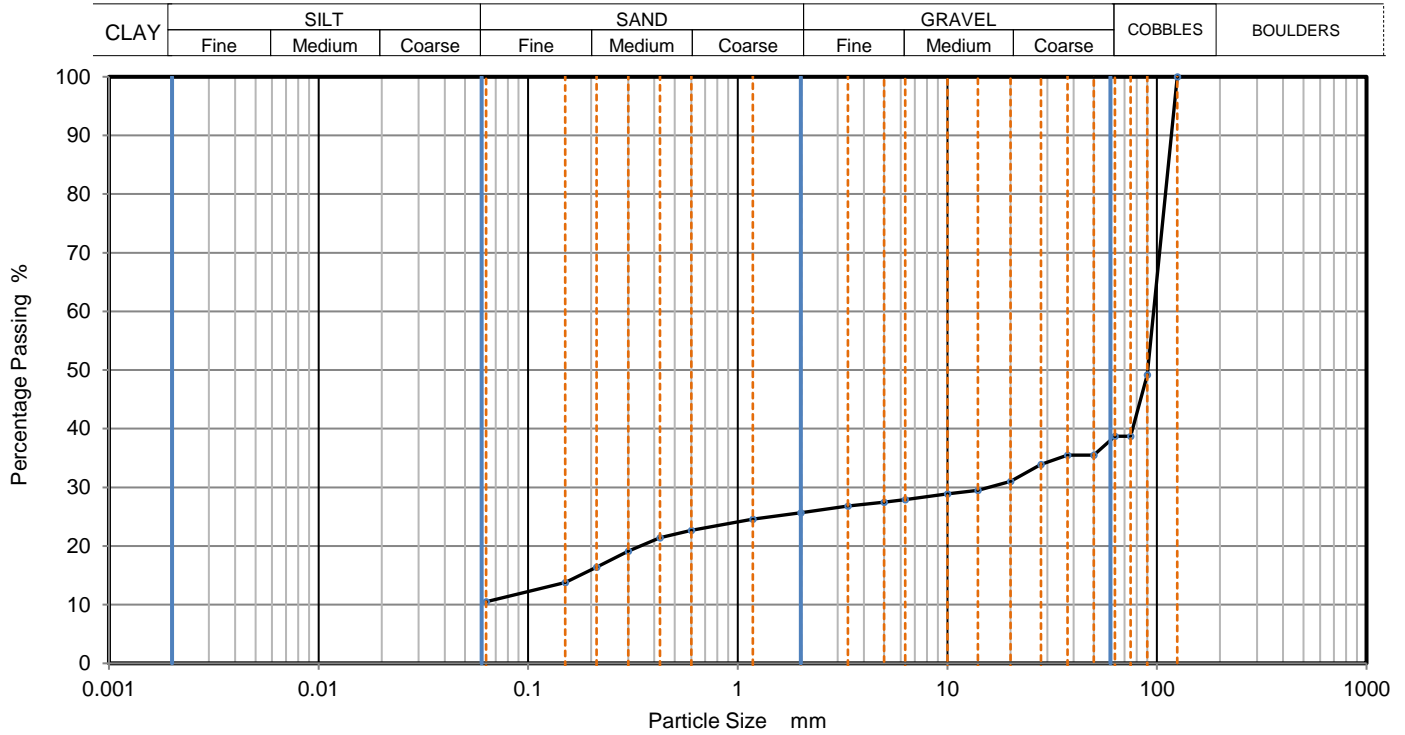
Key Density test Liquid Limit Particle density Linear measurement unless : 4pt cone unless : sp - small pyknometer wd - water displacement cas - Casagrande method gj - gas jar wi - immersion in water 1pt - single point test	Date Printed 02/03/2025 00:00	Approved By Stephen Watson	 10122
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PARTICLE SIZE DISTRIBUTION

Job Ref	24-0430
Borehole/Pit No.	BH001
Sample No.	3
Sample Depth (m)	Top 3.50
	Base 4.00
Sample Type	B
KeyLAB ID	Caus202412172

Site Name	Lissinagroagh, Leitrim		
Specimen Description	Grey COBBLES with grey slightly sandy slightly clayey subangular fine to coarse gravel.		
Specimen Reference	2	Specimen Depth	3.5 m
Test Method	BS1377-2:2022 Clause 10		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	49		
75	39		
63	39		
50	36		
37.5	36		
28	34		
20	31		
14	30		
10	29		
6.3	28		
5	28		
3.35	27		
2	26		
1.18	25		
0.6	23		
0.425	21		
0.3	19		
0.212	16		
0.15	14		
0.063	11		

Dry Mass of sample, g 6775

Sample Proportions	% dry mass
Cobbles	61.3
Gravel	13.0
Sand	15.2
Fines <0.063mm	11.0

Grading Analysis		
D100	mm	125
D60	mm	96.5
D30	mm	15.8
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

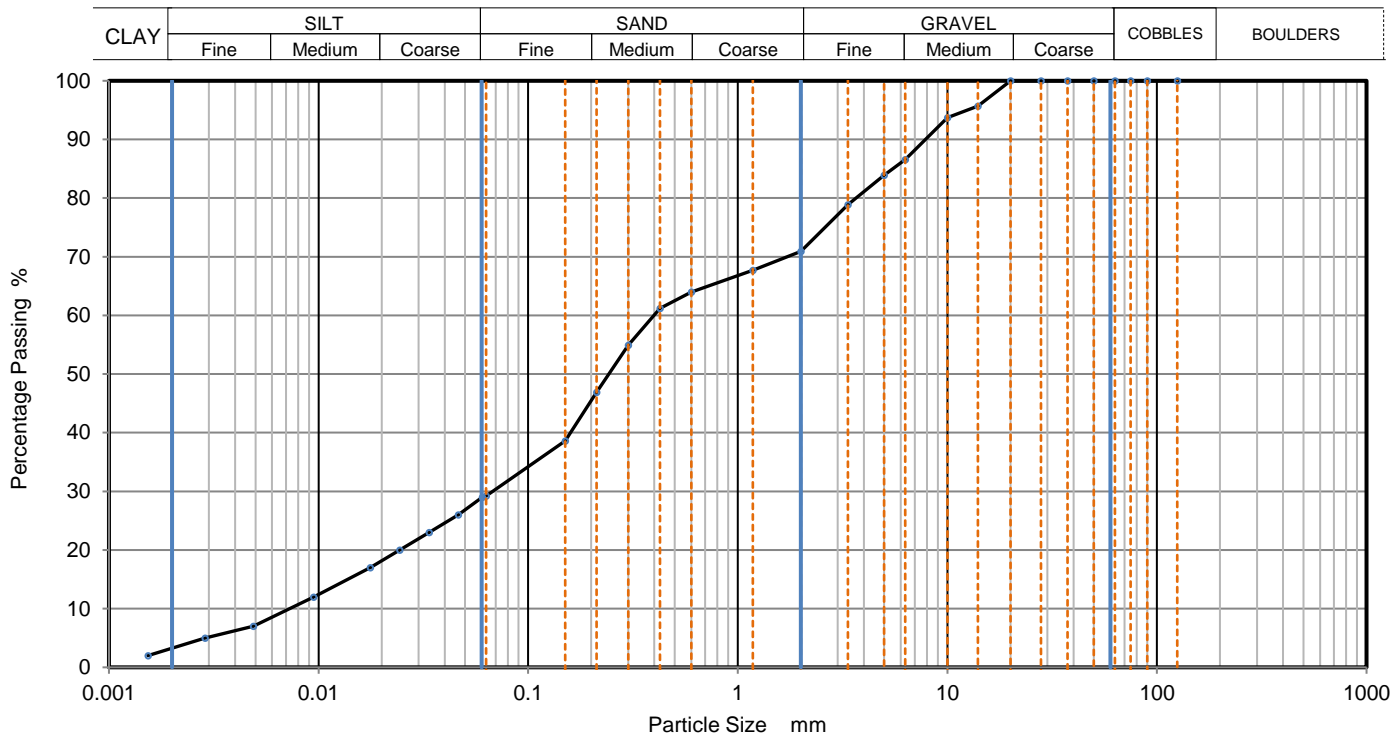




PARTICLE SIZE DISTRIBUTION

Job Ref	24-0430
Borehole/Pit No.	TP245
Sample No.	3
Sample Depth (m)	Top 0.50
	Base
Sample Type	D
KeyLAB ID	Caus202412174

Site Name	Lissinagroagh, Leitrim		
Specimen Description	Brown sandy slightly gravelly clayey SILT.		
Specimen Reference	3	Specimen Depth	0.5 m
Test Method	BS1377-2:2022 Clause 10		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06050	29
90	100	0.04637	26
75	100	0.03373	23
63	100	0.02434	20
50	100	0.01766	17
37.5	100	0.00946	12
28	100	0.00489	7
20	100	0.00287	5
14	96	0.00153	2
10	94		
6.3	87		
5	84		
3.35	79		
2	71		
1.18	68		
0.6	64	Particle density (assumed) 2.65 Mg/m3	
0.425	61		
0.3	55		
0.212	47		
0.15	39		
0.063	29		

Dry Mass of sample, g	320
-----------------------	-----

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.1
Sand	41.7
Silt	25.7
Clay	3.5

Grading Analysis	
D100	mm
D60	mm 0.399
D30	mm 0.068
D10	mm 0.00705
Uniformity Coefficient	57
Curvature Coefficient	1.6

Remarks
Preparation and testing in accordance with ISO 17892-4:2016

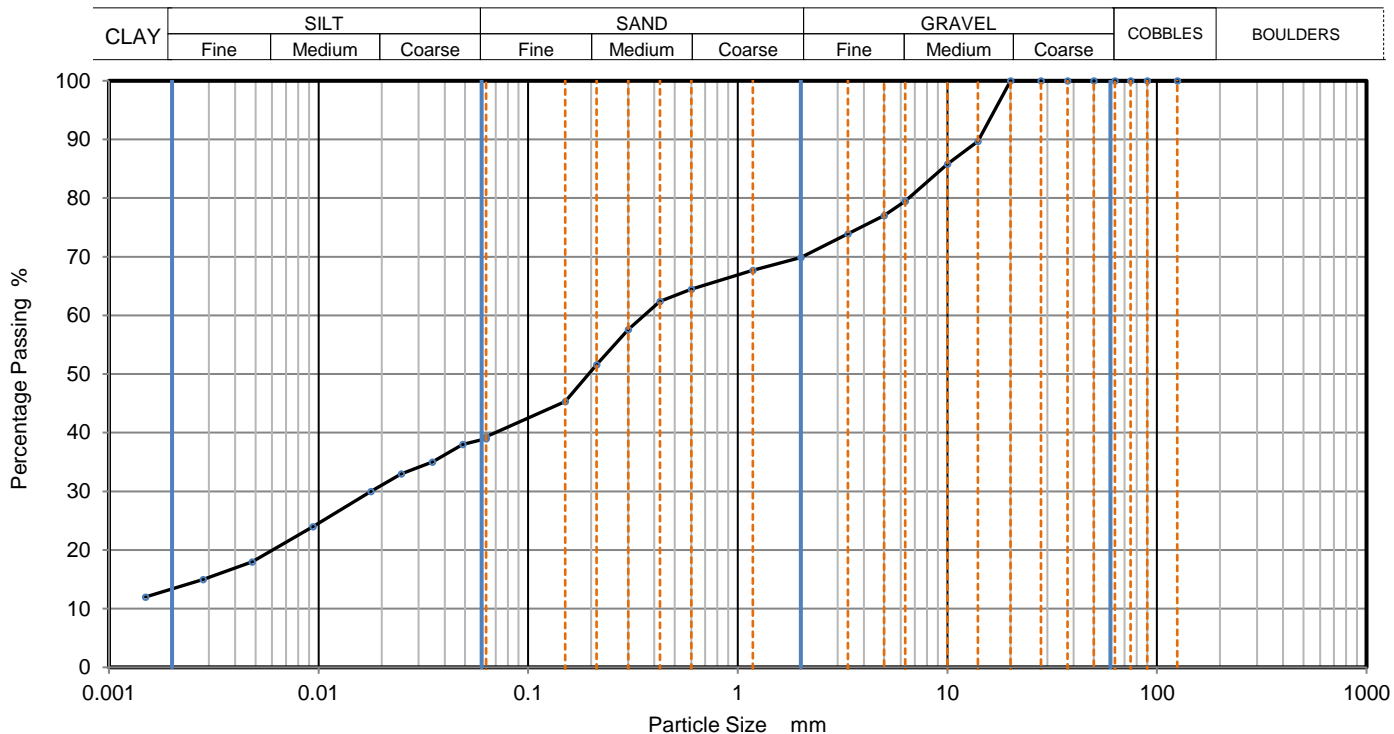
Approved
Stephen Watson





PARTICLE SIZE DISTRIBUTION

Job Ref	24-0430
Borehole/Pit No.	TP245
Sample No.	8
Sample Depth (m)	Top 2.60
	Base
Sample Type	B
KeyLAB ID	Caus202412177



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	39
90	100	0.04869	38
75	100	0.03488	35
63	100	0.02482	33
50	100	0.01778	30
37.5	100	0.00940	24
28	100	0.00481	18
20	100	0.00281	15
14	90	0.00149	12
10	86		
6.3	80		
5	77		
3.35	74		
2	70		
1.18	68		
0.6	65		
0.425	62	Particle density (assumed) 2.65 Mg/m3	
0.3	58		
0.212	52		
0.15	45		
0.063	39		

Dry Mass of sample, g 385

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	30.1
Sand	30.7
Silt	25.7
Clay	13.5

Grading Analysis	
D100	mm
D60	mm 0.358
D30	mm 0.0173
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

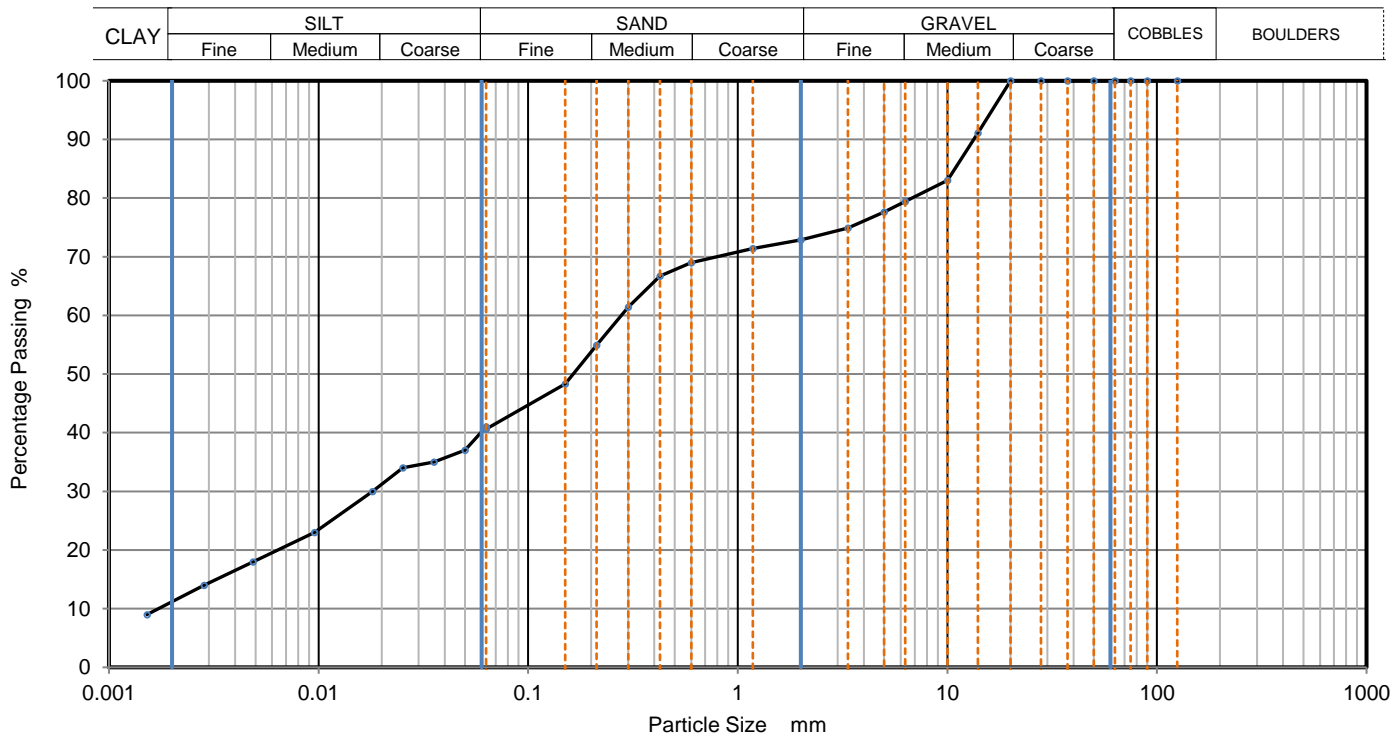




PARTICLE SIZE DISTRIBUTION

Job Ref	24-0430
Borehole/Pit No.	TP246
Sample No.	6
Sample Depth (m)	Top 2.00
	Base
Sample Type	D
KeyLAB ID	Caus2024121711

Site Name	Lissinagroagh, Leitrim		
Specimen Description	Brown sandy slightly gravelly silty CLAY.		
Specimen Reference	3	Specimen Depth	2 m
Test Method	BS1377-2:2022 Clause 10		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	41
90	100	0.04996	37
75	100	0.03555	35
63	100	0.02529	34
50	100	0.01810	30
37.5	100	0.00957	23
28	100	0.00487	18
20	100	0.00284	14
14	91	0.00152	9
10	83		
6.3	79		
5	78		
3.35	75		
2	73		
1.18	71		
0.6	69	Particle density (assumed) 2.65 Mg/m3	
0.425	67		
0.3	61		
0.212	55		
0.15	48		
0.063	41		

Dry Mass of sample, g	350
Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.1
Sand	32.3
Silt	29.4
Clay	11.2
Grading Analysis	
D100	mm
D60	mm 0.278
D30	mm 0.0181
D10	mm 0.00175
Uniformity Coefficient	160
Curvature Coefficient	0.67

Remarks
Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson





PARTICLE SIZE DISTRIBUTION

Job Ref **24-0430**

Borehole/Pit No. **TP246**

Site Name **Lissinagroagh, Leitrim**

Sample No. **5**

Specimen Description **Brown sandy slightly gravelly silty CLAY.**

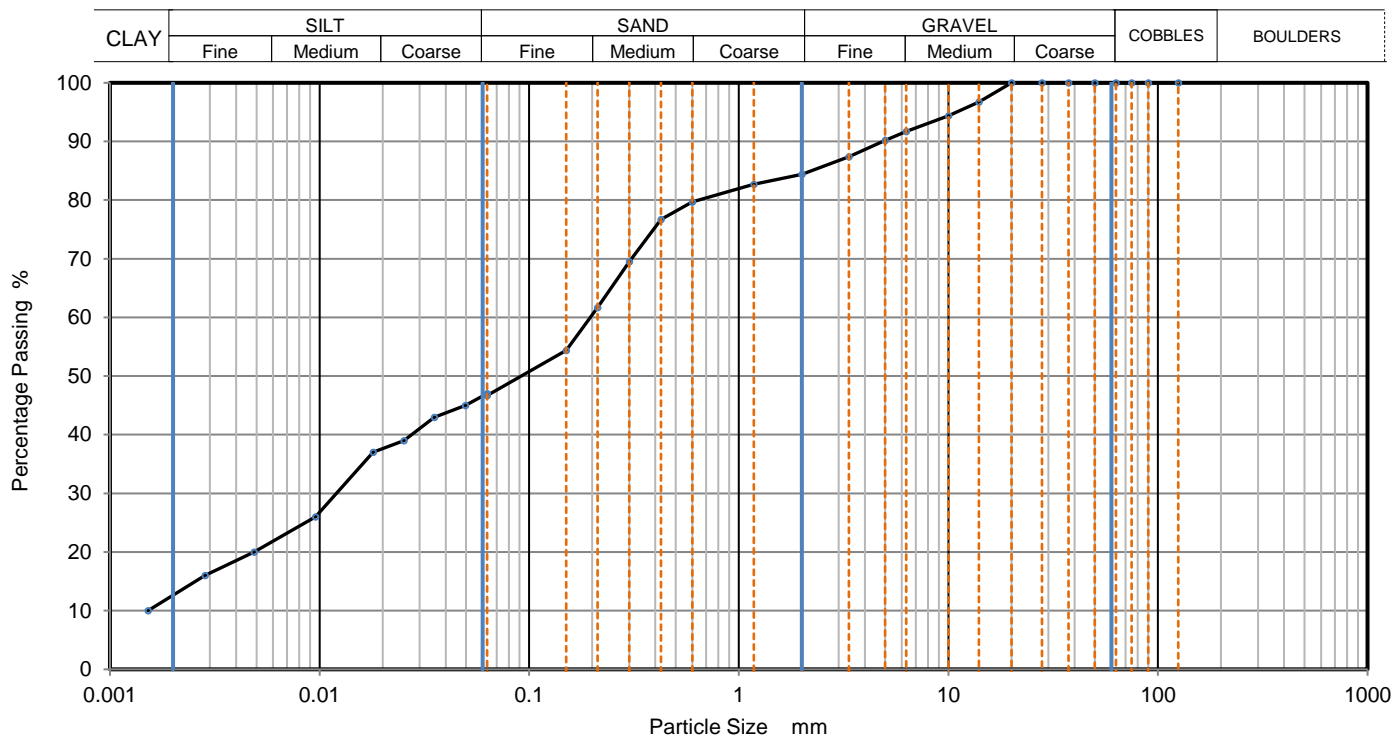
Sample Depth (m)	Top	2.80
	Base	

Specimen Reference	3	Specimen Depth	2.8	m
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Sample Type **B**

Test Method **BS1377-2:2022 Clause 10**

KeyLAB ID **Caus2024121712**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	47
90	100	0.04965	45
75	100	0.03533	43
63	100	0.02529	39
50	100	0.01800	37
37.5	100	0.00957	26
28	100	0.00487	20
20	100	0.00284	16
14	97	0.00152	10
10	94		
6.3	92		
5	90		
3.35	87		
2	84		
1.18	83		
0.6	80	Particle density (assumed)	
0.425	77	2.65	Mg/m3
0.3	70		
0.212	62		
0.15	54		
0.063	47		

Dry Mass of sample, g **360**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	15.6
Sand	37.7
Silt	33.9
Clay	12.8

Grading Analysis	
D100	mm
D60	mm 0.196
D30	mm 0.012
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with ISO 17892-4:2016

Approved

Stephen Watson





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Registered in Ireland.
Company Number: 633786

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

25 November
2024

Project Name:	Lissinagroagh, Leitrim
Project No.:	24-0430
Client:	Tobin

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 22/11/2024 and 25/11/2024.

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

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

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



Project Name: Lissinagroagh, Leitrim

Report Reference: Rock Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report. 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	<i>ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985</i>	6
ROCK	Uniaxial Compressive Strength (UCS)	<i>The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson</i>	1



UNIAXIAL COMPRESSIVE STRENGTH
ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

Site Name	Lissinagroagh, Leitrim		Project number	24-0430	
Sample Description	LIMESTONE		Location ID	BH001	
Sample Type	C	Sample number	8	Top Depth	7.20
Date of sampling	NOT KNOWN	Date of receipt	25/11/2024	Base Depth	7.50
Test Method	International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p153, part 1		Keylab ID	Caus2024112221	

Specimen Details

Test number	1	
Diameter	82.5	mm
Height	173.9	mm
Water Content	0.3	%
Sample Mass	2580	g
Bulk Density	2.78	Mg/m3
Dry Density	2.77	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	22/11/2024	
Test Duration	31.0	Secs
Orientation of sample	VERTICAL	
Rate of Strain	0.75	MPa/s
Strain at Failure	345.0	kN
Unconfined Compressive Strength	64.50	MPa
Mode of failure	FRAGMENTED	

Test Remarks

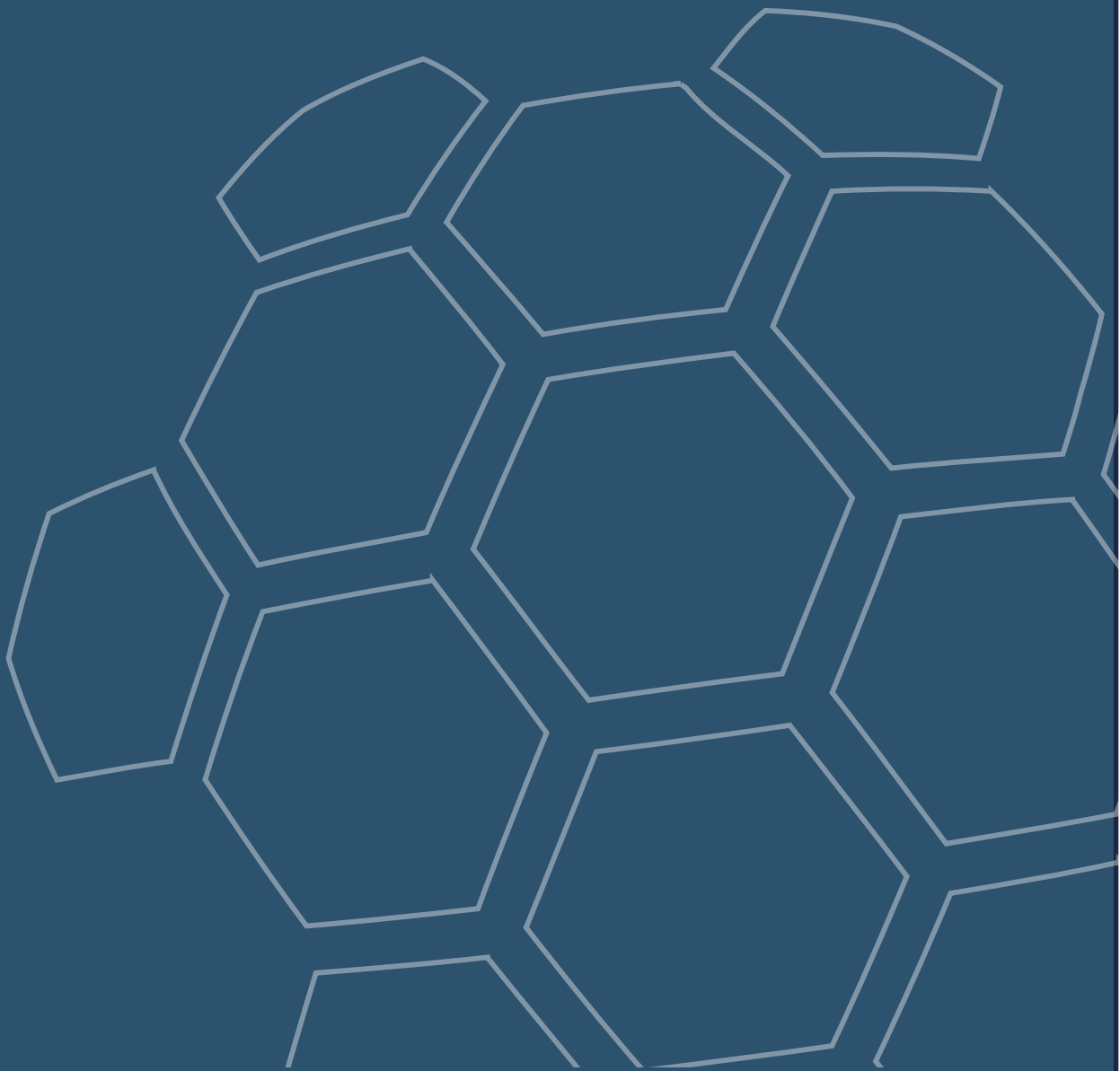
Approved

Stephen Watson



10122

APPENDIX H – GEOPHYSICAL SURVEY REPORT



AGP24088_02

**REPORT
ON THE
GEOPHYSICAL INVESTIGATION
AT
LISSINAGROAGH WIND FARM
CO. LEITRIM,
FOR
CAUSEWAY GEOTECH LIMITED**



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13TH DECEMBER 2024

PRIVATE AND CONFIDENTIAL

THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOPHYSICS LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGP24088		
AUTHOR	CHECKED	REPORT STATUS	DATE
SEBASTIAN CORRALES B.SC. (GEOPHYSICS)	TONY LOMBARD M.SC. (GEOPHYSICS)	V.01	25 TH OCTOBER 2024
SEBASTIAN CORRALES B.SC. (GEOPHYSICS)	TONY LOMBARD M.SC. (GEOPHYSICS)	V.02	13 TH DECEMBER 2024

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2.2.2	Geology	4
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1. EXECUTIVE SUMMARY

APEX Geophysics Limited was requested by Causeway Geotech Limited to carry out a geophysical investigation within the site of the proposed Lissinagroagh Wind Farm in County Leitrim. The purpose of the geophysical investigation is to assess subsoil conditions at a proposed turbine base.

The objectives of the geophysical investigation were to estimate the overburden stiffness, type and thickness, assess the depth to, type of and weathering of bedrock, identify any potential fault/fissure zones within the bedrock and propose direct investigation locations.

The site is situated on a hillside, approximately 5.0 km northeast of Manorhamilton town, Co. Leitrim. The site consists of open ground and is located around 120 m from the access road to the west. The ground rises from 326.4 mOD in the northwest to 347.1 mOD in the southeast.

The Geological Survey of Ireland (GSI) Quaternary sediments and bedrock maps indicates blanket peat across the site, underlain by mudbank limestone.

The survey was carried out on the 7th of October 2024 and involved the collection of an ERT profile, seismic refraction profiles with a 1D MASW sounding acquired at the centre of each seismic refraction profile and soft ground probing along the ERT profile. In December 2024 additional direct investigation was provided for inclusion in this final report.

The results of the combined geophysical and direct investigation data have interpreted as follows:

- **Layer 1:** consists of soft sandy gravelly clay, which is 0.6 to 1.1 m thick (average 0.7m), with a possible 'pocket' of peat.
- **Layer 2:** consists of firm to stiff sandy gravelly clay which is 0.6 to 3.0 m thick (average 2.0 m). This layer is thickest towards the centre of the ERT profile.
- The seismic velocities indicate some completely to highly weathered rock may be present towards the base of layers 1 and 2.
- **Layer 3:** consists of dense clayey sand/gravel and/or moderately weathered/fractured limestone which is 0.2m to 3.9 m thick (average 2.1 m). Depth to the top of this layer ranges from 0.6 to 4.0 m bgl (average 2.1 m bgl).
- **Layer 4:** consists of slightly weathered/fractured to fresh limestone. Depth to the top of this layer ranges from 2.7 m bgl in the northwest to 4.8 m bgl to the southeast (average 3.8m bgl).

The seismic velocities indicate that any moderately weathered/fractured rock will be marginally rippable to requiring breaking/blasting if within proposed construction depth. Slightly weathered/fractured to fresh rock will require breaking/blasting.

Where bedrock excavation is proposed, a detailed assessment of excavatability should be carried out combining the results of the geophysical survey, any rotary core drilling, strength testing and trial excavation pits using a high-powered excavator of similar rating to that to be used during construction. Trial excavations should be attempted down to formation level.

The findings of the geophysical investigation should be reviewed following any further direct investigation.

2. INTRODUCTION

APEX Geophysics Limited was requested by Causeway Geotech Limited to carry out a geophysical investigation within the site of the proposed Lissinagroagh Wind Farm in County Leitrim. The purpose of the geophysical investigation is to assess subsoil conditions at one proposed turbine base.

2.1 Survey Objectives

The objectives of the geophysical investigation were to provide information on:

- Soil stiffness, type and thickness
- Depth to bedrock
- Type of bedrock
- Weathering and excavatability of bedrock
- Potential faults / fissure zones
- Propose direct investigation locations

2.2 Site Background

The site is situated on a hillside, approximately 5.0 km northeast of Manorhamilton town, Co. Leitrim. The site consists of open ground and is located around 120 m from the access road to the west (Fig.2.1a). The ground rises from 326.4 mOD in the northwest to 347.1 mOD in the southeast (Fig.2.1b). South of the survey area rock is exposed on the hillside (Fig. 2.1c).



Fig 2.1a: Survey location map.



Fig 2.1b: Undulating nature of the survey area, looking north.



Fig 2.1c: rock outcrop south of survey line, looking north.

2.2.1 Soils

The Geological Survey of Ireland (GSI) Quaternary sediments map for the area (Fig. 2.2) indicates blanket peat across the site. Bedrock outcrop or subcrop is indicated to the west of the survey profile while Karstified bedrock outcrop or subcrop is indicated to the northeast of the survey profile.

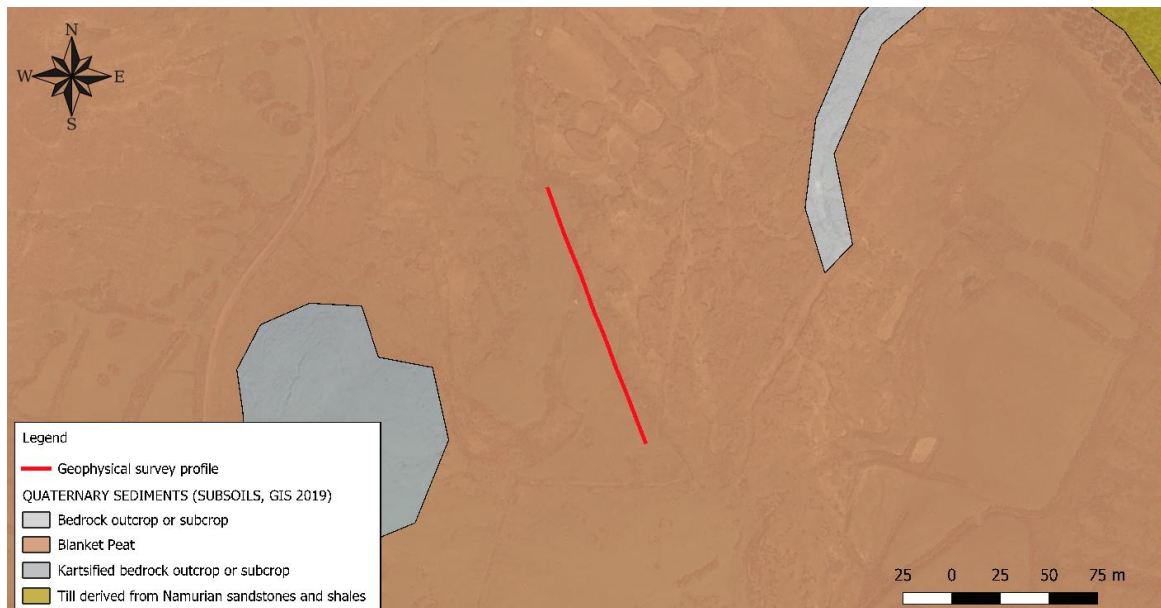


Fig 2.2: GSI soils map.

2.2.2 Geology

The GSI 1:100k Bedrock Geology map (Fig. 2.3) indicates that the survey area is underlain by Mudbank Limestone. Bedrock outcrop is shown to the west and southeast of the survey profile. Faults are indicated to the west and east of the survey profile.

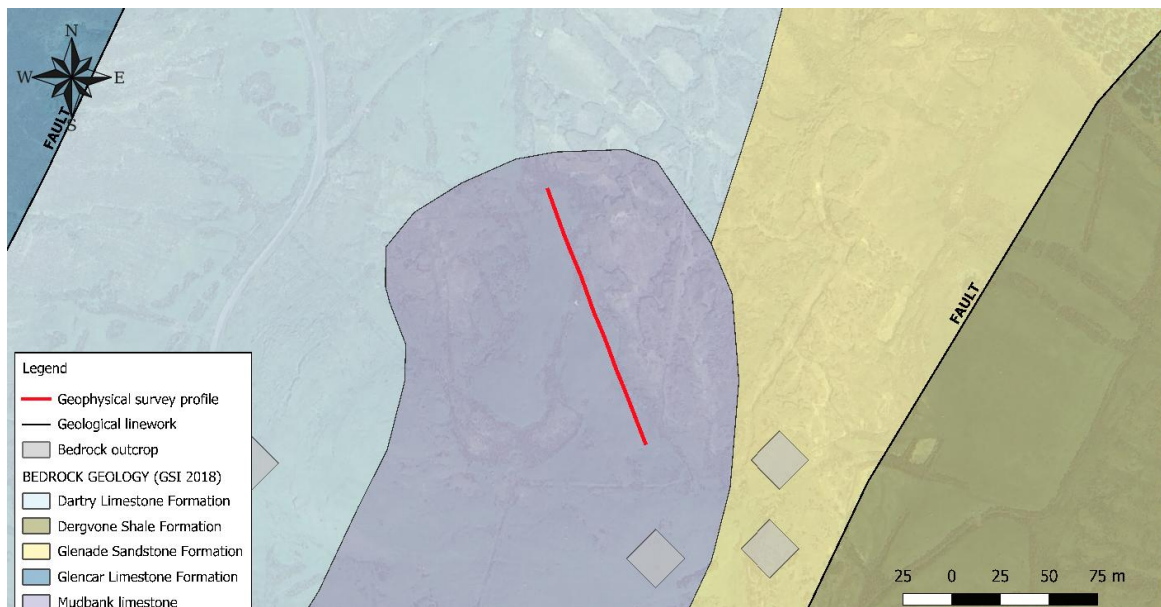


Fig 2.3: GSI bedrock map.

2.2.3 Groundwater Vulnerability

The GSI Groundwater Vulnerability map (Fig. 2.4) indicates that the survey area is in an area of high vulnerability. Rock at or near surface or karst is shown to the southwest and northeast of the survey profile.

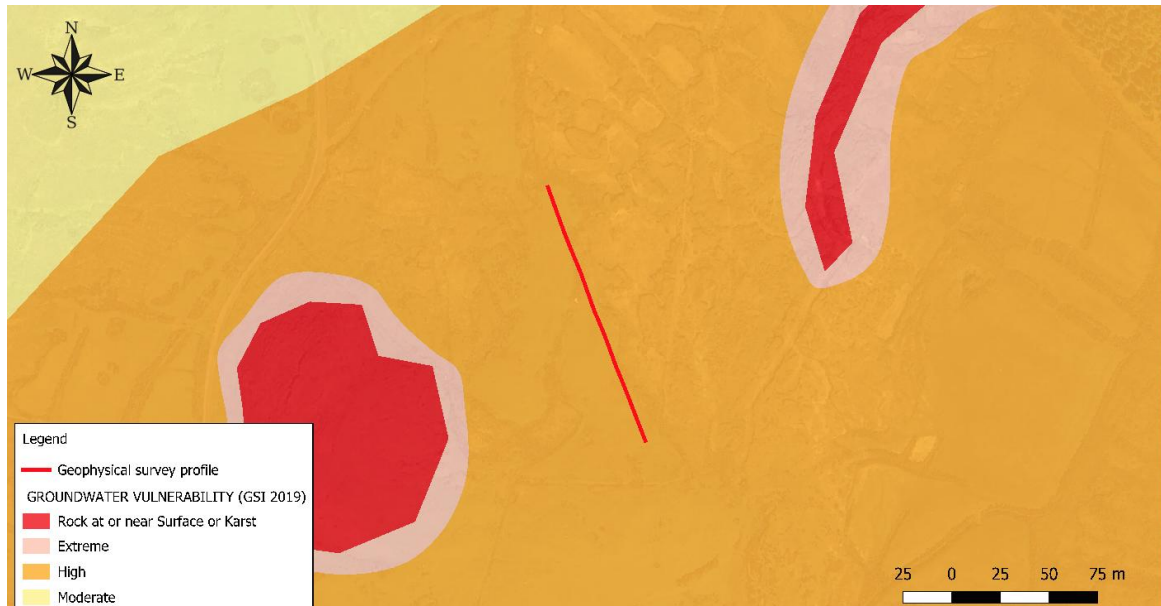


Fig 2.4: GSI groundwater vulnerability map.

2.2.4 Bedrock Aquifers

The bedrock is classified as a 'Regionally important aquifer Karstified (conduit)', (Fig. 2.5).

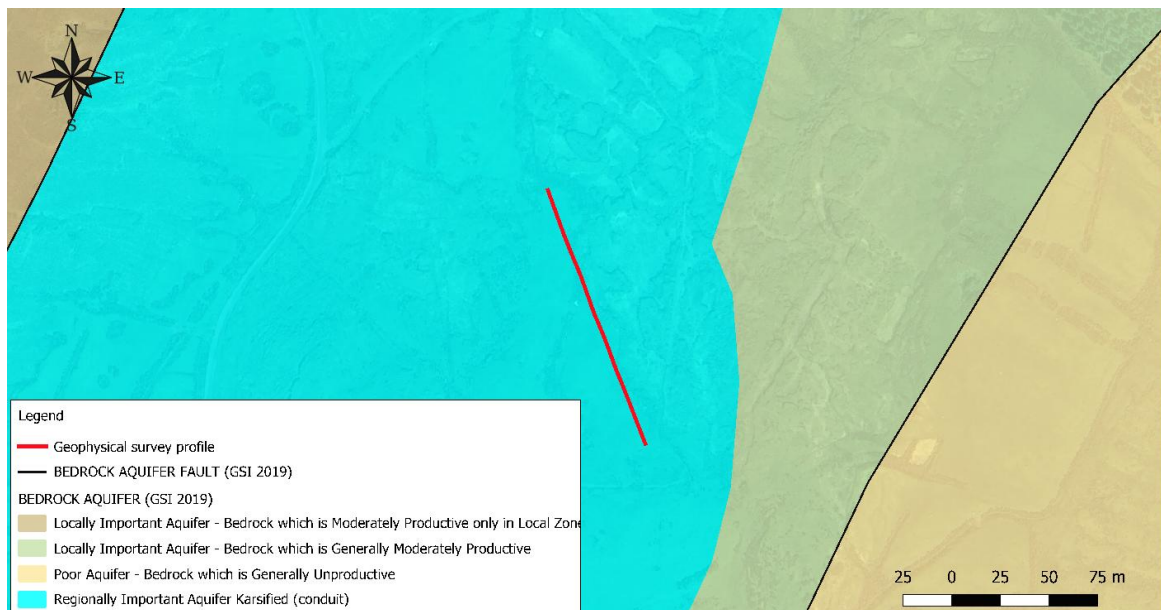


Fig 2.5: GSI bedrock aquifer map.

2.2.5 Historical Geological Mapping

The historical 6-inch map (Fig. 2.6) indicates massively bedded quartzose grits to the north of the survey profile, with a strike orientation of southwest-northeast and a dip of 10 degrees to the southeast. To the south of the survey profile, the map shows limestone (blue area on map) which has a strike of northeast-southwest and a dip of 5 degrees to the southeast. Massive grits, sandstone and black ferruginous shale are also indicated to the southeast of the survey profile.

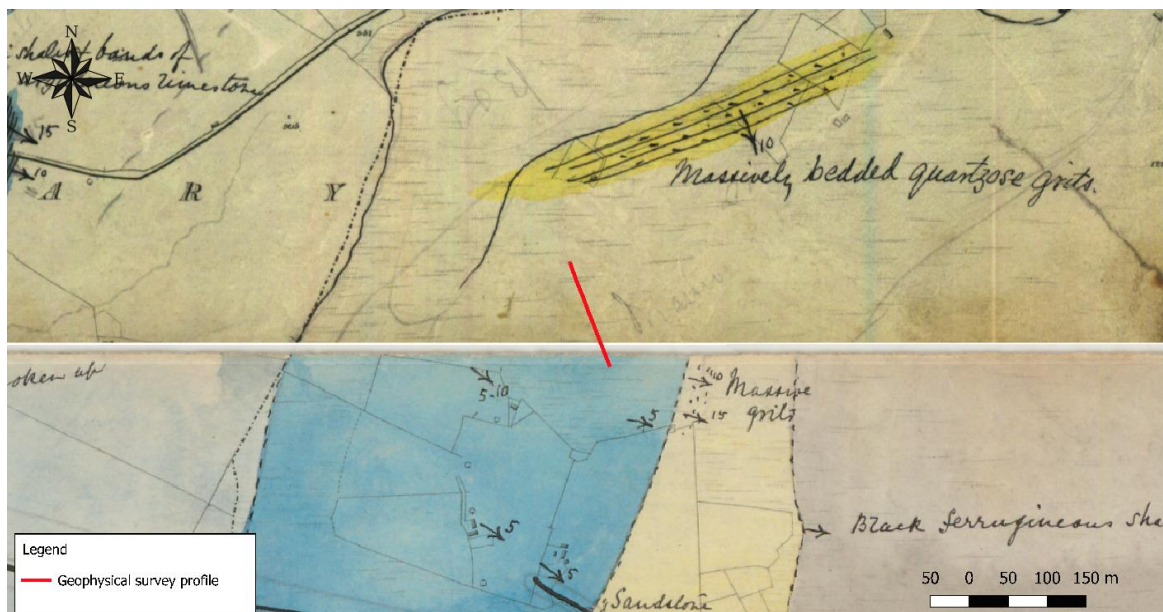


Fig 2.6: Historical 6-inch map.

2.2.6 Direct Investigation

The log for a hand auger, acquired prior to this geophysical investigation was provided by the client. The auger encountered 0.2 m of topsoil over soft sandy gravelly clay. The auger terminated at 0.3 m due to refusal on possible shallow rock/cobbles.

A rotary corehole (BH001) was completed between the 12th and 13th November 2024. The corehole encountered 0.4 m of peat over dense sandy clayey gravel over moderately weathered limestone at 4.0 m bgl over slightly weathered limestone at 5.35 m bgl with termination depth at 10.2 m bgl.

The direct investigation location is shown on Drawing AGP24088_01 (Appendix D).

2.3 Survey Rationale

The investigation consisted of 2D Electrical Resistivity Tomography (ERT), Seismic Refraction profiling and Multi-channel Analysis of Surface Waves (MASW).

ERT images the resistivity of the materials in the subsurface along a profile to produce a cross-section showing the variation in resistivity with depth, depending on the length of the profile. Each cross-section will be interpreted to determine the material type along the profile at increasing depth, based on the typical resistivities returned for Irish ground materials.

Seismic Refraction profiling measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. Readings are taken using geophones connected via multi-core cable to a seismograph. This method should allow us to profile the depth to the top of the bedrock, along profiles across the site.

The **MASW** method is used to estimate shear-wave (S-wave) velocities in the ground material to indicate possible soft zones. Overburden material with an S-wave velocity of <175 m/s is generally classified as soft/loose. The depth of investigation for this method will depend on the source type and geophone spacing. This method may also be used to indicate bedrock depth.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED GEOPHYSICAL METHODOLOGY**.

3. RESULTS

The survey was carried out on the 7th of October 2024 and involved the collection of an ERT profile, 3 seismic refraction profiles with a 1D MASW sounding acquired at the centre of each seismic refraction profile. In addition soft ground probing was also conducted along the ERT profile. The geophysical survey locations are shown on Drawing AGP24048_01 (Appendix D).

3.1 Soft Ground Probing

Soft ground probing was carried out during the geophysical survey at 29 locations along the ERT profile R1 using a series of 1 m long metal rods. The refusal depths vary from 0.1 m to 1.1 m bgl in the centre of the profile and they are plotted on Drawing AGP24088_R1 (Appendix D).

3.2 ERT

The ERT resistivity values have been interpreted in conjunction with the seismic refraction data on the following basis:

Resistivity (Ohm-m)	Interpretation
50-250	PEAT / sandy gravelly SILT/CLAY
	Possible weathered/fractured LIMESTONE
250-500	Clayey SAND/GRAVEL
	Weathered/fractured LIMESTONE
500-3000	LIMESTONE

3.3 Seismic refraction profiling

Three seismic refraction profiles were acquired in line with the ERT profile, and have been interpreted in conjunction with the ERT and direct investigation data, on the following basis:

P-Wave Seismic Velocity (m/s)	Interpretation	Stiffness/Rock Quality	Excavatability
289*	Soils	Soft / Loose	Diggable
941	Soils	Firm / Medium Dense	Diggable
	Possible highly weathered/fractured rock	Very poor	Diggable
1296-1610**	Soils	Stiff / Dense	Diggable
	Moderately weathered/fractured rock	Poor	Marginally rippable to break/blast
3989-4476	Slightly weathered/fractured to fresh rock	Good	Break/Blast

* Completely weathered/fractured rock may be present at the base of this layer.

**It should be noted that the cut-off velocity for excavatability will be lower if excavating in trenches.

3.4 MASW

A 1D MASW sounding was recorded at the centre of each seismic profile. The MASW data was acquired with the aim of resolving a Shear-wave velocity (V_s) profile (indicative of soil stiffness) and deriving a G_{max} profile and other dynamic moduli of the non-peat soil layers. While the data quality was good a satisfactory 'dispersion curve' could not be generated in the processing sequence due to the presence of thin non-peat soils/shallow rock.

3.5 Interpretation

The results of the combined geophysical and direct investigation data are shown on Drawing AGP24088_R1 and have been interpreted as follows:

Layer 1: consists of soft sandy gravelly clay, which is 0.6 to 1.1 m thick (average 0.7m), with a possible 'pocket' of peat.

Layer 2: consists of firm to stiff sandy gravelly clay which is 0.6 to 3.0 m thick (average 2.0 m). This layer is thickest towards the centre of ERT profile R1.

The seismic velocities indicate some completely to highly weathered rock may be present towards the base of layers 1 and 2.

Layer 3: consists of dense clayey sand/gravel and/or moderately weathered/fractured limestone which is 0.2m to 3.9 m thick (average 2.1 m). Depth to the top of this layer ranges from 0.6 to 4.0 m bgl (average 2.1 m bgl).

Layer 4: consists of slightly weathered/fractured to fresh limestone. Depth to the top of this layer ranges from 2.7 m bgl in the northwest to 4.8 m bgl to the southeast (average 3.8m bgl).

While the corehole encountered dense sandy clayey gravel, the velocity of seismic waves (V_p), 1296-1610 m/s, and resistivity values 250-500 Ohm-m indicate this layer may also contain moderately weathered/fractured limestone.

Within the bedrock areas of slightly decreased resistivity values of 500-1,000 Ohm-m may indicate zones of some increased weathering/fracturing.

The seismic velocities indicate that any moderately weathered/fractured rock will be marginally rippable to requiring breaking/blasting if within proposed construction depth. Slightly weathered/fractured to fresh rock will require breaking/blasting.

4. RECOMMENDATIONS

The results of the geophysical investigation should be reviewed based on the findings of any further direct investigation.

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APPENDIX A: DETAILED METHODOLOGY

A combination of geophysical techniques was used to provide a high quality interpretation and reduce any ambiguities, which may otherwise exist.

Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

Principles

This surveying technique makes use of the Gradient resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection

Profiles were recorded using an Abem Terrameter LS resistivity meter, up to three 21 takeout multicore cables and up to 61 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after surveying.

Data Processing

The field readings were stored in computer files and inverted using the RES2DINV package (Geotomo Software, 2006) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Profiles have been contoured using the same contour intervals and colour codes. Distance is indicated along the horizontal axis of the profiles.

P-wave Seismic Refraction Profiling

Principles

This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity (V_p) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher V_p velocities while soft, loose or fractured materials have lower V_p velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection

A Geode high resolution 24 channel digital seismograph, 24 10 Hz vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable (3m spacing). Equipment was carried and operated by a three-people crew.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile (e.g. 69m profile ~ 23m depth).

Shots from seven different positions were taken (2 x off-end, 2 x end, 3 x middle) to ensure optimum coverage of all refractors.

Data Processing

The recorded data was processed and interpreted using the ray-tracing and tomographic inversion methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the SeisImager/2D programme from Geometrics.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The programme includes three methods for data analysis, time-term inversion, the reciprocal method and tomography.

The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method and was then converted to a layer model for display and interpretation.

Approximate errors for Vp velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

Multichannel Analysis of Surface Waves (MASW)

Principles

The Multi-channel Analysis of Surface Waves (MASW) (Park et al., 1998, 1999) utilizes Surface waves (Rayleigh waves) to determine the elastic properties of the shallow subsurface (<15m). Surface waves carry up to two-thirds of the seismic energy but are usually considered as noise in conventional body wave reflection and refraction seismic surveys. The penetration depth of surface waves changes with wavelength, i.e. longer wavelengths penetrate deeper. When the elastic properties of near surface materials vary with depth, surface waves then become dispersive, i.e. propagation velocity changes with frequency. The propagation (or phase) velocity is determined by the average elastic property of the medium within the penetration depth. Therefore, the dispersive nature of surface waves may be used to investigate changes in elastic properties of the shallow subsurface. The MASW method employs multi-channel recording and processing techniques (Sheriff and Geldart, 1982) that have similarities to those used in a seismic reflection survey and which allow better waveform analysis and noise elimination.

To produce a shear wave velocity (Vs) profile and a stiffness profile of the subsurface using Surface waves the following basic procedure is followed:

- (i) A point source (e.g. a sledgehammer) is used to generate vertical ground motions,
- (ii) The ground motions are measured using low frequency geophones, which are disposed along a straight line directed toward the source,
- (iii) the ground motions are recorded using either a conventional seismograph, oscilloscope or spectrum analyzer,

- (iv) a dispersion curve is produced from a spectral analysis of the data showing the variation of Surface wave velocity with wavelength,
- (iv) the dispersion curve is inverted using a modelling and least squares minimization process to produce a subsurface profile of the variation of Surface wave and shear wave velocity with depth.

Data Collection

The recording equipment consisted of a Geode 24 channel digital seismograph, 24 no. 10 Hz vertical geophones, hammer energy source with mounted trigger and a 24 take-out cable.

Data Processing

MASW processing was carried out using the SURFSEIS processing package developed by Kansas Geological Survey (KGS, 2000). SURFSEIS is designed to generate a shear wave (V_s) velocity profile.

SURFSEIS data processing involves three steps:

- (i) Preparation of the acquired multichannel record. This involves converting data file into the processing format.
- (ii) Production of a dispersion curve from a spectral analysis of the data showing the variation of Raleigh wave phase velocity with wavelength. Confidence in the dispersion curve can be estimated through a measure of signal to noise ratio (S/N), which is obtained from a coherency analysis. Noise includes both body waves and higher mode surface waves. To obtain an accurate dispersion curve the spectral content and phase velocity characteristics are examined through an overtone analysis of the data.
- (iii) Inversion of the dispersion curve is then carried out to produce a subsurface profile of the variation of shear wave velocity with depth.

Spatial Relocation

All the geophysical investigation locations were acquired using Trimble Geo 7X high-accuracy GNSS handheld using the settings listed below. This system allows collecting GPS data with c.20mm accuracy.

Coordinate zone:	Irish Transverse Mercator (ITM)
Datum:	IRENET95
Coordinate units:	Meters
Altitude units:	Meters
Survey altitude reference:	MSL
Geoid model:	OSGM15_Malin

APPENDIX B: EXCAVATABILITY

The seismic velocity of a rock formation is related to characteristics of the rock mass which include rock hardness and strength, degree of weathering and discontinuities. Usually, the velocity is just one of several parameters used in the assessment of excavatability. The excavatability of a rock formation is favoured by the following factors:

- Open fractures, faults and other planes of weakness of any kind
- Weathering
- Brittleness and crystalline nature
- High degree of stratification or lamination
- Large grain size
- Low compressive strength

Weaver (1975) presented a comprehensive rippability rating chart (Fig.1) in which the p-wave velocity value and the relevant geological factors could be entered and assigned appropriate weightings. The total weighted index was found to correlate very well with actual rippability.

Fig.1 Rippability Rating Chart

Rock class	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock
Seismic velocity (m/s)	>2150	2150-1850	1850-1500	1500-1200	1200-450
Rating	26	24	20	12	5
Rock hardness	Extremely hard rock	Very hard rock	Hard rock	Soft rock	Very soft rock
Rating	10	5	2	1	0
Rock weathering	Unweathered	Slightly weathered	Weathered	Highly weathered	Completely weathered
Rating	9	7	5	3	1
Joint spacing (mm)	>3000	3000-1000	1000-300	300-50	<50
Rating	30	25	20	10	5
Joint continuity	Non continuous	Slightly continuous	Continuous- no gouge	Continuous- some gouge	Continuous- with gouge
Rating	5	5	3	0	0
Joint gouge	No separation	Slight separation	Separation <1mm	Gouge <5mm	Gouge >5mm
Rating	5	5	4	3	1
Strike and dip orientation	Very unfavourable	Unfavourable	Slightly unfavourable	Favourable	Very favourable
Rating	15	13	10	5	3
Total rating	100-90	90-70*	70-50	50-25	<25
Rippability assessment	Blasting	Extremely hard ripping and blasting	Very hard ripping	Hard ripping	Easy ripping
Tractor horsepower		770/385	385/270	270/180	180
Tractor kilowatts		575/290	290/200	200/135	135

APPENDIX C: SEISMIC REFRACTION DATA

The tomographic inversion results for the seismic refraction spreads are shown below:

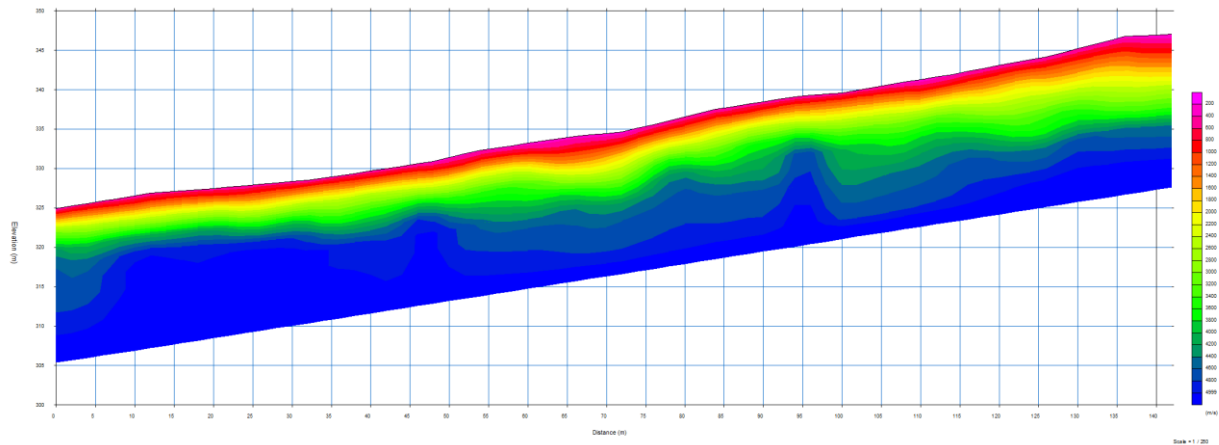


Fig.C.1. Tomographic inversion for seismic refraction spreads S1, S2 & S3 (NW-SE).

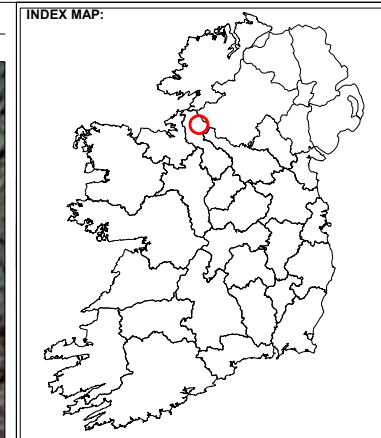
APPENDIX D: DRAWINGS

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

AGP24088_01	Geophysical survey Locations	1:1000@A4
AGP24088_R1	Results & interpretation of ERT R1 & seismic refraction profiles S1, S2 & S3	1:750@A4

GEOPHYSICAL SURVEY LOCATIONS

SCALE 1:1000



LEGEND:

- R1 2D resistivity profile
- S1 Seismic refraction profile
- Soft probe location
- GA281 Hand auger location
- BH001 Borehole location

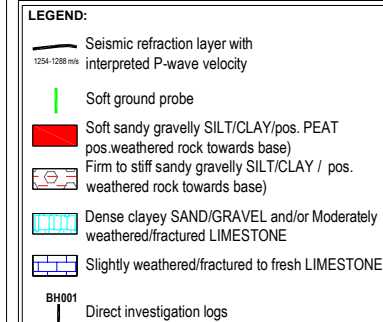
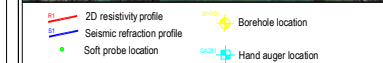
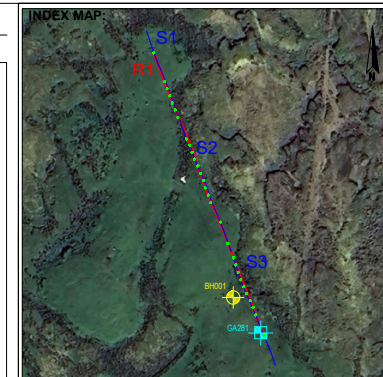
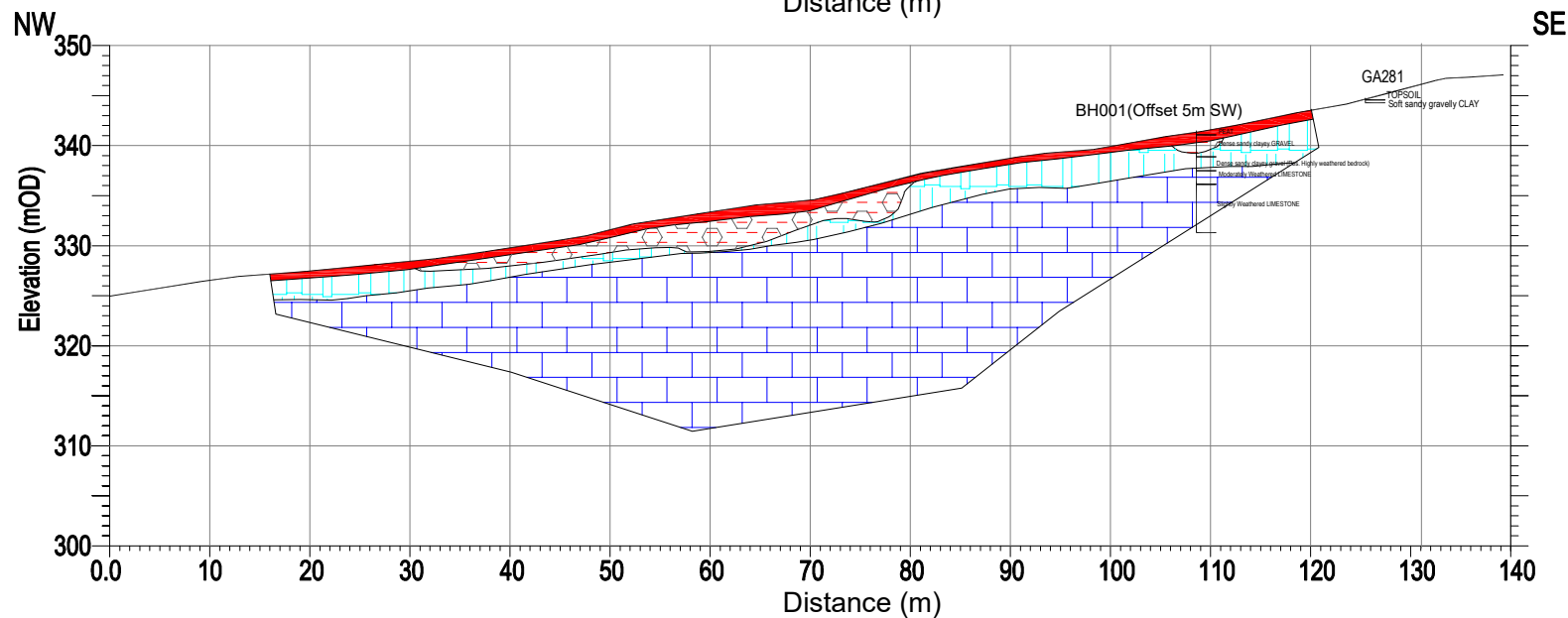
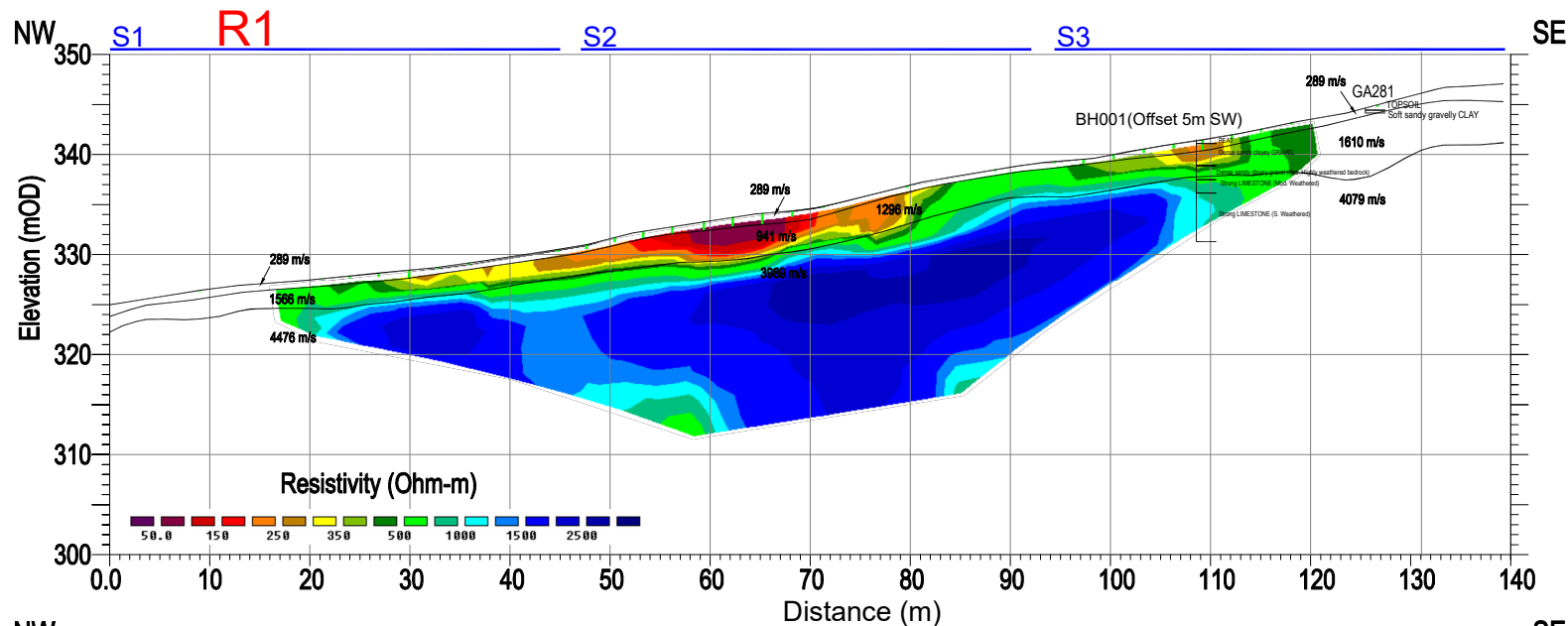
The information displayed here is to be used in conjunction with AGP24088_02 Report on the Geophysical Investigation at Lissinagroagh Wind Turbine, Co. Leitrim for Causeway Geotech Ltd., APEX Geophysics Ltd. 13th December 2024.



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PROJECT: LISSINAGROAGH WIND FARM GEOPHYSICAL INVESTIGATION			
CLIENT: CAUSEWAY GEOTECH LIMITED			
DRAWING NO: AGP24088_01			
SCALE: AS INDICATED @ A4			
DATE: 13-12-2024			
Version:	Date:	Drawn By:	Checked:
01	25-10-2024	SC	TL
02	13-12-2024	SC	TL



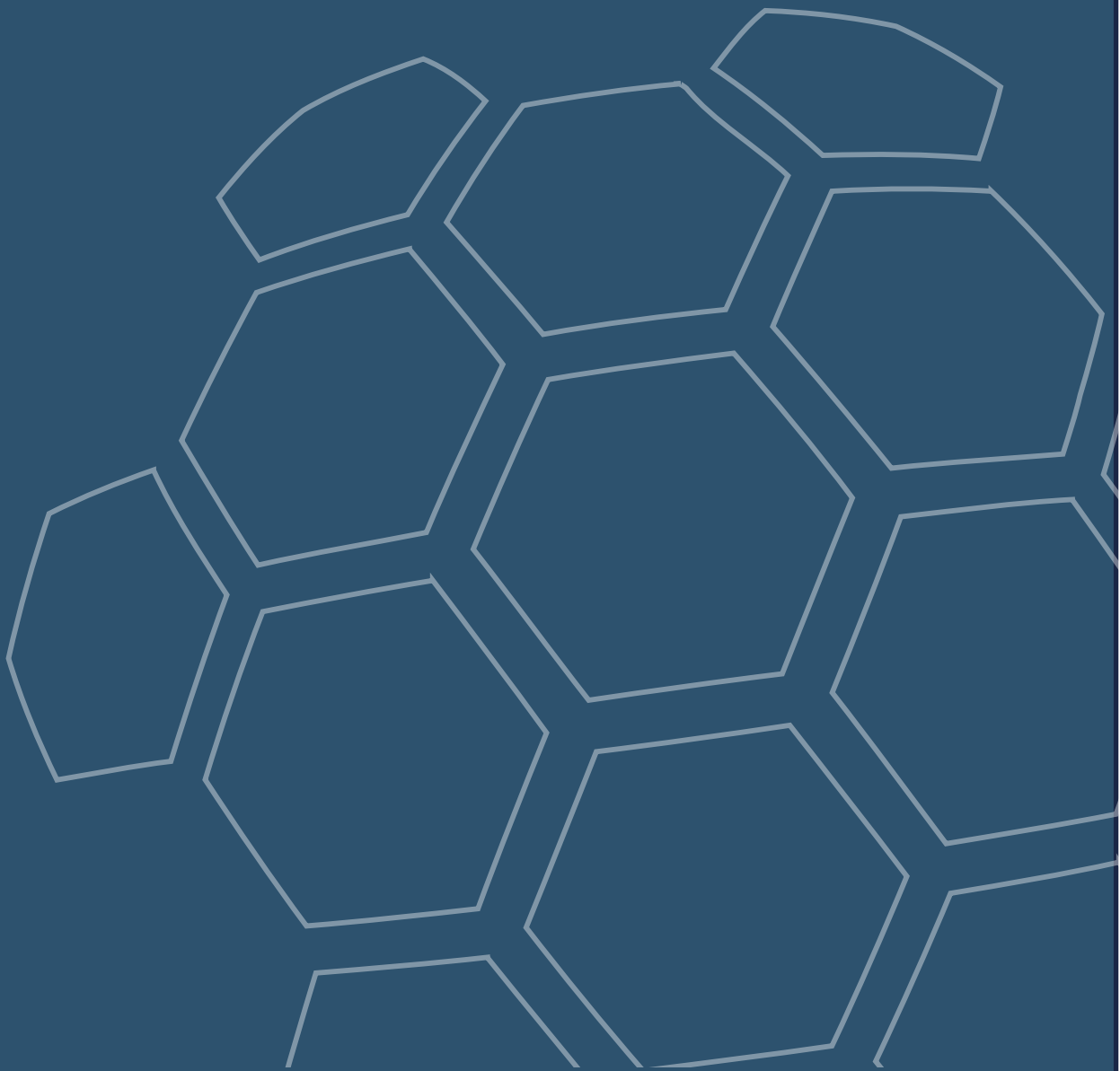
The information displayed here is to be used in conjunction with AGP24088_02 Report on the Geophysical Investigation at Lissinagroagh Wind Turbine, Co. Leitrim for Causeway Geotech Ltd., APEX Geophysics Ltd. 13th December 2024.



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PROJECT:	LISSINAGROAGH WIND FARM GEOPHYSICAL INVESTIGATION		
CLIENT:	CAUSEWAY GEOTECH LIMITED		
DRAWING NO:	AGP24088_R1		
SCALE:	AS INDICATED @ A4		
DATE:	13-12-2024		
Version:	Date:	Drawn By:	Checked:
01	25-10-2024	SC	TL
02	13-12-2024	SC	TL

APPENDIX I – SPT HAMMER ENERGY MEASUREMENT REPORT



SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing
Unit 11
Charlwoods Road
East Grinstead
West Sussex
RH19 2HU

SPT Hammer Ref: 1377
Test Date: 17/02/2024
Report Date: 19/02/2024
File Name: 1377.spt
Test Operator: RS

Instrumented Rod Data

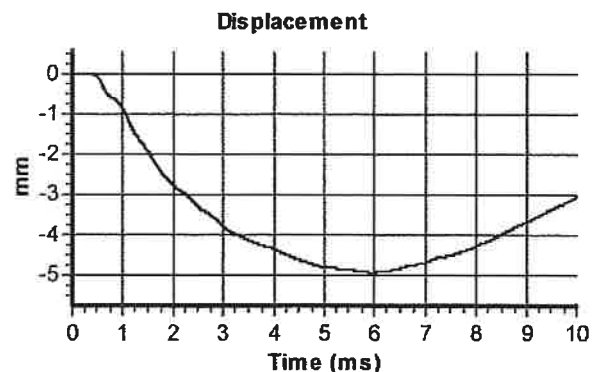
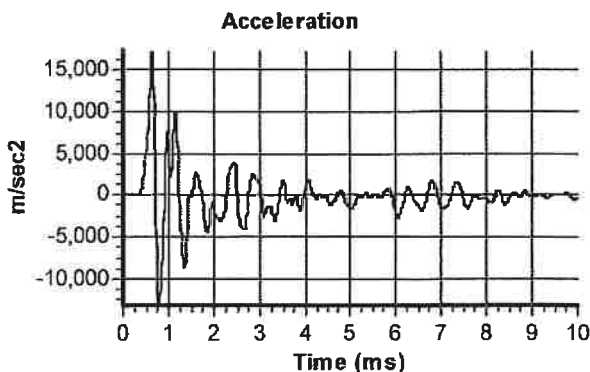
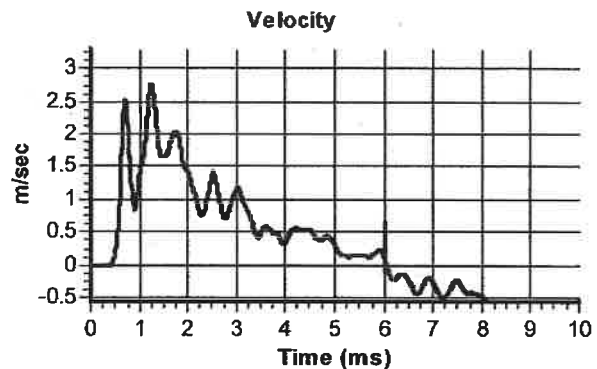
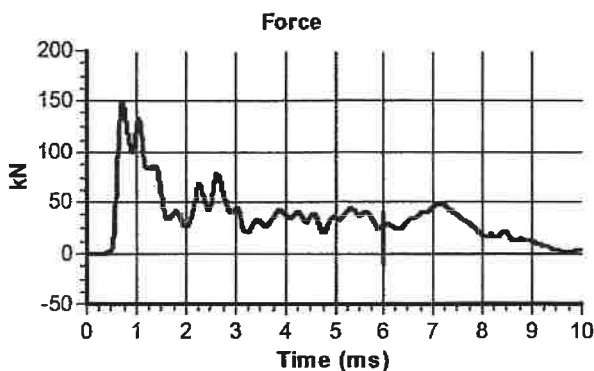
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.6
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 64786
Accelerometer No.2: 64789

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

CAUSEWAY



Calculations

Area of Rod A (mm^2): 983
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 325

Energy Ratio E_r (%): 69

Signed: Bob Stewart
Title: Technician

The recommended calibration interval is 12 months



CAUSEWAY
GEO TECH

Causeway Geotech Limited has made its commitment to health and safety of people, the environment and the quality of its services an integral part of our strategy.

Whether it be ensuring people's safety or meeting the challenges of operating in an ecologically diverse environment, we aim to act in a sustainable and responsible manner at all times.

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Whether it be ensuring people's safety or meeting the challenges of operating in an ecologically diverse environment, we aim to act in a sustainable and responsible manner at all times.

CERTIFICATIONS / ACCREDITATIONS



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