



DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 7

Land, Soils and Geology

Appendix 7-1: Ground Investigation Report
(August 2022 - Ground Investigations Ireland)

Appendix 7-2: Ground Investigation Report
(June 2023 - Ground Investigations Ireland)

Appendix 7-3: Ground Investigation Report
(March 2024 - Ground Investigations Ireland)

APPENDIX 7.1

Ground Investigation Report
(August 2022 - Ground Investigations Ireland)



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Ground Investigations Ireland

Littleton Wind Farm

Fehily Timoney and Company

Ground Investigation Report

October 2022





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



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GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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1.0 Preamble

On the instructions of Fehily Timoney and Company, a site investigation was carried out by Ground Investigations Ireland Ltd. (GII) between July and August 2022, at the site of the proposed wind farm in Littleton, County Tipperary.

2.0 Overview

2.1. Background

Construction of a new wind farm with associated substations and access road network is proposed at the site in Littleton, County Tipperary. At the time of the site investigation the site consisted of three interlinked boglands - Longfordpass Bog, Littleton Bog and Lanespark Bog.

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 28 No. Trial Pits to a maximum depth of 4.50m BGL
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing were 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+A1:2020.

3.2. Trial Pits

The trial pits were excavated using a 12T wide 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 a Geo-Environmental Engineer 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. Surveying

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

3.4. Laboratory Testing

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

Chemical testing, as required by the specification, including the organic matter, total sulphur, water soluble sulphate and acid soluble sulphate testing, was carried out by Element Materials Technology Laboratory in the United Kingdom (UK).

Geotechnical testing consisting of Moisture Content, Atterberg Limits, and Particle Size Distribution (PSD), California Bearing Ratio (CBR), Moisture Condition Value (MCV) and Compaction tests were carried out by Professional Soils Laboratory (PSL) in the UK.

The results of the laboratory testing are included in Appendix 3 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 consistent across the site and generally comprised;

- Topsoil / Possible Made Ground
- Peat
- Cohesive Deposits
- Granular Deposits

TOPSOIL: Topsoil was encountered in TP-05 only and was present to a depth of 0.10m BGL.

POSSIBLE MADE GROUND: Possible Made Ground deposits were encountered in exploratory holes TP-06 and TP-26 and were present to depths of 0.65m and 1.30m BGL, respectively. These deposits were described generally as *dark brown slightly clayey amorphous Peat with roots and occasional boulders*. These deposits have been referred to as possible made ground as they appeared to have been reworked.

PEAT: Peat was encountered in all the exploratory holes and was generally described as *dark brown slightly clayey pseudo-fibrous PEAT*. In several of the exploratory holes a layer of *dark brown slightly clayey amorphous PEAT* overlay the pseudo-fibrous Peat. The thickness of peat varied from 0.50m to 4.50m, with the full extent of the peat not determined at TP-02, TP-21 and TP-23.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the peat at most locations and were described typically as *grey slightly sandy slightly gravelly clayey SILT* or a *grey slightly sandy slightly gravelly silty CLAY*. These deposits generally had *occasional cobbles and boulders* within the mass of the material. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. When in contact with water, the Silt deposits appeared to partially liquify. These deposits had occasional (<5%), some (5%-20%) or many (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

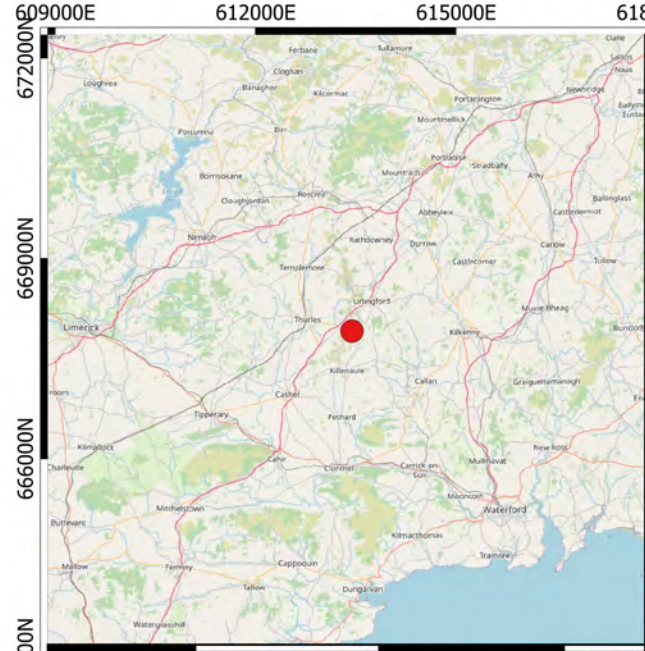
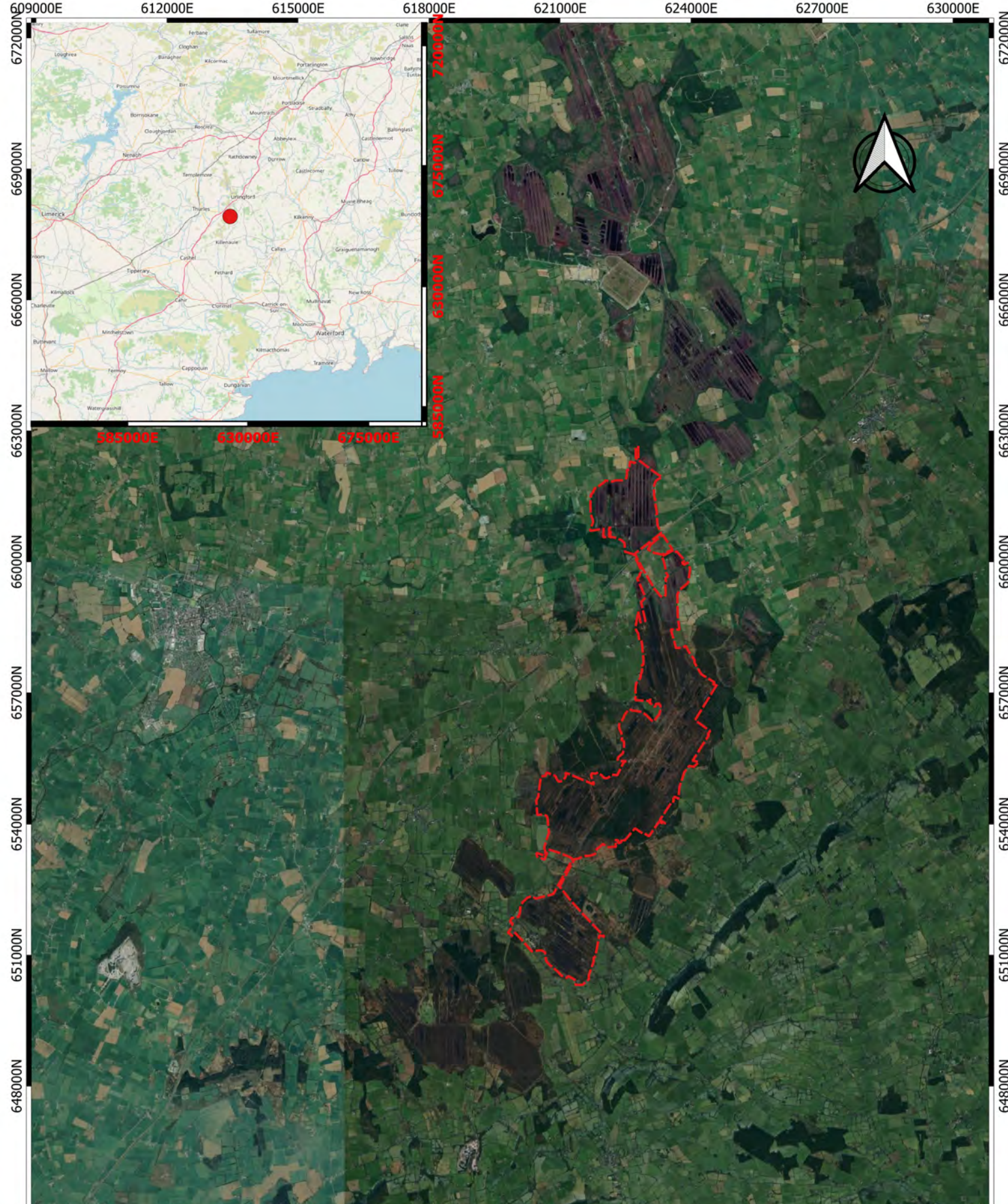
GRANULAR DEPOSITS: The granular deposits were encountered below the peat deposits at TP-13 and TP-35, and below the cohesive deposits at most other locations. They were typically described as *grey slightly sandy silty clayey subangular to subrounded fine to coarse GRAVEL with occasional cobbles and boulders*. The secondary sand and silt/clay constituents varied across the site and with depth, while occasional (<5%), some (5%-20%) or many (20%-50%) cobble and boulder content was also present, where noted on the exploratory hole logs. In TP-35, a layer of sand was encountered below the peat and was described as *grey slightly clayey gravelly silty fine to coarse SAND with occasional cobbles*. This sand layer overlay the gravel deposit.





4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred. 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 time of year, rainfall, nearby construction, and other factors.

APPENDIX 1 - Figures





 GROUND INVESTIGATIONS IRELAND Geotechnical & Environmental Ground Investigations Ireland Ltd. Catherinstown House, Hazelhatch Road, Newcastle, Co. Dublin www.gii.ie 01-6015175/5176	Engineer:  FEHILY TIMONEY	Project Title: Littleton Wind Farm		 Indicative Site Boundary  Site Location
		Drawing Title: Figure 1 Proposed SI			GII Project Reference: 11947-06-22
0 1,000 2,000 3,000 4,000 m 		Drawn By: JC	Date: 28/09/2022	

618000E

620000E

622000E

624000E

626000E

628000E

662000N

662000N

660000N

660000N

658000N

658000N

656000N

656000N

654000N

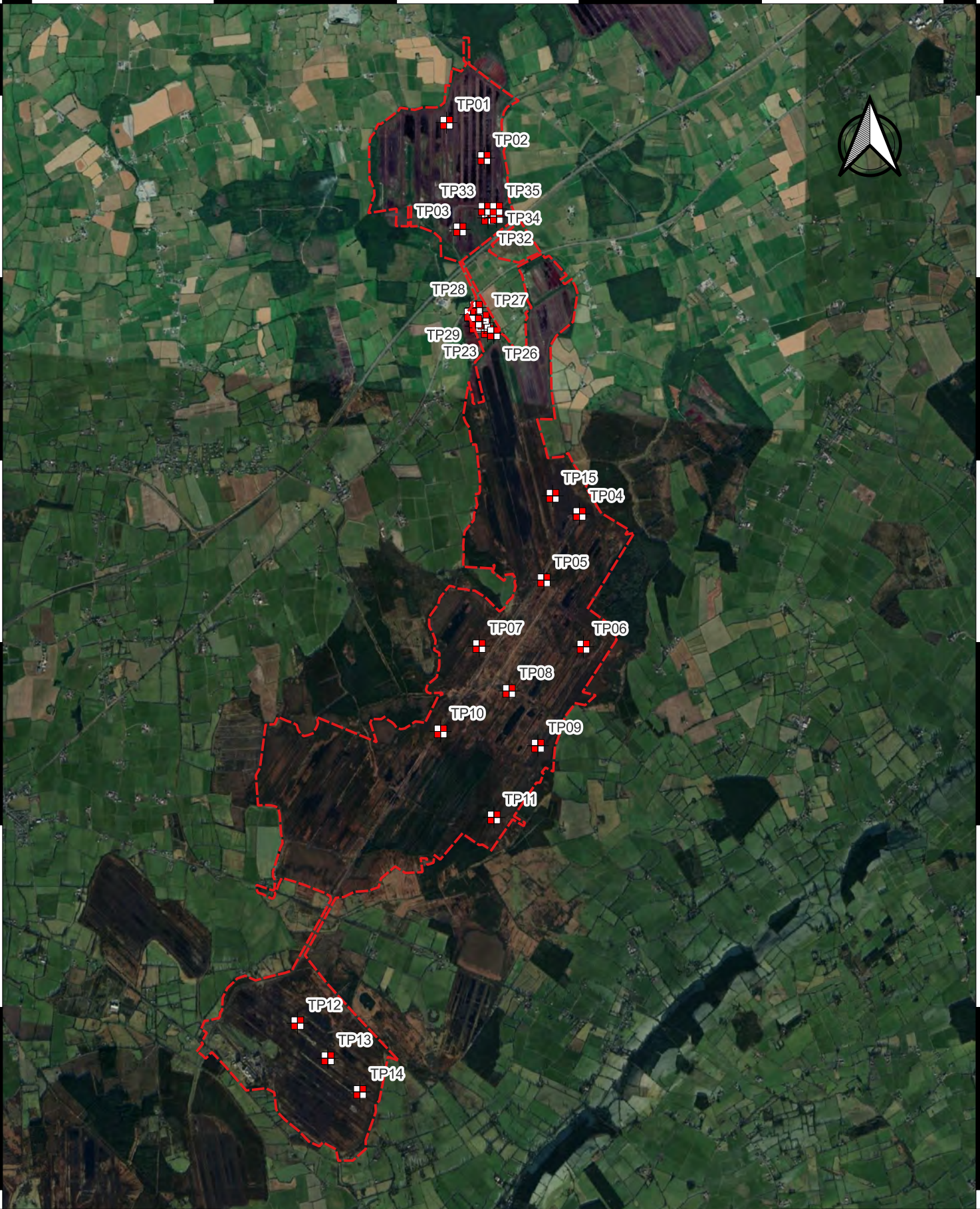
654000N

652000N

652000N

650000N

650000N



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Engineer:



0 600 1,200 1,800 m




Project Title:
Littleton Wind Farm

Drawing Title:
Figure 2 - All Exploratory Hole Locations

GII Project Reference:
11947-06-22

Drawn By:
CMP

Date:
01/09/2022

 Indicative Site Boundary

 Trial Pit



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Newcastle, Co. Dublin
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Engineer:

**FEHILY
TIMONEY**

0 150 300 450 m

Project Title:
Littleton Wind Farm

Drawing Title:
Figure 3 - Northern SI Plan

GII Project Reference:
11947-06-22

Drawn By:
CMP

Date:
01/09/2022

Indicative Site Boundary

Trial Pit

620000E

622000E

624000E

658000N

658000N

656000N

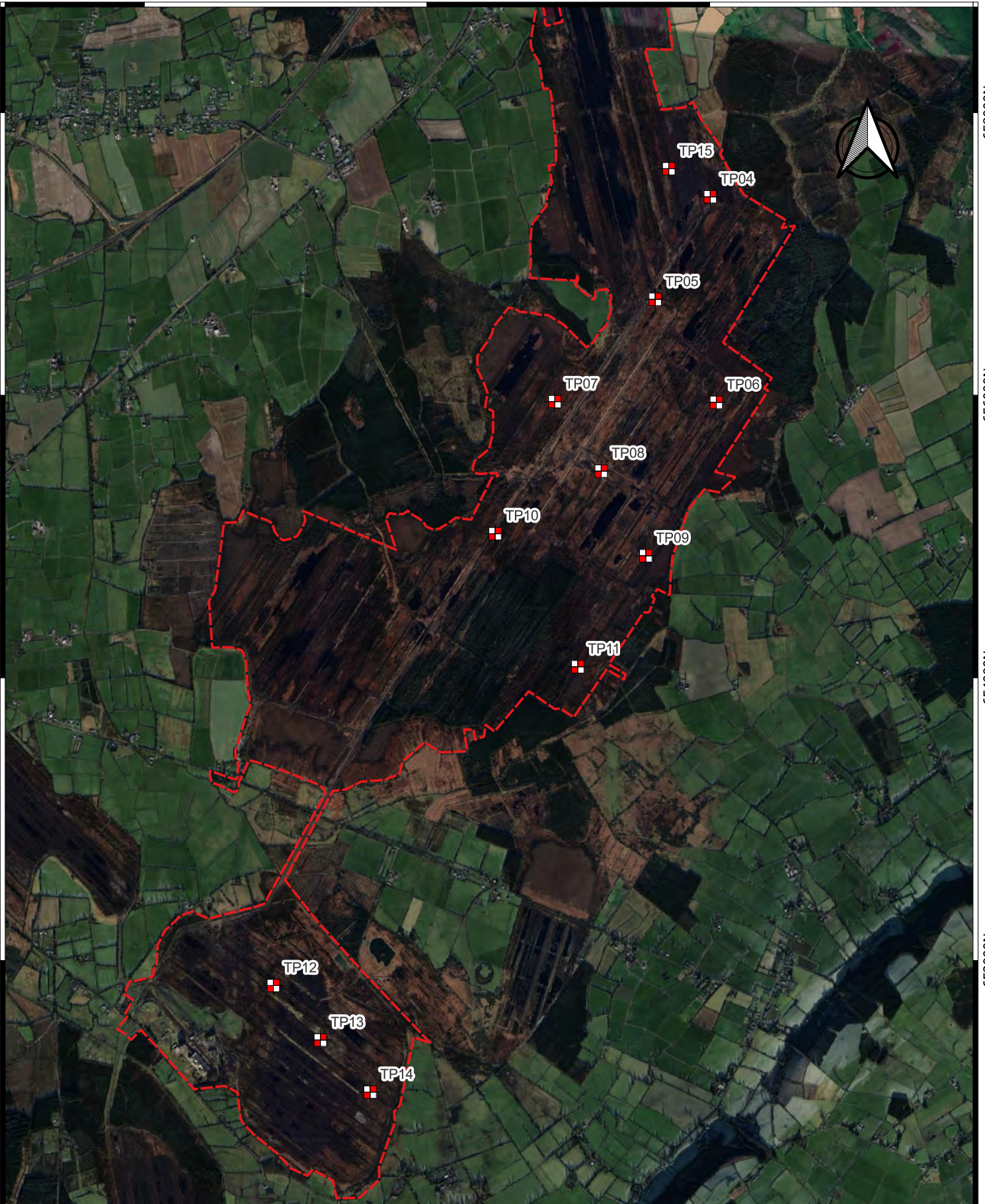
656000N

654000N

654000N

652000N

652000N



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Engineer:



0 150 300 450 m



Project Title:

Littleton Wind Farm

Drawing Title:


Figure 4 - Southern SI Plan

GII Project Reference:

11947-06-22

Drawn By:
CMP

Date:
01/09/2022

 Indicative Site Boundary

 Trial Pit

APPENDIX 2 – Trial Pit Records





Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.70m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 121.23	Client Bord na Móna	Job Number 11947-06-22
	Location 622546.8 E 661687.4 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
3.50 3.50	B T		Seepage(1) at 3.50m.	119.63	(1.60)	Very soft brown slightly clayey pseudo fibrous PEAT		
					(1.80)	Very soft dark brown slightly clayey pseudo fibrous PEAT with plant remains and tree limbs/trunks		
					3.40 (0.60)	Soft to firm bluish grey slightly sandy slightly gravelly silty CLAY with occasional cobbles		
				117.83	4.00			

Plan	<p>Remarks</p> <p>Groundwater encountered at 3.50m and 4.00m BGL; Seepage and Fast Ingress Trial pit stable Trial pit backfilled upon completion</p>
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Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-01
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Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.70m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 121.23	Client Bord na Móna	Job Number 11947-06-22
	Location 622546.8 E 661687.4 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.30 4.30	B T		Fast Ingress(2) at 4.00m.	116.73	(0.50) 4.50	Grey slightly sandy slightly silty clayey subangular to subrounded fine to coarse GRAVEL with occasional cobbles and boulders Complete at 4.50m		

Plan 	Remarks 	
		Scale (approx) 1:25



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.00m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 121.38	Client Bord na Móna	Job Number 11947-06-22
	Location 622959.4 E 661300.1 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				120.88	0.50	Very soft dark brown slightly clayey amorphous PEAT		
					(4.00)	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains		

Plan .	Remarks Groundwater encountered at 4.50m BGL; Seepage Trial pit unstable; Side walls collapsed Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>11947-06-22.TP-02</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	11947-06-22.TP-02				



Machine : 12 Tonne tracked excavator
Method : Trial Pit

Dimensions
5.00m x 1.00m x 4.50m
(L x W x D)

Ground Level (mOD)
121.38

Client
Bord na Móna

Job Number
11947-06-22

Location
622959.4 E 661300.1 N

Dates
30/08/2022

Engineer
Fehily Timoney

Sheet
2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Seepage(1) at 4.50m.	116.88	4.50	Complete at 4.50m		∇ ₁

Plan 	Remarks		
	Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-02



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.20m x 1.00m x 3.70m (L x W x D)	Ground Level (mOD) 121.55	Client Bord na Móna	Job Number 11947-06-22
	Location 622693.1 E 660517.2 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T			120.85	(0.70) 0.70	Very soft brown slightly clayey pseudo fibrous PEAT		
					(1.70)	Soft to firm grey slightly sandy slightly gravelly clayey SILT with occasional cobbles and boulders		
						Occasional sand lens encountered between 0.70m and 2.40m BGL		
				119.15	2.40	Soft to firm slightly sandy gravelly clayey SILT with occasional cobbles and boulders		
3.00 3.00	B T				(1.00)			
			Medium Ingress(1) at 3.40m.	118.15	3.40	Grey slightly sandy slightly silty slightly clayey subangular to subrounded fine to coarse GRAVEL with occasional cobbles and boulders		▽1
				117.85	(0.30) 3.70	Obstruction: Presumed bedrock/boulders		
						Complete at 3.70m		

Plan .	Remarks Groundwater encountered at 3.40m BGL; Medium Ingress Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>11947-06-22.TP-03</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	11947-06-22.TP-03				



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Site
Littleton Wind Farm

Trial Pit Number
TP-04

Machine : 12 Tonne tracked excavator

Method : Trial Pit

Dimensions
4.80m x 1.00m x 4.00m
(L x W x D)

Ground Level (mOD)
125.93

Client
Bord na Móna

Job Number
11947-06-22

Location
624004.1 E 657397.4 N

Dates
18/07/2022

Engineer
Fehily Timoney

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.50	B T		Seepage(1) at 0.70m.	125.23	0.70	Very soft dark brown slightly clayey pseudo fibrous PEAT with roots, plant remains and rare cobbles		V1
2.50						Very soft grey slightly sandy slightly gravelly clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		
4.00	BT		Seepage(2) at 3.80m.	121.93	4.00			V2

Plan								Remarks	
.	.	.	.	.	.	.	.	Groundwater encountered at 0.70m and 3.80m BGL; Both Seepage	
.	.	.	.	.	.	.	.	Trial pit unstable; side walls collapsed	
.	.	.	.	.	.	.	.	Trial pit backfilled upon completion	
.		
.		
.		
.		
.		
						Scale (approx)	Logged By	Figure No.	
						1:25	CMP	11947-06-22.TP-04	



Machine : 12 Tonne tracked excavator		Dimensions 4.50m x 1.00m x 3.20m (L x W x D)		Ground Level (mOD) 123.11		Client Bord na Móna		Job Number 11947-06-22	
Method : Trial Pit		Location 623614.5 E 656671.8 N		Dates 18/07/2022		Engineer Fehily Timoney		Sheet 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.50	B			123.01	(0.10)	TOPSOIL		
1.50	T		Seepage(1) at 1.20m.		(1.00)	Very soft dark brown slightly clayey pseudo fibrous PEAT with roots		
				122.01	1.10	Very soft grey slightly sandy slightly gravelly clayey SILT with occasional cobbles. Silt oozing when in contact with water		∇1
					(0.90)			
				121.11	2.00	Grey slightly sandy silty subangular to subrounded fine to coarse GRAVEL with occasional cobbles		∇2
			Fast Ingress(2) at 2.90m.		(1.20)			
3.00	B							
3.00	T			119.91	3.20	Complete at 3.20m		

Plan					Remarks				
.					Groundwater encountered at 1.20m and 2.90m BGL; Seepage and Fast Ingress				
.					Trial pit unstable; side walls collapsed				
.					Trial pit backfilled upon completion				
.									
.									
					Scale (approx)		Logged By		Figure No.
					1:25		CMP		11947-06-22.TP-05



Machine : 12 Tonne tracked excavator		Dimensions 4.70m x 1.00m x 4.50m (L x W x D)		Ground Level (mOD) 124.19		Client Bord na Móna		Job Number 11947-06-22	
Method : Trial Pit		Location 622904.6 E 655947.8 N		Dates 19/07/2022		Engineer Fehily Timoney		Sheet 1/2	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.00 2.00	B T			122.89	(1.30)	Very soft dark brown slightly clayey pseudo fibrous PEAT with a tree stump		
			Seepage(1) at 2.50m.			Very soft grey slightly sandy slightly gravelly very clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		
3.50 3.50	B T			121.39	(1.70)	Very soft grey slightly sandy slightly silty very gravelly CLAY with many cobbles and boulders		
			Medium Ingress(2) at 3.70m.					

Plan						Remarks			
.						Groundwater encountered at 2.50m and 3.70m BGL; Seepage and Medium Ingress			
.						Trial pit unstable; side walls collapsed			
.						Trial pit backfilled upon completion			
.									
.									
						Scale (approx)		Logged By	Figure No.
						1:25		CMP	11947-06-22.TP-10



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.70m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 124.19	Client Bord na Móna	Job Number 11947-06-22
	Location 622904.6 E 655947.8 N	Dates 19/07/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				119.69	4.50	Complete at 4.50m		

Plan 	Remarks



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.50m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 122.80	Client Bord na Móna	Job Number 11947-06-22
	Location 623232.6 E 655455.9 N	Dates 19/07/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.50 2.50	B T		Seepage(1) at 1.20m.	121.60	(1.20)	Very soft dark brown slightly clayey amorphous PEAT with branches		
				121.00	(0.60)	Very soft light brown slightly clayey pseudo fibrous PEAT		▽1
				121.00	(0.70)	Very soft grey slightly sandy slightly gravelly clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		
				120.30	(2.00)	Very soft grey slightly sandy slightly silty very gravelly CLAY with many cobbles and boulders		

Plan .	Remarks Groundwater encountered at 1.20m BGL; Seepage Trial pit unstable; side walls collapsed Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>11947-06-22.TP-08</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	11947-06-22.TP-08				



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.50m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 122.80	Client Bord na Móna	Job Number 11947-06-22
	Location 623232.6 E 655455.9 N	Dates 19/07/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T			118.30	4.50	Complete at 4.50m		

Plan .	Remarks 	
		Scale (approx) 1:25



Machine : 12 Tonne tracked excavator		Dimensions 4.50m x 1.00m x 3.20m (L x W x D)		Ground Level (mOD) 123.96		Client Bord na Móna		Job Number 11947-06-22	
Method : Trial Pit		Location 623548.1 E 654856.5 N		Dates 19/07/2022		Engineer Fehily Timoney		Sheet 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.70 1.70	B T			122.76	(1.20)	Very soft dark brown slightly clayey pseudo fibrous PEAT with roots and wood		
2.70 2.70	B T		Fast Ingress(1) at 3.00m.	120.96 120.76	(1.80) (0.20) 3.20	Very soft grey slightly clayey sandy gravelly SILT with occasional cobbles and boulders. Silt oozing when in contact with water		
						Grey slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders		▽1
						Terminated at 3.20m		

Plan 	Remarks Groundwater encountered at 3.00m BGL; Fast Ingress Trial pit unstable; side walls collapsed Trial pit backfilled upon completion Trial pit terminated at 3.20m due to collapsed side walls		
	Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-06



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.80m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 123.04	Client Bord na Móna	Job Number 11947-06-22
	Location 622481.9 E 655012.8 N	Dates 19/07/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
3.00 3.00	B T		Seepage(1) at 3.00m.	121.44 120.04	(1.60) 1.60 3.00 (1.50)	<p>Very soft dark brown slightly clayey pseudo fibrous PEAT with plant remains and branches</p> <p>Very soft grey slightly sandy slightly gravelly silty CLAY with occasional cobbles and boulders</p> <p>Very soft grey slightly sandy slightly gravelly very clayey SILT with many cobbles and boulders. Silt oozing when in contact with water</p>		

Plan .	Remarks Groundwater encountered at 3.00m BGL; Seepage Trial pit unstable; side walls collapsed Trial pit backfilled upon completion		
	<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By CMP</td> <td>Figure No. 11947-06-22.TP-10</td> </tr> </table>	Scale (approx) 1:25	Logged By CMP
Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-10	



Machine : 12 Tonne tracked excavator
Method : Trial Pit

Dimensions
4.80m x 1.00m x 4.50m
(L x W x D)

Ground Level (mOD)
123.04

Client
Bord na Móna

Job Number
11947-06-22

Location
622481.9 E 655012.8 N

Dates
19/07/2022

Engineer
Fehily Timoney

Sheet
2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T			118.54	4.50	Complete at 4.50m		

Plan 	Remarks	
	Scale (approx) 1:25	Logged By CMP
		Figure No. 11947-06-22.TP-10



Machine : 12 Tonne tracked excavator
Method : Trial Pit

Dimensions
4.50m x 1.00m x 4.50m
(L x W x D)

Ground Level (mOD)
125.46

Client
Bord na Móna

Job Number
11947-06-22

Location
623066.7 E 654070.5 N

Dates
19/07/2022

Engineer
Fehily Timoney

Sheet
1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Very soft dark brown slightly clayey pseudo fibrous PEAT with plant remains		
					(3.00)			
			Seepage(1) at 3.00m.	122.46	3.00	Very soft grey slightly sandy slightly gravelly clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		<input checked="" type="checkbox"/>
					(0.80)			
3.50	B			121.66	3.80	Grey slightly sandy slightly silty slightly clayey subangular to subrounded fine to coarse GRAVEL		
3.50	T							

Plan										
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Remarks

Groundwater encountered at 3.00m BGL; Seepage
Trial pit unstable; side walls collapsed
Trial pit backfilled upon completion

Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-11
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Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.50m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 125.46	Client Bord na Móna	Job Number 11947-06-22
	Location 623066.7 E 654070.5 N	Dates 19/07/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T			120.96	(0.70) 4.50	Complete at 4.50m		

Plan 	Remarks 	
		Scale (approx) 1:25



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.80m x 1.00m x 3.00m (L x W x D)	Ground Level (mOD) 120.68	Client Bord na Móna	Job Number 11947-06-22
	Location 620912.7 E 651814.4 N	Dates 20/07/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.00 2.00	B T		Seepage(1) at 2.00m.	120.03	0.65 (0.65)	Very soft dark brown slightly clayey pseudo fibrous PEAT with plant remains and branches		
					(1.35)	Very soft grey slightly sandy gravelly clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		
2.00 2.00	B T		Seepage(1) at 2.00m.	118.68	2.00 (1.00)	Grey slightly sandy slightly silty clayey subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders		∇1
3.00 3.00	B T		Seepage(2) at 3.00m.	117.68	3.00	Terminated at 3.00m		∇2

Plan .	Remarks Groundwater encountered at 2.00m and 3.00m BGL; Both Seepage Trial pit unstable; side walls collapsed Trial pit backfilled upon completion Trial pit terminated due to excavator sinking in wet bog area		
	<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By CMP</td> <td>Figure No. 11947-06-22.TP-12</td> </tr> </table>	Scale (approx) 1:25	Logged By CMP
Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-12	



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.80m x 1.00m x 2.80m (L x W x D)	Ground Level (mOD) 121.40	Client Bord na Móna	Job Number 11947-06-22
	Location 621245.6 E 651428.9 N	Dates 20/07/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T			120.60	(0.80)	Very soft dark brown slightly clayey pseudo fibrous PEAT with tree stumps		
				119.60	0.80 (1.00)	Grey slightly sandy slightly silty slightly clayey subangular to subrounded fine to coarse GRAVEL with occasional cobbles		
2.50 2.50	B T		Seepage(1) at 2.60m. Medium Ingress(2) at 2.80m.	118.60	1.80 (1.00)	Very soft grey slightly sandy gravelly clayey SILT with many cobbles and boulders. Silt oozing when in contact with water		
					2.80	Obstruction: No progress - Presumed Bedrock Terminated at 2.80m		∇1 ∇2

Plan .	Remarks Groundwater encountered at 2.60m and 2.80m BGL; Seepage and Medium Ingress Trial pit unstable; side walls collapsed Trial pit backfilled upon completion	
		Scale (approx) 1:25



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Site
Littleton Wind Farm
Trial Pit Number
TP-14

Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.80m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 124.94	Client Bord na Móna	Job Number 11947-06-22
	Location 621597.4 E 651060.1 N	Dates 20/07/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.90 0.90	B T			124.24 124.04	(0.70) 0.70 (0.20) 0.90	Very soft dark brown slightly clayey amorphous PEAT with roots Very soft light brown slightly clayey pseudo fibrous PEAT with roots Very soft grey slightly sandy gravelly clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		
2.00 2.00	B T			122.94	2.00 (2.50)	Very soft grey slightly sandy gravelly silty CLAY with many cobbles and boulders		∇_1

Seepage(1) at 3.80m.

Plan	Remarks Groundwater encountered at 3.80m BGL; Seepage Trial pit unstable; side walls collapsed Trial pit backfilled upon completion		
	Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-14



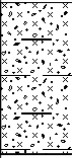
Machine : 12 Tonne tracked excavator		Dimensions 4.00m x 1.00m x 4.50m (L x W x D)		Ground Level (mOD) 126.79		Client Bord na Móna		Job Number 11947-06-22	
Method : Trial Pit		Location 623710.9 E 657596.2 N		Dates 18/07/2022		Engineer Fehily Timoney		Sheet 1/2	

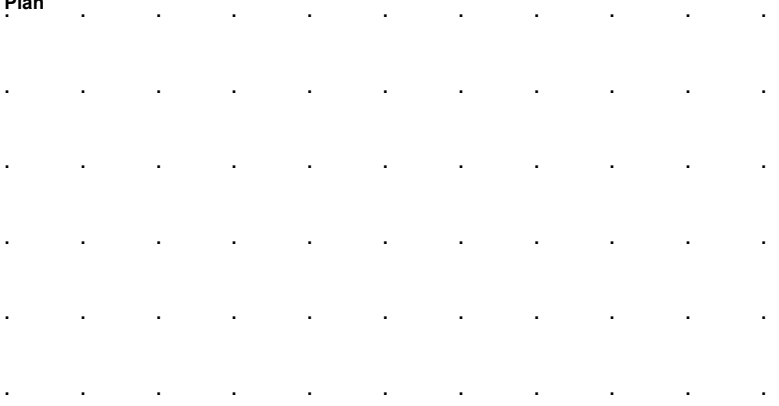
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B				(1.40)	Very soft dark brown slightly clayey pseudo fibrous PEAT with roots		
1.50	B		Seepage(1) at 1.40m.	125.39	1.40	Very soft grey slightly sandy slightly gravelly clayey SILT with occasional cobbles and boulders. Silt oozing when in contact with water		▽1
1.50	T				(1.60)			
				123.79	3.00	Very soft grey slightly sandy slightly gravelly clayey SILT with some subangular to subrounded cobbles and occasional boulders		
					(1.50)			

Plan				Remarks					
<p>Groundwater encountered at 1.40m BGL; Seepage Trial pit unstable; side walls collapsed Trial pit backfilled upon completion</p>									
				Scale (approx)		Logged By		Figure No.	
				1:25		CMP		11947-06-22.TP-15	



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.00m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 126.79	Client Bord na Móna	Job Number 11947-06-22
	Location 623710.9 E 657596.2 N	Dates 18/07/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				122.29	4.50	Complete at 4.50m		

Plan 	Remarks 		
	Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-15



Machine : 12 Tonne tracked excavator Method : Trial Pit		Dimensions 4.60m x 1.00m x 4.00m (L x W x D)	Ground Level (mOD) 125.90	Client Bord na Móna	Job Number 11947-06-22
		Location 622867.9 E 659455.4 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				121.90	4.00	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains and tree trunks/limbs		
			Seepage(1) at 3.60m.			Terminated due to maximum excavator reach. Pit completed on slight incline.		

Plan	Remarks	
	Groundwater encountered at 3.60m BGL; Seepage Trial pit stable Trial pit backfilled upon completion	
	Scale (approx) 1:25	Logged By CMP
	Figure No. 11947-06-22.TP-21	



Machine : 12 Tonne tracked excavator
Method : Trial Pit

Dimensions
4.00m x 1.00m x 3.00m
(L x W x D)

Ground Level (mOD)
126.78

Client
Bord na Móna

Job Number
11947-06-22

Location
622996.3 E 659400.5 N

Dates
29/08/2022

Engineer
Fehily Timoney

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.50 1.50	B T		Seepage(1) at 1.90m.	123.78	(3.00) 3.00	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains Terminated at 3.00m		

Plan										
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Remarks
Groundwater encountered at 1.90m BGL; Seepage
Trial pit unstable; side walls collapsed
Trial pit backfilled upon completion

Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-23
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Machine : 12 Tonne tracked excavator
Method : Trial Pit

Dimensions
4.60m x 1.00m x 4.50m
(L x W x D)

Ground Level (mOD)
125.40

Client
Bord na Móna

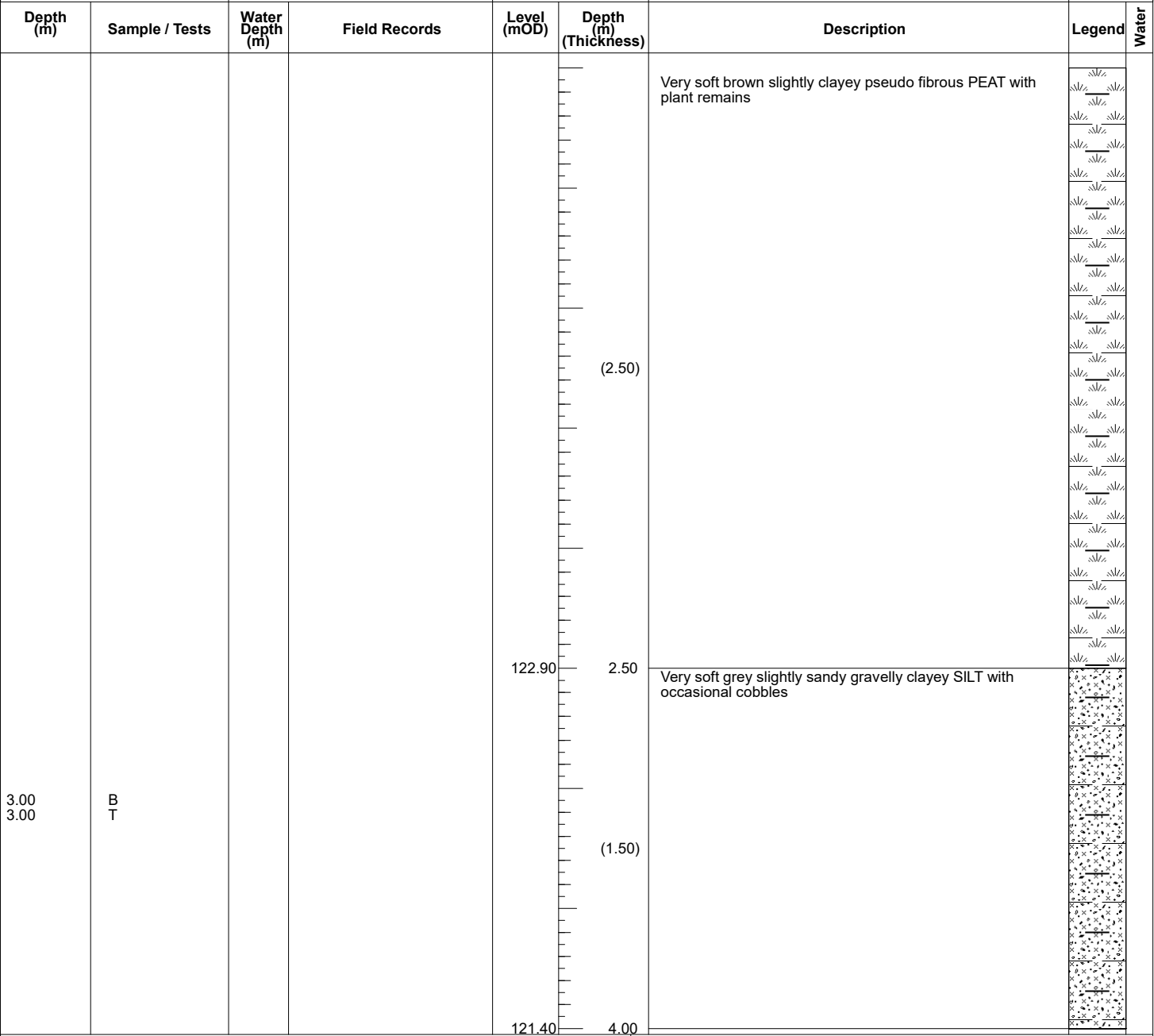
Job Number
11947-06-22

Location
622959.3 E 659492.4 N

Dates
29/08/2022

Engineer
Fehily Timoney

Sheet
1/2



Plan
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Remarks

Groundwater encountered at 4.10m and 4.50m BGL; Both Seepage
Trial pit stable
Trial pit backfilled upon completion

Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-24
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Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.60m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 125.40	Client Bord na Móna	Job Number 11947-06-22
	Location 622959.3 E 659492.4 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50	B T		Seepage(1) at 4.10m.	120.90	(0.50)	Grey slightly sandy slightly silty clayey subangular to subrounded fine to coarse GRAVEL with occasional cobbles and boulders Complete at 4.50m		▽1
4.50			Seepage(2) at 4.50m.		4.50				▽2

Plan .	Remarks 	
		Scale (approx) 1:25



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.70m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 126.71	Client Bord na Móna	Job Number 11947-06-22
	Location 623065.3 E 659379.2 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						POSSIBLE MADE GROUND: Very soft dark brown slightly clayey amorphous Peat with occasional boulders		
				125.41	1.30	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains and tree trunks/limbs		
2.70 2.70	B T				(1.80)			
				123.61	3.10	Very soft grey slightly silty sandy gravelly CLAY with occasional cobbles		
3.50 3.50	B T				(0.90)			
				122.71	4.00			

Plan .	Remarks Groundwater encountered at 4.50m BGL; Seepage Trial pit stable Trial pit backfilled upon completion
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Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-26
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Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.70m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 126.71	Client Bord na Móna	Job Number 11947-06-22
	Location 623065.3 E 659379.2 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T		Seepage(1) at 4.50m.	122.21	(0.50) 4.50	Very soft grey slightly silty slightly sandy gravelly CLAY with occasional cobbles and boulders Complete at 4.50m		√1

Plan .	Remarks 	
		Scale (approx) 1:25



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.90m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 125.47	Client Bord na Móna	Job Number 11947-06-22
	Location 622945.6 E 659545.3 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.50 2.50	B T			123.27	(2.20) 2.20	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains and tree trunks/limbs		
3.50 3.50	B T			121.97	(1.30) 3.50	Very soft grey slightly sandy gravelly clayey SILT with occasional cobbles		
						Very soft grey slightly silty slightly sandy gravelly CLAY with occasional cobbles		

Plan .	Remarks Groundwater encountered at 4.20m BGL; Seepage Trial pit stable Trial pit backfilled upon completion	
		Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-27



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.90m x 1.00m x 4.50m (L x W x D)	Ground Level (mOD) 125.47	Client Bord na Móna	Job Number 11947-06-22
	Location 622945.6 E 659545.3 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Seepage(1) at 4.20m.		(1.00)			∇1
				120.97	4.50	Complete at 4.50m		

Plan 	Remarks 		
	Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-27



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.50m x 1.00m x 3.60m (L x W x D)	Ground Level (mOD) 125.15	Client Bord na Móna	Job Number 11947-06-22
	Location 622870.3 E 659661.1 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.00 2.00	B T			124.85	(0.30)	Very soft dark brown slightly clayey amorphous PEAT		
					0.30	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains and tree limbs/trunks		
3.00 3.00	B T		Seepage(1) at 2.70m. Medium Ingress(2) at 3.00m.	123.45	(1.40)	Very soft to soft grey slightly sandy clayey gravelly SILT with occasional cobbles and boulders		
					1.70				Grey slightly sandy silty clayey subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders
				122.55	2.60			
				121.55	3.60	Complete at 3.60m		

Plan .	Remarks Groundwater encountered at 2.70m and 3.00m BGL; Seepage and Medium Ingress Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>11947-06-22.TP-28</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	11947-06-22.TP-28				



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.50m x 1.00m x 3.00m (L x W x D)	Ground Level (mOD) 124.40	Client Bord na Móna	Job Number 11947-06-22
	Location 622810.5 E 659582.8 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
3.00 3.00	B T			121.90 121.40	(2.50) (0.50) 3.00	Very soft brown slightly clayey pseudo fibrous PEAT with plant remains and tree limbs/trunks Firm bluish grey slightly sandy slightly gravelly silty CLAY with occasional cobbles and boulders Terminated at 3.00m		

Plan .	Remarks No groundwater encountered Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>11947-06-22.TP-29</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	11947-06-22.TP-29				



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.60m x 1.00m x 4.00m (L x W x D)	Ground Level (mOD) 125.50	Client Bord na Móna	Job Number 11947-06-22
	Location 622865.1 E 659507.2 N	Dates 29/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Very soft brown slightly clayey pseudo fibrous PEAT with plant remains and tree limbs/trunks		
					(3.80)			
				121.70	3.80	Firm bluish grey slightly sandy slightly gravelly silty CLAY with occasional cobbles		
				121.50	4.00			

Plan								

Remarks

No groundwater encountered
Trial pit stable
Trial pit backfilled upon completion

Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-30
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Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.60m x 2.00m x 0.90m (L x W x D)	Ground Level (mOD) 123.96	Client Bord na Móna	Job Number 11947-06-22
	Location 623032.3 E 660688.2 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.70 0.70	B T			123.46	0.50 (0.50)	Very soft dark brown slightly clayey amorphous PEAT with roots		
				123.06	0.90 (0.40)	Soft to firm grey mottled light brown slightly sandy slightly gravelly silty CLAY with occasional cobbles and rare boulders		
						Obstruction: Presumed bedrock/boulders		
						Terminated at 0.90m		

Plan .	Remarks No groundwater encountered Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>11947-06-22.TP-03</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	11947-06-22.TP-03				



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 4.90m x 1.00m x 3.30m (L x W x D)	Ground Level (mOD) 124.32	Client Bord na Móna	Job Number 11947-06-22
	Location 623001.4 E 660643.5 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.00 2.00	B T			123.32	1.00	Very soft brown slightly clayey pseudo fibrous PEAT with roots, plant remains and tree limbs/trunks		
					(1.10)	Soft to firm grey slightly sandy slightly gravelly silty CLAY with occasional cobbles and boulders		
				122.22	2.10	Grey slightly clayey slightly silty sandy subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders		
					(1.20)			
3.00 3.00	B T			121.02	3.30	Obstruction: Presumed bedrock/boulders Terminated at 3.30m		

Plan	Remarks							
	No groundwater encountered Trial pit stable Trial pit backfilled upon completion							
	Scale (approx)		Logged By			Figure No.		
	1:25		CMP			11947-06-22.TP-32		



Machine : 12 Tonne tracked excavator
Method : Trial Pit

Dimensions
5.20m x 1.00m x 2.10m
(L x W x D)

Ground Level (mOD)
122.59

Client
Bord na Móna

Job Number
11947-06-22

Location
622965.5 E 660742.1 N

Dates
30/08/2022

Engineer
Fehily Timoney

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00	B T		Medium Ingress(1) at 1.20m.	121.99	0.60 (0.60)	Very soft dark brown slightly clayey amorphous PEAT with roots		V1
1.00		Soft to firm grey slightly sandy slightly gravelly silty CLAY with occasional cobbles and boulders						
		121.39			1.20 (0.90)	Grey slightly clayey slightly silty sandy subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders		
						Obstruction: Presumed bedrock/boulders		
				120.49	2.10	Complete at 2.10m		

Plan	Remarks	
.	Groundwater encountered at 1.20m BGL; Medium Ingress	
.	Trial pit stable	
.	Trial pit backfilled upon completion	
.	Scale (approx)	Logged By
.	1:25	CMP
		Figure No.
		11947-06-22.TP-33



Machine : 12 Tonne tracked excavator Method : Trial Pit	Dimensions 5.00m x 1.00m x 1.90m (L x W x D)	Ground Level (mOD) 122.73	Client Bord na Móna	Job Number 11947-06-22
	Location 623095.1 E 660652.6 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T			122.23	0.50	Very soft dark brown slightly clayey amorphous PEAT with roots		
				121.43	0.80	Soft to firm light brown mottled grey slightly sandy slightly gravelly silty CLAY with occasional cobbles		
			Medium Ingress(1) at 1.70m.	120.83	1.30	Grey slightly sandy slightly clayey slightly silty subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders		∇ ₁
1.90 1.90	B T				1.90	Obstruction: Presumed bedrock/boulders		
						Complete at 1.90m		

Plan .	Remarks Groundwater encountered at 1.70m BGL; Medium Ingress Trial pit stable Trial pit backfilled upon completion		
	<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By CMP</td> <td>Figure No. 11947-06-22.TP-34</td> </tr> </table>	Scale (approx) 1:25	Logged By CMP
Scale (approx) 1:25	Logged By CMP	Figure No. 11947-06-22.TP-34	



Machine : 12 Tonne tracked excavator	Dimensions 5.10m x 1.00m x 3.30m (L x W x D)	Ground Level (mOD) 122.85	Client Bord na Móna	Job Number 11947-06-22
Method : Trial Pit	Location 623093.1 E 660741.8 N	Dates 30/08/2022	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.70 2.70	B T		Fast Ingress(1) at 3.10m.	122.05	(0.80)	Very soft dark brown slightly clayey amorphous PEAT with roots		
					0.80	Very soft brown slightly clayey pseudo fibrous PEAT		
					(1.70)			
					2.50	Grey slightly clayey gravelly silty fine to coarse SAND with occasional cobbles		
				119.75	(0.20)	Grey slightly sandy slightly clayey slightly silty subangular to subrounded fine to coarse GRAVEL with many cobbles and boulders		▽1
				119.55	3.30	Complete at 3.30m		

Plan	Remarks		
.	Groundwater encountered at 3.10m BGL; Fast Ingress		
.	Trial pit stable		
.	Trial pit backfilled upon completion		
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.			
.			
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.			
	Scale (approx)	Logged By	Figure No.
	1:25	CMP	11947-06-22.TP-35

Littleton Wind Farm – Trial Pit Photographs

TP-01



TP-01



Littleton Wind Farm – Trial Pit Photographs

TP-01



TP-01



Littleton Wind Farm – Trial Pit Photographs

TP-01



Littleton Wind Farm – Trial Pit Photographs

TP-02



TP-02



Littleton Wind Farm – Trial Pit Photographs

TP-02



TP-02



Littleton Wind Farm – Trial Pit Photographs

TP-02



Littleton Wind Farm – Trial Pit Photographs

TP-03



TP-03



Littleton Wind Farm – Trial Pit Photographs

TP-03



TP-03



Littleton Wind Farm – Trial Pit Photographs

TP-03



Littleton Wind Farm – Trial Pit Photographs

TP-04



TP-04



Littleton Wind Farm – Trial Pit Photographs

TP-04



TP-04



Littleton Wind Farm – Trial Pit Photographs

TP-04



Littleton Wind Farm – Trial Pit Photographs

TP-05



TP-05



Littleton Wind Farm – Trial Pit Photographs

TP-05



TP-05



Littleton Wind Farm – Trial Pit Photographs

TP-05



Littleton Wind Farm – Trial Pit Photographs

TP-06



TP-06



Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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Littleton Wind Farm – Trial Pit Photographs

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TP-35



Littleton Wind Farm – Trial Pit Photographs

TP-35



APPENDIX 3 – Laboratory Testing



Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland



Attention : James Cashen
Date : 12th August, 2022
Your reference : 11947-06-22
Our reference : Test Report 22/12848 Batch 1
Location : Littleton Wind Farm
Date samples received : 9th August, 2022
Status : Final Report
Issue : 1

Seven samples were received for analysis on 9th August, 2022 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Liza Klebe

Project Co-ordinator

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/12848

SOILS and ASH

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

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

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

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

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

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

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

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

EMT Job No: 22/12848

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes

Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland



Attention : James Cashen
Date : 29th September, 2022
Your reference : 11947-06-22
Our reference : Test Report 22/15269 Batch 1
Location : Littleton Wind Farm
Date samples received : 20th September, 2022
Status : Final Report
Issue : 1

Six samples were received for analysis on 20th September, 2022 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/15269

SOILS and ASH

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

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

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

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

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

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

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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DEVIATING SAMPLES

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SURROGATES

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

DILUTIONS

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

BLANKS

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

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
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ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

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

EMT Job No: 22/15269

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH ₄ ⁺ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH ₄ ⁺ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes



LABORATORY REPORT



4043

Contract Number: PSL22/5677

Report Date: 27 September 2022
Client's Reference: 11947-06-22
Client Name: Ground Investigations Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: James Cashen

Contract Title: Littleton Wind Farm
Date Received: 31/8/2022
Date Commenced: 31/8/2022
Date Completed: 26/09/2022

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.

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP-04		B	2.50		Grey slightly sandy gravelly CLAY.
TP-05		B	1.50		Grey slightly sandy gravelly CLAY.
TP-05		B	3.00		Brown silty slightly sandy GRAVEL.
TP-06		B	4.00		Brown sandy gravelly CLAY.
TP-07		B	2.00		Grey slightly sandy gravelly CLAY.
TP-07		B	3.50		Grey slightly sandy gravelly CLAY.
TP-08		B	2.50		Brown sandy gravelly CLAY.
TP-08		B	4.50		Grey sandy slightly gravelly CLAY.
TP-09		B	1.70		Grey sandy gravelly CLAY.
TP-09		B	2.70		Brown sandy GRAVEL.
TP-10		B	3.00		Brown slightly gravelly sandy CLAY.
TP-11		B	3.50		Brown sandy slightly gravelly CLAY.
TP-11		B	4.50		Brown sandy slightly gravelly CLAY.
TP-12		B	2.00		Brown sandy GRAVEL.
TP-13		B	1.00		Brown silty sandy GRAVEL.
TP-14		B	2.00		Brown sandy gravelly CLAY.
TP-14		B	4.50		Brown sandy gravelly CLAY.
TP-15		B	0.50		Dark brown PEAT.
TP-15		B	1.50		Brown slightly sandy slightly gravelly CLAY.



4043

PSL

Professional Soils Laboratory

Littleton Wind Farm

Contract No:

PSL22/5677

Client Ref:

11947-06-22

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP-04		B	2.50		8.1			26	14	12	45	Low Plasticity CL
TP-05		B	1.50		10			24	14	10	54	Low Plasticity CL
TP-06		B	4.00		10			23	13	10	53	Low Plasticity CL
TP-07		B	2.00		6.8			24	13	11	49	Low Plasticity CL
TP-07		B	3.50		11			23	14	9	57	Low Plasticity CL
TP-08		B	2.50		8.9			25	13	12	48	Low Plasticity CL
TP-09		B	1.70		8			23	12	11	48	Low Plasticity CL
TP-09		B	2.70		13				NP			
TP-10		B	3.00		10			29	14	15	51	Low Plasticity CL
TP-11		B	3.50		8.3			26	13	13	56	Low Plasticity CL
TP-11		B	4.50		11							
TP-12		B	2.00		7							
TP-13		B	1.00		8.0							
TP-14		B	2.00		10			22	13	9	45	Low Plasticity CL
TP-14		B	4.50		10			27	14	13	55	Low Plasticity CL
TP-15		B	0.50		340							
TP-15		B	1.50		18			36	17	19	74	Intermediate Plasticity CI

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.



PSL
Professional Soils Laboratory

Littleton Wind Farm

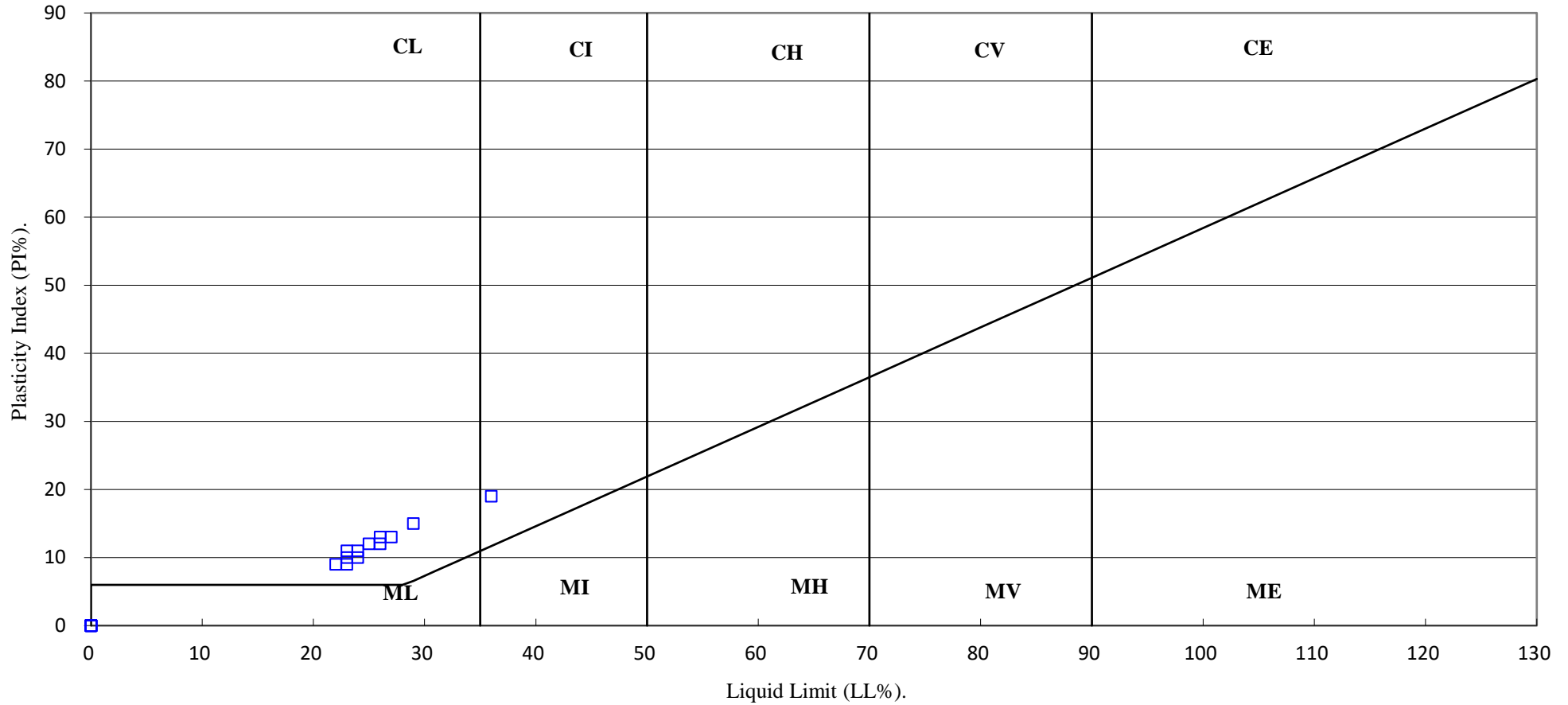
Contract No:

PSL22/5677

Client Ref:

11947-06-22

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

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Littleton Wind Farm

Contract No:

PSL22/5677

Client Ref:

11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

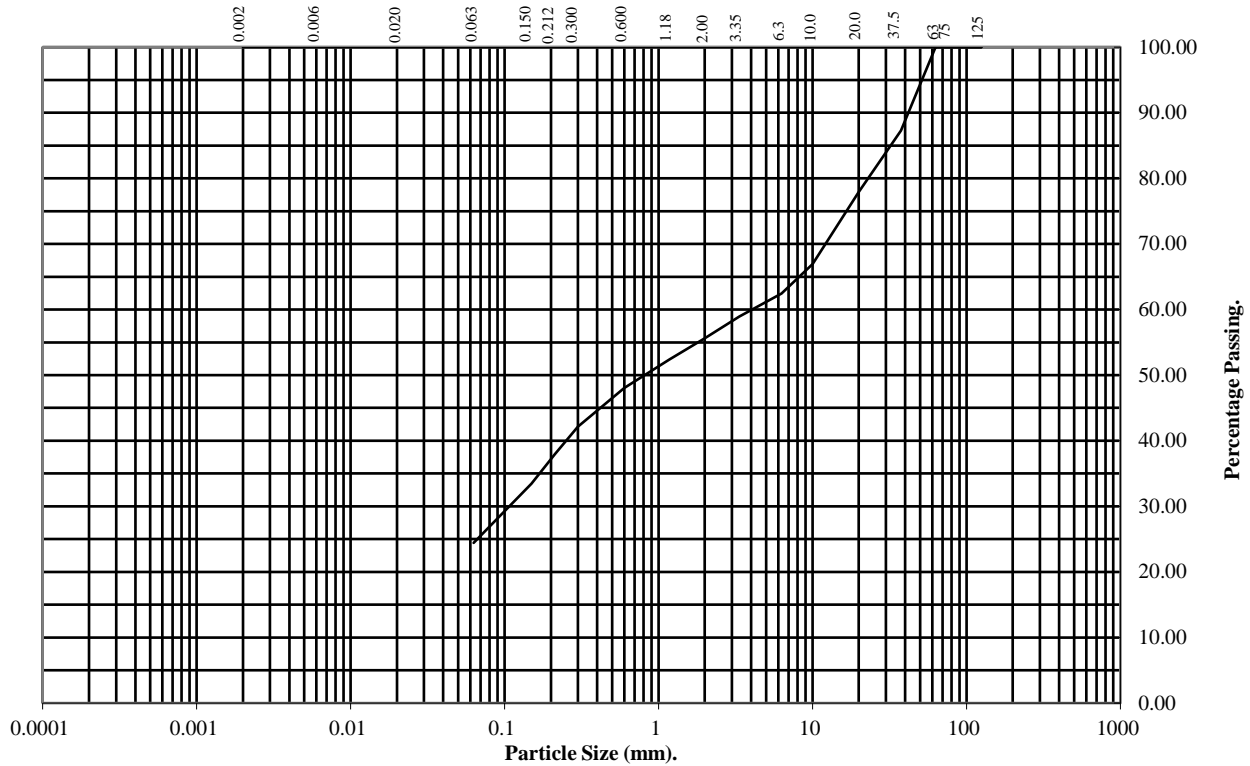
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP-04 **Top Depth (m):** 2.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	87
20	78
10	67
6.3	62
3.35	59
2	56
1.18	52
0.6	48
0.3	42
0.212	38
0.15	33
0.063	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	44
Sand	32
Silt/Clay	24

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

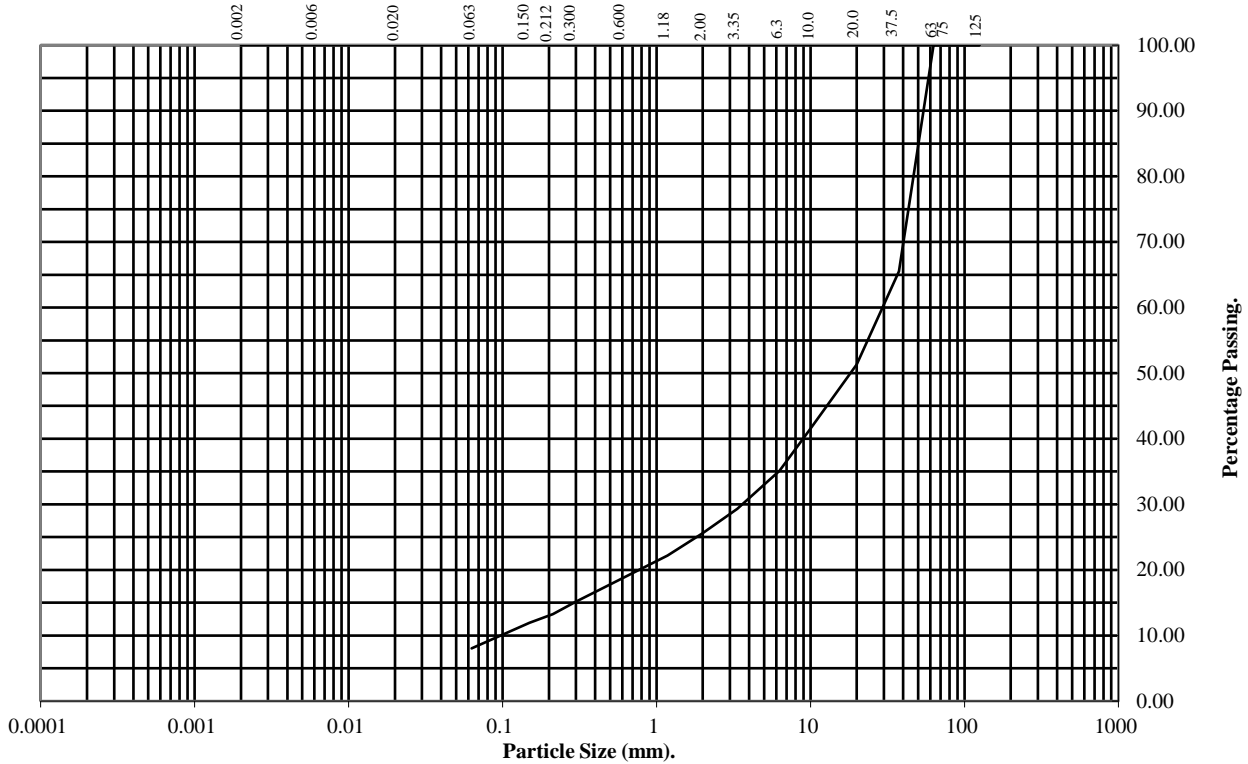
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-05** Top Depth (m): **3.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	66
20	51
10	42
6.3	35
3.35	29
2	26
1.18	22
0.6	19
0.3	15
0.212	13
0.15	12
0.063	8

Soil Fraction	Total Percentage
Cobbles	0
Gravel	74
Sand	18
Silt/Clay	8

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

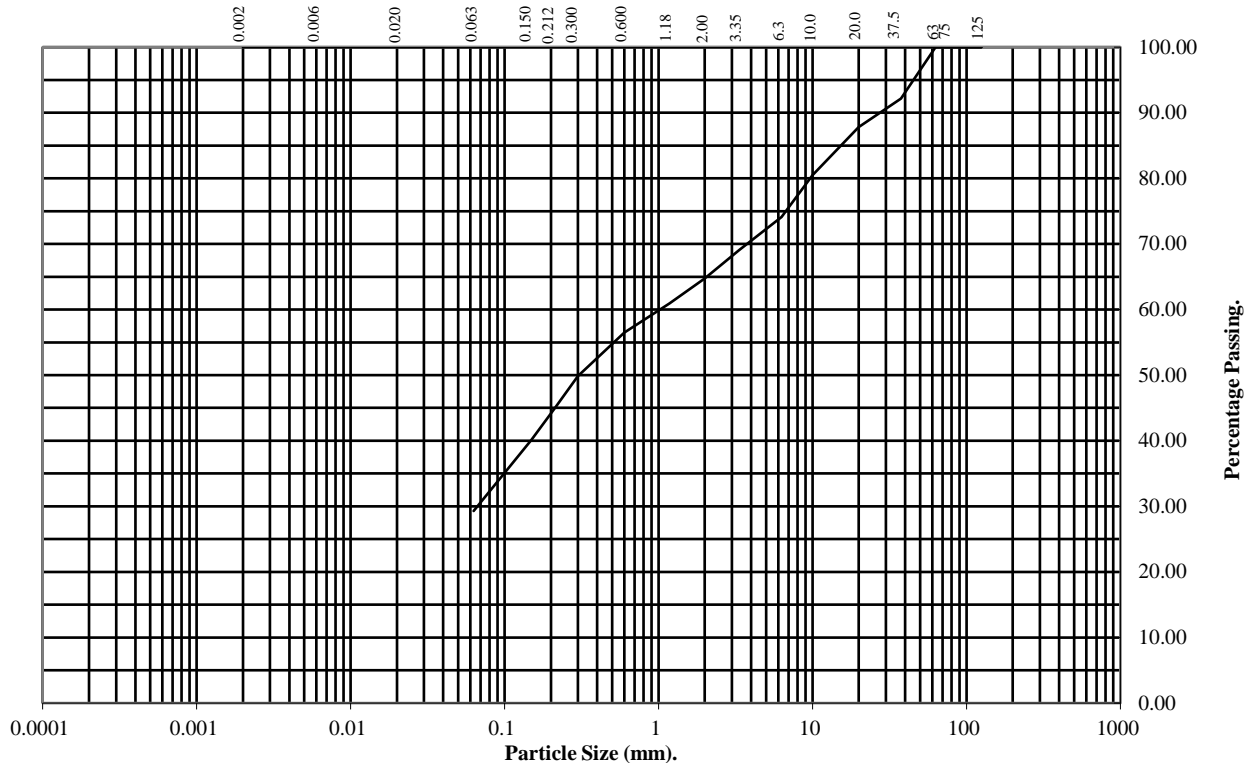
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP-06 **Top Depth (m):** 4.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	92
20	88
10	80
6.3	74
3.35	69
2	65
1.18	61
0.6	56
0.3	50
0.212	45
0.15	40
0.063	29

Soil Fraction	Total Percentage
Cobbles	0
Gravel	35
Sand	36
Silt/Clay	29

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

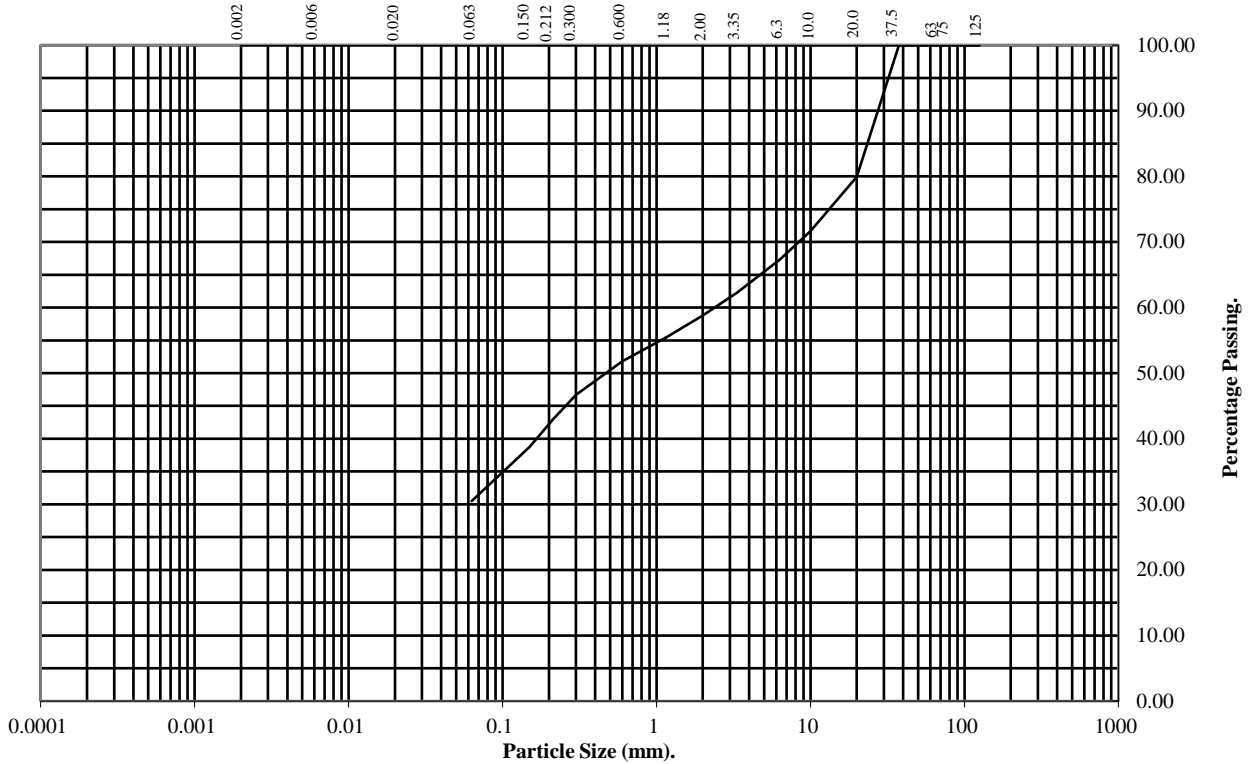
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-07** Top Depth (m): **2.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	80
10	72
6.3	67
3.35	62
2	59
1.18	56
0.6	52
0.3	47
0.212	43
0.15	39
0.063	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	41
Sand	29
Silt/Clay	30

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

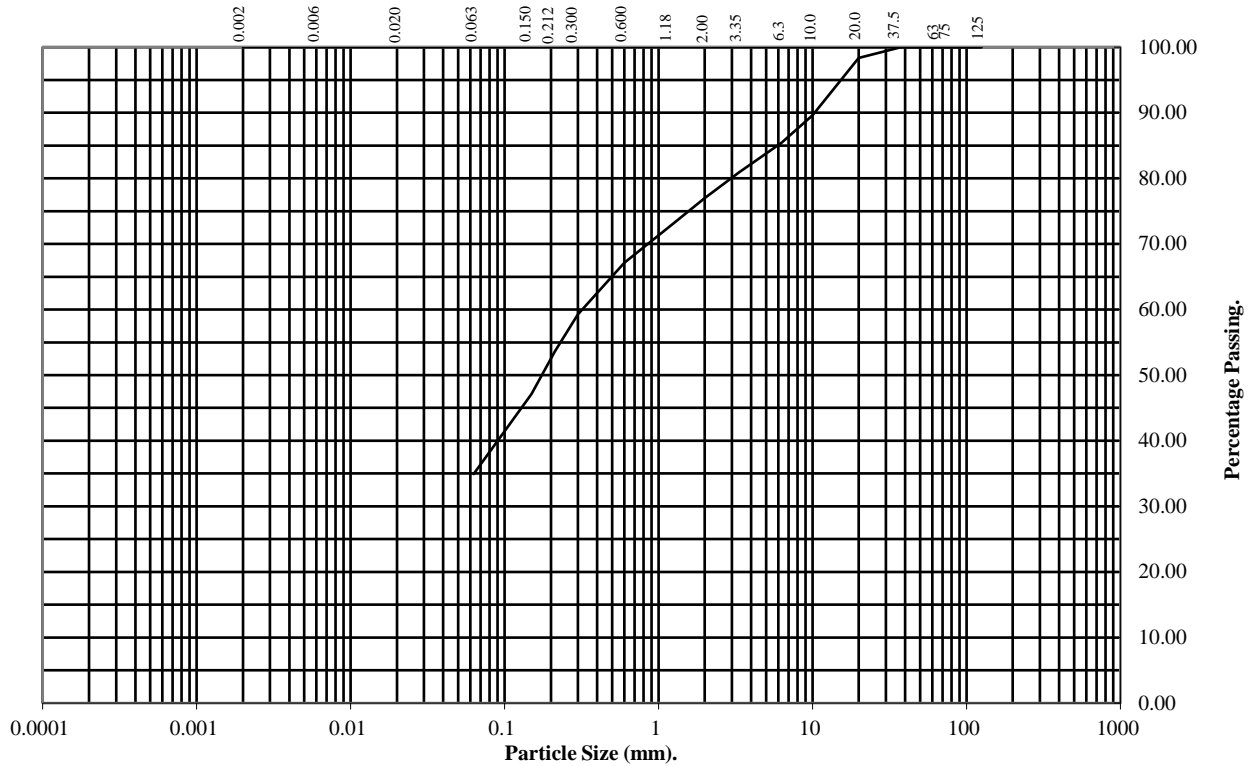
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-08** Top Depth (m): **4.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	90
6.3	85
3.35	81
2	77
1.18	73
0.6	67
0.3	59
0.212	54
0.15	47
0.063	35

Soil Fraction	Total Percentage
Cobbles	0
Gravel	23
Sand	42
Silt/Clay	35

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

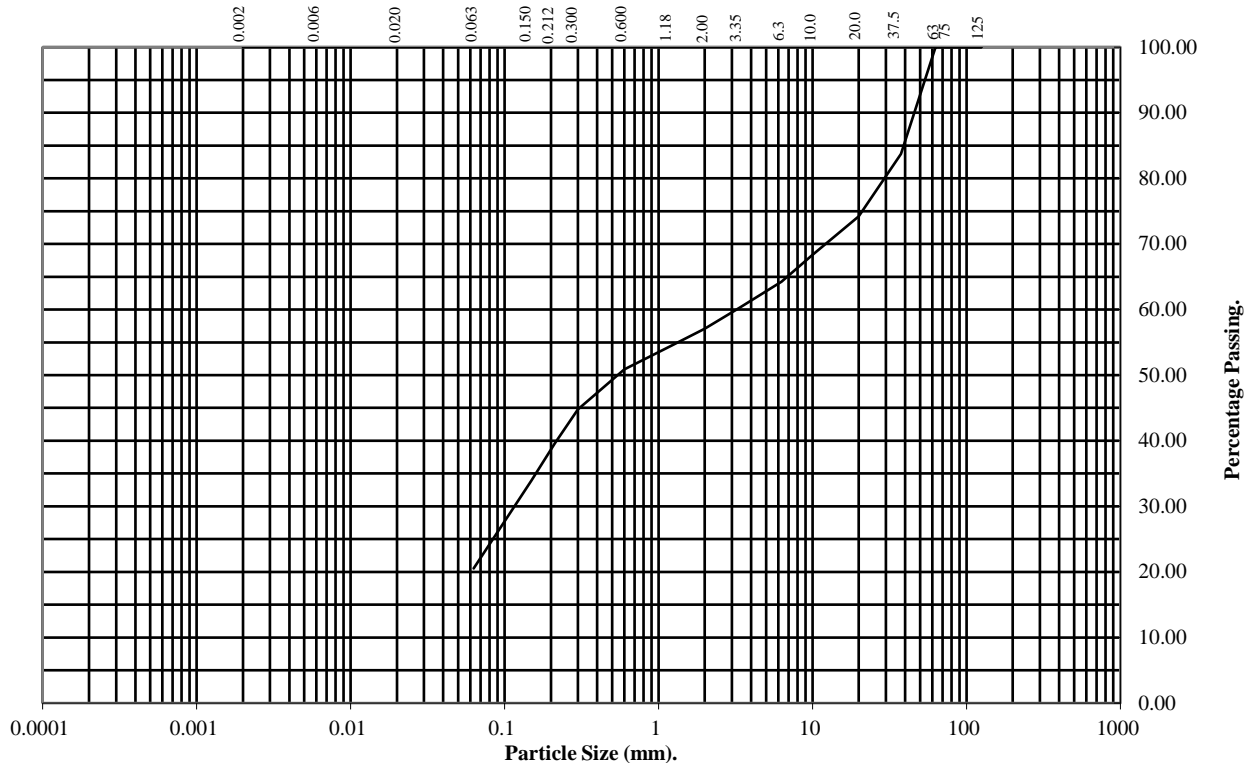
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-09** Top Depth (m): **1.70**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	84
20	74
10	68
6.3	64
3.35	60
2	57
1.18	54
0.6	51
0.3	45
0.212	40
0.15	34
0.063	21

Soil Fraction	Total Percentage
Cobbles	0
Gravel	43
Sand	36
Silt/Clay	21

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

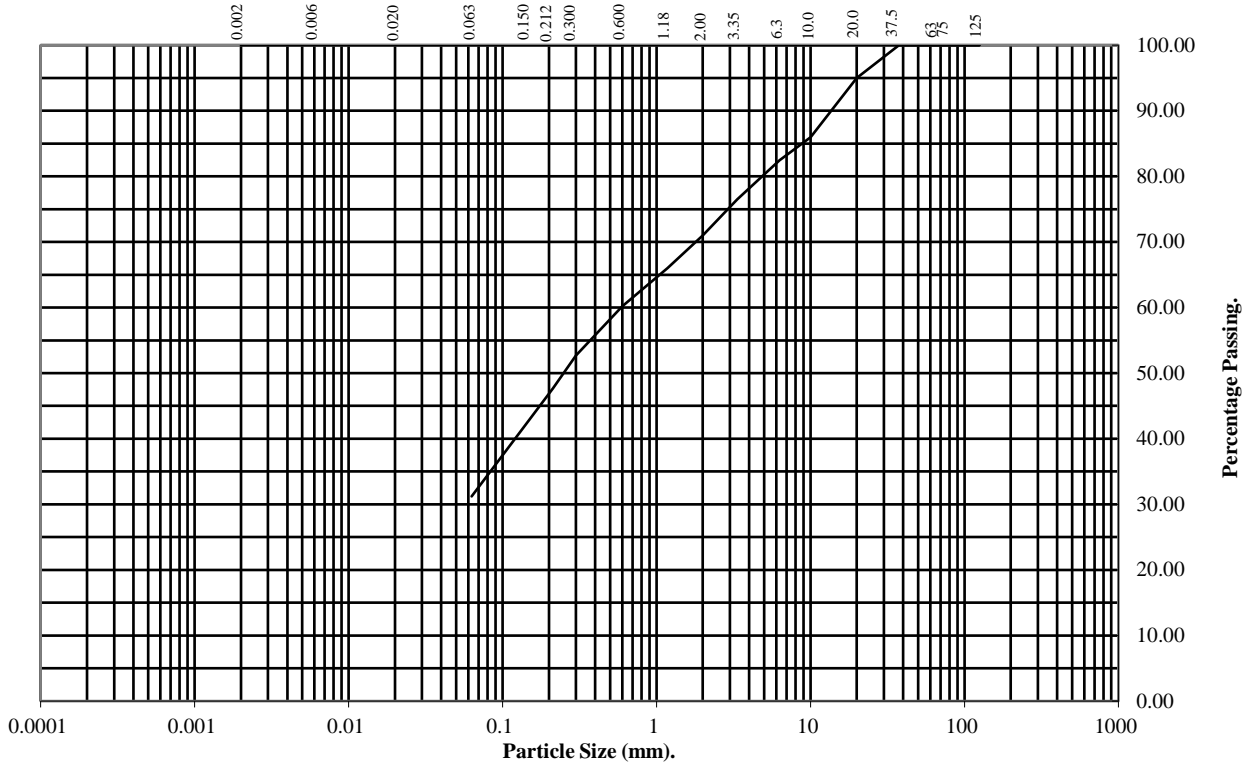
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-11** **Top Depth (m):** **3.50**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	86
6.3	82
3.35	77
2	71
1.18	66
0.6	60
0.3	53
0.212	48
0.15	43
0.063	31

Soil Fraction	Total Percentage
Cobbles	0
Gravel	29
Sand	40
Silt/Clay	31

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

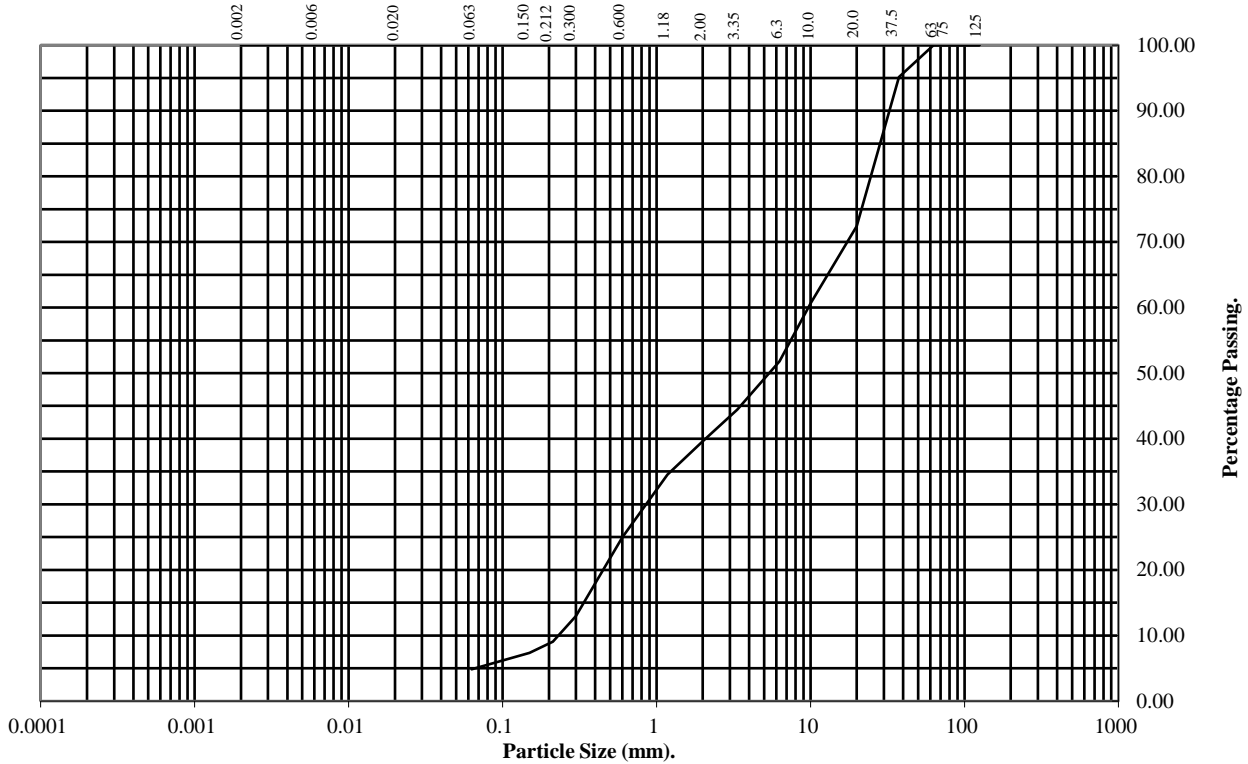
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-13** Top Depth (m): **1.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	72
10	61
6.3	52
3.35	44
2	40
1.18	35
0.6	25
0.3	13
0.212	9
0.15	7
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	60
Sand	35
Silt/Clay	5

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/5677
Client Ref:
11947-06-22

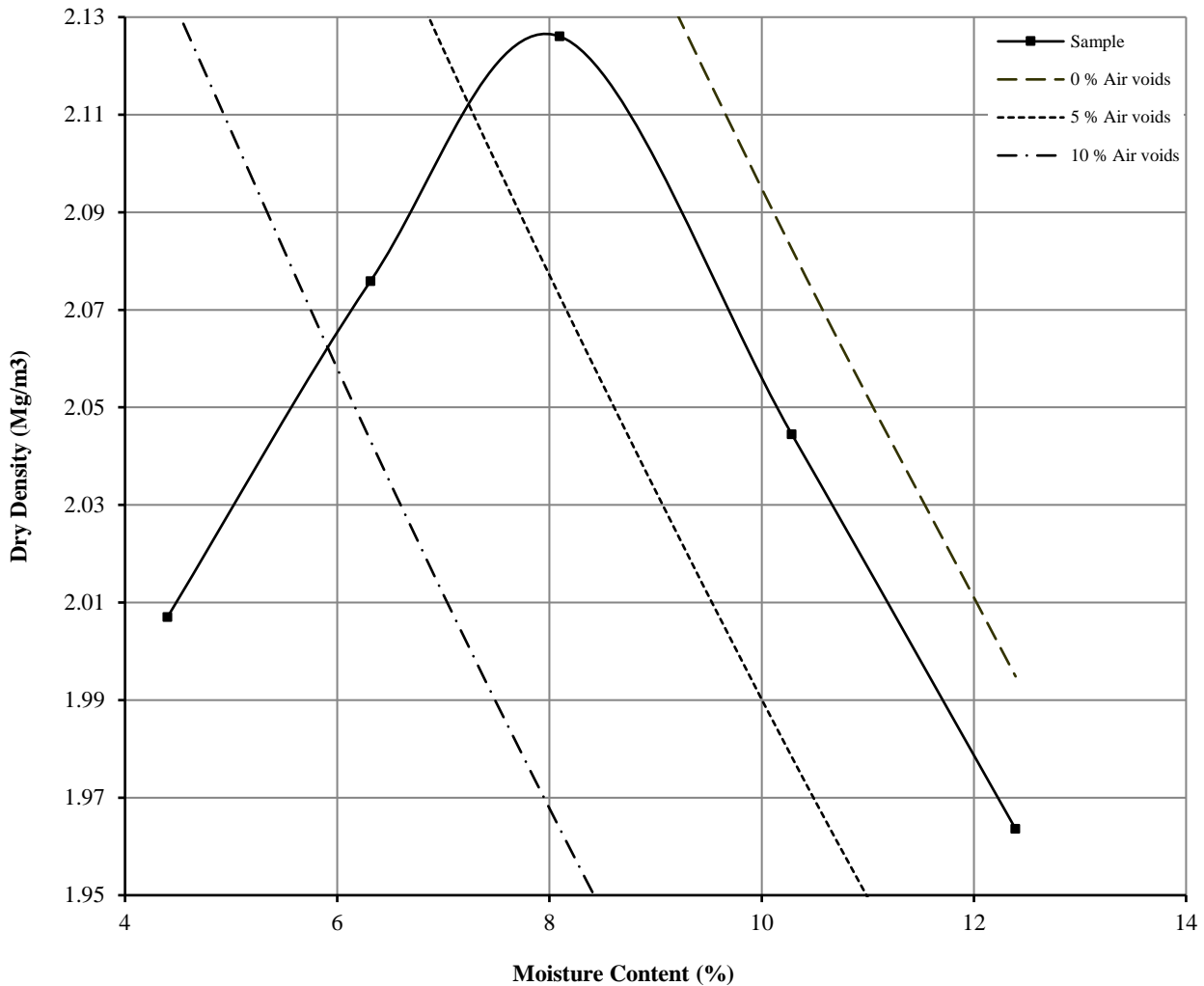
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: **TP-09** Top Depth (m) : **1.70**

Sample Number: Base Depth (m) :

Sample Type: **B**



Initial Moisture Content:	8.1	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	9
Maximum Dry Density (Mg/m ³):	2.13	Material Retained on 20.0 mm Test Sieve (%):	14	
Optimum Moisture Content (%):	8			
Remarks See summary of soil descriptions				



Littleton Wind Farm

Contract
PSL22/5677
Client Ref
11947-06-22

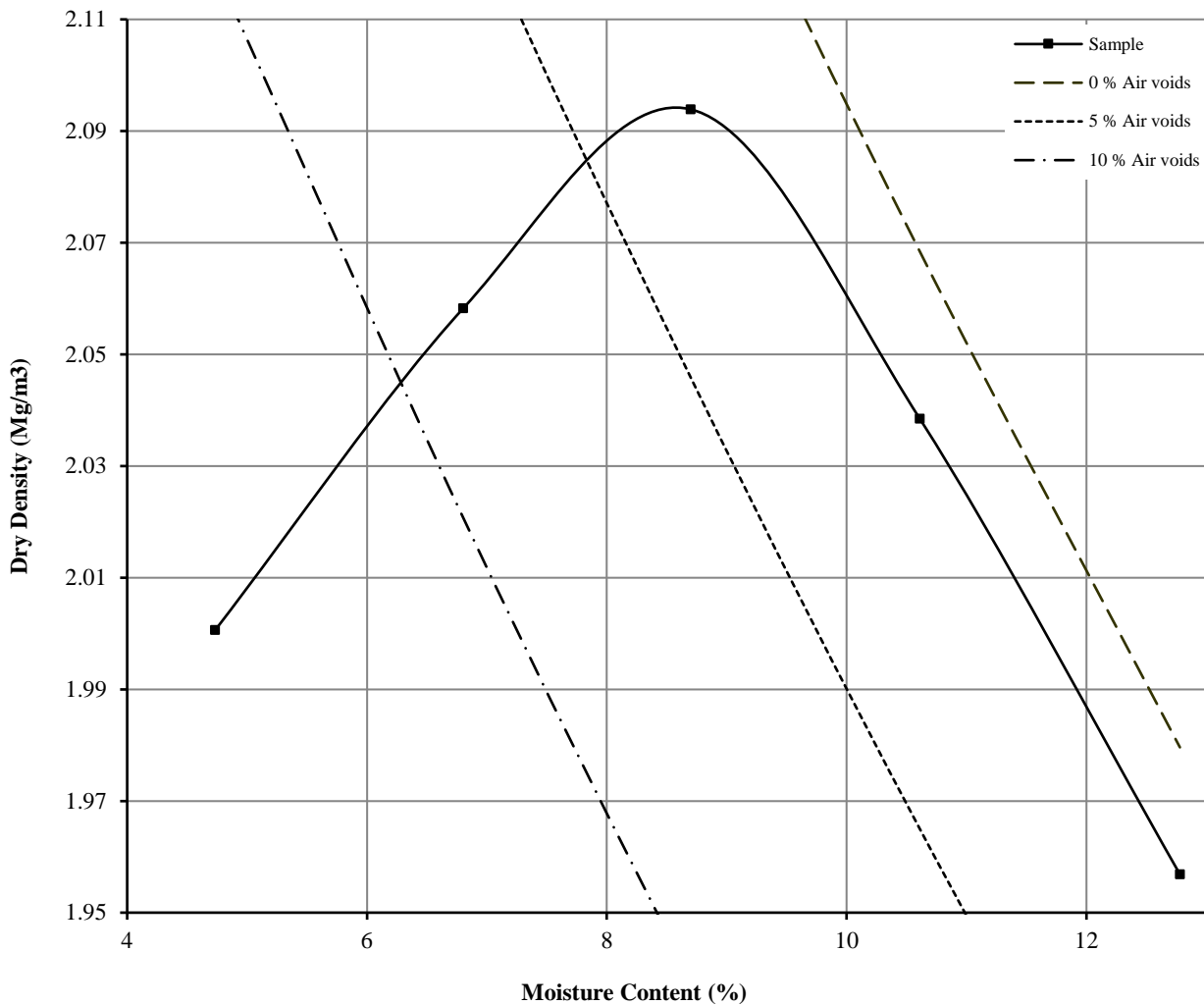
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP-10 Top Depth (m) : 3.00

Sample Number: Base Depth (m) :

Sample Type: B



Initial Moisture Content:	8.1	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	9
Maximum Dry Density (Mg/m ³):	2.09	Material Retained on 20.0 mm Test Sieve (%):	14	
Optimum Moisture Content (%):	9			
Remarks See summary of soil descriptions				



Littleton Wind Farm

Contract
PSL22/5677
Client Ref
11947-06-22



LABORATORY REPORT



4043

Contract Number: PSL22/6090

Report Date: 13 October 2022
Client's Reference: 11947-06-22
Client Name: Ground Investigations Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: James Cashen

Contract Title: Littleton Wind Farm
Date Received: 21/9/2022
Date Commenced: 21/9/2022
Date Completed: 13/10/2022

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.

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP-01		B&T	3.50		Grey slightly sandy CLAY.
TP-01		B&T	4.30		Grey slightly sandy gravelly CLAY with cobbles.
TP-03		B&T	1.00		Grey slightly sandy gravelly CLAY.
TP-03		B&T	3.00		Brown sandy gravelly CLAY.
TP-24		B&T	3.00		Grey sandy gravelly CLAY.
TP-26		B&T	3.50		Brown very gravelly SAND.
TP-27		B&T	2.50		Grey sandy slightly gravelly CLAY.
TP-28		B&T	2.00		Grey sandy slightly gravelly CLAY.
TP-28		B&T	3.00		Grey sandy gravelly CLAY.
TP-29		B&T	3.00		Grey slightly sandy gravelly CLAY.
TP-31		B&T	0.70		Brown sandy slightly gravelly CLAY.
TP-32		B&T	2.00		Grey slightly sandy gravelly CLAY.
TP-32		B&T	3.00		Grey mottled brown clayey sandy GRAVEL.
TP-33		B&T	1.00		Brown sandy gravelly CLAY.
TP-34		B&T	1.00		Brown sandy gravelly CLAY.
TP-35		B&T	2.70		Brown sandy gravelly CLAY.



4043

PSL

Professional Soils Laboratory

Littleton Wind Farm

Contract No:

PSL22/6090

Client Ref:

11947-06-22

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP-01		B&T	3.50		23			33	18	15	100	Low Plasticity CL
TP-03		B&T	1.00		9.0			26	14	12	54	Low Plasticity CL
TP-03		B&T	3.00		8.0			25	13	12	51	Low Plasticity CL
TP-24		B&T	3.00		13			27	14	13	54	Low Plasticity CL
TP-26		B&T	3.50		8.0				NP			
TP-27		B&T	2.50		12			25	13	12	58	Low Plasticity CL
TP-28		B&T	2.00		13			30	16	14	52	Low Plasticity CL
TP-29		B&T	3.00		21			43	22	21	57	Intermediate Plasticity CI
TP-31		B&T	0.70		16			30	15	15	90	Low Plasticity CL
TP-32		B&T	2.00		11			28	14	14	48	Low Plasticity CL
TP-33		B&T	1.00		14			26	13	13	53	Low Plasticity CL
TP-34		B&T	1.00		13			29	14	15	49	Low Plasticity CL
TP-35		B&T	2.70		12							

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.



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Professional Soils Laboratory

Littleton Wind Farm

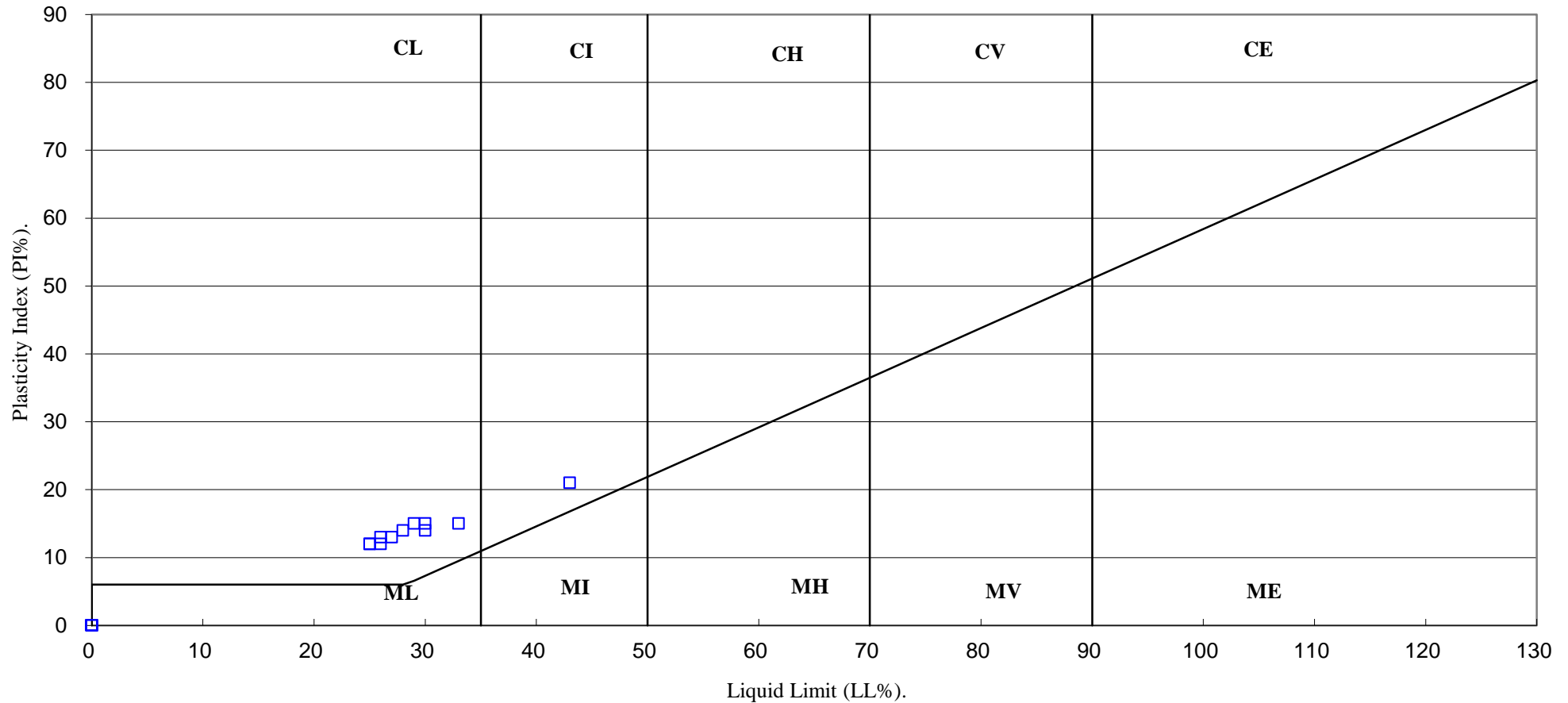
Contract No:

PSL22/6090

Client Ref:

11947-06-22

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

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Professional Soils Laboratory

Littleton Wind Farm

Contract No:

PSL22/6090

Client Ref:

11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

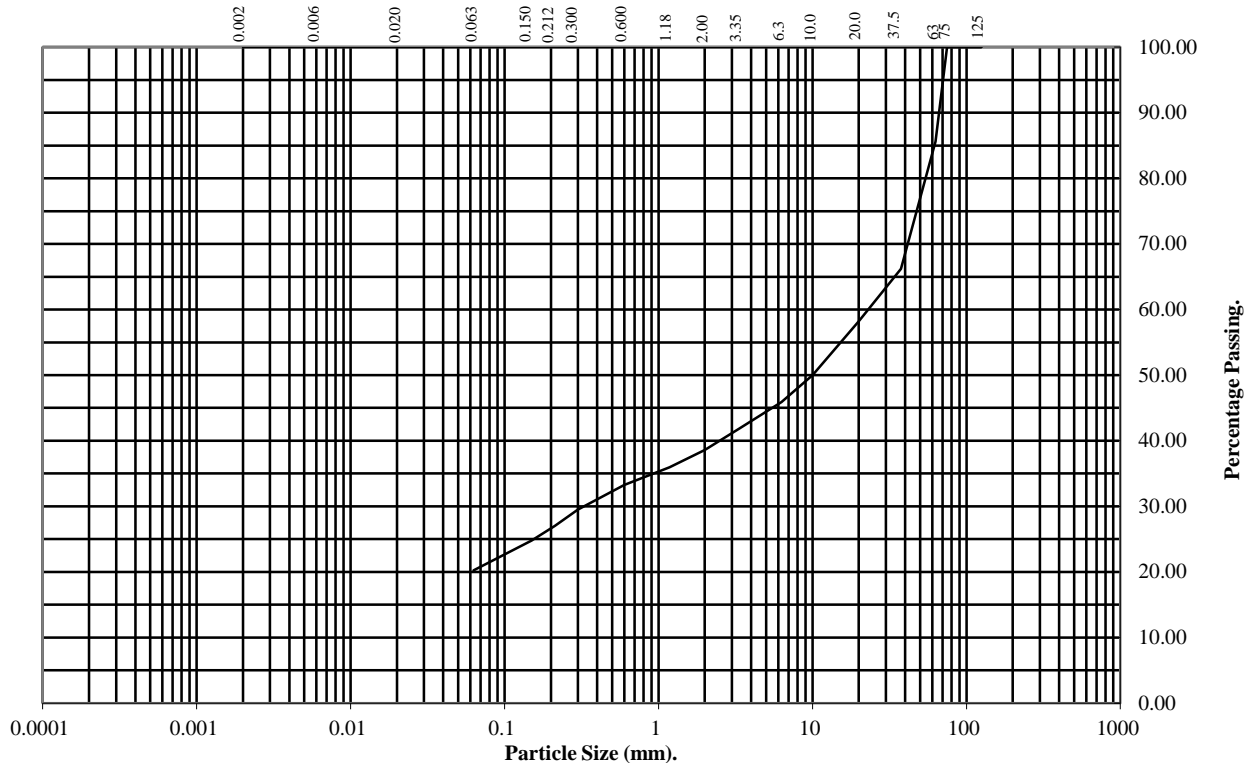
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-01** Top Depth (m): **4.30**

Sample Number: Base Depth(m):

Sample Type: **B&T**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	86
37.5	66
20	58
10	50
6.3	46
3.35	42
2	39
1.18	36
0.6	33
0.3	29
0.212	27
0.15	25
0.063	20

Soil Fraction	Total Percentage
Cobbles	14
Gravel	47
Sand	19
Silt/Clay	20

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

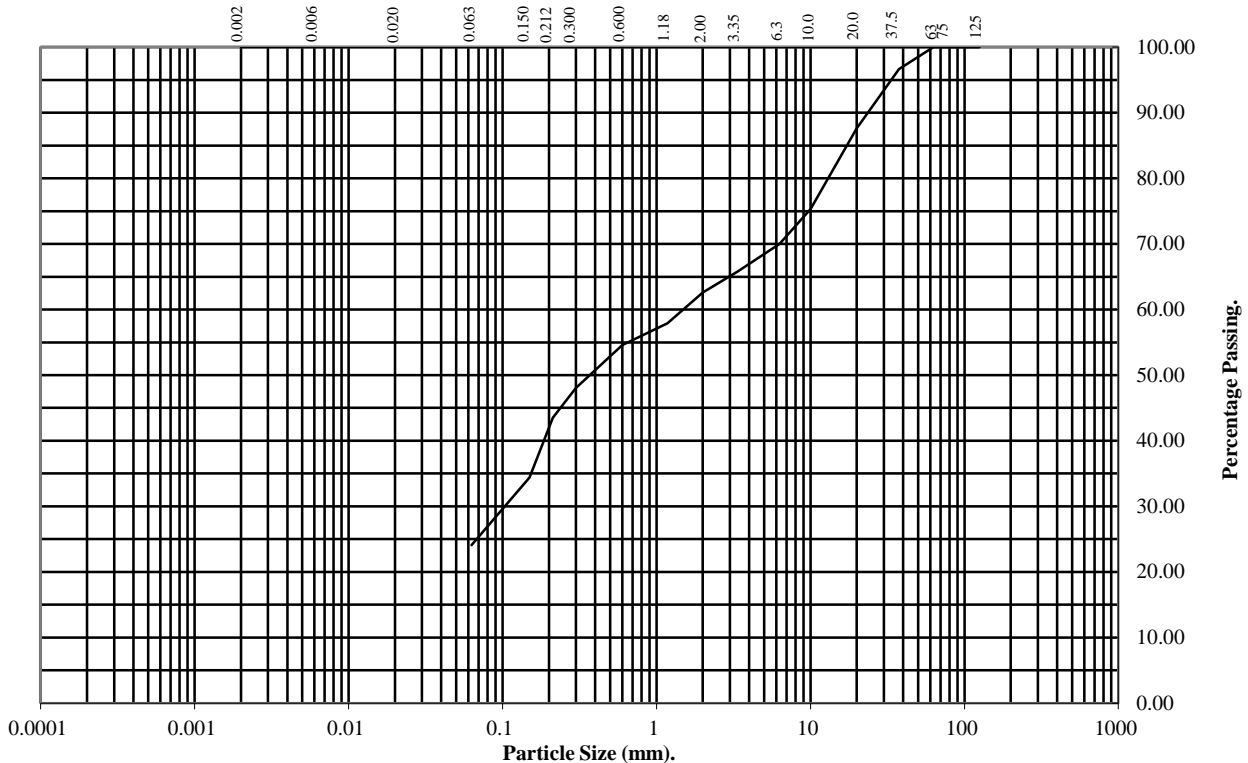
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP-03 **Top Depth (m):** 3.00

Sample Number: **Base Depth(m):**

Sample Type: B&T



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	97
20	88
10	75
6.3	70
3.35	66
2	63
1.18	58
0.6	55
0.3	48
0.212	44
0.15	34
0.063	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	37
Sand	39
Silt/Clay	24

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

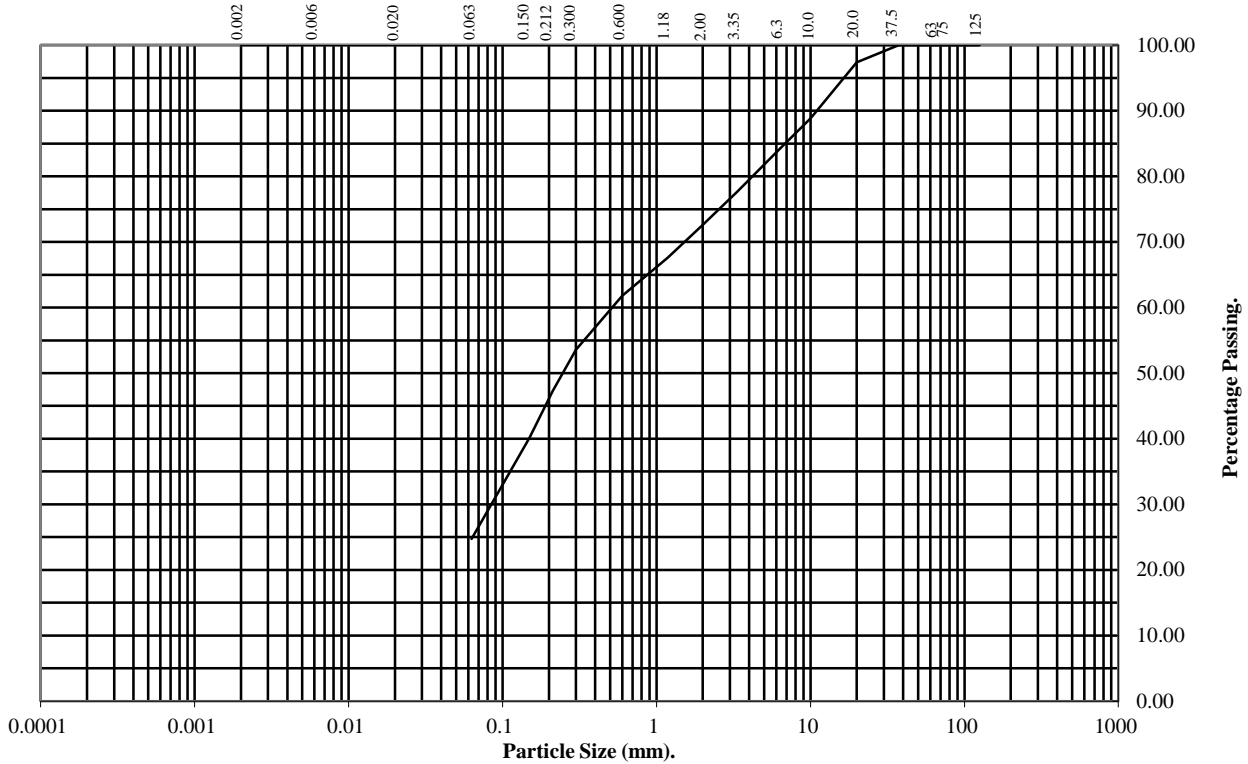
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-27** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B&T**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	89
6.3	84
3.35	78
2	73
1.18	68
0.6	62
0.3	54
0.212	47
0.15	40
0.063	25

Soil Fraction	Total Percentage
Cobbles	0
Gravel	27
Sand	48
Silt/Clay	25

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

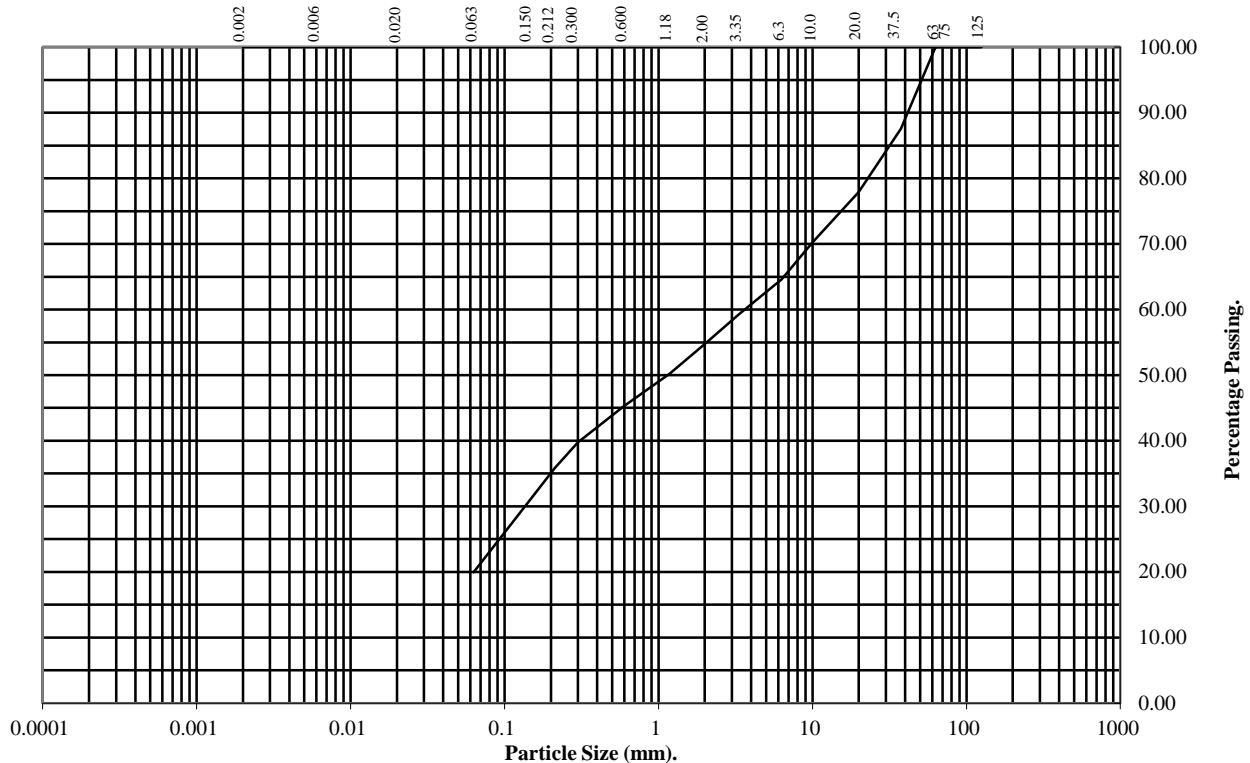
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP-28 **Top Depth (m):** 3.00

Sample Number: **Base Depth(m):**

Sample Type: B&T



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	88
20	78
10	70
6.3	65
3.35	59
2	55
1.18	50
0.6	45
0.3	40
0.212	36
0.15	31
0.063	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	45
Sand	35
Silt/Clay	20

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

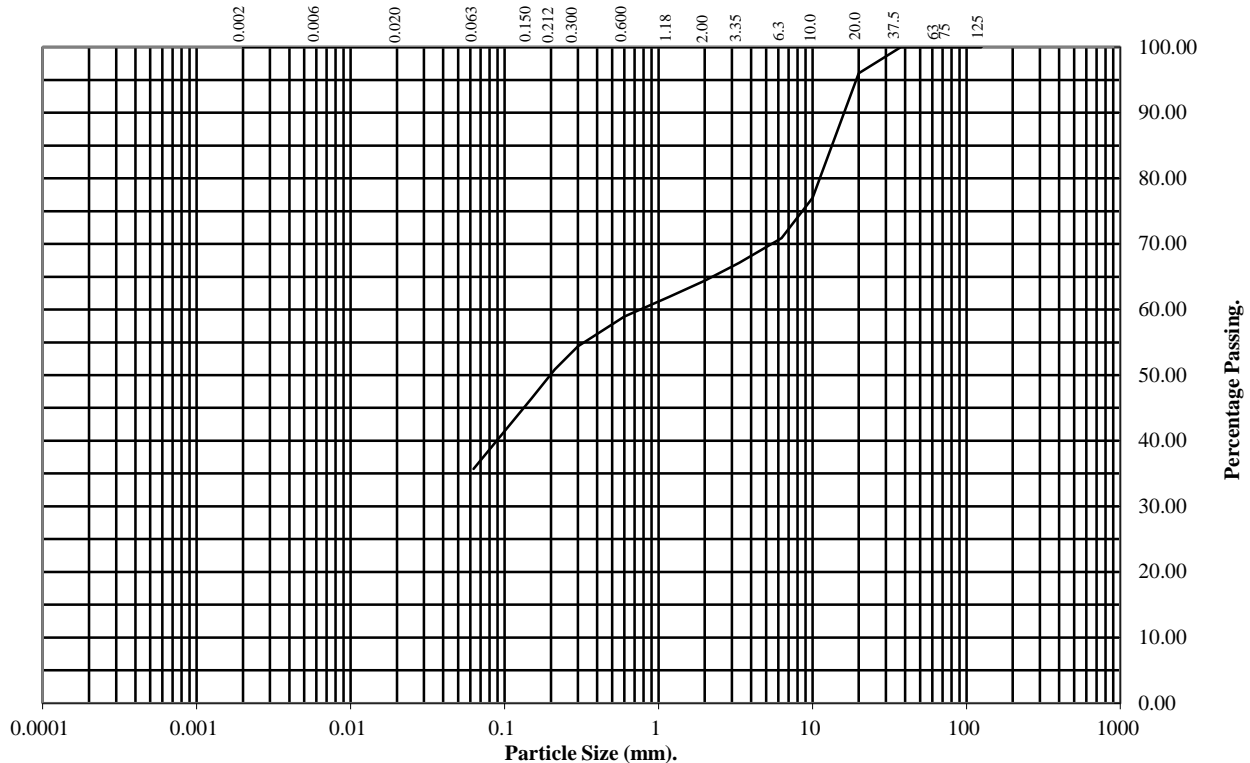
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-29** Top Depth (m): **3.00**

Sample Number: Base Depth(m):

Sample Type: **B&T**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	77
6.3	71
3.35	67
2	64
1.18	62
0.6	59
0.3	54
0.212	51
0.15	46
0.063	36

Soil Fraction	Total Percentage
Cobbles	0
Gravel	36
Sand	28
Silt/Clay	36

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

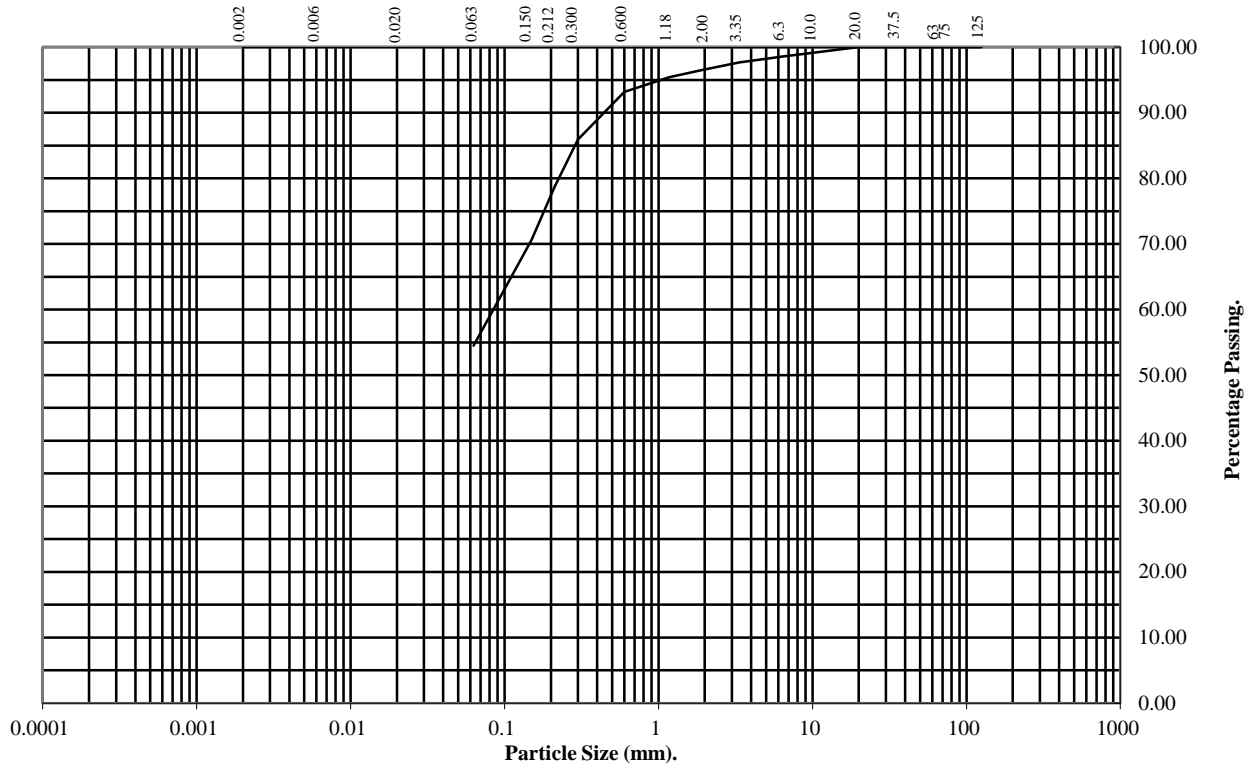
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-31** Top Depth (m): **0.70**

Sample Number: Base Depth(m):

Sample Type: **B&T**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	99
3.35	98
2	97
1.18	95
0.6	93
0.3	86
0.212	79
0.15	71
0.063	54

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	43
Silt/Clay	54

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

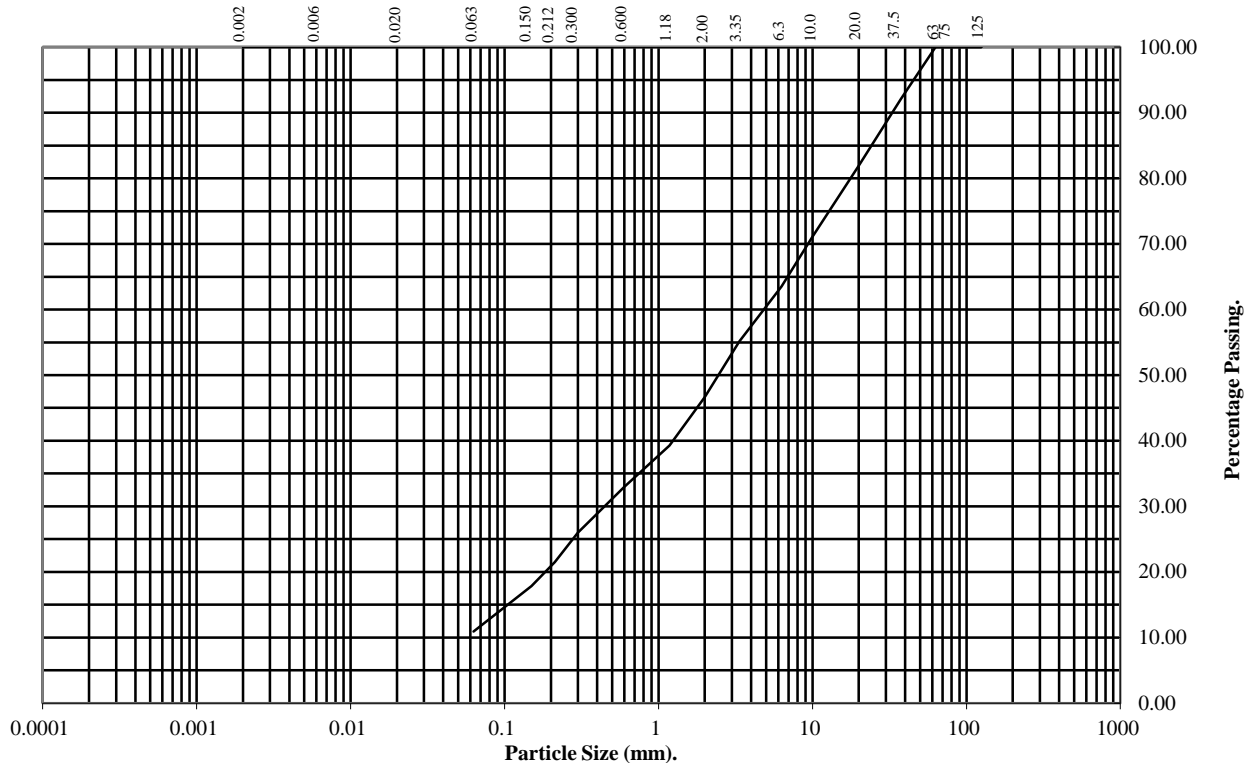
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-32** Top Depth (m): **3.00**

Sample Number: Base Depth(m):

Sample Type: **B&T**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	92
20	82
10	71
6.3	64
3.35	55
2	47
1.18	39
0.6	33
0.3	26
0.212	21
0.15	18
0.063	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	53
Sand	36
Silt/Clay	11

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

PARTICLE SIZE DISTRIBUTION TEST

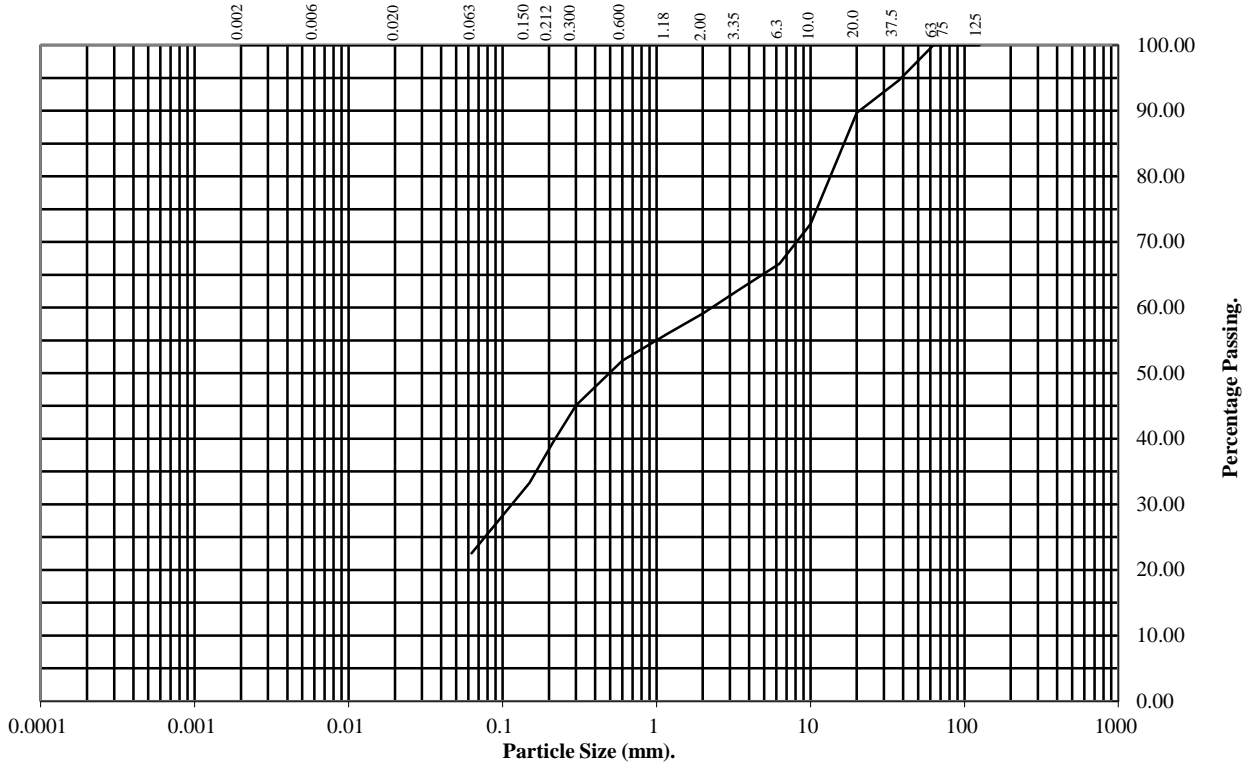
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP-35 Top Depth (m): 2.70

Sample Number: Base Depth(m):

Sample Type: B&T



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	90
10	73
6.3	67
3.35	63
2	59
1.18	56
0.6	52
0.3	45
0.212	39
0.15	33
0.063	23

Soil Fraction	Total Percentage
Cobbles	0
Gravel	41
Sand	36
Silt/Clay	23

Remarks:
See Summary of Soil Descriptions



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Contract No:
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Client Ref:
11947-06-22

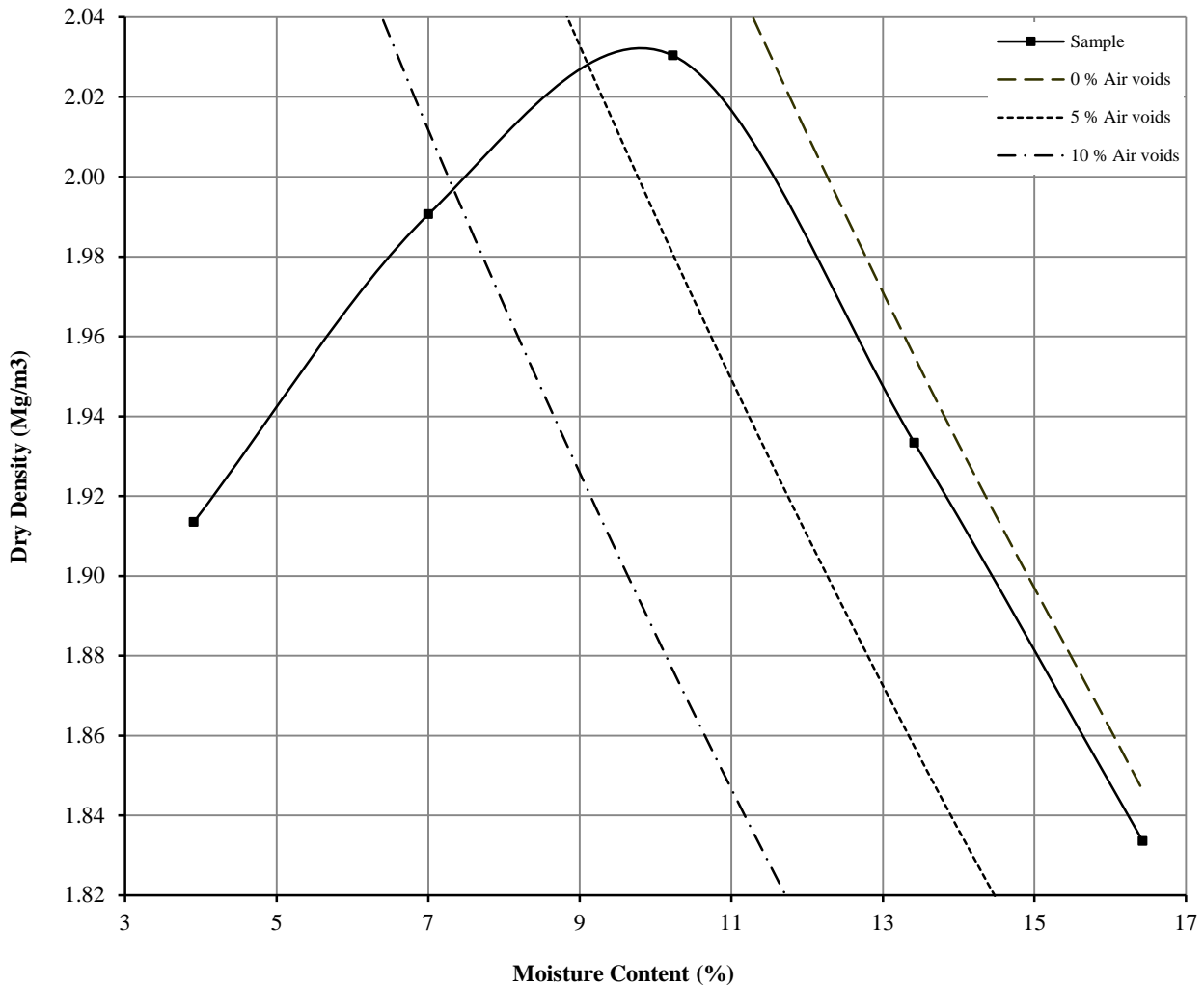
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: **TP-01** Top Depth (m) : **4.30**

Sample Number: Base Depth (m) :

Sample Type: **B&T**



Initial Moisture Content:	10	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	34
Maximum Dry Density (Mg/m ³):	2.03		Material Retained on 20.0 mm Test Sieve (%):	8
Optimum Moisture Content (%):	10			
Remarks See summary of soil descriptions				



Littleton Wind Farm

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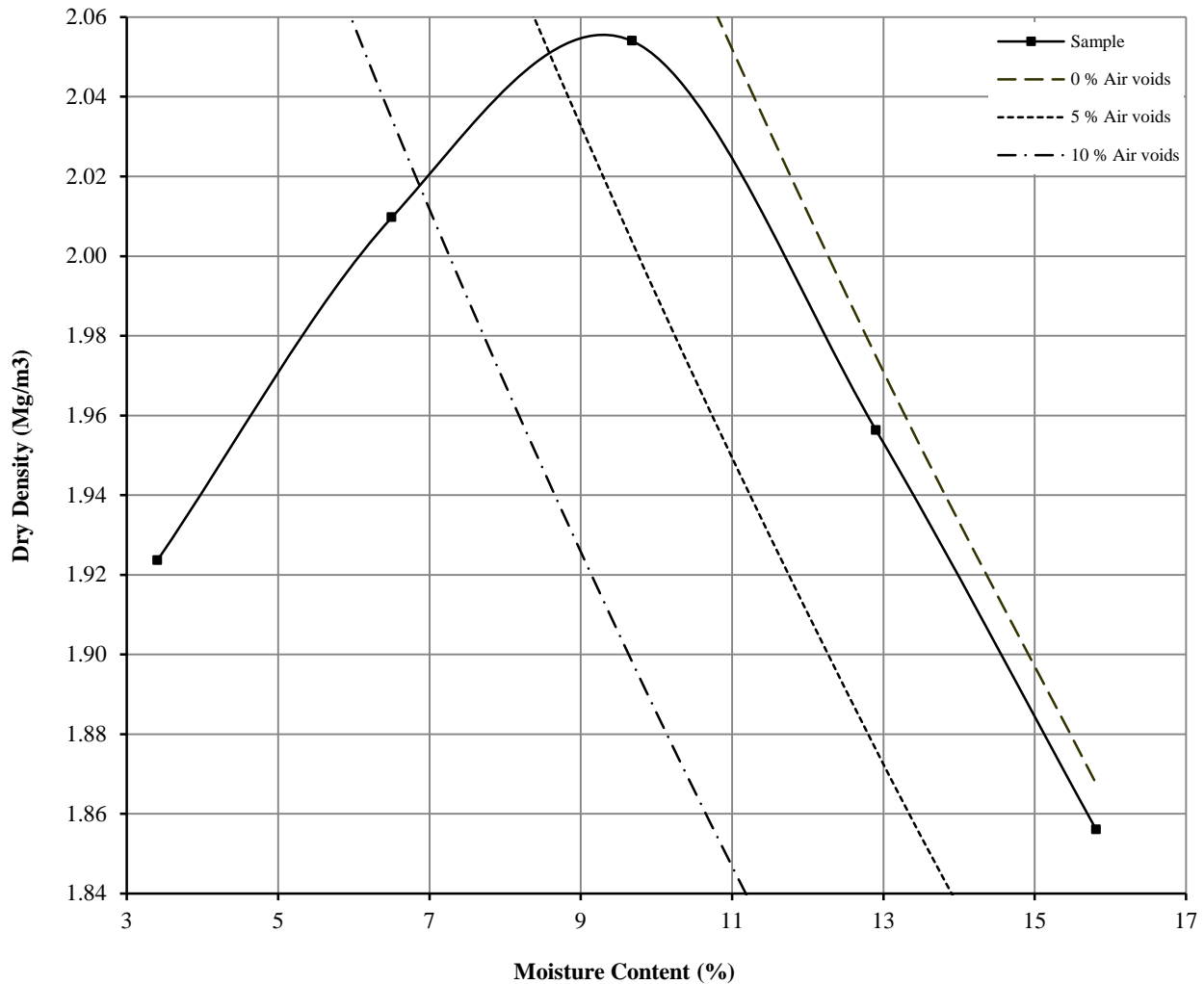
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP-28 Top Depth (m) : 3.00

Sample Number: Base Depth (m) :

Sample Type: B&T



Initial Moisture Content:	9.7	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	12
Maximum Dry Density (Mg/m ³):	2.05		Material Retained on 20.0 mm Test Sieve (%):	10
Optimum Moisture Content (%):	10			
Remarks See summary of soil descriptions				



Littleton Wind Farm

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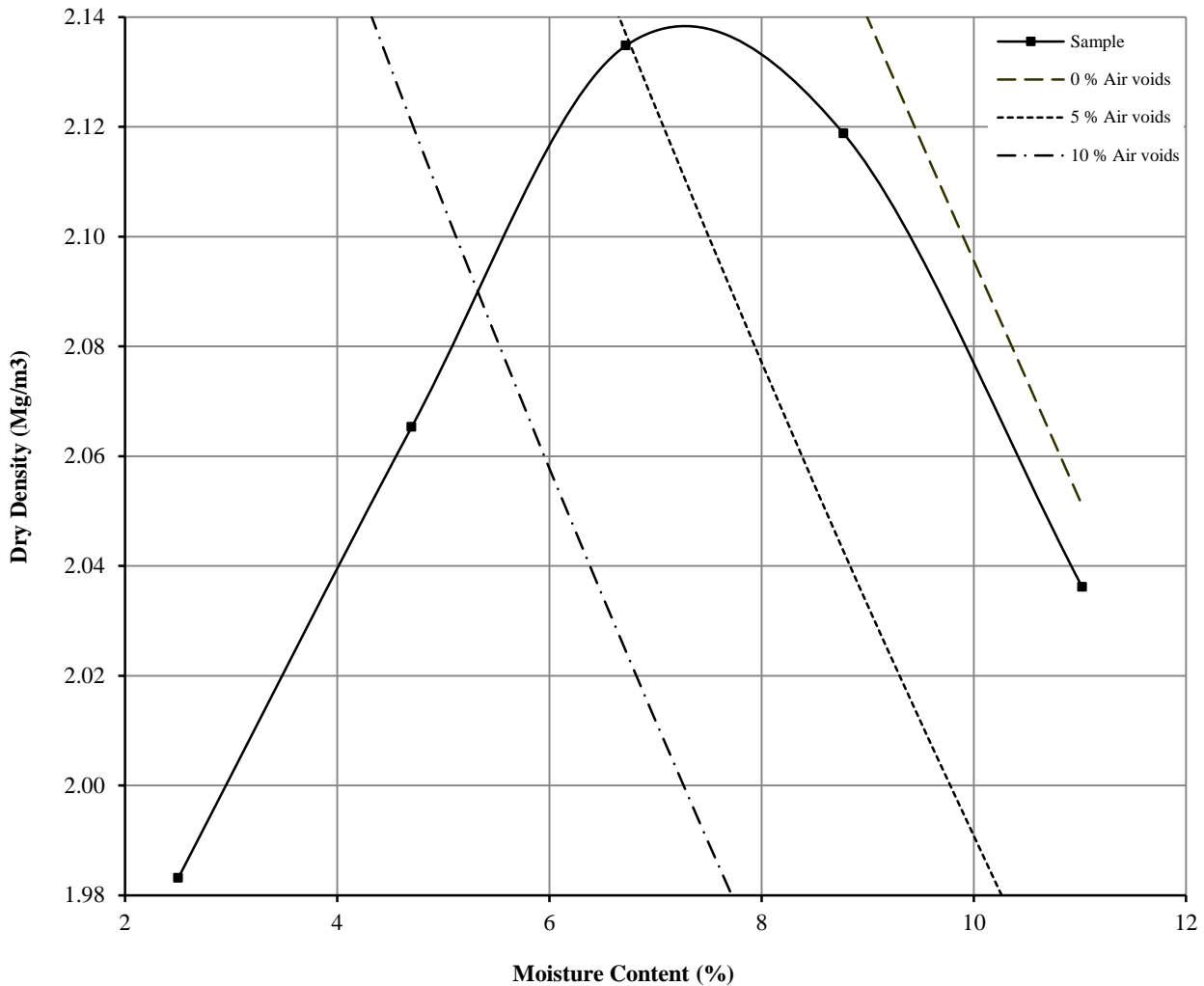
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP-32 Top Depth (m) : 3.00

Sample Number: Base Depth (m) :

Sample Type: B&T



Initial Moisture Content:	8.8	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	8
Maximum Dry Density (Mg/m ³):	2.13	Material Retained on 20.0 mm Test Sieve (%):	10	
Optimum Moisture Content (%):	7			
Remarks See summary of soil descriptions				



Littleton Wind Farm

Contract
PSL22/6090
Client Ref
11947-06-22

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

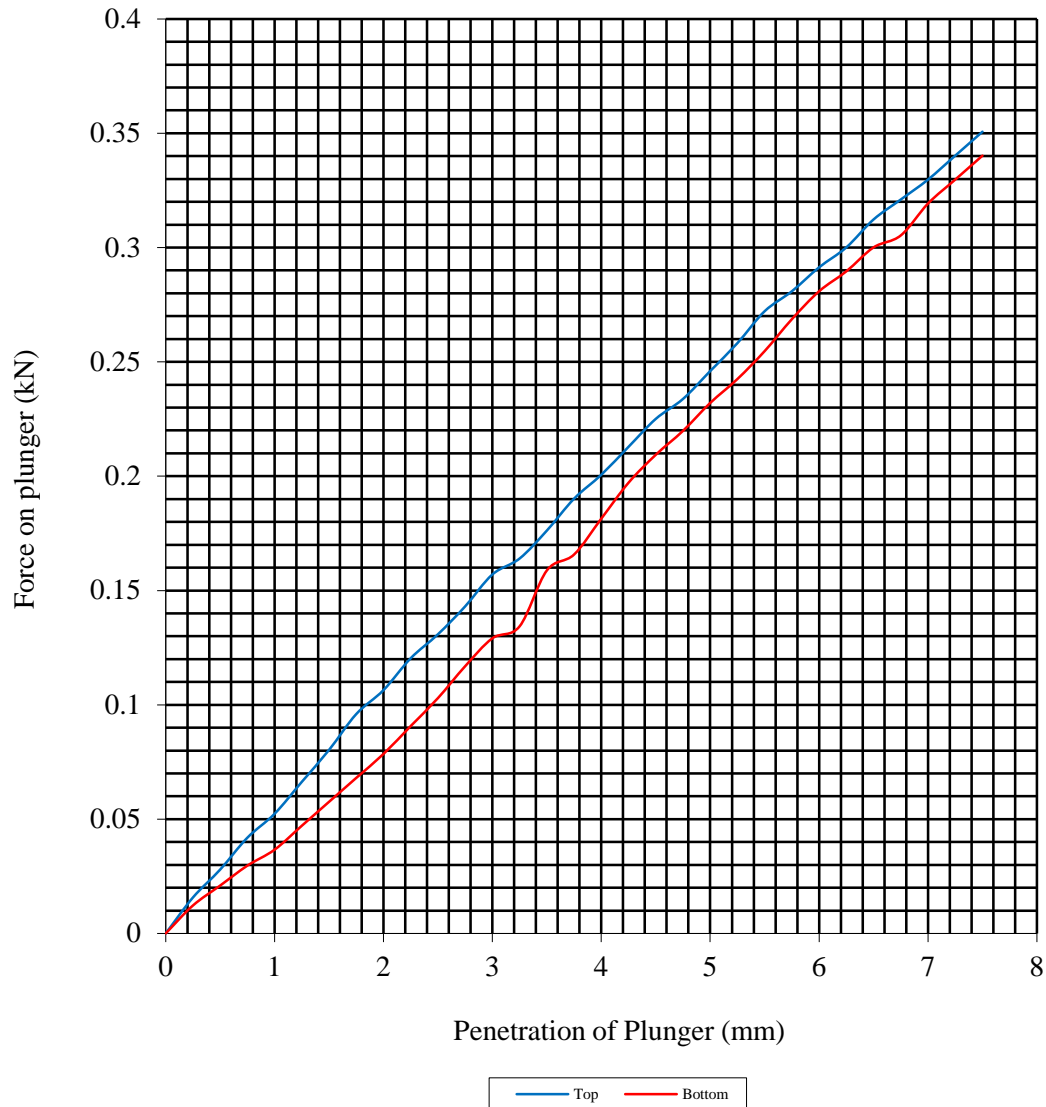
Hole Number: TP-24

Top Depth (m): 3.00

Sample Number:

Base Depth (m):

Sample Type: B&T



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	13	Surcharge Kg:	4.20	Sample Top	13	Sample Top	1.2
Bulk Density Mg/m ³ :	2.17	Soaking Time hrs	0	Sample Bottom	13	Sample Bottom	1.2
Dry Density Mg/m ³ :	1.92	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			4				
Compaction Conditions	2.5kg						



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Professional Soils Laboratory

Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
11947-06-22

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

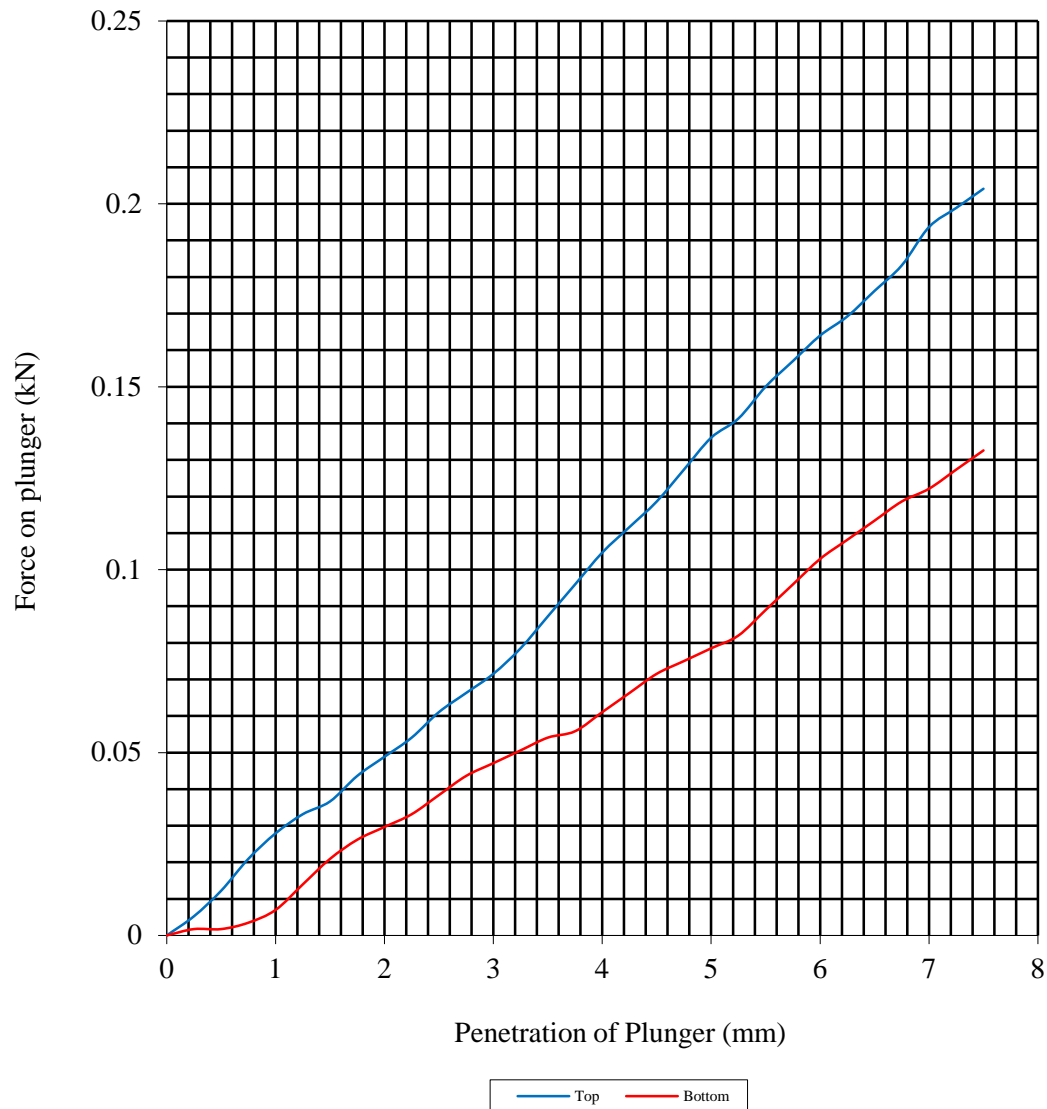
Hole Number: TP-27

Top Depth (m): 2.50

Sample Number:

Base Depth (m):

Sample Type: B&T



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	12	Surcharge Kg:	4.20	Sample Top	12	Sample Top	0.7
Bulk Density Mg/m ³ :	2.26	Soaking Time hrs	0	Sample Bottom	12	Sample Bottom	0.4
Dry Density Mg/m ³ :	2.01	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:	3						
Compaction Conditions	2.5kg						



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CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

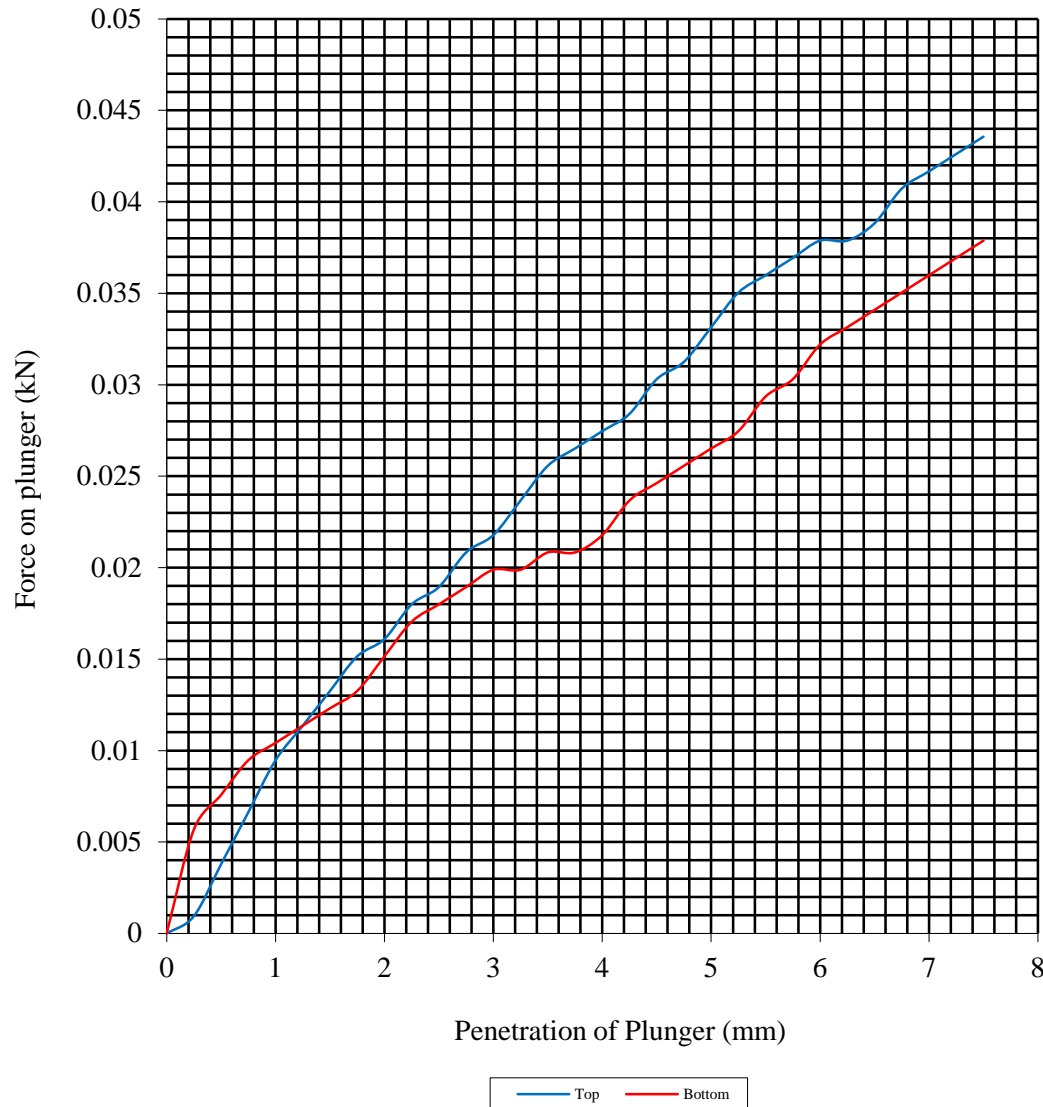
Hole Number: TP-29

Top Depth (m): 3.00

Sample Number:

Base Depth (m):

Sample Type: B&T



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	21	Surcharge Kg:	4.00	Sample Top	21	Sample Top	0.2
Bulk Density Mg/m ³ :	1.96	Soaking Time hrs	0	Sample Bottom	21	Sample Bottom	0.1
Dry Density Mg/m ³ :	1.62	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:	4						
Compaction Conditions	2.5kg						



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CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

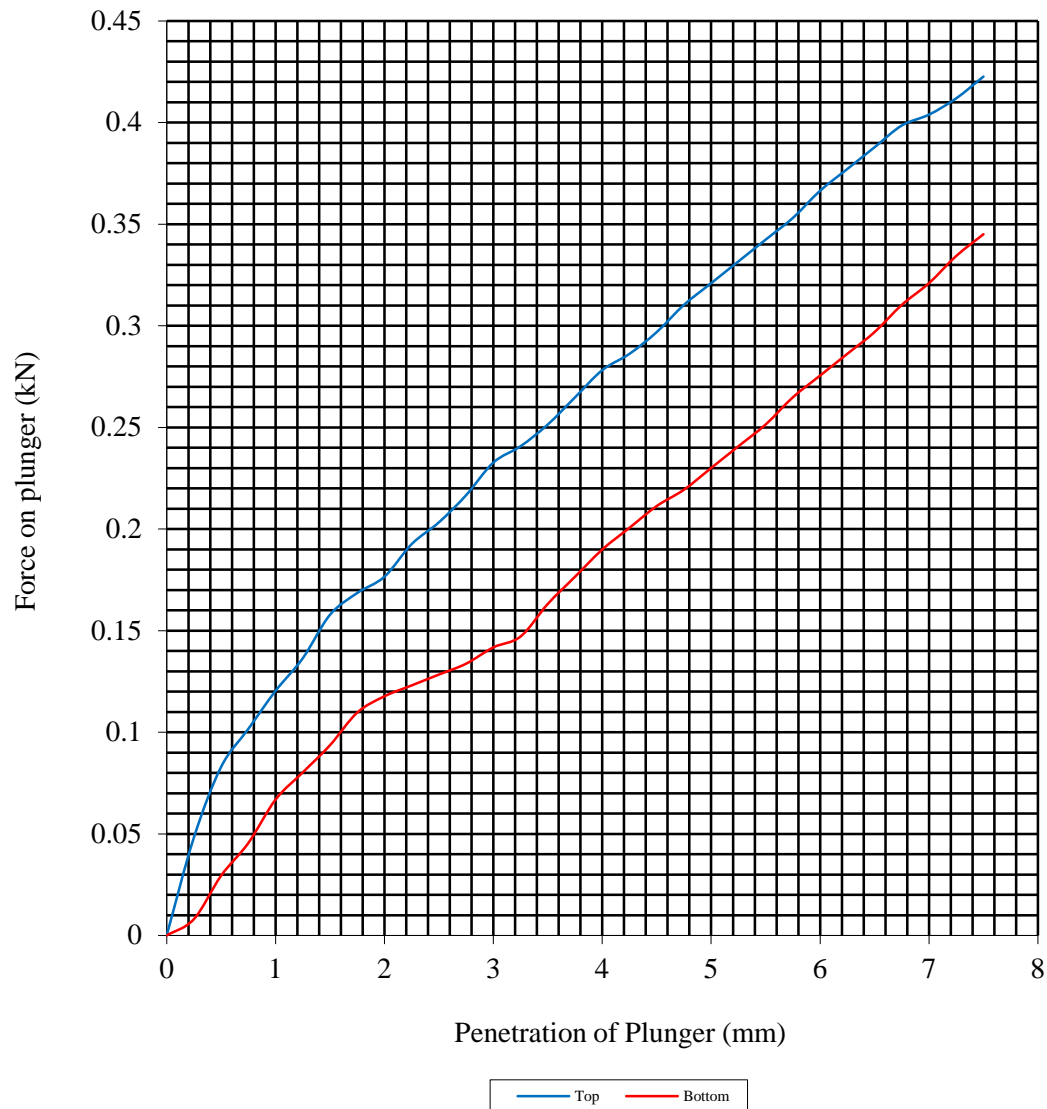
Hole Number: TP-31

Top Depth (m): 0.70

Sample Number:

Base Depth (m):

Sample Type: B&T



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	16	Surcharge Kg:	4.00	Sample Top	16	Sample Top	1.6
Bulk Density Mg/m ³ :	2.07	Soaking Time hrs	0	Sample Bottom	16	Sample Bottom	1.2
Dry Density Mg/m ³ :	1.79	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:		0					
Compaction Conditions		2.5kg					



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CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

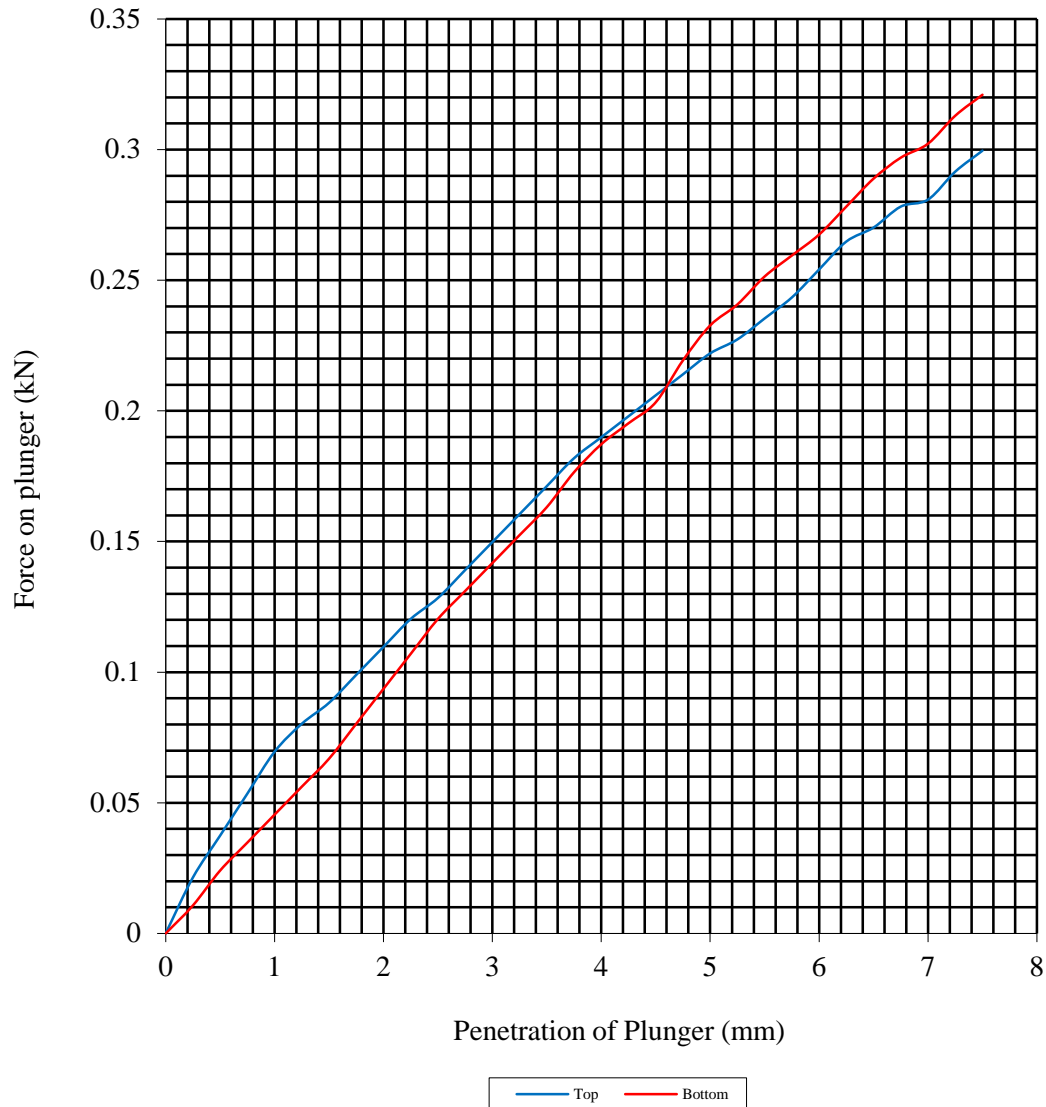
Hole Number: TP-34

Top Depth (m): 1.00

Sample Number:

Base Depth (m):

Sample Type: B&T



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	13	Surcharge Kg:	4.00	Sample Top	13	Sample Top	1.1
Bulk Density Mg/m ³ :	2.19	Soaking Time hrs	0	Sample Bottom	13	Sample Bottom	1.2
Dry Density Mg/m ³ :	1.94	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			19				
Compaction Conditions		2.5kg					



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MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

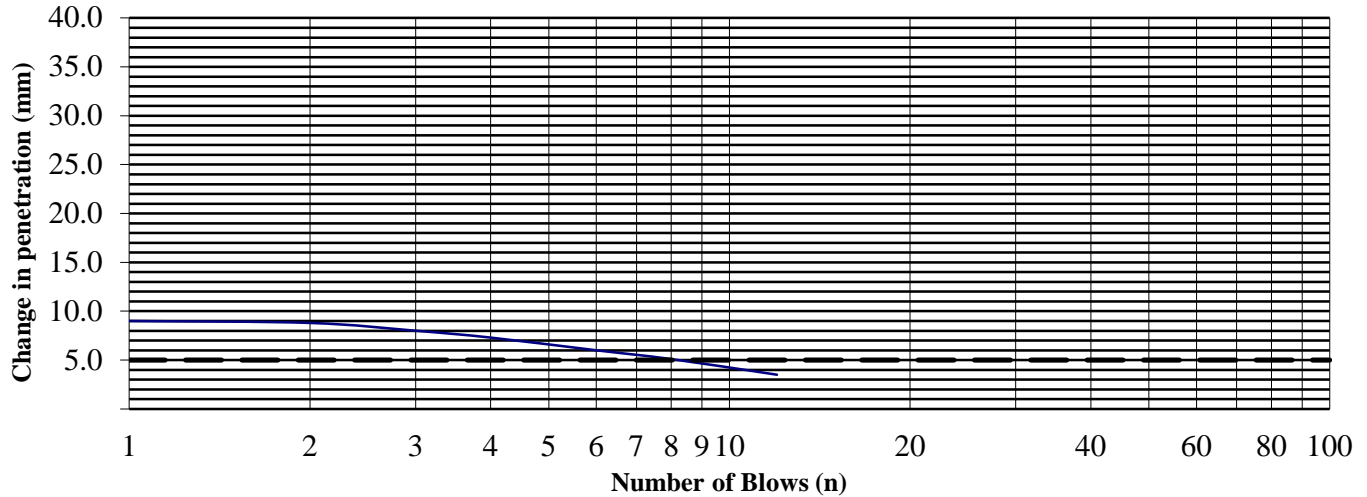
Hole Number: TP-03 Top Depth (m): 1.00

Sample Number: Base Depth (m):

Sample Type: B&T

Material Retained on the 20mm BS Test Sieve (%):	3
Interpretation based on steepest straight line intercept with 5mm change in penetration.	

MCV Determination



Blows (N)	Penetration (mm)	n to 4n (mm)
1	69.7	9.0
2	65.4	8.8
3	62.7	8.0
4	60.7	7.3
6	58.3	6.0
8	56.6	5.1
12	54.7	3.5
16	53.4	
24	52.3	
32	51.5	
48	51.2	
64		
96		
128		
192		
256		

Test Results.

Moisture Content (%)	9.0
MCV	9.1



Littleton Wind Farm

Contract No:
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11947-06-22

MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

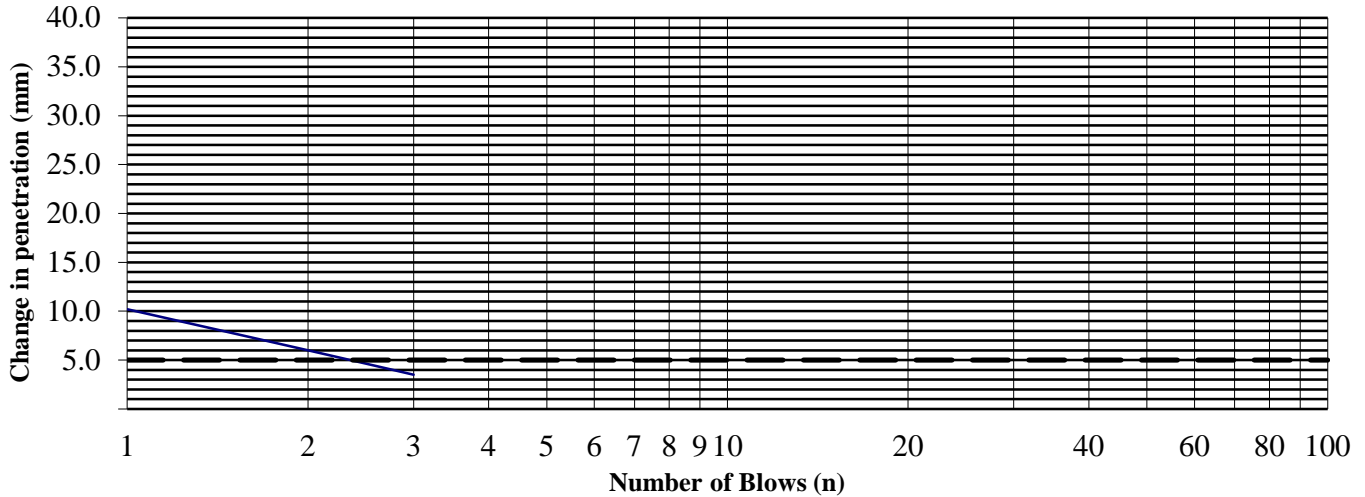
Hole Number: TP-28 Top Depth (m): 2.00

Sample Number: Base Depth (m):

Sample Type: B&T

Material Retained on the 20mm BS Test Sieve (%):	0
Interpretation based on steepest straight line intercept with 5mm change in penetration.	

MCV Determination



Blows (N)	Penetration (mm)	n to 4n (mm)
1	66.2	10.2
2	60.6	6.0
3	57.8	3.5
4	56.0	
6	54.9	
8	54.6	
12	54.3	
16		
24		
32		
48		
64		
96		
128		
192		
256		

Test Results.

Moisture Content (%)	13
MCV	3.8



Littleton Wind Farm

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MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

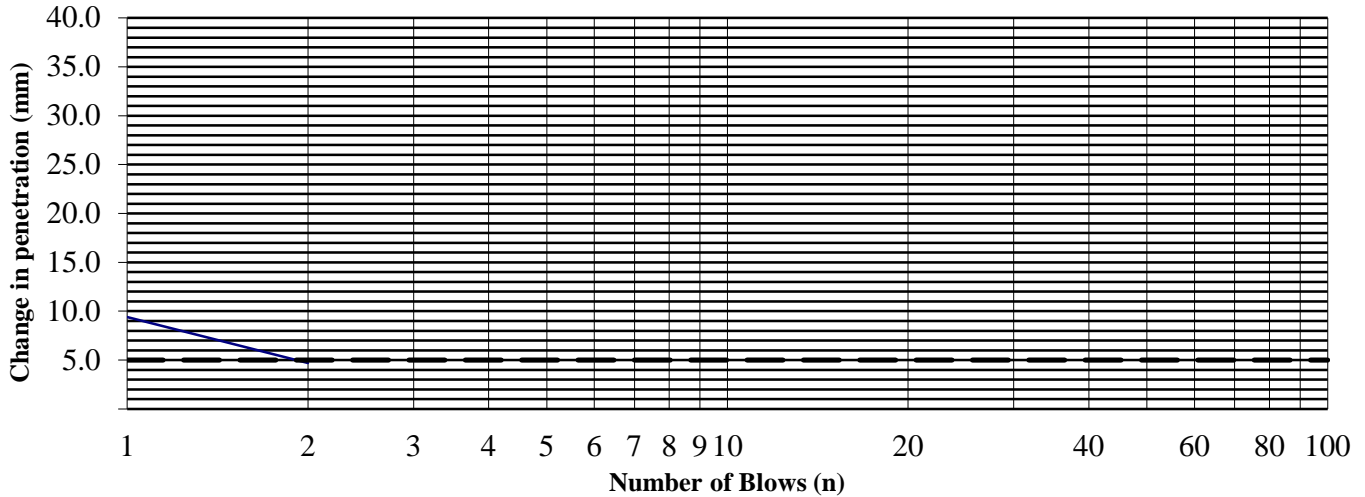
Hole Number: TP-32 Top Depth (m): 2.00

Sample Number: Base Depth (m):

Sample Type: B&T

Material Retained on the 20mm BS Test Sieve (%):	15
Interpretation based on steepest straight line intercept with 5mm change in penetration.	

MCV Determination



Blows (N)	Penetration (mm)	n to 4n (mm)
1	63.6	9.4
2	58.2	4.7
3	55.3	
4	54.2	
6	53.6	
8	53.5	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		

Test Results.

Moisture Content (%)	11
MCV	2.9



Littleton Wind Farm

Contract No:
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Client Ref:
11947-06-22

MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

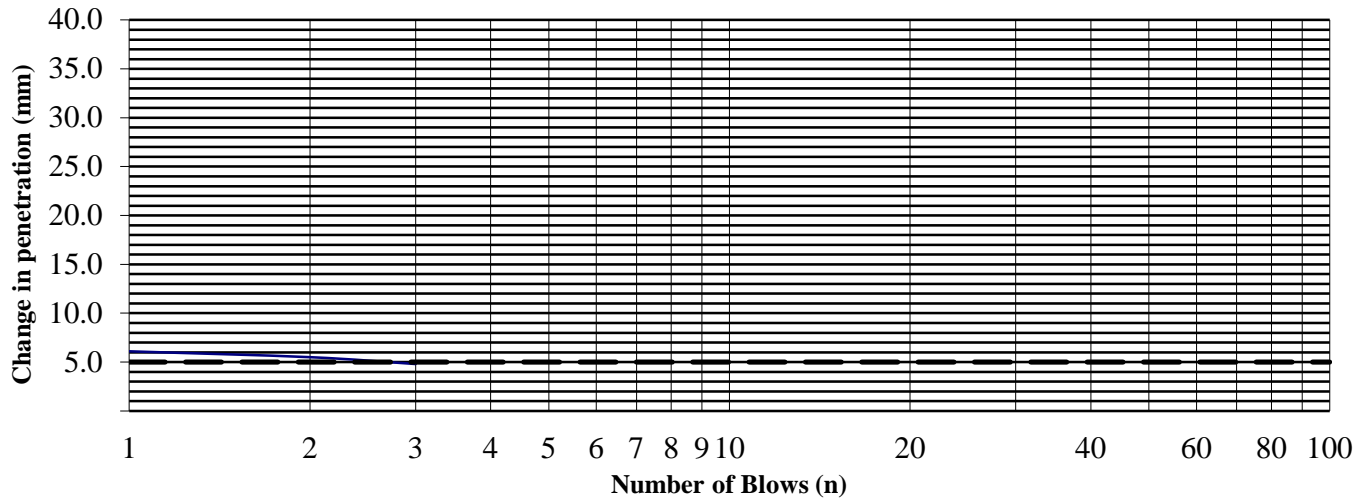
Hole Number: TP-33 Top Depth (m): 1.00

Sample Number: Base Depth (m):

Sample Type: B&T

Material Retained on the 20mm BS Test Sieve (%):	4
Interpretation based on steepest straight line intercept with 5mm change in penetration.	

MCV Determination



Blows (N)	Penetration (mm)	n to 4n (mm)
1	62.1	6.1
2	57.5	5.5
3	56.5	4.8
4	56.0	
6	55.5	
8	52.0	
12	51.7	
16		
24		
32		
48		
64		
96		
128		
192		
256		

Test Results.

Moisture Content (%)	14
MCV	3.3



Littleton Wind Farm

Contract No:
PSL22/6090
Client Ref:
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APPENDIX 7.2

Ground Investigation Report
(June 2023 - Ground Investigations Ireland)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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Ground Investigations Ireland

Littleton Wind Farm Additional Site
Investigation

Fehily Timoney and Company

Ground Investigation Report

June 2023





GROUND INVESTIGATIONS IRELAND
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Web: www.gii.ie

DOCUMENT CONTROL SHEET

Project Title	Littleton Wind Farm Additional Site Investigation
Engineer	Fehily Timoney and Company
Client	Bord na Móna
Project No	12613-03-23
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	J Cashen	B Sexton	B Sexton	Dublin	26 June 2023

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



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GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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APPENDICES

Appendix 1	Figures
Appendix 2	Trial Pit Records
Appendix 3	Laboratory Testing



1.0 Preamble

On the instructions of Fehily Timoney and Company, a site investigation was carried out by Ground Investigations Ireland Ltd. (GII) in April 2023 at the site of the proposed wind farm in Littleton, County Tipperary. A previous site investigation was completed by GII on the site between July and August 2022.

2.0 Overview

2.1. Background

Construction of a new wind farm with associated substations and access road network is proposed at the site in Littleton, County Tipperary. At the time of the site investigation the site consisted of three interlinked boglands - Longfordpass Bog, Littleton Bog and Lanespark Bog.

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 11 No. Trial Pits to a maximum depth of 4.50m BGL
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing were 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+A1:2020.

3.2. Trial Pits

The trial pits were excavated using a 12T wide 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 a Geo-Environmental Engineer 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. Surveying

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

3.4. Laboratory Testing

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

Chemical testing, as required by the specification, including pH, organic matter content, total sulphur, water soluble sulphate and acid soluble sulphate testing, was carried out by Element Materials Technology Laboratory in the United Kingdom (UK).

Geotechnical testing consisting of Moisture Content, Atterberg Limits, and Particle Size Distribution (PSD) wet sieve and hydrometer tests were carried out by Professional Soils Laboratory (PSL) in the UK.

The results of the laboratory testing are included in Appendix 3 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 consistent across the site and generally comprised;

- Peat
- Cohesive Deposits

PEAT: Peat was encountered at most exploratory holes and was generally described as *dark brown slightly clayey pseudo-fibrous PEAT*. In several of the exploratory holes a layer of *dark brown slightly clayey amorphous PEAT* overlay the pseudo-fibrous Peat. The depth of peat varied from 0.20m BGL in TP-36, to 3.10m BGL in TP-42.

COHESIVE DEPOSITS: Cohesive deposits were encountered from ground level at TP-37, and beneath the peat at all other locations and were described predominantly as a *grey sandy gravelly silty CLAY*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. When in contact with water, this deposit appeared to partially

liquify. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred. 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 time of year, rainfall, nearby construction, and other factors.

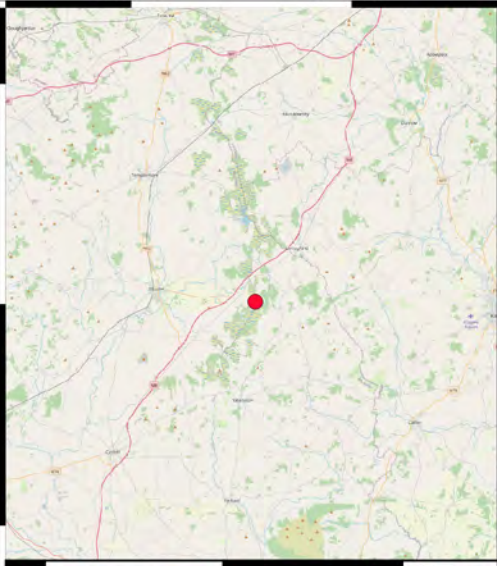
APPENDIX 1 - Figures



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654000N
651000N
648000N



600000.000 620000.000 640000.000

660000.000
663000.000
666000.000



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:



**FEHILY
TIMONEY**

Project Title:

Littleton Wind Farm Additional SI

Drawing Title:

Figure 1 - Site Location

GII Project Reference:

12613-03-23



Indicative Site Boundary



Site Location

0 900 1,800 2,700 3,600 m



Drawn By:
JC

Date:
26-06-2023

623100E

623400E

623700E

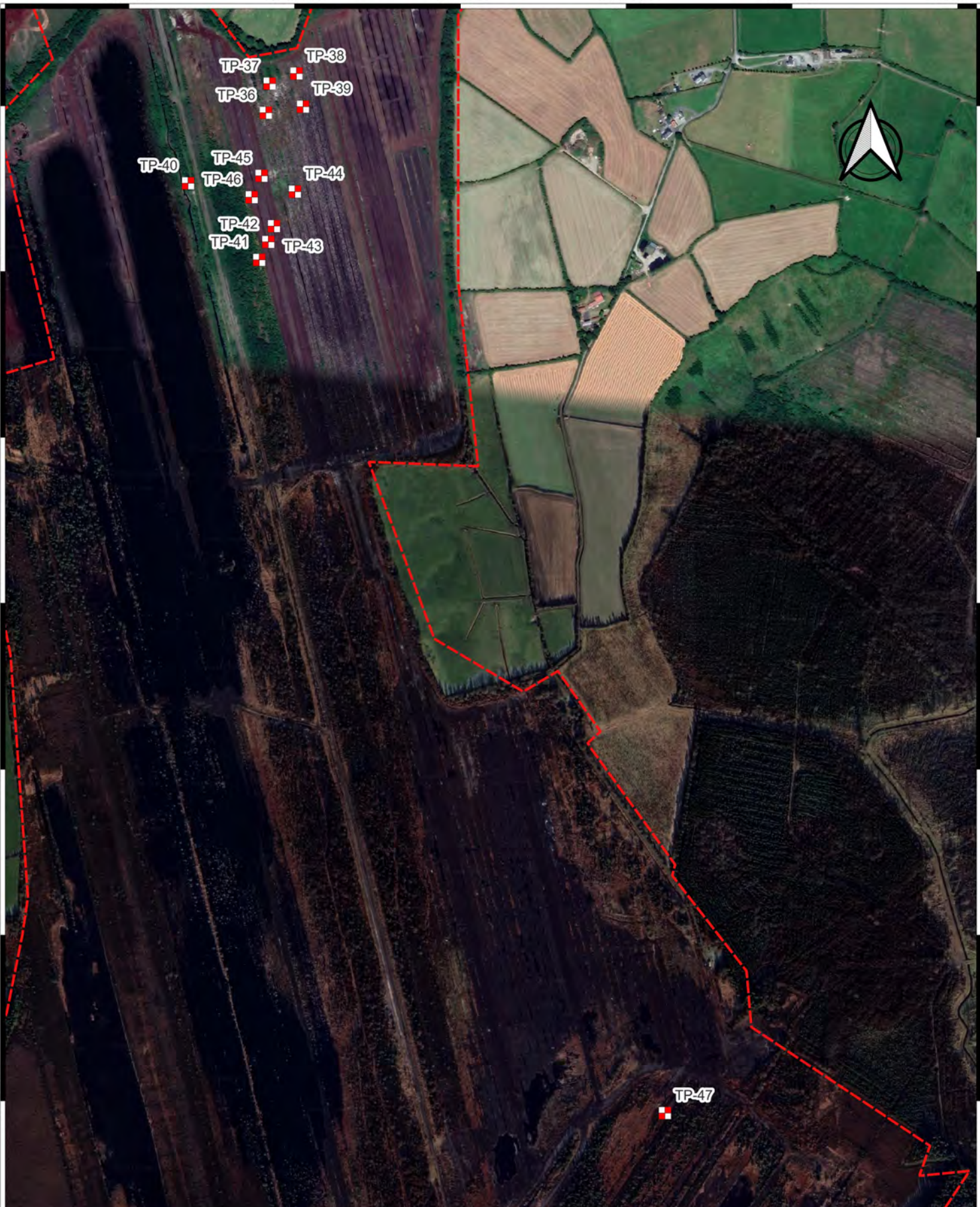
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624300E

624600E

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658200N
657900N
657600N
657300N


659100N
658800N
658500N
658200N
657900N
657600N
657300N




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Client:



**FEHILY
TIMONEY**

0 80 160 240 320 m



Project Title:
Littleton Wind Farm Additional SI


Drawing Title:
Figure 2 - Site Investigation Points

GII Project Reference:
12613-03-23

Drawn By:
JC

Date:
26-06-2023

 Indicative Site Boundary

 Trial Pit

APPENDIX 2 – Trial Pit Records





Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.30m x 2.50m x 3.50m (L x W x D)	Ground Level (mOD) 125.74	Client Bord na Móna	Job Number 12613-03-23
	Location 623347.8 E 659085.5 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T			125.59	(0.15) 0.15	Very soft black slightly clayey amorphous PEAT		
					(1.65)	Soft to firm brownish grey sandy gravelly silty CLAY with high cobble content		
			Seepage(1) at 2.00m.	123.94	1.80	Very soft grey sandy slightly gravelly silty CLAY with medium cobble content. Soil liquified by excavation and water ingress.		∇ ₁
				122.24	3.50	Complete at 3.50m		

Plan .	Remarks Groundwater encountered at 2.00m BGL; Seepage Trial pit unstable; side walls collapsed Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>12613-03-23.TP-36</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	12613-03-23.TP-36				



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.90m x 1.20m x 3.50m (L x W x D)	Ground Level (mOD) 126.85	Client Bord na Móna	Job Number 12613-03-23
	Location 623354.6 E 659138.3 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T			126.55	0.30	Soft grey sandy gravelly silty CLAY with medium cobble content		
					(1.60)	Soft to firm greyish brown sandy gravelly silty CLAY with medium cobble and boulder content		
				124.95	1.90	Firm grey slightly sandy gravelly silty CLAY with high cobble and medium boulder content		
2.50 2.50	B T				(1.60)			
3.50 3.50	B T		Seepage(1) at 3.50m.	123.35	3.50	Obstruction: Possible Boulders/Bedrock		∇1
						Complete at 3.50m		

Plan .	Remarks Groundwater encountered at 3.50m BGL; Seepage Trial pit stable Trial pit backfilled upon completion		
	<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By CMP</td> <td>Figure No. 12613-03-23.TP-39</td> </tr> </table>	Scale (approx) 1:25	Logged By CMP
Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-39	



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.00m x 2.50m x 4.50m (L x W x D)	Ground Level (mOD) 125.76	Client Bord na Móna	Job Number 12613-03-23
	Location 623403.1 E 659156.6 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				121.26	4.50	Complete at 4.50m		

Plan .	Remarks 		
		<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By CMP</td> <td>Figure No. 12613-03-23.TP-38</td> </tr> </table>	Scale (approx) 1:25
Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-38	



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.20m x 1.20m x 4.00m (L x W x D)	Ground Level (mOD) 125.23	Client Bord na Móna	Job Number 12613-03-23
	Location 623415.1 E 659096.6 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.50 2.50	B T		Medium Ingress(1) at 1.00m.	124.93	(0.30)	Possible MADE GROUND: Black slightly clayey amorphous Peat		
					0.30	Very soft brown clayey pseudo fibrous PEAT with occasional fragments of wood		
					(1.80)			▽1
4.00	BT			123.13	2.10	Soft grey sandy gravelly silty CLAY with medium cobble content		
					(1.90)	Encountered multiple sand lens between 2.10m and 3.50m BGL		
4.00	BT			121.23	4.00			

Plan .	Remarks Groundwater encountered at 1.00m BGL; Medium Ingress Trial pit unstable; side walls collapsed Trial pit backfilled upon completion	
		Scale (approx) 1:25



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.10m x 1.20m x 4.00m (L x W x D)	Ground Level (mOD) 124.97	Client Bord na Móna	Job Number 12613-03-23
	Location 623207 E 658957.9 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.50 1.50	B T			124.87	0.10	Possible MADE GROUND: Brown slightly sandy slightly gravelly Clay		
					0.30	Possible MADE GROUND: Brown slightly sandy slightly gravelly silty Clay		
				124.57	0.40	Possible MADE GROUND: Black slightly clayey amorphous Peat		
					0.30			
				124.27	0.70	Soft to firm brown slightly sandy gravelly silty CLAY with medium cobble content		
					(1.70)			
				122.57	2.40	Soft grey sandy gravelly silty CLAY with medium cobble and boulder content		
					(1.60)			
				120.97	4.00			

Plan	Remarks							
	No groundwater encountered Trial pit unstable; side walls spalling Trial pit backfilled upon completion							
Scale (approx)				Logged By		Figure No.		
1:25				CMP		12613-03-23.TP-40		



Machine : 12T wide tracked excavator
Method : Trial Pit

Dimensions
5.80m x 1.20m x 4.50m
(L x W x D)

Ground Level (mOD)
124.23

Client
Bord na Móna

Job Number
12613-03-23

Location
623335.7 E 658819.3 N

Dates
05/04/2023

Engineer
Fehily Timoney

Sheet
1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.00 2.00	B T		Seepage(1) at 1.30m.	122.83	(1.40) 1.40	Very soft brown clayey pseudo fibrous PEAT with rare fragments of wood		
			Medium Ingress(2) at 2.30m.		(2.10) 2.10	Soft to firm grey slightly sandy gravelly silty CLAY with medium cobble content. Soil liquified by excavation and water ingress.		∇ ₁
4.00	BT			120.73	3.50	Soft to firm grey sandy gravelly silty CLAY with medium cobble and boulder content		∇ ₂

Plan
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Remarks

Groundwater encountered at 1.30m and 2.30m BGL; Seepage and Medium Ingress
Trial pit unstable; side walls spalling
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	CMP	12613-03-23.TP-41



Machine : 12T wide tracked excavator
Method : Trial Pit

Dimensions
5.80m x 1.20m x 4.50m
(L x W x D)

Ground Level (mOD)
124.23

Client
Bord na Móna

Job Number
12613-03-23

Location
623335.7 E 658819.3 N

Dates
05/04/2023

Engineer
Fehily Timoney

Sheet
2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(1.00)			
				119.73	4.50	Complete at 4.50m		

Plan

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Remarks

Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-41
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Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.40m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 124.83	Client Bord na Móna	Job Number 12613-03-23
	Location 623352.2 E 658851.8 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T			120.33	(0.50) 4.50	Soft grey sandy gravelly silty CLAY with medium cobble content Complete at 4.50m		

Plan .	Remarks 	
		Scale (approx) 1:25



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.80m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 124.88	Client Bord na Móna	Job Number 12613-03-23
	Location 623362.4 E 658880.3 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.50 2.50	B T			124.48	0.40	Very soft black slightly clayey amorphous PEAT		
					1.90	Very soft brown clayey pseudo fibrous PEAT with occasional fragments of wood		
					2.30	Soft to firm grey sandy gravelly silty CLAY with medium cobble content		
				122.58	(1.90)			

Plan .	Remarks Groundwater encountered at 4.20m BGL; Seepage Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>12613-03-23.TP-43</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	12613-03-23.TP-43				



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.80m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 124.88	Client Bord na Móna	Job Number 12613-03-23
	Location 623362.4 E 658880.3 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T		Seepage(1) at 4.20m.	120.68 120.38	4.20 (0.30) 4.50	Soft grey sandy gravelly silty CLAY. Soil liquified by excavation and water ingress. Complete at 4.50m		∇1

Plan 	Remarks 		
	Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-43



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.40m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 124.12	Client Bord na Móna	Job Number 12613-03-23
	Location 623400.4 E 658942.8 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.50 1.50	B T		Seepage(1) at 1.10m.	123.92	(0.20)	Very soft black slightly clayey amorphous PEAT with occasional roots		
					0.20	Very soft brown clayey pseudo fibrous PEAT		
3.00 3.00	B T		Medium Ingress(2) at 2.30m.	123.07	(0.85)			∇1
					1.05	Firm grey sandy gravelly silty CLAY		
				121.42	(1.65)			∇2
					2.70	Soft grey sandy gravelly clayey SILT with medium cobble content. Soil liquified by excavation and water ingress.		
					(1.80)			

Plan .	Remarks Groundwater encountered at 1.10m and 2.30m BGL; Seepage and Medium Ingress Trial pit unstable; side walls spalling Trial pit backfilled upon completion	
		Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-44



Machine : 12T wide tracked excavator
Method : Trial Pit

Dimensions
5.40m x 1.20m x 4.50m
(L x W x D)

Ground Level (mOD)
124.12

Client
Bord na Móna

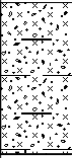
Job Number
12613-03-23

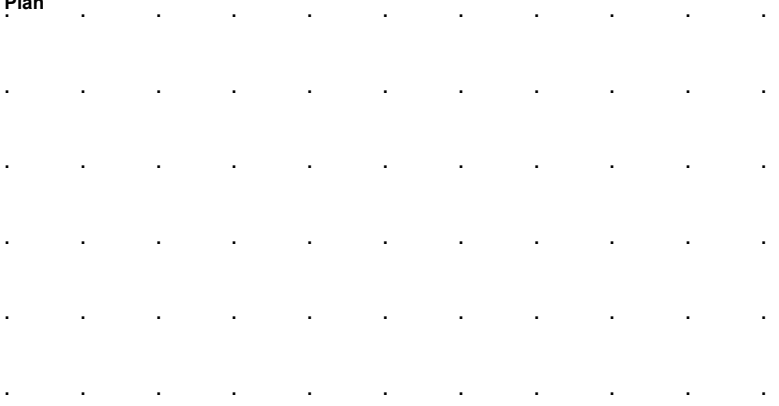
Location
623400.4 E 658942.8 N

Dates
06/04/2023

Engineer
Fehily Timoney

Sheet
2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				119.62	4.50	Complete at 4.50m		

Plan 	Remarks		
	Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-44



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.60m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 125.29	Client Bord na Móna	Job Number 12613-03-23
	Location 623339.9 E 658971.5 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T			124.69	0.60	Very soft black slightly clayey amorphous PEAT		
					(1.30)	Very soft brown clayey pseudo fibrous PEAT with rare fragments of wood		
2.50 2.50	B T			123.39	1.90	Soft to firm grey slightly sandy gravelly silty CLAY with medium cobble content		
					(1.30)			
				122.09	3.20	Soft to firm grey sandy gravelly silty CLAY with medium cobble content		
					(1.30)			

Plan .	Remarks No groundwater encountered Trial pit stable Trial pit backfilled upon completion		
	Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-45



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.60m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 125.29	Client Bord na Móna	Job Number 12613-03-23
	Location 623339.9 E 658971.5 N	Dates 06/04/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T			120.79	4.50	Complete at 4.50m		

Plan .	Remarks 	
		Scale (approx) 1:25



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.80m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 124.43	Client Bord na Móna	Job Number 12613-03-23
	Location 623322.3 E 658932.7 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
2.50 2.50	B T		Seepage(1) at 1.10m.	122.03	(2.40)	Very soft brown clayey pseudo fibrous PEAT with occasional fragments of wood		
3.50 3.50	B T			121.23	(0.80)	Firm grey slightly sandy slightly gravelly silty CLAY with medium cobble content		
					(1.30)	Firm grey slightly sandy gravelly silty CLAY with medium cobble content		

Plan .	Remarks Groundwater encountered at 1.10m BGL; Seepage Trial pit stable Trial pit backfilled upon completion		
	<table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By CMP</td> <td>Figure No. 12613-03-23.TP-46</td> </tr> </table>	Scale (approx) 1:25	Logged By CMP
Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-46	



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.80m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 124.43	Client Bord na Móna	Job Number 12613-03-23
	Location 623322.3 E 658932.7 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				119.93	4.50	Complete at 4.50m		

Plan 	Remarks



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.10m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 125.48	Client Bord na Móna	Job Number 12613-03-23
	Location 624070.1 E 657275.9 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B T		Seepage(1) at 1.00m.	125.28	(0.20) 0.20	Very soft black slightly clayey amorphous PEAT Very soft brown clayey pseudo fibrous PEAT with occasional fragments of wood		
2.00 2.00	B T			123.58	1.90 (0.80)	Soft grey slightly sandy slightly gravelly silty CLAY with occasional organic fibres		▽1
3.50 3.50	B T		Medium Ingress(2) at 2.70m.	122.78	2.70 (1.30)	Grey sandy gravelly silty CLAY with medium cobble content. Soil liquified by excavation and water ingress.		▽2
				121.48	4.00			

Plan .	Remarks Groundwater encountered at 1.00m and 2.70m BGL; Seepage and Medium Ingress Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>12613-03-23.TP-47</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	12613-03-23.TP-47				



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.10m x 1.20m x 4.50m (L x W x D)	Ground Level (mOD) 125.48	Client Bord na Móna	Job Number 12613-03-23
	Location 624070.1 E 657275.9 N	Dates 05/04/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
4.50 4.50	B T			120.98	(0.50) 4.50	Soft grey sandy gravelly clayey SILT with medium cobble content Complete at 4.50m		

Plan .	Remarks 	Scale (approx) 1:25	Logged By CMP	Figure No. 12613-03-23.TP-47
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Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-36



TP-36



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-36



TP-36



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-36



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-37



TP-37



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-37



TP-37



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-37



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-38



TP-38



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-38



TP-38



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-38



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-39



TP-39



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-39



TP-39



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-39



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-40



TP-40



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-40



TP-40



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-40



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-41



TP-41



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-41



TP-41



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-41



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-42



TP-42



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-42



TP-42



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-42



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-43



TP-43



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-43



TP-43



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-43



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-44



TP-44



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-44



TP-44



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-44



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-45



TP-45



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-45



TP-45



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-45



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-46



TP-46



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-46



TP-46



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-46



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-47



TP-47



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-47



TP-47



Littleton Wind Farm Additional GI – Trial Pit Photographs

TP-47



APPENDIX 3 – Laboratory Testing



Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland
D22 K5P8



Attention : James Cashen
Date : 17th May, 2023
Your reference : 12613-03-23
Our reference : Test Report 23/7422 Batch 1
Location : Littleton Wind Farm Additional GI
Date samples received : 11th May, 2023
Status : Final Report
Issue : 1

Nine samples were received for analysis on 11th May, 2023 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Liza Klebe

Project Co-ordinator

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12613-03-23
Location: Littleton Wind Farm Additional GI
Contact: James Cashen
EMT Job No: 23/7422

Report : Solid

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

EMT Sample No.	1	2	3	4	5	6	7	8	9				
Sample ID	TP-37	TP-39	TP-40	TP-41	TP-43	TP-44	TP-45	TP-46	TP-47				
Depth	1.00	2.50	1.50	4.00	2.50	1.50	1.00	2.50	3.50				
COC No / misc													
Containers	T	T	T	T	T	T	T	T	T				
Sample Date	09/05/2023	09/05/2023	09/05/2023	09/05/2023	09/05/2023	09/05/2023	09/05/2023	09/05/2023	09/05/2023				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023				
											LOD/LOR	Units	Method No.
Sulphur as S	0.01	0.01	-	0.02	-	-	-	0.02	0.02		<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	0.01	<0.01	-	0.01	-	-	-	0.01	0.01		<0.01	%	TM50/PM29
Sulphate as SO4 (2:1 Ext) #	0.0029	0.0039	-	0.0053	-	-	-	0.0094	0.0111		<0.0015	g/l	TM38/PM20
Organic Matter	-	-	<0.2	<0.2	-	-	88.7	-	-		<0.2	%	TM21/PM24
pH #	8.51	8.44	-	8.24	8.48	8.67	5.20	8.39	8.09		<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/7422

SOILS and ASH

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

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

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

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

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

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

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

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

EMT Job No: 23/7422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



LABORATORY REPORT



Contract Number: PSL23/3461

Report Date: 22 June 2023
Client's Reference: 12613-03-23
Client Name: Ground investigation Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: James Cashen/Conor McParland

Contract Title: Littleton Wind Farm Additional GI
Date Received: 10/5/2023
Date Commenced: 10/5/2023
Date Completed: 22/6/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)


L Knight
(Assistant Laboratory Manager)

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP-36		B	1.00		Brown sandy slightly gravelly CLAY.
TP-37		B	1.00		Brown very clayey very sandy GRAVEL.
TP-38		B	2.00		Brown slightly sandy slightly gravelly CLAY.
TP-39		B	2.50		Grey very clayey very sandy GRAVEL.
TP-40		B	1.50		Brown sandy slightly gravelly CLAY.
TP-41		B	4.00		Grey sandy gravelly CLAY.
TP-42		B	4.50		Brown sandy slightly gravelly CLAY.
TP-43		B	2.50		Brown slightly sandy gravelly CLAY..
TP-44		B	1.50		Brown very clayey SAND & GRAVEL.
TP-45		B	1.00		Dark brown fibrous PEAT.
TP-46		B	2.50		Brown mottled grey slightly sandy slightly gravelly CLAY.
TP-47		B	2.00		Brown sandy slightly gravelly CLAY.
TP-47		B	3.50		Brown slightly sandy gravelly CLAY.



Littleton Wind Farm Additional GI

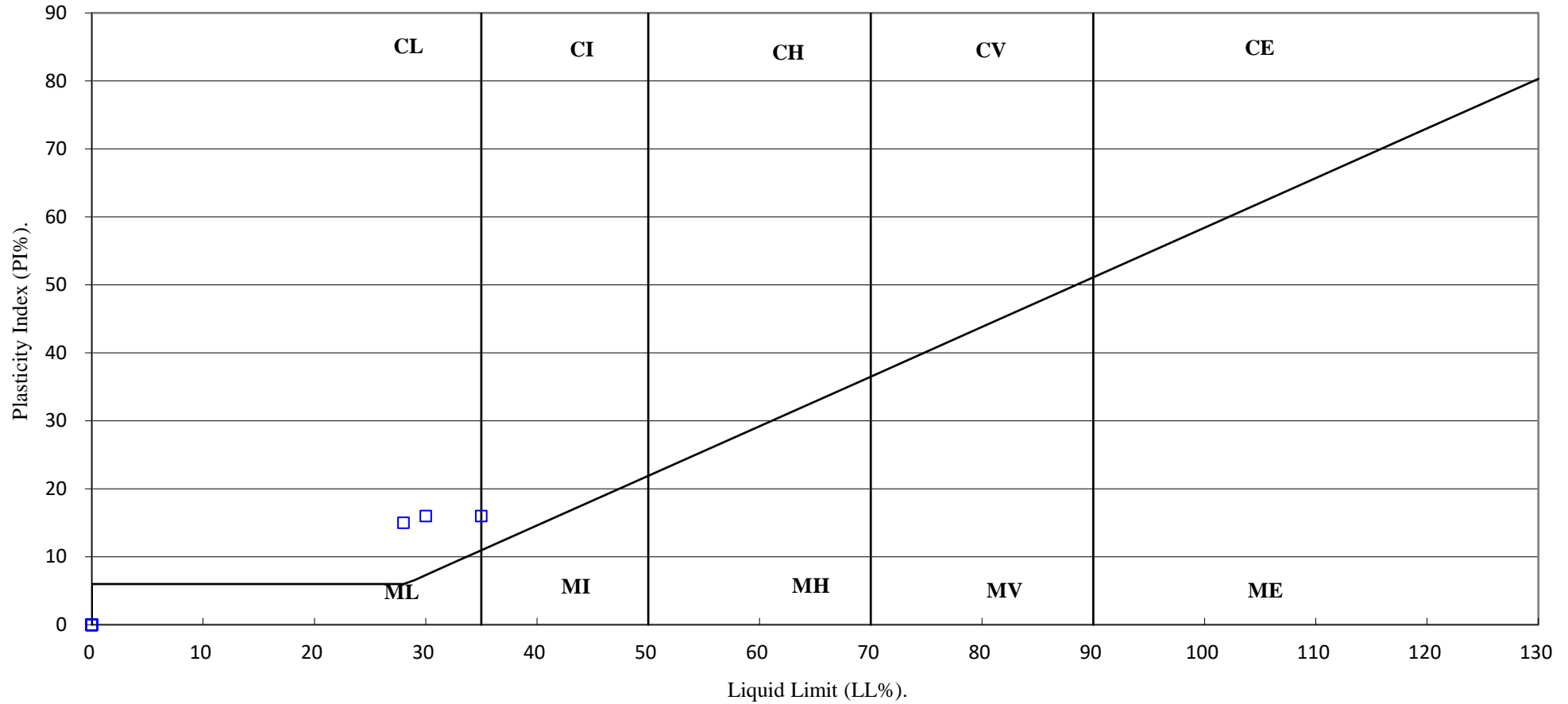
Contract No:

PSL23/3461

Client Ref:

12613-03-23

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Littleton Wind Farm Additional GI

Contract No:

PSL23/3461

Client Ref:

12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

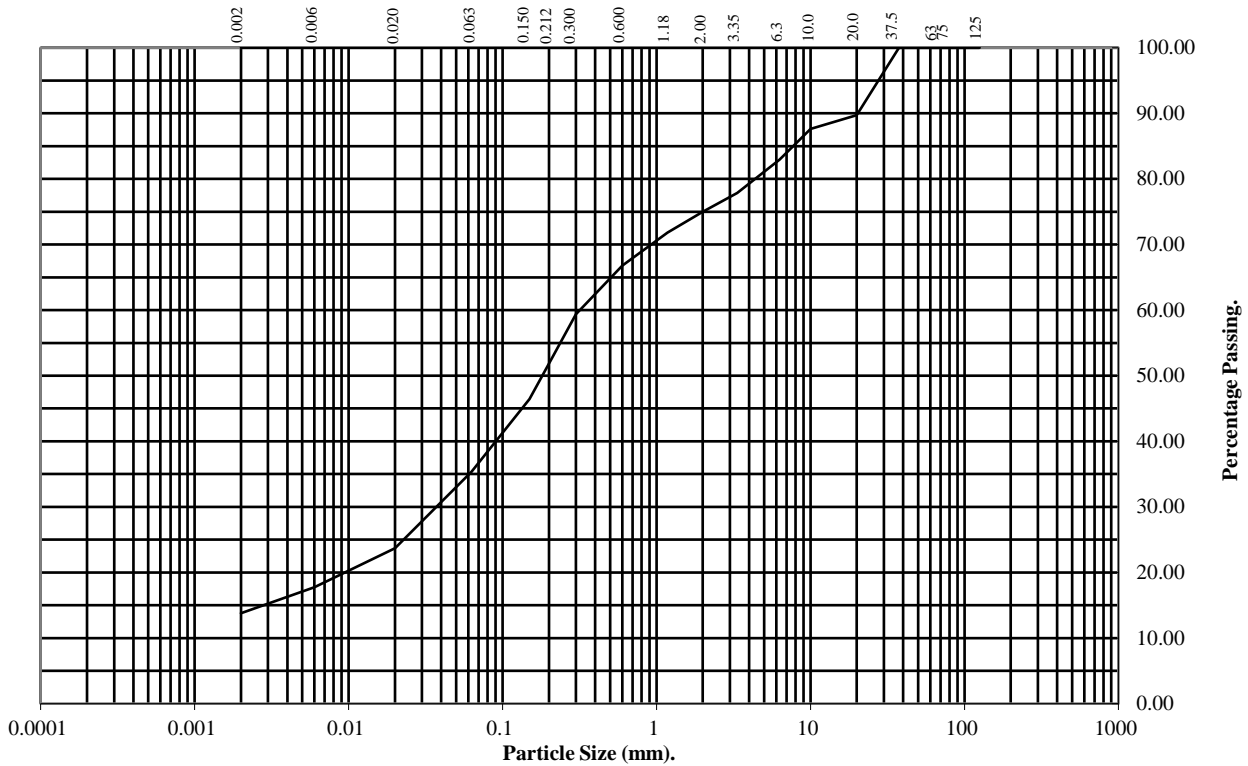
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-36** Top Depth (m): **1.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	90
10	88
6.3	83
3.35	78
2	75
1.18	72
0.6	67
0.3	59
0.212	53
0.15	46
0.063	35

Particle Diameter	Percentage Passing
0.02	24
0.006	18
0.002	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	25
Sand	40
Silt	21
Clay	14

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

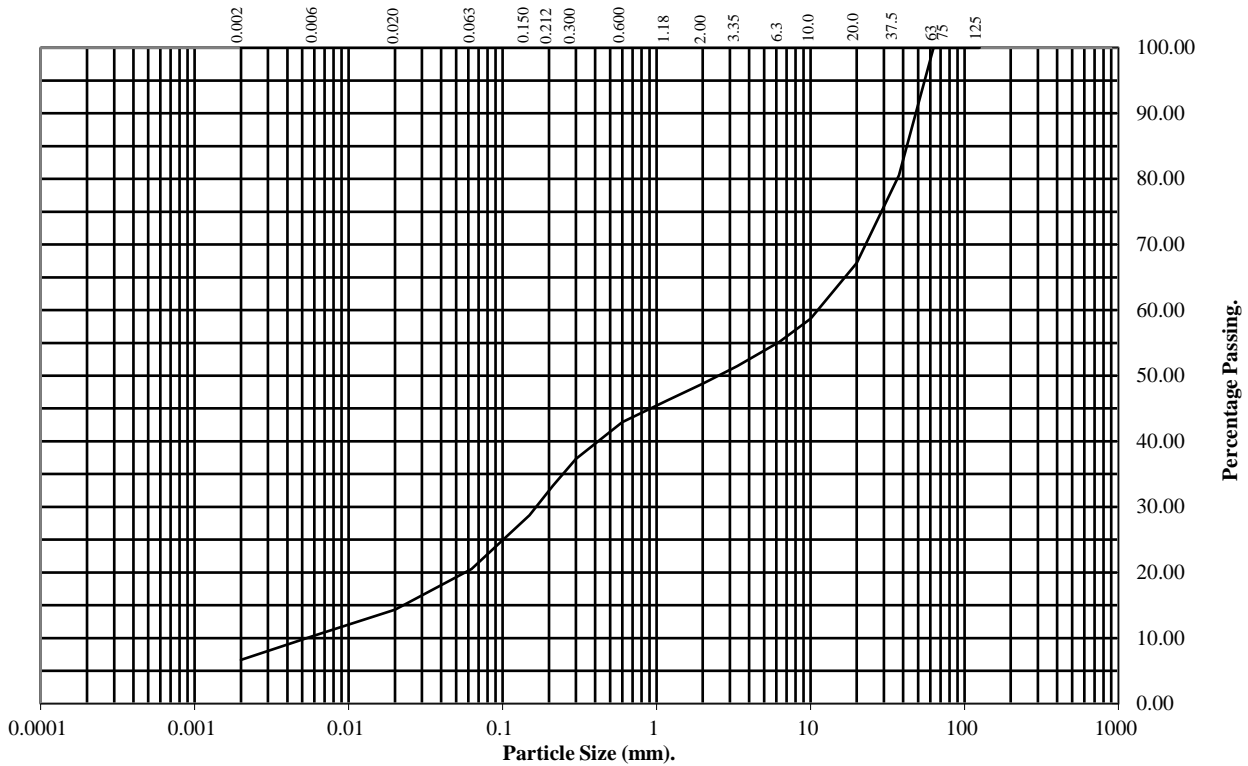
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-37** Top Depth (m): **1.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	81
20	67
10	59
6.3	55
3.35	51
2	49
1.18	46
0.6	43
0.3	37
0.212	33
0.15	29
0.063	21

Particle Diameter	Percentage Passing
0.02	14
0.006	10
0.002	7

Soil Fraction	Total Percentage
Cobbles	0
Gravel	51
Sand	28
Silt	14
Clay	7

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

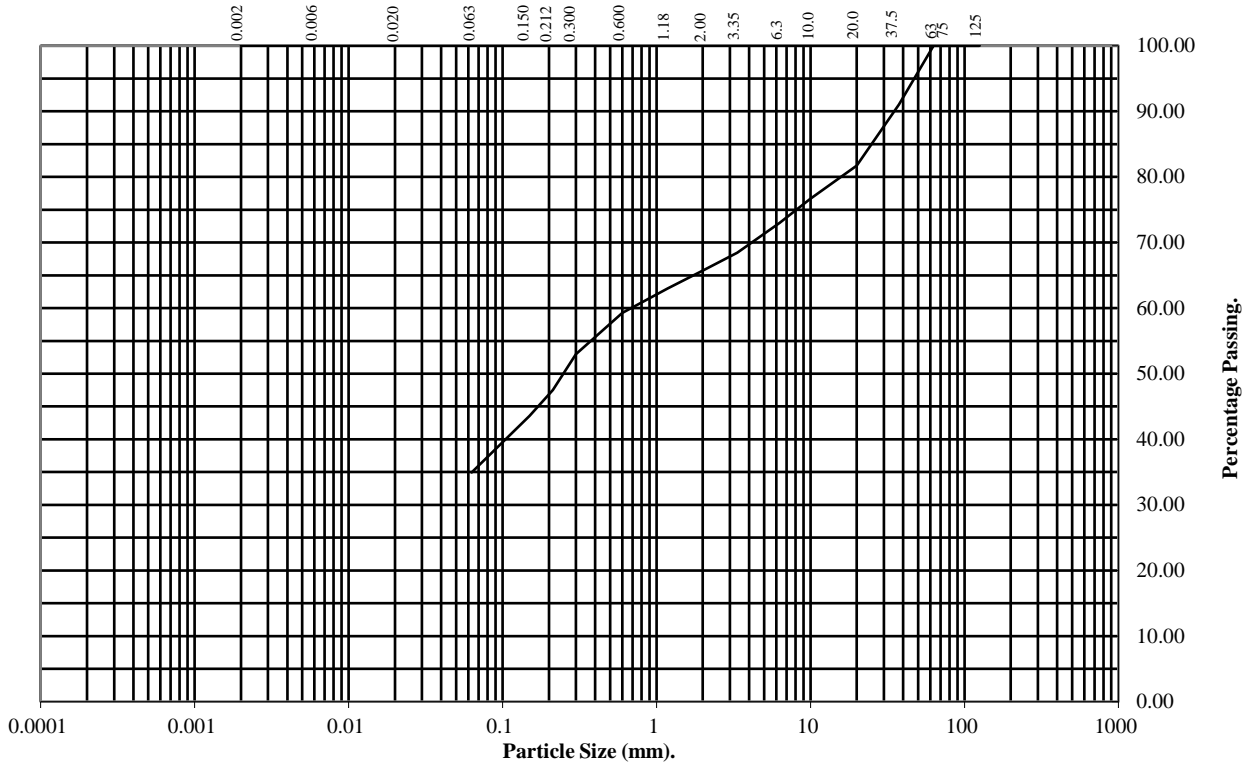
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-38** Top Depth (m): **2.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	91
20	82
10	77
6.3	73
3.35	68
2	66
1.18	63
0.6	59
0.3	53
0.212	48
0.15	44
0.063	35

Soil Fraction	Total Percentage
Cobbles	0
Gravel	34
Sand	31
Silt/Clay	35

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

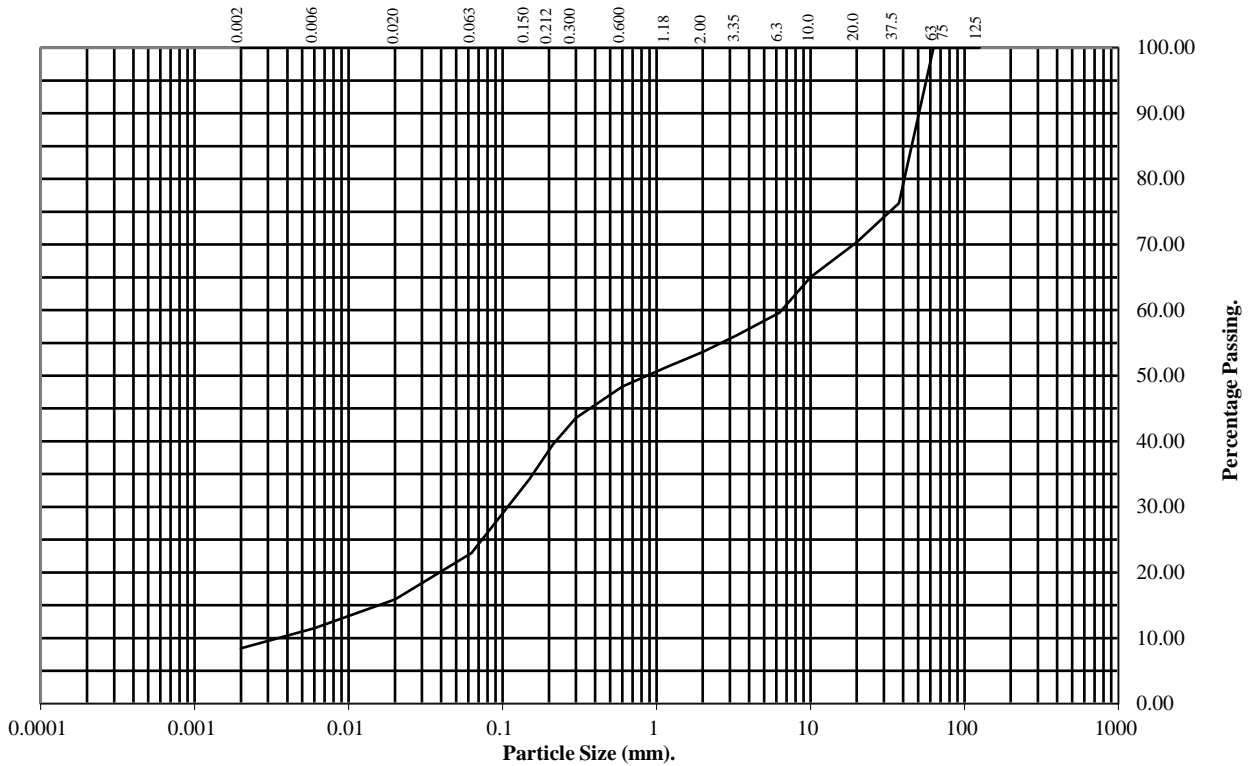
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-39** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	76
20	70
10	65
6.3	60
3.35	56
2	54
1.18	51
0.6	48
0.3	44
0.212	39
0.15	34
0.063	23

Particle Diameter	Percentage Passing
0.02	16
0.006	12
0.002	8

Soil Fraction	Total Percentage
Cobbles	0
Gravel	46
Sand	31
Silt	15
Clay	8

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

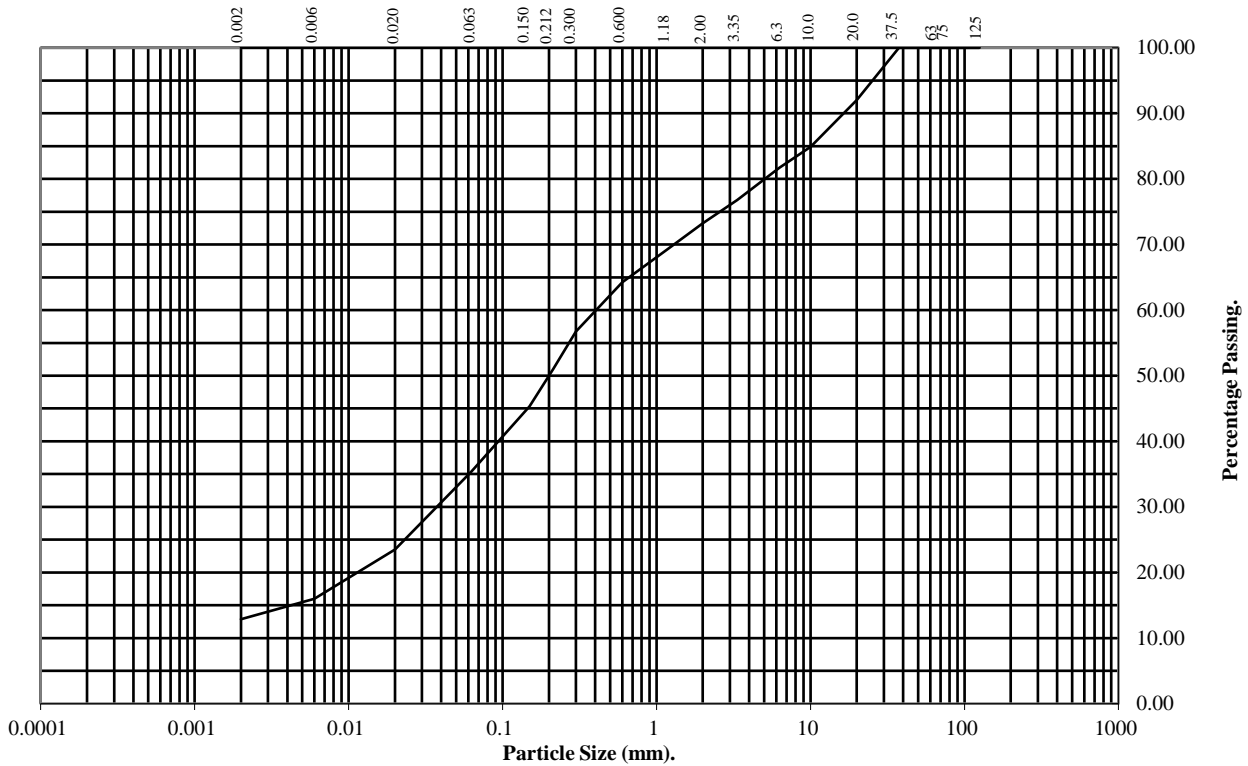
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-40** Top Depth (m): **1.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	92
10	85
6.3	82
3.35	77
2	73
1.18	69
0.6	64
0.3	57
0.212	51
0.15	45
0.063	35

Particle Diameter	Percentage Passing
0.02	23
0.006	16
0.002	13

Soil Fraction	Total Percentage
Cobbles	0
Gravel	27
Sand	38
Silt	22
Clay	13

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

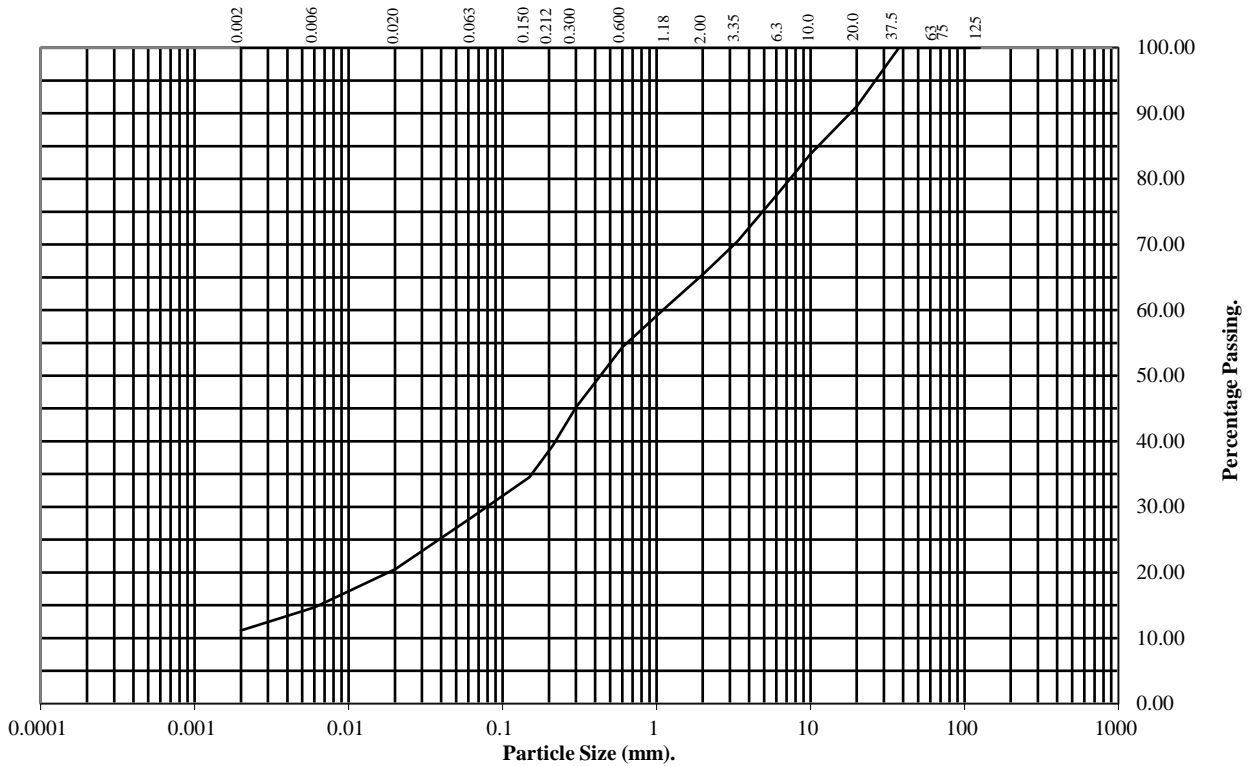
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-41** Top Depth (m): **4.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	91
10	84
6.3	78
3.35	70
2	65
1.18	61
0.6	54
0.3	45
0.212	39
0.15	35
0.063	28

Particle Diameter	Percentage Passing
0.02	20
0.006	15
0.002	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	35
Sand	37
Silt	17
Clay	11

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

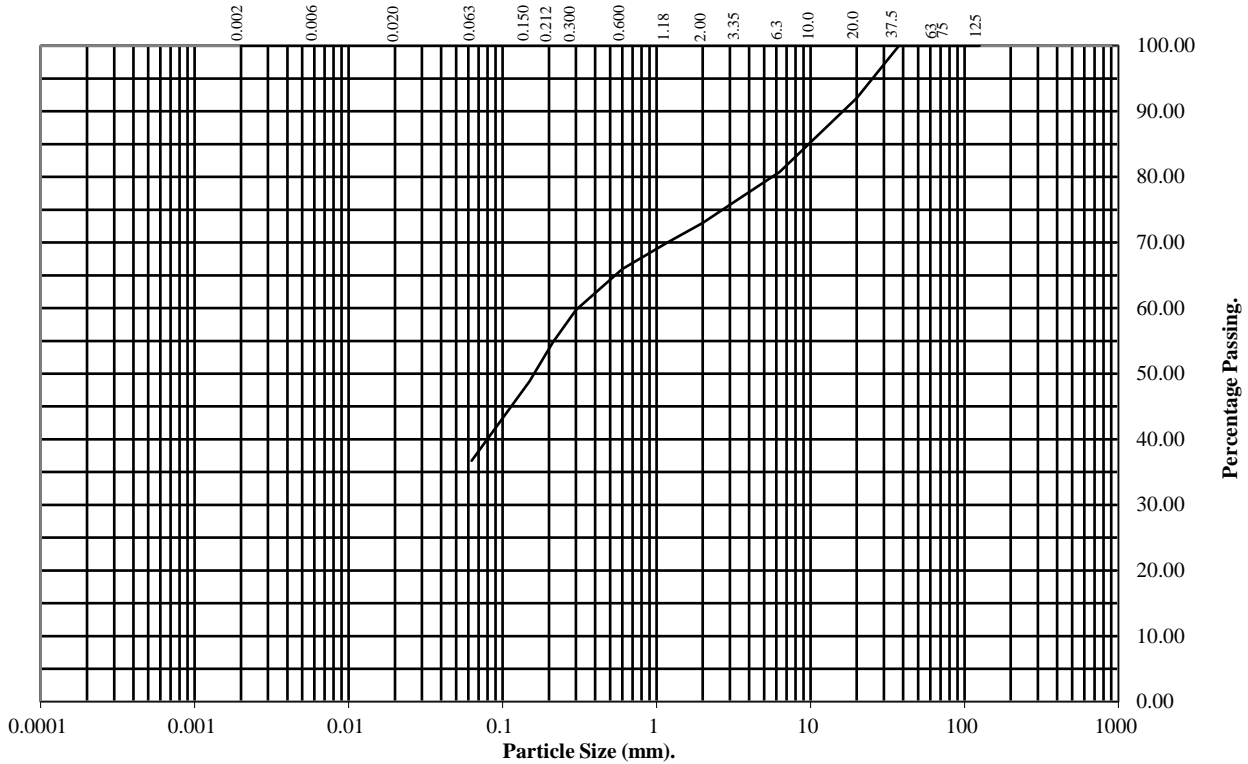
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP-42** Top Depth (m): **4.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	92
10	85
6.3	81
3.35	77
2	73
1.18	70
0.6	66
0.3	60
0.212	55
0.15	49
0.063	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	27
Sand	36
Silt/Clay	37

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

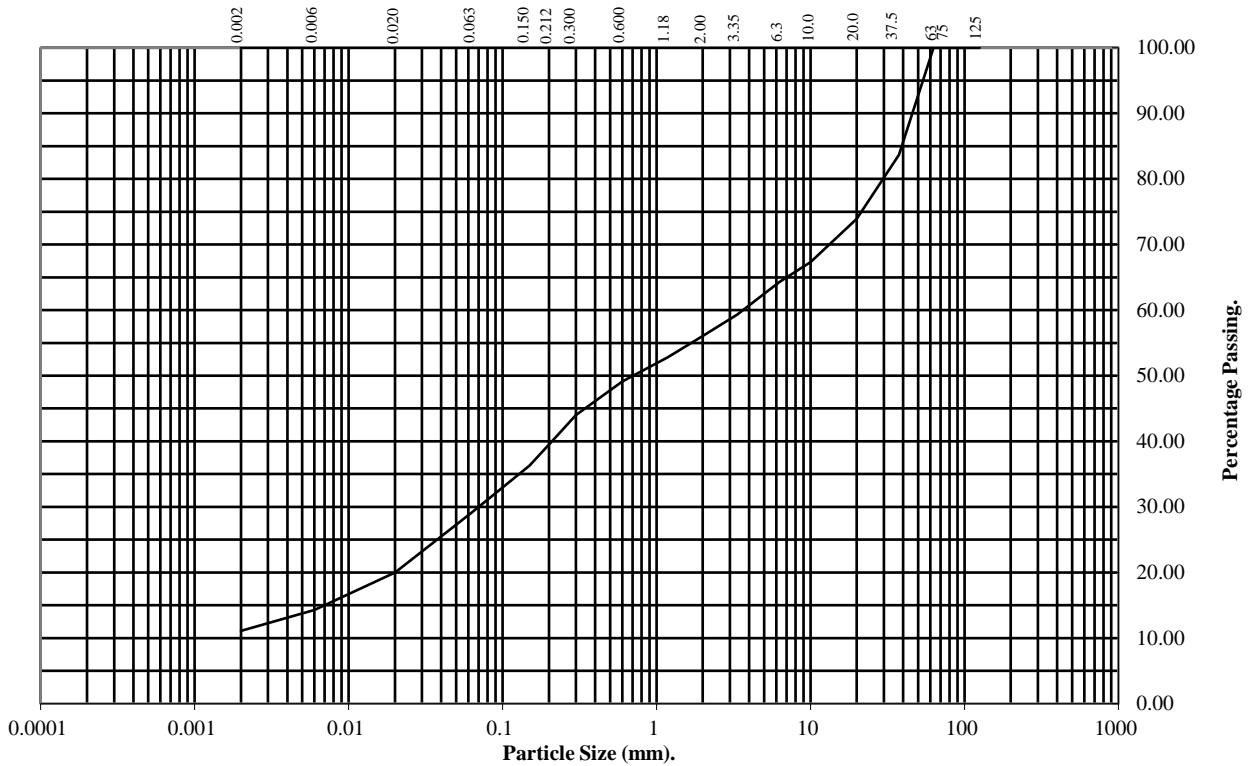
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-43** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	84
20	74
10	67
6.3	64
3.35	59
2	56
1.18	53
0.6	49
0.3	44
0.212	40
0.15	36
0.063	29

Particle Diameter	Percentage Passing
0.02	20
0.006	14
0.002	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	44
Sand	27
Silt	18
Clay	11

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

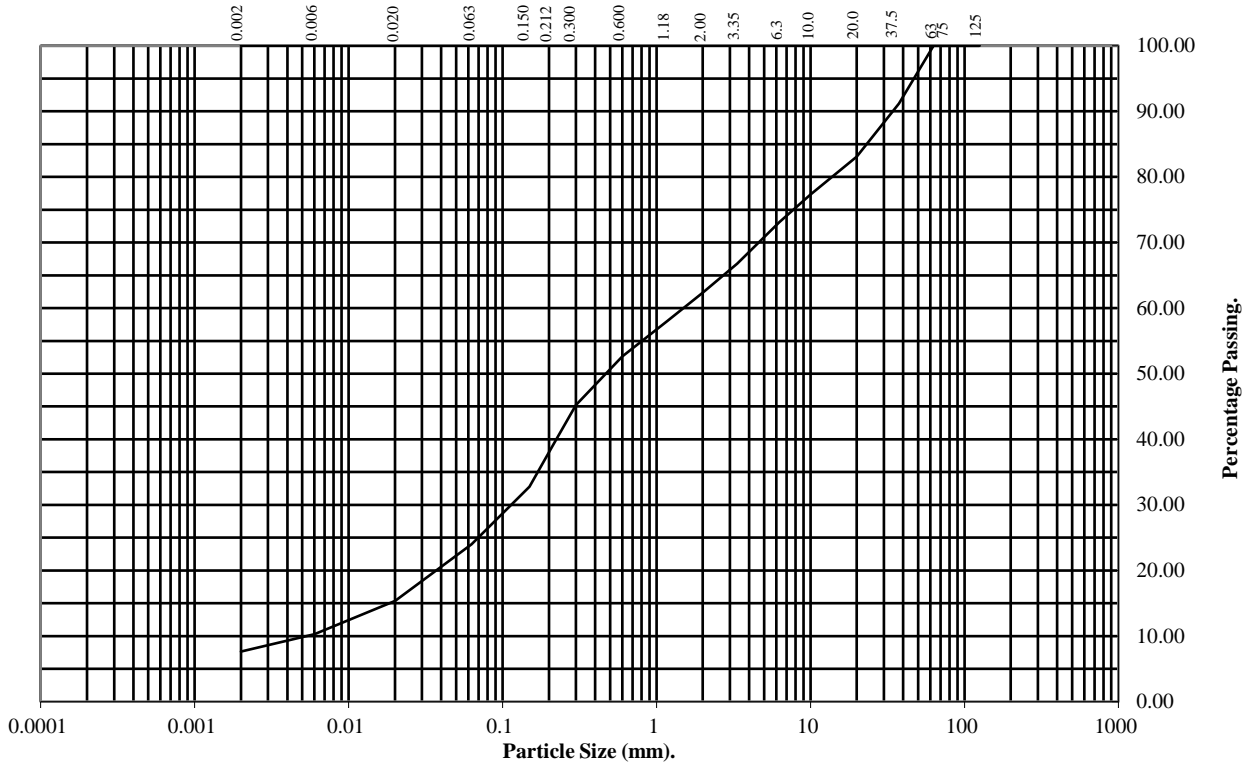
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-44** Top Depth (m): **1.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	91
20	83
10	77
6.3	73
3.35	67
2	62
1.18	58
0.6	53
0.3	45
0.212	39
0.15	33
0.063	24

Particle Diameter	Percentage Passing
0.02	15
0.006	10
0.002	8

Soil Fraction	Total Percentage
Cobbles	0
Gravel	38
Sand	38
Silt	16
Clay	8

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

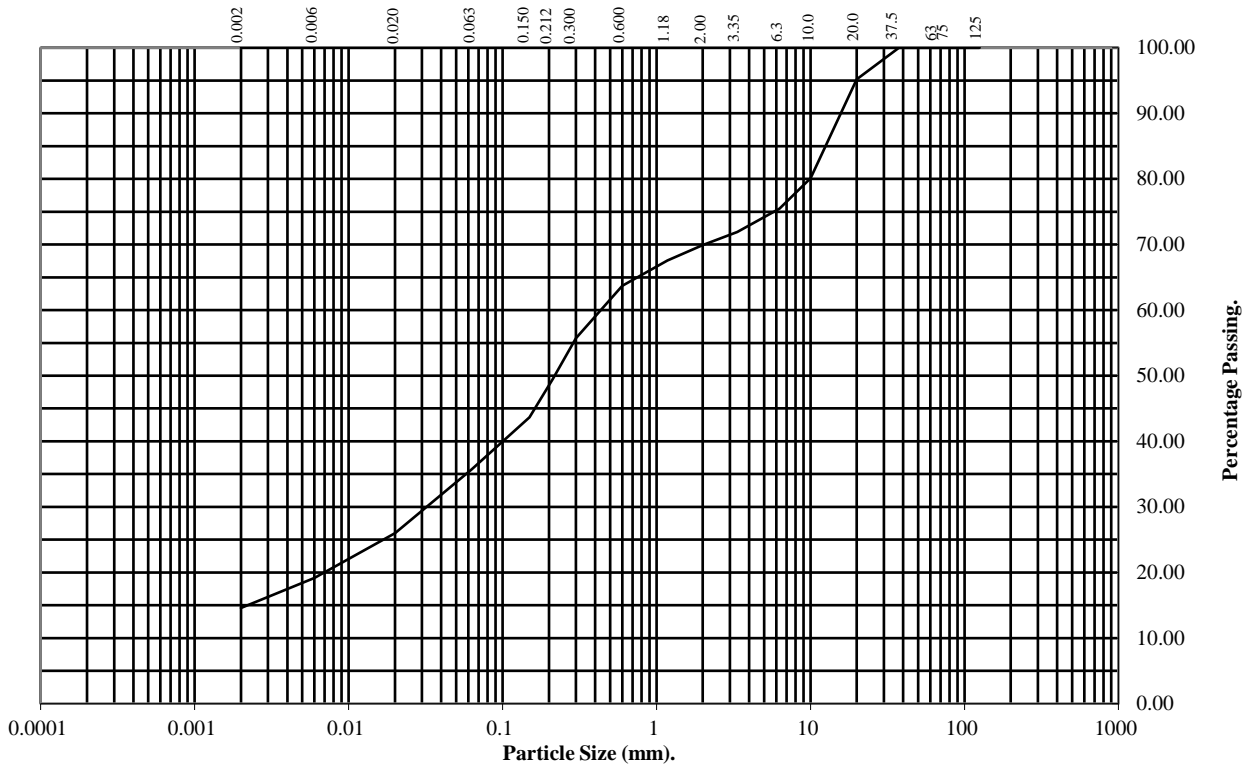
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-46** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	80
6.3	75
3.35	72
2	70
1.18	68
0.6	64
0.3	56
0.212	50
0.15	44
0.063	36

Particle Diameter	Percentage Passing
0.02	26
0.006	19
0.002	15

Soil Fraction	Total Percentage
Cobbles	0
Gravel	30
Sand	34
Silt	21
Clay	15

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

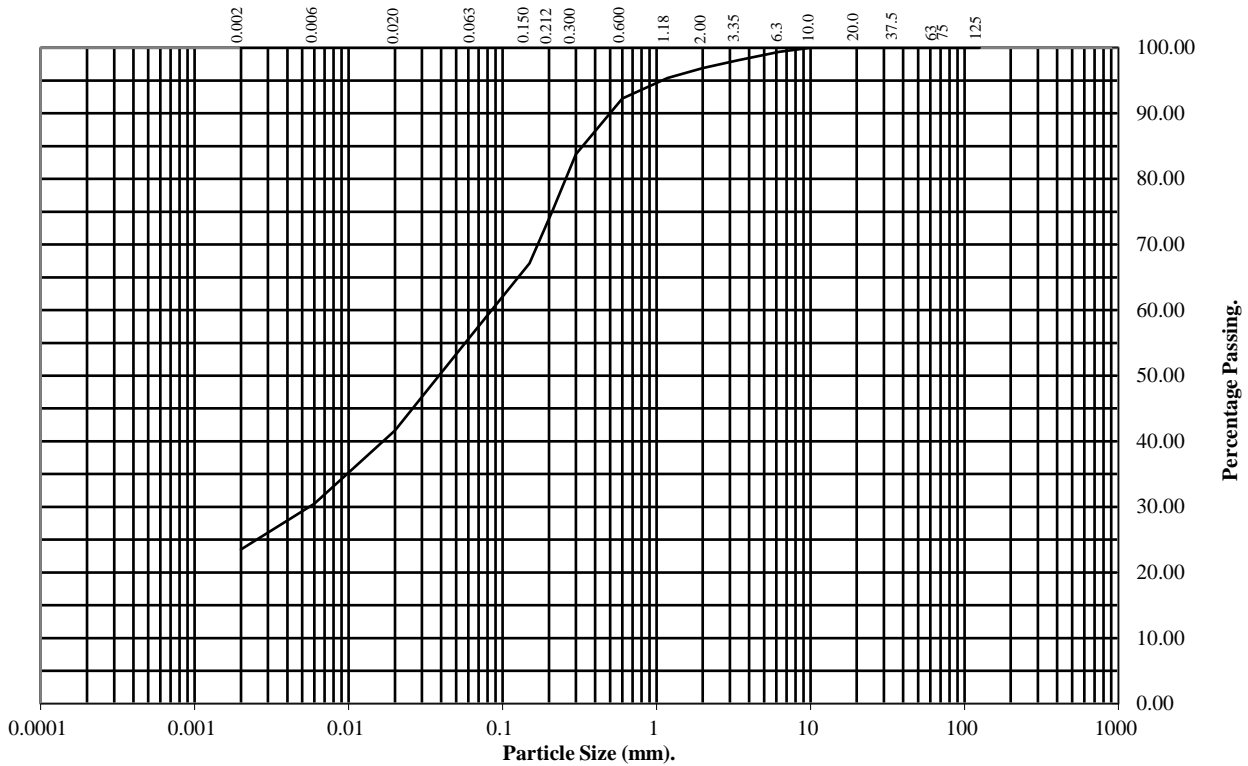
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-47** Top Depth (m): **2.00**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	98
2	97
1.18	95
0.6	92
0.3	84
0.212	75
0.15	67
0.063	56

Particle Diameter	Percentage Passing
0.02	42
0.006	30
0.002	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	41
Silt	32
Clay	24

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

PARTICLE SIZE DISTRIBUTION TEST

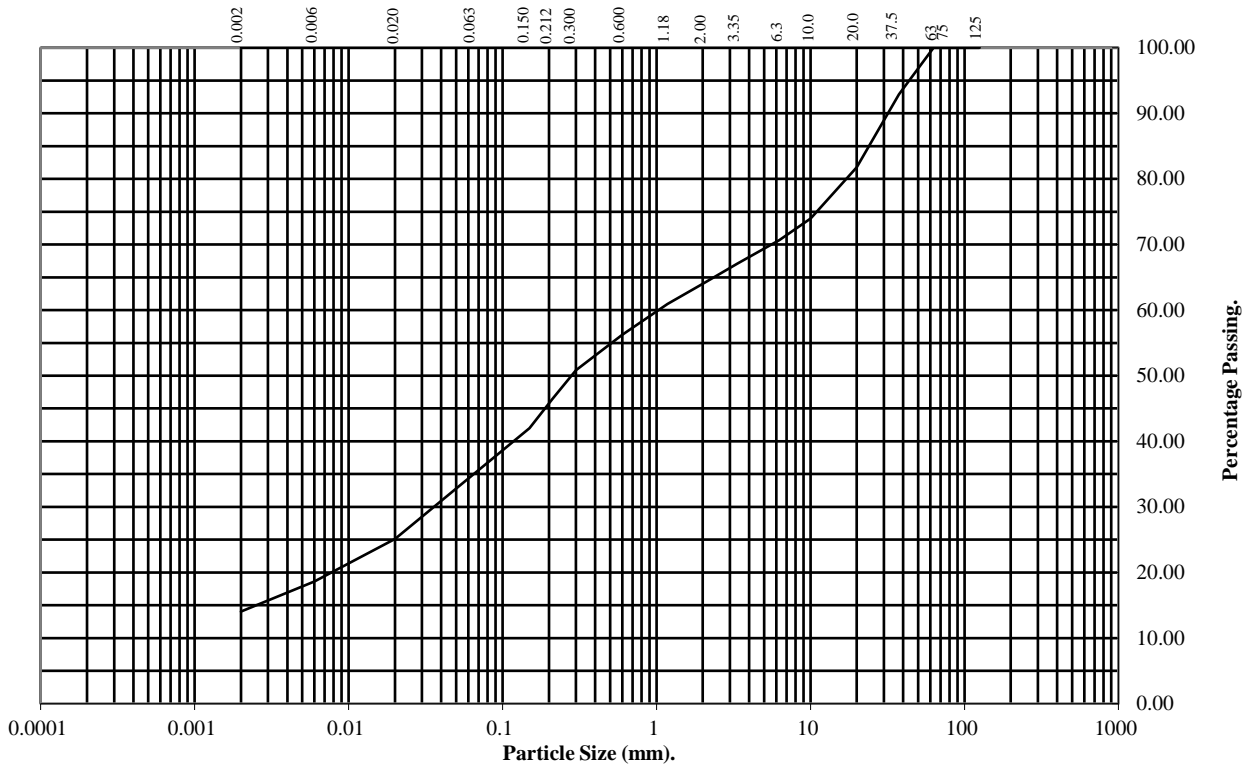
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-47** Top Depth (m): **3.50**

Sample Number: Base Depth(m):

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	93
20	82
10	74
6.3	71
3.35	67
2	64
1.18	61
0.6	56
0.3	51
0.212	47
0.15	42
0.063	35

Particle Diameter	Percentage Passing
0.02	25
0.006	19
0.002	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	36
Sand	29
Silt	21
Clay	14

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Additional GI

Contract No:
PSL23/3461
Client Ref:
12613-03-23

APPENDIX 7.3

Ground Investigation Report
(March 2024 - Ground Investigations Ireland)



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Ground Investigations Ireland
Littleton Wind Farm Borrow Pit
Fehily Timoney and Company
Ground Investigation Report
March 2024





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DOCUMENT CONTROL SHEET

Project Title	Littleton Wind Farm Borrow Pit
Engineer	Fehily Timoney and Company
Project No	13103-08-23
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	J Cashen	B Sexton	B Sexton	Dublin	05 March 2024

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



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GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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APPENDICES

Appendix 1	Figures
Appendix 2	Trial Pit Records
Appendix 3	Rotary Core Records
Appendix 4	Laboratory Testing
Appendix 5	Groundwater Monitoring



1.0 Preamble

On the instructions of Fehily Timoney and Company, a site investigation was carried out by Ground Investigations Ireland Ltd. (GII) between October and December 2023 at the site of the proposed wind farm in Littleton, County Tipperary. A series of previous site investigations were completed by GII on the site between July and August 2022, and in April 2023, respectively.

2.0 Overview

2.1. Background

Construction of a new wind farm with associated substations and access road network is proposed at the site in Littleton, County Tipperary. At the time of the site investigation the site consisted of three interlinked boglands - Longfordpass Bog, Littleton Bog and Lanespark Bog and a grass field area where the borrow pit site is proposed.

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 ten (10 No.) trial pits to a maximum depth of 4.10m BGL
- Carry out seven (7 No.) rotary core boreholes to a maximum depth of 12.40m BGL
- Installation of six (6 No.) groundwater monitoring wells
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing were 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+A1:2020.

3.2. Trial Pits

The trial pits were excavated using 7T and 12T wide tracked excavators at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geo-Environmental Engineer 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 T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole 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 KQGeo M8 GNSS System which records the coordinates and elevation of the locations to ITM as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.5. Groundwater Monitoring Installations

Groundwater Monitoring Installations were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and

finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.6. Laboratory Testing

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

Chemical testing, as required by the specification, including pH, organic matter content, total sulphur, water soluble sulphate and acid soluble sulphate testing, was carried out by Element Materials Technology Laboratory in the United Kingdom (UK).

Geotechnical testing consisting of Moisture Content, Atterberg Limits, and Particle Size Distribution (PSD) wet sieve and hydrometer tests were carried out by Professional Soils Laboratory (PSL) in the UK.

Rock testing including Point Load (I_{s50}), Unconfined Compressive Strength (UCS), Slake Durability and Los Angeles Abrasion testing was carried out by Construction Materials Testing Laboratories (CMTL) in County Laois.

The results of the laboratory testing are included in Appendix 4 of this Report.

4.0 Ground Conditions

4.1. General

This ground investigation included an assessment of two areas of the proposed site. This included the proposed borrow pit area which is located in agricultural lands next to the bog, and the proposed substation area located within the bog. The ground conditions encountered at each location are summarised separately 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.

At the proposed substation area, the sequence of strata encountered were consistent and generally comprised;

- Peat
- Fine-Grained Deposits
- Coarse-Grained Deposits
- Bedrock

PEAT: Peat was encountered at all exploratory and was generally described as *dark brown slightly clayey pseudo-fibrous PEAT*. In several of the exploratory holes a layer of *dark brown slightly clayey amorphous PEAT* overlay the pseudo-fibrous PEAT. The depth of peat varied from 0.30m to 2.00m BGL at the trial pit locations, while at the rotary core locations the peat may have extended to depths of between 2.00m and 3.50m BGL, based on the limited recovery and low SPT values.

FINE-GRAINED DEPOSITS: Fine-grained deposits were encountered beneath the Peat at most locations and were described as a *grey sandy gravelly clayey SILT*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. When in contact with water, this deposit appeared to partially liquify. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

COARSE-GRAINED DEPOSITS: Coarse-grained deposits were encountered below fine-grained deposits and were typically described as *brownish grey clayey very sandy subangular to subrounded fine to coarse GRAVEL with high cobble and boulder content*. The secondary sand and fines constituents varied across the site and with depth, while low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content was also present, where noted on the exploratory hole logs.

BEDROCK: The rotary core borehole at BH03 recovered *medium strong to very strong very thinly to medium bedded dark grey fine to coarse grained fossiliferous argillaceous LIMESTONE*. The degree of weathering ranged from fresh to slightly weathered. The depth to rock was recorded as 9.10m BGL in BH03.

At the proposed borrow pit area, the sequence of strata encountered were relatively consistent and generally comprised;

- Topsoil
- Fine-Grained Deposits
- Coarse-Grained Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.30m BGL.

FINE-GRAINED DEPOSITS: Fine-grained deposits were encountered beneath the Topsoil and were described as a *reddish brown / light brown slightly sandy slightly gravelly silty CLAY*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

COARSE-GRAINED DEPOSITS: Coarse-grained deposits were encountered below fine-grained deposits at TP-B2 and TP-B4 and were typically described as *grey clayey sandy subangular to subrounded fine to coarse GRAVEL with high cobble content*. The secondary sand and fines constituents varied across the site and with depth, while low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content was also present, where noted on the exploratory hole logs.

WEATHERED BEDROCK: Presumed weathered bedrock was encountered at TP-B1, TP-B5 and TP-B6 which was diggable with the large excavator to a depth of up to 0.40m 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 Limestone, however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand/gravel 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 at BH-B2 and BH-B3 recovered a *medium strong to very strong thinly to medium bedded dark grey fine to coarse grained fossiliferous argillaceous LIMESTONE*. The degree of weathering ranged from fresh to highly weathered. The depth to rock was recorded as 0.50m BGL in BH-B2 and 1.00m BGL in BH-B3. At BH-B1 and BH-B4, a *medium strong light brownish grey fine to coarse grained dolomitic LIMESTONE* was encountered at 1.50m BGL and 3.00m BGL, respectively. The degree of weathering ranged from fresh to highly weathered.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred. It should be noted 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 time of year, rainfall, nearby construction, and other factors. For this reason, standpipes were installed in BH01, BH03, BH-B1, BH-B2, BH-B3, and BH-B4 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 5 of this Report.

APPENDIX 1 - Figures



612000E

615000E

618000E

621000E

624000E

627000E

630000E

669000N
666000N
663000N
660000N
657000N
654000N
651000N
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Client:



Project Title:

Littleton Wind Farm Borrow Pit

Drawing Title:

Figure 1 - Site Location

GII Project Reference:



13103-08-23

Drawn By:
JC

Date:
29-02-2024

- Site Location
- Indicative Site Boundary
- Indicative Borrow Pit Area
- Indicative Substation Area



-  Trial Pit
-  Borehole



Client:



Project Code:

13103-08-23

Project Title:

Littleton Wind Farm
Borrow Pit

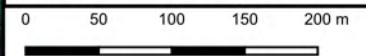
Drawing Title:

Figure 2 Site Investigation
Points



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Drawn By:
CMP

Date:
28/11/2023

APPENDIX 2 – Trial Pit Records





Machine : 12T wide tracked excavator
Method : Trial Pit

Dimensions
4.10m x 1.20m x 3.80m
(L x W x D)

Ground Level (mOD)
125.14

Client
Bord na Móna

Job Number
13103-08-23

Location
623640.6 E 656697 N

Dates
18/10/2023

Engineer
Fehily Timoney

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50 0.50	B D				(1.40)	Very soft brown clayey pseudo fibrous PEAT		
1.50 1.50	B D			123.74	1.40	Soft grey sandy gravelly clayey SILT with medium cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded		
2.50 2.50	B D			122.44	2.70	Soft grey sandy gravelly clayey SILT with high cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded. Soil liquified by excavation and water ingress		∇1
3.50 3.50	B D		Medium Ingress(1) at 3.10m.	121.34	3.80	Terminated at 3.80m		

Plan										
.
.
.
.
.

Remarks

Groundwater encountered at 3.10m BGL; Medium Ingress
 Trial pit unstable; Side walls collapsed
 Shear hand vanes not completed at all scheduled depths due to high granular content of material
 Trial pit backfilled upon completion

Scale (approx) 1:25	Logged By CMP	Figure No. 13103-08-23.TP-48
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Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 4.30m x 1.20m x 3.20m (L x W x D)	Ground Level (mOD) 124.73	Client Bord na Móna	Job Number 13103-08-23
	Location 623593.9 E 654970.7 N	Dates 18/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50 0.50	B D			124.43	(0.30) 0.30	Very soft dark brown slightly clayey amorphous PEAT		
				124.03	(0.40) 0.70	Grey mottled brown silty clayey sandy subangular to subrounded fine to coarse GRAVEL with medium cobble content. Cobbles are subangular to subrounded. (Visually assessed as Medium Dense)		
1.50 1.50	B D				(2.50)	Soft grey sandy gravelly clayey SILT with high cobble and medium boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded		
2.50 2.50	B D		Medium Ingress(1) at 2.50m.	121.53	3.20	Terminated at 3.20m		∇ ₁

Plan .	Remarks Groundwater encountered at 2.50m BGL; Medium Ingress Trial pit unstable; Side walls collapsed Shear hand vanes not completed at all scheduled depths due to high granular content of material Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>13103-08-23.TP-49</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	13103-08-23.TP-49				



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.50m x 1.20m x 4.10m (L x W x D)	Ground Level (mOD) 124.71	Client Bord na Móna	Job Number 13103-08-23
	Location 623319.8 E 654712.8 N	Dates 18/10/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B D				(2.00)	Very soft brown clayey pseudo fibrous PEAT		
3.00 3.00	B D			122.71	2.00 (2.10)	Soft grey sandy gravelly clayey SILT with medium cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded		

Plan .	Remarks Groundwater encountered at 4.00m BGL; Seepage Trial pit stable Shear hand vanes not completed at all scheduled depths due to high granular content of material Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>13103-08-23.TP-50</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	13103-08-23.TP-50				



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 5.50m x 1.20m x 4.10m (L x W x D)	Ground Level (mOD) 124.71	Client Bord na Móna	Job Number 13103-08-23
	Location 623319.8 E 654712.8 N	Dates 18/10/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Seepage(1) at 4.00m.	120.61	4.10	Complete at 4.10m		∇1

Plan .	Remarks 	
		Scale (approx) 1:25



Machine : 12T wide tracked excavator Method : Trial Pit	Dimensions 4.10m x 1.20m x 4.00m (L x W x D)	Ground Level (mOD) 121.85	Client Bord na Móna	Job Number 13103-08-23
	Location 621783.7 E 654532.7 N	Dates 18/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00 1.00	B D			121.65	(0.20) 0.20	Very soft dark brown slightly clayey amorphous PEAT		
					(1.30)	Very soft brown clayey pseudo fibrous PEAT		
2.50 2.50	B D		Medium Ingress(1) at 1.40m.	120.35	1.50	Soft grey sandy gravelly clayey SILT with low cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded. Soil liquified by excavation and water ingress		∇1
4.00	BD		Fast Ingress(2) at 3.40m.	118.45	(1.90) 3.40	Brownish grey silty clayey sandy subangular to subrounded fine to coarse GRAVEL with high cobble and boulder content. Cobbles and boulders are subangular to subrounded. (Visually assessed as Medium Dense)		∇2
				117.85	(0.60) 4.00	Complete at 4.00m		

Plan								
						Remarks		
						Groundwater encountered at 1.40m and 3.40m BGL; Medium and Fast Ingress		
						Trial pit unstable; Side walls spalling		
						Shear hand vanes not completed at all scheduled depths due to high granular content of material		
						Trial pit backfilled upon completion		
						Scale (approx)	Logged By	Figure No.
						1:25	CMP	13103-08-23.TP-51



Machine : 8T tracked excavator Method : Trial Pit	Dimensions 4.10m x 1.20m x 1.00m (L x W x D)	Ground Level (mOD) 136.56	Client Bord na Móna	Job Number 13103-08-23
	Location 623969.1 E 659000.6 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	HRV 16kPa B HV 26kPa D B		10,20,18/Av. 16.00 20,31,27/Av. 26.00	136.36	(0.20)	TOPSOIL		
0.50					0.20	Soft reddish brown slightly sandy slightly gravelly silty CLAY with high cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are angular		
0.50					0.60	Presumed WEATHERED BEDROCK recovered as grey angular Cobbles and Boulders of Limestone with some clay		
0.50					1.00	Obstruction: Presumed Bedrock at 1.00m BGL		
0.70				135.56	Complete at 1.00m			

Plan .	Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depths due to high granular content of material Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>13103-08-23.TP-B1</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	13103-08-23.TP-B1				



Machine : 8T tracked excavator Method : Trial Pit	Dimensions 5.00m x 1.20m x 4.10m (L x W x D)	Ground Level (mOD) 131.14	Client Bord na Móna	Job Number 13103-08-23
	Location 623803 E 659170.4 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50 0.50	B D			130.94	(0.20) 0.20	TOPSOIL Soft reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse		
1.50 1.50	B D			130.54	(0.40) 0.60	Firm light brown slightly sandy gravelly silty CLAY with high cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded		
2.50 2.50	B D				(2.20)			
3.50 3.50	B D			128.34	2.80 (1.30)	Brownish grey clayey very sandy subangular to subrounded fine to coarse GRAVEL with high cobble and boulder content. Cobbles and boulders are subangular to subrounded. (Visually assessed as Medium Dense)		

Plan .	Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depths due to granular content of material Trial pit backfilled upon completion	
		Scale (approx) 1:25	Logged By CMP	Figure No. 13103-08-23.TP-B2



Machine : 8T tracked excavator Method : Trial Pit	Dimensions 5.00m x 1.20m x 4.10m (L x W x D)	Ground Level (mOD) 131.14	Client Bord na Móna	Job Number 13103-08-23
	Location 623803 E 659170.4 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				127.04	4.10	Complete at 4.10m		

Plan .	Remarks 	Scale (approx) 1:25	Logged By CMP	Figure No. 13103-08-23.TP-B2
---	--	-------------------------------	-------------------------	--



Machine : 8T tracked excavator Method : Trial Pit	Dimensions 4.50m x 1.20m x 1.20m (L x W x D)	Ground Level (mOD) 132.57	Client Bord na Móna	Job Number 13103-08-23
	Location 623755.1 E 659040.2 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50 0.50	B D			132.37	(0.20) 0.20	TOPSOIL		
					(0.40)	Soft reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse		
				131.97	0.60	Firm light brown slightly sandy gravelly silty CLAY with high cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are angular		
					(0.60)			
1.20 1.20	B D			131.37	1.20	Obstruction: Possible Bedrock at 1.20m BGL Complete at 1.20m		

Plan .	Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depths due to high granular content of material Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>13103-08-23.TP-B3</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	13103-08-23.TP-B3				



Machine : 7T tracked excavator Method : Trial Pit	Dimensions 4.70m x 1.20m x 2.80m (L x W x D)	Ground Level (mOD) 129.59	Client Bord na Móna	Job Number 13103-08-23
	Location 623734.1 E 658843.9 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50 0.50	B D			129.29	(0.30)	TOPSOIL		
				128.89	(0.40)	Soft reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse		
1.50 1.50	B D			127.09	(1.80)	Firm light brown slightly sandy gravelly silty CLAY with high cobble and medium boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subangular to subrounded		
2.70 2.70	B D		Seepage(1) at 2.80m.	126.79	2.80	Grey clayey sandy subangular to subrounded fine to coarse GRAVEL with high cobble content. Cobbles and boulders are subangular to subrounded. (Visually assessed as Medium Dense) Obstruction: Possible Bedrock at 2.80m BGL Complete at 2.80m		▽1

Plan .	Remarks Groundwater encountered at 2.80m BGL; Seepage Trial pit stable Shear hand vanes not completed at all scheduled depths due to high granular content of material Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>13103-08-23.TP-B4</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	13103-08-23.TP-B4				



Machine : 8T tracked excavator Method : Trial Pit	Dimensions 4.40m x 1.20m x 0.80m (L x W x D)	Ground Level (mOD) 139.61	Client Bord na Móna	Job Number 13103-08-23
	Location 623925.5 E 658892.4 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50 0.50	B D			139.41	(0.20) 0.20	TOPSOIL Soft reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse		
0.80 0.80	B D			139.01 138.81	0.60 (0.20) 0.80	Presumed WEATHERED BEDROCK recovered as grey slightly clayey slightly sandy angular fine to coarse GRAVEL with high cobble and boulder content. Cobbles and boulders are angular. (Visually assessed as Medium Dense) Obstruction: Presumed Bedrock at 0.80m BGL Complete at 0.80m		

Plan 	Remarks No groundwater encountered Trial pit stable Trial pit backfilled upon completion



Machine : 7T tracked excavator Method : Trial Pit	Dimensions 4.60m x 1.20m x 0.80m (L x W x D)	Ground Level (mOD) 138.95	Client Bord na Móna	Job Number 13103-08-23
	Location 623878.1 E 658978.7 N	Dates 17/10/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.80 0.80	B D			138.75	0.20	TOPSOIL		
					0.20	Soft reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse		
					0.40	Presumed WEATHERED BEDROCK recovered as grey slightly clayey sandy angular fine to coarse GRAVEL with high cobble and boulder content. Cobbles and boulders are angular. (Visually assessed as Medium Dense)		
					0.80	Obstruction: Presumed Bedrock at 0.80m BGL		
				138.15	0.80	Complete at 0.80m		

Plan .	Remarks No groundwater encountered Trial pit stable Trial pit backfilled upon completion					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>CMP</td> <td>13103-08-23.TP-B4</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	CMP
Scale (approx)	Logged By	Figure No.				
1:25	CMP	13103-08-23.TP-B4				

Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-48



TP-48



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-48



TP-48



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-48



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-49



TP-49



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-49



TP-49



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-49



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-50



TP-50



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-50



TP-50



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-50



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-51



TP-51



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-51



TP-51



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-51



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B1



TP-B1



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B1



TP-B1



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B1



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B2



TP-B2



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B2



TP-B2



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B2



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B3



TP-B3



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B3



TP-B3



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B3



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B4



TP-B4



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B4



TP-B4



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B4



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B5



TP-B5



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B5



TP-B5



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B5



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B6



TP-B6



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B6



TP-B6



Littleton Wind Farm Borrow Pit – Trial Pit Photographs

TP-B6



APPENDIX 3 – Rotary Core Records





Machine : Beretta T44		Casing Diameter 96mm cased to 6.50m		Ground Level (mOD) 124.51		Client Bord na Móna		Job Number 13103-08-23	
Flush : Water		Location 623340.4 E 658859.9 N		Dates 04/12/2023		Engineer Fehily Timoney		Sheet 1/1	
Core Dia: 63.5 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	100						(2.00)	Very soft dark brown spongy pseudofibrous PEAT			
1.50 1.50-1.95	100				1,0/0,1,0,0 SPT(C) N=1	122.51	2.00	Recovery consists of dark brown pseudofibrous spongy PEAT onto grey slightly sandy slightly gravelly silty CLAY. Driller notes; Peat onto Clay (Very soft)			
2.00	67						(1.50)				
3.50 3.50-3.95	20				1,1/1,0,1,1 SPT(C) N=3	121.01	3.50	Recovery consists of grey slightly sandy slightly gravelly silty CLAY onto grey slightly sandy subangular to subrounded fine to coarse GRAVEL. Driller notes; Clay to Gravel (Very soft)			
5.00 5.00-5.45	43				4,6/9,9,11,13 SPT(C) N=42	119.51	5.00	Recovery consists of grey slightly sandy subangular to subrounded fine to coarse GRAVEL. Driller notes; Gravel (Dense)			
6.50 6.50-6.88					7,9/11,12,27 SPT(C) 50/225	118.01	6.50	Complete at 6.50m			

Remarks 50mm slotted standpipe with pea gravel surround installed from 6.50m to 4.00m BGL. 50mm plain standpipe with a bentonite seal installed from 4.00m to GL with a raised cover.	Scale (approx)	Logged By
	1:50	LM
	Figure No. 13103-08-23.BH01	



Machine : Beretta T44 Flush : Water Core Dia: 63.5 mm Method : Rotary Cored	Casing Diameter 96mm cased to 6.50m	Ground Level (mOD) 124.54	Client Bord na Móna	Job Number 13103-08-23
	Location 623325.5 E 658894.9 N	Dates 05/12/2023	Engineer Fehily Timoney	Sheet 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00	100							Very soft dark brown pseudofibrous spongy PEAT		
1.50 1.50-1.95	100				1,1/0,1,0,0 SPT(C) N=1	122.54	2.00	Recovery consists dark brown pseudofibrous spongy PEAT onto grey slightly sandy subangular to subrounded fine to coarse GRAVEL. Driller notes; Peat to Gravel (Very soft)		
2.00	67						(1.50)			
3.50 3.50-3.95	33				1,0/0,1,0,1 SPT(C) N=2	121.04	3.50	Recovery consists of grey slightly sandy slightly gravelly silty CLAY. Driller notes; silty Clay (Very soft)		
5.00 5.00-5.45	67				7,9/11,11,17,11 SPT(C) N=50	119.54	5.00	Recovery consists of grey slightly sandy subangular to subrounded fine to coarse GRAVEL. Driller notes; Gravel (dense)		
6.50 6.50-6.65					14,11/50 SPT(C)	118.04	6.50	Complete at 6.50m		

Remarks	Scale (approx)	Logged By
	1:50	LM
	Figure No. 13103-08-23.BH02	



Machine : Beretta T44		Casing Diameter 96mm cased to 12.40m		Ground Level (mOD) 124.73		Client Bord na Móna		Job Number 13103-08-23	
Flush : Water		Location 623335.4 E 658949.8 N		Dates 29/11/2023-30/11/2023		Engineer Fehily Timoney		Sheet 1/2	
Core Dia: 63.5 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	67							Very soft dark brown pseudofibrous PEAT			
1.50 1.50-1.95	100				1,0/0,1,0,1 SPT(C) N=2		(2.00)				
2.00	33					122.73	2.00	Recovery consists of dark brown pseudofibrous spongy PEAT			
3.50 3.50-3.95	27				1,2/0,2,3,4 SPT(C) N=9	121.23	3.50	Recovery consists of slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL with low cobble content. Driller notes; Gravel (Loose to medium dense)			
5.00 5.00-5.45	20				3,6/4,6,9,10 SPT(C) N=29	119.73	5.00	Recovery consists of slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL with low cobble content. Driller notes; Gravel (Medium dense to dense)			
6.50 6.50-6.95	47				7,7/12,12,17,9 SPT(C) N=50	118.23	6.50	Recovery consists of slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL with low cobble content. Driller notes; Gravel (Dense)			
8.00 8.00-8.15	73	27	21		25/50 SPT(C) 25*/75 50/75		(2.60)				
9.10						115.63	9.10	Medium strong to strong very thinly to medium bedded dark grey fine to coarse grained fossiliferous argillaceous LIMESTONE. Slightly weathered			
9.50 9.55-9.75					U		(1.30)	(9.10m to 11.00m BGL) 1 No. Fracture set. F1: 0-30 degree fracture close to medium spaced undulating rough with clay infill			

Remarks 50mm slotted standpipe with pea gravel surround installed from 11.00m to 7.00m BGL. 50mm plain standpipe with a bentonite seal installed from 7.00m to GL with a raised cover. Bentonite seal from 12.40m to 11.00m BGL.								Scale (approx)	Logged By
								1:50	LM
								Figure No. 13103-08-23.BH02	



Machine : Beretta T44 Flush : Water Core Dia: 63.5 mm Method : Rotary Cored	Casing Diameter 96mm cased to 12.40m	Ground Level (mOD) 124.73	Client Bord na Móna	Job Number 13103-08-23
	Location 623335.4 E 658949.8 N	Dates 29/11/2023- 30/11/2023	Engineer Fehily Timoney	Sheet 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.40-10.60	88	73	59	8	U	114.33	10.40	Strong very thinly to medium bedded dark grey fine to coarse grained fossiliferous argillaceous LIMESTONE. Fresh (11.00m to 12.40m BGL) 1 No. Fracture set. F1: 0-15 degree fracture medium spaced undulating rough			
11.00						(2.00)					
11.85-12.00	100	85	61	7	U						
12.40						112.33	12.40	Complete at 12.40m			

Remarks	Scale (approx)	Logged By
	1:50	LM
	Figure No. 13103-08-23.BH02	



Machine : Beretta T44		Casing Diameter 96mm cased to 7.50m		Ground Level (mOD) 133.39		Client Bord na Móna		Job Number 13103-08-23	
Flush : Water		Location (dGPS) 623918.5 E 659094.8 N		Dates 08/12/2023		Engineer Fehily Timoney		Sheet 1/1	
Core Dia: 63.5 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	67					133.14	(0.25) 0.25	TOPSOIL			
						(1.25)	Recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL. Driller notes: Clay onto possible bedrock.				
1.50	100	33	20	NI		131.89	1.50	Medium strong massive grey medium grained LIMESTONE. Slightly to moderately weathered			
2.00							(1.50)	(1.50m to 2.30m BGL) Non intact (2.30m to 4.25m BGL) 1 No. Fracture set. F1: 0-40 degree fracture closely spaced undulating rough			
2.30				100	61	41	8	U	130.39	3.00	Medium strong massive brownish grey medium to coarse grained dolomitic LIMESTONE. Slightly to moderately weathered
2.75-3.00										130.09	3.30
3.50	97	84	80			129.64	(0.45) 3.75	Medium strong massive brownish grey medium to coarse grained dolomitic LIMESTONE. Slightly to moderately weathered with occasional white mineral veins			
4.25										(1.50)	(4.25m to 7.50m BGL) 1 No. Fracture set. F1: 0-20 degree fracture closely spaced undulating to planar rough
4.45-4.70						128.14	5.25	Strong massive reddish grey medium to coarse grained dolomitic LIMESTONE. Slightly to moderately weathered with occasional white mineral veins			
5.00						100	100	98	4	U	
5.00-5.25											
5.40-5.65											
6.50						100	86	86			
7.50						125.89	7.50	Complete at 7.50m			

Remarks
50mm slotted standpipe with pea gravel surround installed from 6.50m to 2.50m BGL. 50mm plain standpipe with a bentonite seal installed from 2.50m to GL with a raised cover. Bentonite seal from 7.50m to 6.50m BGL.

Scale (approx)	Logged By
1:50	LM
Figure No. 13103-08-23.BH-B1	



Machine : Beretta T44 Flush : Water Core Dia: 63.5 mm Method : Rotary Cored	Casing Diameter 96mm cased to 6.50m Location (dGPS) 623871.4 E 658897.4 N	Ground Level (mOD) 140.17 Dates 06/12/2023	Client Bord na Móna Engineer Fehily Timoney	Job Number 13103-08-23 Sheet 1/1
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Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00							(0.50)	TOPSOIL			
0.50	100	9	0	NI		139.67	0.50	Medium strong to strong thinly to medium bedded dark grey fine to coarse grained fossiliferous argillaceous LIMESTONE. Slightly weathered			
1.35 1.50	100	92	0				(2.55)	(1.35m to 3.05m BGL) 2 No. fracture sets. F1: 0-30 degree fracture closely spaced undulating rough. F2: 70-90 degree fracture widely spaced undulating and rough.			
2.00 2.00-2.10	100	81	53	13	U						
3.05 3.10-3.35					U	137.12	3.05	Strong thinly to medium bedded dark grey medium to coarse grained fossiliferous argillaceous LIMESTONE. Fresh			
3.50 4.05-4.17	100	83	59	7	U		(3.45)	(3.05m to 6.50m BGL) 1 No. Fracture set. F1: 0-40 degree fracture close to medium spaced undulating rough with clay infill on fractured surfaces			
5.00 5.25-5.50	100	85	65		U						
6.50						133.67	6.50	Complete at 6.50m			

Remarks
50mm slotted standpipe with pea gravel surround installed from 5.50m to 1.00m BGL. 50mm plain standpipe with a bentonite seal installed from 1.00m to GL with a raised cover. Bentonite seal from 6.50m to 5.50m BGL.

Scale (approx)
1:50

Logged By
LM

Figure No.
13103-08-23.BH-B2



Machine : Beretta T44	Casing Diameter 96mm cased to 7.00m	Ground Level (mOD) 140.09	Client Bord na Móna	Job Number 13103-08-23
Flush : Water			Engineer Fehily Timoney	Sheet 1/1
Core Dia: 63.5 mm	Location (dGPS) 623869 E 658810.4 N	Dates 07/12/2023		
Method : Rotary Cored				

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00							(0.50)	TOPSOIL			
	100	9	0			139.59	0.50	No recovery. Driller notes; Clay			
1.00						139.09	1.00	Medium strong thinly bedded dark grey fine grained argillaceous LIMESTONE. Highly weathered (1.00m to 2.65m BGL) Mostly non-intact			
1.50	100	0	0	NI			(1.65)				
2.00											
2.65	100	61	41			137.44	2.65	Medium strong to strong thinly bedded dark grey fine grained slightly fossiliferous argillaceous LIMESTONE. Moderately weathered			
2.95-3.00				13	U		(1.65)	(2.65m to 4.30m BGL) 2 No. fracture sets. F1: 0-20 degree fracture closely spaced planar rough. F2: 40-60 degree fracture close to medium spaced undulating rough.			
3.50											
4.00	100	83	59		U	135.79	4.30	Strong thinly bedded dark grey fine grained slightly fossiliferous argillaceous LIMESTONE. Fresh			
4.00-4.25					U			(4.30 to 7.00m BGL) 2 No. Fracture sets. F1: 0-20 degree fracture medium spaced undulating rough. F2: 40-60 degree fracture medium spaced undulating rough.			
4.35-4.55											
5.00											
5.40-5.75	100	85	65	7	U		(2.70)				
6.50	100	100	100								
7.00						133.09	7.00	Complete at 7.00m			

Remarks 50mm slotted standpipe with pea gravel surround installed from 6.00m to 1.00m BGL. 50mm plain standpipe with a bentonite seal installed from 1.00m to GL with a raised cover. Bentonite seal from 7.00m to 5.50m BGL.	Scale (approx)	Logged By
	1:50	LM
	Figure No. 13103-08-23.BH-B2	



Machine : Beretta T44		Casing Diameter 96mm cased to 8.00m		Ground Level (mOD) 133.94		Client Bord na Móna		Job Number 13103-08-23	
Flush : Water		Location (dGPS) 623785.4 E 659075.7 N		Dates 07/12/2023		Engineer Fehily Timoney		Sheet 1/1	
Core Dia: 63.5 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	67					133.64	(0.30) 0.30	TOPSOIL			
							Recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL. Driller notes; clayey Gravel				
1.50	20						(1.60)				
2.00	100	33	27			132.04	1.90	Recovery consists of reddish brown slightly sandy gravelly CLAY with low cobble content			
3.00											(1.10)
3.25-3.30	60	60	23		U	130.94	3.00	Medium strong brownish grey fine to coarse grained fossiliferous dolomitic LIMESTONE. Moderately weathered with clay infill and reduced recovery			
3.50											(2.00)
5.00	100	96	75	7	U	128.94	5.00	Medium strong brownish grey fine to coarse grained fossiliferous dolomitic LIMESTONE. Slightly to moderately weathered with clay infill and rare white mineral veins			
5.35-5.60											(3.00)
6.50	100	83	70		U						
6.60-6.75											
8.00						125.94	8.00	Complete at 8.00m			

Remarks
50mm slotted standpipe with pea gravel surround installed from 7.00m to 2.00m BGL. 50mm plain standpipe with a bentonite seal installed from 2.00m to GL with a raised cover. Bentonite seal from 8.00m to 7.00m BGL.

Scale (approx)	Logged By
1:50	LM
Figure No. 13103-08-23.BH-B4	

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BH01



BH01 – Box 1



BH01 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BH02



BH02 – Box 1



BH02 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BH03



BH03 – Box 1



BH03 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs



BH03 – Box 3

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BHB1



BHB1 – Box 1



BHB1 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs



BHB1 – Box 3

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BHB2



BHB2 – Box 1



BHB2 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs



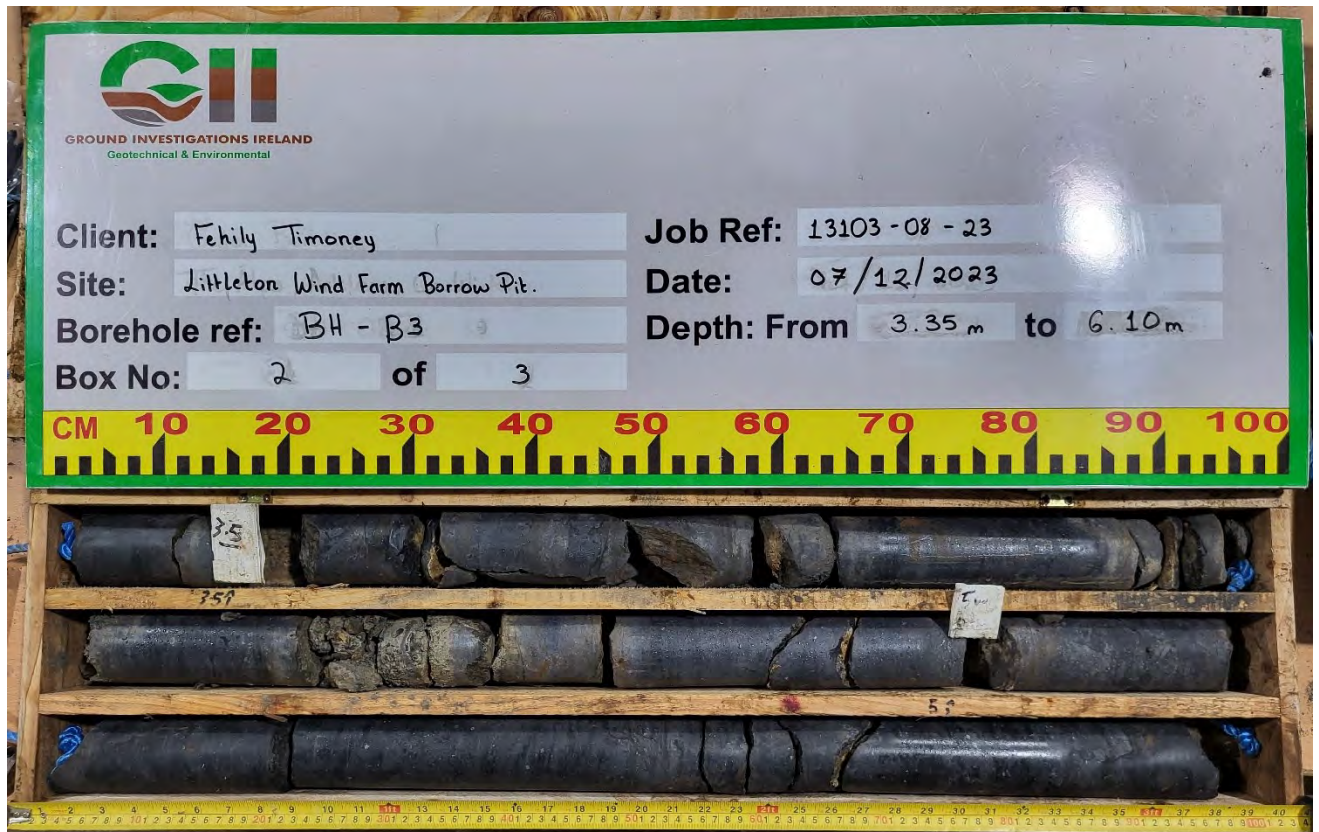
BHB2 – Box 3

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BHB3



BHB3 – Box 1



BHB3 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs



BHB3 – Box 3

Littleton Wind Farm Borrow Pit – Rotary Core Photographs

BHB4



BHB4 – Box 1



BHB4 – Box 2

Littleton Wind Farm Borrow Pit – Rotary Core Photographs



BHB4 – Box 3

APPENDIX 4 – Laboratory Testing



Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland
D22 K5P8



4225



Attention : James Cashen
Date : 9th November, 2023
Your reference : 13103-08-23
Our reference : Test Report 23/18517 Batch 1
Location : Littleton Wind Farm Borrow Pit
Date samples received : 6th November, 2023
Status : Final Report
Issue : 1

Four samples were received for analysis on 6th November, 2023 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

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

Scope 1&2 emissions - 6.661 kg of CO2

Scope 1&2&3 emissions - 15.741 kg of CO2

Authorised By:



Liza Klebe

Project Co-ordinator

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/18517

SOILS and ASH

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

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

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

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

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

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

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

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

EMT Job No: 23/18517

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



LABORATORY REPORT



Contract Number: PSL23/10530

Report Date: 10 January 2024
Client's Reference: 13103-08-23
Client Name: Ground investigation Ireland Ltd
Catherinestown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: James Cashen/Conor McParland

Project Name: Littleton Wind Farm Borrow Pit

Date Received: 15/12/2023
Date Commenced: 15/12/2023
Date Completed: 10/01/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)


M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road,
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Page 1 of

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

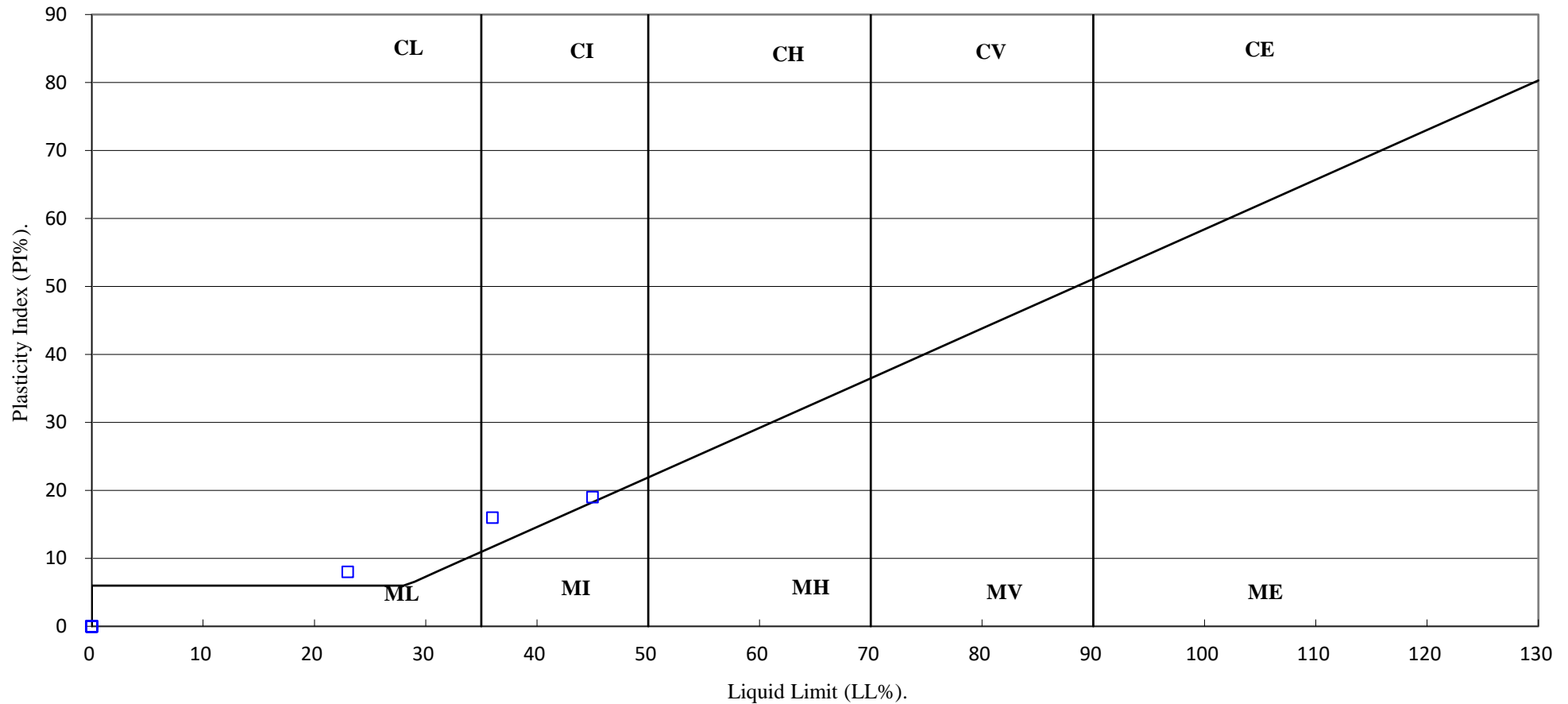
Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % <small>Clause 3.2</small>	Linear Shrinkage % <small>Clause 6.5</small>	Particle Density Mg/m ³ <small>Clause 8.2</small>	Liquid Limit % <small>Clause 4.3/4</small>	Plastic Limit % <small>Clause 5.3</small>	Plasticity Index % <small>Clause 5.4</small>	Passing .425mm %	Remarks
TP-B1		B&D	0.50		18			36	20	16	85	Intermediate Plasticity CI
TP-B2		B&D	3.50		12							
TP-B3		B&D	1.20		13			23	15	8	81	Low Plasticity CL
TP-B5		B&D	0.50		17			45	26	19	31	Intermediate Plasticity CI
TP-48		B&D	3.50		14				NP			
TP-49		B&D	1.50		9.5				NP			
TP-50		B&D	3.00		5.3				NP			
TP-51		B&D	2.50		10				NP			

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

		<p>Littleton Wind Farm Borrow Pit</p>	Contract No:
			PSL23/10530
			Client Ref:
			13103-08-23

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Littleton Wind Farm Borrow Pit

Contract No:

PSL23/10530

Client Ref:

13103-08-23

PARTICLE SIZE DISTRIBUTION TEST

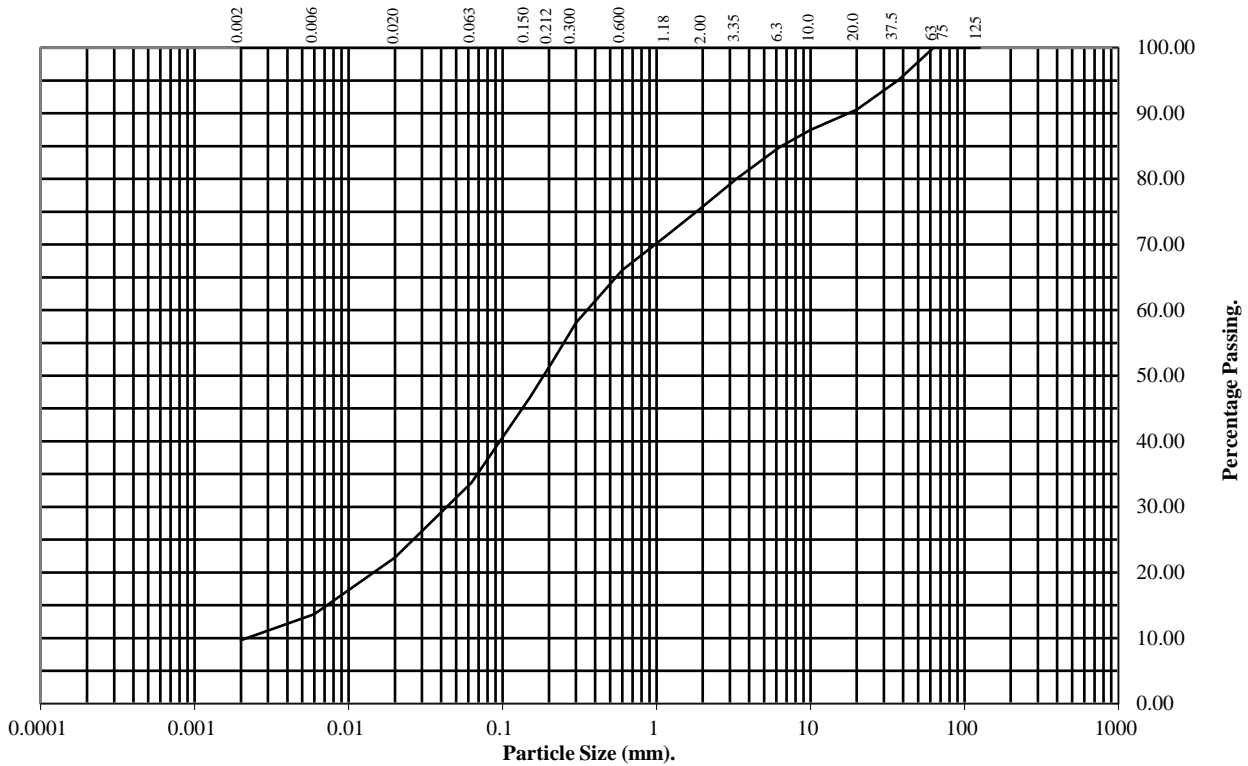
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-49** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B&D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	91
10	87
6.3	85
3.35	80
2	76
1.18	71
0.6	66
0.3	58
0.212	52
0.15	47
0.063	34

Particle Diameter	Percentage Passing
0.02	22
0.006	14
0.002	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	24
Sand	42
Silt	24
Clay	10

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Borrow Pit

Contract No:
PSL23/10530
Client Ref:
13103-08-23

PARTICLE SIZE DISTRIBUTION TEST

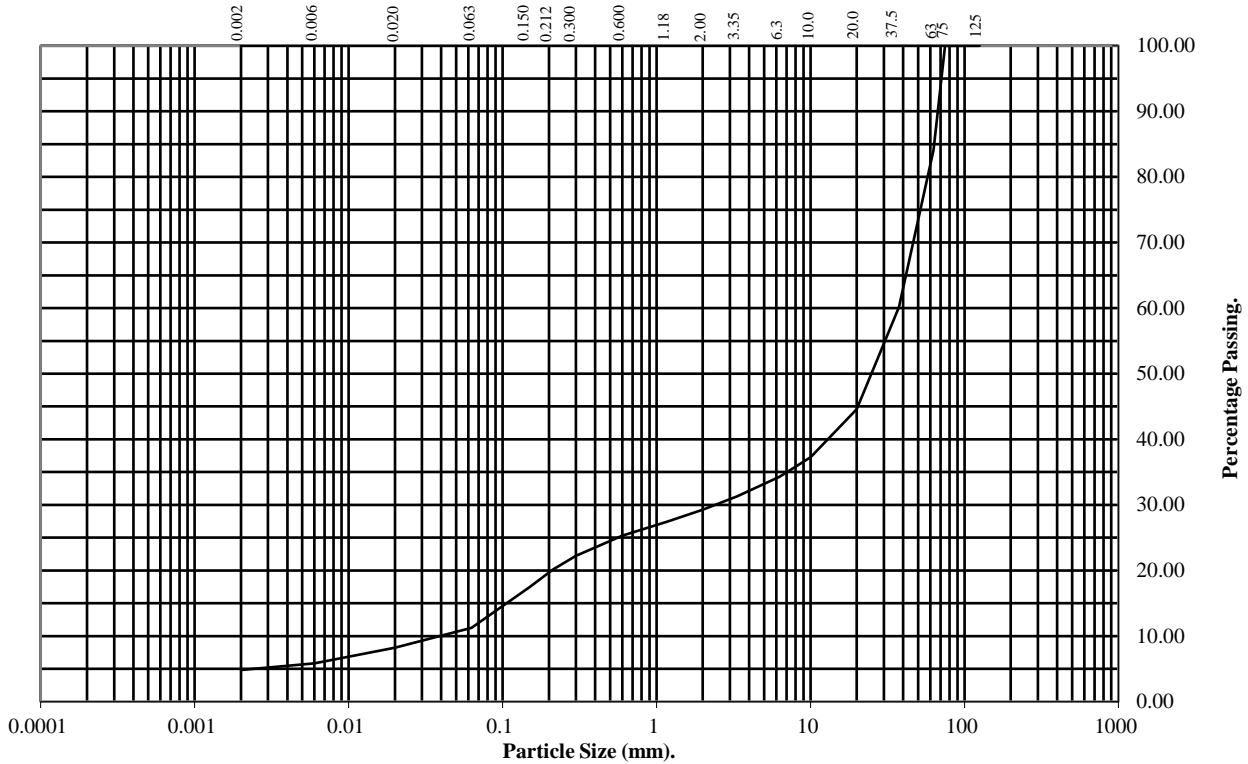
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-51** Top Depth (m): **4.00**

Sample Number: Base Depth(m):

Sample Type: **B&D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	84
37.5	60
20	45
10	37
6.3	34
3.35	31
2	29
1.18	27
0.6	25
0.3	22
0.212	20
0.15	17
0.063	11

Particle Diameter	Percentage Passing
0.02	8
0.006	6
0.002	5

Soil Fraction	Total Percentage
Cobbles	16
Gravel	55
Sand	18
Silt	6
Clay	5

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Borrow Pit

Contract No:
PSL23/10530
Client Ref:
13103-08-23

PARTICLE SIZE DISTRIBUTION TEST

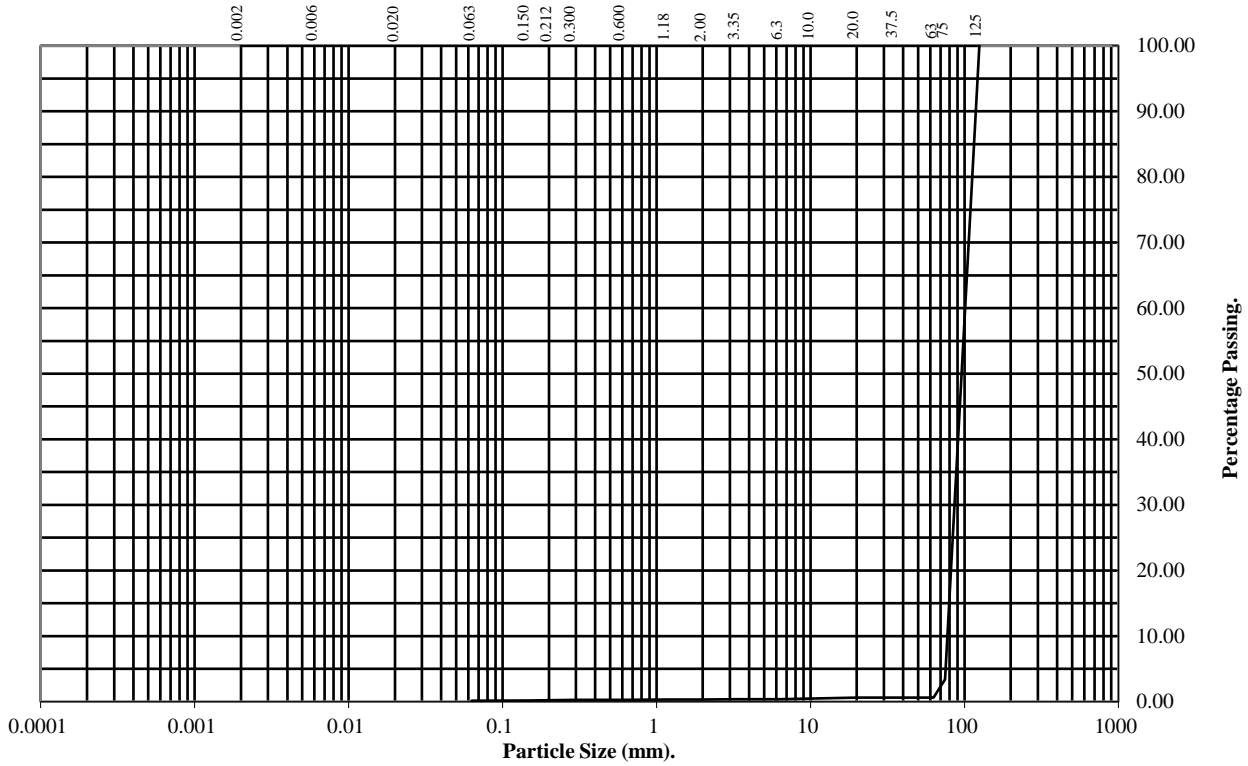
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP-B1 **Top Depth (m):** 0.70

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	3
63	1
37.5	1
20	1
10	0
6.3	0
3.35	0
2	0
1.18	0
0.6	0
0.3	0
0.212	0
0.15	0
0.063	0

Soil Fraction	Total Percentage
Cobbles	99
Gravel	1
Sand	0
Silt/Clay	0

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Borrow Pit

Contract No:
PSL23/10530
Client Ref:
13103-08-23

PARTICLE SIZE DISTRIBUTION TEST

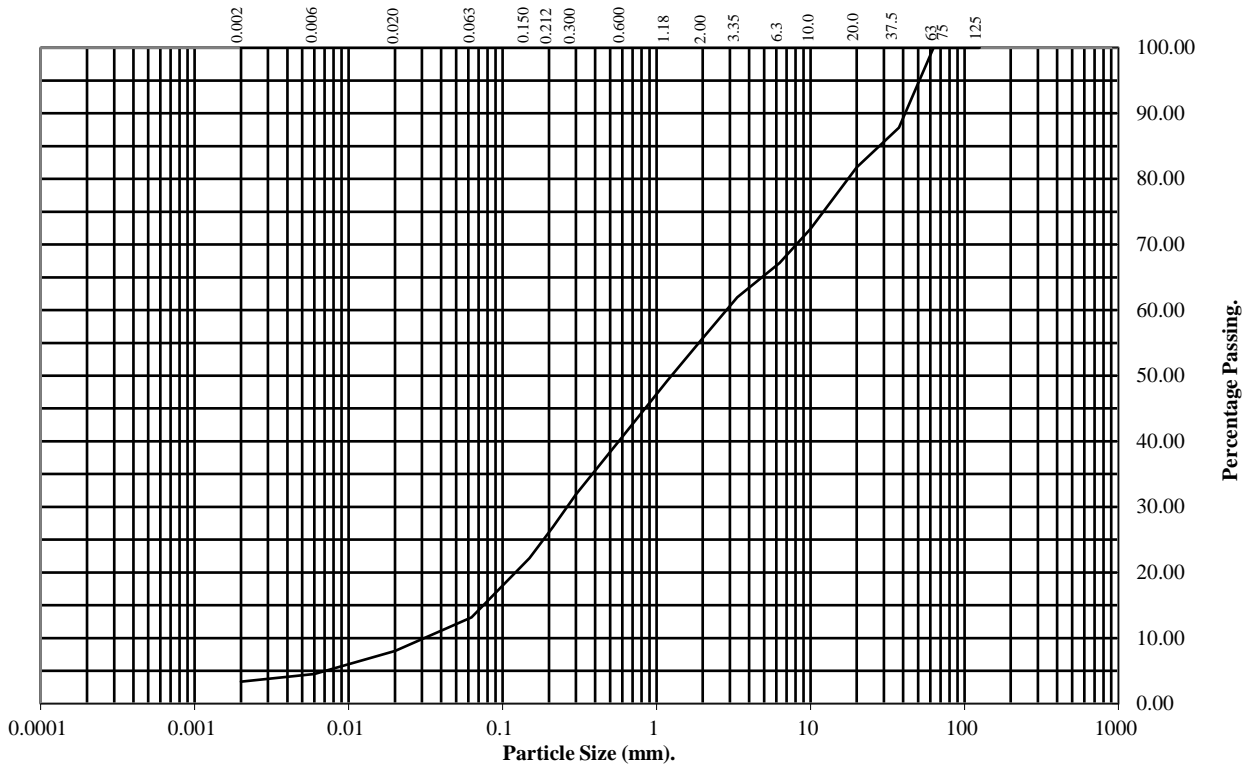
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-B2** Top Depth (m): **3.50**

Sample Number: Base Depth(m):

Sample Type: **B&D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	88
20	82
10	72
6.3	67
3.35	62
2	56
1.18	49
0.6	41
0.3	32
0.212	27
0.15	22
0.063	13

Particle Diameter	Percentage Passing
0.02	8
0.006	5
0.002	3

Soil Fraction	Total Percentage
Cobbles	0
Gravel	44
Sand	43
Silt	10
Clay	3

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Borrow Pit

Contract No:
PSL23/10530
Client Ref:
13103-08-23

PARTICLE SIZE DISTRIBUTION TEST

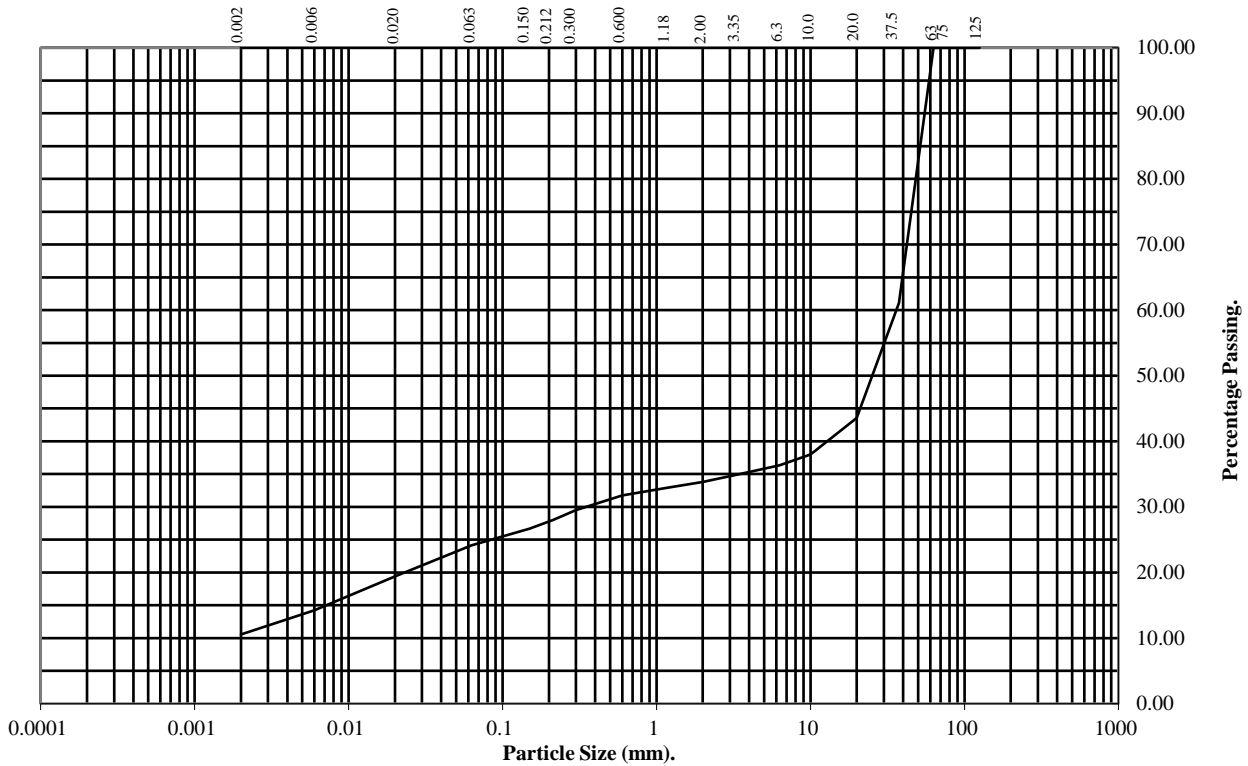
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP-B5** Top Depth (m): **0.50**

Sample Number: Base Depth(m):

Sample Type: **B&D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	61
20	44
10	38
6.3	36
3.35	35
2	34
1.18	33
0.6	32
0.3	30
0.212	28
0.15	27
0.063	24

Particle Diameter	Percentage Passing
0.02	19
0.006	14
0.002	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	66
Sand	10
Silt	13
Clay	11

Remarks:
See Summary of Soil Descriptions



Littleton Wind Farm Borrow Pit

Contract No:
PSL23/10530
Client Ref:
13103-08-23

**Laboratory Test Report
 Point Load Strength Index**

Project : Littleton Wind Farm Borrow Pit	Job Number 13103-08-23
Client : Ground Investigations Ireland	Lab Ref No ST 27246
Catherinestown House, Hazelhatch Road	Date Received 17/01/2024
Newcastle, Co. Dublin	Date Tested 22/01/2024
Originator : Eoin Byrne	Date Reported 23/01/2024

Point Load Strength Index

Sample No:-	Depth (m)	Description	Type	Orientation	W (mm)	D (mm)	P (kN)	A	De (mm)	I _s	F	I _{s(50)} MN/m ²
BH-03	9.55-9.75	1,2	A	⊥	63.0	63.0	23.00	3969	63.0	5.795	1.11	6.43
BH-03	10.40-10.60	1,2	A	⊥	66.0	63.0	21.00	4158	63.0	5.291	1.11	5.87
BH-03	11.85-12.00	1,2	A	⊥	63.0	63.0	5.50	3969	63.0	1.386	1.11	1.54
BH-B1	2.75-3.00	1,2,3	A	⊥	64.0	63.0	18.00	4032	63.0	4.535	1.11	5.03
BH-B1	5.00-5.25	1,2,3,4	A	⊥	65.0	63.0	18.00	3969	63.0	4.535	1.11	5.03
BH-B1	5.40-5.65	2,3,4,5	A	⊥	66.0	63.0	15.00	3969	63.0	3.779	1.11	4.19
BH-B2	2.00-2.10	1	A	⊥	64.0	63.0	19.00	3969	63.0	4.787	1.11	5.31
BH-B2	4.05-4.17	1,3	A	⊥	66.0	63.0	20.00	3969	63.0	5.039	1.11	5.59
BH-B2	5.25-5.50	1	A	⊥	64.0	63.0	21.00	3969	63.0	5.291	1.11	5.87
BH-B3	2.95-3.00	1	A	⊥	63.0	63.0	18.00	3969	63.0	4.535	1.11	5.03
BH-B3	4.35-4.55	1,2	A	⊥	65.0	63.0	14.00	3969	63.0	3.527	1.11	3.91
BH-B3	5.40-5.75	1,2	A	⊥	65.0	63.0	11.00	3969	63.0	2.771	1.11	3.08
BH-B4	3.25-3.30	2,3,4	A	⊥	63.0	63.0	2.30	3969	63.0	0.579	1.11	0.64
BH-B4	5.35-5.60	1,2,3,4	A	⊥	64.0	63.0	10.00	3969	63.0	2.520	1.11	2.80
BH-B4	6.60-6.75	1,2,3,4	A	⊥	65.0	63.0	18.00	3969	63.0	4.535	1.11	5.03

Description 1 : Grey Rock
 Description 2 : Cracks
 Description 3 : White Veins
 Description 4 : Brown Rock
 Description 5 : Red Rock

I _{s(50)} MN/m ² for	Description 1,2,3,4,5
Min	0.64
Mean	5.03
Max	6.43

Test
A = axial
D = diametrical

Relationship to planes of weakness
IL = irregular lump ⊥ = perpendicular
II = parallel

	Mean Value	
	$I_{s(50)}$ MN/m ²	U.C.S. MN/m ²
Extremely Weak	<0.05	0.6-1.0
Very Weak	0.05-0.20	1.0-5.0
Weak	0.20-0.50	5.0-25.0
Medium Strong	0.50-2.00	25-50
Strong	2.00-4.50	50-100
Very Strong	4.50-9.00	100-250
Extremely Strong	9.00 +	>250

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

pp.



Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

Laboratory Test Report Uniaxial Compressive Strength

Project:	Littleton Wind Farm Borrow Pit	Job Number	13103-08-23
Client:	Ground Investigations Ireland Catherinstown House, Hazelhatch Road Newcastle. Co. Dublin	Lab Ref No	ST 27247
Originator:	Eoin Byrne	Date Received	17/01/2024
		Date Tested	22/01/2024
		Date Reported	23/01/2024

Sample Reference	Moisture Content	Density (Mg/m ³)	Uniaxial Compressive Strength (N/mm ²)
BH-B1 4.45-4.70 RC	2.6	2681	96.7
BH-B2 3.10-3.35 RC	0.4	2638	104.1
BH-B3 4.00-4.25 RC	2.2	2695	108.9

Remarks: Cores BH-B1 4.45-4.70 & BH-B2 3.10-3.35 Visible Cracks

pp.



Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

LABORATORY TEST REPORT

**To determine Fragmentation of Aggregate - Los Angeles
Test Method in accordance with BS EN 1097-2: 2020**

Project:	Littleton Wind Farm Borrow Pit	Job No.:	PL
Client:	Ground Investigations Ireland Catherinestown House, Hazelhatch Road Newcastle, Co. Dublin	Lab Ref. No.:	ST 27250
Order No.:	13103-08-23	Date Received:	17/01/2024
Originator:	James Cashen	Date Reported:	26/02/2024
		Material:	Rock Core
		Date Tested:	20/02/2024
		Specification:	Client

Sample Details

BH-B1 2.45 - 5.65

Supplier:	Ground Investigations Ireland	Date of Sampling:	Client Info
Source:	Littleton Wind Farm Borrow Pit	Sampled By:	Client
Sample Location:	BH-B1 4.45 - 4.70	Sampling Reason:	Request

Results

Size Fraction from which the test portion was obtained: 14mm to 12.5mm
12.5mm to 10.0mm

Los Angeles Coefficient (LA) = 54

Comments:

None

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

**Tested in accordance with the above specifications
Subcontracted to a laboratory accredited for this testing**

JRWard

**Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited**

LABORATORY TEST REPORT

**To determine Fragmentation of Aggregate - Los Angeles
Test Method in accordance with BS EN 1097-2: 2020**

Project:	Littleton Wind Farm Borrow Pit	Job No.:	PL
Client:	Ground Investigations Ireland Catherinestown House, Hazelhatch Road Newcastle, Co. Dublin	Lab Ref. No.:	ST 27251
Order No.:	13103-08-23	Date Received:	17/01/2024
Originator:	James Cashen	Date Reported:	26/02/2024
		Material:	Rock Core
		Date Tested:	20/02/2024
		Specification:	Client

Sample Details

BH-B3 2.95 - 5.75

Supplier:	Ground Investigations Ireland	Date of Sampling:	Client Info
Source:	Littleton Wind Farm Borrow Pit	Sampled By:	Client
Sample Location:	BH-B3 4.35 - 4.55	Sampling Reason:	Request

Results

Size Fraction from which the test portion was obtained: 14mm to 12.5mm
12.5mm to 10.0mm

Los Angeles Coefficient (LA) = 24

Comments:

None

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

**Tested in accordance with the above specifications
Subcontracted to a laboratory accredited for this testing**

JRWard
Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

LABORATORY TEST REPORT
To determine Slake Durability Index of an Aggregate Sample
in accordance with ASTM D 4644-16

Project:	Littleton Wind Farm Borrow Pit	Job No.:	N/A
Client:	Ground Investigations Ireland Catherinestown House, Hazelhatch Road Newcastle Co. Dublin	Lab Ref. No.:	ST 27248
Order No.:	13103-08-23	Date Received:	17/01/2024
Originator:	Eoin Byrne	Date Reported:	23/01/2024
		Date Tested:	18/01/2024
		Material:	Rock Core
		Specification:	Client

Sample Details **BH-B1 2.45 - 5.65**

Sample Supplier:	Ground Investigations Ireland	Date of Sampling:	Client Info
Sample Source:	Littleton Wind Farm Borrow Pit	Ticket No.	N/A
Sample Location:	Littleton Wind Farm Borrow Pit	Sampled By:	Client
Sample Cert:	No	Sampling Reason:	Routine

Results

Test	Result
Slake Durability % (Second Cycle)	98.7
Natural Water Content (%)	1.5
Water Temperature Range (°C)	18.3 to 18.3
Average Water Temperature (°C)	18.3

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with the above specification

Description of the appearance of the fragments retained in the drum:

Type I - Retained pieces remain virtually unchanged

pp.



Approved Signature
 CMTL Ireland Ltd
 James Ward, Operations Manager



LABORATORY TEST REPORT
To determine Slake Durability Index of an Aggregate Sample
in accordance with ASTM D 4644-16

Project:	Littleton Wind Farm Borrow Pit	Job No.:	N/A
Client:	Ground Investigations Ireland Catherinestown House, Hazelhatch Road Newcastle Co. Dublin	Lab Ref. No.:	ST 27249
Order No.:	13103-08-23	Date Received:	17/01/2024
Originator:	Eoin Byrne	Date Reported:	23/01/2024
		Date Tested:	18/01/2024
		Material:	Rock Core
		Specification:	Client

Sample Details **BH-B3 2.95-5.75**

Sample Supplier:	Ground Investigations Ireland	Date of Sampling:	Client Info
Sample Source:	Littleton Wind Farm Borrow Pit	Ticket No.	N/A
Sample Location:	Littleton Wind Farm Borrow Pit	Sampled By:	Client
Sample Cert:	No	Sampling Reason:	Routine

Results

Test	Result
Slake Durability % (Second Cycle)	98.6
Natural Water Content (%)	1.0
Water Temperature Range (°C)	18.4 to 18.4
Average Water Temperature (°C)	18.4

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with the above specification

Description of the appearance of the fragments retained in the drum:

Type I - Retained pieces remain virtually unchanged

pp.



Approved Signature
 CMTL Ireland Ltd
 James Ward, Operations Manager



APPENDIX 5 – Groundwater Monitoring





GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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

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

GROUNDWATER MONITORING

Littleton Wind Farm Borrow Pit

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH-01	01/03/2024	9.55am	0.85	
BH-03	01/03/2024	10.05am	1.12	
BH-B1	01/03/2024	8.55am	5.81	
BH-B2	01/03/2024	9.25am	5.19	
BH-B3	01/03/2024	9.20am	5.63	
BH-B4	01/03/2024	9.10am	6.23	