

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 2

Geotechnical Report





Historical Landfills in Mid Kerry - Castleisland

Client: Kerry County Council

Client's Representative: Feehily Timoney

Report No.: 18-1102b

Date: September 2019

Status: Fing for Issue

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Document Control Sheet

Report No.:		18-1102b								
Project Title:		Historical Landfills in Mid Kerry - Castleisland								
Client:		Kerry County Council								
Client's Repres	entative:	Fehily Timoney	Fehily Timoney							
Revision:	A00	Status:	Final for Issue	Issue Date: 23 September 2019						
Prepared by:		Reviewed by:		Approved by:						
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The works were conducted in accordance with the British Standards Inc.

British Standards Institute (2015) BS \$930:2015, Code of practice for site investigations.

BS EN 1997-2: 2007: Eurocode Cecotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9



METHODS OF DESCRIBING SOILS AND ROCKS

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

Abbreviations used	on exploratory hole logs
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler)
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler)
P	Nominal 100mm diameter undisturbed piston sample
В	Bulk disturbed sample
LB	Large bulk disturbed sample
D	Small disturbed sample
С	Core sub-sample (displayed in the Field Records column on the logs)
L	Liner sample from dynamic sampled borehole
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained)
SPT (c)	Standard penetration test using 60 degree solid cone
x,x/x,x,x,x	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
	The length achieved is stated (mm) for any test increment less than 75mm
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm)
N=X/Z	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (man)
V VR	Shear vane test (borehole) tand vane test (trial pit) Shear strength stated in kPa V: undisturbed vane shear strength VR: remoulded vane shear strength
dd/mm/yy: 1.0 dd/mm/yy: dry	Date & water levels at the borehole depth at the end of shift and the start of the following whift
$\overline{}$	Water strike: initial depth of strike
~	Water strike: depth water rose to
Abbreviations relating	to rock core – reference Clause 36.4.4 of BS 5930: 2015
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum).

Historical Landfills in Mid Kerry - Castleisland

1 **AUTHORITY**

On the instructions of Fehily Timoney Consulting Engineers, ("the Client's Representative"), acting on the behalf of Kerry County Council ("the Client"), a ground investigation was undertaken at the above location to allow the geotechnical and environmental assessment of the historical landfill present on site. The information will input into the Tier 2 and 3 reports being compiled by the Client's Representative.

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

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

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

2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, trial pits, soil sampling, environmental sampling and laboratory testing, and the preparation of a factual report on the findings.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on a site located 1km north east of Castleisland, Co. Kerry. The site is accessed off College Road and is bordered to the west by Clonough housing estate and to the north, east and south by agricultural lands.

SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 31st May and 19th June 2019, comprised:

- one borehole by rotary drilling methods;
- one standpipe installation; and
- five machine dug trial pits.

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

4.2 **Boreholes**

One borehole (BH01) was put to its completion by rotary drilling techniques only. The borehole was completed using a Hanjin 8D tracked rotary drilling rig.

Symmetrix-cased full hole rotary percussive drilling techniques was employed to advance the borehole to scheduled depth. of copyright owner

Appendix B presents the borehole logs.

4.3 Standpipe installations

A groundwater monitoring standpipe was installed in BH01.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

4.4 **Trial Pits**

Five trial pits (TP01-TP05) were excavated using a JCB 3CX excavator fitted with a 600mm wide bucket, to a maximum depth of 2.50m.

Environmental samples were taken at various depths of in each trial pit.

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



Groundwater was not encountered during any of the trial pits. The stability of the trial pit walls was noted on completion.

Appendix C presents the trial pit logs with photographs of the pits and arising provided in Appendix D.

4.5 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these asbuilt positions.

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described and their descriptions incorporated into the barehole logs.

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

atory testing of soils comprised:

permeability testing: permeability by triaxial compression

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

The test results are presented in Appendix E.

5.2 **Environmental laboratory testing of soils**

Environmental testing, as specified by the Client's Representative was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out according to Engineer's Ireland Suite E which comprises a single stage waste acceptance criteria (WAC) test.

Results of environmental laboratory testing are presented in Appendix F.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise Glacial Till with bedrock at subcrop level in the north of the site. These deposits are underlain by limestones of the Cracoean Reef Member.

6.2 Ground types encountered during investigation of the site

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

- **Topsoil:** encountered at all locations with a thickness range of 100 -300mm.
- **Made Ground (fill):** reworked sandy gravelly clay fill with varying amounts of glass bottles, plastic bags, metal fragments, brick and clothes encountered in TP01, TP02 and TP04 to a depth of 2.00m. Not the full extent of landfill material present was not determined in the trial pits.
- Glacial Till: sandy gravelly clay/silt, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.
- **Bedrock (Limestone):** Rockhead was encountered at a depth of 0.30m in BH01 and 8.80m in BH02.

6.3 Groundwater

Groundwater was not noted during drilling at any of the locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes and the possibility of encountering groundwater at other depths should not be ruled out.

It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Groundwater was not noted during excavation of any of the trial pits.

7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.



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

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

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

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description

BS EN ISO 22282-2: 2012: Geotechnical investigation and testing. Geohydraulic testing – Part 2: Water permeability tests in a borehole using open systems.

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APPENDIX A SITE AND EXPLORATORY HOLE LOCATION PLANS





Project No.: 18-1102b

Client: Kerry County Council

Project Name:

Historical Landfill in Kerry - Castleisland

Client's

Representative: Fehily Timoney

Legend Key



Title:

Site Location Plan

Last Revised: Scale: 16/08/2019 1:10000

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Project No.: 18-1102b

Client: Kerry County Council

Project Name:

Historical Landfill in Kerry - Castleisland

Client's

Representative: Fehily Timoney

Legend Key

O Locations By Type - RO

Locations By Type - TP



Title:

Exploratory Hole Location Plan

Last Revised: 16/08/2019

Scale: 1:1000



APPENDIX B BOREHOLE LOGS



4.5						Project	No.:	Project	Name:	Во	rehole I	No.:
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Depth	Sample /	Casing Depth (m)	Water Depth (m)	Field Re	cords	Level	Depth (m) (Thickness)	Legend	Description	Water	Backfill	
(m)	Tests	(m)	(m)			(mOD)	(0.30)		TOPSOIL (Driller's description)	>		
						43.86	0.30		Grey LIMESTONE. (Driller's description)	-		
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						(0.30)		TOPSOIL (Driller's description)		
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APPENDIX C TRIAL PIT LOGS



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Trial Pitting						Timoney			Jeane.	1.23
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			44.16	0.20		fine to coarse of limestone. Col MADE GROUND: Soft greyish b	rown slightly sand	slightly gravelly silty	-1	
				-		CLAY with low cobble and bould coarse. Gravel is subangular to				
				-		Cobbles and boulders are subar bottles, glass fragments and pla	ngular of limestone		ss	0.5 -
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				-		angular to rounded fine to coar limestone. Rubbish includes gla				
				-		white plastic bags.				
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lant:			Ground Level:		Date:						
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				(0.25)		low cobble content. Sand is fin subrounded fine to coarse of li					
			44.82	0.40		limestone.					
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				(0.70)		fine to coarse of limestone. Co increasing with depth. Rubbish					
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.40	ES1		1	(0.20)	4 00	Firm orangish brown slightly sand cobble content. Sand is fine to co			ne			
			41.65	0.50		to coarse of limestone. Cobbles a Firm grey and orangish brown slip cobble content. Sand is fine to co to coarse of limestone. Cobbles a	are subrounded o ghtly sandy slight parse. Gravel is a	of argillaceous limeston ly gravelly SILT with low ngular to subangular fi	e.		0 -	
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				[1.5	
				<u> </u>						4	د.	
				-								
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marks	er encountered.						Water		tability:			
o. Sanawatt							Struck at (m):	Remarks:	table			
									Width:	0.8	0	
rminated du	e to no landfill ma	terial present.						լ	ength:	2.8	0	

202			Project			Name:			Tr	ial Pit	
CAUSEWAY GEOTECH		WΔY	18-110			al Landfill in Kerry - Castle	island			TP(04
3-51	——GE	OTECH	Co-ord	inates:	Client:					Sheet	1 of 1
/lethod:			10066	1.69 E		ounty Council Representative:					
rial Pitting			11079	0.85 N		imoney			Sc	ale:	1:25
Plant:			Ground	d Level:	Date:	inioney					
CB 3CX				Ground Level: 44.62 mOD		2019			Lo	gger:	PF
Depth	Sample / Tests	Field Records	Level	Depth (m)	Logond		Description		Water		
(m)	1 7 7		(mOD)	(Thickness)		TOPSOIL			3		
0.20			44.52	(0.10) 0.10		MADE GROUND: Firm brown sli			vith		
0.20	B3			(0.30)		low cobble content. Sand is fin subrounded fine to coarse of lir					
			44.22	0.40		limestone	مرياه مومولي ماخطعة المرسيا	liabeli avarralli siler (L AV		
						MADE GROUND: Black and brow with low cobble content and ru	bbish. Sand is fine	to coarse. Gravel is			0.5
				-		subangular to subrounded fine are subangular to subrounded of					
						black, white and blue plastic ba	gs, brick, glass bott	tles and socks.			
				-							
.00	ES1			Ė							1.0 -
				[
				(1.60)							
				-							1.5
				-		authoses only any other use. For required for any other use.					
90	ES2			-		other					
90	E32		42.62	2.00		any any	(1:1:1:1000				2.0 -
				-		Ses of for End of	of trial pit at 2.00m				
						nir Quite					
				-	HOLE	S 1004					
					Speriory						2.5
				rot i	right						
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			Con								2.0
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emarks							Water	Strikes:	Stabilit	y:	
o groundwate	er encountered.						Struck at (m):	Remarks:	Slightly	unstak	ole
									Width	:	1.20
rminated due	e to >1.50m of lan	dfill material preser	nt.						Length	1:	2.90

			Project	No.:	Project	Name:			Tria	al Pit	No.:	
183	CALICE	:\A/A¥	18-110	2b	Historia	cal Landfill in Kerry - Castlei	island			TPC)5	
	CAUSE	OTECH	Co-ord	inates:	Client: Kerry County Council					Sheet 1 o		
	GE	OTLON	10055	1.85 E								
/lethod:					Client's	Representative:				la:	1.25	
rial Pitting			11074	7.41 N	Fehily 7	imoney			Sca	iie:	1:25	
Plant:				d Level:	Date:				Logger:		PF	
CB 3CX				2 mOD	31/05/	2019				, sc.	' '	
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Firm dark brown slightly sandy s	Description silty CLAY. Sand is	fine to coarse	Water			
.20	B5			-	X							
.20	ES1			(0.70)	×							
				(6.76)	X							
0.50	ES2			-	X						0.5	
			40.32	0.70	×-^-							
			40.32	0.70	0 × 0 0 × 0 0 × 0	Firm greyish brown slightly sand content. Sand is fine to coarse. coarse of limestone. Cobbles ar	Gravel is angular t	o subrounded fine to				
				-	× × 0						1.0 -	
				(0.90)	×××°							
				ļ ,	0 × o							
				-	× × 0							
.50	ES3			<u> </u>	<u>∞ ×</u> 0						1.5	
- -			39.42	1.60	× × ·	Fine valley deliberary P. 191	العاد والعاد العاد ا	la CLAV voiale le			-	
				<u> </u>		Firm yellowish brown slightly sa content. Sand is fine to coarse.	Gravel is subangu	lar to subrounded fine	to			
					4 300	content. Sand is fine to coarse. coarse of limestone. Cobbles are coarse of limestone. Cobbles are coarse.	re subrounded of li	mestone				
				-		14. udgar						
				(0.90)		25 Ofti, at					2.0	
				Ė ,		object?						
				[Sir Colin						
				<u> </u>		et.						
.50	ES4		38.52	- 2.50 . <		Endo	of trial pit at 2.50m		_		2.5	
				COLY	1100	Elid o	νι αιαι μιι αι ∠.υ∪ΠΙ					
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emarks	ı		<u> </u>	<u> </u>	1		Water	Strikes:	tability	<i>r</i> :		
	er encountered.								table			
							Struck at (m):	Remarks:				
									Width:	(0.80	
								1				