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Ground Investigations Ireland

Castlebanny Windfarm

Tobin Consulting Engineers

Ground Investigation Report

April 2020

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APPENDICES

1.0 Preamble

On the instructions of Tobin Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between January and February 2020 at the site of the proposed windfarm in Castlebanny, Co. Kilkenny.

2.0 Overview

2.1. Background

It is proposed to construct a new windfarm with associated services and access roads at the proposed site. The site is situated on Coillte Forested Land in Castlebanny, Co. Kilkenny. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

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 36 No. Trial Pits to a maximum depth of 5.20m BGL
- Carry out 4 No. Rotary Core Boreholes to a maximum depth of 20.20m BGL
- Installation of 3 No. Groundwater monitoring wells
- Geotechnical Laboratory testing
- Report with recommendations

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 13T tracked 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 an 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. Rotary Boreholes

The rotary coring was carried out by a track mounted Comacchio Geo-305 rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The Comacchio Geo-305 is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The Comacchio Geo -305 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 logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 3 of this Report.

3.4. Surveying

The exploratory hole locations have been recorded using a Trimble R10 GNSS System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.5. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical testing to assist in the classification of soils and to provide information for the proposed design.

Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer, California Bearing Ratio (CBR) and Moisture Condition Value (MCV) tests were carried out in Geotechnical Laboratory in Carlow.

The results of the laboratory testing are included in Appendix 4 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 variable across the site and are generally comprised;

- Topsoil
- Granular Deposits
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in the majority of the exploratory holes and was present to a maximum depth of 0.40m BGL.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Topsoil in the majority of the exploratory holes to a maximum depth of 4.30m BGL and were described typically as *reddish/grey brown slightly sandy gravelly CLAY/SILT with occasional cobbles and boulders* overlying a *firm to stiff pinkish brown slightly sandy gravelly CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was firm to stiff or stiff below 3.00m BGL in the majority of the exploratory holes. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

GRANULAR DEPOSITS: Two types of granular deposits were encountered below the cohesive deposits to a maximum depth of 3.50m BGL and were typically described as G*rey brown clayey gravelly fine to coarse SAND with occasional cobbles and rare boulders* or a *Grey/brown clayey sandy fine to coarse GRAVEL.* The secondary sand/gravel and silt/clay constituents varied across the site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs.

WEATHERED BEDROCK: In the majority of exploratory holes weathered rock was encountered which was diggable with the large excavator to a depth of up to 0.30m 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 Shale* 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 boreholes recovered *Medium strong to strong dark red fine to coarse grained SANDSTONE* and *Weak to medium strong coarsely crystalline light brown GRANITE.*
The depth to rock varies from ground level at BHN and BHS to a maximum of 3.70m BGL in BH North River and 9.20m BGL in BH South River. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. 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 tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH2 and BH3 to allow the equilibrium groundwater level to be determined.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 18.20% and 36.80% generally with fines contents of 28.60 to 45%.
The Particle Size Distribution tests confirm that generally the granular deposits are well-graded with percentages of and silt/clay typically between 0.40% and 21% with a gravel/sand content of typically 76% to 90.60%.
The CBR testing on remoulded samples gave results ranging between 0.07% and 2.55% for the cohesive deposits.

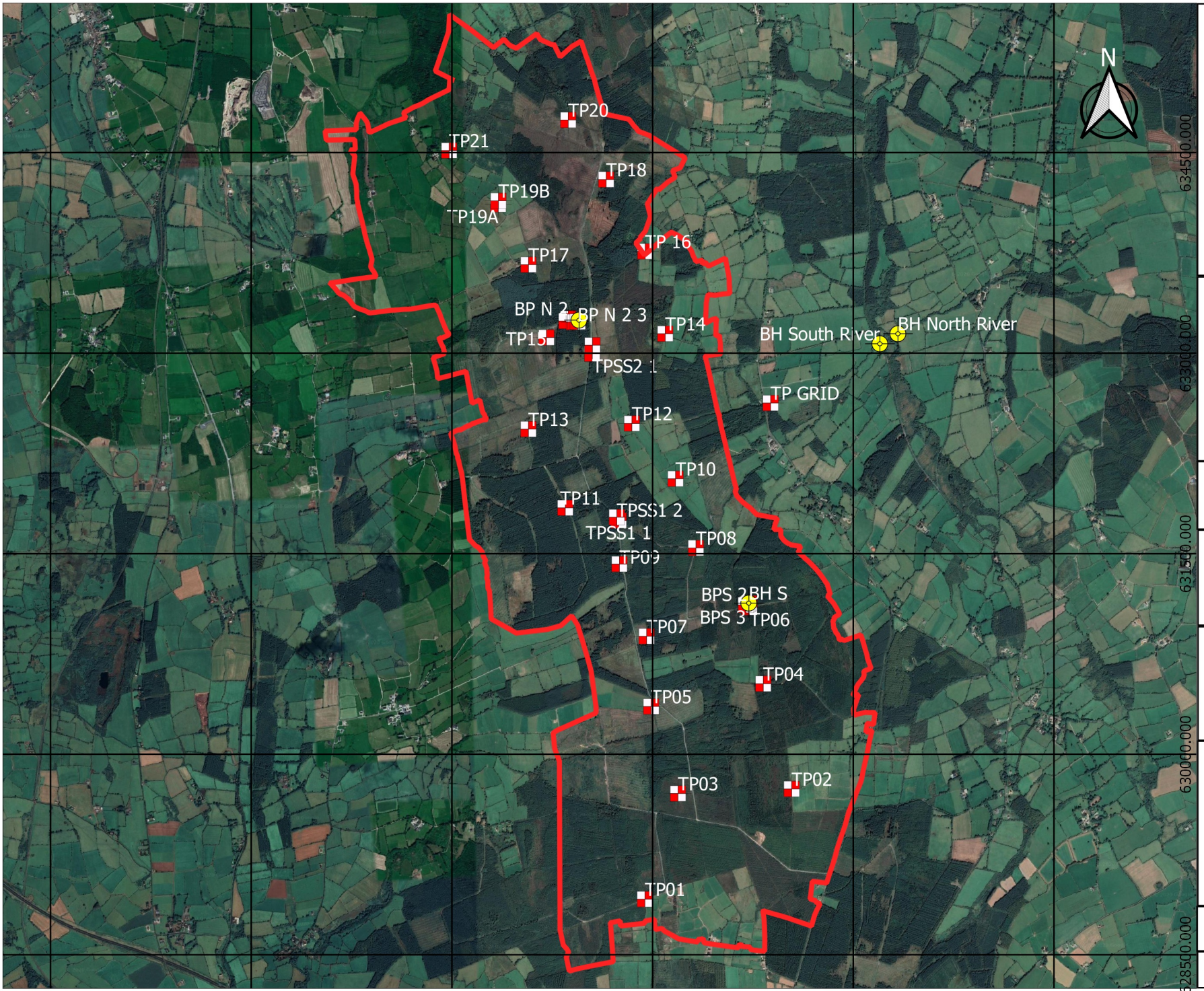
4.3.1. Rock Laboratory Testing

The rock testing carried out on samples recovered from the boreholes reported Point Load (PL) Is50 values ranging between 0.90 and 9.76 MPa for the Sandstone and between 0.08 and 0.25 MPa for the Granite. The Is50 results correlate to the UCS values using a factor of approximately 20, giving values of between 18.00 MPa and 195.2 MPa for the Sandstone and between 1.60 MPa and 5.00 MPa for the Granite. These results correlate to the strength descriptions for the Sandstone ranging between medium

strong to strong and confirming the variability of this stratum and the descriptions on the logs. The average of correlated values from the point loading suggest the Sandstone rock is typically on the border of medium strong to strong. The granite was very weak throughout, confirming recovery and descriptions on the exploratory logs.

The results from the completed laboratory testing are included in Appendix 4 of this report.

APPENDIX 1 - Site Location Plan



LEGEND

- Site Boundary
- Rotary Borehole
- Trial Pit

Client:

TOBIN

Project Code:
8747-05-19

Project Title:
Castlebanny

Drawing Title:
Figure 1 Site Location

GROUND INVESTIGATIONS IRELAND
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0 5 10 m

Drawn By:	Date:
SK	28/04/2020

APPENDIX 2 – Trial Pit Records

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Site Castlebanny Kilkenny			**Trial Pit Number** BPN1 1
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.20x1.00x1.90m	**Ground Level (mOD)** 225.72	**Client** Coillte	**Job Number** 8747-05-19
	Location 657888.3 E 633234.9 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Dark brown organic Clay TOPSOIL		
				225.32	0.40	Reddish brown slightly silty very gravelly fine SAND with some angular to subrounded cobbles and boulders		
					(1.40)			
				223.92	1.80	Competent SHALE		
				223.82	(0.10) 1.90	Complete at 1.90m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPN1 1

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Site Castlebanny Kilkenny			**Trial Pit Number** BPN1 2
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.80x1.00x1.40	**Ground Level (mOD)** 225.28	**Client** Coillte	**Job Number** 8747-05-19
	Location 657869.3 E 633248.8 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Dark brown organic Clay TOPSOIL		
				224.88	0.40	MADE GROUND: Brown slightly sandy gravelly Clay		
			Very fast ingress(1) at 0.80m.		(0.90)			▽1
				223.98	1.30	Rock or boulder pit base submerged		
				223.88	(0.10) 1.40	Complete at 1.40m		

Plan

Remarks

Trial Pit stable
Groundwater encountered at 0.80m BGL as very fast ingress
Trial Pit backfilled upon completion
Trial Pit terminated on rock/boulder

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPN1 2

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Site Castlebanny Kilkenny			**Trial Pit Number** BPN1 3
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.20	**Ground Level (mOD)** 224.69	**Client** Coillte	**Job Number** 8747-05-19
	Location 657855.5 E 633230.4 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				224.59	(0.10) 0.10	Brown gravelly Clay TOPSOIL		
0.20	B			224.49	(0.10) 0.20	Competent SHALE		
						Complete at 0.20m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPN1 3

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Site Castlebanny Kilkenny			**Trial Pit Number** BPN2 1
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.40x1.00x0.80	**Ground Level (mOD)** 225.72	**Client** Coillte	**Job Number** 8747-05-19
	Location 657912 E 633221.9 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Brown Clay TOPSOIL		
				225.22	0.50			
					(0.20)	Soft greyish white sandy slightly gravelly CLAY with occasional angular cobbles		
				225.02	0.70			
					(0.10)	Competent SHALE		
				224.92	0.80	Complete at 0.80m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock
Survey point taken from road due to signal, 5.50m away

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPN2 1

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Site Castlebanny Kilkenny			**Trial Pit Number** BPN2 2
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.70	**Ground Level (mOD)** 226.01	**Client** Coillte	**Job Number** 8747-05-19
	Location 657923.7 E 633223.4 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown Clay TOPSOIL		
				225.71	0.30			
					(0.20)	Soft greyish white sandy slightly gravelly CLAY with occasional angular cobbles		
				225.51	0.50			
					(0.20)	Competent SHALE		
				225.31	0.70			
						Complete at 0.70m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock
Survey point taken from road due to signal, 5.50m away

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPN2 2

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Site Castlebanny Kilkenny			**Trial Pit Number** BPN2 3
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.65	**Ground Level (mOD)** 226.42	**Client** Coillte	**Job Number** 8747-05-19
	Location 657940 E 633224.9 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Brown Clay TOPSOIL		
				226.17	0.25			
					(0.20)	Soft greyish white sandy slightly gravelly CLAY with occasional angular cobbles		
				225.97	0.45			
					(0.20)	Competent SHALE		
				225.77	0.65			
						Complete at 0.65m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock
Survey point taken from road due to signal, 5.50m away

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPN2 3

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Site Castlebanny Kilkenny			**Trial Pit Number** BPS1
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.70	**Ground Level (mOD)** 248.05	**Client** Coillte	**Job Number** 8747-05-19
	Location 659219.1 E 631119.3 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Brown slightly gravelly Clay TOPSOIL		
				247.55	0.50			
					(0.20)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
0.70	B			247.35	0.70	Complete at 0.70m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPS1

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Site Castlebanny Kilkenny			**Trial Pit Number** BPS2
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.40x1.00x0.90	**Ground Level (mOD)** 247.23	**Client** Coillte	**Job Number** 8747-05-19
	Location 659207.7 E 631112.5 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Dark brown organic slightly gravelly Clay TOPSOIL		
				246.73	0.50			
					(0.30)	Firm grey sandy slightly gravelly CLAY with occasional angular cobbles		
				246.43	0.80			
					(0.10)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
				246.33	0.90	Complete at 0.90m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPS2

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Site Castlebanny Kilkenny			**Trial Pit Number** BPS3
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.00x1.00x0.60	**Ground Level (mOD)** 246.84	**Client** Coillte	**Job Number** 8747-05-19
	Location 659197.1 E 631106.8 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Brown slightly gravelly Clay TOPSOIL		
				246.34	0.50			
					(0.10)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
				246.24	0.60	Complete at 0.60m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.BPS3

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Site Castlebanny Kilkenny			**Trial Pit Number** TP01
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.00x1.00x0.60	**Ground Level (mOD)** 203.82	**Client** Coillte	**Job Number** 8747-05-19
	Location 658442.4 E 628906.3 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Brown slightly silty Clay TOPSOIL		
				203.32	0.50			
					(0.10)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
				203.22	0.60	Complete at 0.60m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP01

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Site Castlebanny Kilkenny			**Trial Pit Number** TP02
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.40x1.00x3.00	**Ground Level (mOD)** 245.52	**Client** Coillte	**Job Number** 8747-05-19
	Location 659539.1 E 629730.5 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown organic TOPSOIL		
				245.27	0.25	Soft greyish white sandy slightly gravelly silty CLAY with occasional subangular cobbles		
0.50	B				(0.50)			
				244.77	0.75	Pink very clayey gravelly fine to coarse SAND with some subangular to subrounded cobbles and boulders		
1.50	B		Moderate ingress(1) at 1.90m.		(1.55)			▽1
				243.22	2.30	Soft to firm purple sandy slightly gravelly CLAY with some angular to subrounded cobbles and boulders		
2.50	B				(0.60)			
				242.62	2.90	Competent SHALE		
				242.52	(0.10) 3.00	Complete at 3.00m		

Plan

Remarks

Trial Pit collapse from 0.75m BGL
Groundwater encountered at 1.90m BGL as moderate ingress
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP02

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Site Castlebanny Kilkenny			**Trial Pit Number** TP03
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.50x1.00x3.00	**Ground Level (mOD)** 210.48	**Client** Coillte	**Job Number** 8747-05-19
	Location 658689.7 E 629696.4 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly silty Clay TOPSOIL		
				210.18	0.30	Soft grey mottled orange sandy slightly gravelly SILT with some subrounded cobbles and boulders		
					(1.00)			
				209.18	1.30	Soft grey/brown sandy slightly gravelly SILT with some subrounded cobbles and boulders		
					(1.40)			
				207.78	2.70	Soft grey sandy slightly silty slightly gravelly CLAY with some subrounded cobbles and boulders		
					(0.30)			
				207.48	3.00	Complete at 3.00m		

Plan

Remarks

Trial Pit collapse from 1.00m BGL
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated due to constant collapse

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP03

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Site Castlebanny Kilkenny			**Trial Pit Number** TP04
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.65	**Ground Level (mOD)** 253.37	**Client** Coillte	**Job Number** 8747-05-19
	Location 659326.8 E 630517.4 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly silty Clay TOPSOIL		
				253.17	0.20	Firm greyish white sandy slightly gravelly silty CLAY with occasional angular cobbles		
					(0.40)			
				252.77	0.60	Competent SHALE		
				252.72	0.65	Complete at 0.65m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP04

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Site Castlebanny Kilkenny			**Trial Pit Number** TP05
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.10x1.00x2.70	**Ground Level (mOD)** 198.30	**Client** Coillte	**Job Number** 8747-05-19
	Location 658488.9 E 630347.5 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly silty Clay TOPSOIL		
				198.00	0.30			
0.50	B					Stiff greyish white with black speckling slightly gravelly clayey SILT with occasional subangular to subrounded cobbles and boulders		
0.90 0.90	SV 34kPa RSV 17kPa				(1.00)			
			Slow seepage(1) at 1.30m.	197.00	1.30			▽1
1.50	B				(0.70)	Soft pink sandy slightly gravelly CLAY with some subangular to subrounded cobbles and boulders		
				196.30	2.00			
					(0.65)	Soft pink sandy slightly gravelly CLAY with many angular to subrounded cobbles and boulders		
2.50	B			195.65	2.65			
				195.60	2.70	Competent SHALE Complete at 2.70m		

Plan

Remarks

Trial Pit collapse from 1.30m BGL
Groundwater encountered at 1.30m BGL as slow seepage
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP05

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Site Castlebanny Kilkenny			**Trial Pit Number** TP06
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.00x1.00x0.55	**Ground Level (mOD)** 248.49	**Client** Coillte	**Job Number** 8747-05-19
	Location 659223.7 E 631089.1 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.45)	Brown slightly gravelly Clay TOPSOIL		
				248.04	0.45			
					(0.10)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
				247.94	0.55	Complete at 0.55m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP06

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Site Castlebanny Kilkenny			**Trial Pit Number** TP07
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.90x1.00x4.30	**Ground Level (mOD)** 203.08	**Client** Coillte	**Job Number** 8747-05-19
	Location 658455.2 E 630872.4 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.70)	Brown Clay TOPSOIL		
0.50	B			202.38	0.70	Soft white sandy slightly gravelly SILT with some subrounded to rounded cobbles and boulders		
					(0.50)			
			Slow seepage(1) at 1.20m.	201.88	1.20	Soft pink sandy slightly gravelly CLAY with some subrounded to rounded cobbles and boulders		▽1
1.50	B				(1.10)			
				200.78	2.30	Soft to firm brown sandy slightly gravelly CLAY with some subrounded to rounded cobbles and boulders		
2.50	B				(1.90)			
3.50	B							

Plan

Remarks

Trial Pit collapse from 0.70m BGL
Groundwater encountered at 1.20m BGL as slow seepage
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP07

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Site Castlebanny Kilkenny			**Trial Pit Number** TP07
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.90x1.00x4.30	**Ground Level (mOD)** 203.08	**Client** Coillte	**Job Number** 8747-05-19
	Location 658455.2 E 630872.4 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				198.88	4.20 (0.10)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
				198.78	4.30	Complete at 4.30m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP07

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Site Castlebanny Kilkenny			**Trial Pit Number** TP08
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.300x1.00x1.00	**Ground Level (mOD)** 223.63	**Client** Coillte	**Job Number** 8747-05-19
	Location 658823.6 E 631533.1 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B				(0.90)	Brown slightly gravelly Clay TOPSOIL		
				222.73	0.90			
					(0.10)	Grey/pink clayey angular to subrounded GRAVEL of Shale		
				222.63	1.00	Complete at 1.00m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP08

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Site Castlebanny Kilkenny			**Trial Pit Number** TP09
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40x1.00x2.00	**Ground Level (mOD)** 193.44	**Client** Coillte	**Job Number** 8747-05-19
	Location 658251.8 E 631412.6 N	**Dates** 04/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly gravelly Clay TOPSOIL		
				193.24	0.20	Soft to firm light brown sandy slightly gravelly SILT with some subangular to subrounded cobbles and boulders		
0.50	B		Fast ingress(1) at 0.60m.		(1.30)			▽1
1.50	B			191.94	1.50	Soft to firm pink sandy slightly gravelly CLAY with many subangular to subrounded cobbles and boulders		
					(0.40)			
				191.54	1.90			
				191.44	(0.10) 2.00	Grey/pink clayey angular to subrounded GRAVEL with many angular cobbles and boulders of Shale		
						Complete at 2.00m		

Plan

Remarks

Trial Pit collapse from 0.70m BGL
Groundwater encountered at 0.60m BGL as fast ingress
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP09

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Site Castlebanny Kilkenny			**Trial Pit Number** TP10
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.85	**Ground Level (mOD)** 217.47	**Client** Coillte	**Job Number** 8747-05-19
	Location 658671.3 E 632050.6 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly gravelly Clay TOPSOIL		
				217.27	0.20			
0.50	B				(0.50)	Grey/brown clayey sandy fine to coarse angular GRAVEL with many angular cobbles and boulders of Shale		
				216.77	0.70			
					(0.15)	Competent SHALE		
				216.62	0.85	Complete at 0.85m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP10

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Site Castlebanny Kilkenny			**Trial Pit Number** TP11
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.80x1.00x4.30	**Ground Level (mOD)** 186.28	**Client** Coillte	**Job Number** 8747-05-19
	Location 657847.3 E 631833.4 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				186.18	(0.10) 0.10	Brown slightly gravelly Clay TOPSOIL		
					(0.20)	Soft grey/white sandy slightly gravelly SILT		
				185.98	0.30	Soft pink/brown/grey slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		
0.50	B							
					(1.30)			
1.50	B			184.68	1.60	Firm greyish brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		
					(1.40)			
2.50	B			183.28	3.00	Stiff brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		
3.50	B				(1.20)			

Plan

Remarks

Trial Pit collapse from 0.50m BGL
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP11

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Site Castlebanny Kilkenny			**Trial Pit Number** TP11
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.80x1.00x4.30	**Ground Level (mOD)** 186.28	**Client** Coillte	**Job Number** 8747-05-19
	Location 657847.3 E 631833.4 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				182.08	4.20 (0.10)	Grey/pink clayey angular to subrounded fine to coarse GRAVEL with some angular cobbles and boulders of Shale		
				181.98	4.30	Complete at 4.30m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP11

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Site Castlebanny Kilkenny			**Trial Pit Number** TP12
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 6.00x1.00x5.20	**Ground Level (mOD)** 224.39	**Client** Coillte	**Job Number** 8747-05-19
	Location 658344.9 E 632464 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly gravelly Clay TOPSOIL		
				224.19	0.20	Stiff reddish brown slightly sandy gravelly CLAY with occasional subangular cobbles		
0.50	B				(0.70)			
				223.49	0.90	Yellowish brown slightly clayey gravelly predominantly fine SAND with some subangular cobbles and boulders		
1.50	B				(2.10)			
2.50	B							
				221.39	3.00	Reddish brown slightly clayey gravelly fine to coarse SAND with some angular to subangular cobbles and boulders		
3.50	B				(1.10)			

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP12

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Site Castlebanny Kilkenny			**Trial Pit Number** TP12
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 6.00x1.00x5.20	**Ground Level (mOD)** 224.39	**Client** Coillte	**Job Number** 8747-05-19
	Location 658344.9 E 632464 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				220.29	4.10	Reddish brown fine to coarse SAND with cobbles of dense Sand (Possible weathered rock)		
					(1.10)			
				219.19	5.20	Complete at 5.20m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP12

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Site Castlebanny Kilkenny			**Trial Pit Number** TP13
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.80x1.00x3.30	**Ground Level (mOD)** 191.01	**Client** Coillte	**Job Number** 8747-05-19
	Location 657571.4 E 632421.8 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Dark brown Clay TOPSOIL		
				190.81	0.20	Soft red mottled brown/white slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles and boulders		
0.50	B							
					(1.10)			
0.90 0.90	SV 4kPa RSV 2kPa							
				189.71	1.30	Firm grey sandy slightly gravelly CLAY with some subangular to rounded cobbles and boulders		
1.50	B							
					(0.70)			
				189.01	2.00	Firm to stiff reddish/greyish brown sandy slightly gravelly CLAY with some angular to rounded cobbles and boulders		
					(0.80)			
2.50	B							
				188.21	2.80	Stiff red slightly sandy slightly gravelly CLAY with some angular cobbles and boulders		
					(0.40)			
				187.81	3.20			
3.20	B				(0.10)	Red clayey angular to subrounded fine to coarse GRAVEL of Shale		
				187.71	3.30	Complete at 3.30m		

Plan

Remarks

Trial Pit collapse from 1.20m BGL
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP13

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Site Castlebanny Kilkenny			**Trial Pit Number** TP14
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40x1.00x2.00	**Ground Level (mOD)** 232.39	**Client** Coillte	**Job Number** 8747-05-19
	Location 658594.3 E 633135.4 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly gravelly Clay TOPSOIL		
				232.19	0.20	Soft reddish brown slightly sandy slightly gravelly silty CLAY		
0.50	B				(1.00)			
				231.19	1.20	Pink sandy angular fine to coarse GRAVEL with many cobbles and boulders of shale		
1.50	B				(0.70)			
				230.49	1.90	Competent SHALE		
				230.39	(0.10) 2.00	Complete at 2.00m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP14

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Site Castlebanny Kilkenny			**Trial Pit Number** TP15
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.60x1.00x3.20	**Ground Level (mOD)** 210.50	**Client** Coillte	**Job Number** 8747-05-19
	Location 657706.3 E 633106.7 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Dark brown organic Clay TOPSOIL		
0.50	B		Fast ingress(1) at 0.60m.	210.00	0.50	Soft to firm greyish brown/white slightly sandy slightly gravelly CLAY		▽1
					(0.75)			
				209.25	1.25	Soft light pink sandy slightly gravelly CLAY with some subangular cobbles and boulders		
1.50	B				(1.05)			
				208.20	2.30	Brownish red/pink sandy clayey subangular fine to coarse GRAVEL of Shale		
					(0.20)			
2.50	B			208.00	2.50	Brownish red sandy clayey angular fine to coarse GRAVEL with some angular cobbles and boulders of Shale		
					(0.60)			
				207.40	3.10	Competent SHALE		
				207.30	(0.10) 3.20	Complete at 3.20m		

Plan

Remarks

Trial Pit collapse from 0.50m BGL
Groundwater encountered at 0.60m BGL as fast ingress
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP15

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Site Castlebanny Kilkenny			**Trial Pit Number** TP16
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 5.00x1.00x4.50	**Ground Level (mOD)** 223.41	**Client** Coillte	**Job Number** 8747-05-19
	Location 658444.3 E 633750.9 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Brown slightly silty Clay TOPSOIL		
				223.01	0.40			
0.50	B				(0.30)	Soft to firm reddish brown silty slightly gravelly CLAY with occasional subangular cobbles		
				222.71	0.70			
1.50	B				(2.30)	Firm pinkish brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		
2.50	B							
				220.41	3.00			
					(1.30)	Firm to stiff pinkish brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP16

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Site Castlebanny Kilkenny			**Trial Pit Number** TP16
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 5.00x1.00x4.50	**Ground Level (mOD)** 223.41	**Client** Coillte	**Job Number** 8747-05-19
	Location 658444.3 E 633750.9 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				219.11	4.30	White weathered SILTSTONE		
					(0.20)			
4.50	B			218.91	4.50	Complete at 4.50m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP16

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Site Castlebanny Kilkenny			**Trial Pit Number** TP17
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.80x1.00x2.50	**Ground Level (mOD)** 229.72	**Client** Coillte	**Job Number** 8747-05-19
	Location 657571.9 E 633651.6 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Dark brown slightly silty Clay TOPSOIL		
				229.32	0.40			
0.50	B				(0.90)	Soft reddish brown sandy SILT		
				228.42	1.30			
1.50	B				(1.00)	Multicoloured clayey gravelly predominately fine SAND with occasional angular cobbles and boulders		
				227.42	2.30			
					(0.10)	Reddish brown sandy angular fine to coarse GRAVEL with , amy cobbles and boulders of Shale		
				227.32	2.40			
					(0.10)	Competent SHALE		
				227.22	2.50	Complete at 2.50m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP17

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Site Castlebanny Kilkenny			**Trial Pit Number** TP18
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.40x1.00x2.90	**Ground Level (mOD)** 229.59	**Client** Coillte	**Job Number** 8747-05-19
	Location 658152.7 E 634288.5 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Dark brown organic Clay TOPSOIL		
				229.39	0.20	Soft to firm reddish brown slightly gravelly SILT		
0.50	SV 6kPa							
0.50	B							
0.50	RSV 3kPa				(0.80)			
				228.59	1.00	Grey fine to coarse SAND with occasional subangular to subrounded cobbles		
1.50	B							
					(1.80)			
				226.79	2.80			
					(0.10)	Competent SHALE		
				226.69	2.90			
						Complete at 2.90m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP18

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Site Castlebanny Kilkenny			**Trial Pit Number** TP19A
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.10x1.00x0.65	**Ground Level (mOD)** 224.55	**Client** Coillte	**Job Number** 8747-05-19
	Location 657345.6 E 634103.3 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown organic Clay TOPSOIL		
				224.35	0.20			
					(0.35)	Reddish brown sandy clayey angular fine to coarse GRAVEL with occasional angular cobbles and boulders of shale		
0.50	B			224.00	0.55			
					(0.10)	Competent SHALE		
				223.90	0.65	Complete at 0.65m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP19a

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Site Castlebanny Kilkenny			**Trial Pit Number** TP19B
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20x1.00x0.75	**Ground Level (mOD)** 223.22	**Client** Coillte	**Job Number** 8747-05-19
	Location 657347.6 E 634129.6 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown organic Clay TOPSOIL		
				223.02	0.20	Reddish brown sandy clayey angular fine to coarse GRAVEL with occasional angular cobbles and boulders of shale		
					(0.45)			
				222.57	0.65	Competent SHALE		
				222.47	(0.10) 0.75	Complete at 0.75m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP19b

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Site Castlebanny Kilkenny			**Trial Pit Number** TP20
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.90x1.00x1.60	**Ground Level (mOD)** 220.68	**Client** Coillte	**Job Number** 8747-05-19
	Location 657869.1 E 634734.1 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Dark brown organic Clay TOPSOIL		
				220.28	0.40			
0.50	B				(0.90)	Soft brown mottled grey slightly sandy slightly gravelly SILT with some angular cobbles and boulders		
				219.38	1.30			
					(0.20)	Brown mottled grey silty angular fine to coarse GRAVEL with occasional angular cobbles and boulders of Shale		
				219.18	1.50			
1.50	B				(0.10)	Competent SHALE		
				219.08	1.60			
						Complete at 1.60m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP20

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Site Castlebanny Kilkenny			**Trial Pit Number** TP21
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.20x1.00x1.90	**Ground Level (mOD)** 173.89	**Client** Coillte	**Job Number** 8747-05-19
	Location 656979.1 E 634505.5 N	**Dates** 06/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Red silty Clay TOPSOIL		
				173.59	0.30			
0.50	B				(0.60)	Soft reddish brown slightly gravelly silty CLAY with occasional subangular to subrounded cobbles and boulders		
				172.99	0.90			
					(0.90)	Reddish brown clayey sandy angular to subangular fine to coarse GRAVEL with some angular cobbles and boulders of Shale		
1.50	B							
				172.09	1.80			
					(0.10)	Competent SHALE		
				171.99	1.90			
						Complete at 1.90m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TP21

Ground Investigations Ireland Ltd
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Site Castlebanny Kilkenny			**Trial Pit Number** TPGRID
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.00x1.00x3.50	**Ground Level (mOD)** 130.13	**Client** Coillte	**Job Number** 8747-05-19
	Location 659381.8 E 632616.9 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown Clay TOPSOIL		
				129.83	0.30	Soft to firm greyish white sandy slightly gravelly SILT with occasional subangular cobbles and boulders		
0.50	B				(0.60)			
1.00	SV 29kPa		Slow seepage(1) at 0.90m.	129.23	0.90	Stiff greyish reddish brown sandy slightly gravelly CLAY with some subangular to subrounded cobbles and boulders		▽1
1.00	RSV 16kPa							
1.50	B				(1.50)			
				127.73	2.40	Stiff reddish brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		
2.50	B				(1.10)			
				126.63	3.50	Complete at 3.50m		

Plan

Remarks

Trial Pit collapse from 1.00m BGL
Groundwater encountered at 0.90m BGL as slow seepage
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TPGRID

Ground Investigations Ireland Ltd
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Site Castlebanny Kilkenny			**Trial Pit Number** TPSS1 1
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.40x1.00x3.90	**Ground Level (mOD)** 199.30	**Client** Coillte	**Job Number** 8747-05-19
	Location 658246.2 E 631738.5 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Brown slightly gravelly Clay TOPSOIL		
				198.90	0.40	Soft to firm greyish white sandy slightly gravelly SILT		
0.50	B				(0.40)			
0.60	SV 3kPa		20, 10, 9/Av. 13.00	198.50	0.80	Soft to firm brown mottled pink slightly sandy gravelly CLAY with some subangular to rounded cobbles and boulders		
					(0.85)			
1.50	B			197.65	1.65	Soft grey gravelly CLAY with some subangular to subrounded cobbles and boulders		
					(1.05)			
2.50	B			196.60	2.70	Firm greyish brown sandy slightly gravelly CLAY with some subangular to rounded cobbles and boulders		
					(1.20)			
				195.40	3.90	Complete at 3.90m		

Plan

Remarks

Trial Pit collapse from surface
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated due to constant collapse

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TPSS1 1

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Site Castlebanny Kilkenny			**Trial Pit Number** TPSS1 2
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 5.00x1.00x4.50m	**Ground Level (mOD)** 199.08	**Client** Coillte	**Job Number** 8747-05-19
	Location 658232.1 E 631763.2 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Brown slightly silty Clay TOPSOIL		
0.60 0.60	SV 3kPa RSV 2kPa			198.68	0.40	Very soft greyish white slightly sandy slightly gravelly SILT with occasional cobbles		
					(0.60)			
				198.08	1.00	Soft bluish grey slightly sandy gravelly CLAY with many subangular to subrounded cobbles and boulders		
					(2.00)			
				196.08	3.00	Firm to stiff greyish brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles and boulders		
					(1.30)			

Plan

Remarks

Trial Pit collapse from surface
No groundwater encountered
Trial Pit backfilled upon completion
Trial Pit terminated due to rock
Survey point taken from road due to signal, 7.50m away

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TPSS1 2

Ground Investigations Ireland Ltd
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Site Castlebanny Kilkenny			**Trial Pit Number** TPSS1 2
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 5.00x1.00x4.50m	**Ground Level (mOD)** 199.08	**Client** Coillte	**Job Number** 8747-05-19
	Location 658232.1 E 631763.2 N	**Dates** 07/02/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				194.78	4.30	Stiff greyish brown slightly sandy gravelly CLAY with many angular cobbles and boulders		
					(0.20)			
				194.58	4.50	Complete at 4.50m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TPSS1 2

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Trial Pit Number** TPSS2 1
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 4.00x1.00x3.60	**Ground Level (mOD)** 219.62	**Client** Coillte	**Job Number** 8747-05-19
	Location 658048.3 E 632985.3 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B				(1.20)	Soft white/grey slightly sandy slightly gravelly SILT with occasional subrounded cobbles and peaty lenses		
				218.42	1.20			
1.50	B					Soft to firm reddish brown sandy slightly gravelly CLAY with some subangular to rounded cobbles and boulders		
			Moderate ingress(1) at 2.00m.		(1.70)			▽1
2.50	B							
				216.72	2.90	Pink clayey sandy subangular to rounded fine to coarse GRAVEL of Shale		
					(0.60)			
3.50	B			216.12	3.50	Competent SHALE		
				216.02	(0.10) 3.60	Complete at 3.60m		

Plan

Remarks

Trial Pit collapse from 1.00m BGL
Groundwater encountered at 2.00m BGL as moderate ingress
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TPSS2 1

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Trial Pit Number** TPSS2 2
Machine : 13T Tracked Excavator **Method :** Trial Pit	**Dimensions** 3.30x1.00x3.00	**Ground Level (mOD)** 220.37	**Client** Coillte	**Job Number** 8747-05-19
	Location 658050.1 E 633049.2 N	**Dates** 05/02/2020	**Engineer** Tobin	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly gravelly Clay TOPSOIL		
				220.07	0.30	Firm reddish brown sandy slightly gravelly CLAY with many subrounded cobbles and boulders		
					(0.60)			
				219.47	0.90	Firm greyish white sandy slightly gravelly CLAY with many subrounded rounded cobbles and boulders		
			Fast ingress(1) at 1.70m.		(1.60)			▽1
				217.87	2.50	Pink clayey sandy angular to subangular fine to coarse GRAVEL of Shale		
					(0.40)			
				217.47	2.90	Competent SHALE		
				217.37	(0.10) 3.00	Complete at 3.00m		

Plan

Remarks

Trial Pit collapse from GL
Groundwater encountered at 1.70m BGL as fast ingress
Trial Pit backfilled upon completion
Trial Pit terminated on rock

Scale (approx)	Logged By	Figure No.
1:25	EB	8747-05-19.TPSS2 2

Castlebanny Trial Pit Photographs

TP01

TP02

TP03

TP04

TP05

TP06

TP07

TP08

TP09

TP10

TP11

TP12

TP13

TP14

TP15

TP16

TP17

TP18

TP19A

TP19B

TP20

TP21

TPGRID

TPSS1 1

TPSS1 2

TPSS2 1

TPSS2 2

BPS2

BPS3

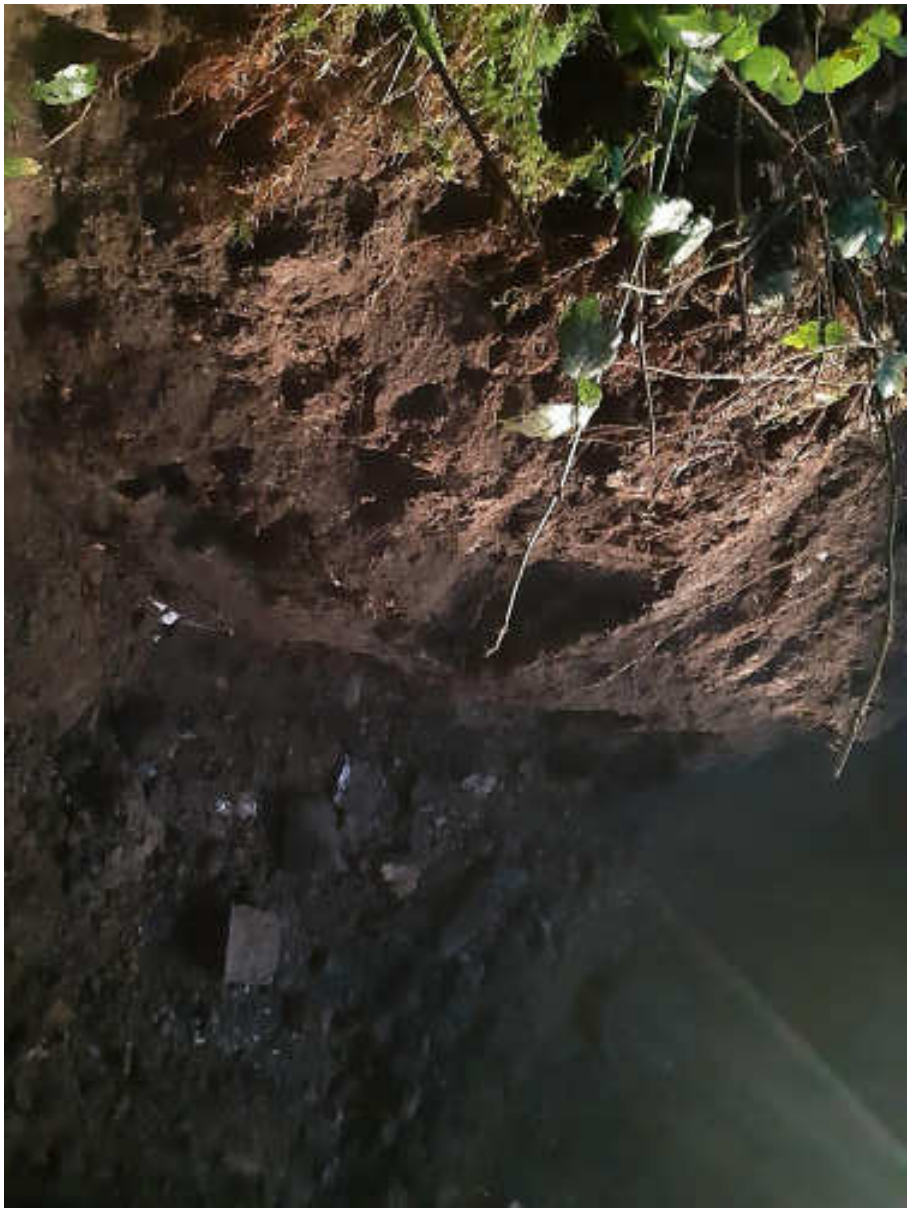
BPN1 1

BPN1 2

BPN1 3

BPN2 1

BPN2 2



BPN2 3

APPENDIX 3 - Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH N
Machine : Comacchio GEO305 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 20.20m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 26/02/2020	**Engineer** Tobin	**Sheet** 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	48	12	6	NI			(3.10)	Medium strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining 0.00m-2.10m BGL: Non Intact			
2.10	100	50	31	12			3.10	2 Fracture Sets. F1: Very Close to close, 0-20 degree, undulating rough with clay infill. F2: Close, 70-90 degree, undulating rough, with clay infill.			
3.10				NI			(0.80)	Weak to medium strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Destructured 3.10m-3.90m BGL: Non Intact			
3.70 3.90	93	33	23				3.90 (1.30)	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining			
5.20	88	66	66				5.20 (2.60)	Strong graded red medium to coarse grained SANDTONE with occasional quartz grains. Partially weathered 3.90m-14.20m BGL: F1: Very Close to close, 0-20 degree, undulating rough with clay infill. F2: Close to wide, 70-90 degree, undulating rough, with clay infill.			
6.80	100	68	68				7.80 (1.60)	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining			
8.20	69	56	44	7			9.40	Strong graded red medium to coarse grained SANDTONE with occasional quartz grains. Partially weathered			
9.80											

Remarks
Complete at 20.20m BGL
50mm Standpipe installed in borehole upon completion, slotted from 10.00m BGL to 2.00m BGL, plain from 2.00m BGL to Ground Level, with bentonite seal and flush cover.

Scale (approx)	Logged By
1:50	AB

Figure No. 8747-05-19.BH N

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH N
Machine : Comacchio GEO305 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 20.20m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 26/02/2020	**Engineer** Tobin	**Sheet** 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	57	29	29				(1.80)				
11.20	13	10	10				11.20	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining			
12.70	13	0	0				(4.50)				
14.20	17	0	0	NI				14.20m-17.00m BGL: Non Intact			
15.70	87	20	17				15.70	Weak to medium strong graded red medium to coarse grained SANDTONE with occasional quartz grains. Destructured			
17.00							(1.30)				
17.20	80	47	30	9			17.00	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining			
							(1.70)	17.00m-18.70m BGL: F1: Very Close to close, 0-20 degree, undulating rough with clay infill. F2: Close, 70-90 degree, undulating rough, with clay infill.			
18.70	100	37	27	NI			18.70	Weak to medium strong graded red medium to coarse grained SANDTONE with occasional quartz grains. Destructured			
							(1.30)	18.70m-20.20m BGL: Non Intact			
							20.00				

Remarks

Scale (approx)	Logged By
1:50	AB

Figure No. 8747-05-19.BH N

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH N
Machine : Comacchio GEO305 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 20.20m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 26/02/2020	**Engineer** Tobin	**Sheet** 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
20.20											

Remarks

Scale (approx)	Logged By
1:50	AB

Figure No. 8747-05-19.BH N

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH S
Machine : Comacchio GEO305 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 10.10m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 27/01/2020-27/02/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	89	67	22	15			(0.50) 0.50	Strong graded red medium to coarse grained SANDTONE with occasional quartz grains. Partially weathered			
1.60							(1.30)	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining 0.00m-1.80m BGL: One Fracture Set: Very close to close, 0-20 degree, undulating rough with occasional clay infill.			
1.80				NI			1.80	Medium strong graded red medium to coarse grained SANDTONE with occasional quartz grains.Partially weathered			
2.00	100	82	57					1.80m-2.00m BGL: Non Intact 2.00m-6.60m BGL: One Fracture Set: Very close to close, 0-20 degree, undulating rough with occasional clay infill.			
3.20	100	67	67				(2.30)	3.10m BGL: Significant Quartz Vein			
4.10	100	73	0	11			4.10	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining			
5.20	100	56	16				(3.60)	5.40m BGL: Significant Quartz Vein			
6.60				NI				6.60m-6.80m BGL: Non Intact			
6.80	78	56	11								
7.70	100	100	83				7.70	Strong graded red medium to coarse grained SANDTONE with occasional quartz grains. Partially weathered 6.80-10.10m BGL: One Fracture Set: Very close to close, 0-20 degree, undulating rough with occasional clay infill.			
8.00	100	100	75	9			(1.30) 9.00				
9.60	100	100	80				(1.00) 10.00	Medium strong to strong graded red fine to medium grained SANDSTONE with occasional quartz grains. Partially weathered with yellow staining			

Remarks
Complete at 10.10m BGL
50mm Standpipe installed in borehole upon completion, slotted from 10.10m BGL to 1.00m BGL, plain from 1.00m BGL to Ground Level, with bentonite seal and flush cover.

Scale (approx)	Logged By
1:50	AB

Figure No. 8747-05-19.BH S

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH S
Machine : Comacchio GEO305 **Flush :** Water **Core Dia:** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 10.10m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 27/01/2020-27/02/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.10											

Remarks

Scale (approx)	Logged By
1:50	AB

Figure No. 8747-05-19.BH S

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH NORTH RIV
Machine : Comacchio GEO305 **Flush :** Water **Core Dia:** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 10.00m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 02/03/2020-03/03/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							(2.00)	NO RECOVERY: Driller notes cobbly CLAY			
2.00	9						2.00 (1.70)	Recovery consists of: Light brown fine to coarse angular to subangular GRAVEL. Driller notes clayey COBBLES			
3.70	12	6	6	11			3.70	Very weak light brown GRANITE. Distinctly weathered to destructured 3.70m-6.80m BGL: Two Fracture Sets: F1: Very close to close, 0-30 degree, undulating rough with clay staining. F2: Close spaced, 40-60 degree, undulating rough with clay staining.			
5.40	100	64	47								
6.80							(6.30)				
7.20	100	31	25	NI				6.80m-8.80m BGL: Non Intact			
8.80	100	56	25	10				8.80m-10.00m BGL: Two Fracture Sets: F1: Very close to close, 0-30 degree, undulating rough with clay staining. F2: Close spaced, 40-60 degree, undulating rough with clay			
9.60	100	88	75								
10.00											

Remarks
Complete at 10.00m BGL
50mm Standpipe installed in borehole upon completion, slotted from 10.00m BGL to 1.00m BGL, plain from 1`.00m BGL yto Ground Level, with bentonite seal and flush cover

Scale (approx)	Logged By
1:50	AB

Figure No.

Ground Investigations Ireland Ltd
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Site Castlebanny Kilkenny			**Borehole Number** BH NORTH RIV
Machine : Comacchio GEO305 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 10.00m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 02/03/2020-03/03/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							10.00	staining. Complete at 10.00m			

Remarks

Scale (approx)	Logged By
1:50	AB

Figure No.

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH SOUTH RIV
Machine : Comacchio GEO305 **Flush :** Water **Core Dia:** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 12.00m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 02/03/2020	**Engineer** Tobin	**Sheet** 1/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	3						(3.80)	Recovery consists of: Grey/brown fine to coarse angular to subangular GRAVEL. Driller notes sandy COBBLES		
1.60	9.2	3								
3.00	2									
3.80	19						(1.60)	Recovery consists of: Greyish brown BOULDER of Sandstone with occasional cobbles		
5.40	33	7.6					(3.80)	Recovery consists of: Grey/brown fine to coarse angular to subangular GRAVEL with many cobbles. Driller notes COBBLES		
6.00	56	38								
9.20			25					Very weak coarse grained crystalline light brown GRANITE. Distinctly weathered to destructured		
10.00										

Remarks
Complete at 12.00m BGL
Borehole Backfilled upon completion.

Scale (approx)	Logged By
1:50	AB

Figure No.

Ground Investigations Ireland Ltd
www.gii.ie

Site Castlebanny Kilkenny			**Borehole Number** BH SOUTH RIV
Machine : Comacchio GEO305 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 68mm cased to 12.00m	**Ground Level (mOD)**	**Client** Coillte	**Job Number** 8747-05-19
	Location	**Dates** 02/03/2020	**Engineer** Tobin	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	81	63	47	8			(2.40)	9.20m-11.60m BGL: One Fracture Set: Close spaced, 0-20 degree, undulating rough with occasional clay infill		
11.60	63	0	0	NI			11.60 (0.40) 12.00	WEATHERD ROCK: Recovered as: grey/brown sandy fine to coarse angular to subangular GRAVEL with occasional cobbles 11.60m-12.00m BGL: Non Intact		
12.00								Complete at 12.00m		

Remarks

Scale (approx)	Logged By
1:50	AB

Figure No.

Castlebanny

RC Photos

BH N

BH N

BH N


GROUND INVESTIGATIONS IRELAND
Geotechnial & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLEROONY, KILKENNY
Borehole ref: BH N
Box No: 3 of 6
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 6.8 to 9.9
CM 10 20 30 40 50 60 70 80 90 100
8.2 m
9.8 m

BH N


GROUND INVESTIGATIONS IRELAND
Geotechnial & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLEROONY, KILKENNY
Borehole ref: BH N
Box No: 4 of 6
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 9.9 to 17.0
CM 10 20 30 40 50 60 70 80 90 100
12.7 m
14.2m
15.7 m

BH N


GROUND INVESTIGATIONS IRELAND
Geotechnial & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLERONNY, KILKENNY
Borehole ref: BH N
Box No: 5 of 6
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 17.0 to 19.4
CM 10 20 30 40 50 60 70 80 90 100
17.1 m
17.7m
18.7 m

BH N


GROUND INVESTIGATIONS IRELAND
Geotechnial & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLERONNY, KILKENNY
Borehole ref: BH N
Box No: 6 of 6
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 19.4 to 20.2
CM 10 20 30 40 50 60 70 80 90 100
20.1 m
20.7m

BH S


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLERONNY, KILKENNY
Borehole ref: BHS
Box No: 1 of 4
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 0.0 to 2.8
CM 10 20 30 40 50 60 70 80 90 100
1.8 m
↑1.8m

BH S


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLERONNY, KILKENNY
Borehole ref: BHS
Box No: 2 of 4
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 2.8 to 5.1
CM 10 20 30 40 60 70 80 90 100
3.7 m
4.7 m

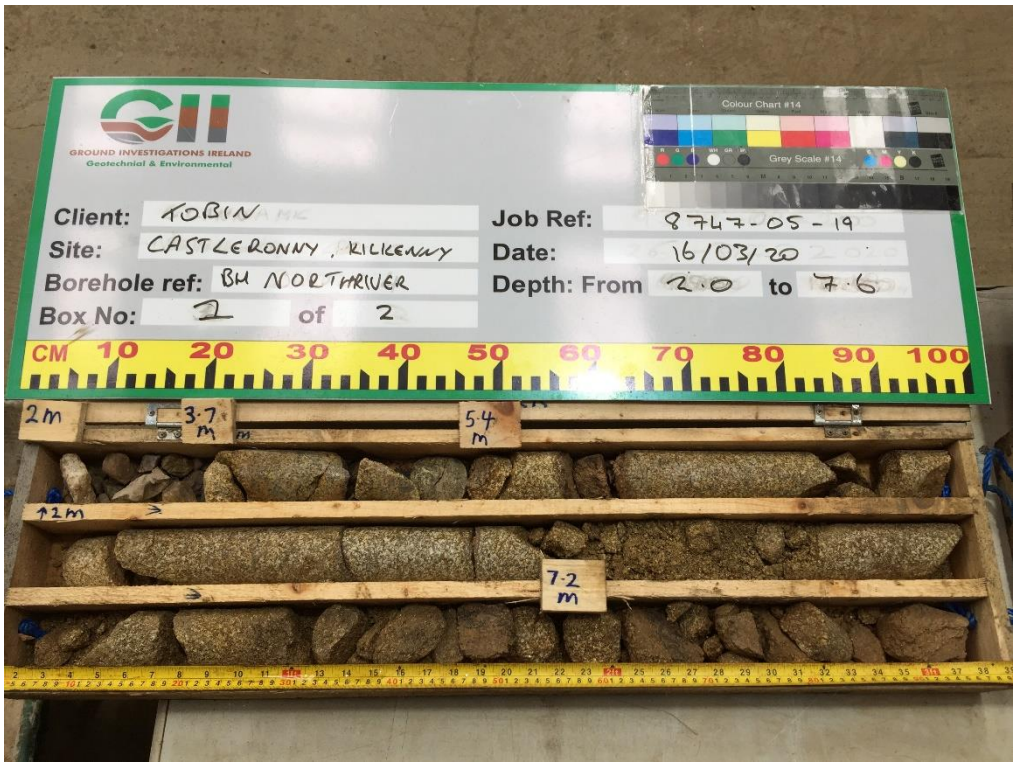
BH S


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLERONNY, KILKENNY
Borehole ref: BHS
Box No: 3 of 6
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 5.1 to 7.8
CM 10 20 30 40 50 60 70 80 90 100
5.2 m
6.8 m
7.7 m

BH S


GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Colour Chart #14
Grey Scale #14
Client: TOBIN
Site: CASTLERONNY, KILKENNY
Borehole ref: BHS
Box No: 4 of 4
Job Ref: 8747-05-19
Date: 16/03/20
Depth: From 7.80 to 10.10
CM 10 20 30 40 50 60 70 80 90 100
8m
10.1 m

BH North River



BH North River

BH South River

BH South River

APPENDIX 4 – Laboratory Testing

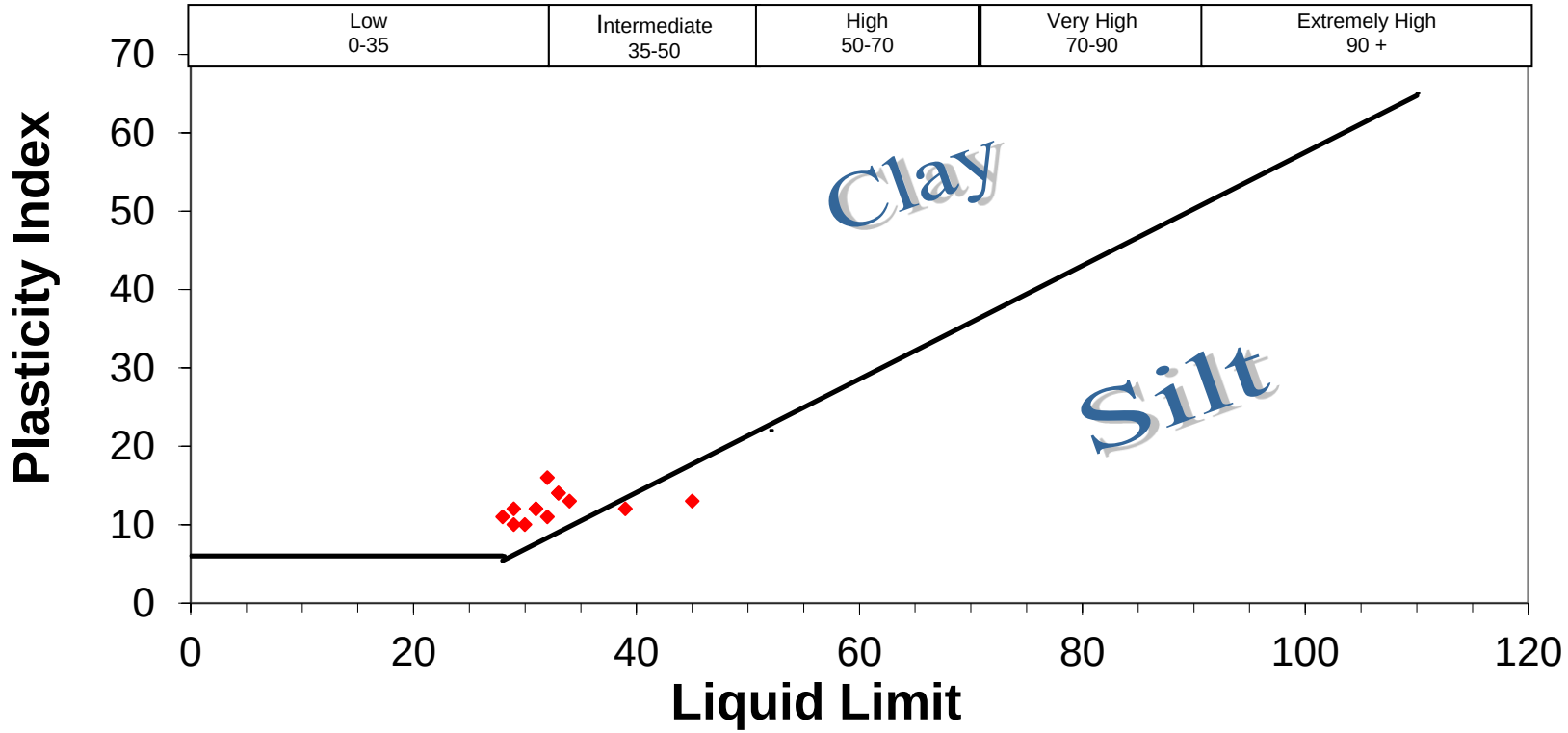
National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
BPN13	0.2	B	10.6											
TP02	0.50	B												MISSING
TP02	1.50	B	11.1											
TP02	2.50	B	10.9		49.9	27	Non Plastic							
TP05	1.50	B	15.3											
TP05	2.50	B	17.1		66.4	33	19	14						
TP07	1.50	B	17.1											
TP07	3.50	B	17.3		61.7	29	19	10						
TP09	0.50	B	17.0		66.8	32	21	11						
TP10	0.50	B	27.1											
TP11	0.5	B	17.9											
TP11	2.5	B	14.8		69.2	31	19	12						
TP11	3.5	B	12.9		69.6	32	16	16						
TP12	1.5	B	24.8											
TP13	0.5	B	15.0		65.4	29	17	12						
TP13	2.50	B	12.8		65.5	28	17	11						
TP14	0.5	B	16.8		45.5	34	Non Plastic							
TP15	1.50	B	12.2		54.7	30	20	10						
TP16	1.50	B	14.7		55.7	34	21	13						
TP17	0.5	B	22.0		52.1	40	Non Plastic							
TP20	0.5	B	18.1		63.9	31	Non Plastic							
TPGRID	0.5	B	16.0		46.6	45	32	13						
TPSS1 1	1.5	B	16.0		55.4	33	19	14						
TPSS2 1	0.5	B	24.7		64.7	39	27	12						
TPSS2 1	1.5	B	17.5		50.7	31	19	12						
NMTL		Notes :									Job ref No.	NMTL 3164	GII Project ID:	8747-05-19
		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Castlebanny, Co. Kilkenny		

NMTL LTD
Unit 18c, Tullow Industrial Estate
Tullow
County Carlow
Tel: 00353 59 9180822
Mob: 00353 872575508
billa@nmtl.ie

Contract:	**Castlebanny, Co. Kilkenny**		
Client:	**Ground Investigations Ireland Ltd**		
Engineer:	**Conor Finnerty**		
GII Project ID	**8747-05-19**		
Date:	**24/03/2020**		
Tested By:	**Sb/Tch/Ms**	**Checked:**	**Bc**
Job ref No.	**NMTL 3164**		

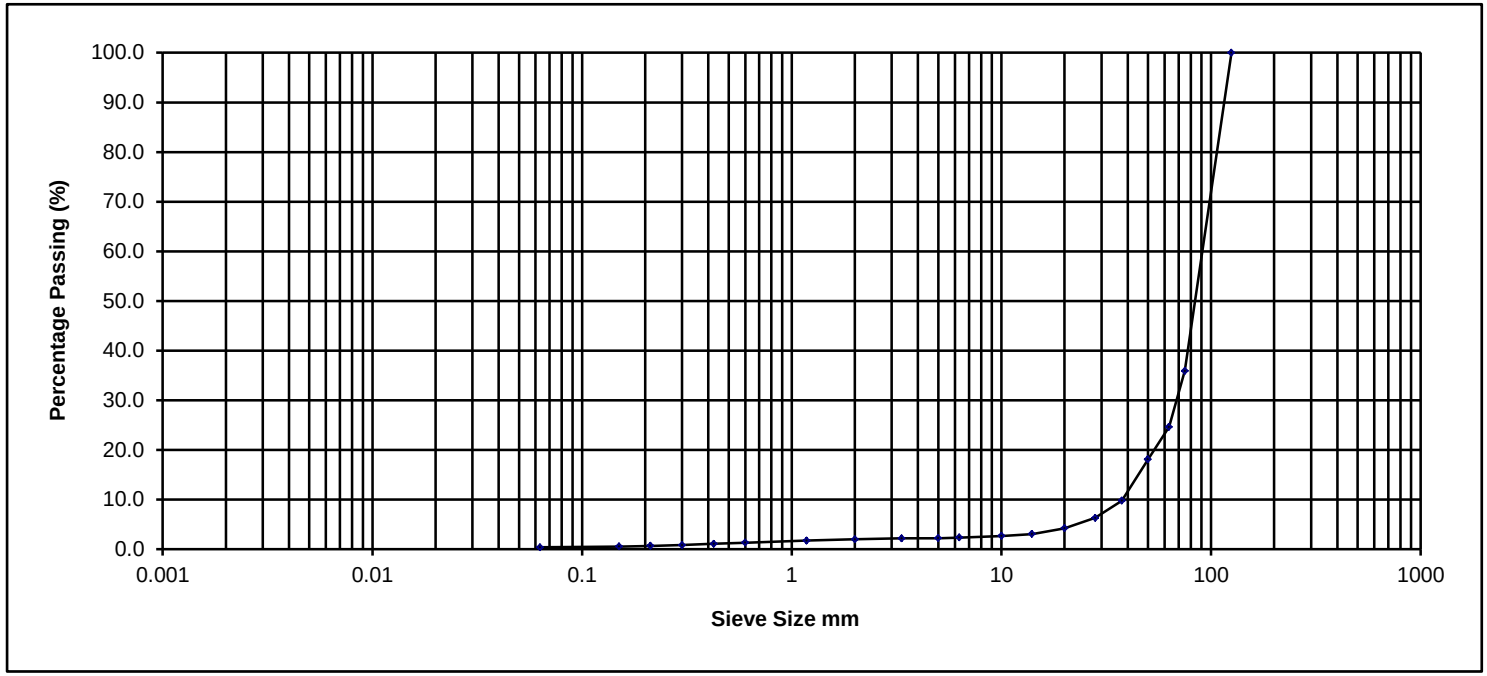


NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	35.9
63.000	24.6
50.000	18.1
37.500	9.8
28.000	6.3
20.000	4.2
14.000	3.1
10.000	2.7
6.300	2.4
5.000	2.2
3.350	2.2
2.000	2.0
1.180	1.8
0.600	1.3
0.425	1.1
0.300	0.8
0.212	0.7
0.150	0.5
0.063	0.4



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		0.4			1.6			22.6		75.4	0.0

Sample Description	Brown slightly sandy GRAVEL with many cobbles.					Project No.	NMTL 3164
						BH/TP No.	BPN13
Project	castlebanny, Co. Kelkenny			GII Project ID:8747-05-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	20/03/2020	Depth	0.20m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	93.4
50.000	91.9
37.500	89.8
28.000	85.3
20.000	79.2
14.000	76.4
10.000	73.5
6.300	67.2
5.000	62.8
3.350	59.9
2.000	53.5
1.180	47.2
0.600	39.1
0.425	34.7
0.300	30.0
0.212	25.7
0.150	22.4
0.063	17.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		17.5			36.0			39.8		6.6	0.0

Sample Description	Brown/red clayey/silty very sandy GRAVEL with some cobbles.					Project No.	NMTL 3164
						BH/TP No.	TP02
Project	castlebanny, Co. Kelkenny			GII Project ID:8747-05-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	20/03/2020	Depth	1.50m

NM TL Ltd

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	97.1
50.000	95.0
37.500	93.5
28.000	92.1
20.000	89.0
14.000	87.4
10.000	84.9
6.300	81.6
5.000	80.7
3.350	79.6
2.000	76.0
1.180	71.9
0.600	63.0
0.425	56.8
0.300	49.6
0.212	41.5
0.150	34.3
0.063	21.0

Percentage Particle Size

Clay	Fine Medium Coarse	Fine Medium Coarse	Fine Medium Coarse	Cobbles	Boulder
	Silt	Sand	Gravel		
	21.0	55.0	21.0	2.9	0.0

Sample Description	Light brown silty gravelly SAND with occasional cobbles.	Project No.	NMTL 3164
		BH/TP No.	TP12
Project	castlebanny, Co. Kelkenny GII Project ID:8747-05-19	Sample No.	B
Operator Tzr	Checked Nc Approved Bc Date sample tested 19/03/2020	Depth	1.50m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	99.3
28.000	99.2
20.000	98.8
14.000	95.8
10.000	95.2
6.300	93.6
5.000	92.4
3.350	90.4
2.000	82.0
1.180	66.8
0.600	48.1
0.425	40.4
0.300	33.4
0.212	27.3
0.150	22.4
0.063	14.8

Percentage Particle Size

Clay	Fine Medium Coarse	Fine Medium Coarse	Fine Medium Coarse	Cobbles	Boulder
	Silt	Sand	Gravel		
	14.8	67.2	18.0	0.0	0.0

Sample Description	Light brown/orange silty gravelly SAND.			Project No.	NMTL 3164
				BH/TP No.	TP12
Project	castlebanny, Co. Kelkenny		GII Project ID:8747-05-19	Sample No.	B
Operator Tzr	Checked Nc	Approved Bc	Date sample tested 19/03/2020	Depth	3.50m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	91.9
28.000	86.2
20.000	83.2
14.000	79.2
10.000	75.9
6.300	71.6
5.000	69.6
3.350	67.8
2.000	64.8
1.180	60.6
0.600	53.7
0.425	49.4
0.300	44.7
0.212	40.2
0.150	36.6
0.063	30.6

Percentage Particle Size

Clay	Fine Medium Coarse	Fine Medium Coarse	Fine Medium Coarse	Cobbles	Boulder
	Silt	Sand	Gravel		
	30.6	34.2	35.2	0.0	0.0

Sample Description	Light brown slightly sandy gravelly cleyey SILT.	Project No.	NMTL 3164
		BH/TP No.	TP18
Project	castlebanny, Co. Kelkenny GII Project ID:8747-05-19	Sample No.	B
Operator Tzr	Checked Nc Approved Bc Date sample tested 20/03/2020	Depth	0.50m

NM TL Ltd

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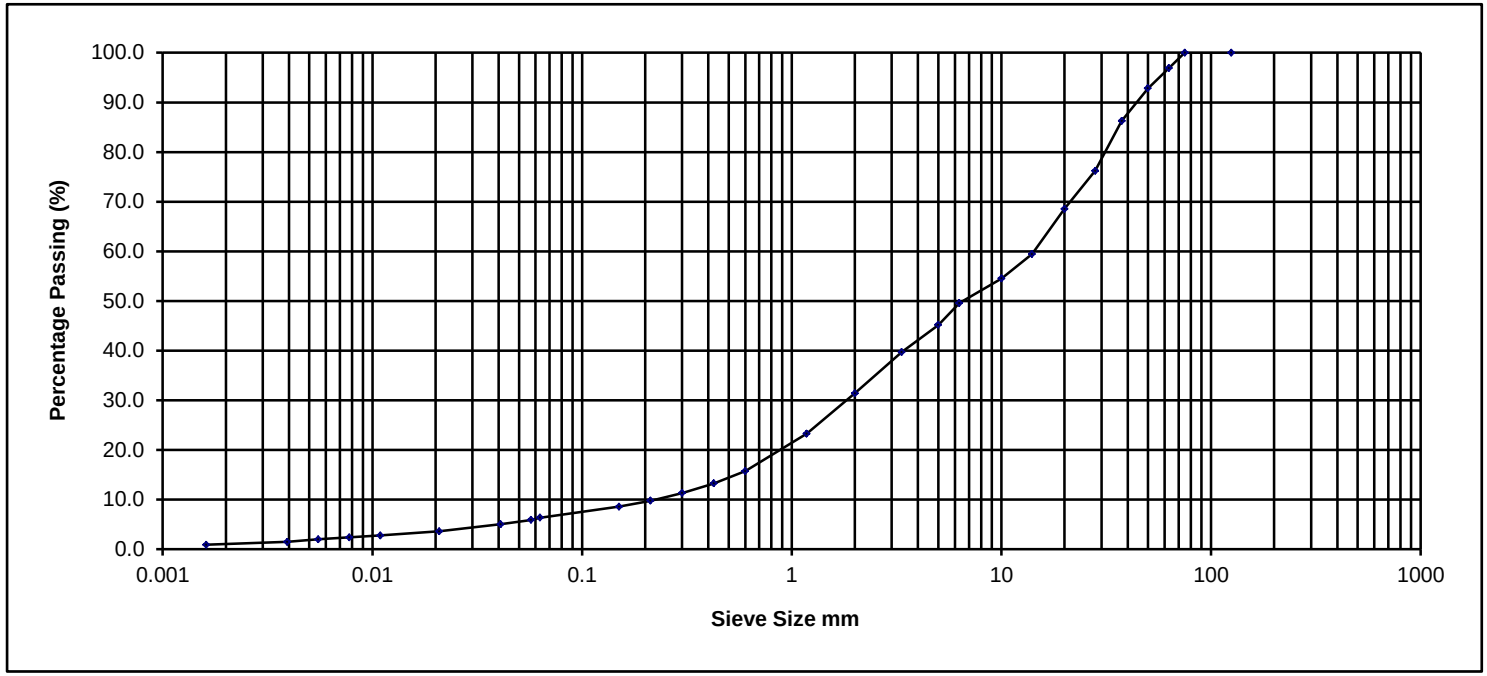
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	96.9
50.000	92.8
37.500	86.3
28.000	76.2
20.000	68.5
14.000	59.4
10.000	54.5
6.300	49.6
5.000	45.2
3.350	39.7
2.000	31.4
1.180	23.3
0.600	15.7
0.425	13.3
0.300	11.3
0.212	9.8
0.150	8.6
0.063	6.3
0.057	5.9
0.041	5.1
0.021	3.6
0.011	2.8
0.008	2.4
0.006	2.0
0.004	1.5
0.002	0.9



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.9		5.4			25.1			65.5		3.1	0.0

Sample Description	Brown silty very sandy fine to coarse GRAVEL with occasional cobbles.			Project No.	NMTL 3164
				BH/TP No.	TP18
Project	Castebanny, Co. Kilkenny		GII Project ID:8747-05-19	Sample No.	B
Operator Tzr	Checked Nc	Approved Bc	Date sample tested 19/03/2020	Depth	1.50m

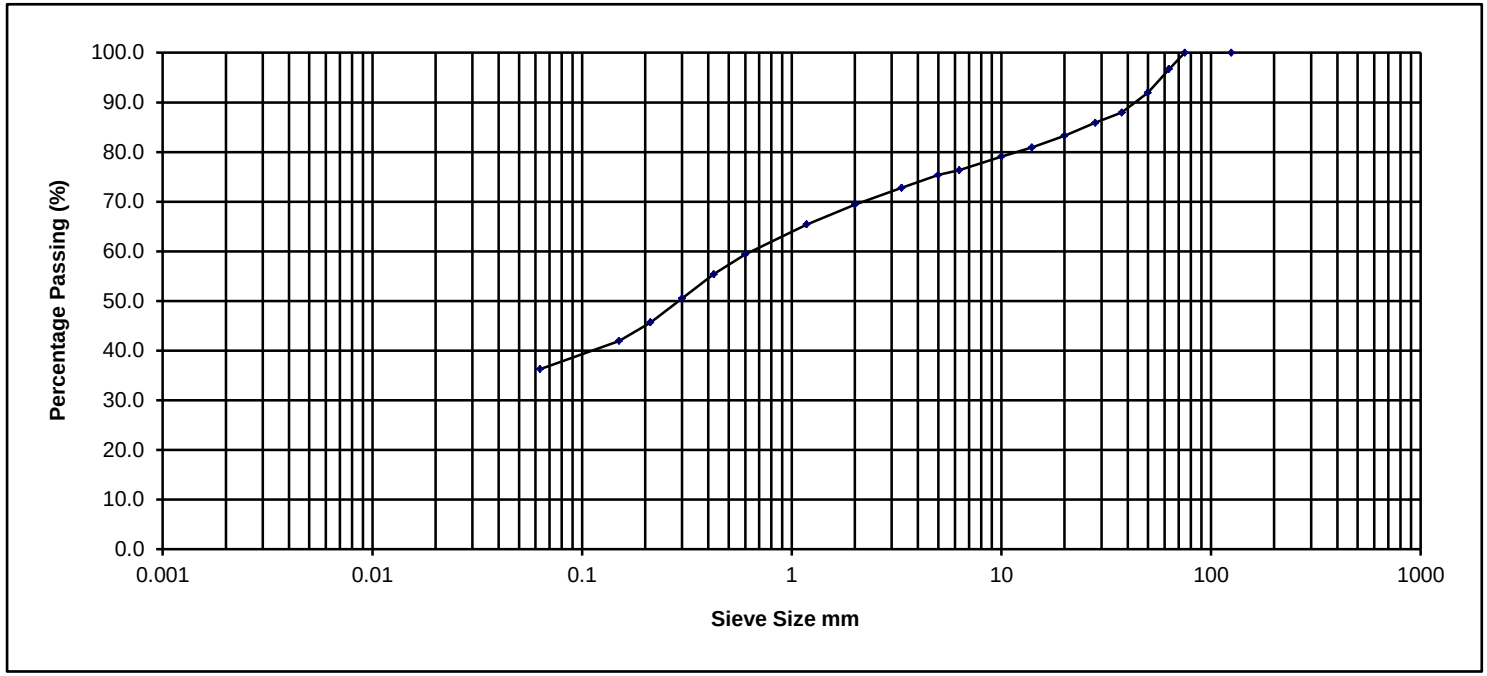
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	96.7
50.000	91.9
37.500	88.0
28.000	85.9
20.000	83.3
14.000	80.9
10.000	79.1
6.300	76.4
5.000	75.4
3.350	72.8
2.000	69.4
1.180	65.4
0.600	59.4
0.425	55.4
0.300	50.5
0.212	45.7
0.150	42.0
0.063	36.3



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		36.3			33.2			27.3		3.3	0.0

Sample Description	Light brown/orange brown slightly gravelly slightly sandy SILT/CLAY with occasional c					Project No.	NMTL 3164
						BH/TP No.	TPSS11
Project	Castlebanny, Co. Kelkenny			GII Project ID:8747-05-19		Sample No.	B
Operator Tzr	Checked Nc		Approved Bc	Date sample tested	19/03/2020	Depth	1.50m

NMTL Ltd

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	95.0
37.500	93.6
28.000	89.8
20.000	88.2
14.000	88.2
10.000	87.0
6.300	86.3
5.000	85.4
3.350	84.3
2.000	81.8
1.180	77.9
0.600	70.0
0.425	64.7
0.300	59.1
0.212	54.2
0.150	50.8
0.063	45.0

Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		45.0			36.8			18.2		0.0	0.0

Sample Description	Light brow grey slightly gravelly sandy SILT/CLAY					Project No.	NMTL 3164
						BH/TP No.	TPSS21
Project	Castlebanny, Co. Kelkenny			GII Project ID:8747-05-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Depth	0.5m
				Date sample tested	19/03/2020		

NMTL Ltd

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	96.5
50.000	91.5
37.500	85.6
28.000	81.7
20.000	79.0
14.000	76.8
10.000	75.4
6.300	71.3
5.000	70.0
3.350	68.6
2.000	65.1
1.180	61.0
0.600	55.1
0.425	50.7
0.300	45.1
0.212	39.8
0.150	35.8
0.063	28.6

Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		28.6			36.4			31.5		3.5	0.0

Sample Description	Light brown slightly gravelly sandy SILT/CLAY					Project No.	NMTL 3164
						BH/TP No.	TPSS21
Project	Castlebanny, Co. Kilkenny			GII Project ID:8747-05-19		Sample No.	B
Operator Tzr	Checked Nc		Approved Bc	Date sample tested	16/03/2020	Depth	1.50m

NMTL Ltd

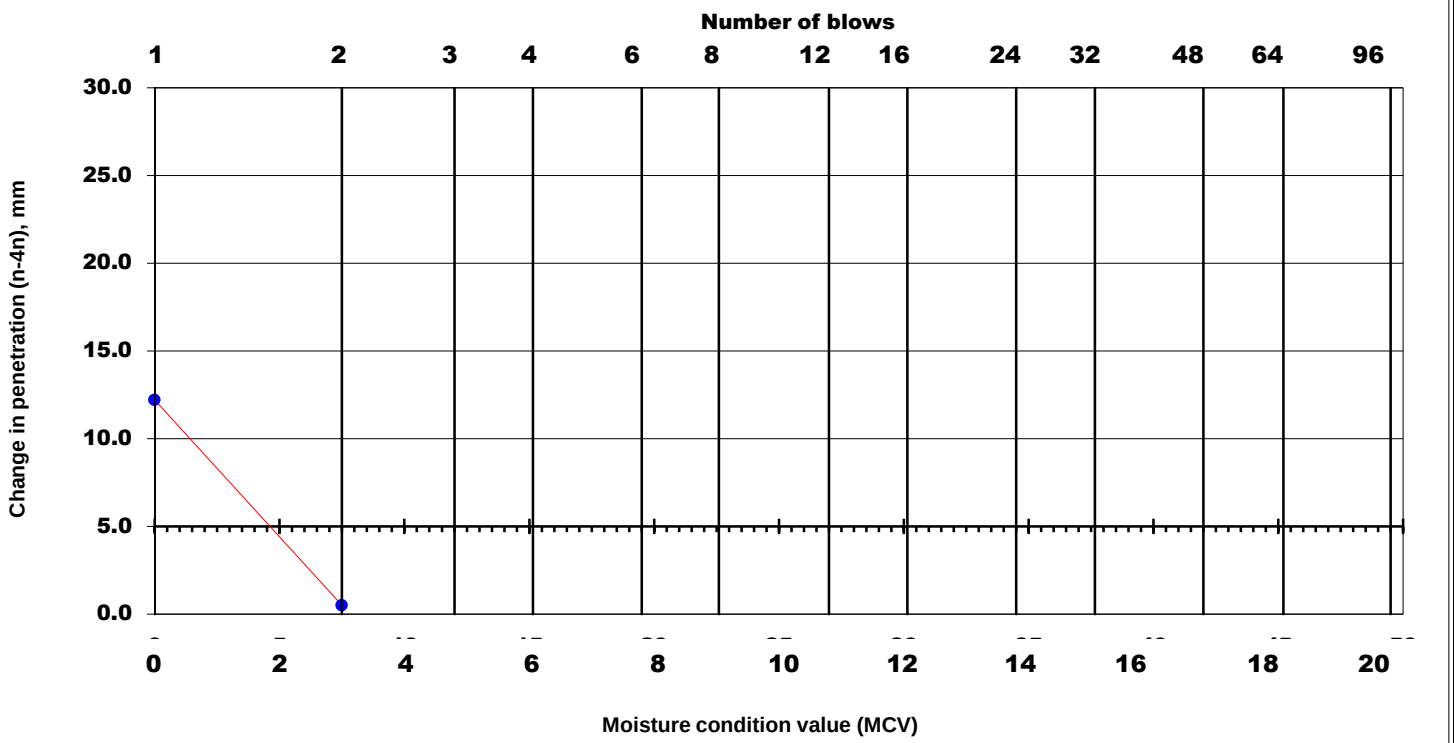
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass	
Initial sample mass	1488 g
Moisture content	16.0 %
Dry mass	1283.0 g
Mass retained on 20mm sieve	g %

* Delete as appropriate

Project Name: Castlebanny, Co. Kilkenny		Job ref.	NMTL_3164
GII Project ID:8747-05-19		Borehole/ Pit No.	TPSS1 1
Soil description:		Sample no.	B
Light brown/orange brown slightly sandy slightly gravelly SILT/CLAY		Depth	1.50m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	16/03/2020
		Date Sampled	N/A
MCV	**1.8** **Natural**	Date Received	09/03/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	52.0	12.2
2	40.3	0.5
3	39.8	
4	39.8	
6	39.8	
8	39.8	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

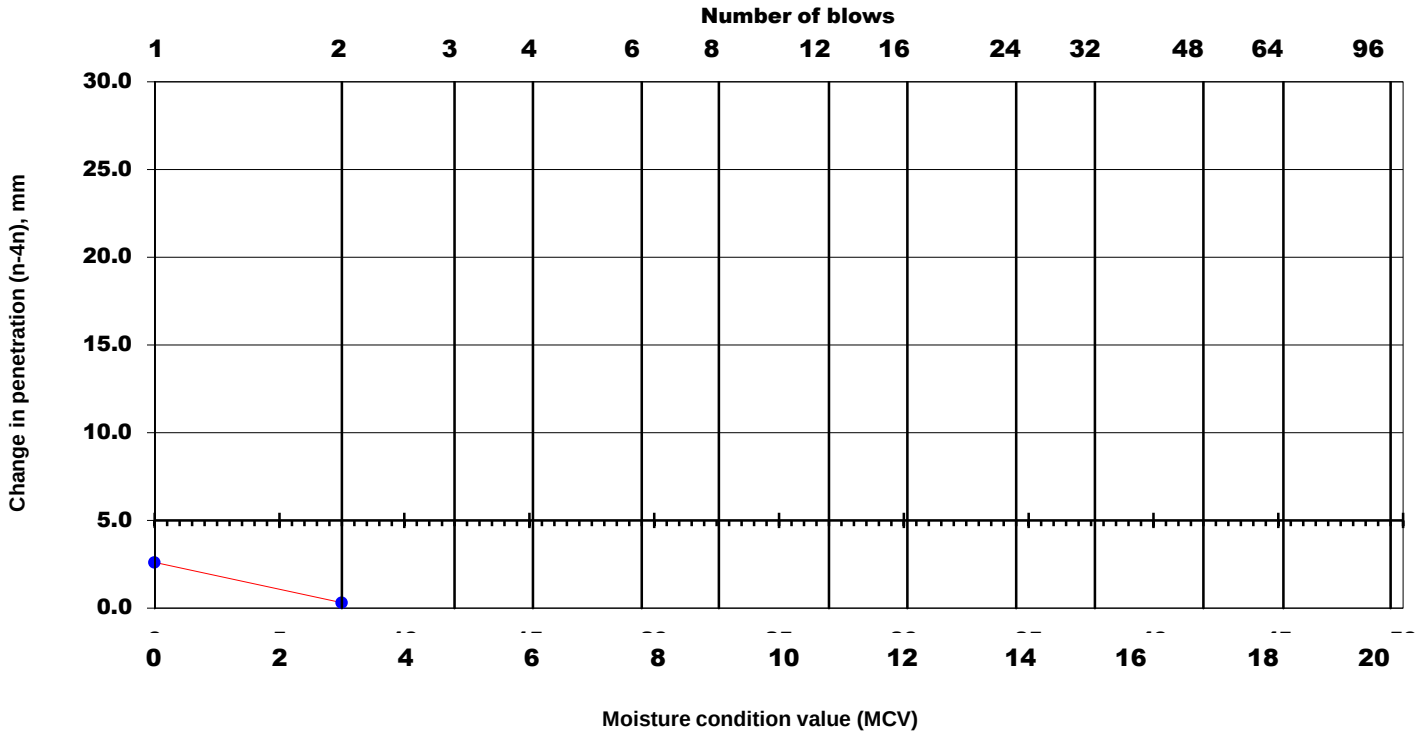
SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass			
Initial sample mass	1492 g		
Moisture content	17.5 %		
Dry mass	1270.0 g		
Mass retained on 20mm sieve	g	%	

* Delete as appropriate

Project Name: Castlebanny, Co. Kilkenny		Job ref.	NMTL_3164
		Borehole/ Pit No.	TPSS2 1
GII Project ID:8747-05-19			
Soil description:		Sample no.	B
Light brown slightly sandy slightly gravelly SILT/CLAY		Depth	1.50m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	16/03/2020
		Date Sampled	N/A
MCV	**N/A** **Natural**	Date Received	09/03/2020

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	44.0	2.6
2	41.6	0.3
3	41.4	
4	41.4	
6	41.3	
8		
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Tch	Nc	Bc

NMTL Ltd

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Brown,red/brown slightly sandy slightly gravelly CLAY/SILT

Date 20-Mar-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

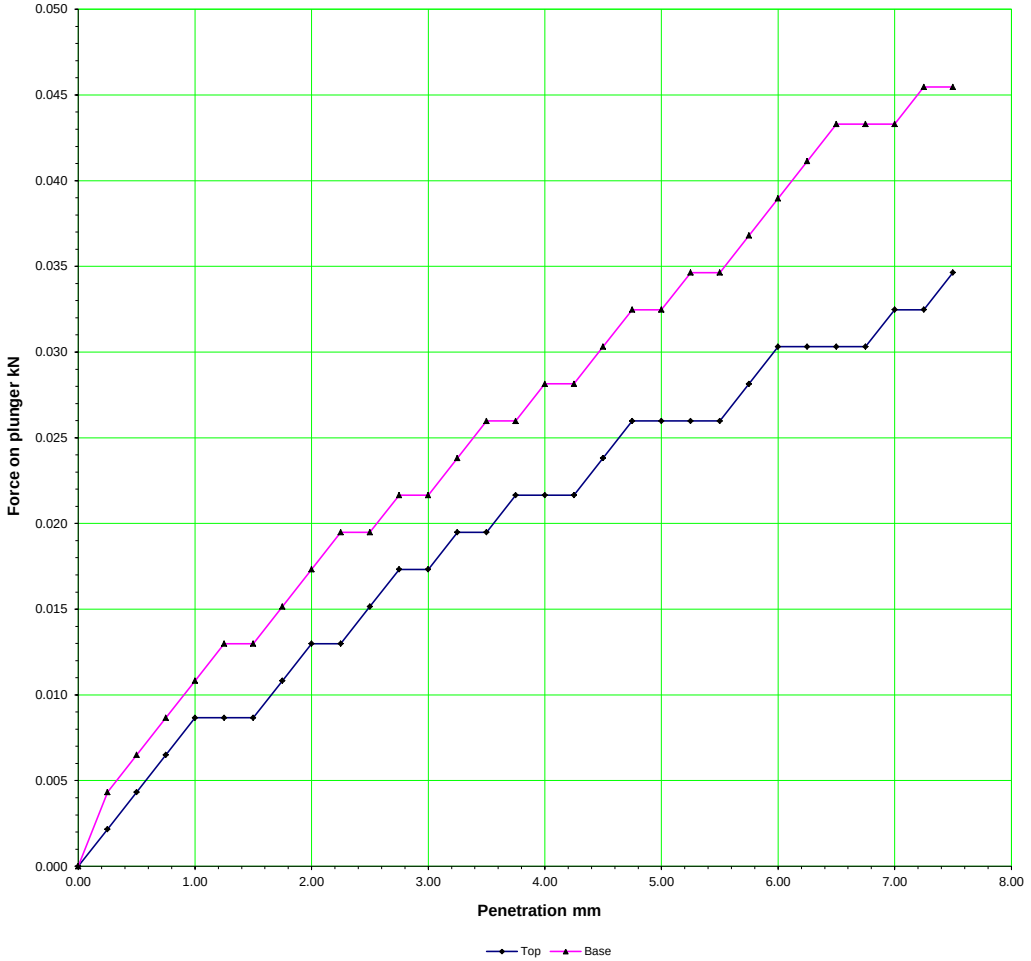
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Bottom	Force on plunger kN Top	Bottom	California Bearing Ratio Results % Top	Base
0.00	0.0	0.0	0.000	0.000		
0.25	0.5	1.0	0.002	0.004		
0.50	1.0	1.5	0.004	0.006		
0.75	1.5	2.0	0.006	0.009		
1.00	2.0	2.5	0.009	0.011		
1.25	2.0	3.0	0.009	0.013		
1.50	2.0	3.0	0.009	0.013		
1.75	2.5	3.5	0.011	0.015		
2.00	3.0	4.0	0.013	0.017		
2.25	3.0	4.5	0.013	0.019		
2.50	**3.5**	**4.5**	**0.015**	**0.019**	**0.11**	**0.15**
2.75	4.0	5.0	0.017	0.022		
3.00	4.0	5.0	0.017	0.022		
3.25	4.5	5.5	0.019	0.024		
3.50	4.5	6.0	0.019	0.026		
3.75	5.0	6.0	0.022	0.026		
4.00	5.0	6.5	0.022	0.028		
4.25	5.0	6.5	0.022	0.028		
4.50	5.5	7.0	0.024	0.030		
4.75	6.0	7.5	0.026	0.032		
5.00	**6.0**	**7.5**	**0.026**	**0.032**	**0.13**	**0.16**
5.25	6.0	8.0	0.026	0.035		
5.50	6.0	8.0	0.026	0.035		
5.75	6.5	8.5	0.028	0.037		
6.00	7.0	9.0	0.030	0.039		
6.25	7.0	9.5	0.030	0.041		
6.50	7.0	10.0	0.030	0.043		
6.75	7.0	10.0	0.030	0.043		
7.00	7.5	10.0	0.032	0.043		
7.25	7.5	10.5	0.032	0.045		
7.50	8.0	10.5	0.035	0.045		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	4870
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	######	1801.00	1760.00	Length mm	127.0
Mass of dry soil + container	g	######	1551.00	1506.00		
Weight of container	g	145.00	187.00	146.00		
Mass of moisture	g	252.00	250.00	254.00	Average MC %	18.49
Dry weight	g	######	1364.00	1360.00	Density Mg/m3	2.11
Moisture content	%	18.48	18.33	18.68	Dry Density Mg/m3	1.78



NM TL Ltd

Project: Castlebanny, Co. Kilkenny

GII Project ID:8747-05-19

		Date
Operator	Ms	20-Mar-20
Checked	Nc	
Approved	Bc	

Project No.	NMTL3164
TP/BH	TP02
Sample No.	B
Depth	0.50m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Brown,red/brown slightly sandy slightly gravelly CLAY/SILT

Date: 19-Mar-20

Test Method: BS 1377: Part 4 : 1990 :7.4

Force Measuring Device: VJT 08211 — Test 1

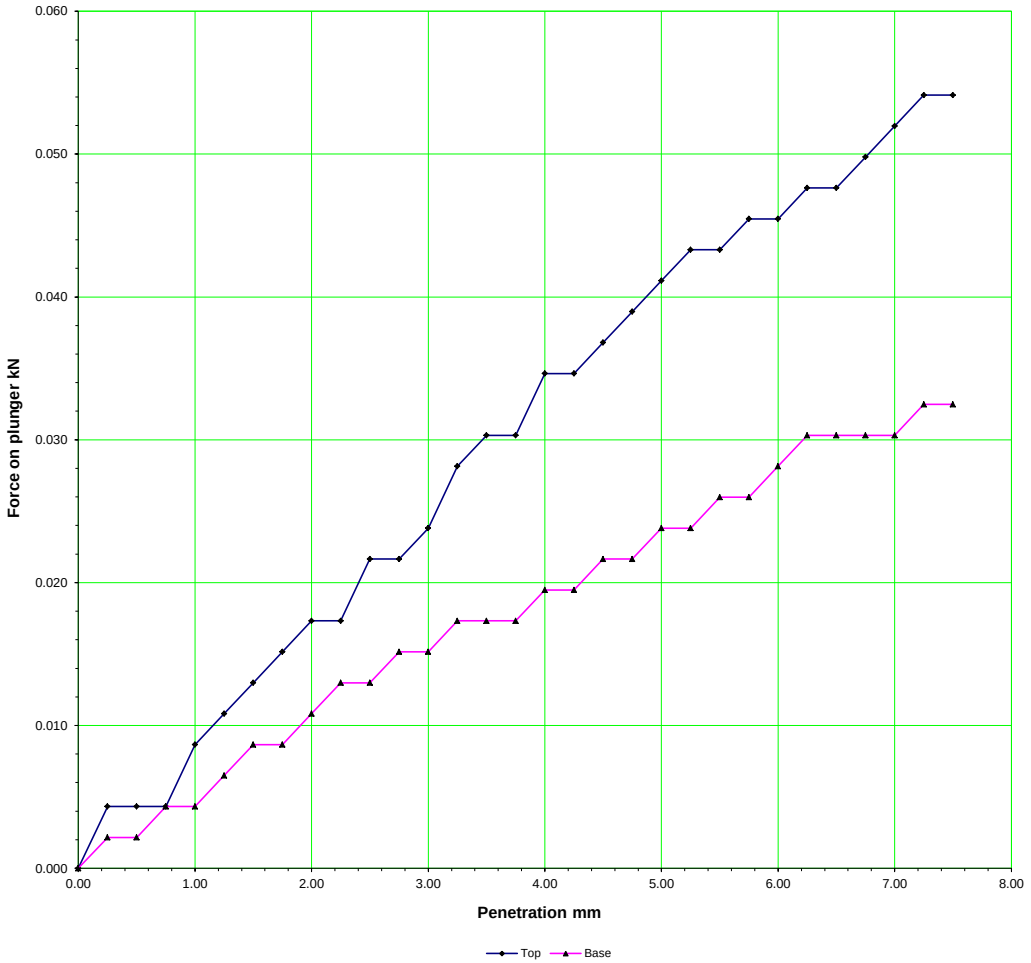
Preperatic: Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	1.0	0.5	0.004	0.002		
0.50	1.0	0.5	0.004	0.002		
0.75	1.0	1.0	0.004	0.004		
1.00	2.0	1.0	0.009	0.004		
1.25	2.5	1.5	0.011	0.006		
1.50	3.0	2.0	0.013	0.009		
1.75	3.5	2.0	0.015	0.009		
2.00	4.0	2.5	0.017	0.011		
2.25	4.0	3.0	0.017	0.013		
2.50	**5.0**	**3.0**	**0.022**	**0.013**	**0.16**	**0.10**
2.75	5.0	3.5	0.022	0.015		
3.00	5.5	3.5	0.024	0.015		
3.25	6.5	4.0	0.028	0.017		
3.50	7.0	4.0	0.030	0.017		
3.75	7.0	4.0	0.030	0.017		
4.00	8.0	4.5	0.035	0.019		
4.25	8.0	4.5	0.035	0.019		
4.50	8.5	5.0	0.037	0.022		
4.75	9.0	5.0	0.039	0.022		
5.00	**9.5**	**5.5**	**0.041**	**0.024**	**0.21**	**0.12**
5.25	10.0	5.5	0.043	0.024		
5.50	10.0	6.0	0.043	0.026		
5.75	10.5	6.0	0.045	0.026		
6.00	10.5	6.5	0.045	0.028		
6.25	11.0	7.0	0.048	0.030		
6.50	11.0	7.0	0.048	0.030		
6.75	11.5	7.0	0.050	0.030		
7.00	12.0	7.0	0.052	0.030		
7.25	12.5	7.5	0.054	0.032		
7.50	12.5	7.5	0.054	0.032		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	4965
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	######	2011.00	1680.00	Length mm	127.0
Mass of dry soil + container	g	######	1737.00	1459.00		
Weight of container	g	189.00	146.00	191.00		
Mass of moisture	g	236.00	274.00	221.00	Average MC %	17.34
Dry weight	g	######	1591.00	1268.00	Density Mg/m3	2.15
Moisture content	%	17.38	17.22	17.43	Dry Density Mg/m3	1.84



NM TL Ltd

Project: Castlebanny, Co. Kilkenny

GII Project ID:8747-05-19

		Date		Project No.	NMTL3164
Operator	Ms	19-Mar-20		TP/BH	TP09
Checked	Nc			Sample No.	B
Approved	Bc			Depth	0.50m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description Brown gravelly silty SAND

Date 20-Mar-20

Test Method BS 1377: Part 4 : 1990 :7.4

Force Measuring Device VJT 08211 Test 1

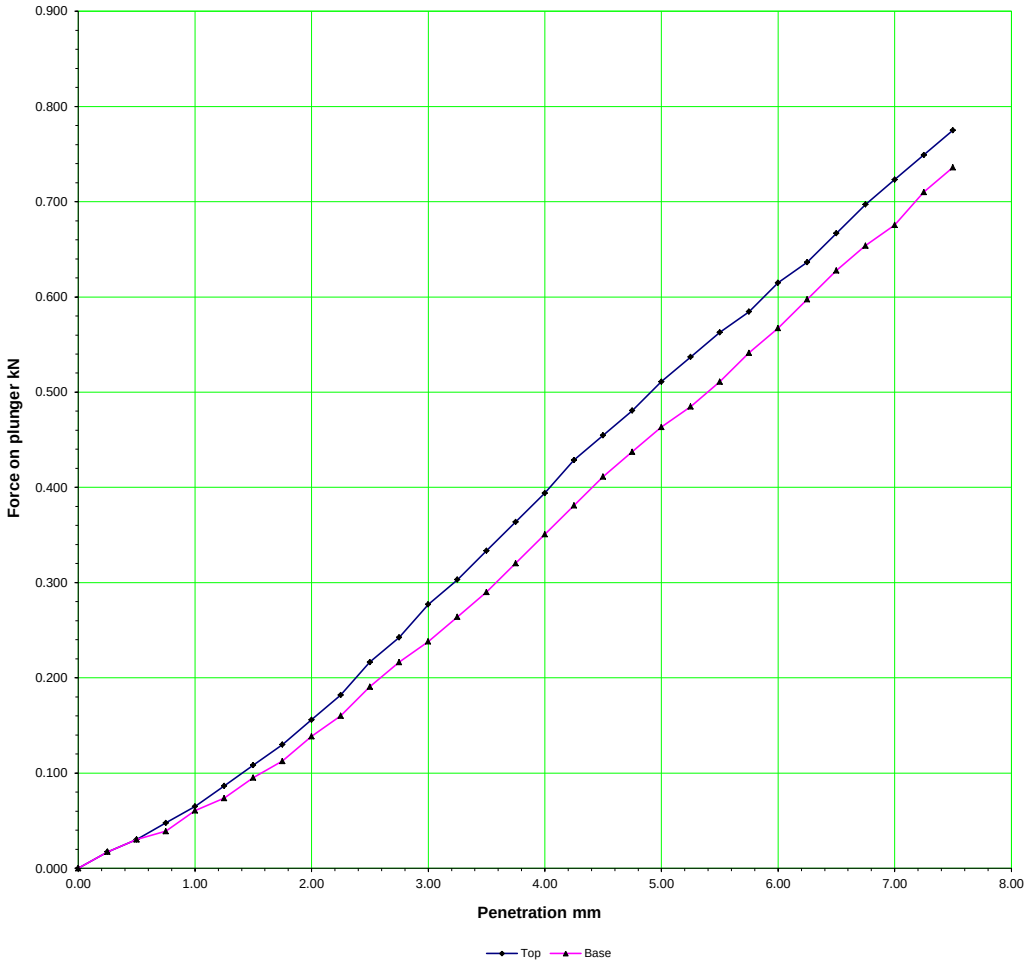
Preperatic Remoulded with 2.5 kg rammer at natural moisture content

Surcharge 10 kPa Mean Calibration 4.33 N/Div

Penetration of plunger mm | Force Gauge reading divisions | Force on plunger kN | California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio Results % Top	California Bearing Ratio Results % Base
0.00	0.0	0.0	0.000	0.000		
0.25	4.0	4.0	0.017	0.017		
0.50	7.0	7.0	0.030	0.030		
0.75	11.0	9.0	0.048	0.039		
1.00	15.0	14.0	0.065	0.061		
1.25	20.0	17.0	0.087	0.074		
1.50	25.0	22.0	0.108	0.095		
1.75	30.0	26.0	0.130	0.113		
2.00	36.0	32.0	0.156	0.139		
2.25	42.0	37.0	0.182	0.160		
2.50	**50.0**	**44.0**	**0.217**	**0.191**	**1.64**	**1.44**
2.75	56.0	50.0	0.242	0.217		
3.00	64.0	55.0	0.277	0.238		
3.25	70.0	61.0	0.303	0.264		
3.50	77.0	67.0	0.333	0.290		
3.75	84.0	74.0	0.364	0.320		
4.00	91.0	81.0	0.394	0.351		
4.25	99.0	88.0	0.429	0.381		
4.50	105.0	95.0	0.455	0.411		
4.75	111.0	101.0	0.481	0.437		
5.00	**118.0**	**107.0**	**0.511**	**0.463**	**2.55**	**2.32**
5.25	124.0	112.0	0.537	0.485		
5.50	130.0	118.0	0.563	0.511		
5.75	135.0	125.0	0.585	0.541		
6.00	142.0	131.0	0.615	0.567		
6.25	147.0	138.0	0.637	0.598		
6.50	154.0	145.0	0.667	0.628		
6.75	161.0	151.0	0.697	0.654		
7.00	167.0	156.0	0.723	0.675		
7.25	173.0	164.0	0.749	0.710		
7.50	179.0	170.0	0.775	0.736		

Moisture content after test		Top	Middle	Base	Specimen wt g	4890
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	######	1419.00	1893.00	Length mm	127.0
Mass of dry soil + container	g	######	1241.00	1650.00		
Weight of container	g	189.00	190.00	189.00		
Mass of moisture	g	279.00	178.00	243.00	Average MC %	16.82
Dry weight	g	######	1051.00	1461.00	Density Mg/m3	2.12
Moisture content	%	16.89	16.94	16.63	Dry Density Mg/m3	1.82



NM TL Ltd

Project: Castlebanny, Co. Kilkenny

GII Project ID:8747-05-19

		Date	Project No.	NMTL3164
Operator	Ms	20-Mar-20	TP/BH	TP14
Checked	Nc		Sample No.	B
Approved	Bc		Depth	0.50m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Light brown slightly sandy slightly gravelly SILT/CLAY

Date: 20-Mar-20

Test Method: BS 1377: Part 4 : 1990 :7.4

Force Measuring Device: VJT 08211 — Test 1

Preperatic: Remoulded with 2.5 kg rammer at natural moisture content

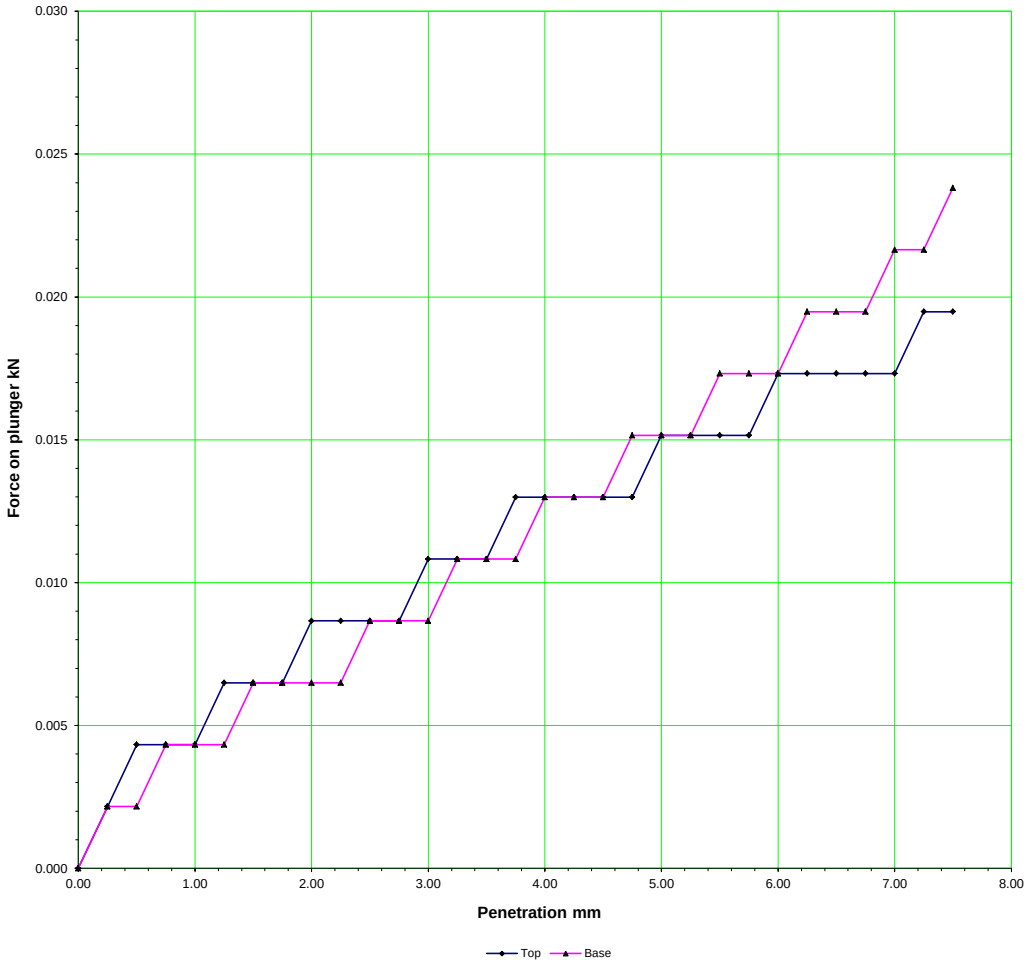
Surcharge: 10 kPa — Mean Calibration: 4.33 N/Div

Penetration of plunger mm: Force Gauge reading divisions — Force on plunger kN: 4.33 N/Div

California Bearing Ratio Results %

Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom	California Bearing Ratio % Top	California Bearing Ratio % Base
0.00	0.0	0.0	0.000	0.000		
0.25	0.5	0.5	0.002	0.002		
0.50	1.0	0.5	0.004	0.002		
0.75	1.0	1.0	0.004	0.004		
1.00	1.0	1.0	0.004	0.004		
1.25	1.5	1.0	0.006	0.004		
1.50	1.5	1.5	0.006	0.006		
1.75	1.5	1.5	0.006	0.006		
2.00	2.0	1.5	0.009	0.006		
2.25	2.0	1.5	0.009	0.006		
2.50	**2.0**	**2.0**	**0.009**	**0.009**	**0.07**	**0.07**
2.75	2.0	2.0	0.009	0.009		
3.00	2.5	2.0	0.011	0.009		
3.25	2.5	2.5	0.011	0.011		
3.50	2.5	2.5	0.011	0.011		
3.75	3.0	2.5	0.013	0.011		
4.00	3.0	3.0	0.013	0.013		
4.25	3.0	3.0	0.013	0.013		
4.50	3.0	3.0	0.013	0.013		
4.75	3.0	3.5	0.013	0.015		
5.00	**3.5**	**3.5**	**0.015**	**0.015**	**0.08**	**0.08**
5.25	3.5	3.5	0.015	0.015		
5.50	3.5	4.0	0.015	0.017		
5.75	3.5	4.0	0.015	0.017		
6.00	4.0	4.0	0.017	0.017		
6.25	4.0	4.5	0.017	0.019		
6.50	4.0	4.5	0.017	0.019		
6.75	4.0	4.5	0.017	0.019		
7.00	4.0	5.0	0.017	0.022		
7.25	4.5	5.0	0.019	0.022		
7.50	4.5	5.5	0.019	0.024		

		Top	Middle	Base		
Moisture content after test					Specimen wt g	4570
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	######	1921.00	1447.00	Length mm	127.0
Mass of dry soil + container	g	######	1572.00	1186.00		
Weight of container	g	139.00	189.00	141.00		
Mass of moisture	g	275.00	349.00	261.00	Average MC %	25.06
Dry weight	g	######	1383.00	1045.00	Density Mg/m3	1.98
Moisture content	%	24.95	25.23	24.98	Dry Density Mg/m3	1.59



NM TL Ltd

Project: Castlebanny, Co. Kilkenny

GII Project ID:8747-05-19

		Date		
Operator	Ms	20-Mar-20	Project No.	NMTL3164
Checked	Nc		TP/BH	TP15
Approved	Bc		Sample No.	B
			Depth	0.50m

LABORATORY REPORT

4043

Contract Number: PSL20/2477

Report Date: 26 May 2020

Client's Reference: 8747-05-19

Client Name: Ground Investigations Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Durham

For the attention of: Conor Finnerty

Contract Title: Castlebanny, Co. Kilkenny

Date Received: 20/5/2020
Date Commenced: 20/5/2020
Date Completed: 26/5/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	R Cowles (Senior Technician)

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Doncaster DN4 0AR
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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH N	2.10	A	Perp	60	41	2460	3132.17	55.97	-	6.19	1.98	1.052	2.08	Valid	
BH N	4.00	A	Perp	60	32	1920	2444.62	49.44	-	5.92	2.42	0.995	2.41	Valid	
BH S	2.12	A	Perp	60	26	1560	1986.25	44.57	-	16.65	8.38	0.950	7.96	Valid	
BH S	3.85	A	Perp	60	38	2280	2902.99	53.88	-	27.41	9.44	1.034	9.76	Valid	
BH N River	5.55	A	Perp	60	50	3000	3819.72	61.80	-	0.48	0.13	1.100	0.14	Valid	
BH N River	6.75	A	Perp	60	31	1860	2368.23	48.66	-	0.59	0.25	0.988	0.25	Valid	
BH S River	9.70	A	Perp	60	45	2700	3437.75	58.63	-	0.63	0.18	1.074	0.20	Valid	
BH S River	11.00	A	Perp	60	36	2160	2750.20	52.44	-	0.27	0.10	1.022	0.10	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Castlebanny, Co. Kilkenny

Contract No:

PSL20/2477

Client Ref:

8747-05-19

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH N	2.10	D	Par	-	60	3600	60.00	-	19.13	5.314	1.086	5.77	Valid	
BH N	4.00	D	Par	-	60	3600	60.00	-	2.98	0.828	1.086	0.90	Valid	
BH S	2.12	D	Par	-	60	3600	60.00	-	17.08	4.744	1.086	5.15	Valid	
BH S	3.85	D	Par	-	60	3600	60.00	-	25.57	7.103	1.086	7.71	Valid	
BH N River	5.55	D	Par	-	60	3600	60.00	-	0.31	0.086	1.086	0.09	Valid	
BH N River	6.75	D	Par	-	60	3600	60.00	-	0.25	0.069	1.086	0.08	Valid	
BH S River	9.70	D	Par	-	60	3600	60.00	-	0.57	0.158	1.086	0.17	Valid	
BH S River	11.00	D	Par	-	60	3600	60.00	-	0.42	0.117	1.086	0.13	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL Professional Soils Laboratory

Castlebanny, Co. Kilkenny

Contract No:

PSL20/2477

Client Ref:

8747-05-19

Castlebanny Wind Farm Cable Crossing at SAC

Geophysical Survey Report

Report No: 2050-20 DRAFT

22nd September 2020

This document has been prepared by Whiteford Geoservices Ltd on behalf of

Ground Investigations Ireland Ltd

Whiteford Geoservices Ltd, 2 Main Street, Straid, Co. Antrim, BT39 9NE
Tel: 0044 (0) 28 93349351 Fax: 0044 (0) 28 93349352
www.whitefordgeoservices.com

CONTENTS

1 INTRODUCTION

During September 2020 Whiteford Geoservices Ltd was commissioned by Ground Investigations Ireland Ltd to undertake a geophysical survey as part of a ground investigation contract at the proposed site of a new cable route associated with Castlebanny Wind Farm.

The investigation was primarily required to obtain information pertaining to the existing geological ground conditions within a Special Area of Conservation (SAC) through which the proposed cable route crosses, between 2 Nr. exploratory boreholes previously undertaken by Ground Investigations Ireland Ltd.

The survey was performed in accordance with the relevant standards (see References) and fieldwork was carried out on 11th September 2020.

This report presents the factual records of the geophysical survey undertaken, together with an interpretation of the results.

2 SITE AND GEOLOGY

2.1 The Site

The survey site is located within the River Barrow & River Nore SAC adjacent to the Arrigle River, approximately 9km north-east of Mullinavat, Co. Kilkenny.

The SAC lies easterly adjacent to an existing forestry access track and is surrounded by agricultural lands of moderately level topography.

2.2 Published Geology

The published geological maps of the area indicate that the solid geology consists primarily of Granite.

Superficial geology consisting of glacial till derived mainly from sandstones is anticipated to dominate to local region, with alluvial deposits present within the vicinity of the Arrigle River.

3 FIELDWORK

3.1 General

The fieldwork was carried out in general accordance with BS 5930:2015, BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006) and other related standards.

Please refer to Appendix A for drawing '*Castlebanny Wind Farm Cable Crossing at SAC – Geophysical Survey Layout Plan* ***2050-20-GEO-L1 Rev01***'. This drawing details the geophysical survey location.

3.2 Geophysical Survey

The geophysical survey involved the following non-intrusive investigation methods.

METHOD	QUANTITY	MAXIMUM DEPTH (m)	EQUIPMENT
2D Electrical Resistivity Tomography	1 Nr.	approx. 20.00m	Campus Tigre Electrical Resistivity Imaging System.

2D Electrical Resistivity Tomography

A Campus Tigre Electrical Resistivity System employing a 32 electrode Wenner Array was used to conduct the geophysical survey, with the intention of analysing the sub-surface to a depth of approximately 15.00m – 20.00m below existing ground level.

Two electrodes input a controlled electrical current into the ground, where the lines of current flow adapt to the sub-surface resistivity pattern. In this way the potential difference between the equipotential surfaces can be measured, where they meet the ground surface, using a second pair of electrodes. Comparison of the input current to the measured potential difference enables the resistance to be calculated.

Imager Pro 2006, a Windows acquisition program allows real time colour pseudo-sections to be generated on the laptop computer used to collect and store data in the field. Such real time presentation offers instant confirmation of data quality.

Res2DinV software was applied to the field data to provide the modelled section which was then interpreted, in terms of resistivity, by an experienced Geologist.

Refer to Appendix B for the interpreted Geophysical Survey Profile.

3.3 Topographical Survey

The topographical survey was undertaken post-completion of all associated geophysical investigation works and is detailed in the following table.

EQUIPMENT	LOCATION	COORDINATE SYSTEM
Leica RTK / GNSS DGPS System	Refer to Appendix A *2050-20-GEO-L1 Rev 01*	Irish National Grid (ING) / Malin Head (Ordnance Datum)

4 SURVEY RESULTS

4.1 Geophysical Survey

The survey has provided geophysical information on the sub-surface ground conditions, indicating the anticipated depths and relative levels of the native soils deposits and underlying bedrock geology and topography.

The table below summarises the geological interpretation of the geophysical survey regime.

Profile ID	Anticipated Peat Depth (m)	Anticipated Glacial Till thickness (m)	Anticipated Depth to Rock (m) b.g.l.	Anticipated Rock Topography (mAOD)
R1	0.40 – 0.85	4.30 – 10.00	4.30 – 10.00	59.20 – 53.50

Geophysical profile R1 indicates a variable glacial till overburden thickness in the order of approximately 4.30m – 10.00m along the survey length, underlain by what is expected to be distinctly weathered Granite of undulating topography in a general easterly to westerly slope trend. Geophysical results along the survey profile indicate undisturbed native glacial soils and bedrock geology.

REFERENCES

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

BS 5930: 2015 : Code of practice for site investigations (Amendment 2). British Standards Institution.

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

BS EN ISO 14688-1: 2002 : Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

BS EN ISO 14689-1: 2003 : Geotechnical investigation and testing - Identification and classification of rock - Part 1 Identification and description. British Standards Institution.

BS EN ISO 22475-1: 2006 : Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 Technical principles for execution. British Standards Institution.

BS EN ISO 22476-2: 2005 : Geotechnical investigation and testing - Field testing - Part 2 Dynamic probing. British Standards Institution.

BS EN ISO 22476-3: 2005 : Geotechnical investigation and testing - Field testing - Part 3 Standard penetration test. British Standards Institution.

ISRM: 2007: The Complete ISRM Suggested Methods for Rock Characterisation, Testing and Monitoring (1974-2006). Commission on Testing Methods, International Society for Rock Mechanics (Editors Ulusay R & Hudson JA).

ASTM D5731-08: Standard test method for determination of the point load strength index of rock and application to rock strength

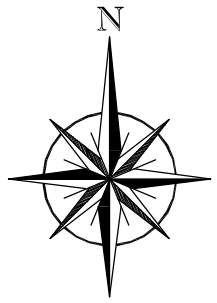
ASTM C215-08: Standard Test Method for Fundamental Transverse, Longitudinal, and Torsional Frequencies of Concrete Specimens

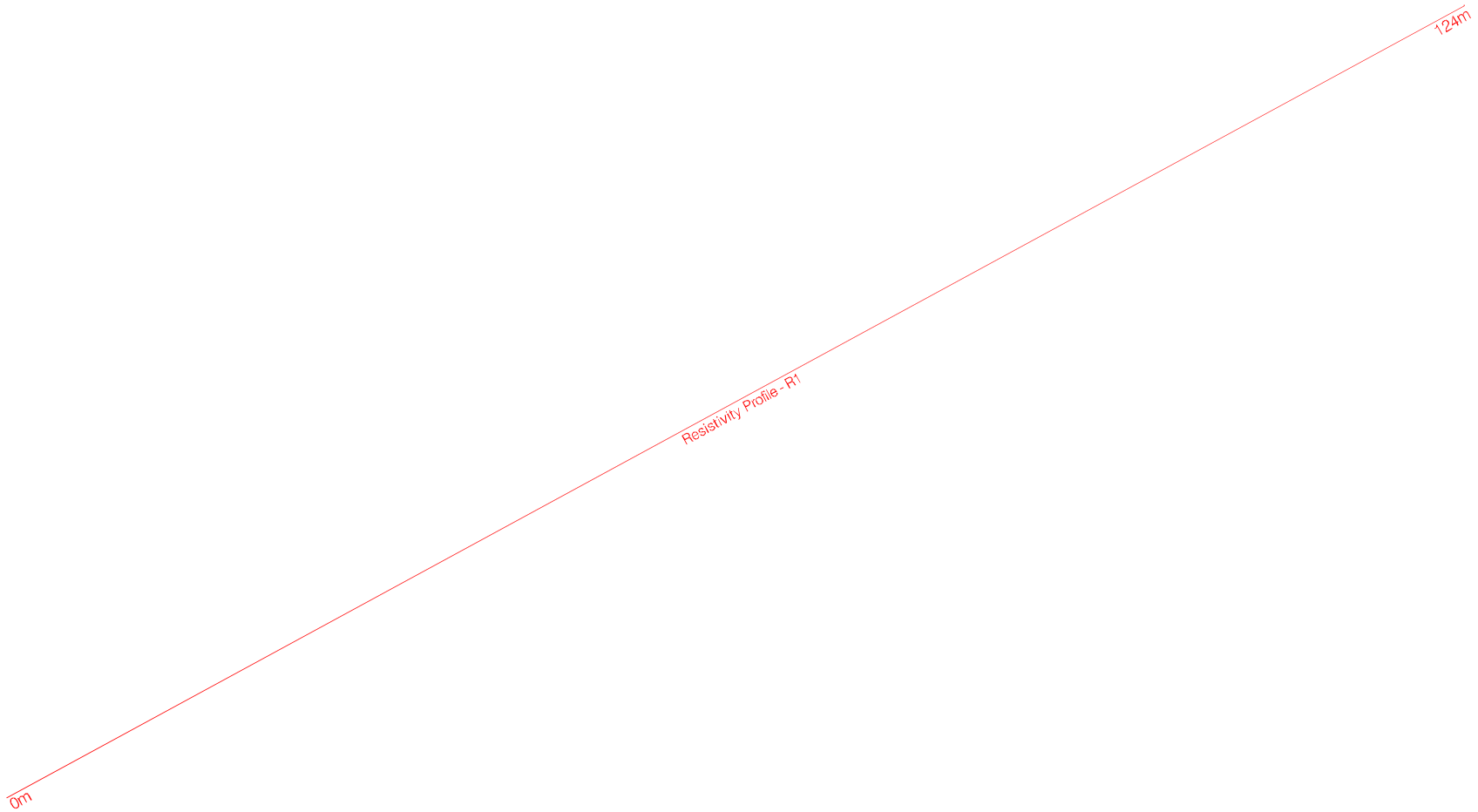
PAS 128: 2014 Specification for underground utility detection, verification and location.

APPENDIX A
DRAWINGS

SITE LOCATION	1 x A3
CASTLEBANNY WIND FARM CABLE CROSSING AT SAC GEOPHYSICAL SURVEY LAYOUT PLAN ***2050-20-GEO-L1 Rev 01***	1 x A3

Site Location





01 GEOPHYSICAL SURVEY LAYOUT PLAN

Survey Drawing Key:

2D RESISTIVITY SURVEY PROFILE

Client
GROUND INVESTIGATIONS IRELAND LTD

Project
CASTLEBANNY WIND FARM

CABLE CROSSING AT SAC

Stage
GEOPHYSICAL SURVEY

Title
GEOPHYSICAL SURVEY LAYOUT PLAN

Scales
1 : 500 @ A3

Surveyed	Drawn	Checked	Date
RC	RC	WGS	Sept 2020

WHITEFORD GEOSERVICES LTD
STRAID HOUSE, 2 MAIN STREET
STRAID, BALLYCLARE
CO. ANTRIM
BT39 9NE
UNITED KINGDOM
+44 (0)28 9334 9351

Drawing No.	Revision - Draft
2050-20-GEO-L1	01

APPENDIX B

GEOPHYSICAL SURVEY RECORDS

2D ELECTRICAL RESISTIVITY TOMOGRAPHY PROFILE 1 x A3

2050-20 Castlebanny Wind Farm Cable Crossing at SAC – Geophysical Survey

2D Electrical Resistivity Tomography Survey – Interpretation at Profile R1

Date: 11th September 2020

E = 260248.70

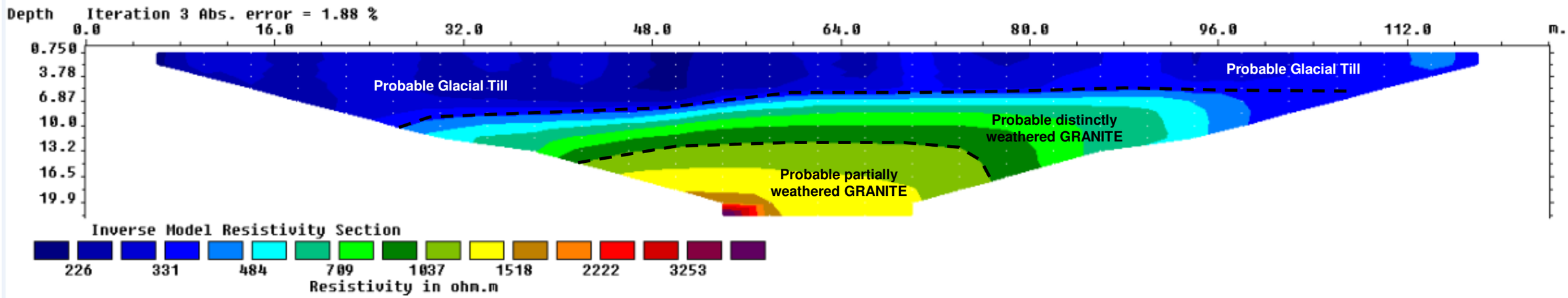
N = 133014.55

Z = 65.55

260357.65 = E

133073.75 = N

63.50 = Z



Notes:

1. Interpretation is based only on the geophysical survey data acquired and available records for the site.
2. Coordinates and elevations provided are to Irish National Grid and Malin Head Ordnance Datum.
3. Drawings are Not To Scale.

APPENDIX C
PHOTOGRAPHS

SITE PHOTOGRAPHS	2 x A4

Plate 1 - Arrigle River

Plate 2 - Crossing location at Arrigle River

Plate 3 - Survey area at SAC

Plate 4 - Geophysical survey in operation