APPENDIX 8-2

TRIAL PITTING REPORT

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Date: 30th July 2021
Our Ref: P1553-0_0010

Ellen Costello
Environmental Scientist,
MKO
Tuam Road,
Co. Galway
Attn: Ms Ellen Costello

Dear Ellen,

Re: Trial Pitting and Bulk Sample Laboratory Analysis at Umma More Renewable Energy Development

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1.0 INTRODUCTION

Hydro-Environmental Services (HES) was commissioned by MKO, on behalf of Umma More Ltd. to complete trial pits, as well as laboratory analysis of bulk samples taken from the trial pits, at the proposed Umma More Renewable Energy Development. The purpose of the survey was to determine the local potential for available subsurface granular deposits that could be used as wind farm access track/hardstand areas construction materials. A site location map is shown as **Figure A**.

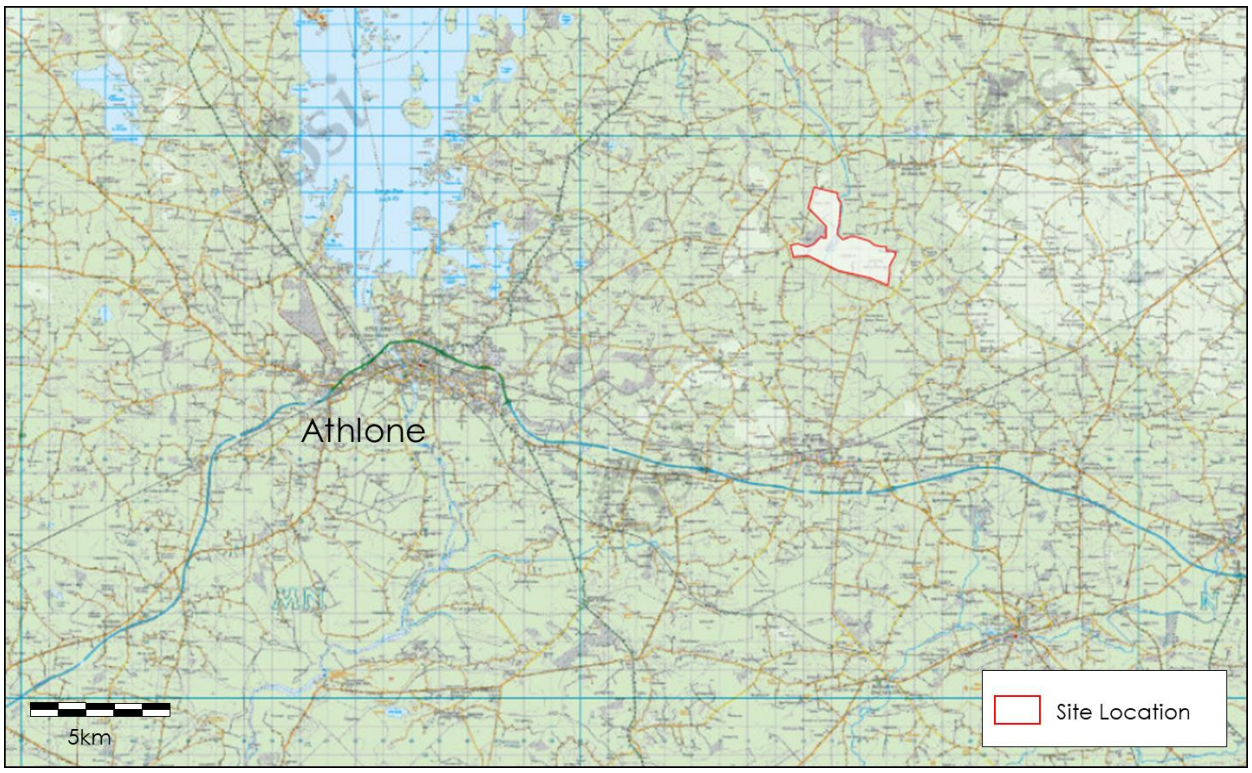

Figure A: Site Location Map

1.1 Desk Study

The proposed Wind Farm Site is located approximately 3.5km southwest of Ballymore village and 14km northwest of Athlone (refer to **Figure A**).

The published subsoils map (www.gsi.ie) shows that the majority of the proposed Wind Farm site is underlain by till derived from limestones (TLs). Localised pockets of Lacustrine sediments occur throughout the south of the proposed Wind Farm Site and are mapped immediately to the north of both Turbine 6 and Turbine 7 (near TP-1, TP-1.2, TP-1.3, TP-2 and TP-3). An expanse of Fen peat is mapped in the west, underlying Turbine 3 (close to TP-6) and immediately to the east of Turbine 4, although no peat was identified at TP-6. Other subsoils mapped within the proposed Wind Farm Site include Alluvium along the Dungolman River to the east of Turbine 1 and Turbine 2 (near TP-4) and eskers comprised of gravels of basic reaction to the north of Turbine 3. The eskers are associated with the Calliaghstown-Milltown Esker which is designated as a Geological Heritage Site. A map of the local subsoils along with the locations of the excavated trial pits are included in **Figure B**, the proposed turbine locations have been omitted to avoid confusion with labelling.

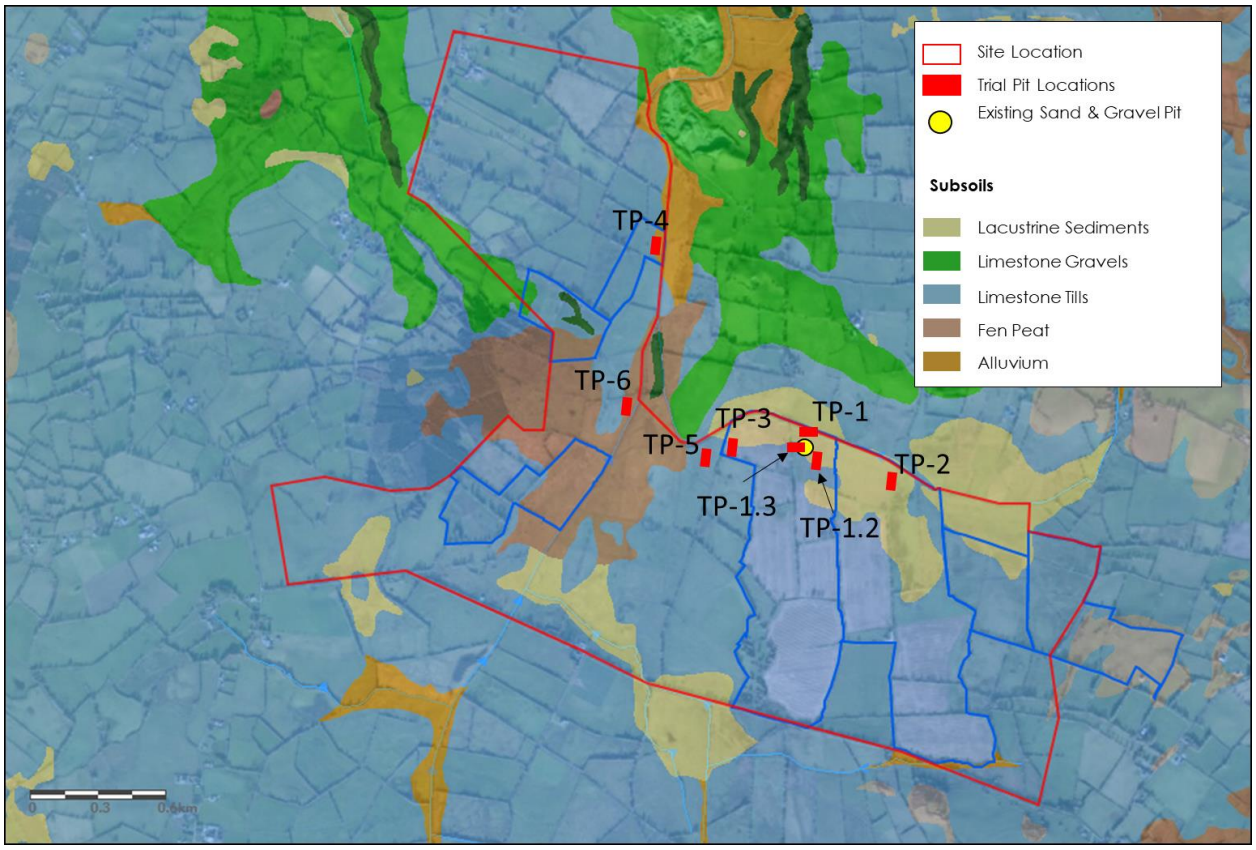

Figure B: Subsoil Map with trial pit locations

1.2 Trial Pitting

8 no. trial pits were excavated across the site, while 1 no. existing face bank of exposed granular deposits was also logged.

Trial pit TP-1, located adjacent to the existing excavated pit, encountered sand and gravel deposits from 0.7 to 2.7m. A further trial pit (TP-1.2) was completed south of the existing pit which did not encounter any granular deposits. A trial pit (TP-1.3) excavated at the base of the existing excavation recorded sandy gravelly COBBLES and gravelly COBBLES to a depth of 1.5m. The water table was encountered at ~0.7m below the base of the excavation and TP-1.3 could not be completed further due to hole collapse.

There were no other noteworthy deposits of granular deposits observed, other than relatively clean SAND at TP-5 and TP-6. A summary of the deposits and PSD analysis are shown below in **Table A**.

Table A: Summary of trial pit logs and PSD Analysis

Trial Pit	Trial Pit Depth (m)	Subsoil	Moisture Content	PSD Analysis			
				Silt (%)	Sand (%)	Gravel (%)	Cobbles (%)
TP-1	2.7	0.7m of Topsoil/Clay over 2m of sandy GRAVEL/silty SAND	3.4%	6.9	23.3	59.8	10
TP-1.2	2.2	0.2m Topsoil over 2m CLAY		No Sample			
TP-1.3	1.5	0.7m sandy gravelly COBBLES over >0.8m of gravelly COBBLES		No Sample			
TP-2	2.3	0.2m Topsoil over 2.1m CLAY		No Sample			
TP-3	2.5	0.4m Topsoil over 2.1m fine-coarse SAND	1.2%	9.2	53.4	37.4	0
TP-4	2.2	0.5m Topsoil over 1.7m clayey sandy SILT		No Sample			
TP-5	2.4	0.3m Topsoil over 0.3m silty CLAY over 1.8m fine-medium grained SAND	15.7&	18.5	81.3	0.2	0
TP-6	2.4	0.2m Topsoil over 1.6m SAND over 0.6m sandy SILT	3.4%	11.9	62.8	14.5	10.8
Face Bank	N/A	0.7m silty cobbly GRAVEL over 0.7m of sandy silty GRAVEL over 1.1m of gravelly, cobbly SAND	5%	5.4	24.7	57.4	12.5

2.0 CONCLUSIONS/RECOMMENDATIONS

Trial pitting and laboratory analysis has been completed at the proposed site for Ballynacorra Wind Farm, Co. Westmeath. There is a relatively small granular deposit at a lcoation which has been excavated in the past. The granular deposits continue north of the existing pit (towards TP-1), however appear to thin out and disappear by TP-1.2. The water level is relatively shallow to ground, with seepages in TP-1 at 1.2m and fast inflows into TP-1.3 at 0.7m, located on the floor of the existing pit. The PSD analysis confirms the granular deposit as ~ 5% SILT, ~25% SAND, ~60% GRAVEL and ~10% COBBLES. This material may be suitable as hardcore for road construction or for other construction related activities. There were no other suitable deposits of granular materials observed across the remainder of the proposed Wind Farm site during these trial pitting works.

CLOSURE

I trust the above meets your current requirements. Please contact the undersigned if any further information is required.

Yours sincerely,

Adam Keegan
B.Sc., M.Sc., MCIWEM

APPENDIX I
Trial Pit logs

Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-1
Easting: 219967
Northing: 246278
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Firm Medium brown slightly peaty TOPSOIL			
		-0.3				
		0.3	Mottled grey/brown CLAY			
		-0.7				
		0.7	Gravelly Medium to coarse grained SAND			
1		-1.2				
		1.2	Sandy GRAVEL. Gravels are sub rounded to sub angular Limestone and generally 10-50mm	▼		Water seepage at 1.2m
			Gravelly, slightly silty SAND. Gravels are subrunded to subangular and 10-75mm diameter			
2		-2.4				
		2.4	Sandy GRAVEL. Gravels are sub rounded to sub angular Limestone and generally 10-50mm			
		-2.7				
		2.7				
3						

Remarks:
Sample taken for PSD and Moisture Content analysis

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Email: info@hydroenvironmental.ie

Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-1.2
Easting: 219988
Northing: 246134
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Medium brown sandy TOPSOIL			
		-0.2				
		0.2	Mottled grey brown silty CLAY			
1		-1.0				
		1.0	Firm grey Lacustrine CLAY			
2		-2.2				
		2.2				

Remarks:

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-1.3
Easting: 219964
Northing: 246232
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Sandy gravelly COBBLES with minor boulders			Reference 0m at base of existing excavation pit (~2.5m below ground level)
		-0.7				
		0.7	Gravelly COBBLES with minor boulders			Fast Inflow at 0.7mbgl. Hole collapsing, could not proceed past 1.5mbgl
1		-1.5				
		1.5				

Remarks:

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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HYDRO-ENVIRONMENTAL SERVICES

Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: Face Bank
Easting: 219964
Northing: 246232
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Sandy, slightly silty, slightly cobbly GRAVEL. Gravels/cobbles are rounded to subrounded			Reference 0m at ground level
		-0.7				
1		0.7	Sandy silty GRAVEL with some cobbles			
		-1.4				
		1.4	Gravelly, cobbly SAND			
2		-2.5				
		2.5				

Remarks:

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-2
Easting: 220362
Northing: 246007
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Brown firm peaty TOPSOIL			
		-0.2				
		0.2	Brown/grey mottled CLAY			
		-0.9				
1		0.9	Firm Grey Lacustrine CLAY			
2		-2.3				
		2.3				

Remarks:
No sample taken

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-3
Easting: 219659
Northing: 246210
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Sandy Topsoil			
		-0.4				
		0.4	Fine grained, medium brown SAND			
1						
		-1.6				
		1.6	Medium to coarse grained grey SAND			
2		-2.2				
		2.2	Slightly gravelly, medium grained grey SAND			
		-2.5				
		2.5	Limestone bedrock			

Remarks:
No sample taken

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-4
Easting: 219336
Northing: 247175
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Loamy medium-dark brown TOPSOIL			
		-0.5				
		0.5	Mottled grey/brown clayey slightly sandy SILT			
		-0.9				
1		0.9	Grey clayey slightly sandy SILT			
2		-2.2				
		2.2				

Remarks:
No sample taken

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-5
Easting: 219558
Northing: 246171
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Sandy medium brwon TOPSOIL			
		-0.3				
		0.3	Mottled brown/grey silty CLAY			
		-0.6				
		0.6	Grey fine-medium grained SAND			
1						
2		-2.4				
		2.4				

Remarks:
Near existing Met Mast

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

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HYDRO-ENVIRONMENTAL SERVICES

Trial Pit Log

Project No: P1553-0
Site: Ballynacorra WF, Co. Westmeath
Client: MKO

Date started: 14/07/2021
Date finished: 14/07/2021

Trial Pit No: TP-6
Easting: 219180
Northing: 246450
Elevation: .

SUBSURFACE PROFILE

Depth	Symbol	Depth/Elev.	Description	Water Strikes	Sample Type	Comments
0		0.0	Ground Surface			
		0.0	Sandy medium light brown TOPSOIL			
		-0.2				
		0.2	Silty light brown SAND			
		-0.8				
		0.8	Slightly gravelly grey fine-medium grained SAND			
1		-1.8				
		1.8	Sandy grey SILT			
2		-2.4				
		2.4				

Remarks:
No sample taken

Contractor:
Excavator type:
Logged by: A.K.

Scale as shown
Sheet: 1 of 1

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Email: info@hydroenvironmental.ie

APPENDIX II
PSD & Moisture Content Analysis Laboratory results

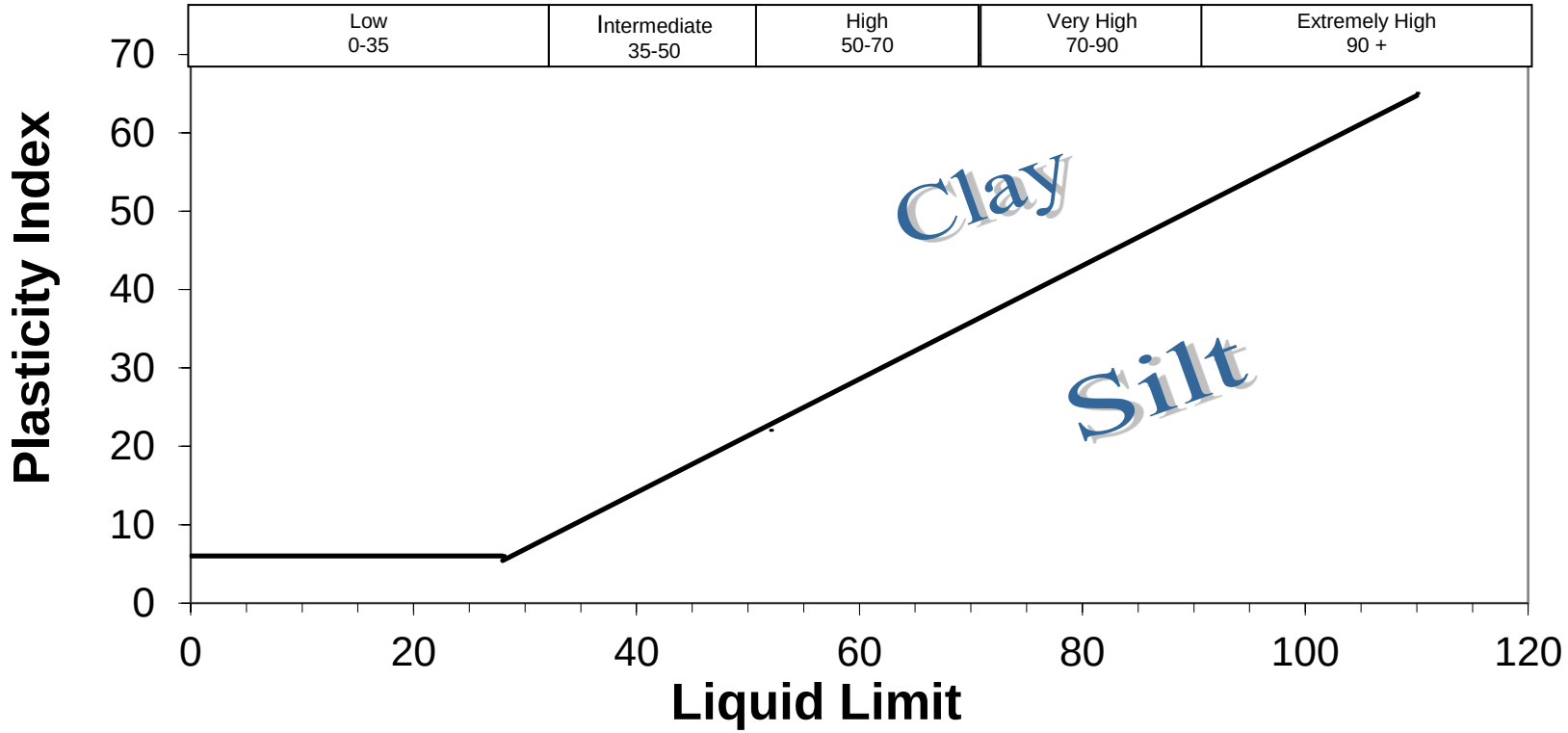
National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP1	N/A	B	3.4											Sample seems dry
TP3	1.00	B	1.2											Sample seems dry
TP3	2.2-2.50	B	0.7											Sample seems dry
TP5	N/A	B	15.7											
TP6	N/A	B	3.4											Sample seems dry
JG-Lennon Face Bank	N/A	B	5.0											Sample seems dry
NMTL		Notes :									Job ref No.	NMTL 3415		
		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Ballyncorra		

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

Contract:	**Ballyncorra**
Client:	**Hydro-Environmental Services**
Engineer:	**Adam Keegan**
Date:	**28/07/2021**
Tested By:	**Sb** **Checked:** **Bc**
Job ref No.	**NMTL 3415**



NMTL Ltd

Determination of Particle Size Distribution

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

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	90.0
50.000	80.6
37.500	74.7
28.000	64.4
20.000	61.1
14.000	54.9
10.000	52.3
6.300	46.5
5.000	42.1
3.350	36.9
2.000	30.2
1.180	24.2
0.600	18.9
0.425	16.6
0.300	14.2
0.212	11.6
0.150	9.7
0.063	6.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		6.9			23.3			59.8		10.0	0.0

Sample Description	Light brown silty very sandy GRAVEL with some cobbles.							Project No.	NMTL3415
								BH/TP No.	TP1
Project	Ballynacorra							Sample No.	B
Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	27/07/2021	Depth	N/A

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

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

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	99.9
2.000	99.9
1.180	99.6
0.600	99.0
0.425	98.0
0.300	95.3
0.212	86.8
0.150	68.8
0.063	31.4

Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		31.4			68.5			0.1		0.0	0.0

Sample Description	Light brown clayey silty SAND.					Project No.	NMTL3415
						BH/TP No.	TP3
Project	Ballynacorra					Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	27/07/2021
						Depth	1.00m

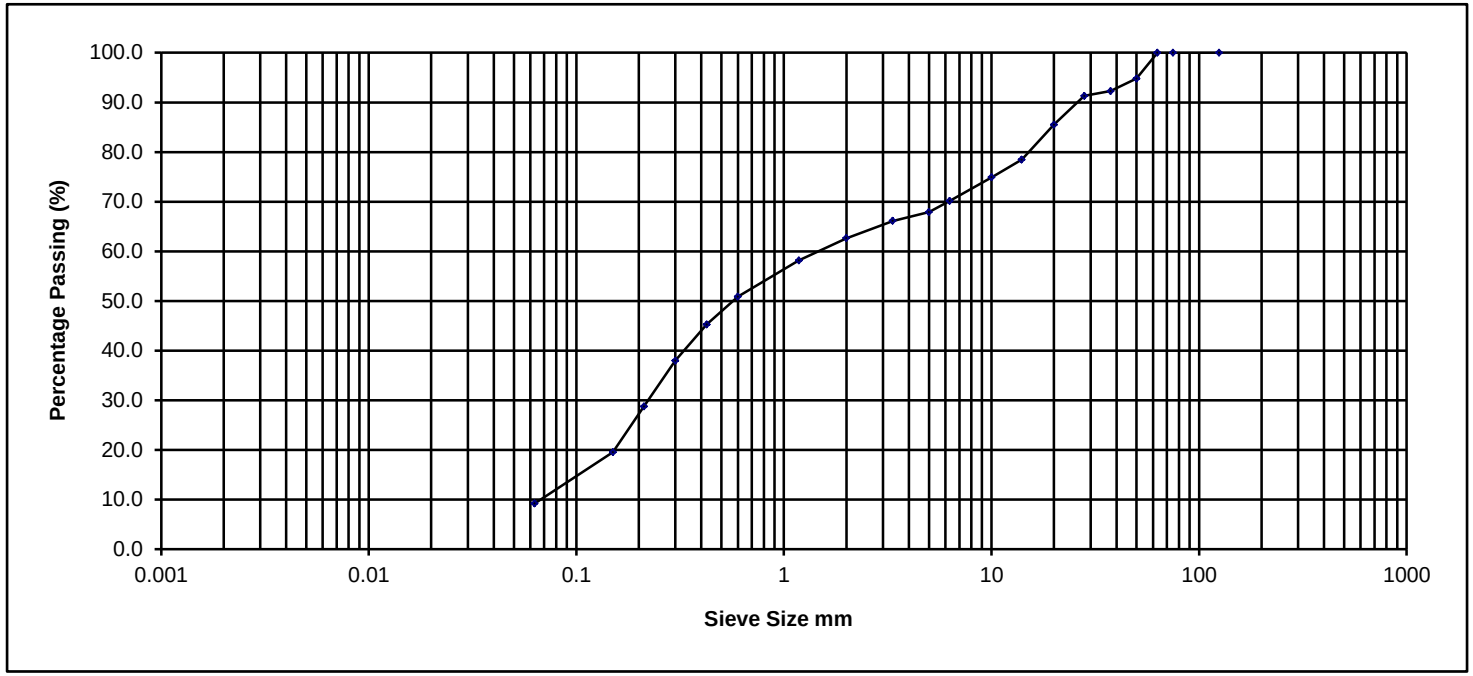
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

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

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	94.8
37.500	92.3
28.000	91.3
20.000	85.5
14.000	78.5
10.000	74.9
6.300	70.2
5.000	67.9
3.350	66.1
2.000	62.6
1.180	58.2
0.600	50.9
0.425	45.3
0.300	38.0
0.212	28.8
0.150	19.5
0.063	9.2



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		9.2			53.4			37.4		0.0	0.0

Sample Description	Light brown silty gravelly SAND.					Project No.	NMTL3415
						BH/TP No.	TP3
Project	Ballynacorra			GII PROJECT ID: 9314-12-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	27/07/2021
						Depth	2.2-2.50M

NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

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

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	99.8
1.180	99.7
0.600	99.5
0.425	99.4
0.300	98.0
0.212	85.4
0.150	59.1
0.063	18.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		18.5			81.3			0.2		0.0	0.0

Sample Description	Light brown slightly clayey silty SAND.					Project No.	NMTL3415
						BH/TP No.	TP5
Project	Ballynacorra			GII PROJECT ID: 9314-12-19		Sample No.	B
Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	27/07/2021
						Depth	N/A

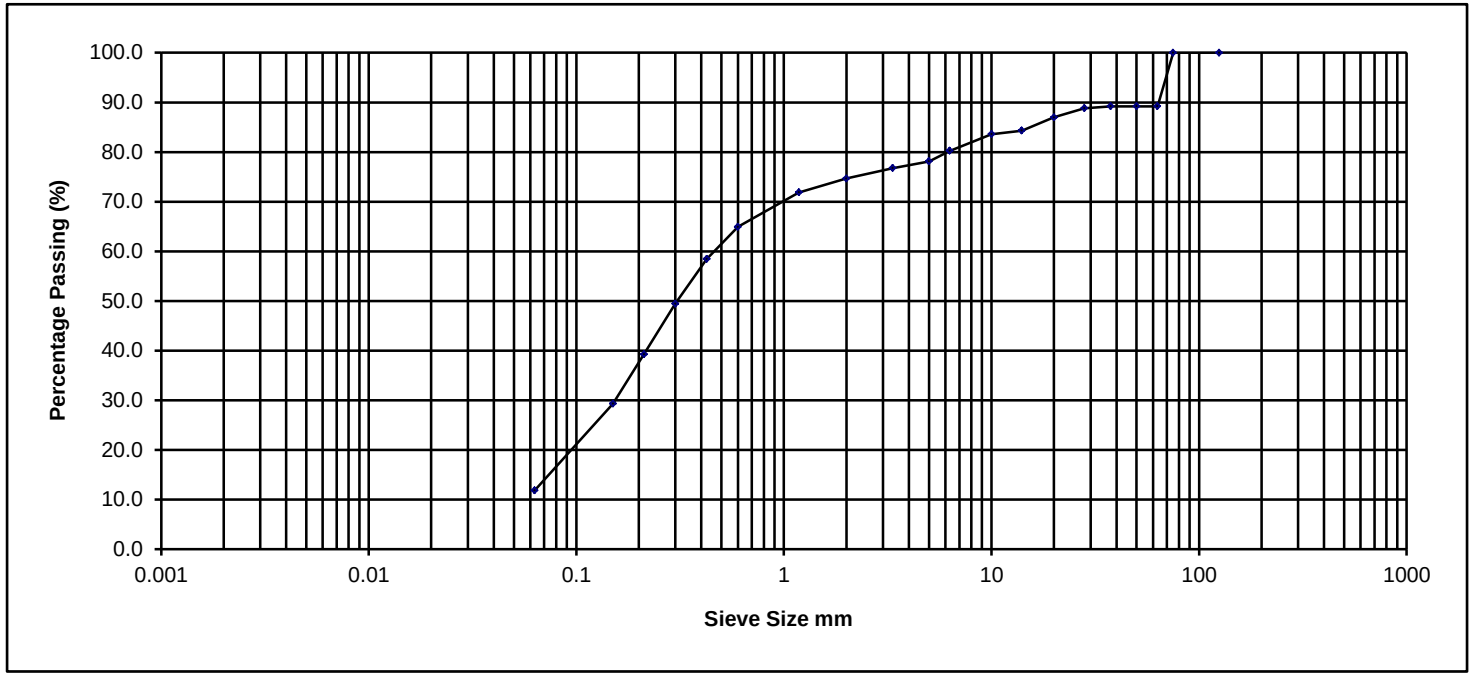
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

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

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	89.2
50.000	89.2
37.500	89.2
28.000	88.8
20.000	87.0
14.000	84.3
10.000	83.6
6.300	80.2
5.000	78.1
3.350	76.8
2.000	74.7
1.180	71.9
0.600	65.0
0.425	58.5
0.300	49.5
0.212	39.3
0.150	29.3
0.063	11.9



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
		11.9			62.8			14.5		10.8	0.0

Sample Description: Light brown silty gravelly SAND with some cobbles.

Project: Ballynacorra

Operator	Checked	Approved	Date sample tested	Project No.	Value
Tzr	Nc	Bc	27/07/2021	BH/TP No.	TP6
				Sample No.	B
				Depth	N/A

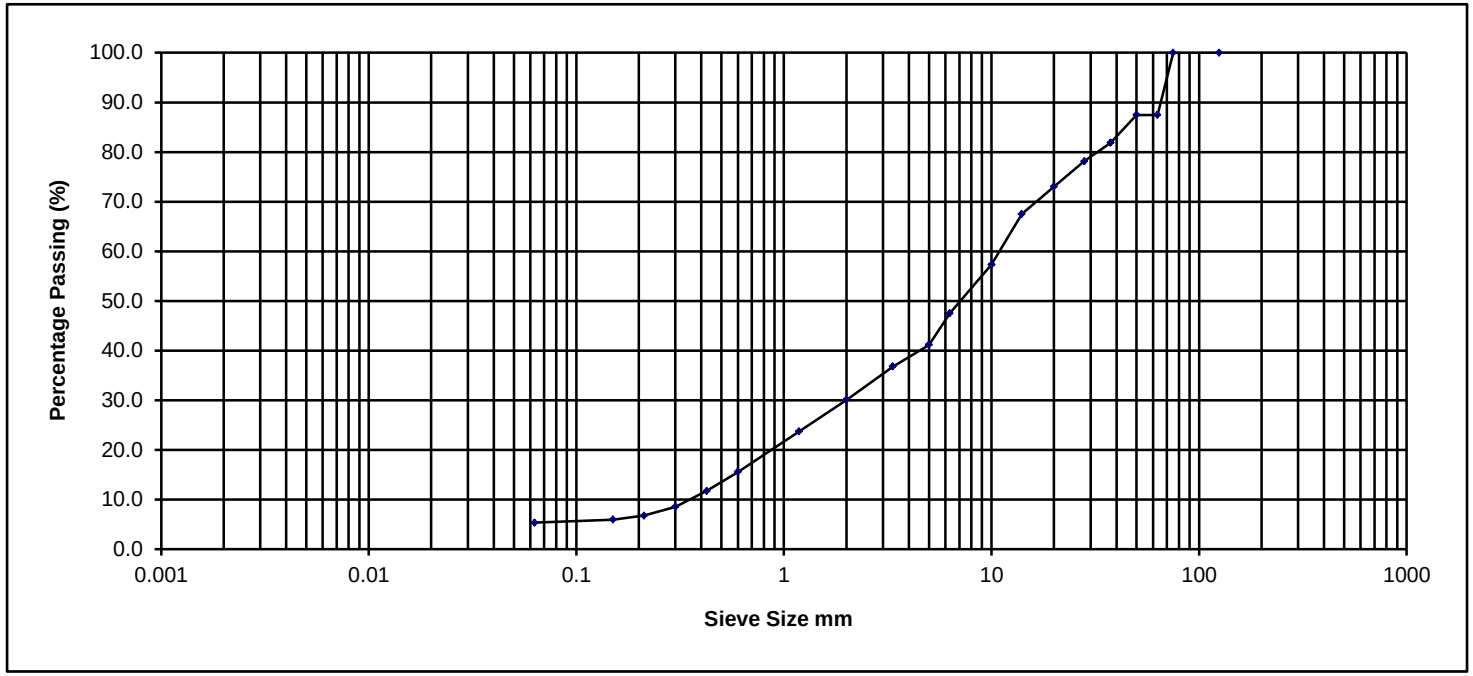
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

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

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	87.5
50.000	87.5
37.500	81.9
28.000	78.1
20.000	73.0
14.000	67.5
10.000	57.3
6.300	47.5
5.000	41.2
3.350	36.8
2.000	30.1
1.180	23.7
0.600	15.6
0.425	11.7
0.300	8.6
0.212	6.8
0.150	6.0
0.063	5.4



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
		5.4			24.7			57.4		12.5	0.0

Sample Description	Bark brown silty very sandy GRAVEL with some cobbles.	Project No.	NMTL3415
		BH/TP No.	JG
Project	Ballynacorra	Sample No.	Lennon Face Bank
Operator Sb	Checked Nc / Approved Bc / Date sample tested 27/07/2021	Depth	N/A

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