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Ground Investigations Ireland

Seskin Renewables Wind Farm

MKO Ireland

Factual Ground Investigation Report

January 2025

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Client	MKO Ireland
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Project No	14166-09-24
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Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

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APPENDICES

1.0 Preamble

On the instructions of MKO Ireland, a site investigation was carried out by Ground Investigations Ireland Ltd., in November 2024 at the site of the proposed Seskin Renewables Wind Farm on the border of County Laois and County Kilkenny.

2.0 Overview

2.1. Background

It is proposed to construct a new wind farm consisting of seven wind turbines with associated services and access roads at the proposed site. At the time of the site investigation the site was greenfield and used primarily as agricultural land. The site is situated an estimated 5km to the south of Durrow, County Laois.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 27 No. Trial Pits to a maximum depth of 3.50m BGL
- Carry out 10 No. Soakaway Tests to determine a soil infiltration value to BRE digest 365
- Carry out 1 No. Rotary Core Borehole to a maximum depth of 30.20m BGL
- Installation of 1 No. Groundwater monitoring well
- Geotechnical & chemical laboratory testing
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a 14T excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

3.4. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the location shown on the location plan in Appendix 1. The rotary borehole was completed from the ground surface.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole log and core photographs are provided to allow assessment of the core recovered. The rotary borehole log is provided in Appendix 4 of this Report.

3.5. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.6. Groundwater Monitoring Installations

A groundwater monitoring installation were installed upon the completion of the borehole to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole log in the appendices of this Report.

3.7. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Chemical testing as required by the specification, including pH and water soluble sulphate testing was carried out by Element Materials Technology Laboratory in the UK.
Geotechnical testing consisting of moisture content, Atterberg limits, and Particle Size Distribution (PSD) tests were carried out by Professional Soils Laboratory (PSL Ltd) in the UK.
The results of the laboratory testing are included in Appendix 5 of this Report.

3.8. Geophysical Survey

A geophysical survey was carried out by Apex Geophysics at the proposed site. The survey involved the acquisition of Electrical Resistivity Tomography (ERT), P-wave Seismic Refraction profiling and Multichannel Analysis of Surface Wave (MASW) 1D soundings. The Geophysical Survey Report are included in Appendix 6 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were relatively consistent across the site and generally comprised;

- Topsoil
- Cohesive Deposits

- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered at all locations and was present to a maximum depth of 0.30m BGL.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the topsoil at most locations and were described typically as *brown / brownish grey / greyish brown slightly sandy slightly gravelly CLAY with low cobble content*. The secondary sand and gravel constituents varied across the site and with depth. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

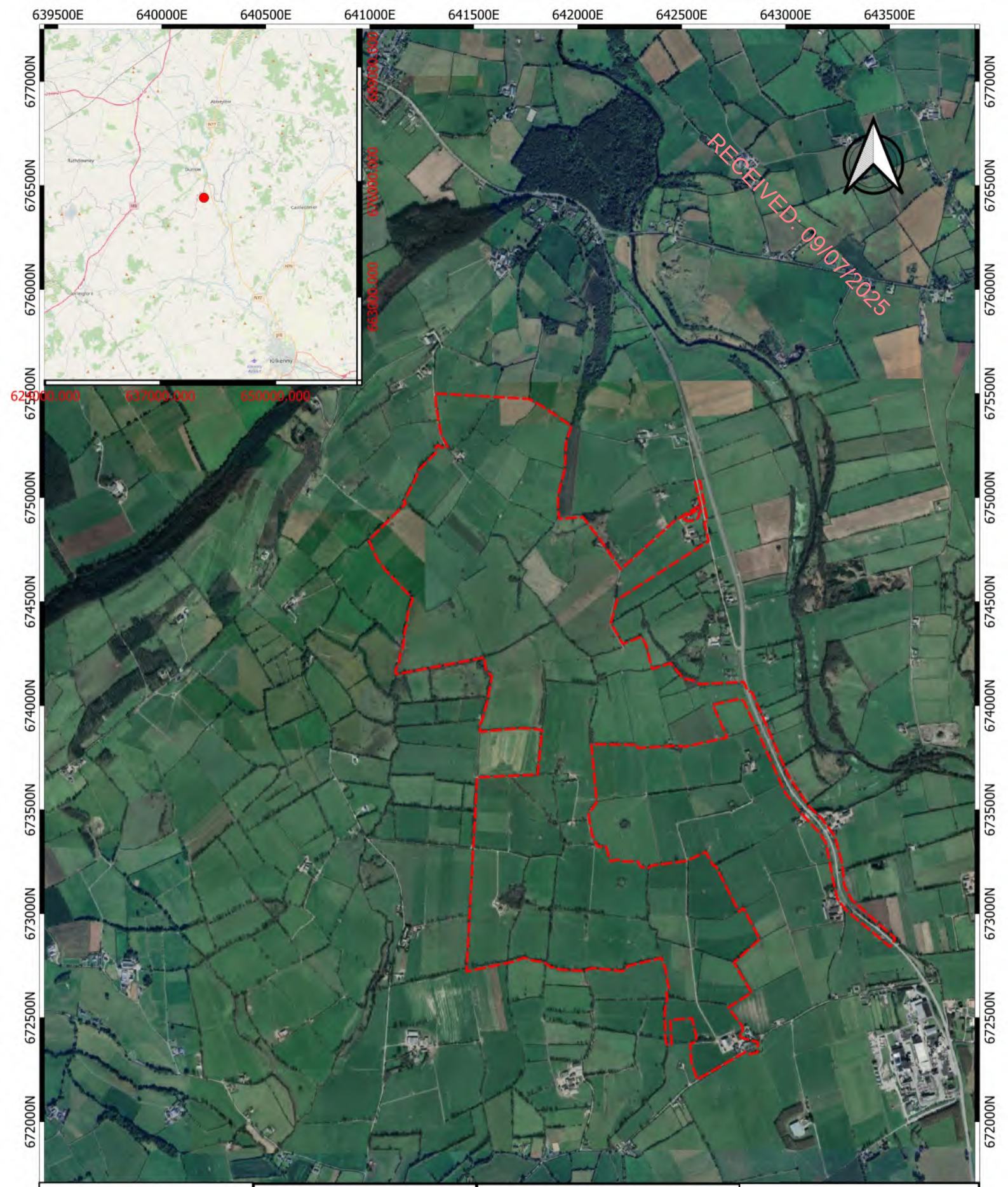
WEATHERED BEDROCK: In most exploratory holes, presumed weathered bedrock was encountered which was diggable with the large excavator to a depth of up to 1.20m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as angular gravel and cobbles of sandstone/siltstone and limestone, however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand were also present with the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

BEDROCK: The rotary core borehole at BH01 recovered a graded interbedded sequence consisting of a dominant Siltstone deposit with thin beds of sandstone from 2.00m to 11.00m BGL, and a dominant Sandstone deposit with thin beds of siltstone from 11.00m to the borehole termination depth of 30.20m BGL. The siltstone was generally described as a *very weak to moderately weak dark grey fine-grained SILTSTONE*, while the sandstone was generally described as a *weak to medium strong thin to thickly bedded dark grey fine-grained SANDSTONE*. This is typical of the Breguan Flagstone Formation, which is noted on Geological Survey Ireland's (GSI) geological mapping of the site. The degree of weathering ranged from fresh to moderately weathered with clay infill of some fractures. The total core recovery is good, typically 100% with some of the runs dropping to 95%. The SCR is relatively poor but generally shows an improvement with depth.

4.2. Groundwater

No groundwater was noted during the investigation however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors. For this reason, a standpipe was installed in BH01 to enable the equilibrium groundwater level to be determined.

APPENDIX 1 - Figures



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Client:

MKO

Project Title:
Seskin Renewables Wind Farm

Drawing Title:
Figure 1 Site Location

GII Project Reference:
14166-09-24

0 200 400 600 800 m

Drawn By:
JC

Date:
10/01/2025

- Site Location
- Indicative Site Boundary

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Client:

MKO

0 100 200 300 400 m

Project Title:
Seskin Renewables Wind Farm

Drawing Title:
Figure 2 - Site Investigation Points

GII Project Reference:
14166-09-24

Drawn By:
JC

Date:
10/01/2025

Site Location

Indicative Site Boundary

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-BP01
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 4.60m x 0.70m x 2.60m L x W x D	**Ground Level (mOD)** 166.08	**Client** MKO Ireland
	Location 641504.1 E 674600.3 N	**Dates** 08/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				165.88	0.20			
0.50 0.50	B D				(0.70)	Soft to firm brown slightly sandy slightly gravelly CLAY with low cobble content		
				165.18	0.90			
1.50 1.50	B D				(1.30)	Firm to stiff greyish brown slightly sandy gravelly CLAY with medium cobble content		
				163.88	2.20			
					(0.40)	Presumed Weathered Bedrock recovered as grey slightly clayey angular fine to coarse Gravel with medium cobble content		
2.50 2.50	B D			163.48	2.60			
						Complete at 2.60m		

Plan

Remarks

No groundwater encountered
Trial pit unstable; sidewall collapse
Refusal at 2.60m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-BP01

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-BP02
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 4.00m x 0.70m x 2.00m L x W x D	**Ground Level (mOD)** 162.02	**Client** MKO Ireland
	Location 641573.2 E 674623.6 N	**Dates** 08/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				161.82	0.20	Soft to firm brown slightly sandy slightly gravelly CLAY		
					(0.70)			
				161.12	0.90	Firm brownish grey slightly sandy gravelly CLAY with medium cobble and boulder content		
					(0.30)			
				160.82	1.20	Presumed Weathered Bedrock recovered as grey slightly clayey angular fine to coarse Gravel with medium cobble content		
					(0.80)			
				160.02	2.00	Complete at 2.00m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 2.00m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-BP03
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 5.60m x 0.70m x 2.30m L x W x D	**Ground Level (mOD)** 170.11	**Client** MKO Ireland
	Location 641534.4 E 674512.9 N	**Dates** 08/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	TOPSOIL		
				169.86	0.25			
					(0.35)	Soft brown slightly sandy slightly gravelly CLAY with low cobble content		
0.50	B							
0.50	D			169.51	0.60			
					(1.00)	Firm brownish grey slightly sandy gravelly CLAY		
				168.51	1.60			
1.70	B					Presumed Weathered Bedrock recovered as grey slightly clayey angular fine to coarse Gravel		
1.70	D				(0.70)			
				167.81	2.30			
						Complete at 2.30m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 2.30m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-BP04
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 5.30m x 0.70m x 2.50m L x W x D	**Ground Level (mOD)** 165.02	**Client** MKO Ireland
	Location 641615 E 674535.4 N	**Dates** 08/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL		
				164.72	0.30	Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.70)			
				164.02	1.00	Firm brownish grey slightly sandy gravelly CLAY with medium cobble and boulder content		
					(0.20)			
				163.82	1.20	Presumed Weathered Bedrock recovered as grey slightly clayey angular fine to coarse Gravel with medium cobble content		
1.50 1.50	B D				(1.30)			
				162.52	2.50	Complete at 2.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 2.50m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA01
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 0.70m x 1.90m L x W x D	**Ground Level (mOD)** 164.80	**Client** MKO Ireland
	Location 641384.6 E 674746.8 N	**Dates** 06/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				164.70	(0.10) 0.10	TOPSOIL		
						Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.70)			
				164.00	0.80	Firm to stiff greyish brown slightly sandy gravelly CLAY with low cobble and boulder content		
					(1.10)			
1.80 1.80	B D			162.90	1.90	Complete at 1.90m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA02
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.70m x 0.70m x 1.80m L x W x D	**Ground Level (mOD)** 147.83	**Client** MKO Ireland
	Location 641697.5 E 674679.1 N	**Dates** 06/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				147.63	0.20	Soft to firm brown slightly sandy slightly gravelly CLAY		
					(0.40)			
				147.23	0.60	Firm brownish grey slightly sandy gravelly CLAY with medium cobble and boulder content		
					(1.20)			
				146.03	1.80	Complete at 1.80m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA03
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 0.70m x 1.80m L x W x D	**Ground Level (mOD)** 91.12	**Client** MKO Ireland	**Job Number** 14166-09-24
	Location 642473.6 E 674864.1 N	**Dates** 06/11/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	TOPSOIL		
				90.97	0.15	Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.65)			
				90.32	0.80	Firm greyish brown sandy gravelly CLAY with low cobble and boulder content		
					(0.40)			
				89.92	1.20	Brownish grey slightly clayey sandy angular to subrounded fine to coarse GRAVEL with low cobble and boulder content		
1.50 1.50	B D				(0.60)			
				89.32	1.80	Complete at 1.80m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA04
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 0.70m x 0.60m L x W x D	**Ground Level (mOD)** 151.88	**Client** MKO Ireland
	Location 642117.8 E 674261.4 N	**Dates** 06/11/2024	**Engineer**
			Job Number 14166-09-24 **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				151.68	0.20	Brown slightly sandy slightly gravelly CLAY with low cobble content		
					(0.20)			
				151.48	0.40	Presumed Weathered Bedrock recovered as grey slightly clayey angular fine to coarse Gravel with medium cobble content		
0.50	B				(0.20)			
0.50	D			151.28	0.60	Complete at 0.60m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Refusal at 0.60m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA05
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 0.60m L x W x D	**Ground Level (mOD)** 119.86	**Client** MKO Ireland
	Location 642368.7 E 674166.8 N	**Dates** 06/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	TOPSOIL		
				119.71	0.15	Soft to firm brown slightly sandy slightly gravelly CLAY		
					(0.45)			
0.50 0.50	B D			119.26	0.60	Complete at 0.60m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Refusal at 0.60m BGL due to presumed Bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA06
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.10m x 1.20m x 1.50m L x W x D	**Ground Level (mOD)** 148.77	**Client** MKO Ireland
	Location 642022.5 E 673714.3 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL		
				148.47	0.30			
0.50 0.50	B D				(0.50)	Firm brown slightly sandy slightly gravelly CLAY		
				147.97	0.80			
					(0.70)	Firm greyish brown slightly sandy gravelly CLAY with low cobble and boulder content		
1.50 1.50	B D			147.27	1.50	Complete at 1.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA06A
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.00m x 1.20m x 1.50m L x W x D	**Ground Level (mOD)** 150.10	**Client** MKO Ireland
	Location 641950.5 E 673703.9 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	TOPSOIL		
				149.70	0.40	Firm brown slightly sandy slightly gravelly CLAY with medium cobble content and low boulder content		
					(1.10)			
				148.60	1.50	Complete at 1.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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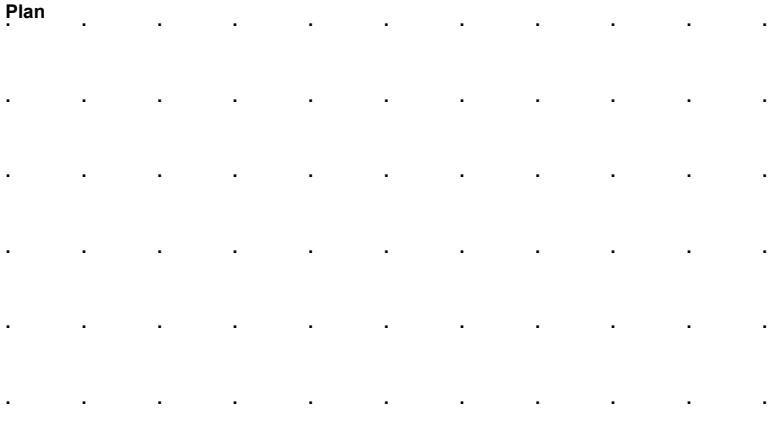
Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA07
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 1.90m x 1.20m x 0.90m L x W x D	**Ground Level (mOD)** 136.46	**Client** MKO Ireland
	Location 641996.8 E 673485.9 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				136.26	0.20			
					(0.40)	Firm brown slightly sandy slightly gravelly CLAY with high cobble and boulder content		
0.50 0.50	B D			135.86	0.60			
					(0.30)	Presumed Weathered Bedrock recovered as angular Cobbles and Boulders		
				135.56	0.90	Complete at 0.90m		

Plan



Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Refusal at 0.90m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA08
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.20m x 1.20m x 1.40m L x W x D	**Ground Level (mOD)** 127.35	**Client** MKO Ireland
	Location 642000.3 E 673287.9 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	TOPSOIL		
				126.85	0.50			
0.80 0.80	B D				(0.90)	Firm brown slightly sandy slightly gravelly CLAY with low cobble and boulder content		
1.40 1.40	B D			125.95	1.40	Complete at 1.40m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Refusal at 1.40m BGL due to presumed boulders
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA09
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.10m x 1.20m x 1.50m L x W x D	**Ground Level (mOD)** 111.51	**Client** MKO Ireland
	Location 642087.3 E 673020.2 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35)	TOPSOIL		
				111.16	0.35	Firm brown slightly sandy slightly gravelly CLAY with medium cobble and boulder content		
					(1.15)			
				110.01	1.50	Complete at 1.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SA10
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.00m x 1.20m x 1.50m L x W x D	**Ground Level (mOD)** 104.59	**Client** MKO Ireland
	Location 642317.3 E 672983.8 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				104.49	(0.10) 0.10	TOPSOIL		
0.50 0.50	B D				(1.10)	Firm brown slightly sandy gravelly CLAY with high cobble and boulder content		
				103.39	1.20			
					(0.30)	Firm light brown slightly sandy slightly gravelly CLAY with medium cobble and boulder content		
1.50 1.50	B D			103.09	1.50	Complete at 1.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway test to BRE Digest 365 completed in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SS01
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.50m x 0.70m x 0.20m L x W x D	**Ground Level (mOD)** 104.39	**Client** MKO Ireland
	Location 642493.7 E 674095.1 N	**Dates** 05/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				104.19	(0.20) 0.20	TOPSOIL Obstruction: Presumed BEDROCK Complete at 0.20m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 0.20m BGL due to presumed Bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-SS02
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 0.25m L x W x D	**Ground Level (mOD)** 104.75	**Client** MKO Ireland
	Location 642462.5 E 674043.9 N	**Dates** 05/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	TOPSOIL		
				104.50	0.25	Obstruction: Presumed BEDROCK		
						Complete at 0.25m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 0.25m BGL due to Bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T01
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 3.40m x 0.70m x 0.90m L x W x D	**Ground Level (mOD)** 152.71	**Client** MKO Ireland	**Job Number** 14166-09-24
	Location 641789.2 E 675093.3 N	**Dates** 04/11/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	TOPSOIL		
				152.56	0.15	Soft to firm brown slightly sandy slightly gravelly CLAY		
					(0.25)			
				152.31	0.40	Presumed Weathered Bedrock recovered as grey slightly sandy clayey angular fine to coarse Gravel with low cobble content		
0.50 0.50	B D				(0.20)			
				152.11	0.60	Presumed Weathered Bedrock recovered as grey slightly clayey slightly sandy angular fine to coarse Gravel with low cobble content		
					(0.30)			
				151.81	0.90	Complete at 1.80m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 0.90m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-T01

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T02
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 0.70m x 2.30m L x W x D	**Ground Level (mOD)** 172.00	**Client** MKO Ireland
	Location 641217.3 E 674885.8 N	**Dates** 07/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				171.80	0.20	Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.60)			
				171.20	0.80	Firm brownish grey slightly sandy gravelly CLAY with medium cobble and boulder content		
1.50 1.50	B D				(1.20)			
				170.00	2.00	Presumed Weathered Bedrock recovered as slightly clayey slightly sandy angular fine to coarse Gravel with low cobble content		
					(0.30)			
				169.70	2.30	Complete at 2.30m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 2.30m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T03
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 4.80m x 0.70m x 3.20m L x W x D	**Ground Level (mOD)** 140.29	**Client** MKO Ireland	**Job Number** 14166-09-24
	Location 641937.7 E 674422.6 N	**Dates** 07/11/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				140.09	0.20	Soft brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.60)			
				139.49	0.80	Firm to stiff brownish grey slightly sandy gravelly CLAY with medium cobble and boulder content		
1.50 1.50	B D				(2.40)			
2.50 2.50	B D							
				137.09	3.20	Complete at 3.20m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 3.20m BGL due to boulder
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-T03

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T04
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 3.20m x 0.70m x 2.00m L x W x D	**Ground Level (mOD)** 174.48	**Client** MKO Ireland
	Location 641394.7 E 674394.4 N	**Dates** 07/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				174.28	0.20	Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.40)			
				173.88	0.60	Firm brownish grey slightly sandy gravelly CLAY with low cobble and boulder content		
1.50 1.50	B D				(1.40)			
				172.48	2.00	Complete at 2.00m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 2.00m BGL due to presumed bedrock or boulders
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T05
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 4.30m x 2.80m x 0.70m L x W x D	**Ground Level (mOD)** 160.33	**Client** MKO Ireland
	Location 642044.1 E 673966.8 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40 0.40	B D			160.13 159.83 159.63	(0.20) 0.20 (0.30) 0.50 (0.20) 0.70	TOPSOIL Firm brown slightly sandy slightly gravelly CLAY with low cobble content Presumed Weathered Bedrock recovered as Cobbles with some clayey angular fine to coarse Gravel Complete at 0.70m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 0.70m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-T05

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T05A
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.60m x 1.20m x 0.80m L x W x D	**Ground Level (mOD)** 163.36	**Client** MKO Ireland
	Location 641935.9 E 673919.7 N	**Dates** 04/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL		
				163.06	0.30			
					(0.30)	Firm brown slightly sandy slightly gravelly CLAY with low cobble content		
0.50 0.50	B D			162.76	0.60			
					(0.20)	Presumed Weathered Bedrock recovered as Cobbles and Boulders with some clayey angular fine to coarse Gravel		
				162.56	0.80	Complete at 0.80m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 0.80m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-05A

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T06
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 4.00m x 0.70m x 3.10m L x W x D	**Ground Level (mOD)** 143.19	**Client** MKO Ireland
	Location 641806.9 E 673294.6 N	**Dates** 05/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	TOPSOIL		
				143.04	0.15	Soft to firm brown slightly sandy slightly gravelly CLAY		
					(0.55)			
0.50 0.50	B D			142.49	0.70	Firm brown slightly sandy gravelly CLAY with medium cobble and boulder content		
1.50 1.50	B D				(1.90)			
2.50 2.50	B D			140.59	2.60	Very stiff light grey slightly sandy gravelly CLAY with medium cobble and boulder content		
					(0.50)			
				140.09	3.10	Complete at 3.10m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 3.10m BGL due to hard strata
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-SA02

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T07
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 3.00m x 0.70m x 2.80m L x W x D	**Ground Level (mOD)** 100.58	**Client** MKO Ireland
	Location 642436.8 E 673032.6 N	**Dates** 05/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL		
				100.28	0.30	Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D				(0.40)			
				99.88	0.70	Firm to stiff greyish brown slightly sandy gravelly CLAY with medium cobble and boulder content		
1.50 1.50	B D				(2.10)			
2.70 2.70	B D			97.78	2.80	Complete at 2.80m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 2.80m BGL due to presumed boulders
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-T07

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-T08
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 3.90m x 0.70m x 3.50m L x W x D	**Ground Level (mOD)** 122.27	**Client** MKO Ireland
	Location 641877.2 E 672893.4 N	**Dates** 05/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				122.12	(0.15) 0.15	TOPSOIL		
					(0.45)	Soft to firm brown slightly sandy slightly gravelly CLAY		
0.50 0.50	B D			121.67	0.60	Firm to stiff greyish brown slightly sandy gravelly CLAY with medium cobble and boulder content		
1.50 1.50	B D				(2.30)			
2.50 2.50	B D			119.37	2.90	Stiff grey slightly sandy gravelly CLAY with low cobble content		
					(0.60)			
3.50 3.50	B D			118.77	3.50	Complete at 3.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-T08

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Site Seskin Renewables Wind Farm			**Trial Pit Number** TP-TH01
Machine : 14T Excavator **Method :** Trial Pit	**Dimensions** 2.40m x 1.20m x 1.30m L x W x D	**Ground Level (mOD)** 170.13	**Client** MKO Ireland
	Location 641537.6 E 673631.1 N	**Dates** 05/11/2024	**Engineer**
			Job Number 14166-09-24 **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL		
				169.93	0.20			
					(0.50)	Soft to firm greyish brown slightly sandy slightly gravelly CLAY		
0.50	B							
0.50	D							
				169.43	0.70			
					(0.60)	Presumed Weathered Bedrock recovered as grey angular fine to coarse GRAVEL with low cobble content		
1.20	B							
1.20	D			168.83	1.30			
						Complete at 1.30m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Refusal at 1.30m BGL due to presumed bedrock
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	JK	14166-09-24.TP-TH01

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T01

TP-T01

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T01

TP-T01

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T02

TP-T02

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T02

TP-T02

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T03

TP-T03

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T03

TP-T03

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T04

TP-T04

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T04

TP-T04

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T05

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T06

TP-T06

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T06

TP-T06

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T07

TP-T07

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T07

TP-T07

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T08

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Seskin Renewables Wind Farm – Trial Pit Photographs

TP-T08

TP-T08

Seskin Renewables Wind Farm – Trial Pit Photographs

TPSS01

TPSS01

Seskin Renewables Wind Farm – Trial Pit Photographs

TPSS01

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Seskin Renewables Wind Farm – Trial Pit Photographs

TPSS02

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-BP01

Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-BP01

Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-BP03

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-BP04

TP-BP04

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-BP04

TP-BP04

Seskin Renewables Wind Farm – Trial Pit Photographs

TPTH01

TPTH01

Seskin Renewables Wind Farm – Trial Pit Photographs

TPTH01

TPTH01

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Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA01

TP-SA01

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA01

TP-SA02

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA02

Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-SA03

Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-SA07

Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-SA07

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA07

TP-SA08

Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-SA08

Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-SA09

Seskin Renewables Wind Farm – Trial Pit Photographs

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TP-SA09

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA09

TP-SA10

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA10

TP-SA10

Seskin Renewables Wind Farm – Trial Pit Photographs

TP-SA10

APPENDIX 3 – Soakaway Testing Records

GROUND INVESTIGATIONS IRELAND
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D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
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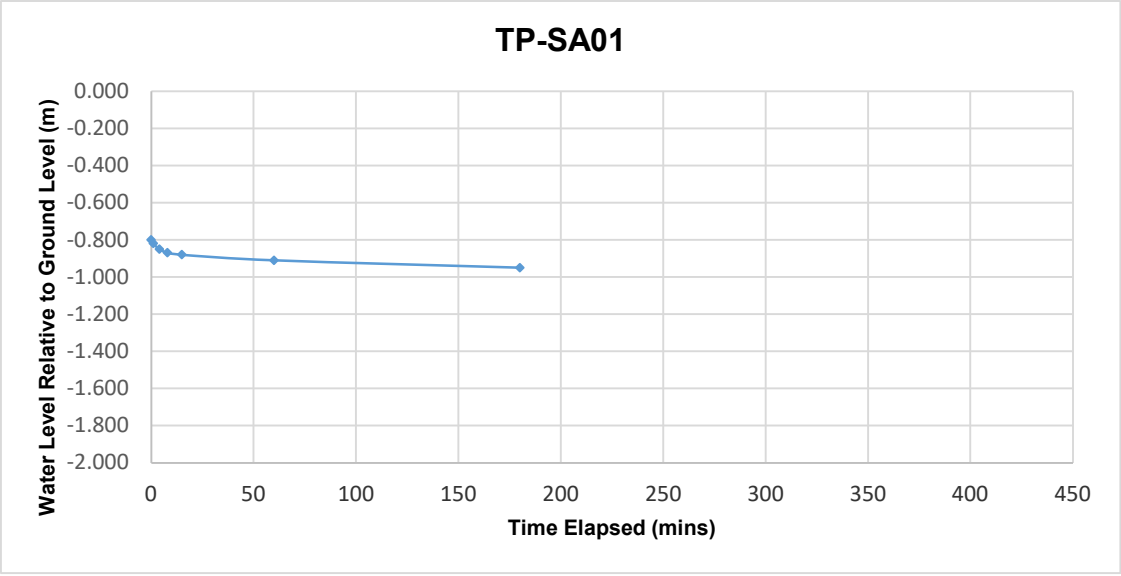
TP-SA01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 3.00m x 0.70m x 1.90m (L x W x D)

Date	Time	Water level (m bgl)
06/11/2024	0	-0.800
06/11/2024	1	-0.820
06/11/2024	4	-0.850
06/11/2024	8	-0.870
06/11/2024	15	-0.880
06/11/2024	60	-0.910
06/11/2024	180	-0.950

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.80	1.900	1.100	1.075	1.625



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

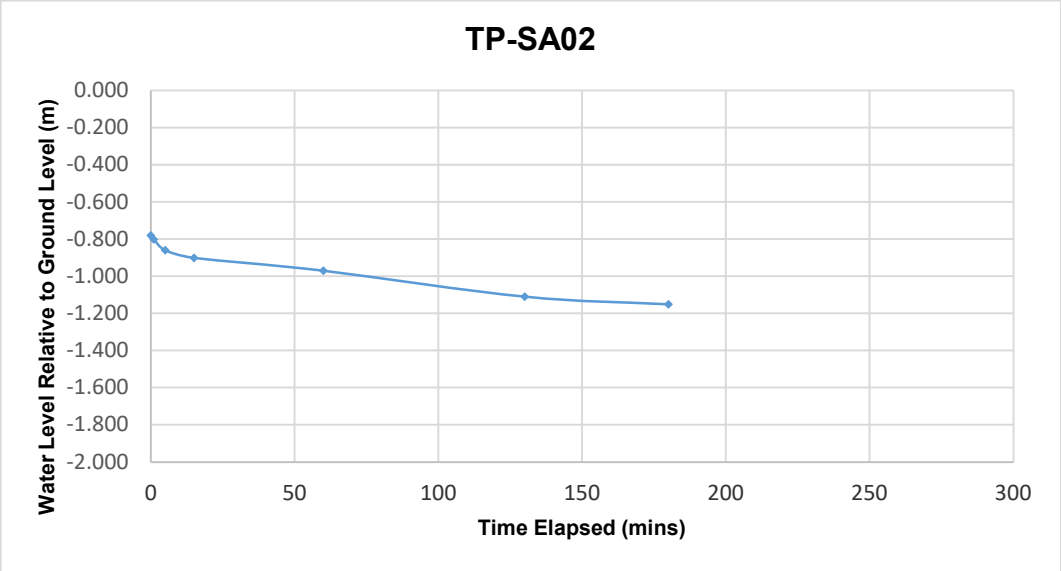
Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

TP-SA02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.00m x 0.70m x 1.80m (L x W x D)

Date	Time	Water level (m bgl)
06/11/2024	0	-0.780
06/11/2024	1	-0.800
06/11/2024	5	-0.860
06/11/2024	15	-0.900
06/11/2024	60	-0.970
06/11/2024	130	-1.110
06/11/2024	180	-1.150

Start depth	Depth of Pit	Diff	75% full	25%full
0.78	1.800	1.020	1.035	1.545



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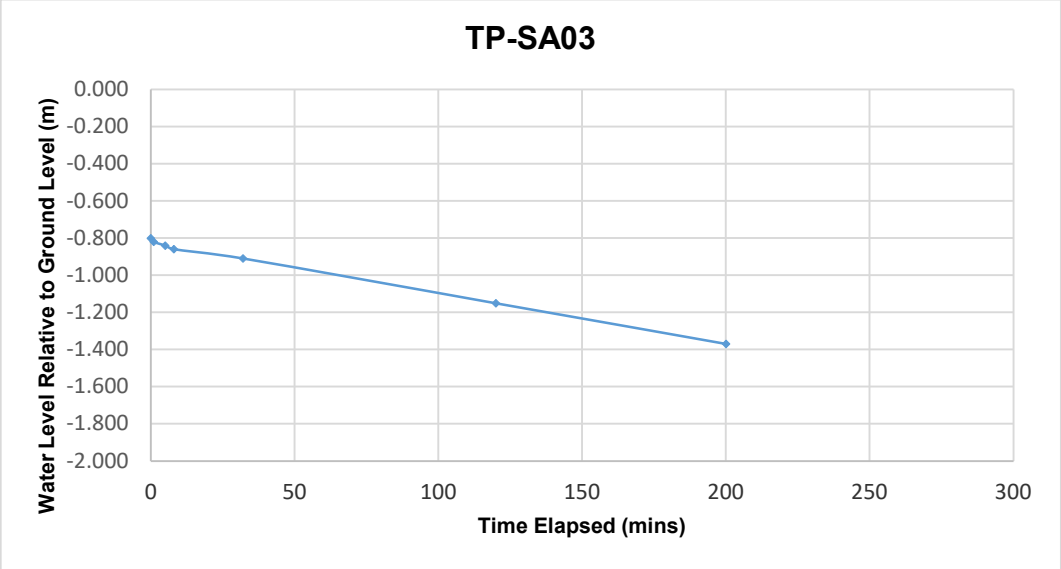
TP-SA03

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.50m x 0.70m x 1.80m (L x W x D)

Date	Time	Water level (m bgl)
06/11/2024	0	-0.800
06/11/2024	1	-0.820
06/11/2024	5	-0.840
06/11/2024	8	-0.860
06/11/2024	32	-0.910
06/11/2024	120	-1.150
06/11/2024	200	-1.370

Start depth	Depth of Pit		Diff	75% full	25%full
0.80	**1.800**		**1.000**	**1.05**	**1.55**
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.500	0.700			0.500	0.88
Tp75-25 (from graph) (s)		**36900**		50% Eff Depth	ap50 (m2)
				0.500	4.95
f =	**4.790E-06**	**m/s**			



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
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Newcastle,
Co. Dublin.
D22 Y852

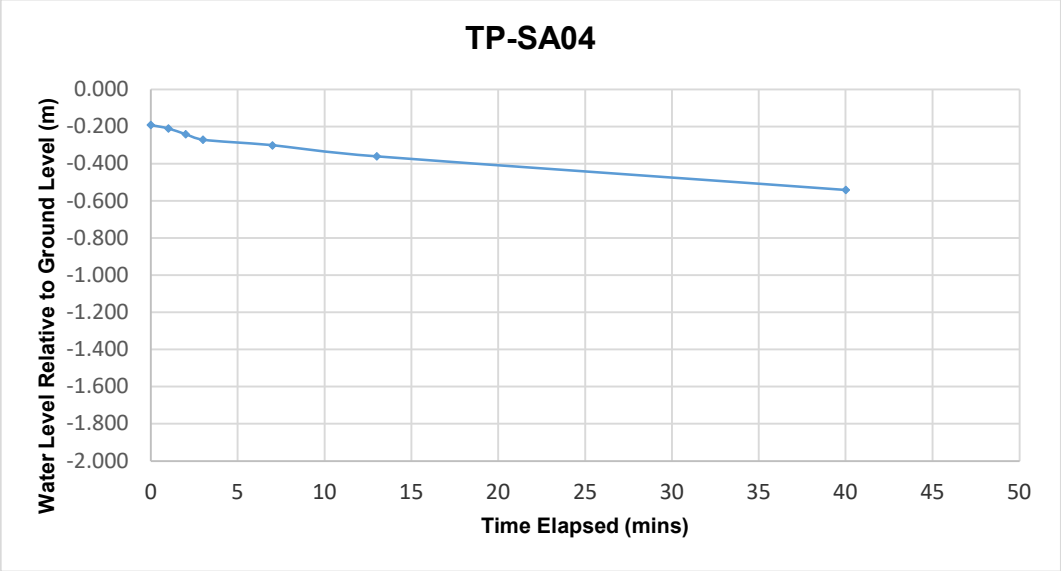
Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

TP-SA04

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.40m x 0.70m x 0.60m (L x W x D)

Date	Time	Water level (m bgl)
06/11/2024	0	-0.190
06/11/2024	1	-0.210
06/11/2024	2	-0.240
06/11/2024	3	-0.270
06/11/2024	7	-0.300
06/11/2024	13	-0.360
06/11/2024	40	-0.540

Start depth	Depth of Pit		Diff	75% full	25%full
0.19	**0.600**		**0.410**	**0.2925**	**0.4975**
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.400	0.700			0.205	0.34
Tp75-25 (from graph) (s)		**1860**		50% Eff Depth	ap50 (m2)
				0.205	2.951
f =	**6.275E-05**	**m/s**			



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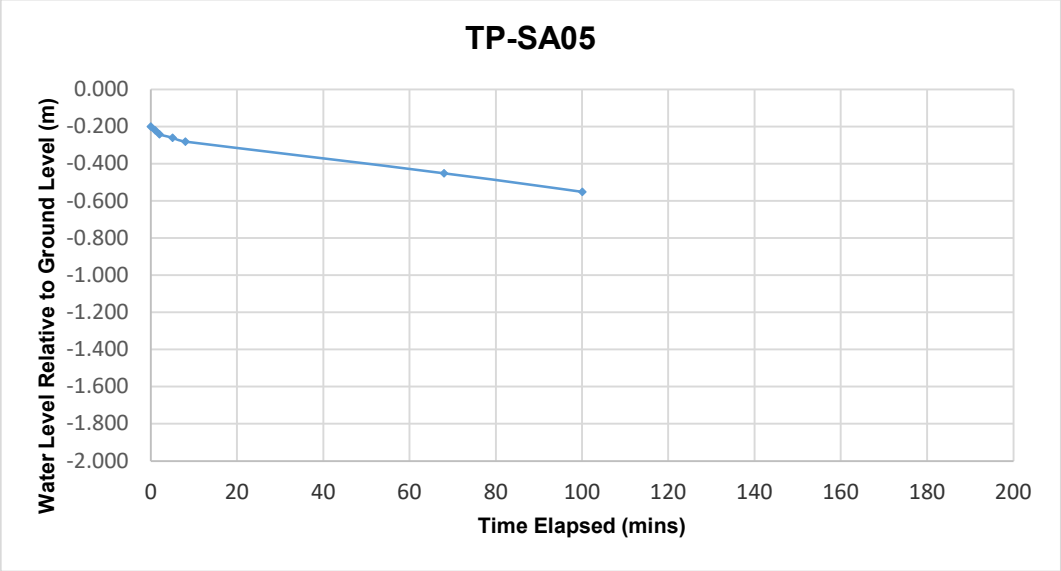
TP-SA05

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.40m x 0.70m x 0.60m (L x W x D)

Date	Time	Water level (m bgl)
06/11/2024	0	-0.200
06/11/2024	1	-0.220
06/11/2024	2	-0.240
06/11/2024	5	-0.260
06/11/2024	8	-0.280
06/11/2024	68	-0.450
06/11/2024	100	-0.550

Start depth	Depth of Pit		Diff	75% full	25%full
0.20	0.600		0.400	0.3	0.5
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.400	0.700			0.200	0.34
Tp75-25 (from graph) (s)		3720		50% Eff Depth	ap50 (m2)
				0.200	2.92
f =	3.093E-05	m/s			



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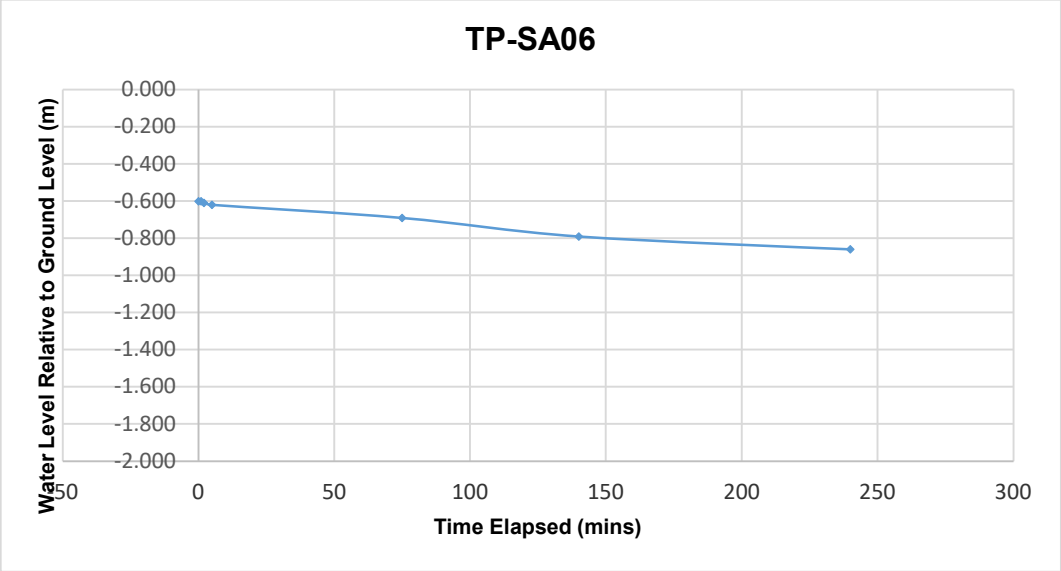
TP-SA06

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.10m x 1.20m x 1.50m (L x W x D)

Date	Time	Water level (m bgl)
04/11/2024	0	-0.600
04/11/2024	1	-0.600
04/11/2024	2	-0.610
04/11/2024	5	-0.620
04/11/2024	75	-0.690
04/11/2024	140	-0.790
04/11/2024	240	-0.860

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.60	1.500	0.900	0.825	1.275



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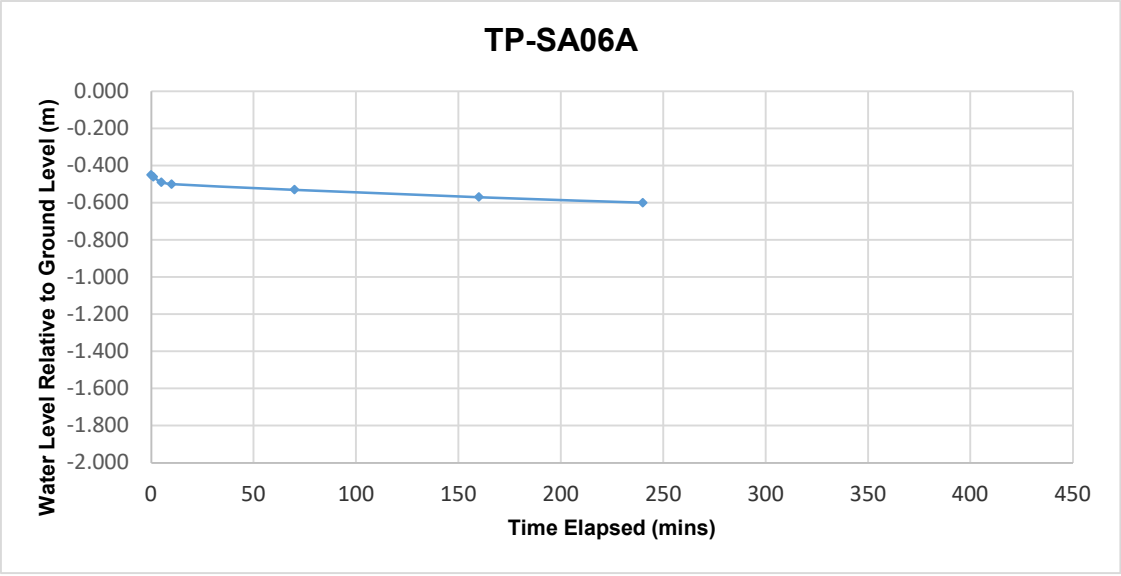
TP-SA06A

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.00m x 1.20m x 1.50m (L x W x D)

Date	Time	Water level (m bgl)
04/11/2024	0	-0.450
04/11/2024	1	-0.460
04/11/2024	5	-0.490
04/11/2024	10	-0.500
04/11/2024	70	-0.530
04/11/2024	160	-0.570
04/11/2024	240	-0.600

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.45	1.500	1.050	0.7125	1.2375



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D22 [illegible]

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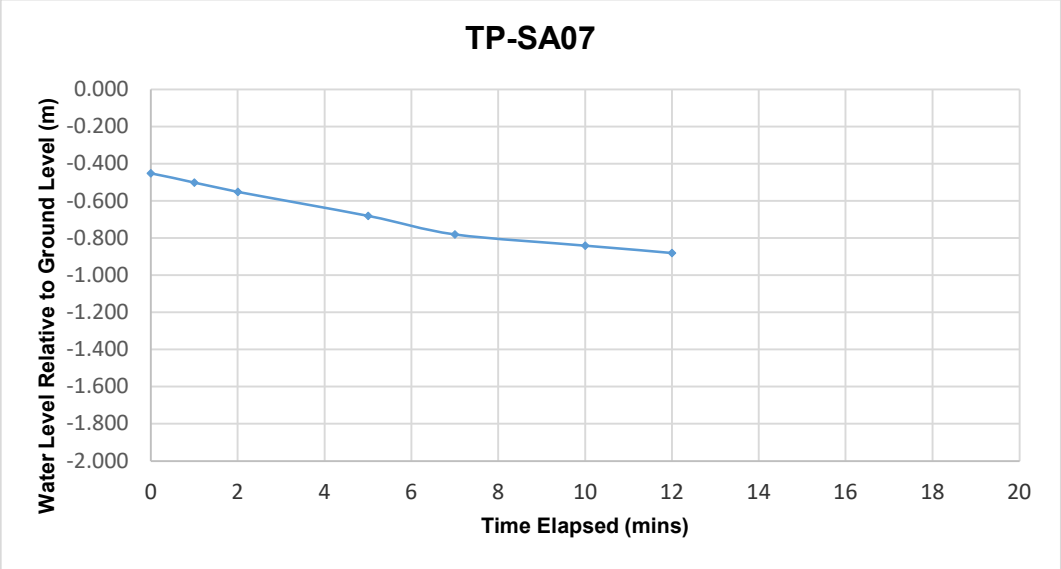
Web: www.gii.ie

TP-SA07

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 1.90m x 1.20m x 0.90m (L x W x D)

Date	Time	Water level (m bgl)
04/11/2024	0	-0.450
04/11/2024	1	-0.500
04/11/2024	2	-0.550
04/11/2024	5	-0.680
04/11/2024	7	-0.780
04/11/2024	10	-0.840
04/11/2024	12	-0.880

Start depth	Depth of Pit		Diff	75% full	25%full
0.45	**0.880**		**0.430**	**0.5575**	**0.7725**
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
1.900	1.200			0.215	0.49
Tp75-25 (from graph) (s)		**300**		50% Eff Depth	ap50 (m2)
				0.215	3.613
f =	**4.523E-04**	**m/s**			



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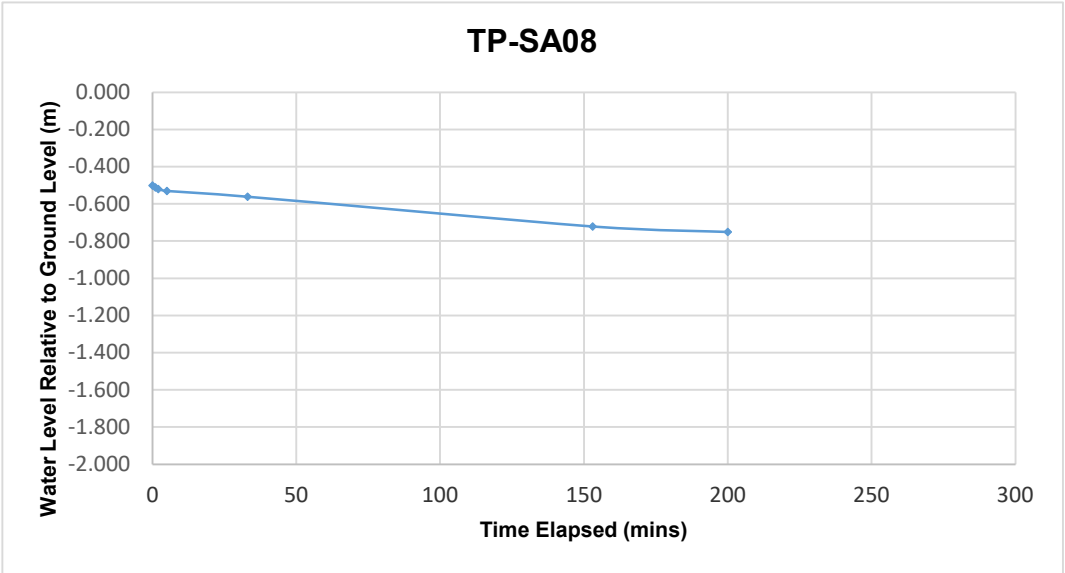
TP-SA08

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 1.20m x 1.40m (L x W x D)

Date	Time	Water level (m bgl)
04/11/2024	0	-0.500
04/11/2024	1	-0.510
04/11/2024	2	-0.520
04/11/2024	5	-0.530
04/11/2024	33	-0.560
04/11/2024	153	-0.720
04/11/2024	200	-0.750

Start depth	Depth of Pit	Diff	75% full	25%full
0.50	1.400	0.900	0.725	1.175



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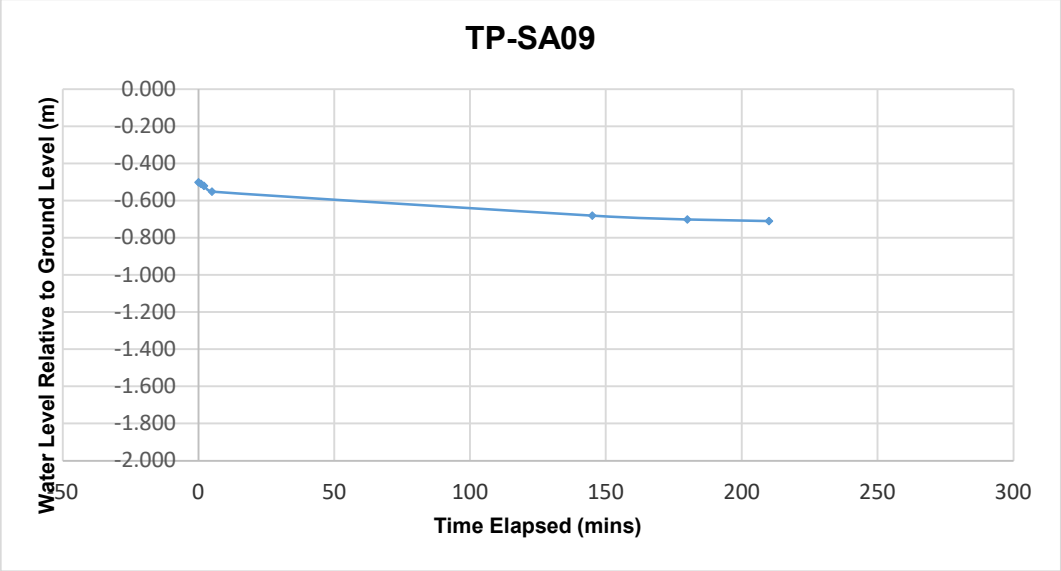
TP-SA09

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.10m x 1.20m x 1.50m (L x W x D)

Date	Time	Water level (m bgl)
04/11/2024	0	-0.500
04/11/2024	1	-0.510
04/11/2024	2	-0.520
04/11/2024	5	-0.550
04/11/2024	145	-0.680
04/11/2024	180	-0.700
04/11/2024	210	-0.710

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.50	1.500	1.000	0.75	1.25



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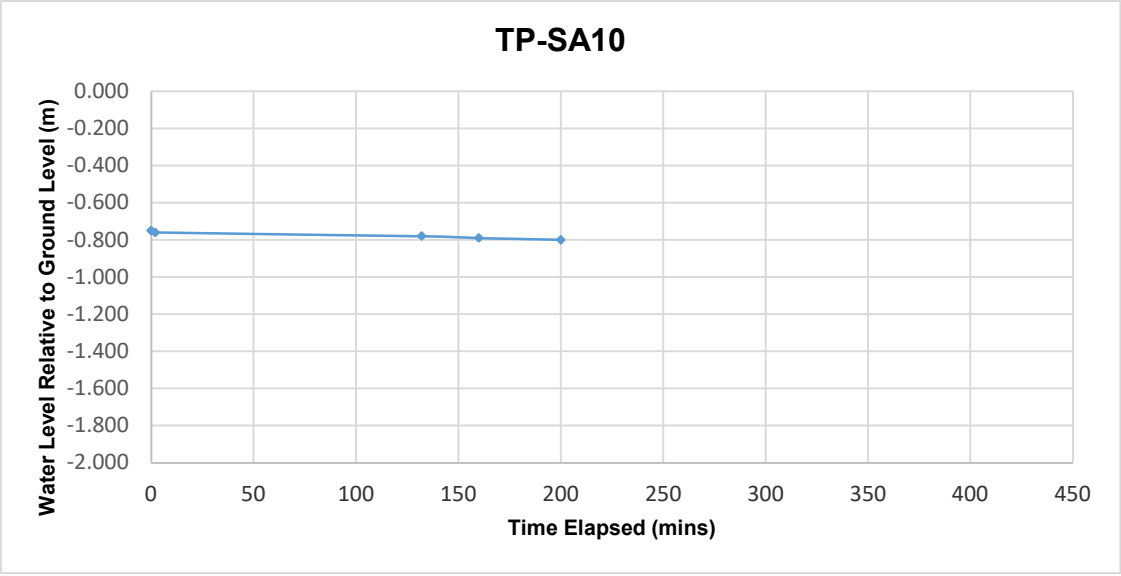
TP-SA10

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.00m x 1.20m x 1.50m (L x W x D)

Date	Time	Water level (m bgl)
04/11/2024	0	-0.750
04/11/2024	2	-0.760
04/11/2024	132	-0.780
04/11/2024	160	-0.790
04/11/2024	200	-0.800

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.75	1.500	0.750	0.9375	1.3125



APPENDIX 4 - Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Seskin Renewables Wind Farm			**Borehole Number** BH01
Machine : Beretta T-44 **Flush :** Water **Core Dia:** 63.5 mm **Method :** Rotary Cored	**Casing Diameter** 96mm cased to 30.20m **Location** (dGPS) 641558.5 E 674568.9 N	**Ground Level (mOD)** 165.79 **Dates** 08/11/2024-11/11/2024	**Client** MKO Ireland **Engineer**	**Job Number** 14166-09-24 **Sheet** 1/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						165.59	(0.20) 0.20	TOPSOIL			
	33						(1.40)	Recovery consists of brown slightly sandy slighty gravelly Clay			
						164.19	1.60				
							(0.40)	Recovery consists of gravelly Cobbles of Limestone and Sandstone			
2.00						163.79	2.00				
	100	20	0					Very weak thinly bedded dark grey fine grained SILTSTONE with occasional thin beds of Sandstone. Moderately weathered.			
3.10											
	100	20	0								
4.10							(4.60)				
	100	30	0					4.30m to 4.80m BGL - Clay Infill			
5.60											
	100	35	0								
6.60				NI		159.19	6.60	6.50m to 6.70m BGL - Clay Infill			
	100	65	0					Very weak to moderately weak thinly to medium bedded dark grey fine grained SILTSTONE with occasional thin beds of Sandstone. Slightly weathered. 6.90m to 7.00m BGL - Clay Infill			
8.10								6.60m to 11.00m BGL - Mostly Non Intact 2.00m to 6.60m BGL - Mostly Non Intact			
	100	80	0				(4.40)				
9.50								9.50m to 9.90m BGL - Clay Infill			

Remarks
Borehole complete at 30.2m BGL
50mm slotted standpipe with pea gravel surround installed from 30.20m to 15.00m BGL. 50mm plain standpipe with a bentonite seal installed from 15.00m to GL with a raised cover

Scale (approx)	Logged By
1:50	JK

Figure No. 14166-09-24.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site Seskin Renewables Wind Farm			**Borehole Number** BH01
Machine : Beretta T-44 **Flush :** Water **Core Dia:** 63.5 mm **Method :** Rotary Cored	**Casing Diameter** 96mm cased to 30.20m **Location** (dGPS) 641558.5 E 674568.9 N	**Ground Level (mOD)** 165.79 **Dates** 08/11/2024-11/11/2024	**Client** MKO Ireland **Engineer**	**Job Number** 14166-09-24 **Sheet** 2/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	100	50	0								
11.00	100	32	20			154.79	11.00	Weak to medium strong thickly bedded dark grey fine grained SANDSTONE with thin beds of Siltstone. Slightly weathered 11.00m to 11.10m BGL - Clay Infill			
12.40	100	60	0					12.40m to 12.50m BGL Clay Infill 13.00m to 13.10m BGL - Clay Infill			
13.70	100	40	41	16				11.00m to 16.60m BGL - Three Fracture Sets - F1: 0 to 30 degree fractures, close to medium spaced, undulating, rough. F2: 40 to 60 degree fractures, close to medium spaced, undulating, rough. F3: 70 to 90 degree fractures, medium spaced, undulating, rough. Orange staining on fracture surfaces.			
14.80	100	80	38				(7.90)	15.00m to 15.10m BGL - Clay Infill			
16.40											
16.60	95	40	27	NI				16.60m to 17.60m BGL - Mostly Non Intact			
17.60				5				17.60m to 18.40m BGL - Three Fracture Sets - F1: 0 to 20 degree fractures, medium to widely spaced, undulating, rough. F2: 40 to 60 degree fractures, close to widely spaced, undulating, rough. F3: 70 to 90 degree fractures, widely spaced, undulating, rough.			
18.00											
18.40	95	75	47	NI				18.40m to 18.90m BGL - Mostly Non Intact			
18.90						146.89	18.90	Medium strong medium to thickly bedded dark grey fine grained SANDSTONE with thin beds of Siltstone. Fresh to slightly weathered.			
19.60											

Remarks

Scale (approx)	Logged By
1:50	JK

Figure No. 14166-09-24.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site Seskin Renewables Wind Farm			**Borehole Number** BH01
Machine : Beretta T-44 **Flush :** Water **Core Dia:** 63.5 mm **Method :** Rotary Cored	**Casing Diameter** 96mm cased to 30.20m **Location** (dGPS) 641558.5 E 674568.9 N	**Ground Level (mOD)** 165.79 **Dates** 08/11/2024-11/11/2024	**Client** MKO Ireland **Engineer**	**Job Number** 14166-09-24 **Sheet** 3/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	100	100	72	5			(2.30)	18.90m to 21.90m BGL - Three Fracture Sets - F1: 0 to 20 degree fractures, medium to widely spaced, undulating, rough. F2: 40 to 60 degree fractures, close to widely spaced, undulating, rough. F3: 70 to 90 degree fractures, widely spaced, undulating, rough.			
21.20						144.59	21.20				
	80	40	21	NI			(1.70)	Very weak to weak thickly bedded dark grey fine grained SANDSTONE with thin beds of Siltstone. Fresh to moderately weathered. 21.90m to 22.80m BGL - Mostly Non Intact with clay infill			
21.90											
22.70											
22.80	95	90	66			142.89	22.90	Medium strong medium to thickly bedded dark grey fine grained SANDSTONE with thin beds of Siltstone. Fresh to slightly weathered.			
24.30	100	95	60	6				24.30m to 24.35m BGL - Clay Infill 24.40m to 24.45m BGL - Clay Infill 24.50m to 24.55m BGL - Clay Infill 22.80m to 26.00m BGL - Three Fracture Sets - F1: 0 to 20 degree fractures, close to medium spaced, undulating, rough. F2: 40 to 60 degree fractures, medium spaced, planar to undulating, rough. F3: 70 to 90 degree fractures, medium spaced, undulating, rough.			
26.00	100	100	82				(7.30)				
27.60	100	100	82	5				26.00m to 30.20m BGL - Three Fractures Sets - F1: 0 to 20 degree fractures, medium to widely spaced, planar to undulating, rough. F2: 40 to 60 degree fractures, medium to widely spaced, undulating, rough. F3: 70 to 90 degree fractures, widely spaced, undulating to stepped, rough.			
29.20	100	95	75					29.20m to 29.25m BGL - Clay Infill			

Remarks

Scale (approx)	Logged By
1:50	JK

Figure No. 14166-09-24.BH01

Ground Investigations Ireland Ltd
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Site Seskin Renewables Wind Farm			**Borehole Number** BH01
Machine : Beretta T-44 **Flush :** Water **Core Dia:** 63.5 mm **Method :** Rotary Cored	**Casing Diameter** 96mm cased to 30.20m	**Ground Level (mOD)** 165.79	**Client** MKO Ireland
	Location (dGPS) 641558.5 E 674568.9 N	**Dates** 08/11/2024-11/11/2024	**Engineer**
			Job Number 14166-09-24
			Sheet 4/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						135.59	30.20				
30.20								Complete at 30.20m			

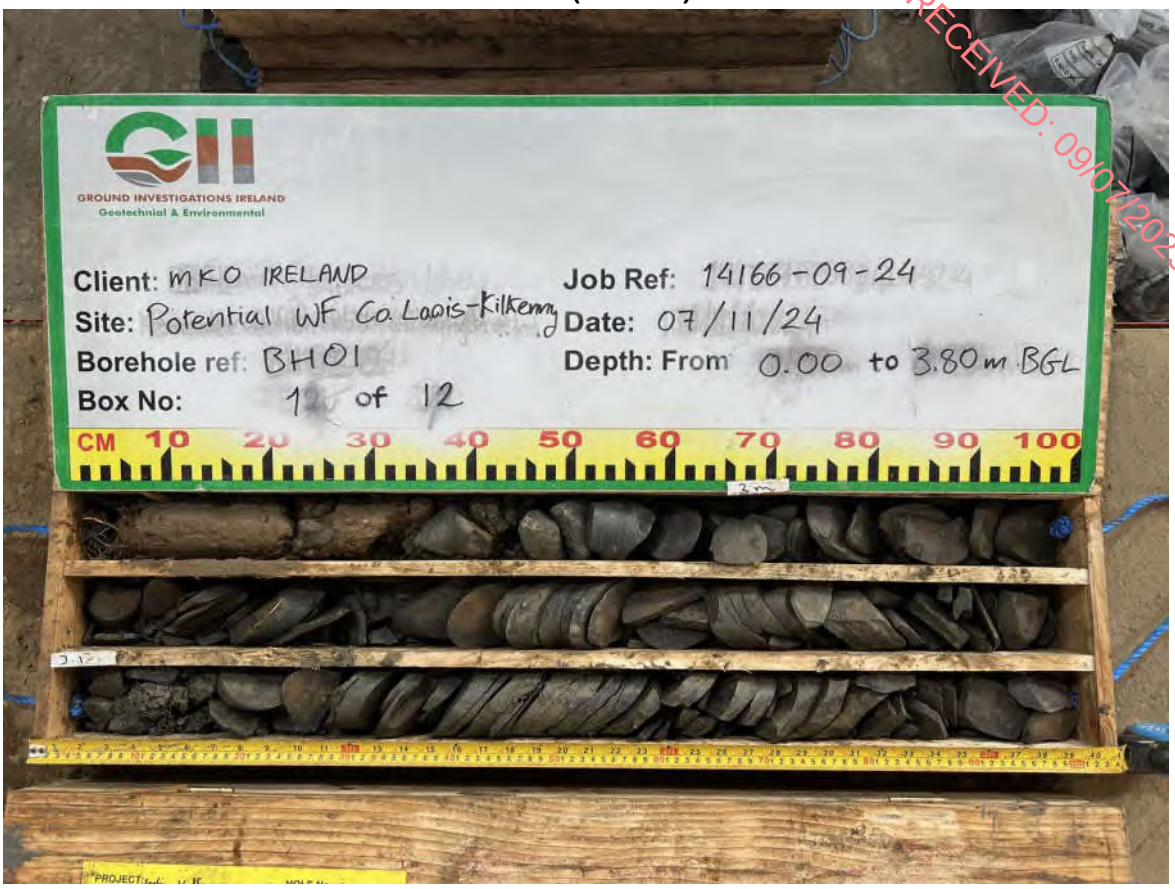
Remarks

Scale (approx)	Logged By
1:50	JK

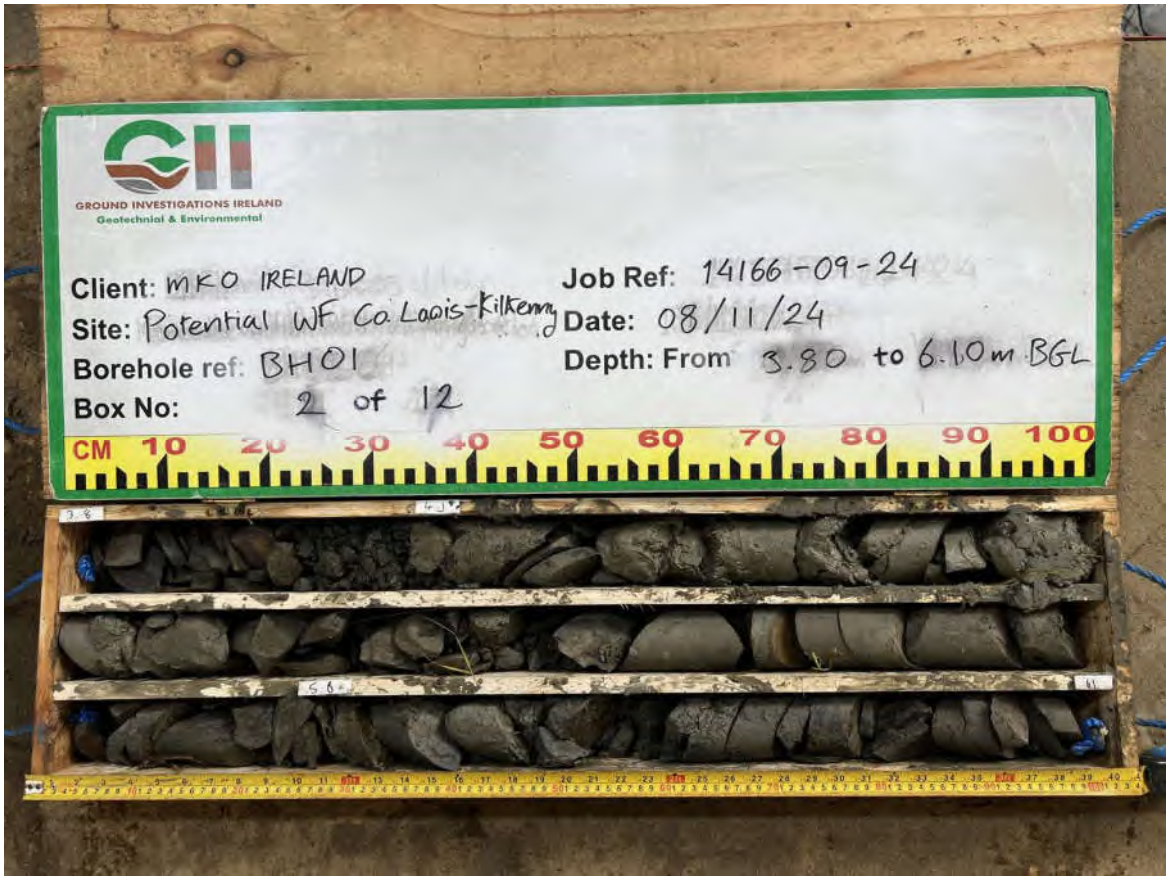
Figure No. 14166-09-24.BH01

Seskin Renewables Wind Farm – Rotary Core Photographs

BH01 (1 of 12)

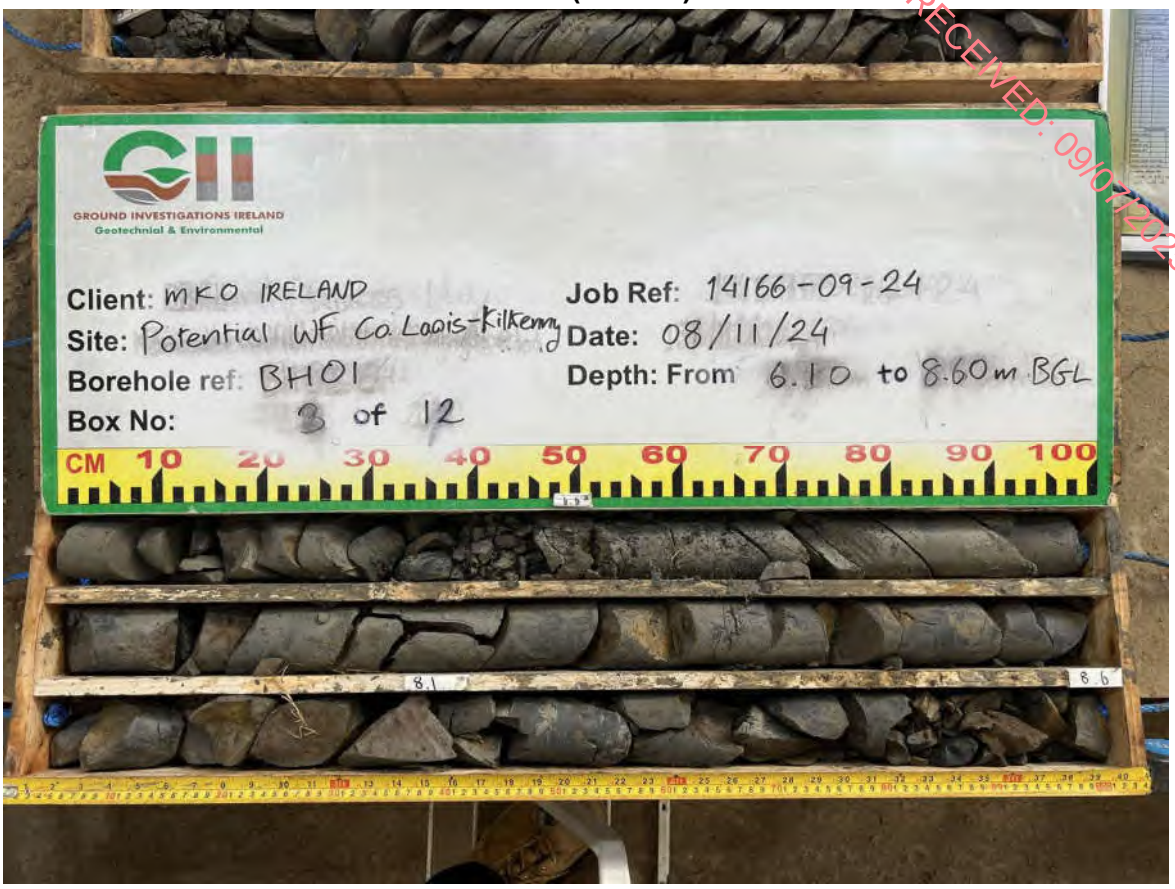


BH01(2 of 12)



Seskin Renewables Wind Farm – Rotary Core Photographs

BH01 (3 of 12)



BH01 (4 of 12)

Seskin Renewables Wind Farm – Rotary Core Photographs

BH01 (5 of 12)

BH01 (6 of 12)

Seskin Renewables Wind Farm – Rotary Core Photographs

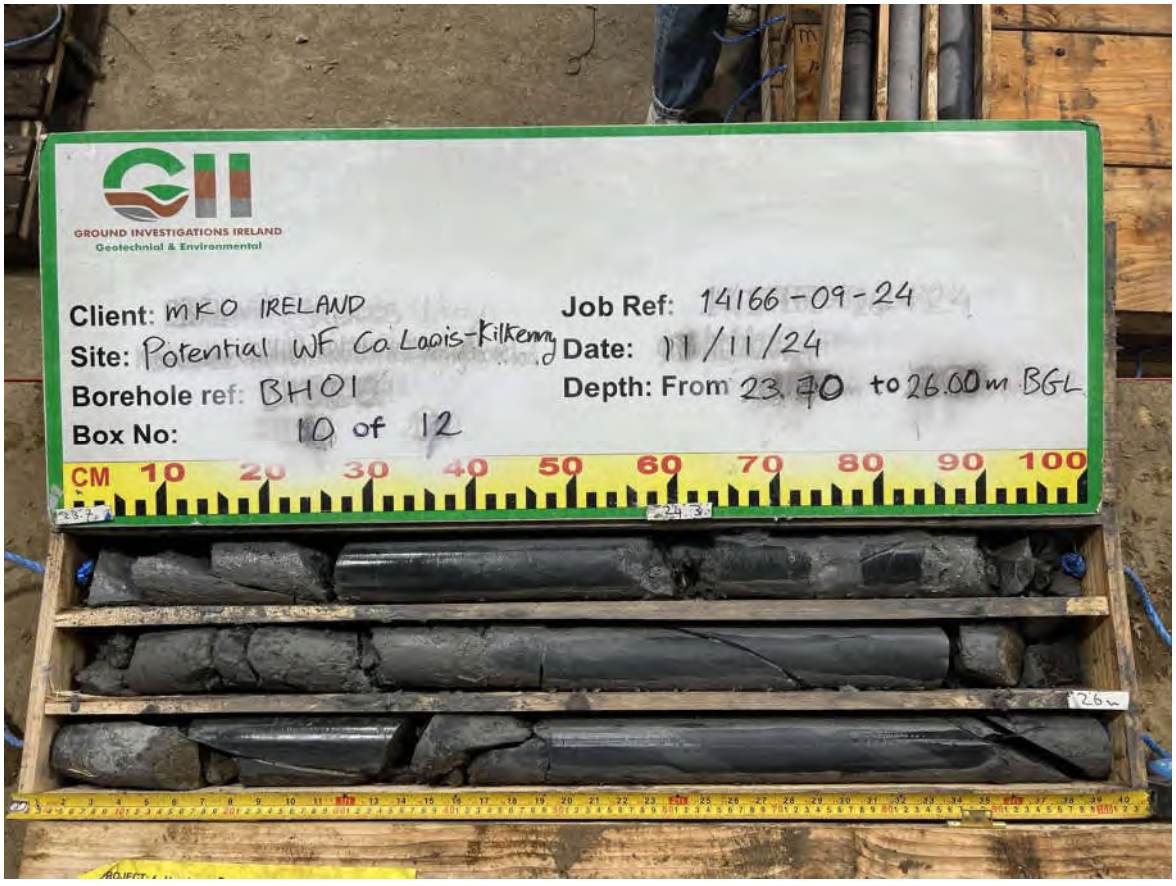
BH01 (7 of 12)

BH01 (8 of 12)

Seskin Renewables Wind Farm – Rotary Core Photographs

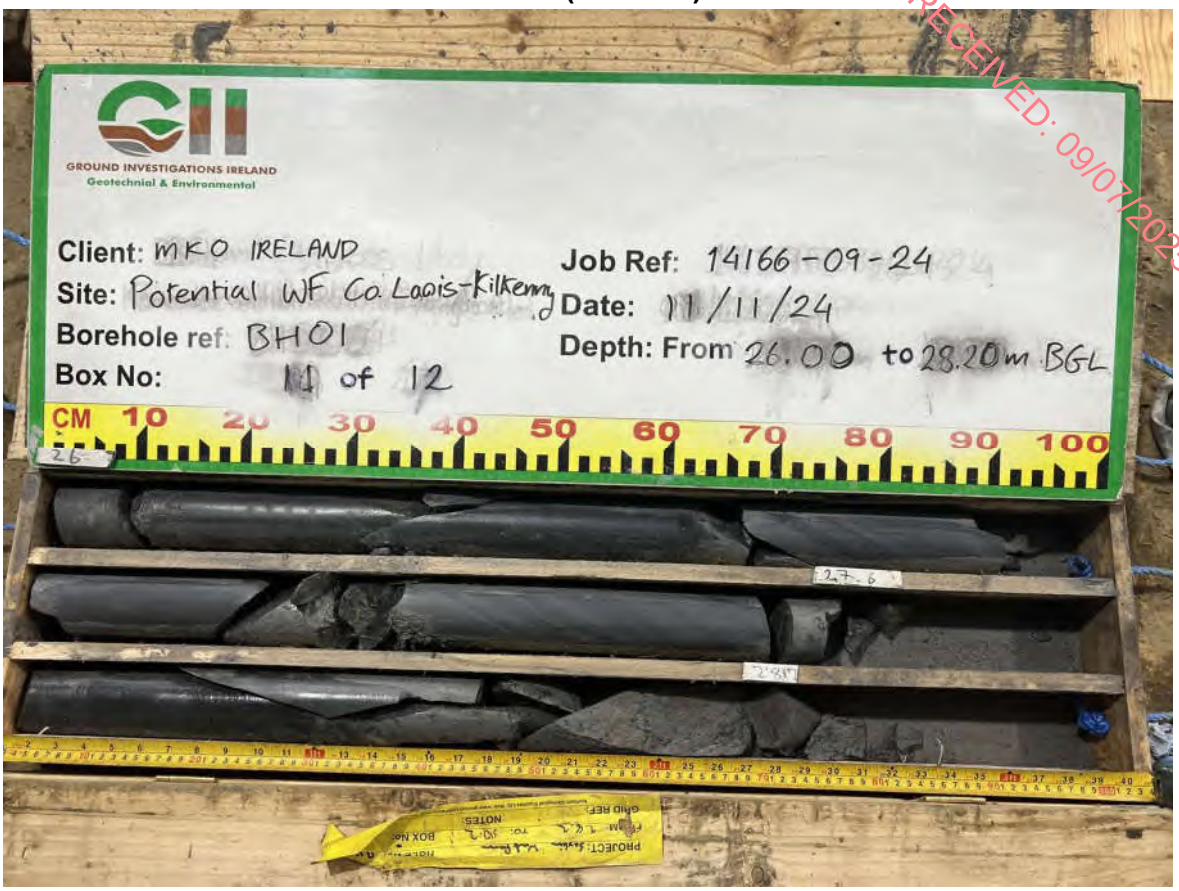
BH01 (9 of 12)

BH01 (10 of 12)



Seskin Renewables Wind Farm – Rotary Core Photographs

BH01 (11 of 12)



BH01 (12 of 12)

APPENDIX 5 – Laboratory Testing

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
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Ireland
D22 K5P8

Attention :	James Cashen
Date :	12th December, 2024
Your reference :	14166-09-24
Our reference :	Test Report 24/20496 Batch 1
Location :	Potential Windfarm Laois
Date samples received :	2nd December, 2024
Status :	Final Report
Issue :	202412121450

Fifteen samples were received for analysis on 2nd December, 2024 of which fifteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 11.946 kg of CO2

Scope 1&2&3 emissions - 28.232 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 14166-09-24
Location: Potential Windfarm Laois
Contact: James Cashen
EMT Job No: 24/20496

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1	2	3	4	5	6	7	8	9	10	LOD/LOR	Units	Method No.
Sample ID	TP-BP01	TP-BP01	TP-BP03	TP-SA01	TP-SA03	TP-SA06	TP-TO02	TP-TO03	TP-TO04	TP-TO06			
Depth	0.50	1.50	1.70	1.50	1.50	0.50	1.50	2.50	1.50	1.50			
COC No / misc													
Containers	T	T	T	T	T	T	T	T	T	T			
Sample Date	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024			
Sulphate as SO4 (2:1 Ext) #	0.0026	0.0037	0.0024	0.0040	0.0029	0.0049	0.0030	0.0029	0.0034	0.0035	<0.0015	g/l	TM38/PM20
pH #	7.22	8.59	8.65	8.36	8.65	7.78	8.58	8.63	8.31	8.37	<0.01	pH units	TM73/PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 14166-09-24
Location: Potential Windfarm Laois
Contact: James Cashen
EMT Job No: 24/20496

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	11	12	13	14	15						LOD/LOR	Units	Method No.
Sample ID	TP-TO07	TP-TO07	TP-TO08	TP-TO08	TP-TH01								
Depth	0.50	2.70	1.50	3.50	1.20								
COC No / misc													
Containers	T	T	T	T	T								
Sample Date	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024								
Sulphate as SO4 (2:1 Ext) #	0.0046	0.0036	0.0047	0.0709	0.0050						<0.0015	g/l	TM38/PM20
pH #	7.73	8.60	8.49	8.41	7.86						<0.01	pH units	TM73/PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Notification of Deviating Samples

Client Name: Ground Investigations Ireland
Reference: 14166-09-24
Location: Potential Windfarm Laois
Contact: James Cashen

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 24/20496						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 24/20496

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/20496

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

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			Geotechnical Testing								
Job No.	GII	369	Determination of Moisture Content, Atterberg Limits, Particle Density Tested in accordeance with BS1377: Part 2 (2022)						Client No.		28
Report No.		GII369 -GEO AA							Date Sampled	07/11/2024	
Client:		Ground Investigations Ireland							Date Received	07/11/2024	
Contract		Potential Wind Farm Co.Laois / Kilkenny							Date Tested	06/12/2024	

Sample No	BH- TP	Depth (m)	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm		Description
2641	TP-BP01 @0.50m	TP-BP01 @0.50m	B	13.8	34	22	10	100		Silty, sandy, gravelly CLAY brown
2642	TP-BP01 @1.50m	TP-BP01 @1.50m	B	15.7	31	18	12	100		Silty, sandy, gravelly CLAY brown
2643	TP0BP03 @1.70m	TP0BP03 @1.70m	B	5.7	31	20	15	100		Silty, sandy, gravelly CLAY brown
2644	TP-SA01 @1.80m	TP-SA01 @1.80m	B	12.5	26	15	10	100		Silty, sandy, gravelly CLAY brown
2645	TP0-SA03 @1.50m	TP0-SA03 @1.50m	B	8.6	20	18	2	100		Silty, sandy, gravelly CLAY brown
2646	TP-SA06 @0.50m	TP-SA06 @0.50m	B	22.4	27	18	10	100		Silty, sandy, gravelly CLAY brown
2647	TP-T02 @1.50m	TP-T02 @1.50m	B	9.5	24	13	11	100		Silty, sandy, gravelly CLAY brown
2648	TP-T03 @2.50m	TP-T03 @2.50m	B	9.7	26	15	11	100		Silty, sandy, gravelly CLAY brown
2649	TP-T04 @1.50m	TP-T04 @1.50m	B	25.9	31	16	16	100		Silty, sandy, gravelly CLAY brown
2650	TP-T06 @1.50m	TP-T06 @1.50m	B	12.5	30	15	15	100		Silty, sandy, gravelly CLAY brown
2651	TP-T07 @0.50m	TP-T07 @0.50m	B	31.2	34	18	18	100		Silty, sandy, gravelly CLAY brown
2652	TP-T07 @2.70m	TP-T07 @2.70m	B	9.7	30	15	16	100		Silty, sandy, gravelly CLAY brown
2653	TP-T08 @1.50m	TP-T08 @1.50m	B	10.2	32	14	20	100		Silty, sandy, gravelly CLAY brown
2654	TP-T08 @3.50m	TP-T08 @3.50m	B	9.5	27	13	14	100		Silty, sandy, gravelly CLAY brown
2655	TP-TH01 @1.20m	TP-TH01 @1.20m	B	23.3	34	19	16	100		Silty, sandy, gravelly CLAY brown

Notes Sample Type: B- Bulk, U- Undisturbed, D- Disturbed Preparation: WS- Wet Sieved, AR- As received, NP- Non plastic, ND - Not Determined

Remarks

Approved by	Date	Page	1	of	1

20/12/2024

ISO 17025 T IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.386T

RS 045 Testing Summary Issue Date: 18/01/2024 Issued by: GR

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Geotechnical and Soil Testing Services Ltd

Sample No. **SA 2655**
Job No. **GII 369**
Client No. **C028**

Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

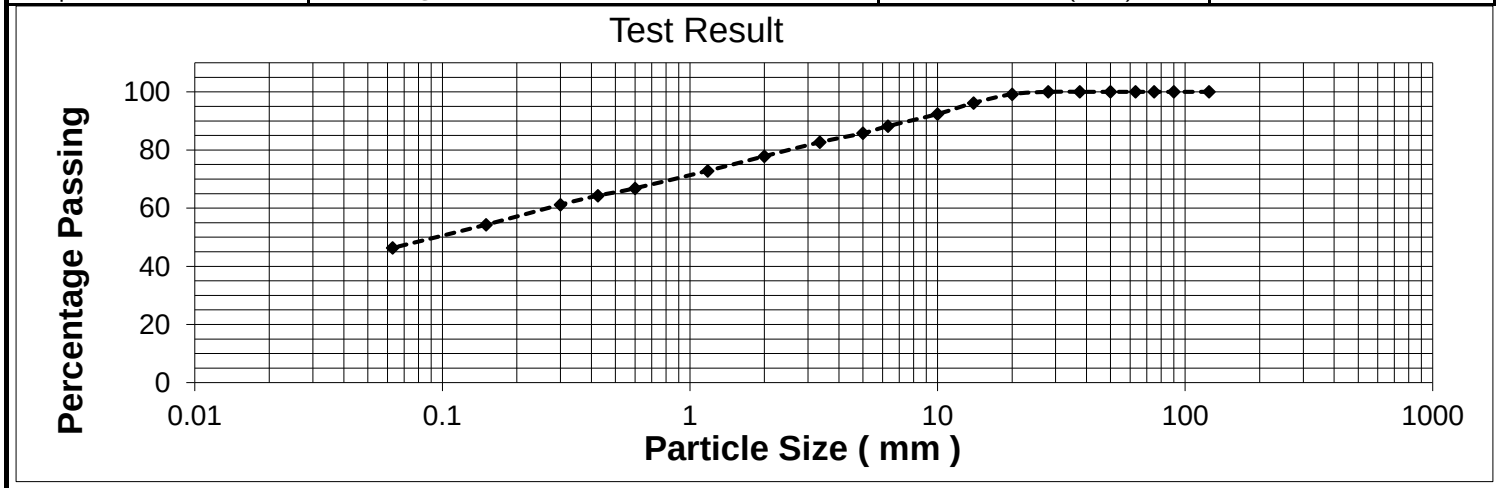
ISO 17025 T IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.3861

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2655 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2655**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-TH01 @1.20m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-TH01 @1.20m	Moisture Content (All in)	23.3 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	46.3	32	22		

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	100	
50 mm	100	
37.5 mm	100	
28 mm	100	
20 mm	99	
14 mm	96	
10 mm	92	
6.3 mm	88	
5 mm	86	
3.35 mm	83	
2 mm	78	
1.18 µm	73	
600 µm	67	
425 µm	64	
300 µm	61	
150 µm	54	
63 µm	**46.3**	

Sample Certificate No.: ***SA2655***

Notes: This test report shall not be reproduced except in full,without the prior written approval of the laboratory.
Results relate only to the sample tested and apply to sample as receieved.
(*) Denotes Sample information above has been provided by the client.

Authorised signatories

Signed: _____
for Geotechnical and Soil Testing Services Ltd

Date: 20/12/2024

G . Reilly - Laboratory Manager

Page 1 of 1 **End of Report**

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Geotechnical and Soil Testing Services Ltd

Sample No. **SA 2654**
Job No. **GII 369**
Client No. **C028**

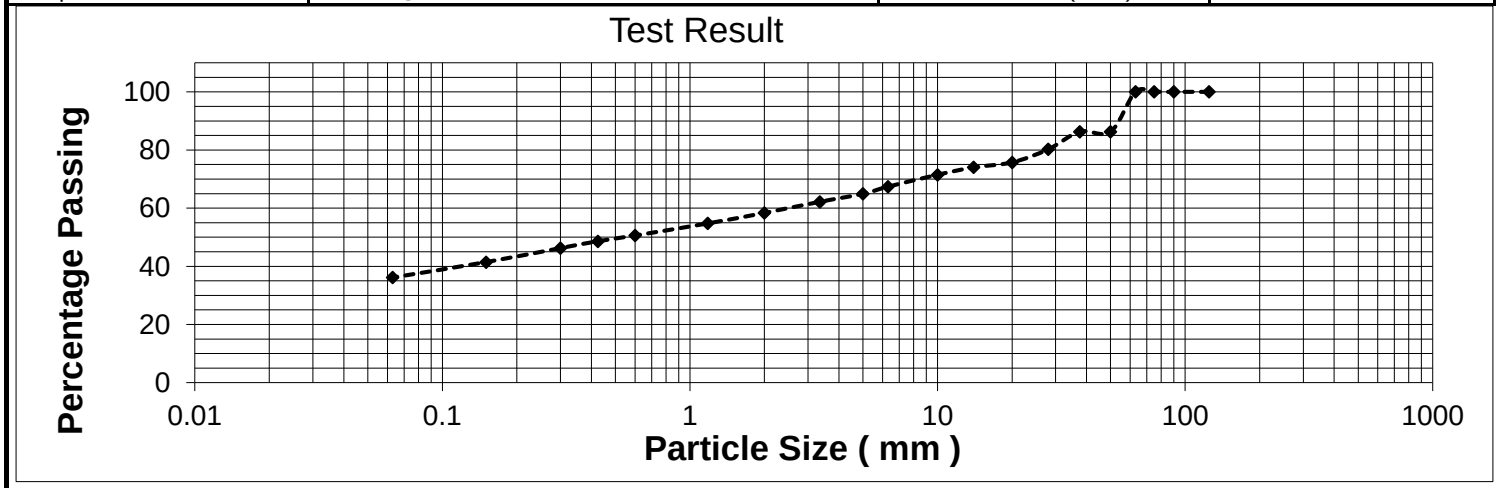
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2654 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2654**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-T08 @3.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T08 @3.50m	Moisture Content (All in)	9.5 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	36.2	22	42		

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	100	
50 mm	86	
37.5 mm	86	
28 mm	80	
20 mm	76	
14 mm	74	
10 mm	71	
6.3 mm	67	
5 mm	65	
3.35 mm	62	
2 mm	58	
1.18 µm	55	
600 µm	51	
425 µm	49	
300 µm	46	
150 µm	41	
63 µm	**36.2**	

Sample Certificate No.: ***SA2654***

Notes: This test report shall not be reproduced except in full,without the prior written approval of the laboratory.
Results relate only to the sample tested and apply to sample as receieved.
(*) Denotes Sample information above has been provided by the client.

Authorised signatories

Signed: _____
for Geotechnical and Soil Testing Services Ltd

Date: 20/12/2024

G . Reilly - Laboratory Manager

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Sample No. **SA 2653**
Job No. **GII 369**
Client No. **C028**

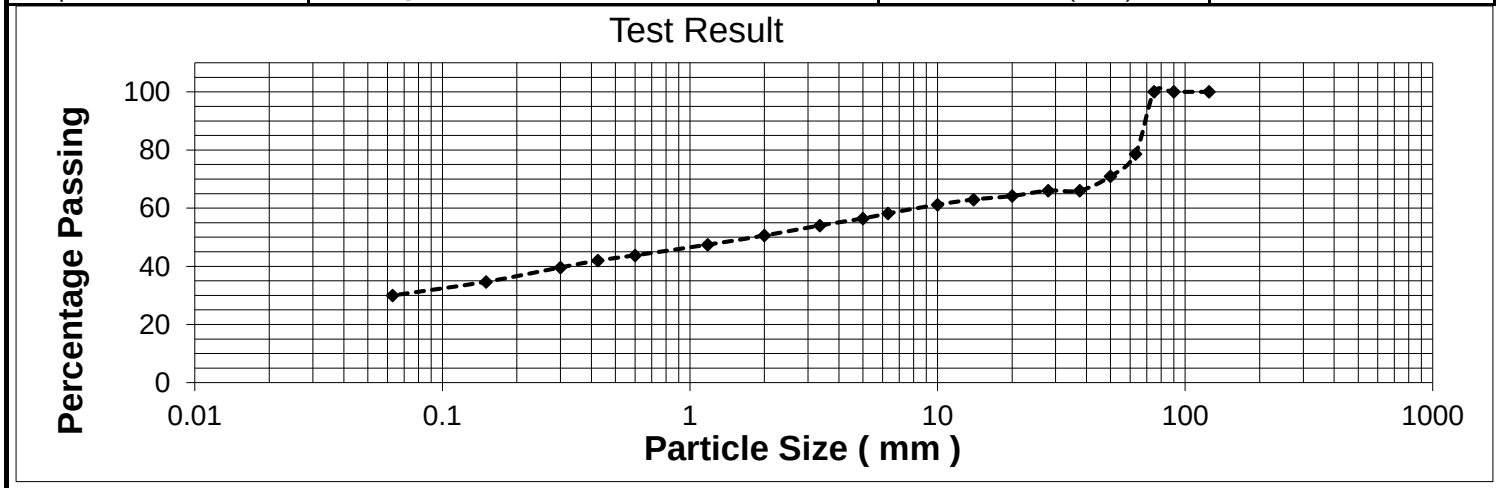
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2653 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2653**
Supplier *	Ground Investigation Ireland	Date Sampled	04/11/2024
Source *	TP-T08 @1.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T08 @1.50m	Moisture Content (All in)	10.2 %



	Fine	Med	Coarse	Fine	Med	Coarse	Fine	Med	Coarse	Coarse	Boulders
CLAY	Silt			Sand			Gravel			Cobbles	
	30.0			21			28			21	

BS Sieve		% Passing	Spec
125	mm	100	
90	mm	100	
75	mm	100	
63	mm	79	
50	mm	71	
37.5	mm	66	
28	mm	66	
20	mm	64	
14	mm	63	
10	mm	61	
6.3	mm	58	
5	mm	56	
3.35	mm	54	
2	mm	51	
1.18	µm	47	
600	µm	44	
425	µm	42	
300	µm	40	
150	µm	35	
63	µm	**30.0**	

Sample Certificate No.: ***SA2653***

Notes: This test report shall not be reproduced except in full,without the prior written approval of the laboratory.
Results relate only to the sample tested and apply to sample as receieved.
(*) Denotes Sample information above has been provided by the client.

Authorised signatories

Signed: _____
for Geotechnical and Soil Testing Services Ltd

Date: 20/12/2024

G . Reilly - Laboratory Manager

Page 1 of 1 **End of Report**

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Geotechnical and Soil Testing Services Ltd

Sample No. **SA 2652**
Job No. **GII 369**
Client No. **C028**

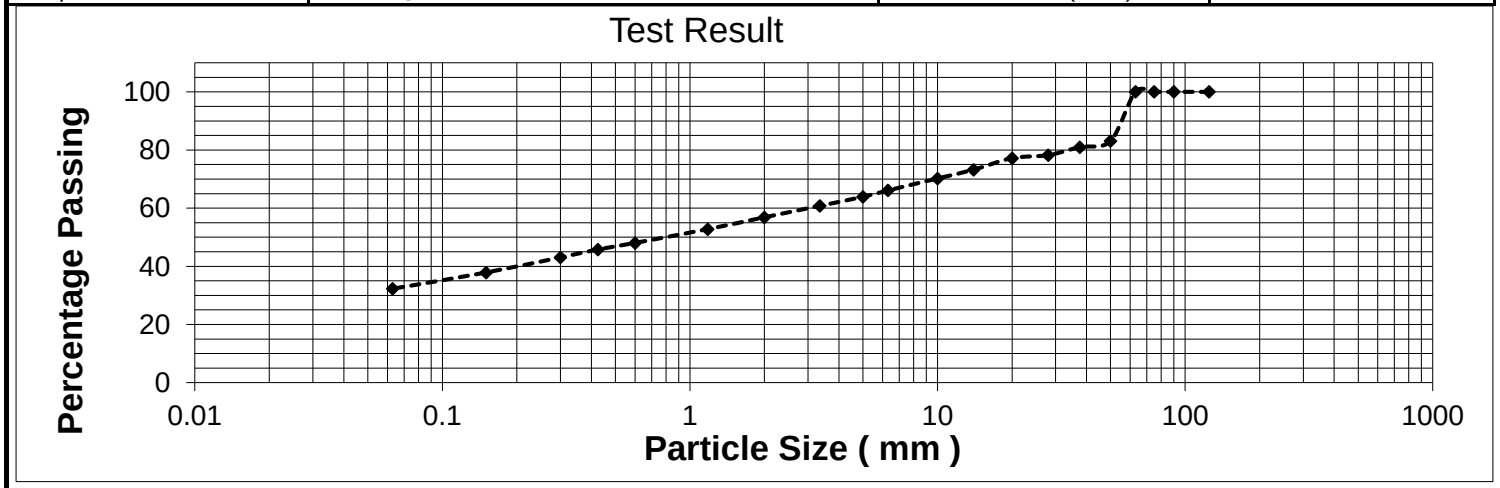
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2652 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2652**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-T07 @2.70m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T07 @2.70m	Moisture Content (All in)	9.7 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	32.3	25	43		

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	100	
50 mm	83	
37.5 mm	81	
28 mm	78	
20 mm	77	
14 mm	73	
10 mm	70	
6.3 mm	66	
5 mm	64	
3.35 mm	61	
2 mm	57	
1.18 µm	53	
600 µm	48	
425 µm	46	
300 µm	43	
150 µm	38	
63 µm	**32.3**	

Sample Certificate No.: ***SA2652***

Notes: This test report shall not be reproduced except in full,without the prior written approval of the laboratory.
Results relate only to the sample tested and apply to sample as receieved.
(*) Denotes Sample information above has been provided by the client.

Authorised signatories

Signed: _____
for Geotechnical and Soil Testing Services Ltd

Date: 20/12/2024

G . Reilly - Laboratory Manager

Page 1 of 1 **End of Report**

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Geotechnical and Soil Testing Services Ltd

Sample No. **SA 2651**
Job No. **GII 369**
Client No. **C028**

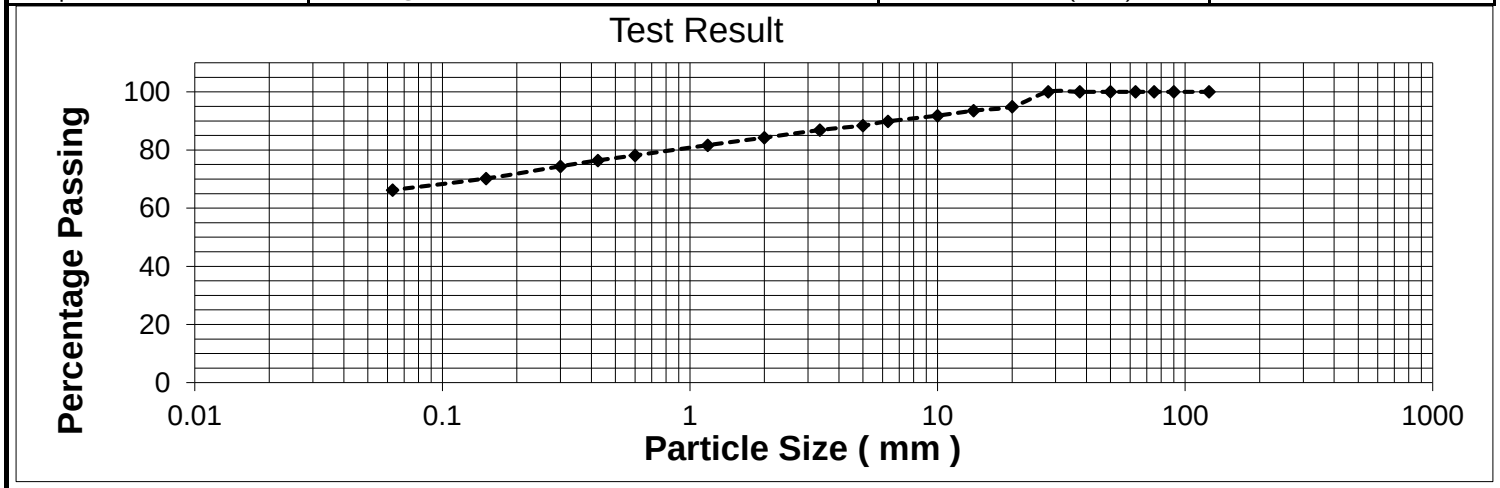
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2651 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2651**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-T07 @0.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T07 @0.50m	Moisture Content (All in)	31.2 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	66.2	18	16		

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	100	
50 mm	100	
37.5 mm	100	
28 mm	100	
20 mm	95	
14 mm	94	
10 mm	92	
6.3 mm	90	
5 mm	88	
3.35 mm	87	
2 mm	84	
1.18 µm	82	
600 µm	78	
425 µm	76	
300 µm	74	
150 µm	70	
63 µm	**66.2**	

Sample Certificate No.: ***SA2651***

Notes: This test report shall not be reproduced except in full,without the prior written approval of the laboratory.
Results relate only to the sample tested and apply to sample as receieved.
(*) Denotes Sample information above has been provided by the client.

Authorised signatories

Signed: _____
for Geotechnical and Soil Testing Services Ltd

Date: 20/12/2024

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Geotechnical and Soil Testing Services Ltd

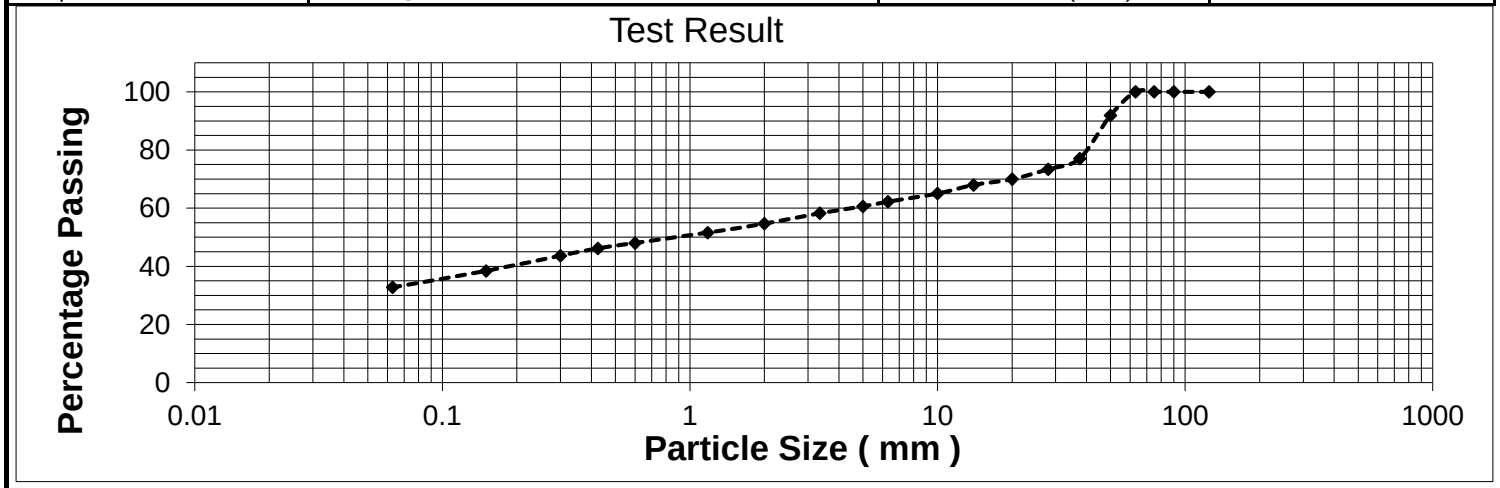
Sample No. **SA 2650**
Job No. **GII 369**
Client No. **C028**

Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method) ***2650 PSD***

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2650**
Supplier *	Ground Investigation Ireland	Date Sampled	05/11/2024
Source *	TP-T06 @1.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T06 @1.50m	Moisture Content (All in)	12.5 %



	Fine	Med	Coarse	Fine	Med	Coarse	Fine	Med	Coarse	Coarse	Boulders
CLAY	Silt			Sand			Gravel			Cobbles	
	32.8			22			45				

BS Sieve		% Passing	Spec
125	mm	100	
90	mm	100	
75	mm	100	
63	mm	100	
50	mm	92	
37.5	mm	77	
28	mm	73	
20	mm	70	
14	mm	68	
10	mm	65	
6.3	mm	62	
5	mm	61	
3.35	mm	58	
2	mm	55	
1.18	µm	52	
600	µm	48	
425	µm	46	
300	µm	44	
150	µm	38	
63	µm	**32.8**	

Sample Certificate No.: ***SA2650***

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Sample No. **SA 2649**
Job No. **GII 369**
Client No. **C028**

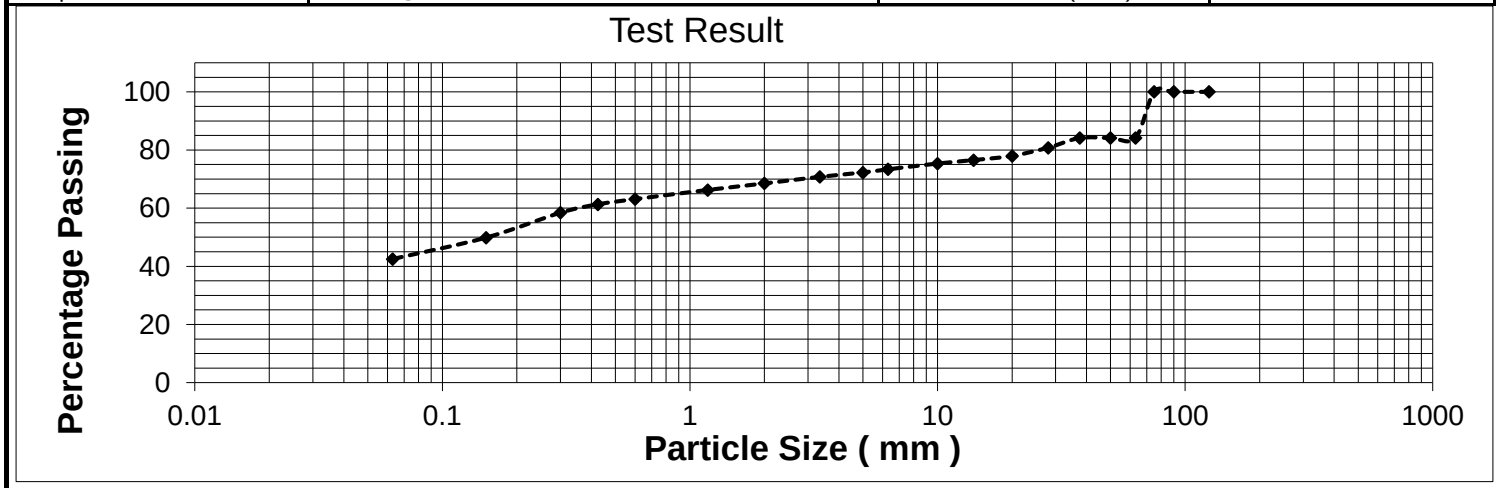
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2649 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2649**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-T04 @1.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T04 @1.50m	Moisture Content (All in)	25.9 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	42.5	26	16	16	

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	84	
50 mm	84	
37.5 mm	84	
28 mm	81	
20 mm	78	
14 mm	77	
10 mm	75	
6.3 mm	73	
5 mm	72	
3.35 mm	71	
2 mm	68	
1.18 µm	66	
600 µm	63	
425 µm	61	
300 µm	58	
150 µm	50	
63 µm	**42.5**	

Sample Certificate No.: ***SA2649***

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Sample No. **SA 2648**
Job No. **GII 369**
Client No. **C028**

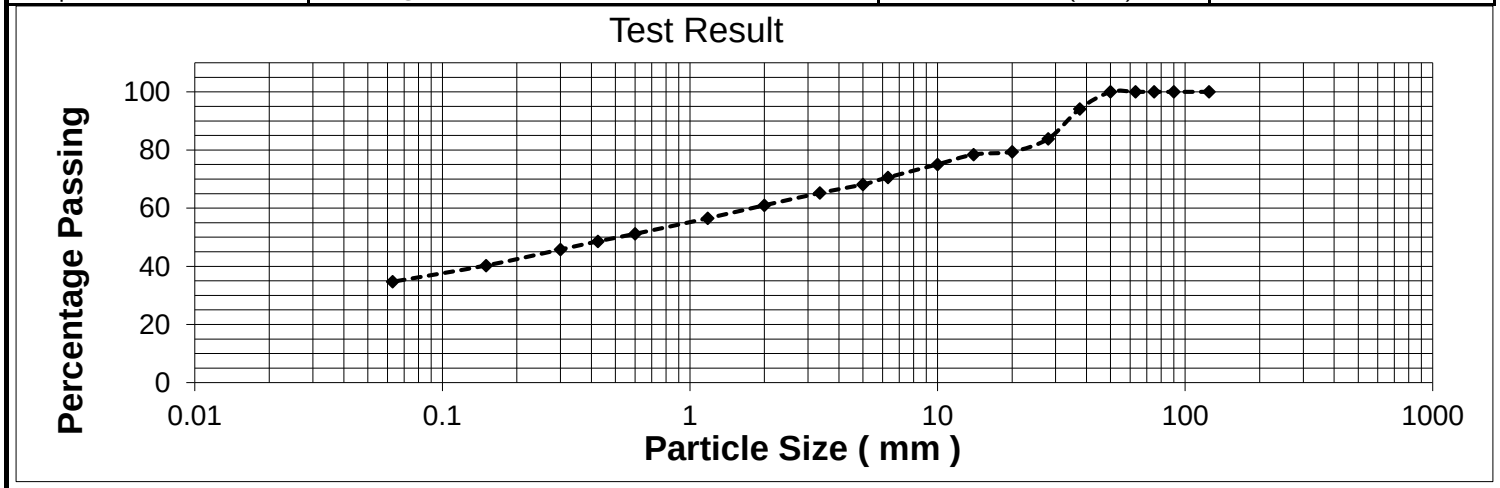
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2648 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2648**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-T03 @2.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T03 @2.50m	Moisture Content (All in)	9.7 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	34.7	26	39		

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	100	
50 mm	100	
37.5 mm	94	
28 mm	84	
20 mm	79	
14 mm	78	
10 mm	75	
6.3 mm	71	
5 mm	68	
3.35 mm	65	
2 mm	61	
1.18 µm	57	
600 µm	51	
425 µm	49	
300 µm	46	
150 µm	40	
63 µm	**34.7**	

Sample Certificate No.: ***SA2648***

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Sample No. **SA 2647**
Job No. **GII 369**
Client No. **C028**

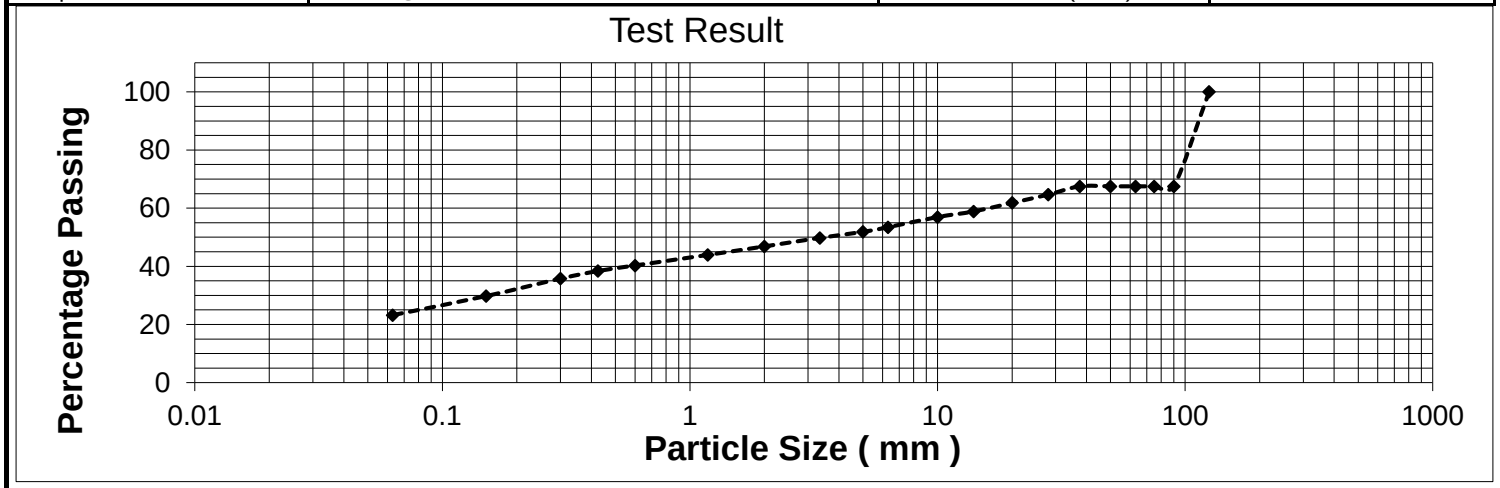
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2647 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2647**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-T02 @1.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-T02 @1.50m	Moisture Content (All in)	9.5 %



	Fine	Med	Coarse	Fine	Med	Coarse	Fine	Med	Coarse	Coarse	Boulders
CLAY	Silt			Sand			Gravel			Cobbles	
	23.2			24			21			32	

BS Sieve		% Passing	Spec
125	mm	100	
90	mm	68	
75	mm	68	
63	mm	68	
50	mm	68	
37.5	mm	68	
28	mm	65	
20	mm	62	
14	mm	59	
10	mm	57	
6.3	mm	53	
5	mm	52	
3.35	mm	50	
2	mm	47	
1.18	µm	44	
600	µm	40	
425	µm	38	
300	µm	36	
150	µm	30	
63	µm	**23.2**	

Sample Certificate No.: ***SA2647***

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Sample No. **SA 2646**
Job No. **GII 369**
Client No. **C028**

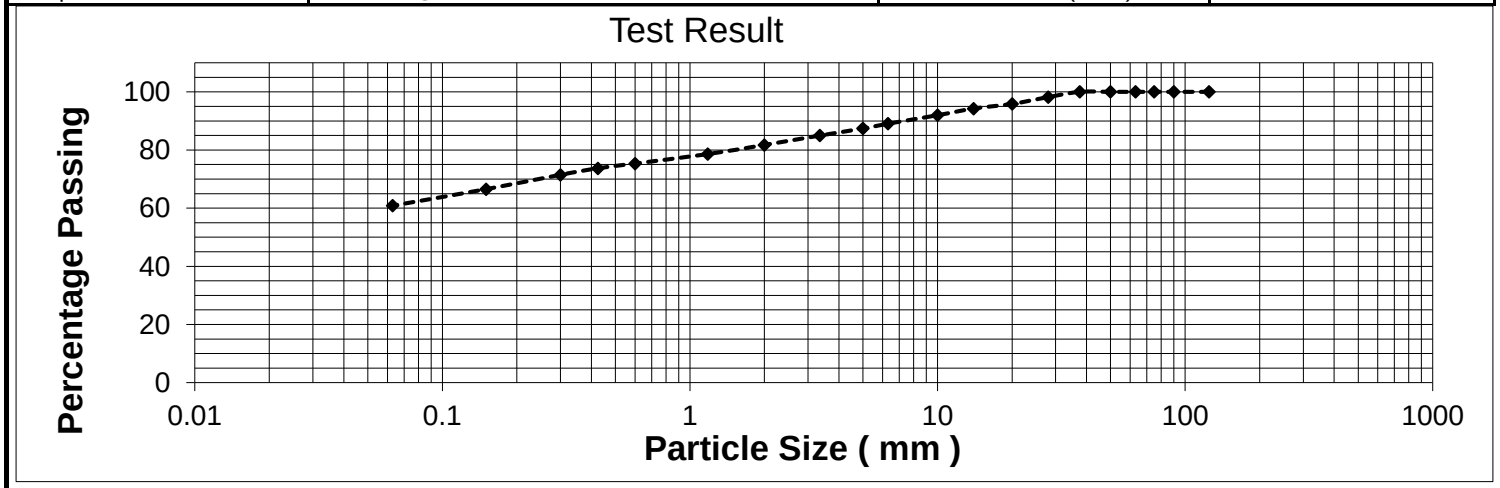
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2646 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2646**
Supplier *	Ground Investigation Ireland	Date Sampled	04/11/2024
Source *	TP-SA06 @0.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-SA06 @0.50m	Moisture Content (All in)	22.4 %



	Fine	Med	Coarse	Fine	Med	Coarse	Fine	Med	Coarse	Coarse	Boulders
CLAY	Silt			Sand			Gravel			Cobbles	
	60.9			21			18				

BS Sieve		% Passing	Spec
125	mm	100	
90	mm	100	
75	mm	100	
63	mm	100	
50	mm	100	
37.5	mm	100	
28	mm	98	
20	mm	96	
14	mm	94	
10	mm	92	
6.3	mm	89	
5	mm	87	
3.35	mm	85	
2	mm	82	
1.18	µm	79	
600	µm	75	
425	µm	74	
300	µm	71	
150	µm	67	
63	µm	**60.9**	

Sample Certificate No.: ***SA2646***

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Date: 20/12/2024

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Sample No. **SA 2645**
Job No. **GII 369**
Client No. **C028**

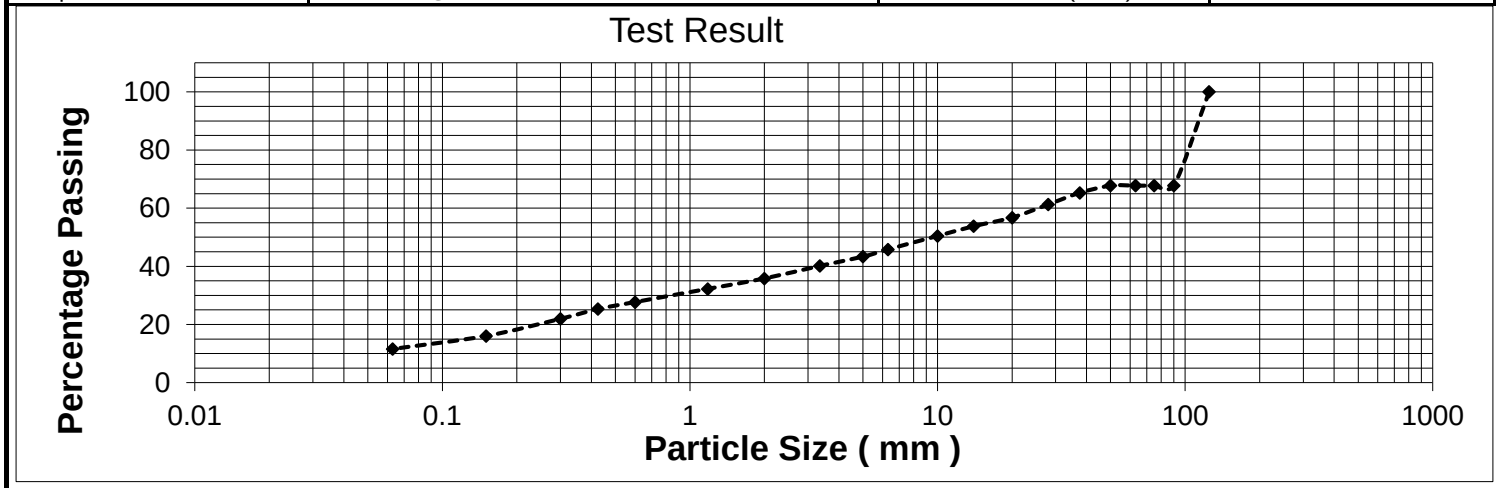
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2645 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2645**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP0-SA03 @1.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP0-SA03 @1.50m	Moisture Content (All in)	8.6 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	11.6	24	32	32	

BS Sieve		% Passing	Spec
125	mm	100	
90	mm	68	
75	mm	68	
63	mm	68	
50	mm	68	
37.5	mm	65	
28	mm	61	
20	mm	57	
14	mm	54	
10	mm	50	
6.3	mm	46	
5	mm	43	
3.35	mm	40	
2	mm	36	
1.18	µm	32	
600	µm	28	
425	µm	25	
300	µm	22	
150	µm	16	
63	µm	**11.6**	

Sample Certificate No.: ***SA2645***

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Sample No. **SA 2644**
Job No. **GII 369**
Client No. **C028**

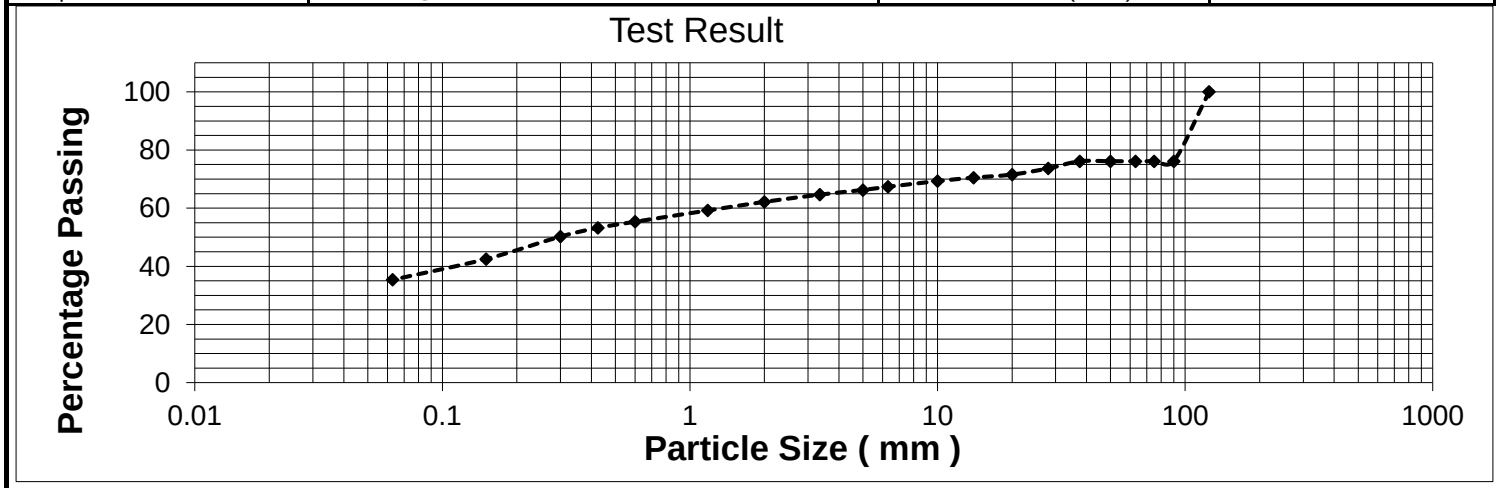
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2644 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2644**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP-SA01 @1.80m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-SA01 @1.80m	Moisture Content (All in)	12.5 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	35.4	27	14	24	

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	76	
75 mm	76	
63 mm	76	
50 mm	76	
37.5 mm	76	
28 mm	74	
20 mm	72	
14 mm	70	
10 mm	69	
6.3 mm	67	
5 mm	66	
3.35 mm	65	
2 mm	62	
1.18 µm	59	
600 µm	55	
425 µm	53	
300 µm	50	
150 µm	42	
63 µm	**35.4**	

Sample Certificate No.: ***SA2644***

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Sample No. **SA 2643**
Job No. **GII 369**
Client No. **C028**

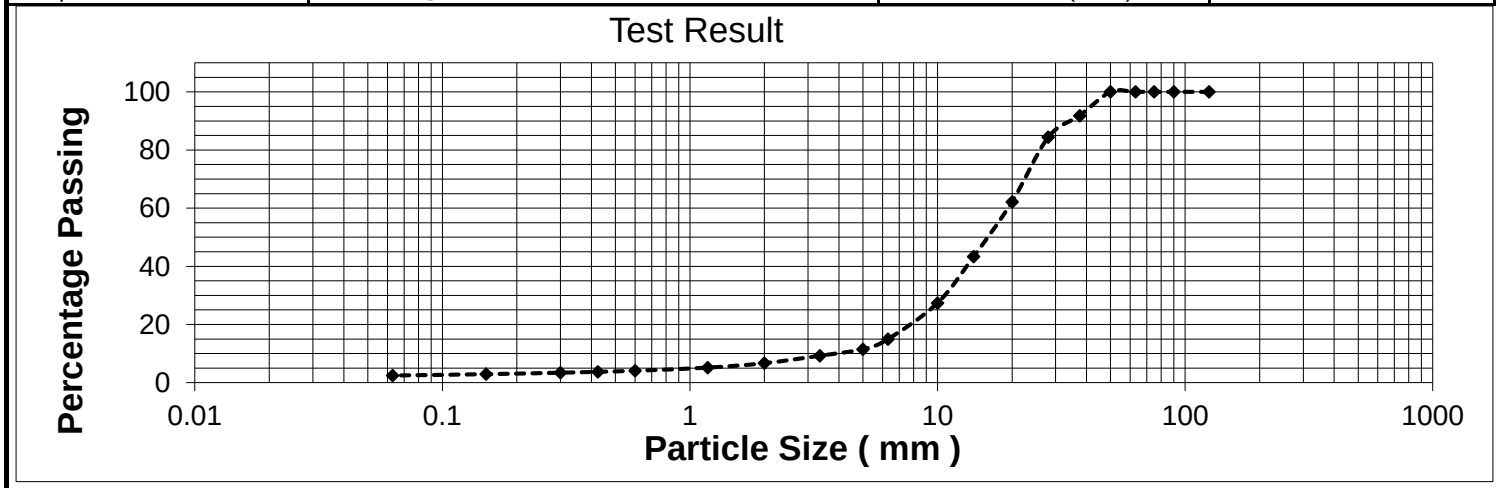
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2643 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2643**
Supplier *	Ground Investigation Ireland	Date Sampled	26/11/2024
Source *	TP0BP03 @1.70m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP0BP03 @1.70m	Moisture Content (All in)	5.7 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	2.4	4	93		

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	100	
63 mm	100	
50 mm	100	
37.5 mm	92	
28 mm	84	
20 mm	62	
14 mm	43	
10 mm	27	
6.3 mm	15	
5 mm	12	
3.35 mm	9	
2 mm	7	
1.18 µm	5	
600 µm	4	
425 µm	4	
300 µm	3	
150 µm	3	
63 µm	**2.4**	

Sample Certificate No.: ***SA2643***

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Sample No. **SA 2642**
Job No. **GII 369**
Client No. **C028**

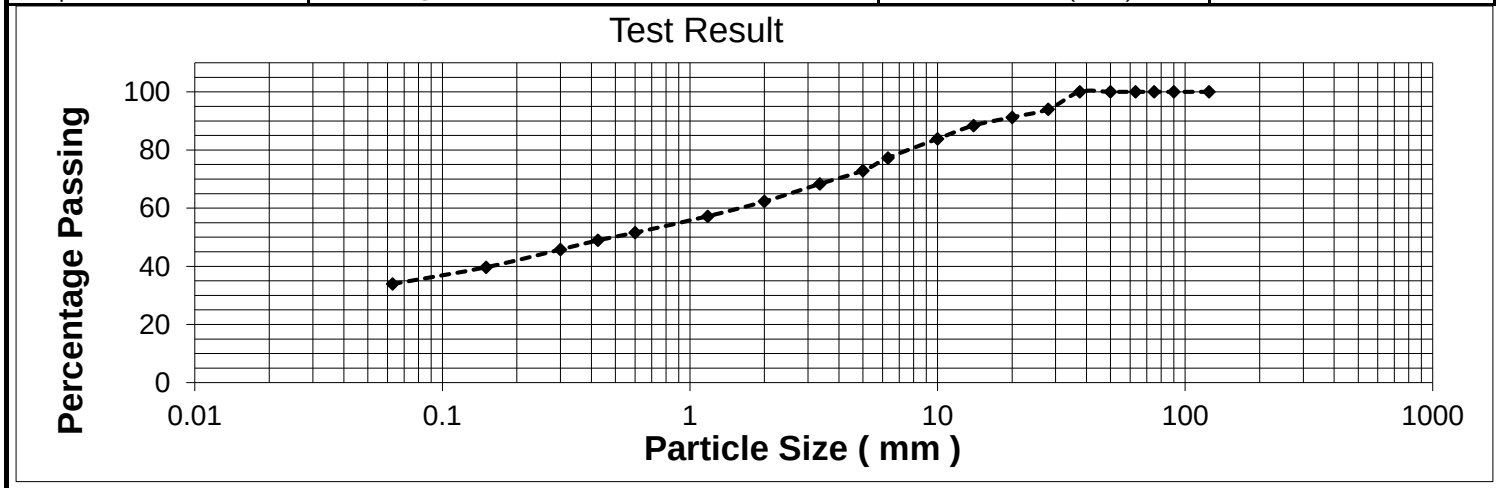
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2642 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2642**
Supplier *	Ground Investigation Ireland	Date Sampled	07/11/2024
Source *	TP-BP01 @1.50m	Date Received	
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-BP01 @1.50m	Moisture Content (All in)	15.7 %



	Fine	Med	Coarse	Fine	Med	Coarse	Fine	Med	Coarse	Coarse	Boulders
CLAY	Silt			Sand			Gravel			Cobbles	
	33.9			28			38				

BS Sieve		% Passing	Spec
125	mm	100	
90	mm	100	
75	mm	100	
63	mm	100	
50	mm	100	
37.5	mm	100	
28	mm	94	
20	mm	91	
14	mm	88	
10	mm	84	
6.3	mm	77	
5	mm	73	
3.35	mm	68	
2	mm	62	
1.18	µm	57	
600	µm	52	
425	µm	49	
300	µm	46	
150	µm	40	
63	µm	**33.9**	

Sample Certificate No.: ***SA2642***

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Sample No. **SA 2641**
Job No. **GII 369**
Client No. **C028**

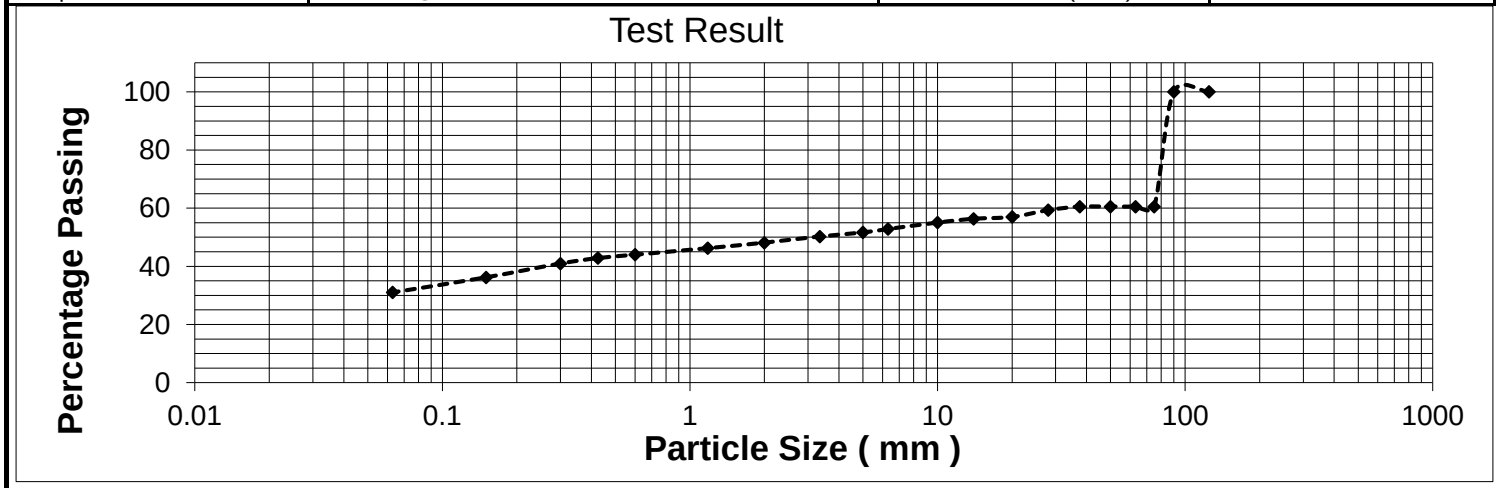
Contract: **Potential Wind Farm Co.Laois / Kilkenny**
Client: **Ground Investigations Ireland**
Client address: Catherinestown House
Hazelhatch Road
Newcastle D22 YD52

TEST REPORT FOR SOILS - PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 2022; BS EN 17892-4:2016 - 5.2 (Wet / Dry sieving method)

2641 PSD

Description of Soil	Silty, sandy, gravelly CLAY brown	Sample Number	**SA2641**
Supplier *	Ground Investigation Ireland	Date Sampled	07/11/2024
Source *	TP-BP01 @0.50m	Date Received	05/12/2024
Deposition / Location *	Potential Wind Farm Co.Laois / Kilkenny	Date Tested	06/12/24
Sample Ref. *	TP-BP01 @0.50m	Moisture Content (All in)	13.8 %



	Fine Med Coarse	Fine Med Coarse	Fine Med Coarse	Coarse	Boulders
CLAY	Silt	Sand	Gravel	Cobbles	
	31.0	17	12	39	

BS Sieve	% Passing	Spec
125 mm	100	
90 mm	100	
75 mm	61	
63 mm	61	
50 mm	61	
37.5 mm	61	
28 mm	59	
20 mm	57	
14 mm	56	
10 mm	55	
6.3 mm	53	
5 mm	52	
3.35 mm	50	
2 mm	48	
1.18 µm	46	
600 µm	44	
425 µm	43	
300 µm	41	
150 µm	36	
63 µm	**31.0**	

Sample Certificate No.: ***SA2641***

Notes: This test report shall not be reproduced except in full,without the prior written approval of the laboratory.
Results relate only to the sample tested and apply to sample as receieved.
(*) Denotes Sample information above has been provided by the client.

Authorised signatories

Signed: _____
for Geotechnical and Soil Testing Services Ltd

Date: 20/12/2024

G . Reilly - Laboratory Manager

Page 1 of 1 **End of Report**

APPENDIX 6 – Geophysical Survey

AGP24148_01

Report
on the
Geophysical Investigation
For the
Seskin Wind Farm
Co. Kilkenny
For
Ground Investigations Ireland Limited

20TH December 2024

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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	AGP24148		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
TONY LOMBARD M.SC (GEOPHYSICS) SEBASTIAN CORRALES B.SC (GEOPHYSICS)	EURGEOL PETER O'CONNOR P.GEO., M.SC (GEOPHYSICS), DIP. EIA MGT.	V.01	20TH DECEMBER 2024

CONTENTS

1. EXECUTIVE SUMMARY

APEX Geophysics Limited was requested by Ground Investigations Ireland Limited to carry out a geophysical investigation at Seskin Renewables Wind Farm in Co. Kilkenny. There is a requirement for a geophysical survey to assess sub-soil conditions at eight proposed turbine bases, a substation, a borrow pit and two additional profiles (HY1 & HY2)

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 Geological Survey of Ireland (GSI) Quaternary Sediments Map indicates till derived from Namurian sandstones and shales with bedrock outcrop or subcrop and Karstified bedrock outcrop and subcrop mapped at a number of locations. The GSI Bedrock Geology Map indicates that the survey area is underlain by three distinct geological formations, the Bregaun Flagstone Formation, consisting of thick flaggy sandstone and siltstone, the Clogrenan Formation consisting of cherty, muddy, calcarenitic limestone and the Killeshin Siltstone Formation described as muddy siltstone and silty mudstone. The GSI karst database indicates a number of swallow holes, southeast of turbine base T6 in the Clongrennan Formation.

The survey was carried out between the 14th and 21st of October 2024 and involved the acquisition of Electrical Resistivity Tomography (ERT), P-wave Seismic Refraction profiling and Multichannel Analysis of Surface Wave (MASW) 1D soundings. Where results for the MASW survey are not presented it is because a satisfactory 'dispersion curve' could not be generated due to the presence of thin soils/shallow rock.

The results of the geophysical investigation, in conjunction with the direct investigation data, are detailed in this report and presented on the drawings in Appendix B and generally indicate:

- **Layer 1** consists predominantly of thin, soft sandy gravelly clay with occasionally loose clayey sand/gravel 'pockets' and may contain completely weathered rock towards the base.
- **Layer 2** consists of firm sandy gravelly clay with occasional 'pockets' of medium dense clayey sand/gravel or firm silt/clay and highly weathered rock.
- **Layer 3** consists predominantly of shallow moderately weathered bedrock and/or stiff to very stiff sandy gravelly clay/ dense to very dense clayey sand/gravel.
- **Layer 4** consists predominantly of slightly weathered to fresh bedrock.

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

A number of the ERT profiles within the limestone setting, T3, T5, T6, T7, T8, the substation and profile HY2 indicate areas of low bedrock resistivity (100 to 300 Ohm-m at T7 & T8) and slightly reduced resistivity (300 – 1,000 Ohm-m on HY2). These areas indicate increased weathering/fracturing/possible karst within the limestone.

Direct investigation locations are recommended across the survey area to confirm overburden type, depth to rock and to investigate the possibility of increased fissuring/karstification within the limestone areas.

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

2. INTRODUCTION

APEX Geophysics Limited was requested by Ground Investigations Ireland Limited to carry out a geophysical investigation at Seskin Renewables Wind Farm in Co. Kilkenny. There is a requirement for a geophysical survey to assess sub-soil conditions at 12 locations: 8 proposed turbine bases (T1 to T8), a substation (SS), a borrow pit (BP) and 2 additional profiles (HY1 and HY2).

2.1 Survey Objectives

The objectives of the investigation were to provide information on:

- The soil stiffness, type and thickness
- Depth to bedrock and the weathering and excavatability of the bedrock
- Type of bedrock
- Potential faults/fissure/karst zones within the bedrock
- Propose borehole locations

2.2 Site Background

The Seskin Renewables Wind Farm is approximately 20 km northwest of Kilkenny city and 2.5 km south of the village of Durrow. The site comprises open ground ranging in elevation from approximately 95 m OD at proposed turbine base T7 in the southeast to 179 m OD at T4 in the northwest. The layout of the survey locations is shown in Fig. 2.1.

Fig 2.1: Location map with geophysical survey locations.

2.2.1 Soils

The Geological Survey of Ireland (GSI) Quaternary Sediments Map (GSIa, 2019) indicates varying sediment types across the survey area. Till derived from Namurian sandstones and shales at survey locations T2, T7, and partially at T3, T5, T8, and the Borrow Pit. Bedrock outcrop or subcrop is mapped at locations T1, T4, HY1, and partially at

T3 and T6. Karstified bedrock outcrop and subcrop are observed at HY2, the Substation, and partially at T3, T5, T6, and T8 (Fig. 2.2).

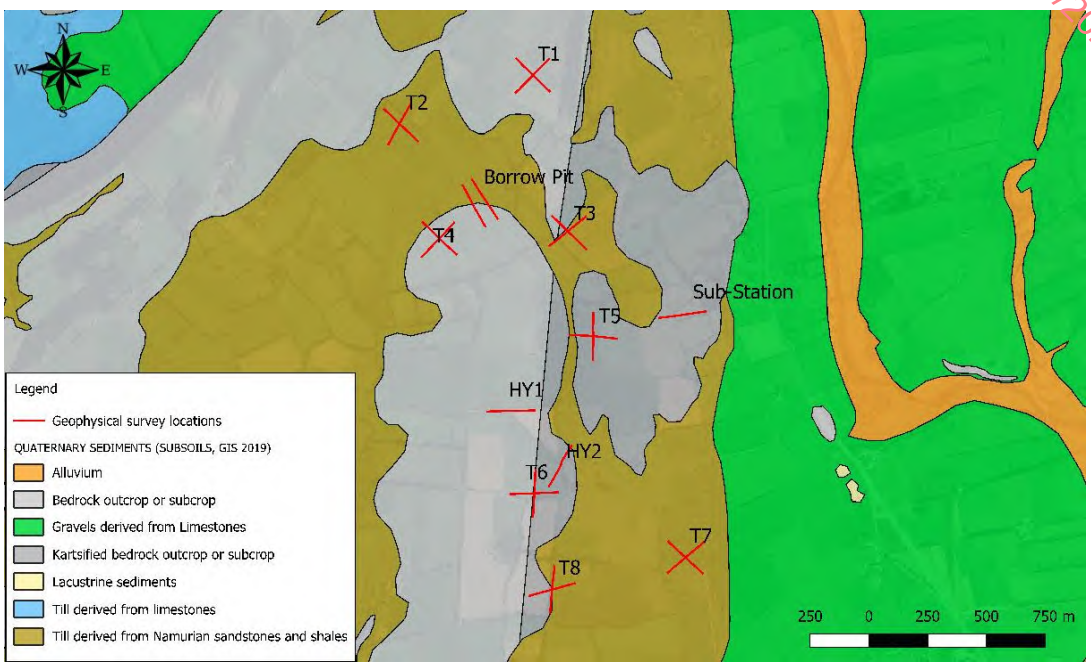

Fig 2.2: Quaternary sediments map with geophysical survey locations.

2.2.2 Geology

The GSI 1:100k Bedrock Geology Map (GSI, 2018) indicates that the survey area is underlain by three geological formations. The Bregaun Flagstone Formation, characterized by thick flaggy sandstone and siltstone, is indicated at survey locations T1, T2, T4, and the Borrow Pit. The Clogrenan Formation, comprising cherty, muddy, calcarenitic limestone, underlies survey locations T5, T7, T8, and HY2. The Killeshin Siltstone Formation, described as muddy siltstone and silty mudstone, is found at survey location HY1. Survey locations T3 and T6 are underlain by both the Clogrenan and Killeshin Siltstone Formations and are intersected by a southwest-northeast trending geological fault. Bedrock outcrop is indicated near T3, T6, HY2, and the Substation. The GSI karst database indicates a number of swallow holes, southeast of turbine base T6 in the Clongrennan Formation. Karst may be defined as the whole or partial dissolution of limestone bedrock by the action of water and the subsequent whole or partial infill with soil material. The degree of karstification depends on the quantity of limestone which has been dissolved and subsequently infilled.

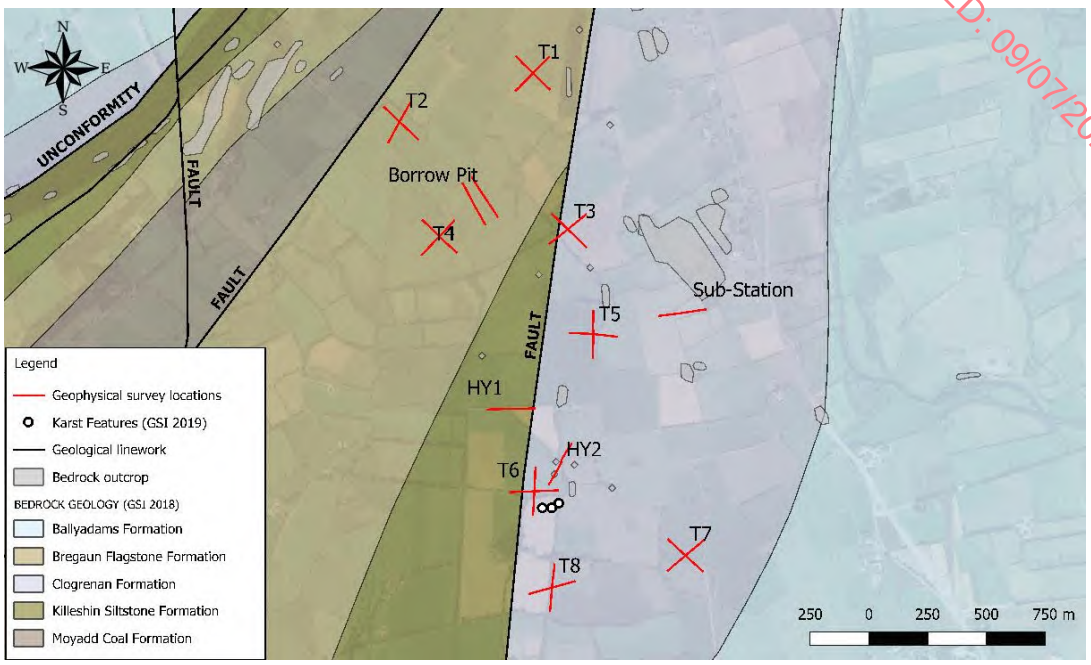

Fig 2.3: Bedrock geology map with geophysical survey locations.

2.2.3 Groundwater

The groundwater vulnerability rating for the site (GSIb, 2019) is classified across the site mainly as 'Extreme' and/or 'Rock at or near surface or karst' while location T7 is classified as 'High' and 'Extreme' (Fig 2.4). Bregaun Flagstone and Killeshin Siltstone formations are classified as 'Poor Aquifer – Bedrock which is generally unproductive except for local zones', while Clogrenan formation is classified as 'Regional important aquifer-Karstified (diffuse)'.

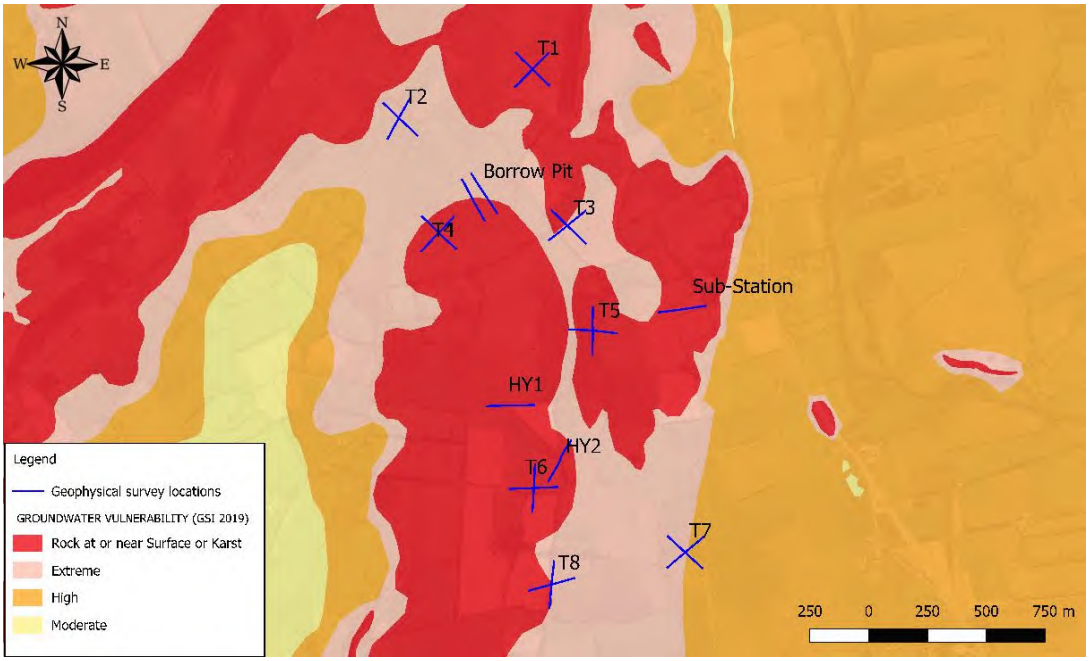

Fig 2.4: Groundwater vulnerability map with geophysical survey locations.

2.2.4 Historical Data

The historical 6-inch sheet for the survey area (Fig. 2.5) delineates key geological features. A south-north dividing line marks a transition from shales on the western side to thick bedded grey crystalline crinoidal limestone at the eastern side. Swallow holes are mapped close to turbine base T6 and profile HY2.

Fig 2.5: Historical 6inch map with geophysical survey locations.

2.2.5 Direct Investigation Data

Trial pit logs and a borehole log were provided to assist with compilation of this report.

One trial pit was opened at each of the proposed turbine base locations, two at the proposed substation location and four at the proposed borrow pit location, while one rotary core was cored at the Borrow pit.

Soils encountered in the survey locations consist generally of 0.2 m of topsoil overlying soft to very stiff sandy gravelly clay up to 3.5 m bgl follow by a presumed weathered bedrock recovered as slightly clayey gravel from 0.2 m to 1.3 m thick. The trial pits terminate at depths of 0.7 m to 3.5 m bgl.

Bedrock was encountered in BH1 at depth of 2.0 m bgl to termination depths of 30.2 m bgl. Bedrock was described as very weak moderately to slightly weathered siltstone with beds of sandstone overlying a very weak to strong moderately weathered to fresh sandstone with beds. RQD values are mainly 0 % up to 13.7 m bgl, after this depth RQD values are gradually increased with depth.

The direct investigation locations are shown on Drawings AGP24148_01(Appendix B).

2.3 Survey Rationale

The investigation consisted of P-wave Seismic Refraction profiling, Multichannel Analysis of Surface Wave (MASW) 1D soundings and 2D Electrical Resistivity Tomography (ERT).

P-wave Seismic Refraction profiling measures the P-wave velocity (Vp) 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.

The **Multichannel Analysis of Surface Waves** (**MASW**) method is used to estimate shear-wave (S-wave) velocities (Vs) and G_{max} values of the ground material. Overburden material with a Vs <175 m/s is generally classified as soft/loose. MASW soundings were recorded at the centre each P-wave profile. The data was acquired using the same acquisition geometry as the P-wave Seismic Refraction profiling.

Electrical resistivity Tomography (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 is interpreted to determine the material type along the profile at increasing depth, based on the typical resistivities returned for ground materials.

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 METHODOLOGY**.

3. RESULTS

The survey was carried out between the 14th and 21st of October 2024. The geophysical survey locations are shown on Drawing AGP24148_01 (Appendix B).

3.1 ERT

Twenty-one ERT profiles were recorded across the survey area. The data have been broadly interpreted in conjunction with p-wave seismic refraction data and the direct investigation data as follows:

Resistivity (Ohm-m)	Interpretation
8-50	SILT/CLAY
50-250	Sandy gravelly SILT/CLAY
250-500	Clayey SAND/GRAVEL
50-300	MUDSTONE/SHALE
>250	SILTSTONE with thin SANDSTONE interbeds (and/or sandstone with siltstone)*
>300	LIMESTONE**

**Higher resistivity values correspond to increased sandstone content.*

***Lower resistivity values may reflect the presence of weathered/fractured zones, reducing the resistivity threshold.*

3.2 Seismic Refraction P-wave Velocity Profiling

Twenty-one seismic refraction profiles were acquired across the survey area. The seismic refraction P-wave data was processed to produce a series of tomographic images which are presented in Appendix C. The data was then converted to layered models for interpretation. The layered model P-wave velocities (Vp) have been interpreted in conjunction with ERT data and direct investigation data as follows:

Layer	Vp Seismic Velocity (m/s)	Average Seismic Velocity (m/s)	Interpretation	Stiffness/ Rock Quality	Estimated Excavatability
1	221-444	310	Soil	Soft/Loose	Diggable
			Possible completely weathered ROCK	Very Poor	Diggable
2	653-975	774	Soil	Firm/Medium dense	Diggable
			Highly weathered ROCK	Very poor	Diggable
3	1,288-2,184*	1,736	Soil	Stiff-Very Stiff / Dense-very dense	Diggable
			Moderately weathered ROCK	Fair	Rippable-Marginally Rippable to Break/Blast
4	2,793-4,984	3,651	Slightly weathered ROCK	Good	Break/Blast

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

Note: Due to seismic anisotropy caused by the soil and rock fabric in the ground there may be small differences in depth to layer boundaries and velocities along profiles acquired in different directions at the proposed turbine bases. These differences are taken account of in the interpreted data.

3.3 MASW S-wave Velocity Profiling

1D MASW shear-wave velocity (Vs) soundings were acquired at the centre of each refraction profile. The MASW data was acquired with the aim of resolving a Shear-wave velocity (Vs) profile (indicative of soil stiffness) and deriving a Gmax profile and other dynamic moduli of the soil layers.

Where results for the MASW survey are not presented it is because a satisfactory 'dispersion curve' could not be generated in the processing sequence due to the presence of thin soils/shallow rock. A good 'dispersion curve' was generated at T3, T7 and T8.

Vs values of 285 to 628 m/s were determined over a depth of investigation range from 3.8 m to 17.0 m bg at T3, T7 and T8. Vs values have been interpreted in conjunction with the ERT data on the following basis:

Vs Seismic Velocity (m/s)	Interpretation	Stiffness
285-300	Soil	Dense
285-350	Soil	Stiff
>300	Soil	Very Dense
>350	Soil	Very Stiff

Soil cohesion ranges of Vs values are summarised in Fig. 3.1.

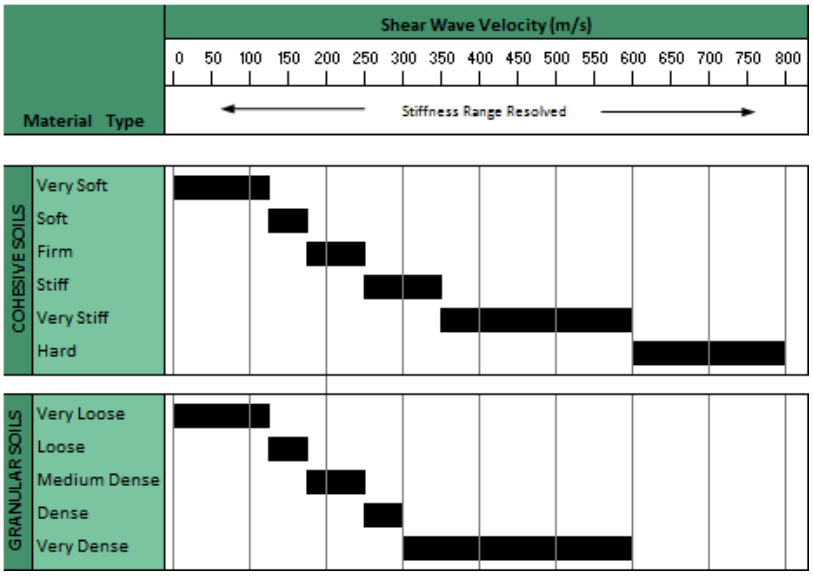

Fig.3.1. Vs velocity and corresponding soil cohesion.

The Vs values and the derived shear modulus (Gmax) values are display in Figs. 3.2 and 3.3 respectively for turbine bases T3, T7 and T8. The data is also presented in graphical and tabular format for each individual survey location in Appendix D.

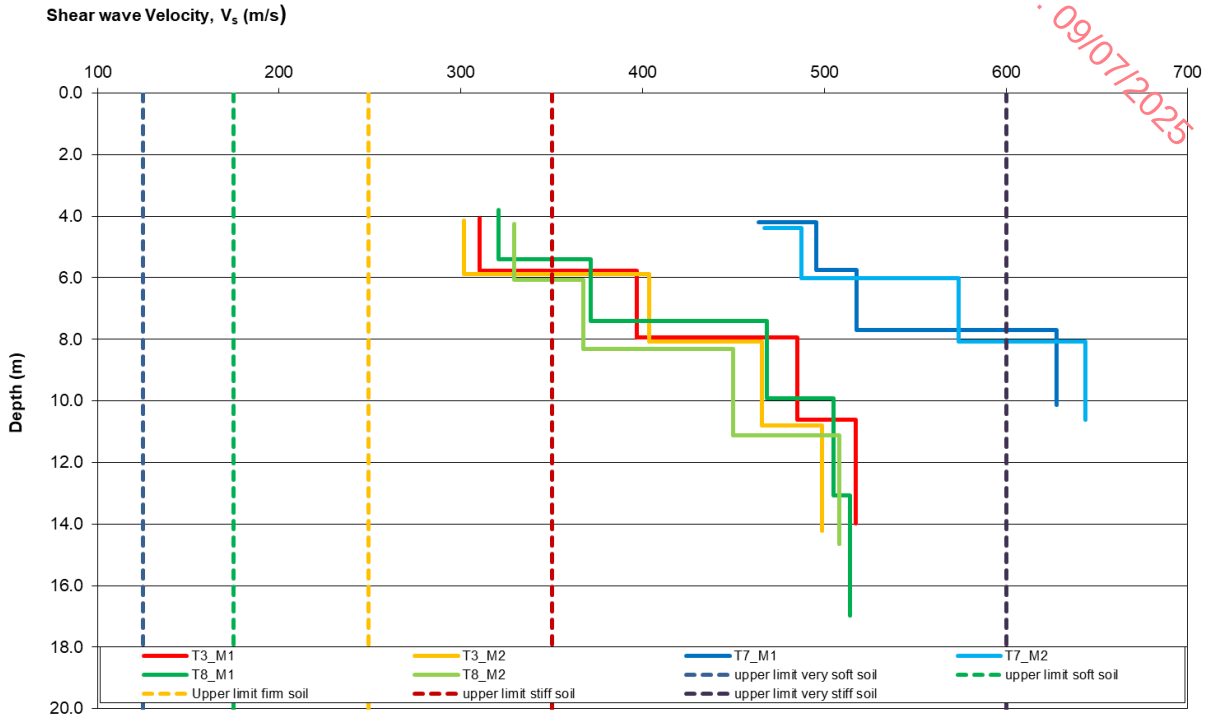

Fig.3.2. Shear wave velocity VS plots for survey locations T3, T7 and T8.

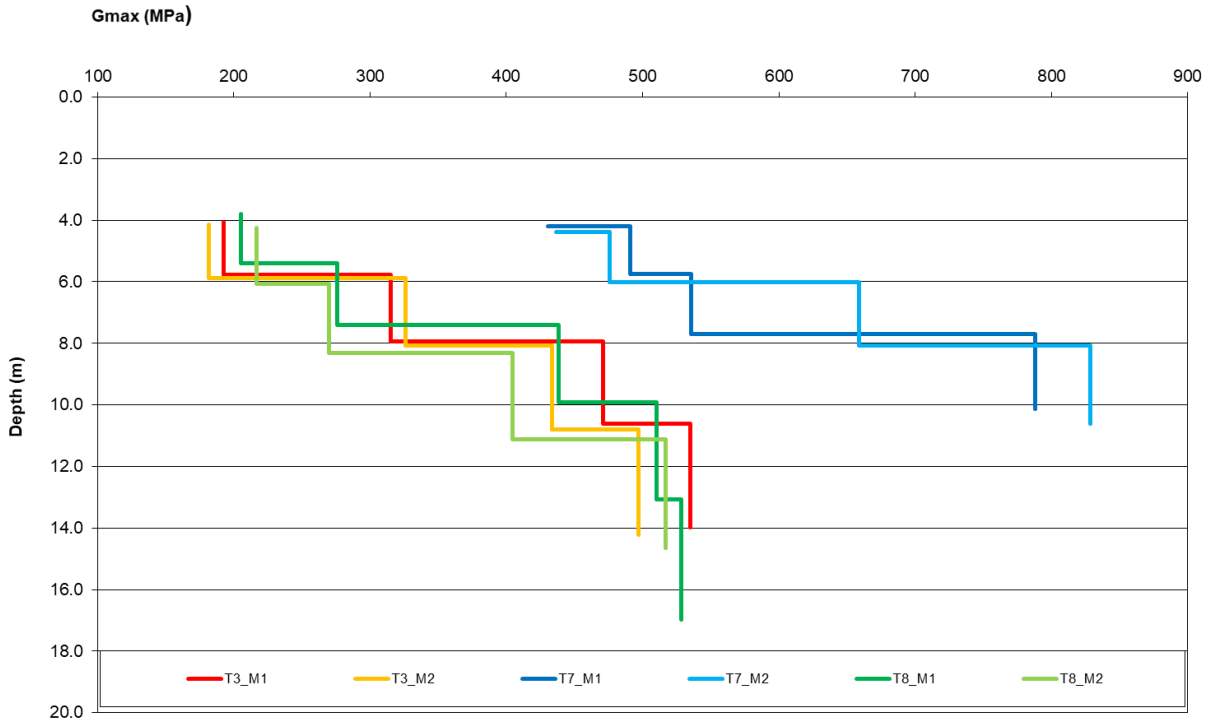

Fig.3.3. Gmax plots for survey locations T3, T7 and T8.

3.4 Discussion

The combined geophysical and direct investigation data have been interpreted for each location as follows:

3.4.1 Turbine Base T1

The results at turbine base T1 are shown on Drawing AGP24148_T1 and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay with 'pockets' of loose clayey sand/gravel, to the north of the turbine centre. This layer is absent to the southwest and is 0.1 to 1.0 m thick (average 0.6 m, and 0.4 m at turbine centre).
- **Layer 2** consists predominantly of highly weathered mudstone/shale (which may be encountered as sandy gravelly clay) with 'pockets' of medium dense clayey sand/gravel. This layer is 0.5 to 2.5 m thick (average 1.5 m, and 1.7 m at turbine centre).
- **Layer 3** consists of moderately weathered rock of mudstone/shale and siltstone with thin sandstone interbeds. This layer is 3.2 to 6.1 m thick (average 4.7 m, and 4.5 m at turbine centre).
- **Layer 4** consists of slightly weathered to fresh mudstone/shale and siltstone with thin sandstone interbeds. Depth to top of this layer ranges from 5.5 to 8.0 m bgl (average 6.1 m bgl, and 6.8 m bgl at turbine centre).

3.4.2 Turbine Base T2

The results at turbine base T2 are shown on Drawing AGP24148_T2 and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay with a 'pocket' of loose clayey sand/gravel to the northeast of the turbine centre. This layer is 0.4 to 0.9 m thick (average 0.6 m, and 0.5 m thick at turbine centre).
- **Layer 2** consists predominantly of firm sandy gravelly clay with a 'pocket' of medium dense clayey sand/gravel. This layer which thickens to the northwest is 0.6 to 6.8 m thick (average 2.0 m, and 0.9 m at turbine centre) and may contain highly weathered rock towards the base.
- **Layer 3** consists of moderately weathered rock of mudstone/shale and siltstone with thin sandstone interbeds. This layer is 2.7 to 4.3 m thick (average 3.5 m, and 2.9 m at turbine centre).
- **Layer 4** consists of slightly weathered to fresh mudstone/shale and siltstone with thin sandstone interbeds. Depth to top of this layer ranges from 4.6 to 11.0 m bgl (average 7.8 m bgl, and 4.6 m bgl at turbine centre).

3.4.3 Turbine Base T3

The results at turbine base T3 are shown on Drawing AGP24148_T3 and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay with a 'pocket' of loose clayey sand/gravel to the northeast of the turbine centre. This layer is 0.6 to 2.3 m thick (average 1.4 m, and 0.9 m thick at turbine centre).
- **Layer 2** consists predominantly of firm sandy gravelly clay with 'pockets' of firm silt/clay. This layer which thickens to the southwest is 0.8 to 4.5 m thick (average 2.7 m, and 2.4 m at turbine centre).
- **Layer 3** consists of stiff to very stiff sandy gravelly clay and silt/clay which is generally 4.7 to 29.2 m thick (average 16.9 m) This layer may increase to > 30 m at the centre of the turbine base. Vs values at the turbine centre also indicate stiff to very stiff material from over depth of investigation of 4.1 to 14.0 m bgl.

- **Layer 4** consists of slightly weathered to fresh limestone. Depth to the top of this layer ranges from 10.0 to 32.7 (average 21.7 m bgl). Depth to this layer thickens to the north of the turbine base, and rock is not interpreted at the turbine centre a possible fault zone/weathered/fractured rock may be present.

3.4.4 Turbine Base T4

The results at turbine base T4 are shown on Drawing AGP24148_T4 and have been interpreted as follows:

- **Layer 1** consists of soft sandy gravelly clay 0.3 to 1.0 m thick (average 0.6 m, and 0.7 m thick at turbine centre).
- **Layer 2** consists of firm sandy gravelly clay which is 1.2 to 3.3 m thick and thickens slightly close to the turbine centre (average 2.2 m, and 2.3 m at turbine centre). Highly weathered rock may be present towards the base of this layer.
- **Layer 3** consists of moderately weathered mudstone/shale 3.2 to 6.2 m thick (average 6.1 m, and 6.0 m at turbine centre).
- **Layer 4** consists of slightly weathered to fresh mudstone/shale with small areas of siltstone with thin sandstone interbeds. Depth to the top of this layer ranges from 5.8 to 10.0 (average 7.9 m bgl and 8.5 m bgl at turbine centre).

3.4.5 Turbine Base T5

The results at turbine base T5 are shown on Drawing AGP24148_T5 and have been interpreted as follows:

- **Layer 1** consists predominantly of thin loose clayey sand/gravel with 'pockets' of soft sandy gravelly clay 0.4 to 2.4 m thick (average 0.7 m, and 0.5 m at turbine centre).
- **Layer 2** consists predominantly highly weathered limestone with firm sandy gravelly clay which is 0.6 to 2.6 m thick (average 1.6 m, and 1.0 m at turbine centre). A trial pit close to the turbine centre (TP-T05) encountered 'presumed weathered bedrock from 0.5 m bgl to termination depth of 0.7 m bgl).
- **Layer 3** consists of moderately weathered limestone which is 2.0 to 4.1 m thick (average 3.0 m bgl, and 3.5 m bgl at turbine centre).
- **Layer 4** consists of slightly weathered to fresh limestone. Depth to the top of this layer ranges from 5.0 to 5.2 (average 5.1 m bgl and 5.0 m bgl at turbine centre). A slight decrease in bedrock resistivity values (<1,000 Ohm-m) may indicate a slight increase in bedrock weathering approximately 60 m east of the turbine base (profile T5_R2).

3.4.6 Turbine Base T6

The results at turbine base T6 are shown on Drawing AGP24148_T6 and have been interpreted as follows:

- **Layer 1** consists of soft sandy gravelly clay 0.9 to 1.5 m thick (average 1.0 m, and 1.0 m at the turbine centre).
- **Layer 2** consists of firm sandy gravelly clay with possible highly weathered rock towards the base. This layer is 0.7 to 2.5 m thick (average 1.6 m, and 1.9 m at the turbine centre).
- **Layer 3** consists of moderately weathered mudstone/shale 1.1 to 4.5 m thick (average 2.8 m, and 3.0 m at the turbine centre).

- **Layer 4** consists of slightly weathered to fresh mudstone/shale with a change to limestone approximately 25 m east of the turbine centre, where a possible faulted contact is interpreted. Depth to the top of this layer ranges from 3.9 m to 8.5 m bgl (average 6.2 m bgl, and 5.7 m bgl at the turbine centre).

3.4.7 Turbine Base T7

The results at turbine base T7 are shown on Drawing AGP24148_T7 and have been interpreted as follows:

- **Layer 1** consists of soft sandy gravelly clay 0.4 to 1.5 m thick (average 0.9 m, and 0.6 m thick at turbine centre).
- **Layer 2** consists of firm sandy gravelly clay which thickens to the north of the turbine base and is 1.1 to 3.9 m thick (average 2.5 m, and 3.3 m at turbine centre).
- **Layer 3** consists predominately of stiff to very stiff sandy gravelly clay with a 'pocket' of dense to very dense clayey sand/gravel which is 7.7 to 22.9 m thick (average 18.0 m). This layer thins to the southeast and northwest from the centre of the turbine base. Vs values at the turbine centre indicate stiff to very stiff material from 4.0 to 10.1 m bgl increasing with depth.
- **Layer 4** consists of undulating moderately weathered limestone which is generally 0.8 to 6.7 m thick (average 3.7 m, and 3.3 m at turbine centre) and increases significantly to > 7 m at 20 m southeast of the turbine base.
- **Layer 5** consists of slightly weathered to fresh limestone at a depth of 14.7 to > 34.0 m bgl (average 23.6 m bgl, and 27.0 m bgl at turbine centre).

3.4.8 Turbine Base T8

The results at turbine base T8 are shown on Drawing AGP24148_T8 and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay with some loose clayey sand/gravel to the north and is 0.6 to 1.8 m thick (average 1.2 m, and 1.6 m thick at turbine centre).
- **Layer 2** consists predominantly of firm sandy gravelly clay with a 'pocket' of medium dense clayey sand/gravel north of the turbine centre and is 2.0 to 4.2 m thick (average 2.8 m, and 2.5 m at turbine centre).
- **Layer 3** consists predominately of stiff to very stiff sandy gravelly clay with 'pockets' of stiff to very stiff silt/clay and is 4.2 to 24.3 m thick (average 14.2 m, and 18.0 m thick at turbine centre). This layer thickens to the southwest of the turbine base. Vs values at the turbine centre indicate stiff to very stiff material from 3.8 to 17.0 m bgl increasing gradually with depth.
- **Layer 4** consists of moderately weathered limestone which is 3.6 to 13.1 m thick (average 8.4 m, and 11.0 m at turbine centre). This layer thickens to the southwest of the turbine base and increases significantly to > 13 m thick at 15 m south of the turbine base.
- **Layer 5** consists of slightly weathered to fresh limestone at a depth of 13.7 to 33.5 m bgl (average 23.6 m bgl and 27.0 m bgl at turbine centre). This layer is shallower to the northeast of the centre of the turbine base.

3.4.9 Borrow Pit (BP)

The results at the proposed borrow pit location are shown on Drawing AGP24148_BP and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay with a 'pocket' of silt/clay 1.4 to 1.9 to m thick (average 1.6 m). Some completely weathered rock may be present towards the base of this layer.
- **Layer 2** consists of moderately weathered rock of mudstone/shale and minor siltstone with thin sandstone interbeds. This layer is 4.2 to 9.7 m thick (average 7.0 m).
- **Layer 3** consists of slightly weathered to fresh mudstone/shale and siltstone with thin sandstone interbeds. Depth to top of this layer ranges from 5.9 to 9.3 m bgl (average 7.6 m bgl).

3.4.10 Hydro Line HY1

The results at Hydro Line HY1 are shown on Drawing AGP24148_HY and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay. This layer is absent at the west of profile HY_R1 is 0.1 to 1.0 m thick (average 0.5 m).
- **Layer 2** consists predominantly of firm sandy gravelly clay which thickens to the east with a 'pocket' of medium dense clayey sand/gravel at the west of profile HY_R1. This layer is 0.1 to 3.6 m thick (average 1.8 m).
- **Layer 3** consists of moderately weathered mudstone/shale and siltstone with thin sandstone interbeds interpreted in the west. This layer is 3.3 to 6.6 m thick (average 4.9 m)
- **Layer 4** consists of slightly weathered to fresh mudstone/shale and siltstone with thin sandstone interbeds interpreted in the west. Depth to the top of this layer ranges from 7.1 to 10.8 m bgl (average 9.0 m bgl).

3.4.11 Hydro Line HY2

The results at Hydro Line HY2 are shown on Drawing AGP24148_HY and have been interpreted as follows:

- **Layer 1** consists predominantly of soft sandy gravelly clay and loose clayey sand/gravel to the northeast of profile HY_R2. This layer is absent at the west of profile HY_R2 and is 0.1 to 1.7 m thick (average 0.9 m).
- **Layer 2** consists predominantly of firm sandy gravelly clay and some medium dense clayey sand/gravel which is 1.3 to 1.9 m thick (average 1.6 m).
- **Layer 3** consists of stiff sandy gravelly clay and dense clayey sand/gravel 0.2 to 5.2 m thick (average 5. m), which thickens to the southwest.
- **Layer 4** consists of moderately weathered limestone which is generally 2.0 to 5.3 m thick and increases significantly to > 25 m bgl in the southwest where the bedrock resistivity decreases to 300 – 1,000 Ohm-m. At the southwest end of the survey profile low resistivity values of 50-300 Ohm-m indicate a likely change in bedrock type to mudstone/shale and/or increasing in weathering/fracturing due to a faulted contact.
- **Layer 5** consists of high resistivity (1,000 – 10,000 Ohm-m) slightly weathered to fresh limestone at a depth of 4.8 to 15.5 m bgl (average 2.8 m bgl). This layer is not interpreted at the southwest end of the survey profile where a possible fault is interpreted and weathered fractured mudstone/shale may be present.

3.4.12 Substation (SS)

The results at the proposed substation are shown on Drawing AGP24148_SS and have been interpreted as follows:

- **Layer 1** consists of thin loose clayey sand/gravel 0.4 to 1.0 m thick (average 0.7 m).
- **Layer 2** consists of highly weathered limestone (which may be encountered as clayey sand/gravel) which is 1.6 to 2.0 m thick (average 1.8 m). Two trial pits opened 18 to 26 m off the geophysical survey profile (TP-SS01 & TP-SS02) encountered 'obstruction of presumed bedrock' at 0.2 m bgl).
- **Layer 3** consists of moderately weathered limestone which is 3.3 to 3.8 m thick (average 3.6 m bgl).
- **Layer 4** consists of slightly weathered to fresh limestone. Depth to the top of this layer ranges from 5.9 to 6.0 m bgl (average 6.0 m bgl).

3.4.13 Bedrock

If any rock excavation is planned across the survey areas, any completely to highly weathered rock should be diggable, the moderately weathered rock should range from rippable to marginally rippable to requiring breaking or blasting and the slightly weathered to fresh rock would require breaking or blasting. More information on excavatability is given in Appendix B.

A number of the ERT profiles acquired at survey locations within the limestone setting, T3, T5, T6, T7, T8, the substation and profile HY2 indicate low bedrock resistivities (100 to 300 Ohm-m at T7 & T8) and slightly reduced resistivities (as a subvertical zone from 300 – 1,000 Ohm-m on HY2). These areas are shown on Drawings in Appendix C and indicate increased weathering/fracturing/possible karst within the limestone and should be further targeted with boreholes to investigate the possibility of increased fissuring/karstification.

A number of the ERT profiles acquired at survey locations where mudstone/shale bedrock is interpreted are within a low resistivity setting. While at bases T4 and T6 the lowest recorded resistivity values of < 50 Ohm-m are lower than generally expected for mudstone/shale and can indicate the presence of clay high, Vp seismic velocities of 3,184 – 3,746 m/s indicate slightly weathered to fresh rock.

4. RECOMENDATIONS

Further investigation by rotary core and Geobor 'S' system is recommended. The Geobor 'S' system is used to obtain high quality samples of the overburden, the underlying rock and the interface between the two. The following boreholes are proposed to a depth of 20 m bgl to confirm overburden type and depth to rock as follows:

No.	Location	ITM Easting	ITM Northing	Drilling Type
PBH1	T1	641792	675091	Rotary core
PBH2	T2	641223	674883	Rotary core
PBH3	T3	641940	674424	Geobor 'S'
PBH4	T4	641392	674392	Geobor 'S'
PBH5	T5	642049	673974	Rotary core
PBH6	T6	641797	673301	Rotary core
PBH7	T7	642442	673026	Geobor 'S'
PBH8	T8	641873	672888	Geobor 'S'
PBH9	HY1	641878	673363	Rotary core

Foundation design for any structures with the limestone areas should take into account the presence of possible cavities in the rock and overburden and foundations capable of spanning voids that may migrate to the surface, should be incorporated into the design. Any cavities exposed during stripping of topsoil or excavation of rock should be backfilled in the appropriate manner for karstified limestone areas as advised by a competent geotechnical engineer.

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

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.

P-wave Seismic Refraction Profiling

Principles

This method measures the velocity of refracted seismic P-waves (compression 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.

Data Collection

A Geode high resolution 24 channel digital seismograph, 24 x 10HZ vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable (2m spacing). Equipment was operated by a two-person 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. 46m profile ~16m 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

First break picking in digital format was carried out using the SeisImager/2D PICKWIN software program from Geometrics to construct p-wave (Vp) traveltime plots for each spread. The processing and interpretation uses the ray-tracing and tomographic inversion methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the SeisImager/2D PLOTREFA program.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The program 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 July 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 estimate 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 motion is measured using low frequency geophones, which are disposed along a straight line directed toward the source,
(iii) the ground motion is 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,

(v) the dispersion curve in inverted using a modelling and least squares minimization process to produce a subsurface profile of the variation of surface wave and derived shear wave velocity with depth.

Data Collection
1D MASW soundings were recorded across the sites. The acquisition configuration was the same as used for the seismic refraction acquisition for the 1D data and a dedicated configuration was used for the 2D acquisition.

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 (Vs) 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.

The shear wave velocities were then converted into shear modulus values using the formula:

(1) $G = V_s^2 * \rho / 1000000$

Where G = Shear Modulus (MPa)
V_s = Shear Wave Velocity (m/s)
ρ = Density (kg/m^3)

NB For the purpose of the calculation in this report a soil density of 2000 kg/m^3 has been assumed.

Averaged P-wave velocities from the seismic refraction data were combined with the shear wave velocity data to calculate Poissons ratio and Youngs Modulus for each of the layers outlined by the P-wave data analysis using the formulae in Davies & Schulteiss, 1980 as follows:

(2) $E = 2V_s^2 \rho(1 + u)/1000$
where E = Youngs Modulus (GPa)
V_s = Shear Wave Velocity (m/s)
ρ = Density (kg/m^3)
u = Poisson's ratio
and
(3) $B = E/3(1-2u)$
where B = Bulk Modulus (MPa)
E = Youngs Modulus (MPa)
u = Poisson's ratio

Electrical Resistivity Tomography (ERT)

2D Electrical Resistivity Tomography (ERT) 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 Wenner array. The electrical 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 a Tigre resistivity meter, imaging software, multicore cables and 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.

Spatial Relocation

All the geophysical investigation locations were acquired using a Trimble R10-2 high-accuracy GNSS handheld system using the settings listed below. This system allows collection of GPS data with c.20mm accuracy.

Coordinate zone:	Irish Transverse Mercator (ITM)
Datum:	IRENET95
Coordinate units:	Metres
Altitude units:	Metres
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) Rating	>2150 26	2150-1850 24	1850-1500 20	1500-1200 12	1200-450 5
Rock hardness Rating	Extremely hard rock 10	Very hard rock 5	Hard rock 2	Soft rock 1	Very soft rock 0
Rock weathering Rating	Unweathered 9	Slightly weathered 7	Weathered 5	Highly weathered 3	Completely weathered 1
Joint spacing (mm) Rating	>3000 30	3000-1000 25	1000-300 20	300-50 10	<50 5
Joint continuity Rating	Non continuous 5	Slightly continuous 5	Continuous-no gouge 3	Continuous-some gouge 0	Continuous-with gouge 0
Joint gouge Rating	No separation 5	Slight separation 5	Separation <1mm 4	Gouge <5mm 3	Gouge >5mm 1
Strike and dip orientation Rating	Very unfavourable 15	Unfavourable 13	Slightly unfavourable 10	Favourable 5	Very favourable 3
Total rating	100-90	90-70*	70-50	50-25	<25
Rippability assessment Tractor horsepower Tractor kilowatts	Blasting	Extremely hard ripping and blasting 770/385 575/290	Very hard ripping 385/270 290/200	Hard ripping 270/180 200/135	Easy ripping 180 135

APPENDIX C: DRAWINGS

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

AGP24148_01	Geophysical Survey Locations	1:12500@A4
AGP24148_T1		
FIG 1: Turbine base T1, results and interpretation ERT T1_R1 & Seismic Profile T1_S1		1:1250@A4
FIG 2: Turbine base T1, results and interpretation ERT T1_R2 & Seismic Profile T1_S2		1:1250@A4
AGP24148_T2		
FIG 1: Turbine base T2, results and interpretation ERT T2_R1 & Seismic Profile T2_S1		1:1250@A4
FIG 2: Turbine base T2, results and interpretation ERT T2_R2 & Seismic Profile T2_S2		1:1250@A4
AGP24148_T3		
FIG 1: Turbine base T3, results and interpretation ERT T3_R1 & Seismic Profile T3_S1		1:1250@A4
FIG 2: Turbine base T3, results and interpretation ERT T3_R2 & Seismic Profile T3_S2		1:1250@A4
AGP24148_T4		
FIG 1: Turbine base T4, results and interpretation ERT T4_R1 & Seismic Profile T4_S1		1:1250@A4
FIG 2: Turbine base T4, results and interpretation ERT T4_R2 & Seismic Profile T4_S2		1:1250@A4
AGP24148_T5		
FIG 1: Turbine base T5, results and interpretation ERT T5_R1 & Seismic Profile T5_S1		1:1250@A4
FIG 2: Turbine base T5, results and interpretation ERT T5_R2 & Seismic Profile T5_S2		1:1250@A4
AGP24148_T6		
FIG 1: Turbine base T6, results and interpretation ERT T6_R1 & Seismic Profile T6_S1		1:1250@A4
FIG 2: Turbine base T6, results and interpretation ERT T6_R2 & Seismic Profile T6_S2		1:1250@A4
AGP24148_T7		
FIG 1: Turbine base T7, results and interpretation ERT T7_R1 & Seismic Profile T7_S1		1:1250@A4
FIG 2: Turbine base T7, results and interpretation ERT T7_R2 & Seismic Profile T7_S2		1:1250@A4
AGP24148_T8		
FIG 1: Turbine base T8, results and interpretation ERT T8_R1 & Seismic Profile T8_S1		1:1250@A4
FIG 2: Turbine base T8, results and interpretation ERT T8_R2 & Seismic Profile T8_S2		1:1250@A4
AGP24148_BP		
FIG 1: Borrow pit BP, results and interpretation ERT BP_R1 & Seismic Profile BP_S1		1:1250@A4
FIG 2: Borrow pit BP, results and interpretation ERT BP_R2 & Seismic Profile BP_S2		1:1250@A4
AGP24148_HY		
FIG 1: Hydro line HY1, results and interpretation ERT HY1_R1 & Seismic Profile H1Y_S1		1:1250@A4
FIG 2: Hydro line HY2, results and interpretation ERT HY2_R2 & Seismic Profile HY2_S2		1:1250@A4
AGP24148_SS Substation SS, Results and interpretation ERT SS_R1 & Seismic Profile SS_S1		1:1250@A4

GEOPHYSICAL SURVEY LOCATIONS

SCALE 1:12500

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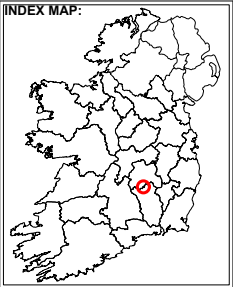
INDEX MAP:



LEGEND:

- R1 — 2D resistivity profile
- S1 — Seismic refraction profile
- M1 — MASW data imaging location
- TP1 — Trial pit location
- BH01 — Borehole location

The information displayed here is to be used in conjunction with AGP24148_01 Report on the Geophysical Investigation at Seskin Wind Farm, Co. Kilkenny for GII Ltd., APEX Geophysics Ltd. 20th December 2024

PROJECT:	SESKIN WIND FARM GEOPHYSICAL INVESTIGATION
CLIENT.:	GROUND INVESTIGATIONS IRELAND LIMITED
DRAWING NO:	AGP24148_01
SCALE:	AS INDICATED @ A4
DATE:	20-12-2024

Version:	Date:	Drawn By:	Checked:
01	20-12-2024	SC	TL

FIG 1: TURBINE BASE T1, RESULTS & INTERPRETATION ERT T1_R1 & SEISMIC PROFILE T1_S1

SCALE 1:1250

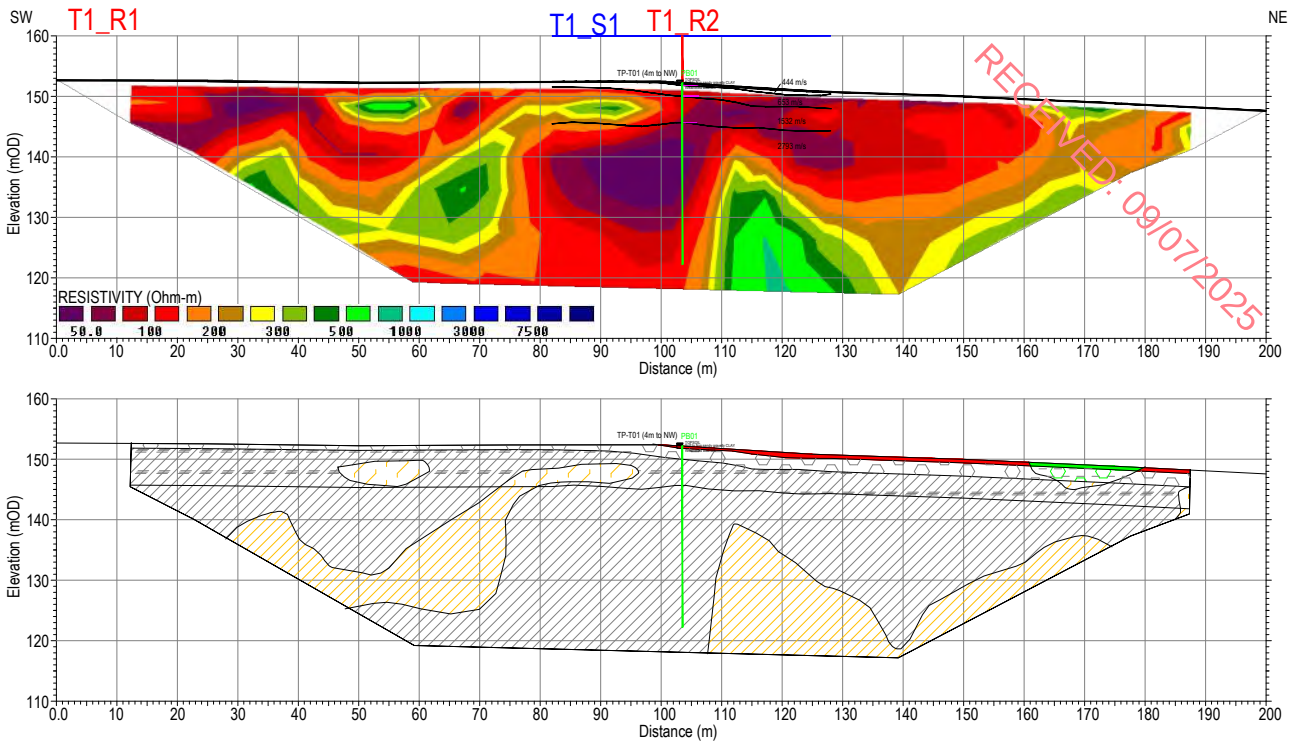
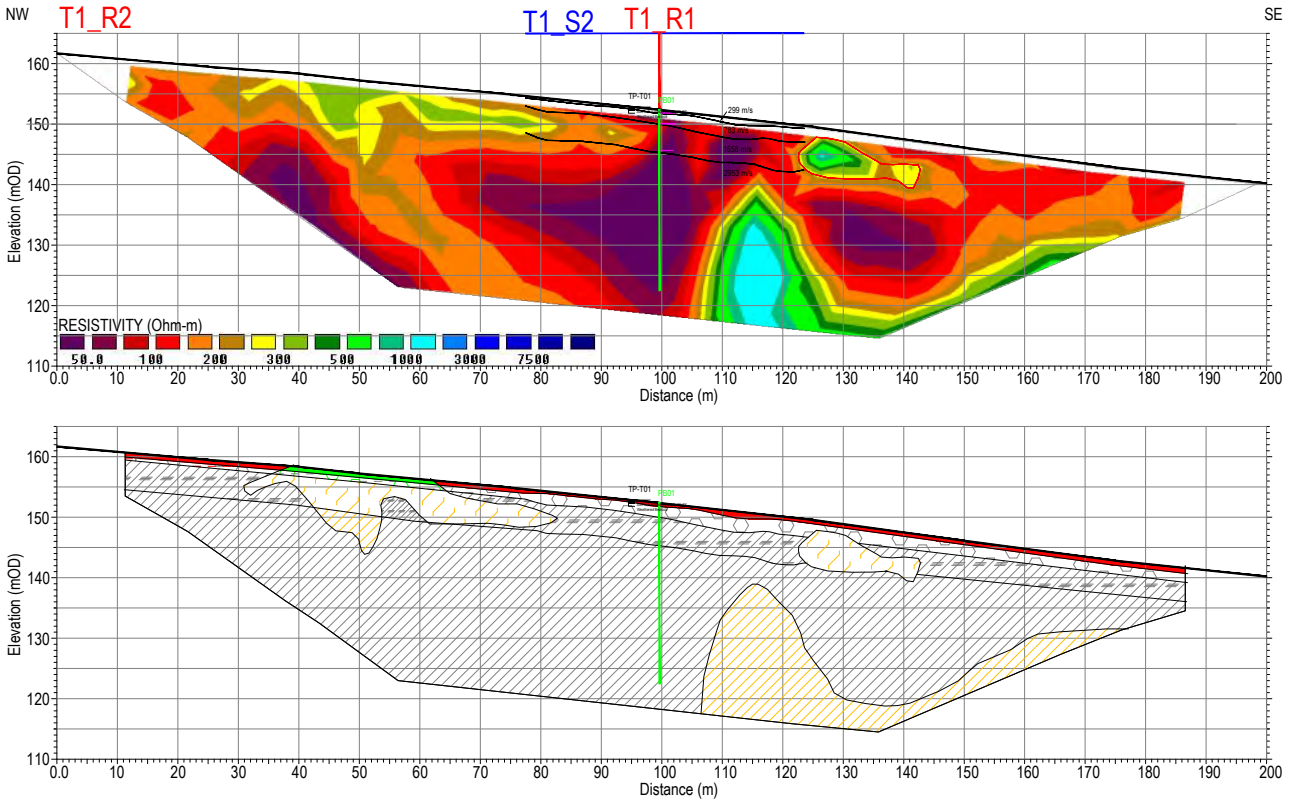


FIG 2: TURBINE BASE T1, RESULTS & INTERPRETATION ERT T1_R2 & SEISMIC PROFILE T1_S2

SCALE 1:1250



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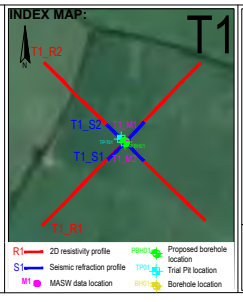

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

The information displayed here is to be used in conjunction with AGP24148_01 Report on the Geophysical Investigation at Seskin Wind Farm, Co. Kilkenny for GII Ltd., APEX Geophysics Ltd. 20th December 2024

PROJECT:	SESKIN WIND FARM GEOPHYSICAL INVESTIGATION
CLIENT.:	GROUND INVESTIGATIONS IRELAND LIMITED
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01	20-12-2024	SC	TL

FIG 1: TURBINE BASE T2, RESULTS & INTERPRETATION ERT T2_R1 & SEISMIC PROFILE T2_S1

SCALE 1:1250

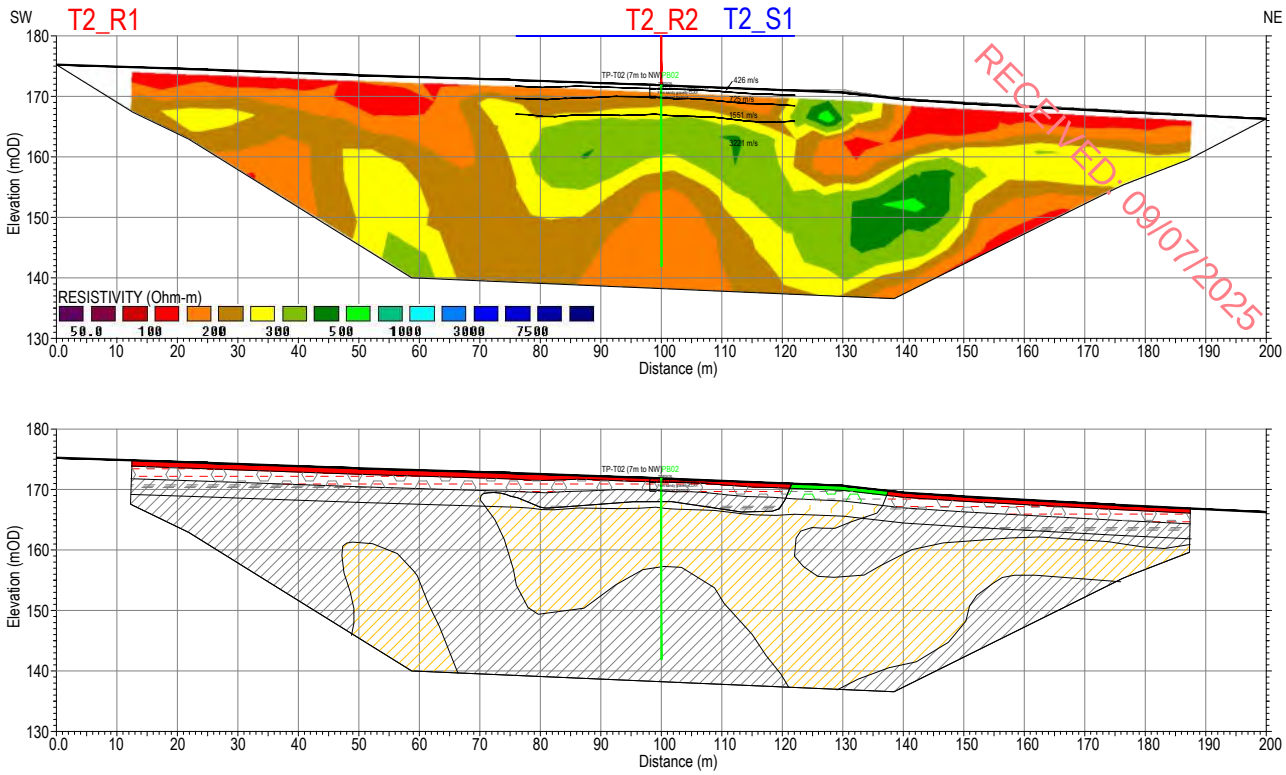
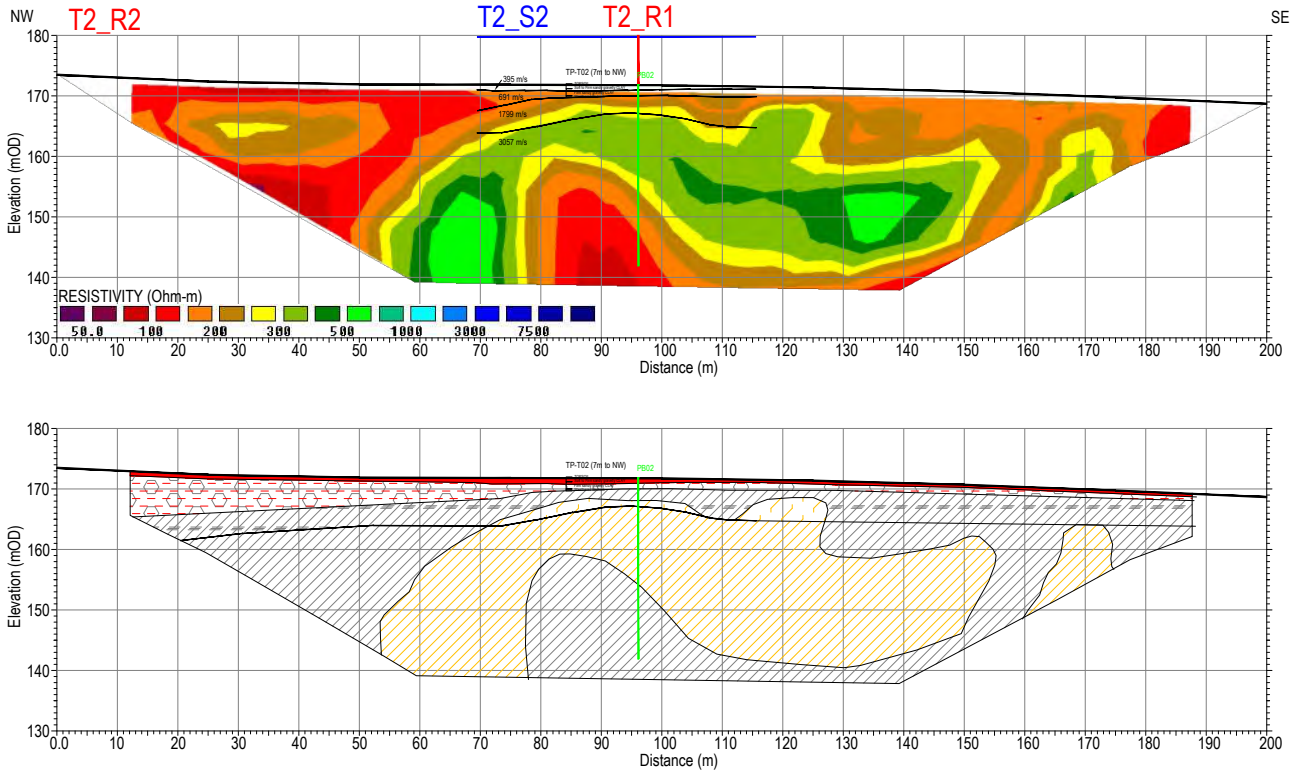


FIG 2: TURBINE BASE T2, RESULTS & INTERPRETATION ERT T2_R2 & SEISMIC PROFILE T2_S2

SCALE 1:1250



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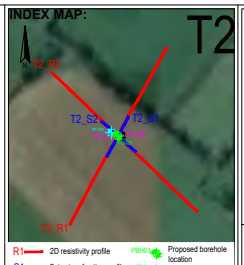

R1 2D resistivity profile
S1 Seismic refraction profile
M1 MASW data location
PBH01 Proposed borehole location
TP01 Trial Pit location
BH01 Borehole location

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
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- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
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- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
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- Proposed direct investigation location

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Version:	Date:	Drawn By:	Checked:
01	20-12-2024	SC	TL

FIG 1: TURBINE BASE T3, RESULTS & INTERPRETATION ERT T3_R1 & SEISMIC PROFILE T3_S1

SCALE 1:1250

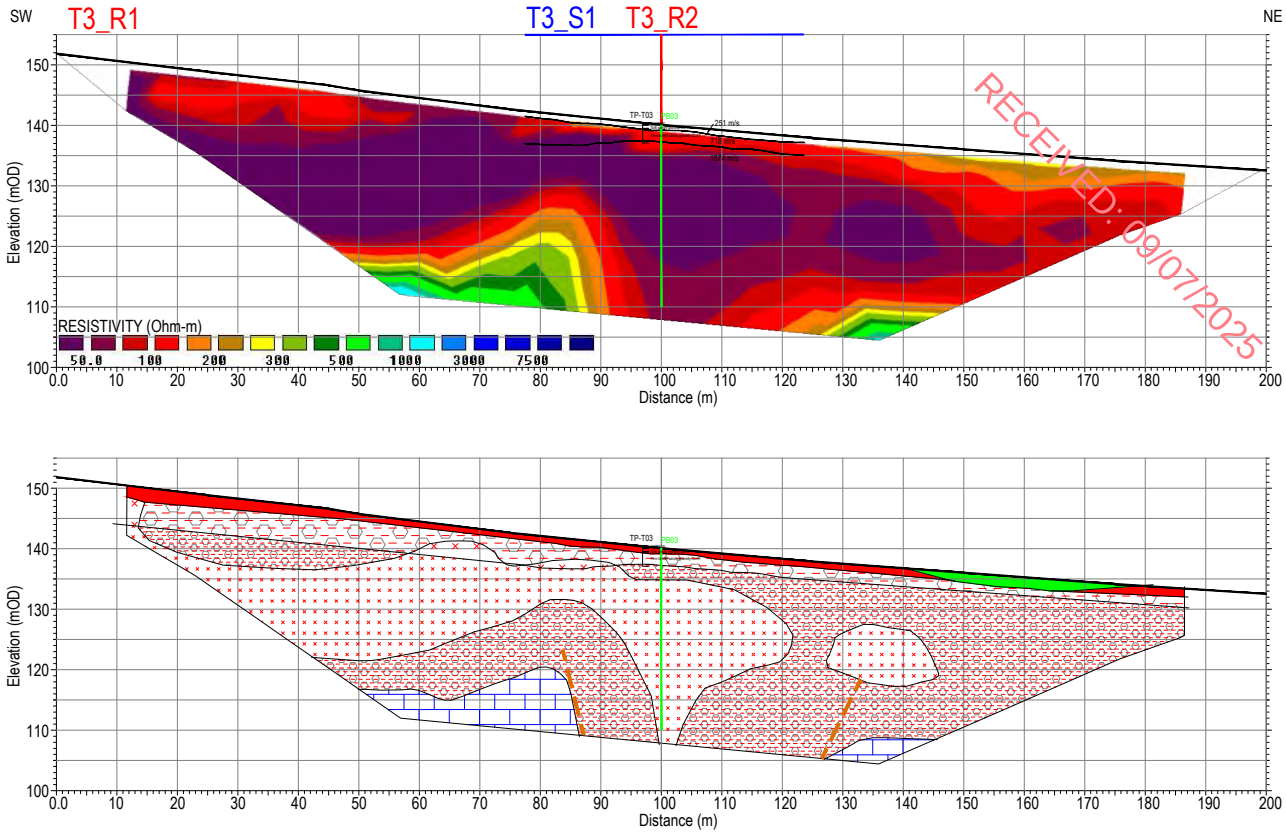
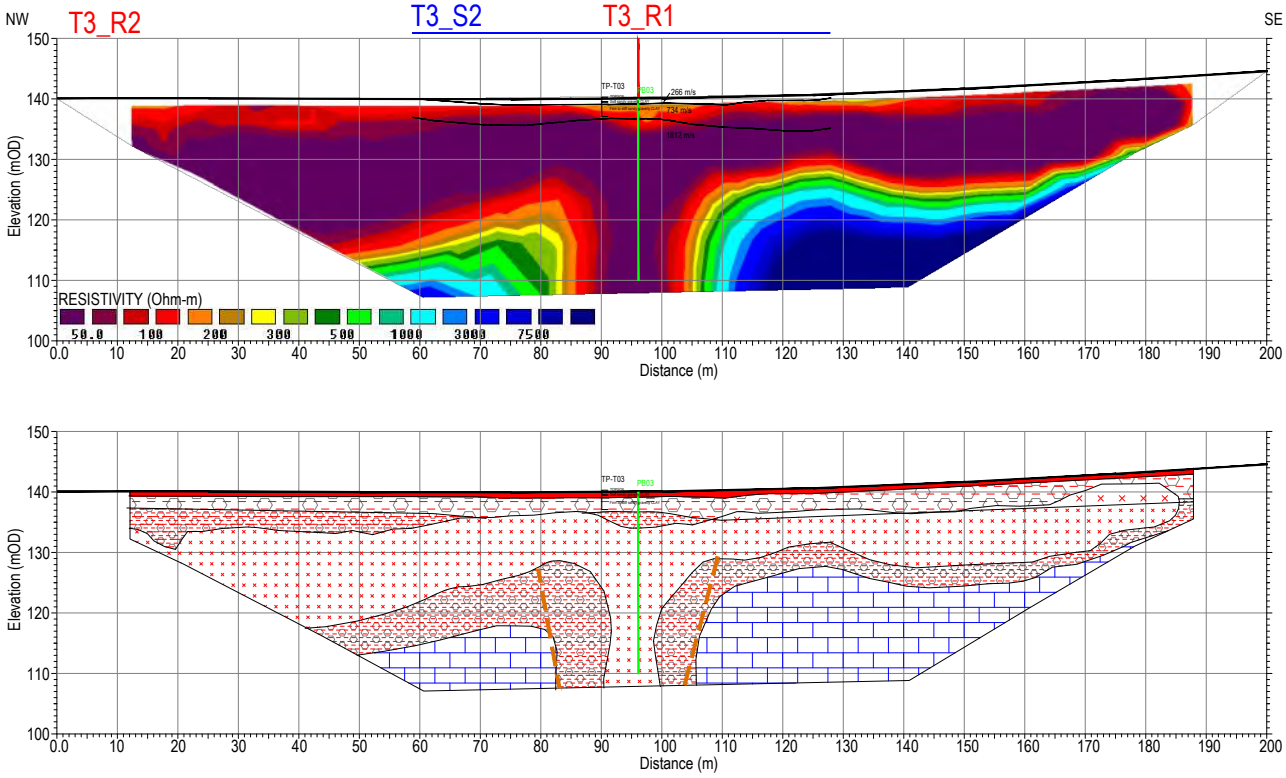


FIG 2: TURBINE BASE T3, RESULTS & INTERPRETATION ERT T3_R2 & SEISMIC PROFILE T3_S2

SCALE 1:1250



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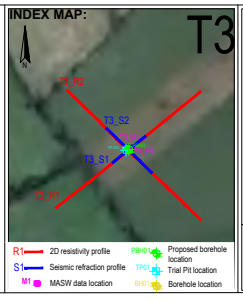
INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

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CLIENT.:	GROUND INVESTIGATIONS IRELAND LIMITED
DRAWING NO:	AGP24148_T3
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FIG 1: TURBINE BASE T4, RESULTS & INTERPRETATION ERT T4_R1 & SEISMIC PROFILE T4_S1

SCALE 1:1250

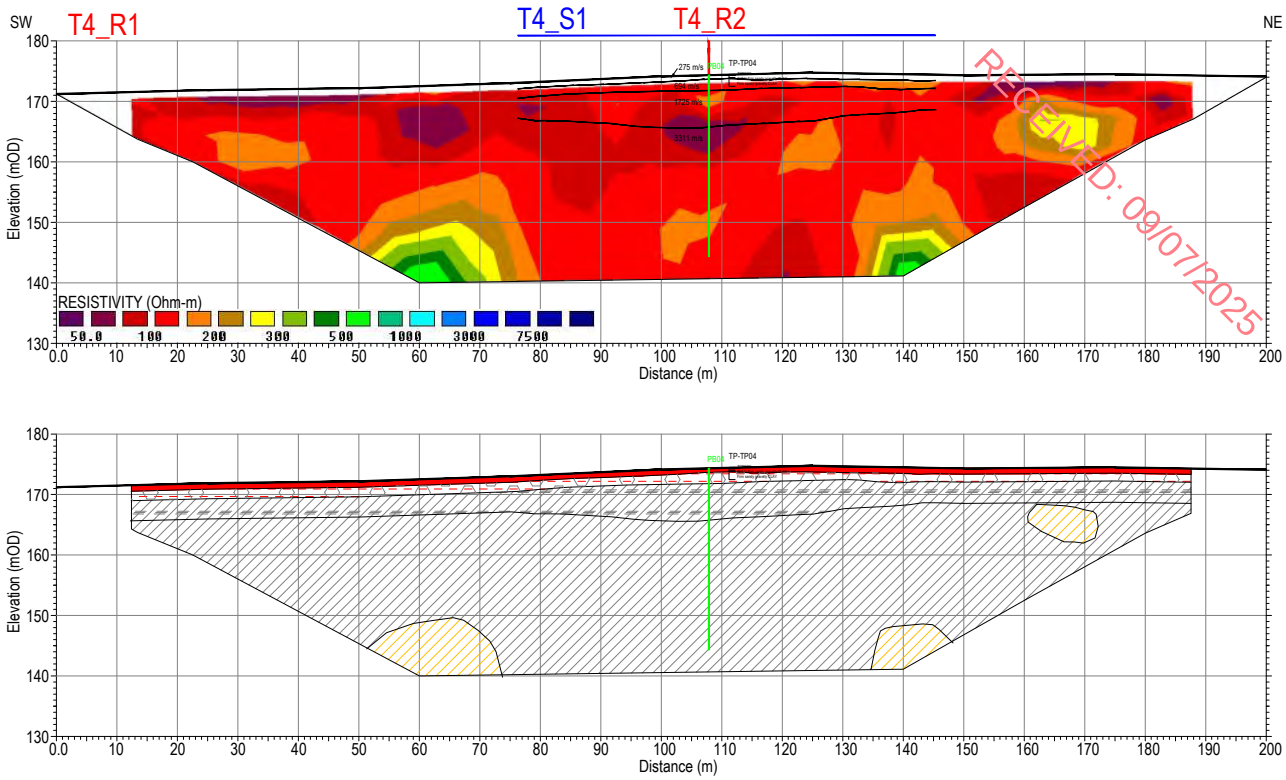
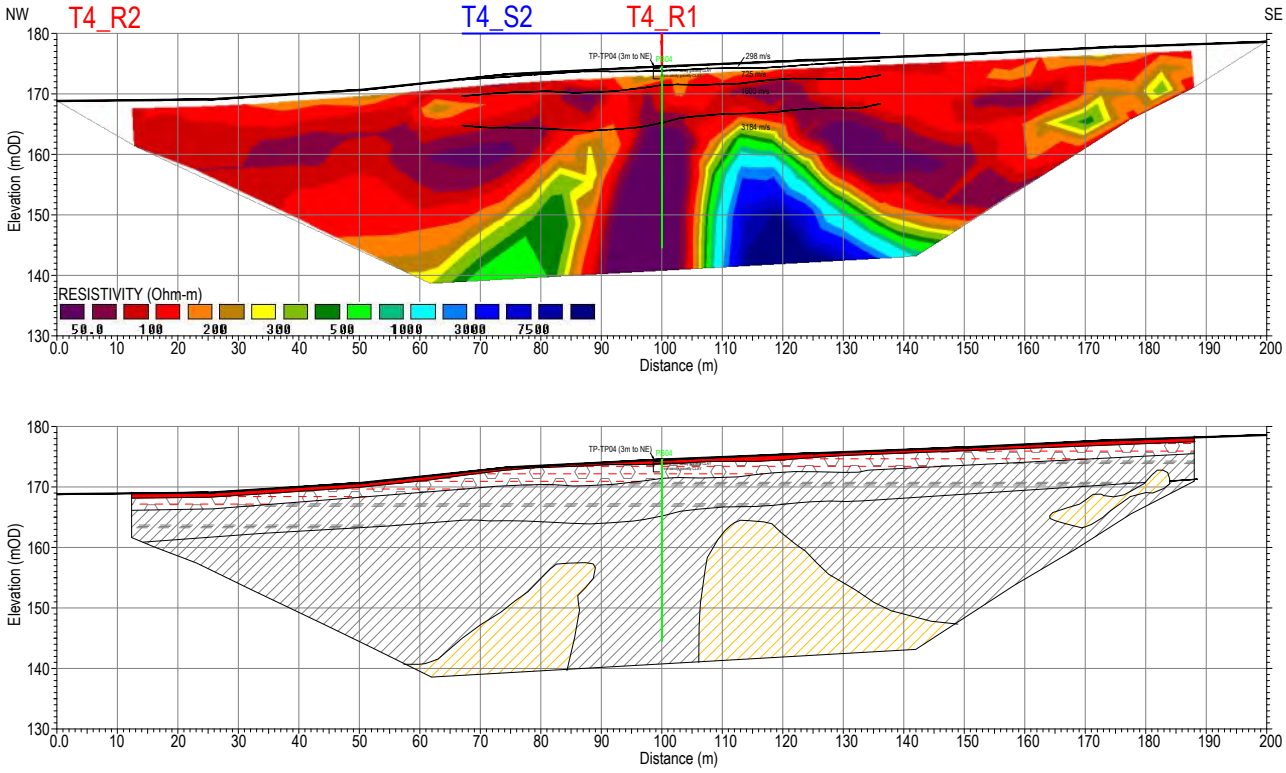


FIG 2: TURBINE BASE T4, RESULTS & INTERPRETATION ERT T4_R2 & SEISMIC PROFILE T4_S2

SCALE 1:1250



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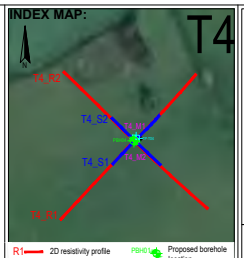

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravellly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

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FIG 1: TURBINE BASE T5, RESULTS & INTERPRETATION ERT T5_R1 & SEISMIC PROFILE T5_S1

SCALE 1:1250

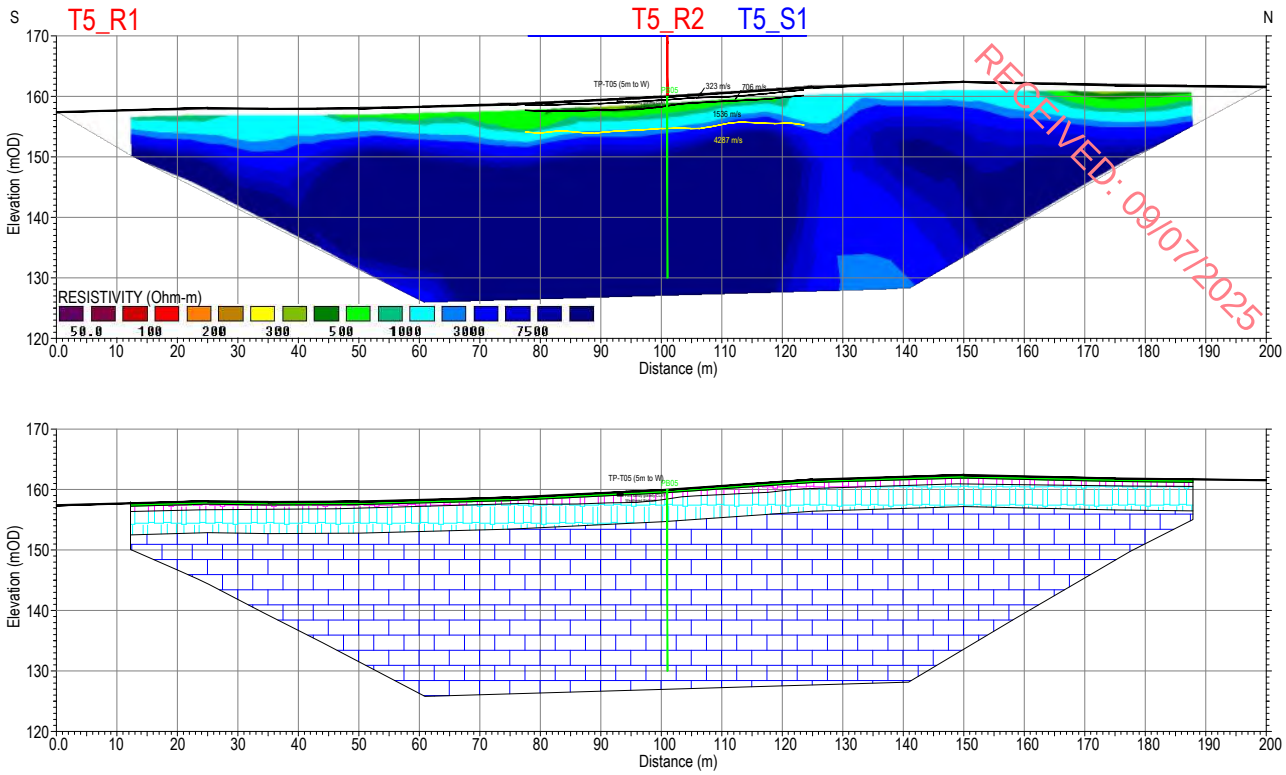
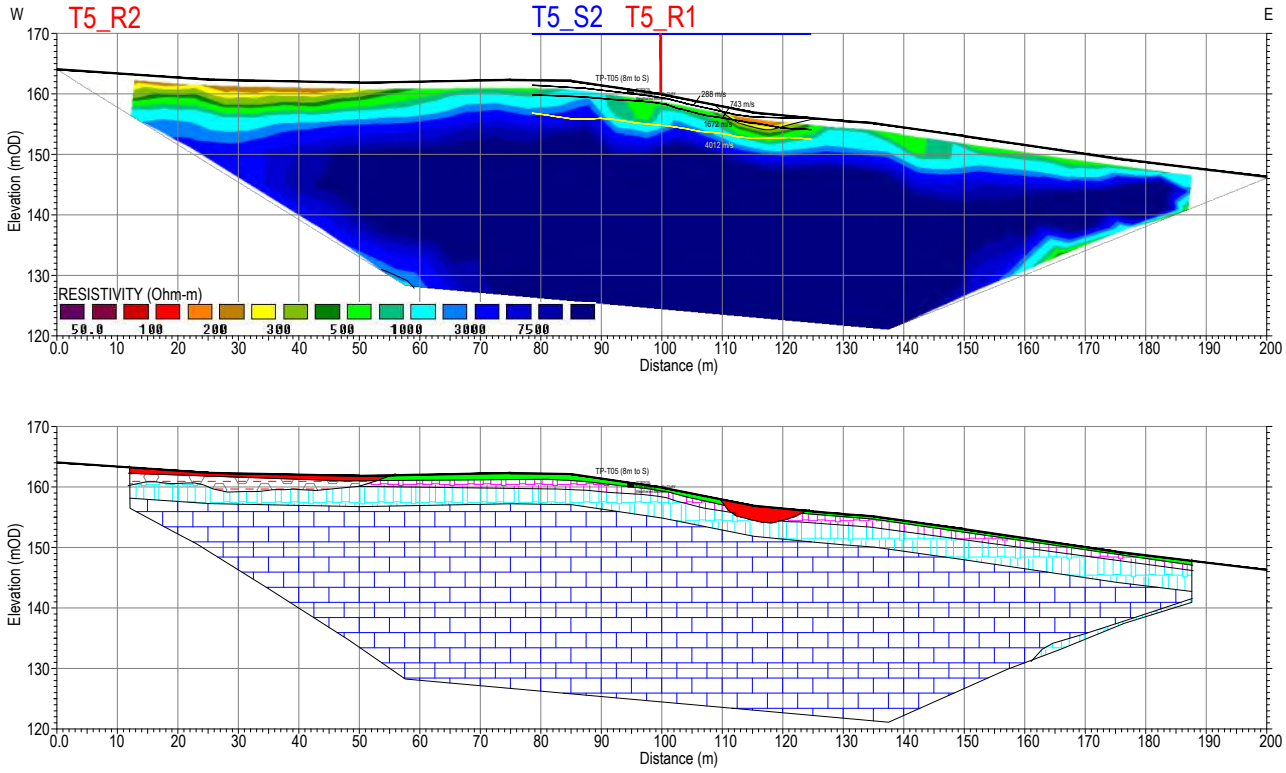


FIG 2: TURBINE BASE T5, RESULTS & INTERPRETATION ERT T5_R2 & SEISMIC PROFILE T5_S2

SCALE 1:1250



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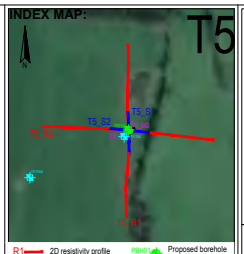

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

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FIG 1: TURBINE BASE T6, RESULTS & INTERPRETATION ERT T6_R1 & SEISMIC PROFILE T6_S1

SCALE 1:1250

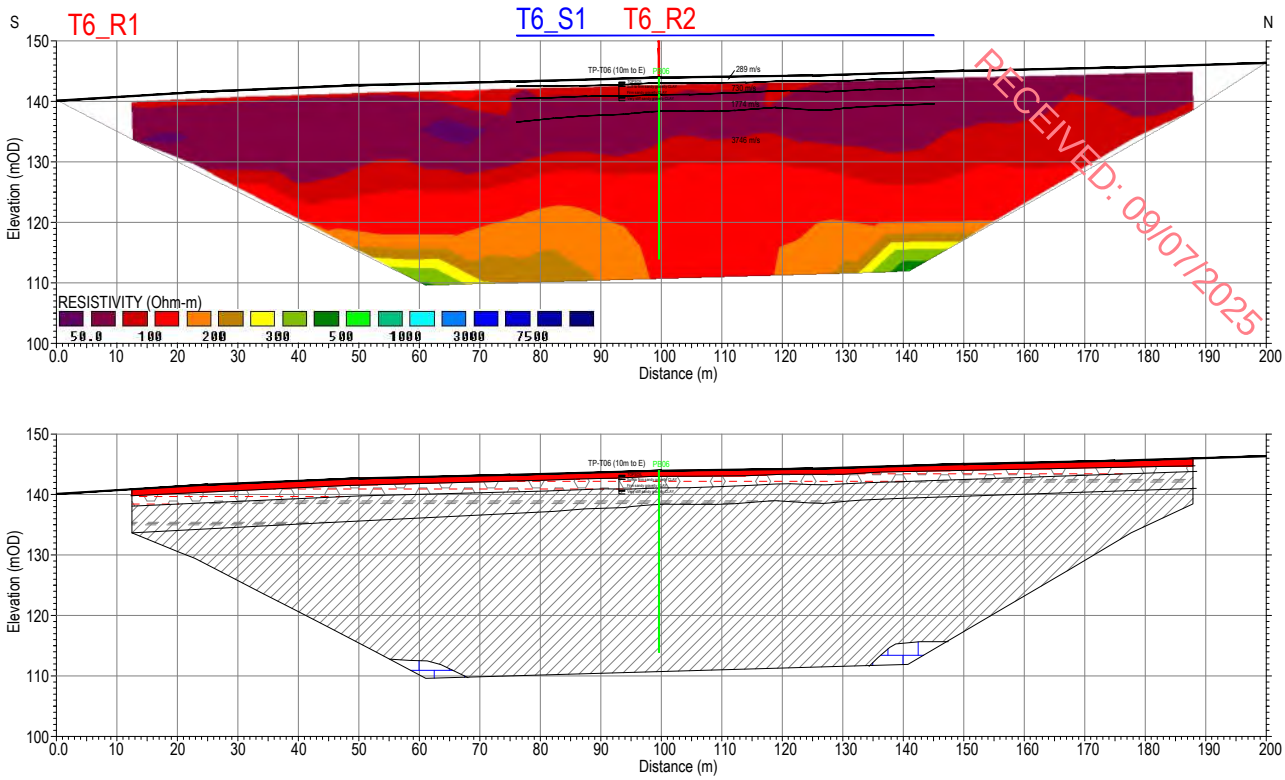
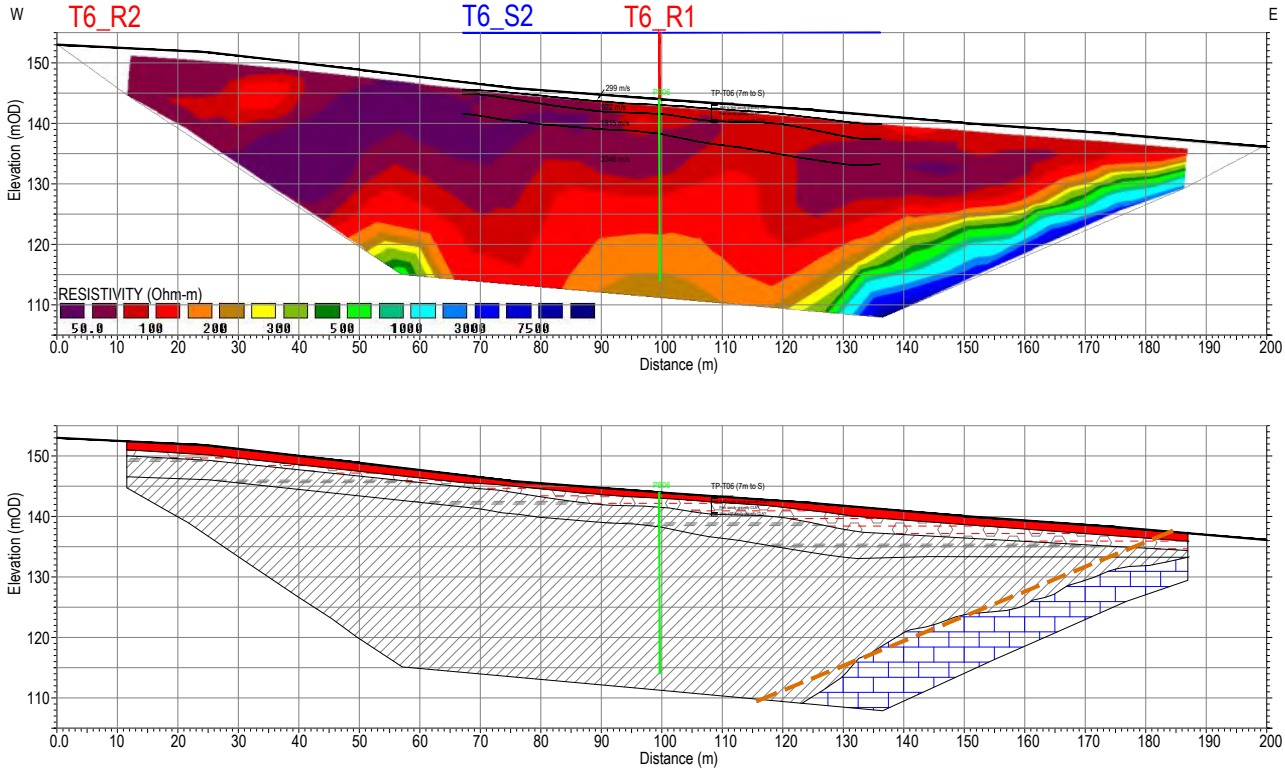


FIG 2: TURBINE BASE T6, RESULTS & INTERPRETATION ERT T6_R2 & SEISMIC PROFILE T6_S2

SCALE 1:1250



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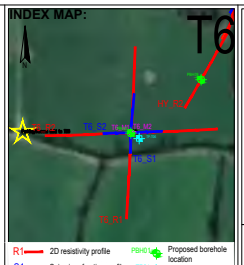

R1 2D resistivity profile
S1 Seismic refraction profile
M1 MASW data location
PBH01 Proposed borehole location
TP01 Trial Pit location
BH01 Borehole location

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

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FIG 1: TURBINE BASE T7, RESULTS & INTERPRETATION ERT T7_R1 & SEISMIC PROFILE T7_S1

SCALE 1:1250

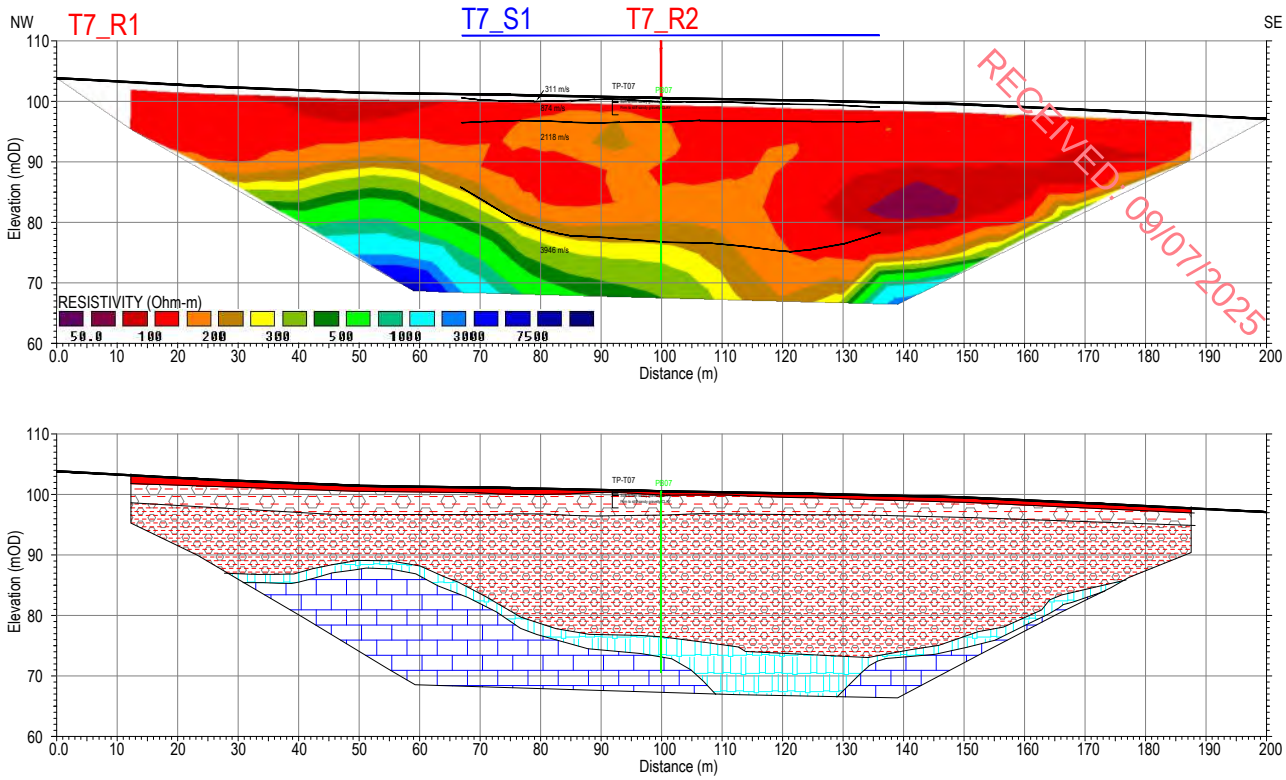
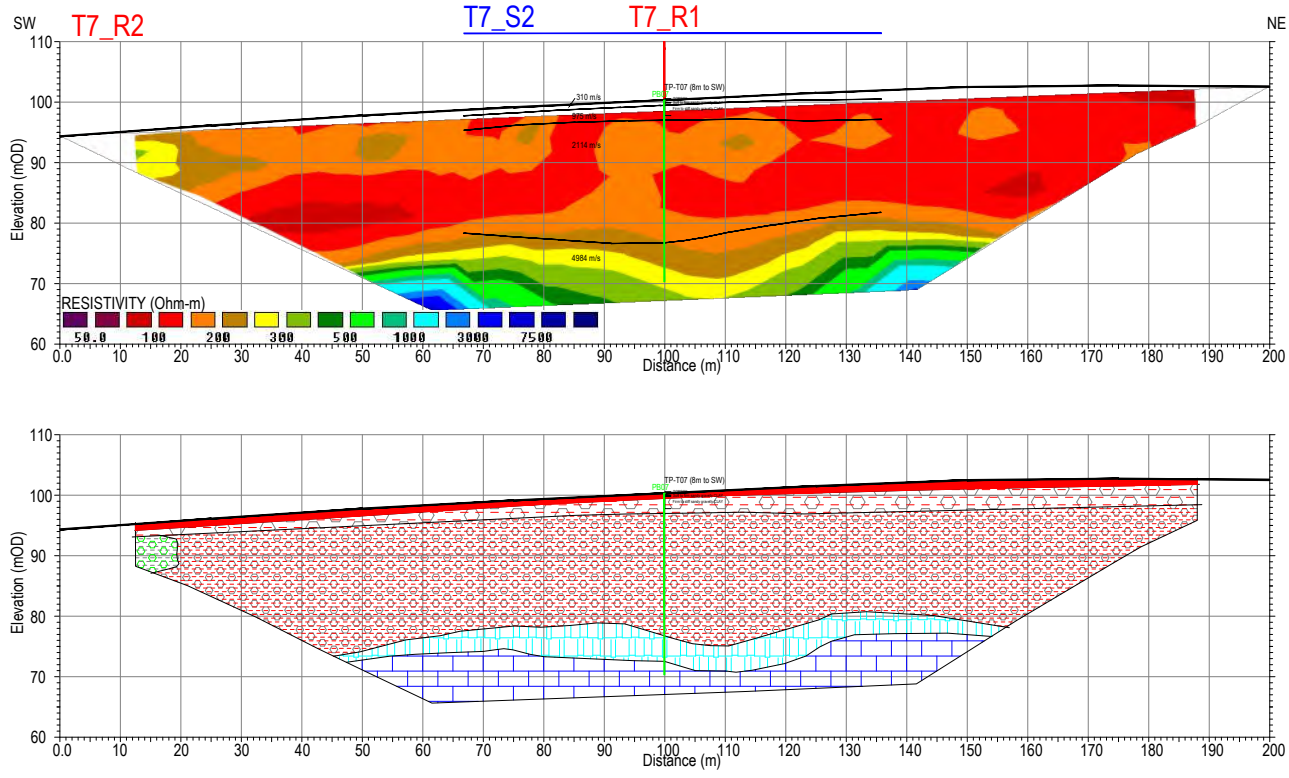


FIG 2: TURBINE BASE T7, RESULTS & INTERPRETATION ERT T7_R2 & SEISMIC PROFILE T7_S2

SCALE 1:1250



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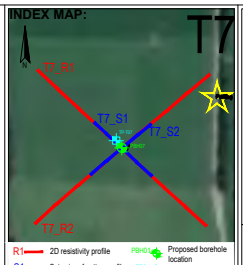

R1 2D resistivity profile
S1 Seismic refraction profile
M1 MASW data location
PBH01 Proposed borehole location
TP01 Trial Pit location
BH01 Borehole location

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravellly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

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FIG 1: TURBINE BASE T8, RESULTS & INTERPRETATION ERT T8_R1 & SEISMIC PROFILE T8_S1

SCALE 1:1250

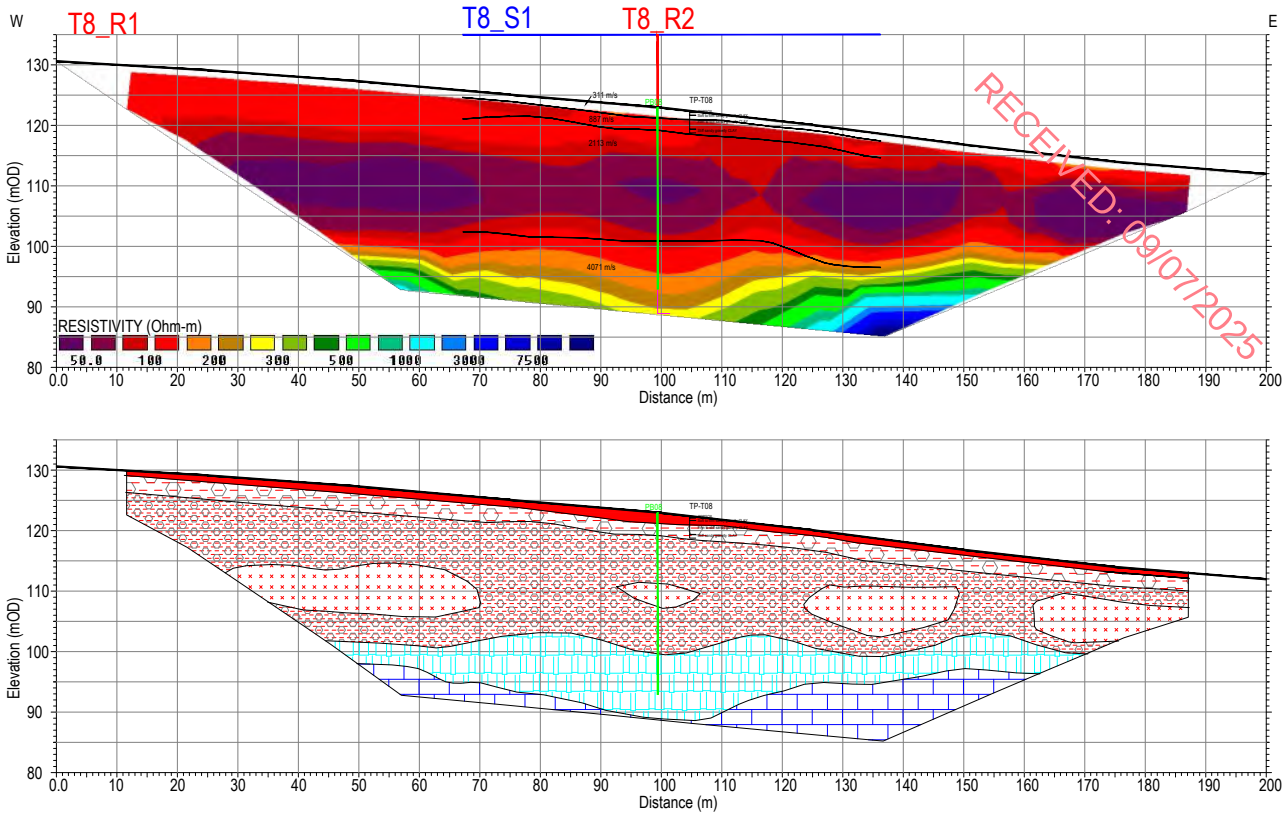
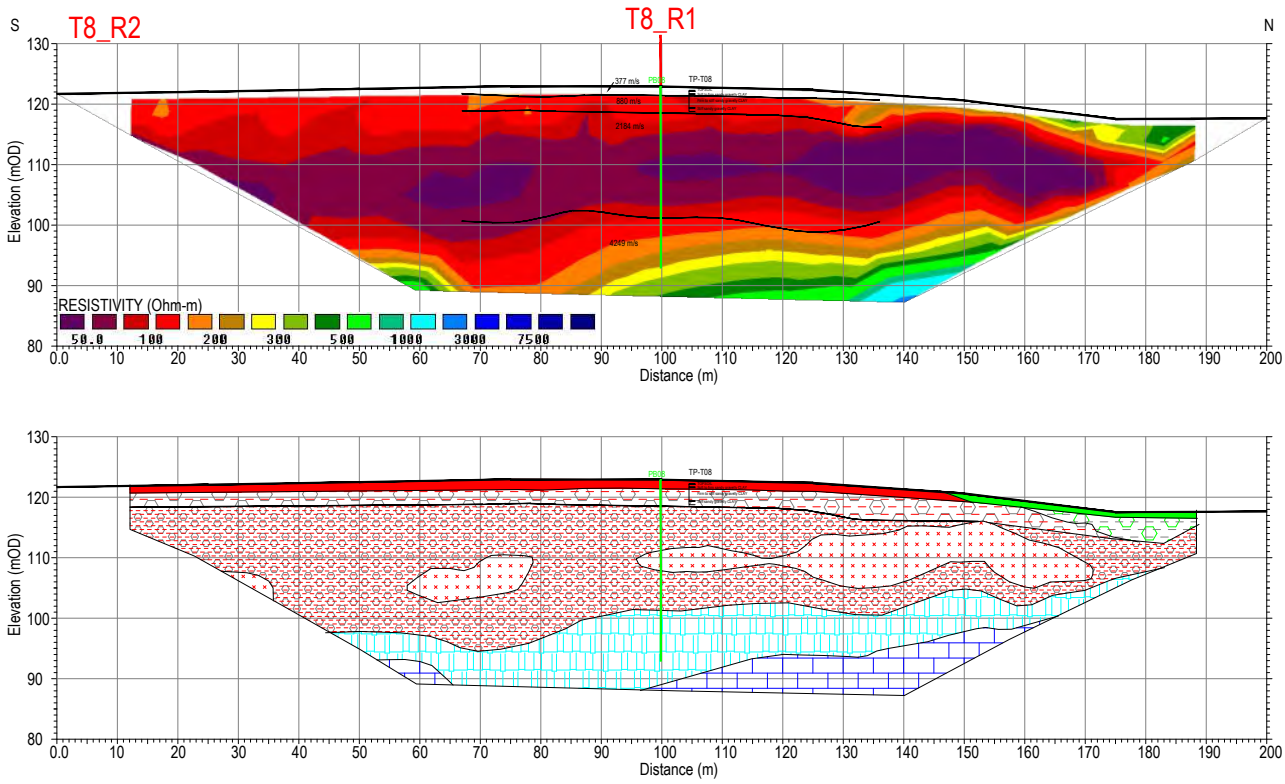


FIG 2: TURBINE BASE T8, RESULTS & INTERPRETATION ERT T8_R2 & SEISMIC PROFILE T8_S2

SCALE 1:1250



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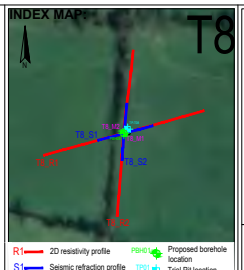

R1 2D resistivity profile
S1 Seismic refraction profile
M1 MASW data location
PBH01 Proposed borehole location
TP01 Trial Pit location
BH01 Borehole location

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
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- Possible fault
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FIG 1: BORROW PIT BP, RESULTS & INTERPRETATION ERT BP_R1 & SEISMIC PROFILE BP_S1

SCALE 1:1250

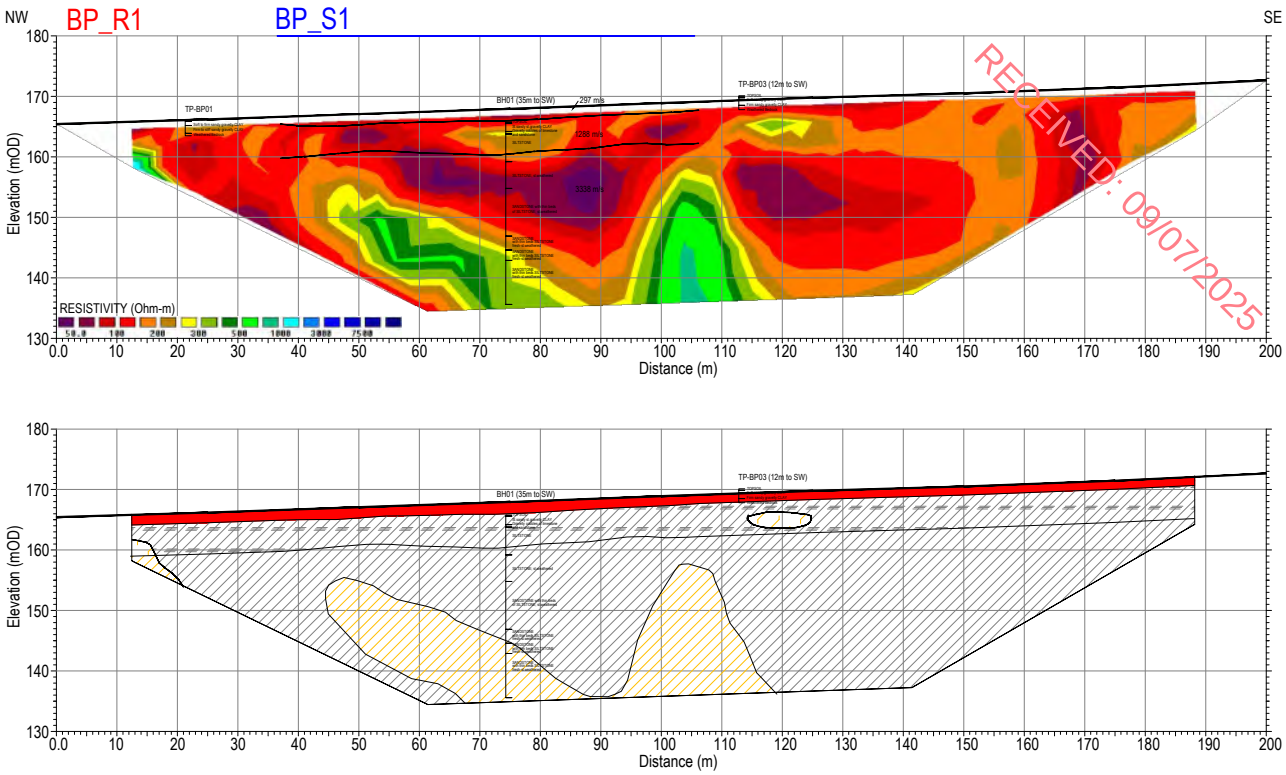
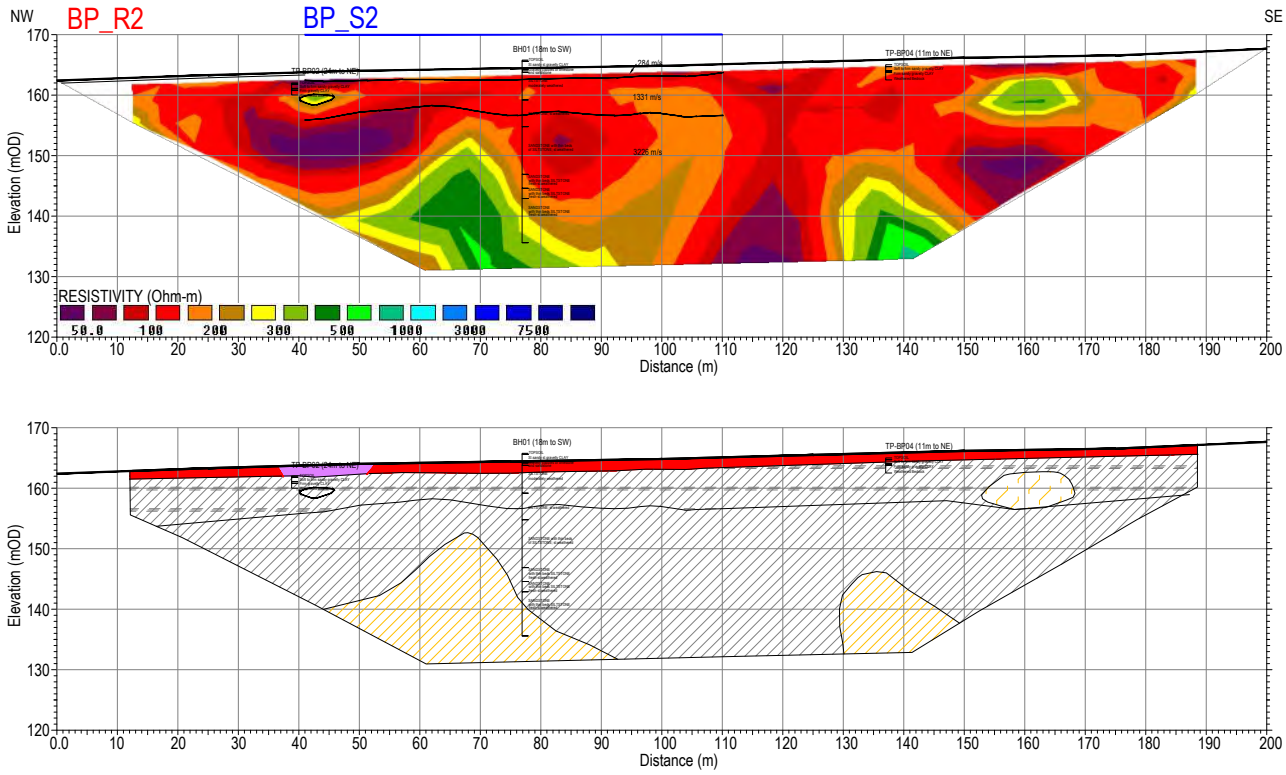


FIG 2: BORROW PIT BP, RESULTS & INTERPRETATION ERT BP_R2 & SEISMIC PROFILE BP_S2

SCALE 1:1250



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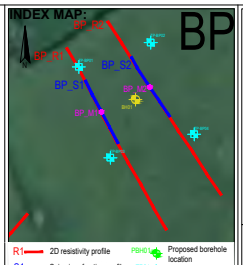

LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravellly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
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Version:	Date:	Drawn By:	Checked:
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FIG 1: HYDRO LINE HY1, RESULTS & INTERPRETATION ERT HY1_R1 & SEISMIC PROFILE HY1_S1

SCALE 1:1250

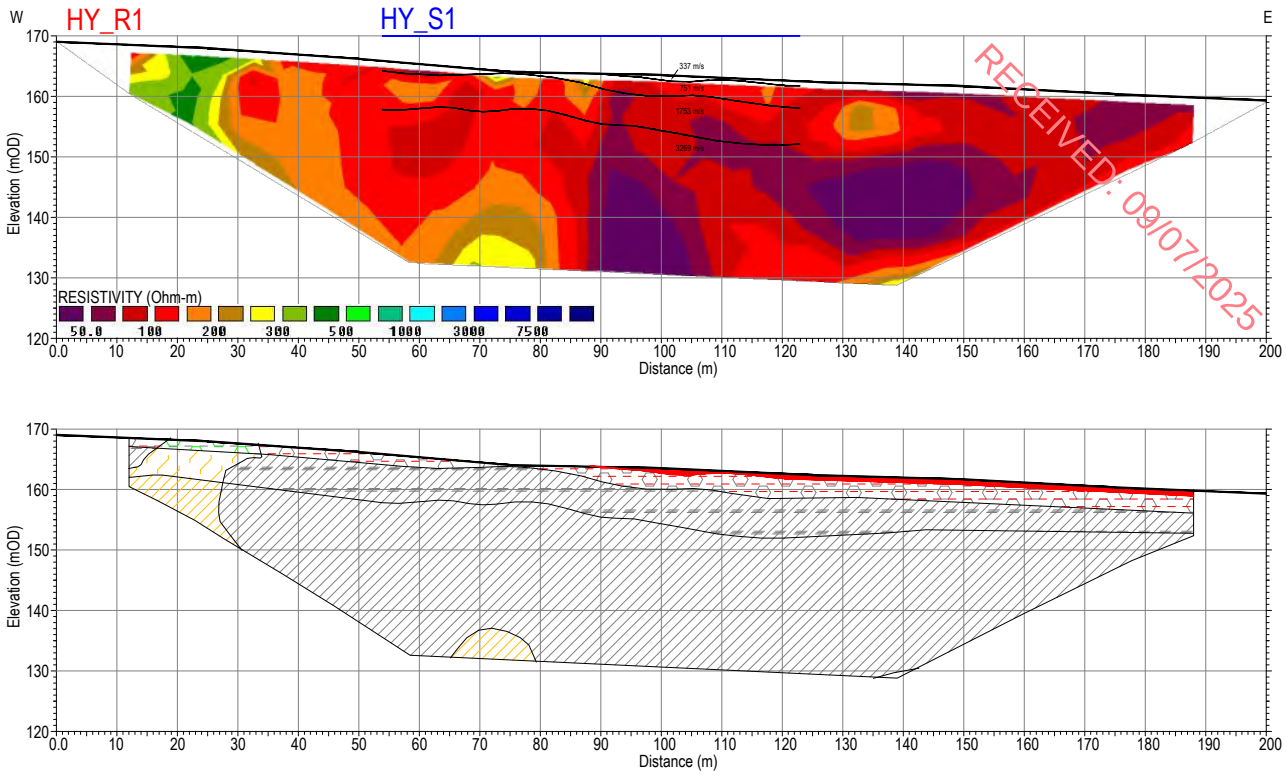
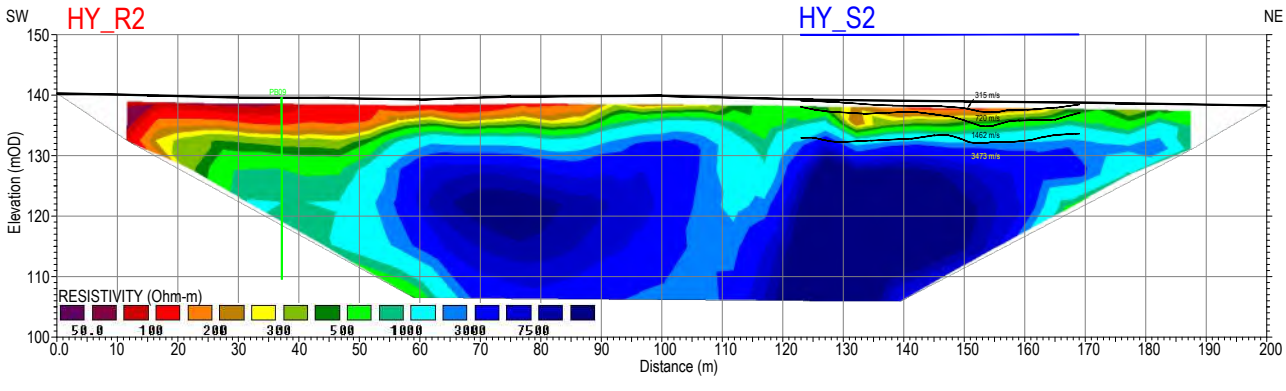
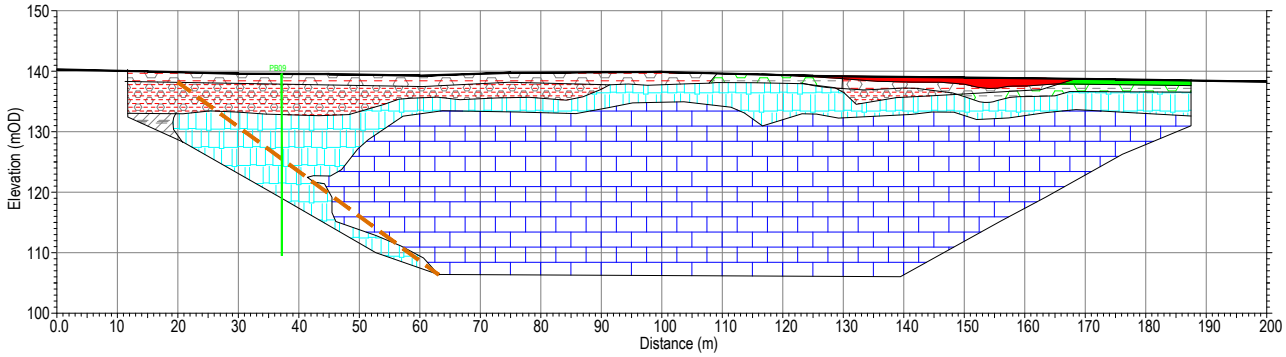


FIG 2: HYDRO LINE HY2, RESULTS & INTERPRETATION ERT HY2_R2 & SEISMIC PROFILE HY2_S2

SCALE 1:1250





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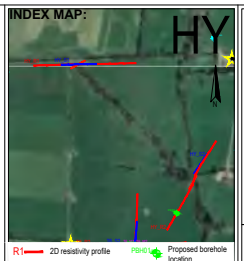


LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravelly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

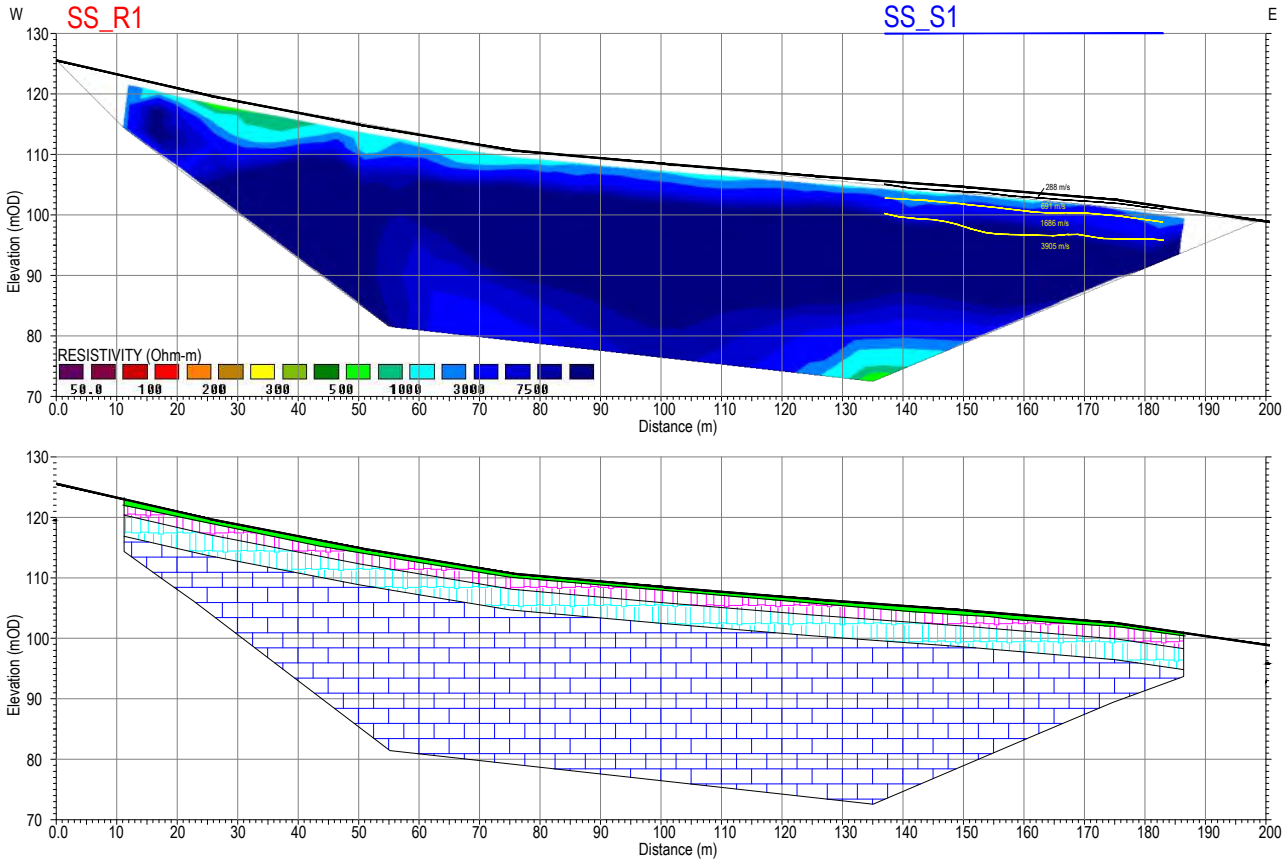
The information displayed here is to be used in conjunction with AGP24148_01 Report on the Geophysical Investigation at Seskin Wind Farm, Co. Kilkenny for GII Ltd., APEX Geophysics Ltd. 20th December 2024

PROJECT:	SESKIN WIND FARM GEOPHYSICAL INVESTIGATION
CLIENT.:	GROUND INVESTIGATIONS IRELAND LIMITED
DRAWING NO:	AGP24148_HY
SCALE:	AS INDICATED @ A4
DATE:	20-12-2024

Version:	Date:	Drawn By:	Checked:
01	20-12-2024	SC	TL

SUBSTATION SS, RESULTS & INTERPRETATION ERT SS_R1 & SEISMIC PROFILE SS_S1

SCALE 1:1250



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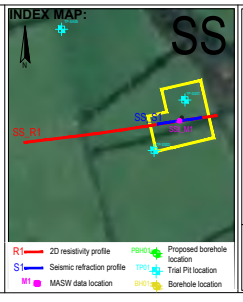
INDEX MAP:



LEGEND:

- Seismic refraction layer with interpreted P-wave velocity
- Soft SILT/CLAY
- Soft sandy gravellly SILT/CLAY
- Loose clayey SAND/GRAVEL
- Firm SILT/CLAY
- Firm sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Medium dense clayey SAND/GRAVEL (pos. weathered rock towards base)
- Stiff to very stiff SILT/CLAY
- Stiff to very stiff sandy gravelly SILT/CLAY (pos. weathered rock towards base)
- Dense to very dense clayey SAND/GRAVEL (or weathered rock)
- Highly weathered MUDSTONE/SHALE
- Moderately weathered MUDSTONE/SHALE
- Slightly weathered to fresh MUDSTONE/SHALE
- Moderately weathered SILTSTONE & SANDSTONE interbeds
- Slightly weathered/fractured to fresh SILTSTONE & SANDSTONE interbeds
- Highly weathered LIMESTONE
- Moderately weathered LIMESTONE
- Slightly weathered to fresh LIMESTONE
- Possible fault
- Direct investigation location
- Proposed direct investigation location

The information displayed here is to be used in conjunction with AGP24148_01 Report on the Geophysical Investigation at Seskin Wind Farm, Co. Kilkenny for GII Ltd., APEX Geophysics Ltd. 20th December 2024

PROJECT:	SESKIN WIND FARM GEOPHYSICAL INVESTIGATION
CLIENT.:	GROUND INVESTIGATIONS IRELAND LIMITED
DRAWING NO:	AGP24148_SS
SCALE:	AS INDICATED @ A4
DATE:	20-12-2024

Version:	Date:	Drawn By:	Checked:
01	20-12-2024	SC	TL

APPENDIX D: SEISMIC REFRACTION TOMOGRAPHIC DATA

The tomographic inversions of the seismic refraction datasets are shown below.

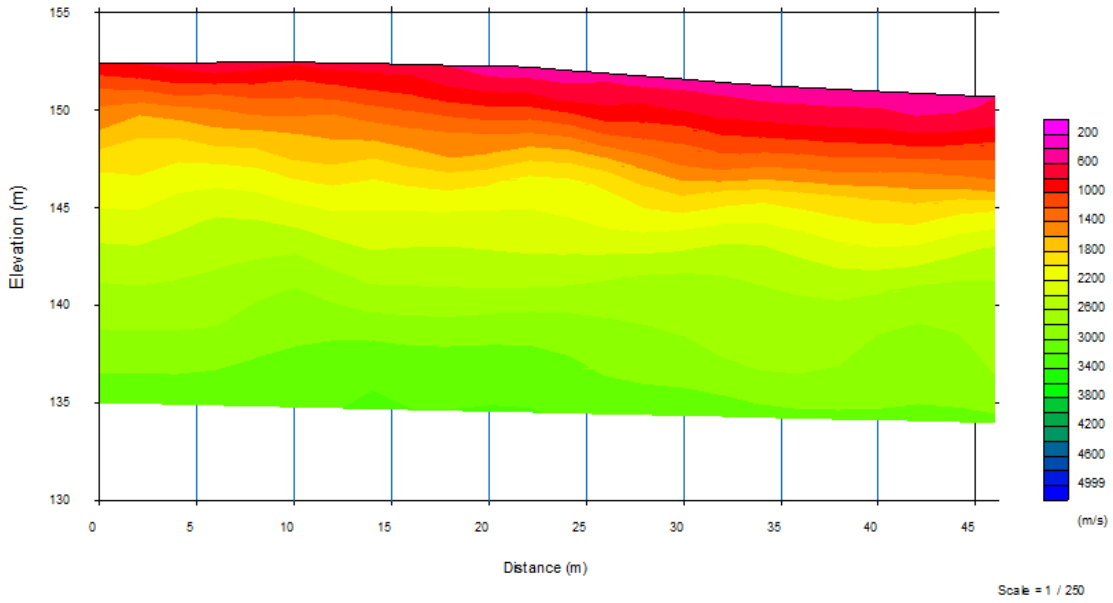


Fig. C.1: Seismic Refraction T1-S1 Tomographic Inversion, plotted SW-NE.

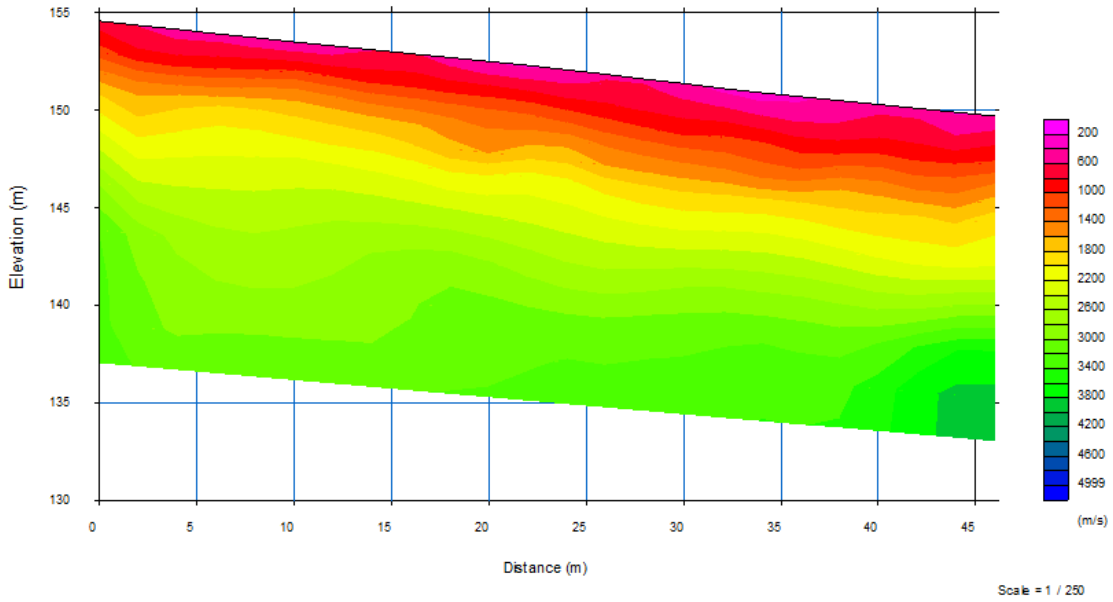


Fig. C.2: Seismic Refraction T1–S2 Tomographic Inversion, plotted NW-SE.

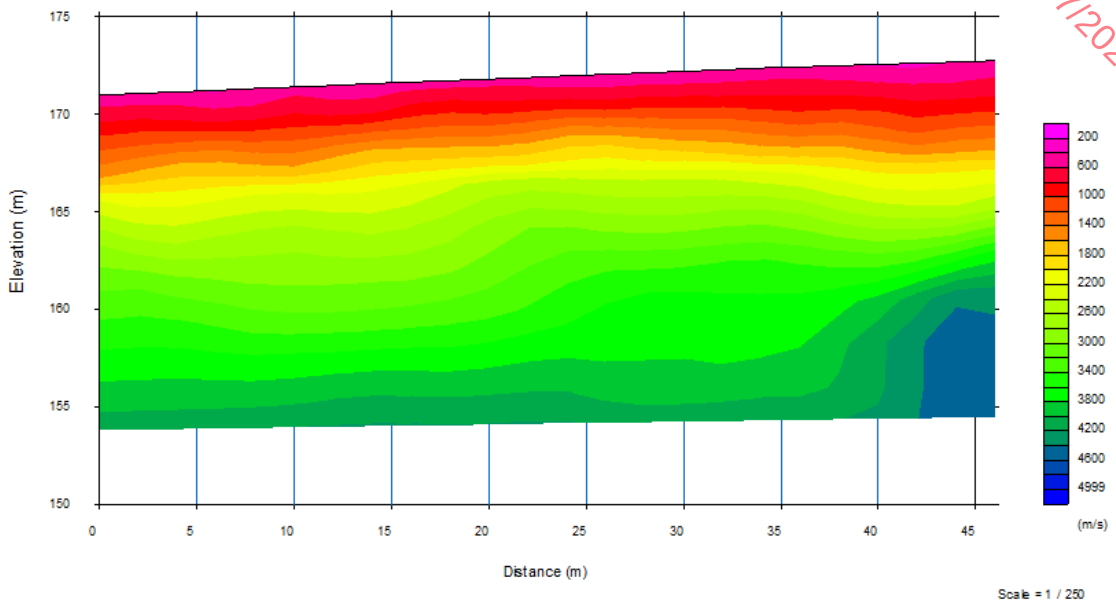


Fig. C.3: Seismic Refraction T2–S1 Tomographic Inversion, plotted NE-SW.

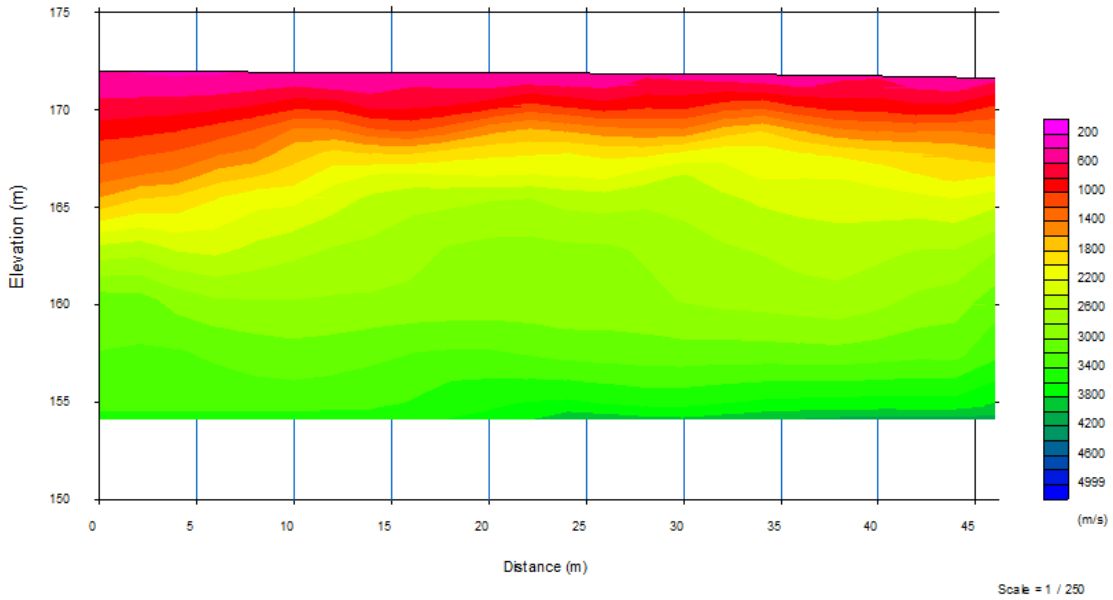


Fig. C.4: Seismic Refraction T2–S2 Tomographic Inversion, plotted NW-SE.

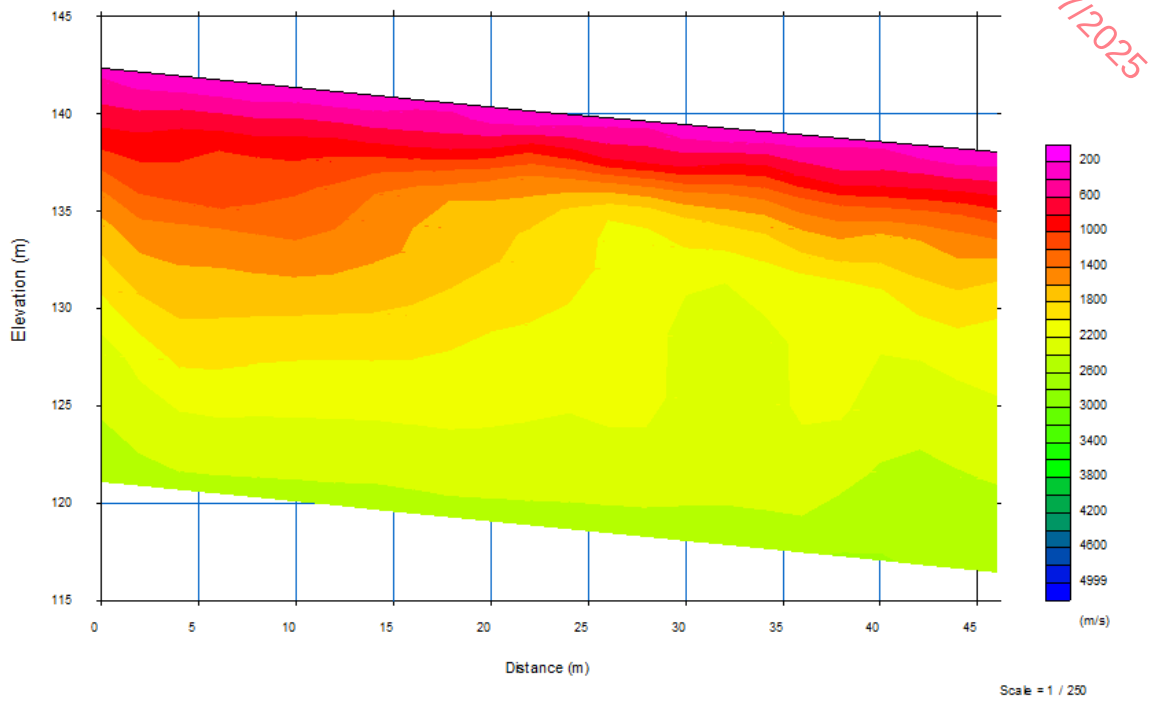


Fig. C.5: Seismic Refraction T3–S1 Tomographic Inversion, plotted SW-NE.

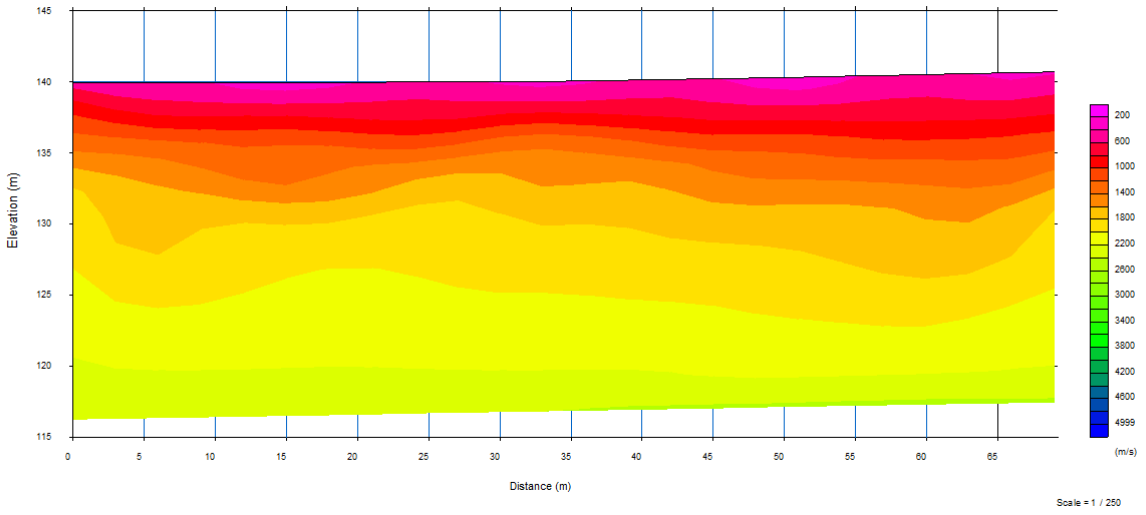


Fig. C.6: Seismic Refraction T3–S2 Tomographic Inversion, plotted NW-SE.

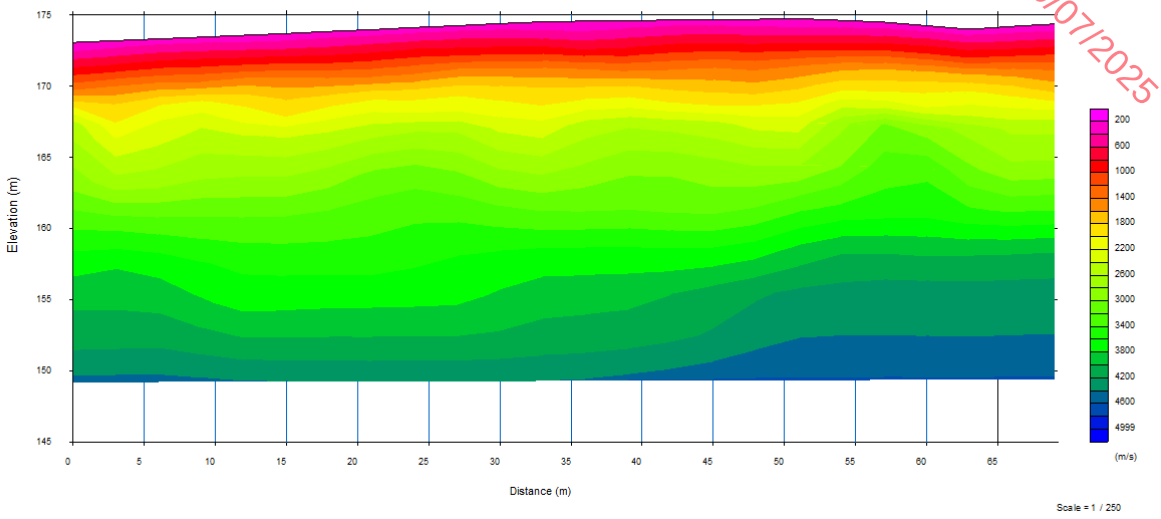


Fig. C.7: Seismic Refraction T4–S1 Tomographic Inversion, plotted SW-NE.

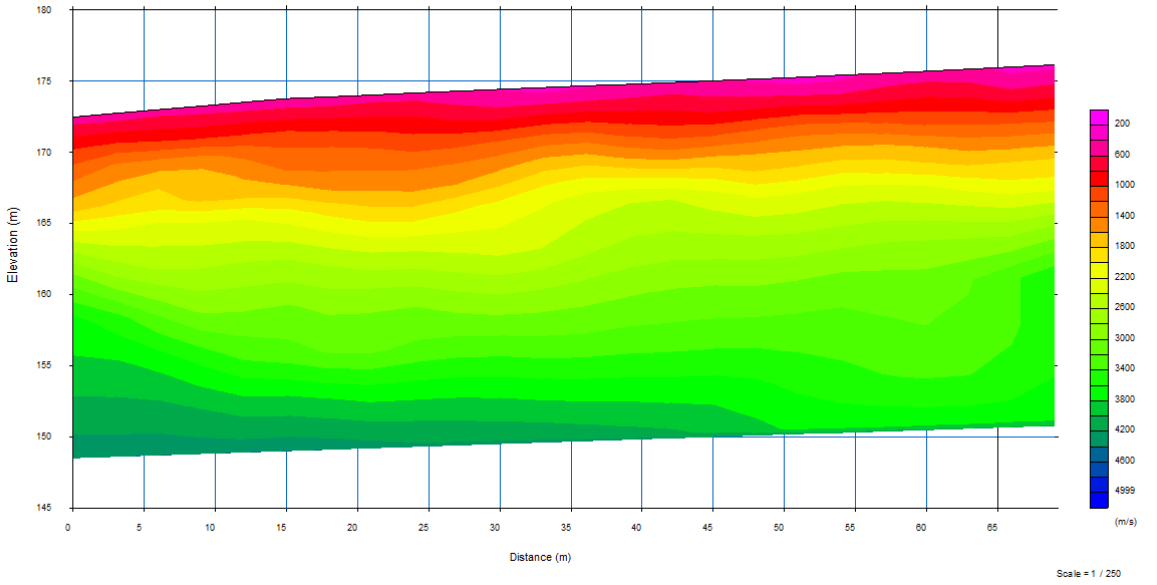


Fig. C.8: Seismic Refraction T4–S2 Tomographic Inversion, plotted NW-SE.

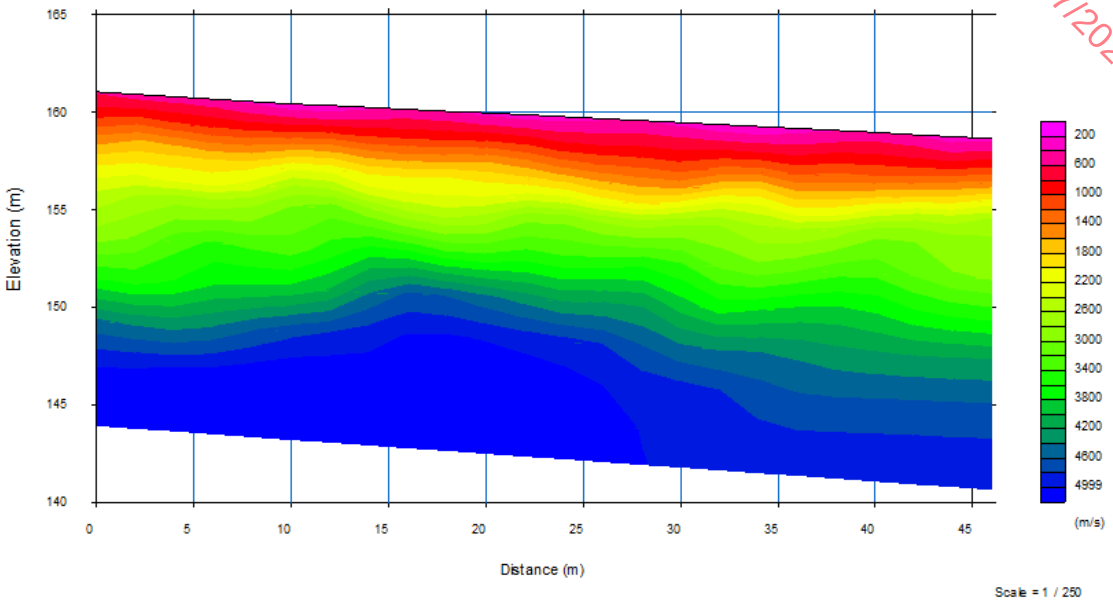


Fig. C.9: Seismic Refraction T5–S1 Tomographic Inversion, plotted N-S.

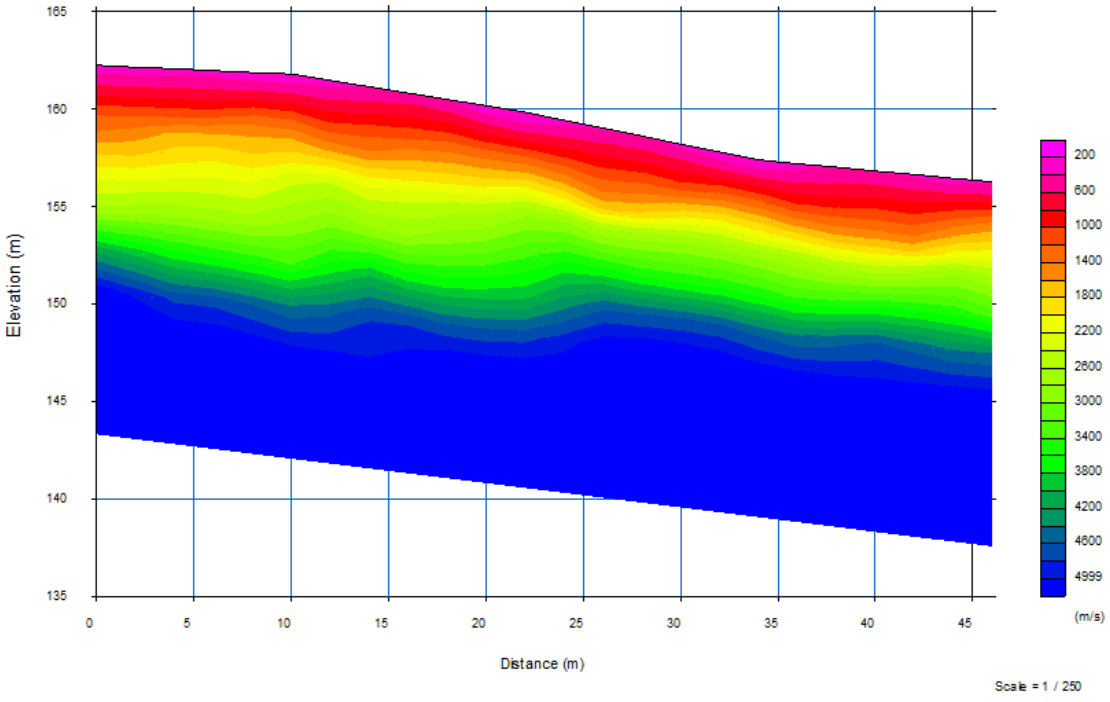


Fig. C.10: Seismic Refraction T5–S2 Tomographic Inversion, plotted W-E.

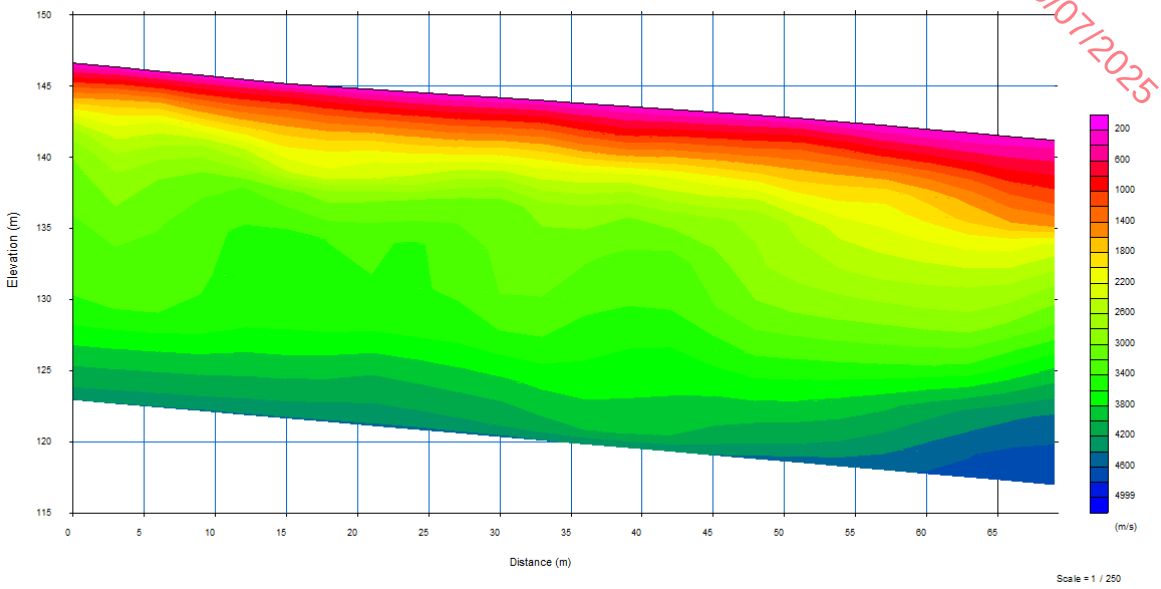


Fig. C.11: Seismic Refraction T6–S1 Tomographic Inversion, plotted S-N.

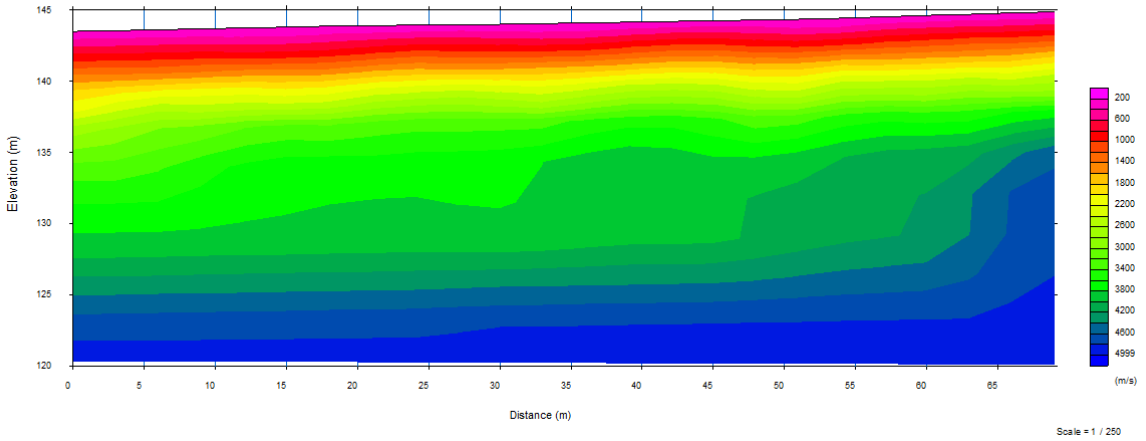


Fig. C.12: Seismic Refraction T6–S2 Tomographic Inversion, plotted W-E.

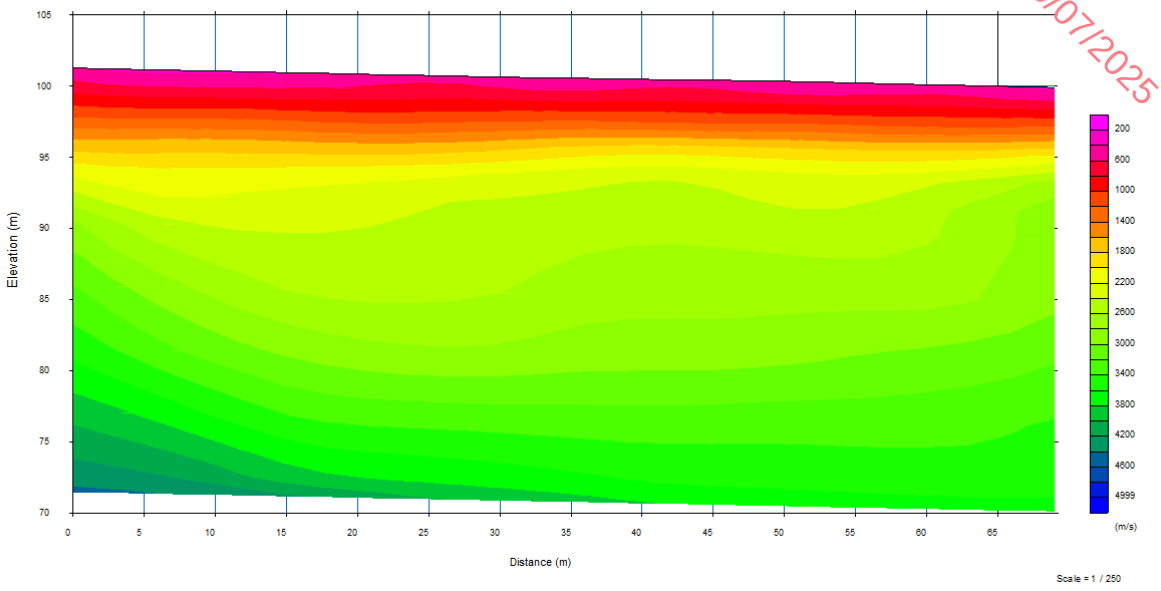


Fig. C.13: Seismic Refraction T7–S1 Tomographic Inversion, plotted NW-SE.

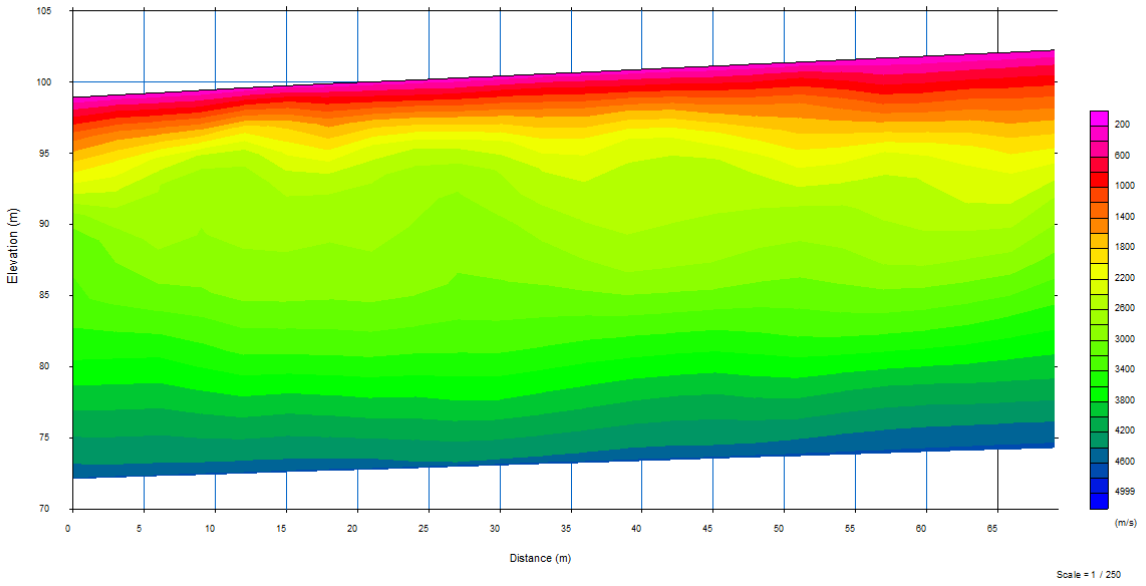


Fig. C.14: Seismic Refraction T7–S2 Tomographic Inversion, plotted NE-SW.

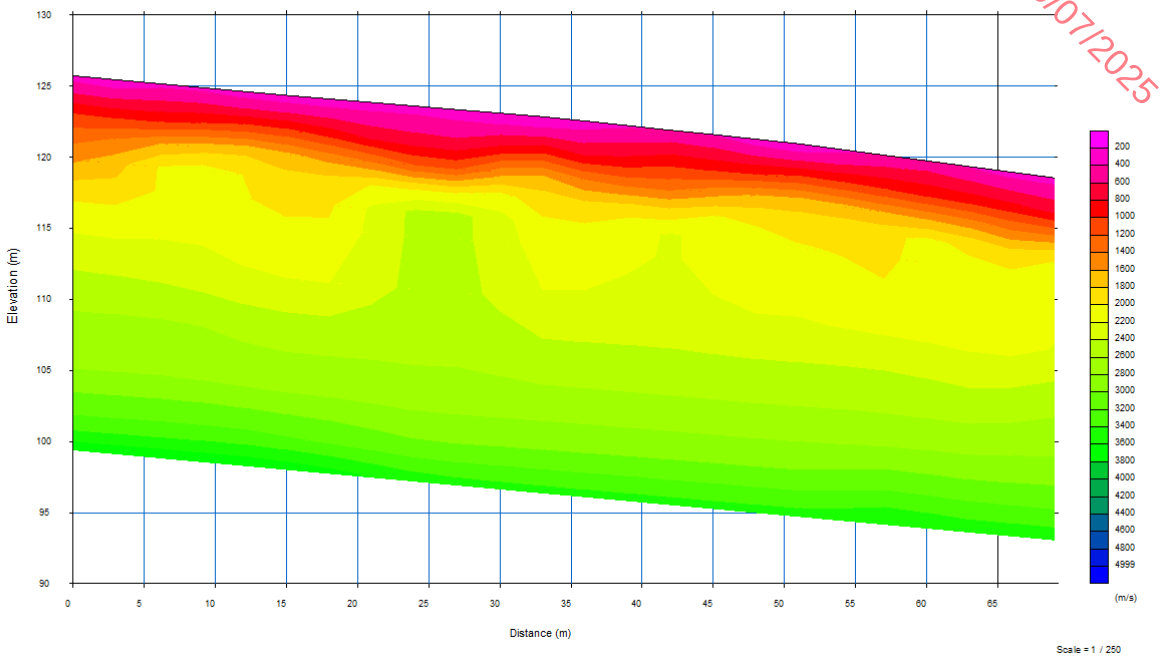


Fig. C.15: Seismic Refraction T8–S1 Tomographic Inversion, plotted W-E.

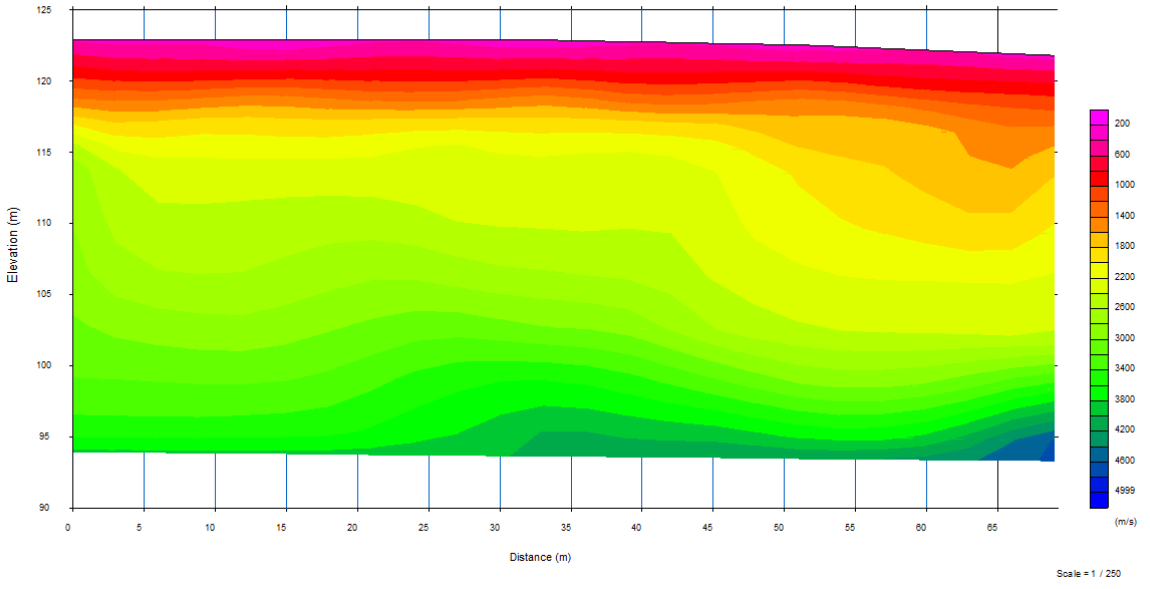


Fig. C.16: Seismic Refraction T8–S2 Tomographic Inversion, plotted S-N.

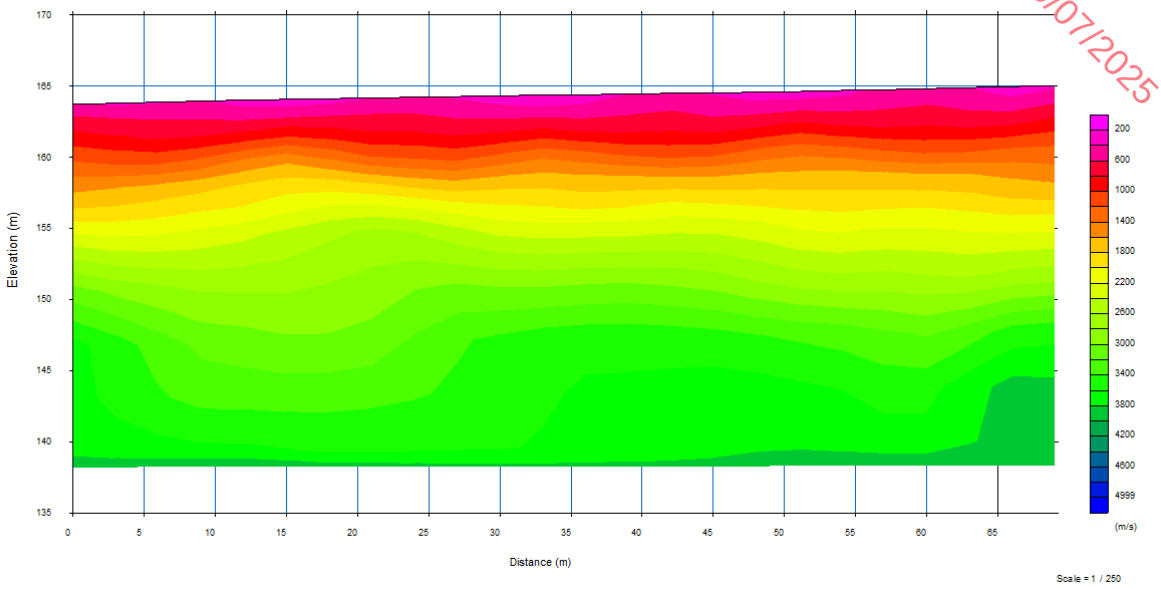


Fig. C.17: Seismic Refraction BP–S1 Tomographic Inversion, plotted N-S.

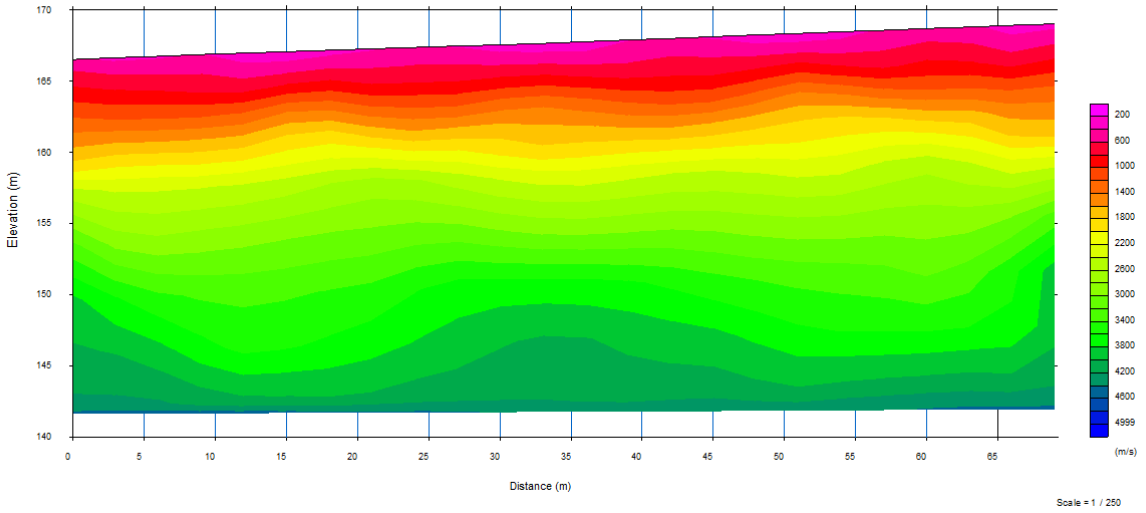


Fig. C.18: Seismic Refraction BP–S2 Tomographic Inversion, plotted N-S.

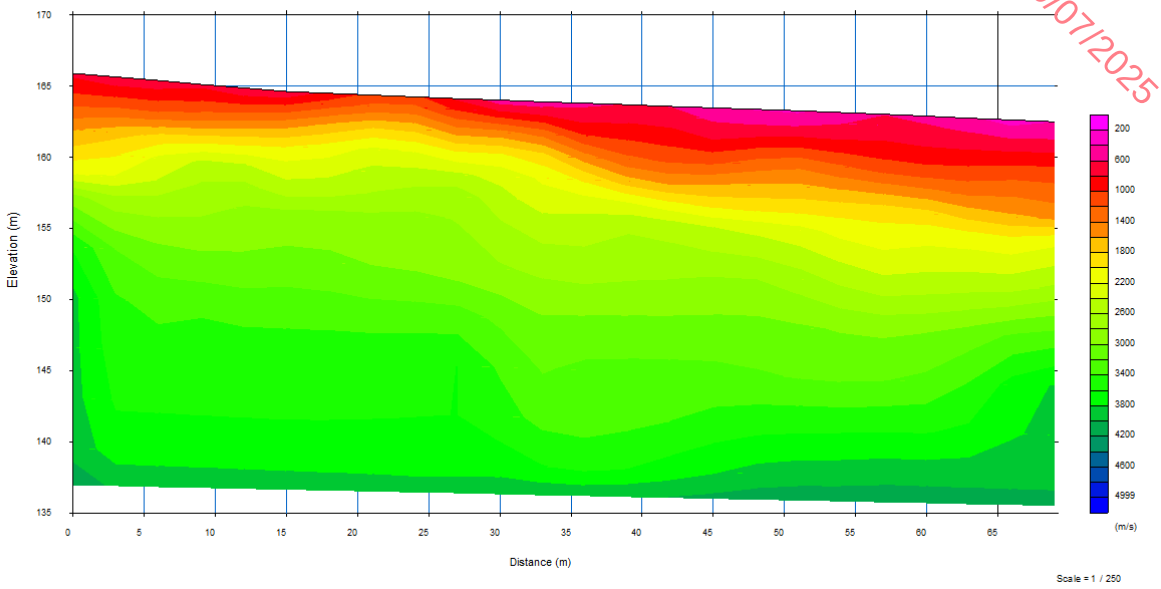


Fig. C.19: Seismic Refraction HY–S1 Tomographic Inversion, plotted W-E.

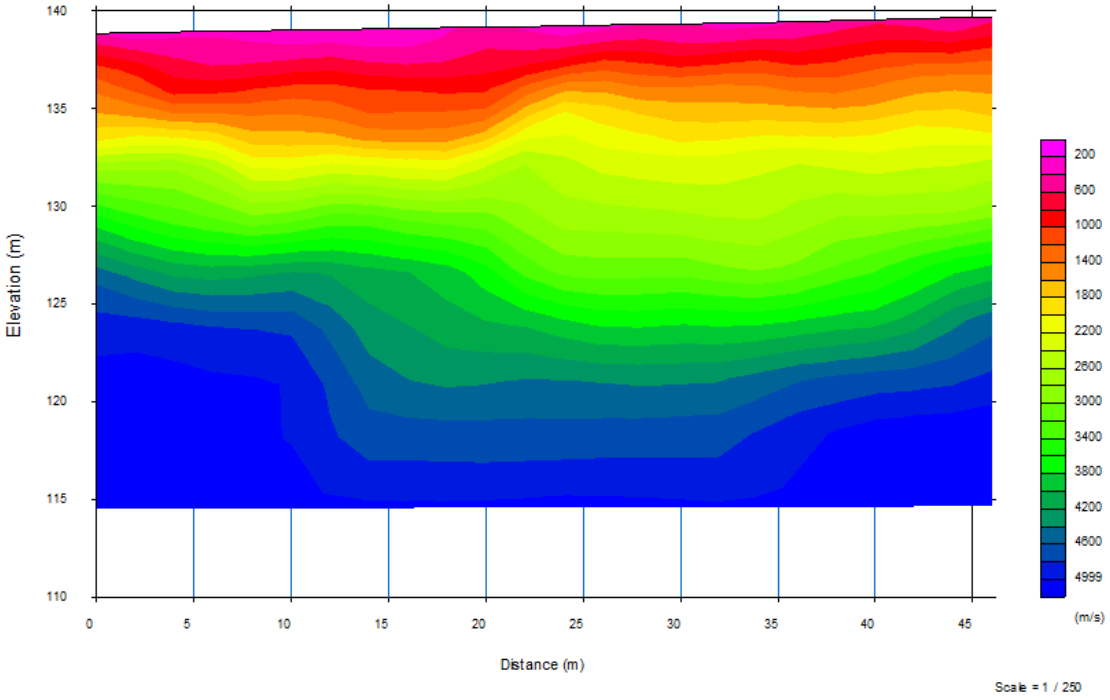


Fig. C.20: Seismic Refraction HY–S2 Tomographic Inversion, plotted NE-SW.

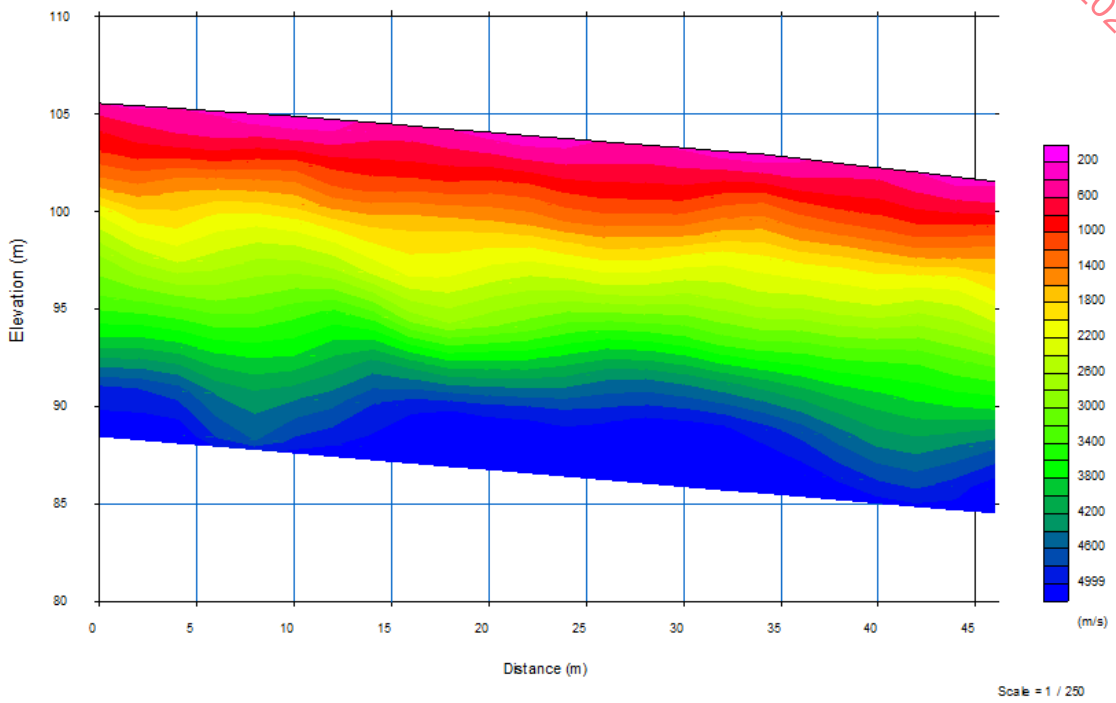


Fig. C.21: Seismic Refraction SS–S1 Tomographic Inversion, plotted W-E.

APPENDIX E: MASW OUTPUT DATA IN GRAPHICAL AND TABULAR FORMAT

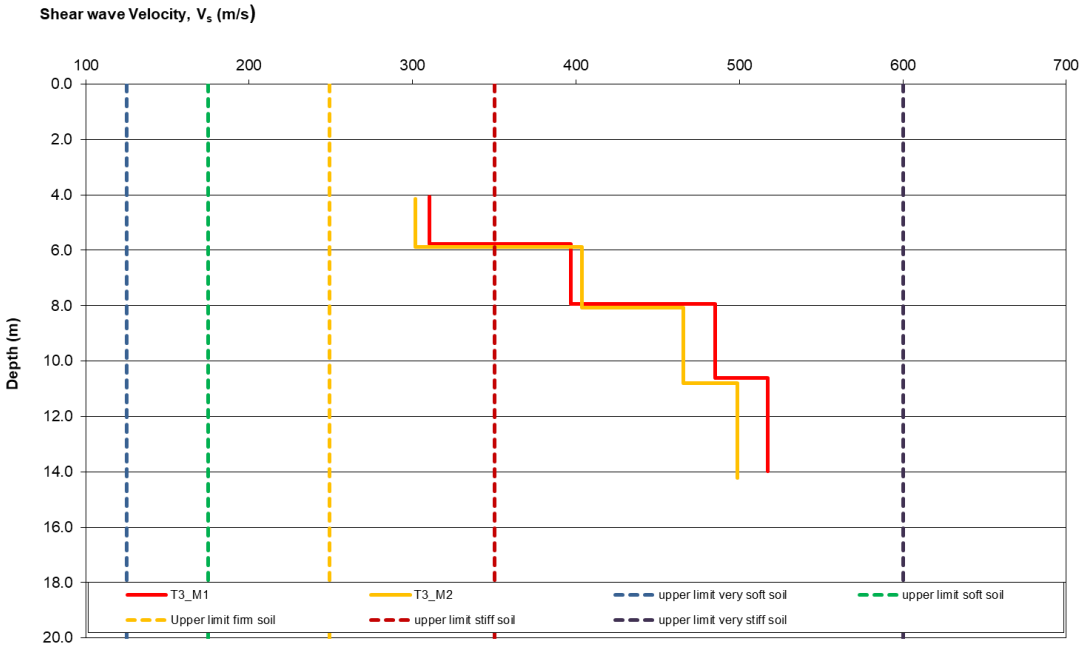


Fig. D.1: Survey location T3 Shear wave velocity (Vs).

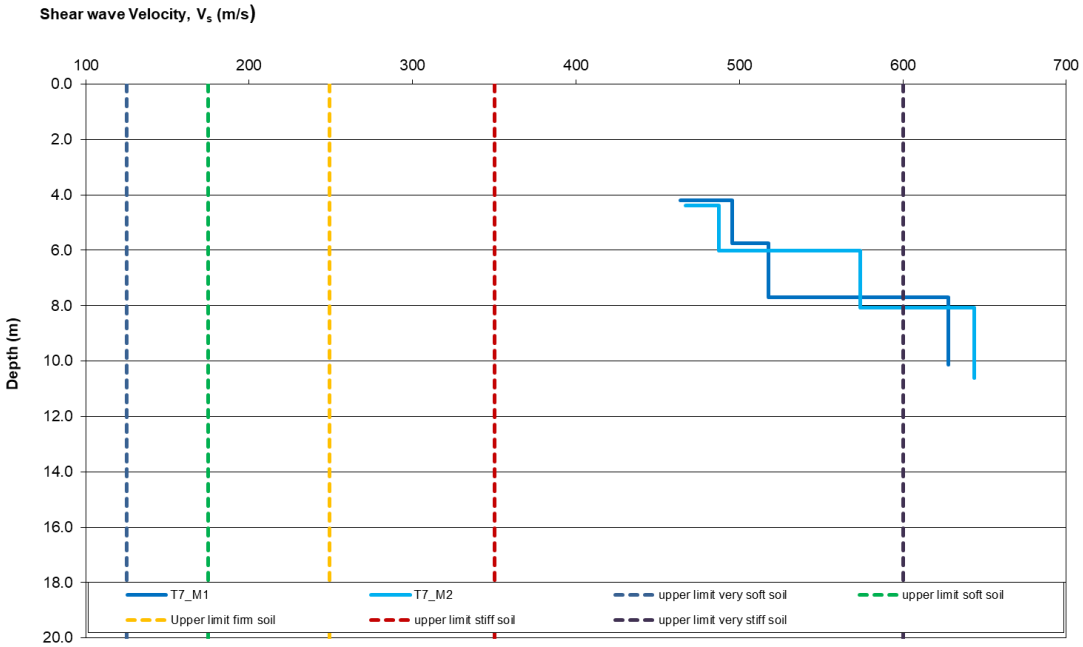


Fig. D.2: Survey location T7 Shear wave velocity (Vs).

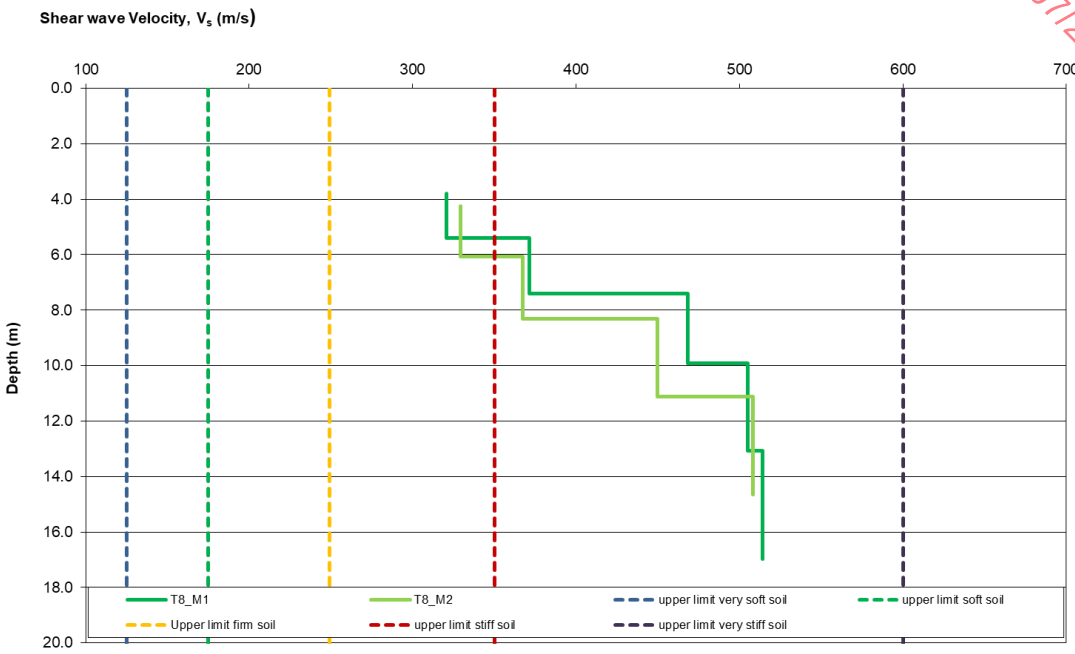


Fig. D.3: Survey location T8 Shear wave velocity (Vs).

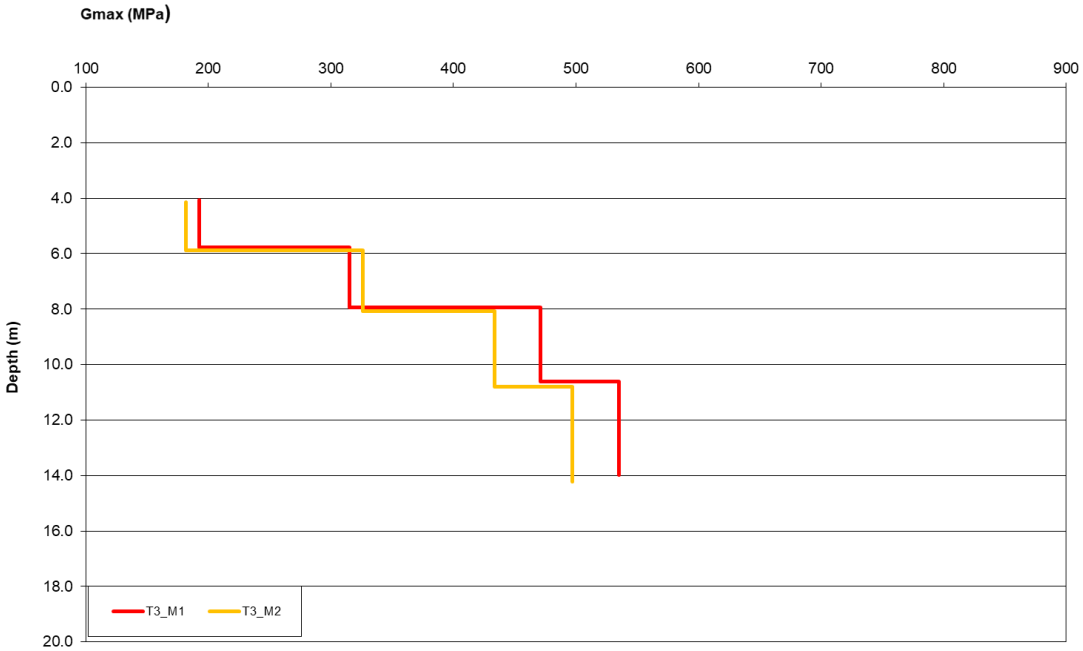


Fig. D.4: Survey location T3 Gmax.

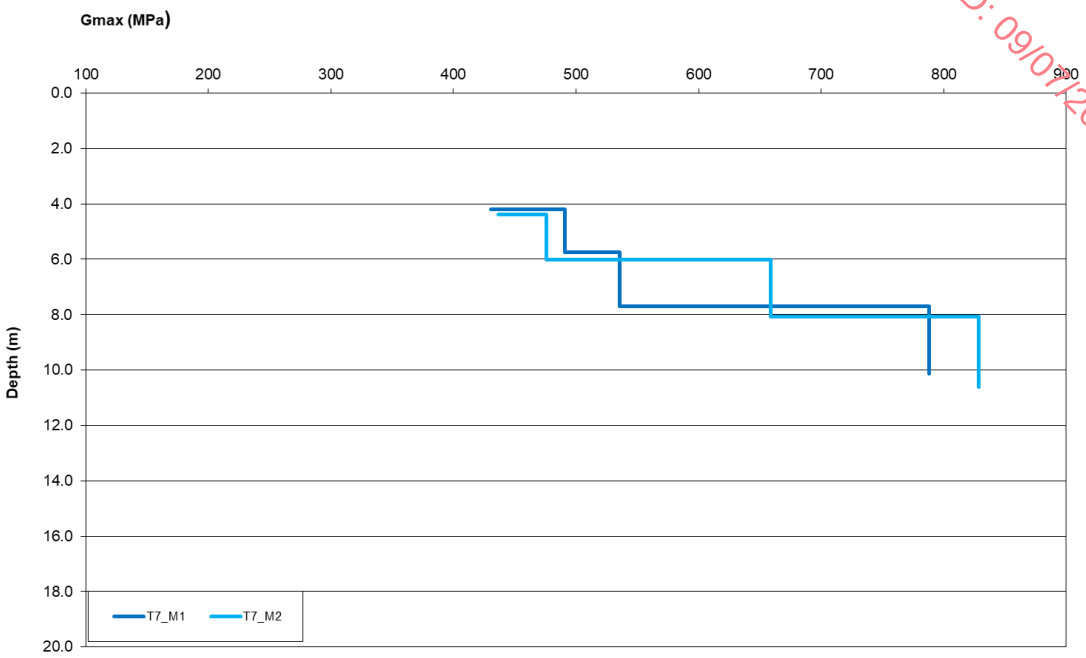


Fig. D.5: Survey location T7 Gmax.

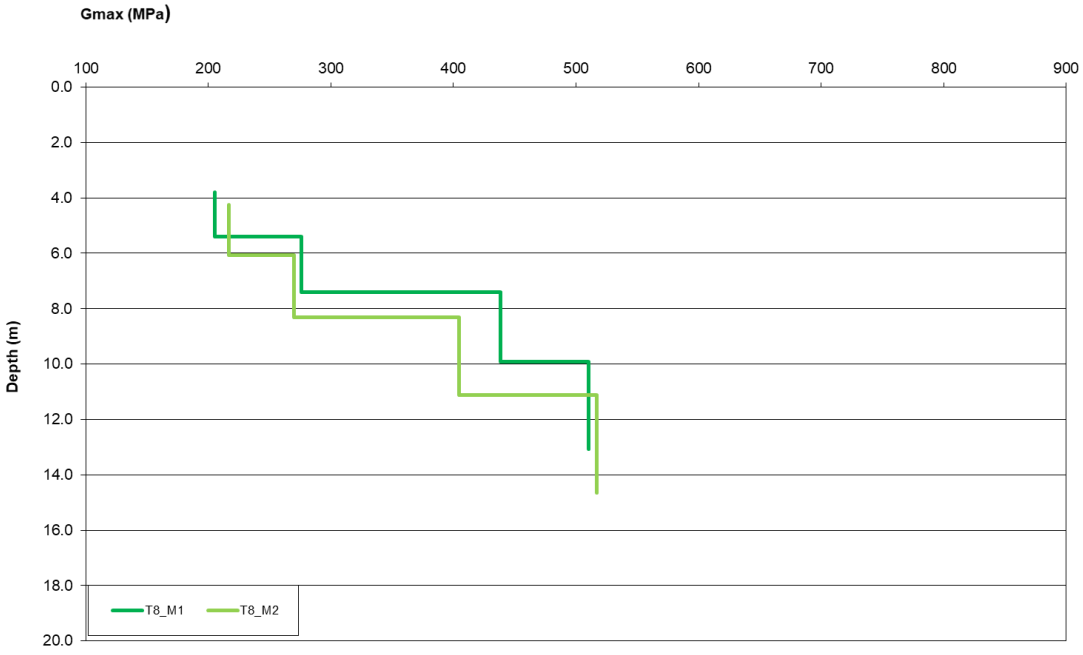


Fig. D.6: Survey location T8 Gmax.

T3	ITM Easting (m)			ITM Northing (m)		
	641941			674424		
Depth	Vs	Vp	Poisson Ratio	Assume Density	Gmax	ε
m	m/s	m/s		kg/m³	MPa	GPa
0.0	-	251	-	-	-	-
1.0	-	251	-	-	-	-
1.0	-	718	-	-	-	-
2.8		718	-	-	-	-
2.8		1874	-	-	-	-
4.1	285	1874	0.49	2000	163	0.48
4.1	311	1874	0.49	2000	193	0.57
5.8	311	1874	0.49	2000	193	0.57
5.8	397	1874	0.48	2000	315	0.93
7.9	397	1874	0.48	2000	315	0.93
7.9	485	1874	0.46	2000	471	1.38
10.6	485	1874	0.46	2000	471	1.38
10.6	517	1874	0.46	2000	535	1.56
14.0	517	1874	0.46	2000	535	1.56

Table. D.1: Survey location T3 data output.

T7	ITM Easting (m)			ITM Northing (m)		
	642442			673026		
Depth	Vs	Vp	Poisson Ratio	Assume Density	Gmax	ε
m	m/s	m/s		kg/m³	MPa	GPa
0.0	-	311	-	-	-	-
0.7	-	311	-	-	-	-
0.7	-	874	-	-	-	-
2.9	-	874	-	-	-	-
2.9	-	874	-	-	-	-
4.0	464	2118	0.47	2000	430	1.27
4.0	496	2118	0.47	2000	491	1.44
5.7	496	2118	0.47	2000	491	1.44
5.7	518	2118	0.47	2000	536	1.57
7.7	518	2118	0.47	2000	536	1.57
7.7	628	2118	0.45	2000	788	2.29
10.1	628	2118	0.45	2000	788	2.29

Table. D.2: Survey location T7 data output.

T8	ITM Easting (m)			ITM Northing (m)		
	641874			672889		
Depth	Vs	Vp	Poisson Ratio	Assume Density	Gmax	ε
m	m/s	m/s		kg/m³	MPa	GPa
0.0	-	311	-	-	-	-
1.5	-	311	-	-	-	-
1.5	-	887	-	-	-	-
3.8	-	887	-	-	-	-
3.8	321	2113	0.49	2000	206	0.61
5.4	321	2113	0.49	2000	206	0.61
5.4	372	2113	0.48	2000	276	0.82
7.4	372	2113	0.48	2000	276	0.82
7.4	468	2113	0.47	2000	439	1.29
9.9	468	2113	0.47	2000	439	1.29
9.9	505	2113	0.47	2000	510	1.50
13.1	505	2113	0.47	2000	510	1.50
13.1	514	2113	0.47	2000	529	1.55
17.0	514	2113	0.47	2000	529	1.55

Table. D.3: Survey location T8 data output.