Appendix 2

Priority Geotechnical Reports

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SCOTCH CORNER LANDFILL
GROUND INVESTIGATION
GEOPHYSCIAL SURVEY
REPORT No. P18175_Gp_Rp_D01

REPORT CONTROL SHEET

Client	Monaghan County Council					
Engineer Representative	Fehily Timoney & Company					
Project Name	SCOTCH CORNER LANDFILL- GROUND INVESTIGATION					
Document Name	Ground Investigation Draft Report					
Project Number	P18175_Gp					
This Report Comprises of	TOC	Text	No. of Volume	No. of Appendices	Drawings	Electronic data
	1	17	1	3	5	*.dwg, *.pdf

Revision	Status	Author(s)	Approved By	Issue Date
D01	Draft	JMcS/ HP	GH	20/11/2018

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INTRODUCTION

A.1) Scope of Works

Priority Geotechnical Ltd. was instructed by Fehily Timoney & Company on behalf of Monaghan County Council to undertake a geophysical investigation in conjunction with a site investigation survey at Scotch Corner Historic Landfill, Castleblaney, Co. Monaghan.

The direct intrusive works consisted of boreholes and trial pit excavations. The geophysical survey consisted of electrical resistivity surveying in accordance with BS5930 and BS7022 and the Geological Society Engineering Group Working Party Report on Engineering Geophysics. The survey locations are shown in Figure A.1 below.

Figure A.1 Background map showing survey location.

A.2) Survey Objectives

The survey objectives were to provide information on the following:

- Lateral and vertical variations in overburden and bedrock type and thickness along the surveyed profiles.
- Extent and thickness of landfill material across along the surveyed profiles.

A.3) Site Topography

Site topography consisted of rough ground, sometimes forested or heavily vegetated. In some areas of the pre-proposed survey profiles ground was inaccessible due to vegetation cover and also due to poor ground conditions under feet (extremely soft ground with random holes). In consultation with the Consulting Engineer these profiles were adjusted in location. Some photographs are given below illustrating site conditions.

Site topography ranged from 122m to 128m (OD Malin).

Figure A.2 Photographs showing nature of the survey area.

A.4) Coordinate System and Datum

All coordinates are given in Irish Transverse Mercator (ITM). All elevations are given in metres Ordnance Datum Malin (OD Malin).

All coordinates are given in Irish Transverse Mercator (ITM). All elevations are given in metres Ordnance Datum Malin (OD Malin). The locations are shown on the exploratory layout plans presented in **APPENDIX C** and summarized below.

Location	Easting	Northing	Ground Level (mOD)	Final Depth (m bgl)	Date Start (dd/mm/yyyy)
BH11	275272	325769.9	125.61	22.0	21/08/2018
BH11A	275273.9	325770.7	125.52	9.5	23/08/2018
BH SI07	275284.2	325267.9	125.93	4.0	24/08/2018
BH SI08	275164.2	325151.5	124.11	4.2	27/08/2018
BH SI09	275085.8	325310.4	125.43	2.6	27/08/2018
BH SI10	275191.2	325346.3	124.45	5.8	28/08/2018
TP01	275022.1	325416.2	124.76	4.3	21/09/2018
TP02	275074.8	325377.7	125.81	4.7	21/09/2018
TP03	275051.6	325348.7	125.63	1.1	21/09/2018
TP04	275154	325360.1	123.52	4.5	21/09/2018
TP05	275196.3	325343.9	124.6	3.1	21/09/2018
TP06	275092.4	325300	125.45	2.5	20/09/2018
TP07	275071.2	325247	126.66	0.35	20/09/2018
TP08	275128.1	325121.4	123.94	3.0	20/09/2018
TP09	275148.9	325159.7	124.07	3.0	20/09/2018
TP10	275273.7	325135.3	127.4	3.8	20/09/2018
TP11	275166.4	325207.1	124.52	3.0	20/09/2018
TP12	275230.5	325196.5	124.58	1.8	20/09/2018
TP13	275188.7	325245.3	125.21	4.5	20/09/2018
TP14	275284.8	325229	125.81	0.65	20/09/2018
TP15	275214.9	325291.6	125.66	4.2	20/09/2018
TP16	275282.8	325291.2	126.51	3.0	20/09/2018
TP17	275361.7	325224.7	127.7	1.8	20/09/2018
TP18	275338.2	325187.9	126.55	2.8	20/09/2018

A.5) Fieldworks

This report considers all relevant site investigation results. Relevant site investigation results have been overlaid on the interpretive drawings, attached.

A.6) Acronyms

bgl – Below ground level
ERT – Electrical Resistivity Tomography
GSI – Geological Survey of Ireland
ITM – Irish Transverse Mercator
OD Malin – Metres above Ordnance Datum Malin
PGL – Priority Geotechnical Ltd.

A.7) Site Geology

According to the GSI 100k Geology Map (see Fig. A.3) the survey area is underlain by the Lough Avaghon Formation, described as “Massive Sandstone & Microconglomerate” and shown in light green. Northwest of the site lies the Slieve Glah Formation, described as "Siltstone, Mudstone & thin Turbidite" and shown in lilac. Further northwest lies the Red Island Formation, described as "Greywacke, Microconglomerate & Argillite" and shown in green. Part of a north-south fault passes through the northern edge of the survey area. The greater area surrounding the site is affected by many large faults; the site being situated in relatively proximity to the Orlock Bridge Fault, which is a major fault extending through Northern Ireland and Scotland.

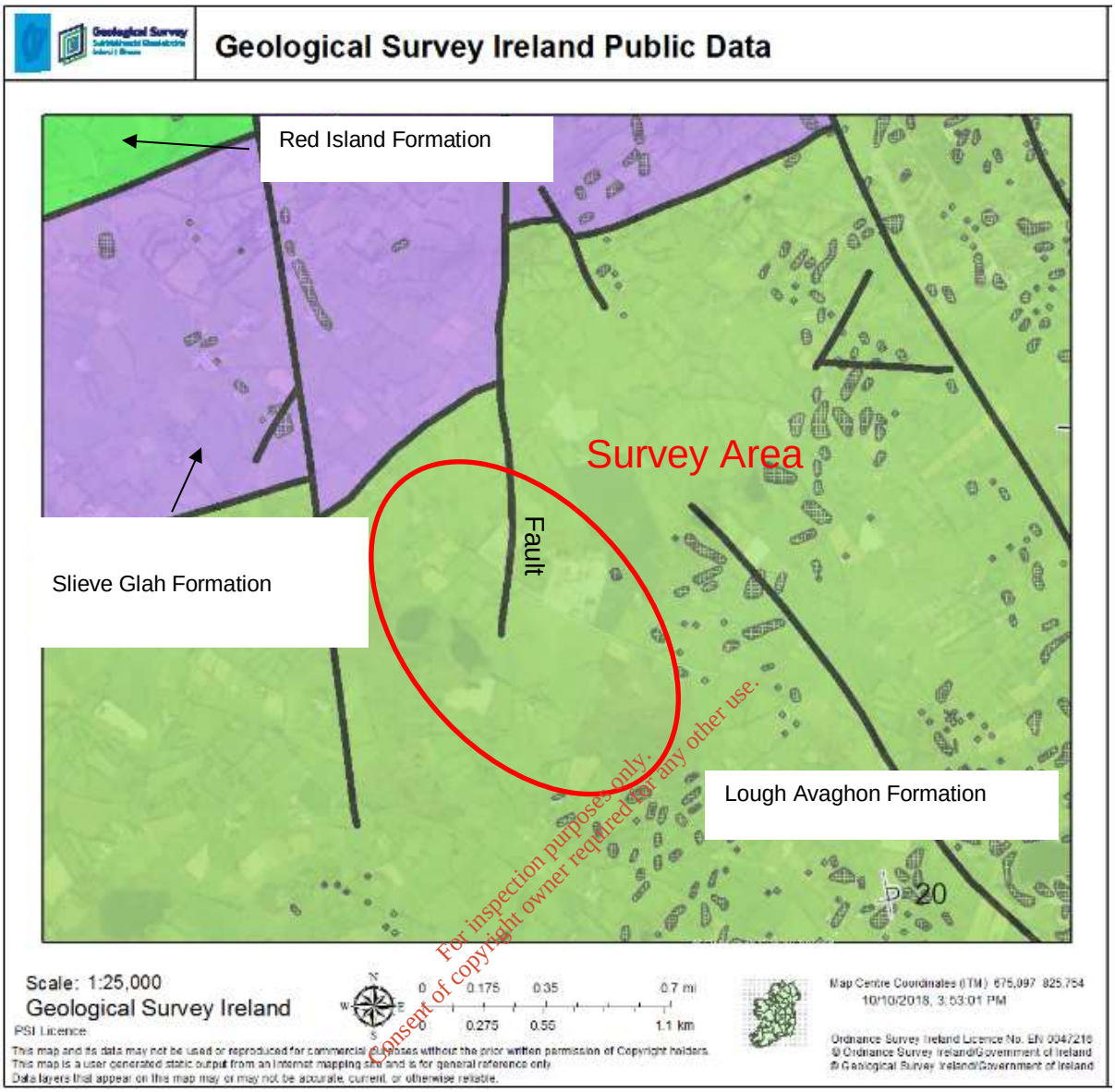


Figure A.3: GSI 100k Bedrock Geology Map of the site.

According to the Quaternary Soils Map (see Fig. A.4) the study area is underlain by a variety of soils types. This variety is also reflected in the area surrounding the site. The areas shown in pale lilac are underlain by soils described as "Till derived from Lower Palaeozoic Sandstones and Shales". Brown areas show soils described as "Cut over raised Peat". Soils described as "Alluvium" are shown in orange. Areas of outcrop at or near the surface are indicated in the survey area and are shown in grey. Regarding the survey area; the north and east of site are underlain by the Tills, while the south of the site is underlain by outcrop or subcrop. Areas of Cut over Peat also exist to a smaller extent in the centre of the site.

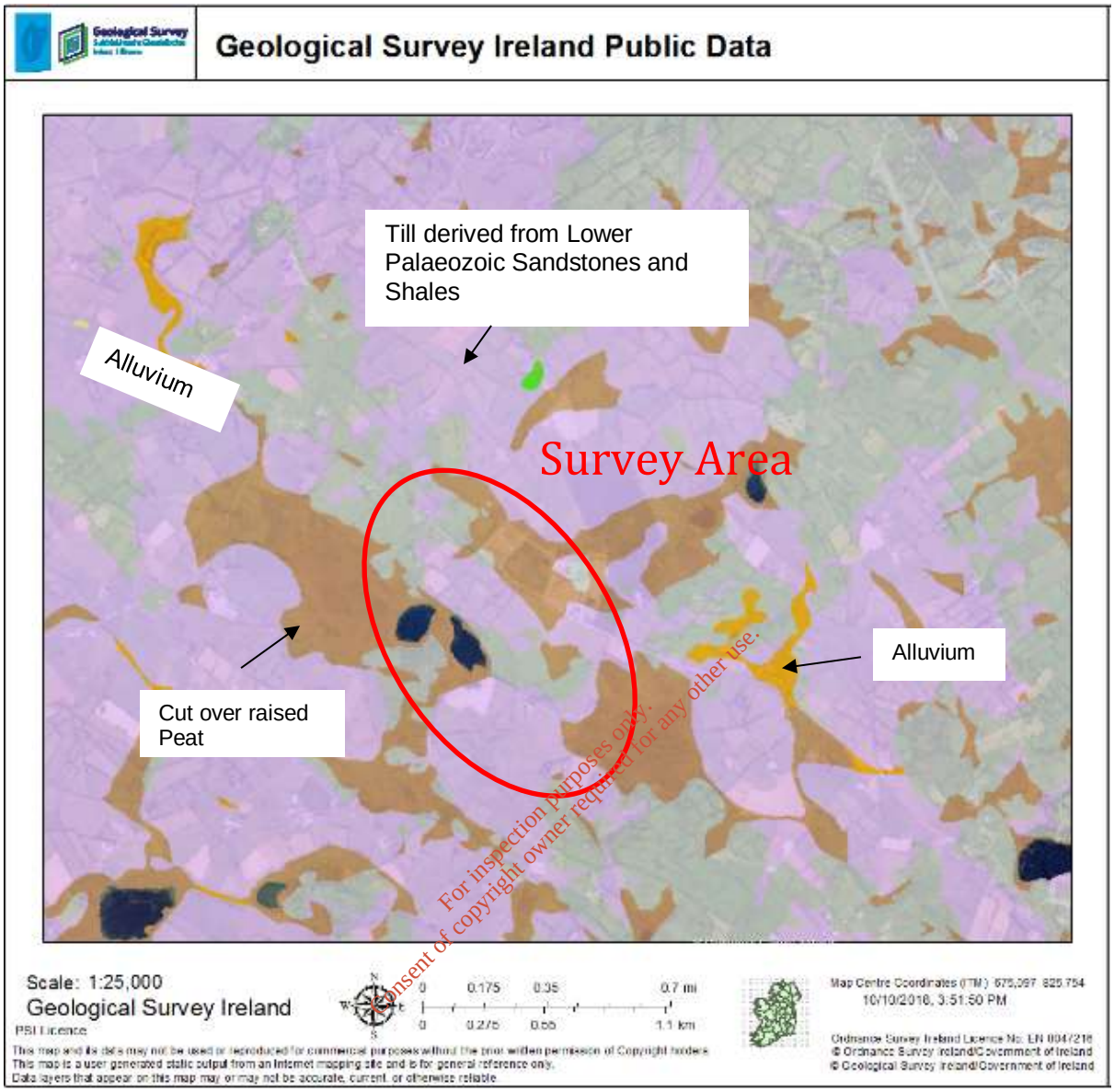


Figure A.4: Quaternary Sediments Map of the site.

All above mapping is available for free viewing on the Geological Survey of Ireland website at *https://www.gsi.ie/en-ie/Pages/default.aspx*.

B) Intrusive, direct investigation fieldworks

This direct investigation fieldworks were undertaken between the 21st August and the 21st September, 2018 under the supervision of PGL, Engineering Geologist(s) in accordance with Eurocode 7- Geotechnical Design Part 2, ground investigation and testing (BS EN 1997-2: 2007) and the relevant British Standards (BS 5930 (2015) Code of Practice for Site Investigation and BS 1377, Method of Tests for Soil for Civil Engineering Purposes, *in situ* Tests Parts 1 to 9). Details of the plant and equipment used are detailed on the relevant exploratory records, attached herein.

B.1.i) Boreholes

Six (6) number rotary boreholes were bored to depths 2.6m below existing ground level (bgl) to 22.0m bgl using PGL's Deltabase 520 rotary rig. The records are presented in **APPENDIX A**.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
BH SI07	4.0	24/08/2018
BH SI08	4.2	27/08/2018
BH SI09	2.6	27/08/2018
BH SI10	5.8	28/08/2018
BH11	22.0	21/08/2018
BH11A	9.5	23/08/2018

B.1.ii) Trial Pits

A total of eighteen (18) Trial Pit excavations were dug to a depth 0.35m bgl to 4.7m bgl using a 13t tracked excavator. Trial pits terminated for a variety of reasons as outlined on the exploratory logs included in **APPENDIX A**.

Location	Final Depth (m, bgl)	Date Start (dd/mm/yyyy)
TP01	4.3	21/09/2018
TP02	4.7	21/09/2018
TP03	1.1	21/09/2018
TP04	4.5	21/09/2018
TP05	3.1	21/09/2018
TP06	2.5	20/09/2018
TP07	0.35	20/09/2018
TP08	3.0	20/09/2018
TP09	3.0	20/09/2018

Location	Final Depth (m, bgl)	Date Start (dd/mm/yyyy)
TP10	3.8	20/09/2018
TP11	3.0	20/09/2018
TP12	1.8	20/09/2018
TP13	4.5	20/09/2018
TP14	0.65	20/09/2018
TP15	4.2	20/09/2018
TP16	3.0	20/09/2018
TP17	1.8	20/09/2018
TP18	2.8	20/09/2018

B.2) Laboratory Testing

Three (3) environmental samples were taken from trial pit locations for the purpose of WAC testing. Testing was carried out by Chemtest UK Ltd. on behalf of PGL. The results are presented in **APPENDIX B.**

B.3) Ground and Groundwater Conditions

The full details of the ground conditions encountered are provided for on the exploratory records accompanying this report. The records provide descriptions, in accordance with BS 5930 (2015) and Eurocode 7, Geotechnical Investigation and Testing, Identification and classification of soils, Part 1, Identification and description (EN ISO 14688-1: 2002),– Identification and Classification of Soil, Part 2: Classification Principles (EN ISO 14688-2:2004) and Identification and Classification of Rock, Part 1: Identification & Description (EN ISO 14689-1:2004) of the materials encountered, in situ testing and details of the samples taken, together with any observations made during the ground investigation.

Groundwater was recorded when encountered during boring over a period of 20 minutes, noting any changes that may occur. Groundwater levels were also monitored at start and end of drilling shifts.

It should be noted that the normal rate of boring may not permit the recording of equilibrium groundwater levels for any one groundwater water strike where casing may exclude low volume flows as the borehole progresses. The normal duration over which a trial excavation remains open may not allow for low volume flow to ingress in cohesive deposits.

Groundwater conditions observed in the borings and the excavations, are those appertaining to the period of the investigation. Groundwater levels may be subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc. Twelve (12) groundwater monitoring installations (six 90mm diameter and six 19mm diameter) were constructed upon request of the engineer. The groundwater regime should be assessed from standpipe well installations, where available. A summary of groundwater is presented below.

Location	Depth Strike (m bgl)	Remarks	Standpipe (Y/N)
BH SI07	0.5	See shift data.	Y
BH SI08	3.6	See shift data.	Y
BH SI09	-	None encountered.	Y
BH SI10	-	None encountered.	Y
BH11	5.6	See shift data.	Y
BH11A	5.5	See shift data.	Y
TP01	3.8	Fast flow rate.	N
TP02	3.6	Steady flow rate.	N
TP03	0.7	Fast flow rate.	N
TP04	3.5	Fast flow rate.	N
TP05	2.6	Steady flow rate.	N
TP06	1.0	Fast flow rate.	N
TP07	-	None encountered.	N
TP08	2.1	Fast flow rate.	N
TP09	2.1	Fast flow rate.	N
TP10	-	None encountered.	N
TP11	0.3	Fast flow rate. Surface runoff.	N
TP11	0.8	Fast flow rate	N
TP12	0.95	Steady flow rate.	N
TP13	2.7	Fast flow rate.	N
TP14	-	None encountered.	N
TP15	3.1	Steady flow rate.	N
TP16	2.3	Slow flow rate.	N
TP17	-	None encountered.	N
TP18	0.6	Slow flow rate.	N

Location	Depth Top (m bgl)	Depth Base (m bgl)	Diameter (mm)	Pipe Type
BH SI07	0.0	1.0	90	PLAIN
BH SI07	1.0	2.6	90	SLOTTED
BH SI07	0.0	1.0	19	PLAIN
BH SI07	1.0	2.6	19	SLOTTED
BH SI08	0.0	1.5	90	PLAIN
BH SI08	1.5	2.0	90	SLOTTED
BH SI08	0.0	1.5	19	PLAIN
BH SI08	1.5	2.0	19	SLOTTED
BH SI09	0.0	0.5	90	PLAIN
BH SI09	0.5	1.9	90	SLOTTED
BH SI09	0.0	0.5	19	PLAIN
BH SI09	0.5	1.9	19	SLOTTED
BH SI10	0.0	1.5	90	PLAIN
BH SI10	1.5	4.2	90	SLOTTED
BH SI10	0.0	1.5	19	PLAIN
BH SI10	1.5	4.2	19	SLOTTED
BH11	0.0	17.0	90	PLAIN
BH11	17.0	22.0	90	SLOTTED
BH11	0.0	17.0	19	PLAIN
BH11	17.0	22.0	19	SLOTTED
BH11A	0.0	5.0	90	PLAIN
BH11A	5.0	8.5	90	SLOTTED
BH11A	0.0	5.0	19	PLAIN
BH11A	5.0	8.5	19	SLOTTED

Exploratory holes were backfilled upon instruction from the engineer. Backfill details are shown graphically on the exploratory logs accompanying this factual report.

GRAVEL Backfill to installation/ borehole	ARISINGS Backfill
uPVC slotted pipe	BENTONITE Backfill to installation/

C) Methodology and Results

C.1) 2D Electrical Resistivity Tomography (ERT)

The geophysical survey comprised of 2D electrical resistivity tomography (ERT) to measure the ground resistivity distribution across the survey area.

The resistivity survey was comprised of four profiles which were named R1 through R4. These profiles were collected with an electrode spacing of 3m spacing, and varied in length with R1, R2, R3 and R4 measuring 285m, 477m, 286m and 402m respectively. The survey was carried out on 15th through 18th October 2018.

C.1.i) Data Acquisition

Survey data was collected using a 64 channel Tigre Resistivity Meter. The Tigre has a maximum power of 36 watts and maximum current output of 200mA. The receiver incorporates automatic gain steps providing a range of measurements from 0.001ohm to 360kohm.

Multicore resistivity cables with 32 take-outs were used with stainless steel electrodes. Contact resistivities were checked prior to running the survey, to ensure an adequate electrical contact between the ground and the electrodes were made. Electrodes with poor contacts were treated with saline solution and rechecked till an optimum contact resistance were obtained.

The Tigre was connected to a laptop running Imager Pro™ 2006 acquisition software (Campus International Products Ltd., 2006) and subsequently viewed and inverted using Res2DInv software. All data was checked on site and any spurious readings were repeated until satisfactory results were achieved.

C.1.ii) Array Type

The Wenner Alpha Array protocol was utilized during this survey. The Wenner Array uses four equally spaced electrodes. Current is injected through the two outer electrodes and the resulting voltage difference at two inner electrodes. From the current (I) and the voltage (V) an apparent resistivity (p_a) value is calculated.

$$p_a = k\,V/I$$

Where k is the geometric factor which depends on the arrangement of the 4 electrodes. This calculated resistivity value is not the true resistivity of the subsurface but an “apparent” resistivity value, i.e. the resistivity of a homogenous ground which would give the same resistance value for the same electrode arrangement. To determine “true” ground resistivity an inversion of the measured apparent resistivity is undertaken, in this case using Res2DInv software.

The Wenner array is relatively sensitive to vertical changes (i.e. horizontal structures), but relatively poor in detecting horizontal changes (i.e. narrow vertical structures). Among the common array types for ERT profiling the Wenner alpha array has the strongest signal strength (Loke, 2000).

C.1.iii) Data Processing

Survey data was processed using Res2DInv, where the raw files were edited and inverted. The software does this by first dividing the subsurface 2D model into rectangular blocks and then calculates the resistivity of these blocks such that the calculated apparent resistivity measurements of the blocks agree with the measured values from the field survey.

Up to 5 iterations of the inversion of the measured data were carried out for each profile to obtain a 2D pseudosection of the apparent resistivities. The least squares inversion was used to produce an apparent resistivity depth model.

A degree of fit between the measured apparent resistances and the inverted resistances is calculated by the program, allowing an assessment of the degree of confidence of the inverted data. A damping factor can be applied to smooth erroneous data points; however, resolution lessens with an increased damping factor. A moderate damping factor was used during all inversions. All ERT profile inversions resulted in an RMS error of close to our less than 10% (R1 = 10.7%, R2 = 10.8%, R3 = 7.3%, R4 = 4.3%) indicative of high-quality data.

Resistivity values in the inverted profiles varied from c. 5 to 2000 Ohm-m.

C.2) Spatial Relocation

Horizontal control and elevation were provided by a Trimble RTK enabled receiver receiving corrections through the Trimble VRS (Virtual Reference Station) correction stream. Survey Controller software was used to provide high-accuracy, GNSS positioning. All positions are plotted in ITM. Elevations are to OD Malin using geoid model OSGM02.

D) Results and Interpretation

The locations of the recorded profiles as well as the modelled profiles and geophysical interpretations are shown in APPENDIX A: Drawing No.'s P18175_GP_D01 to P18175_GP_D02.

The ERT was used to interpret the overburden and bedrock composition on all profiles.

In general bedrock has been interpreted at the 50 Ohm-m boundary where resistivity is seen to increase with depth. The bedrock was seen too have a variable resistivity with many areas having resistivities > 500 Ohm-m. Where resistivity exceeded 500 Ohm-m this has been interpreted as SANDSTONE bedrock. Where resistivity is between 50 Ohm-m and 500 Ohm-m this has been interpreted as MUDSTONE bedrock or a highly weathered SANDSTONE bedrock material. An anomalous vertical area of low resistivity is seen on R3 at 235m and may represent a fault. This feature is also seen to a much lesser extent on R2 at 415m.

The waste material was seen as an area of low resistivity (c. < 25 Ohm-m) close to the surface. It is noted that on ERT profile R1 TP11, TP13 and TP15 terminate in 'natural ground' however there is a significant area of low resistivity beneath the base of the trial pits. In this instance it is interpreted that natural ground may be in place above another area of waste material and as such the interpreted waste material is deeper than the trial pitting indicated depths. It may also be that the leachate from the above landfill material is producing low resistivity in the contaminated ground beneath.

ERT profile R2 did not produce very low resistivity results close to the surface in the first 230m, the extent of the landfill material at this location leans heavily on the trial pit information.

No evidence of landfill material is seen on ERT profile R4.

Overburden outside the areas of waste material has been interpreted on the following basis:

< 250 Ohm: Sandy Gravelly CLAY
> 250 Ohm-m Sandy GRAVEL

APPENDIX A: DRAWINGS

Drawing Number	Description	Scale
P18175_GP_D01	Location Map	1:1000 at A1
P18175_GP_D02	Cross Sections and Interpretations	1:800 at A1.

FIGURE 1: LOCATION MAP SHOWING GEOPHYSICAL PROFILE LOCATIONS
SCALE: 1:1000

PROJECT:	CONSULTING ENGINEERS:	JOB NUMBER:	DRAWN BY:	APPROVED:
GROUND INVESTIGATIONS AT SCOTCH CORNER HISTORIC LANDFILL, MONAGHAN	FEHILY TIMONEY & COMPANY	P18175	PB	GH
			COORDINATE SYSTEM: ITM	VERTICAL DATUM: OD Malin
Sheet Title: LOCATION MAP	SURVEYED BY: PRIORITY GEOTECHNICAL LTD.	DRAWING NUMBER: P18175_GP_D01	SCALE: 1:1000 @ A1	ISSUE DATE: 7/11/2018
			REVISION: D01 - DRAFT FOR COMMENT	

Legend:

ERT Profile

Seismic Refraction Profile

ERT Colour Scale

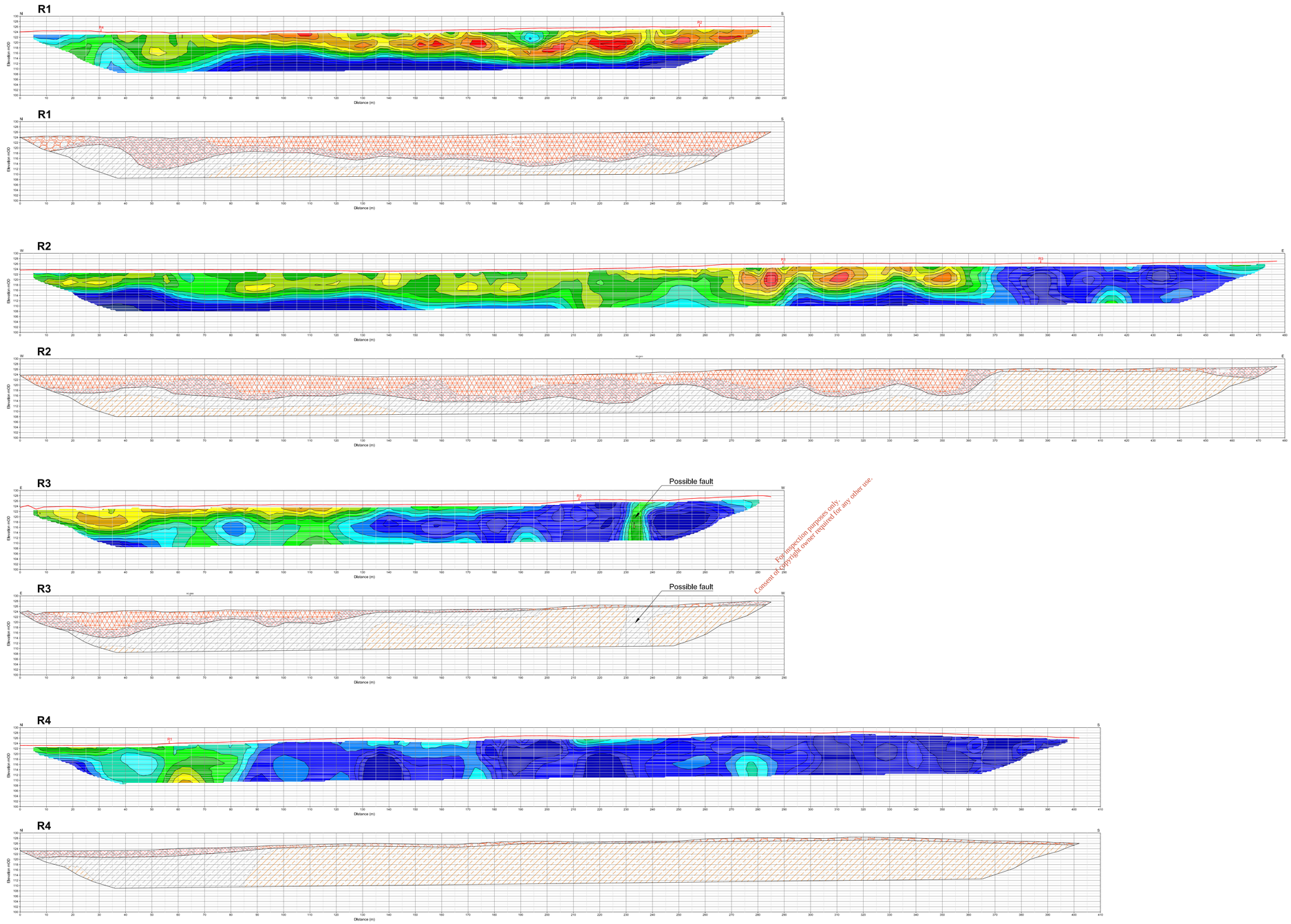
0 1.5 2.5 4 6 10 16 25 40 64 103 165 264 422 676 1081 1729

Geophysical Interpretation

Overburden
- Landfill Material
- Sandy Gravelly CLAY
- Sandy GRAVEL

Bedrock
- SANDSTONE
- Highly Weathered SANDSTONE / MUDSTONE

FIGURE 1: GEOPHYSICAL PROFILE CROSS SECTIONS - R1, R2, R3, R4
SCALE: 1:800



PROJECT:	CONSULTING ENGINEERS:	JOB NUMBER:	DRAWN BY:	APPROVED:
GROUND INVESTIGATIONS AT SCOTCH CORNER HISTORIC LANDFILL, MONAGHAN	FEHILY TIMONEY & COMPANY	P18175	PB	GH
			COORDINATE SYSTEM: ITM	VERTICAL DATUM: Malin
Sheet Title: GEOPHYSICAL PROFILE INTERPRETED CROSS SECTIONS - R1, R2, R3, R4	SURVEYED BY: PRIORITY GEOTECHNICAL LTD.	DRAWING NUMBER: P18175_GP_D02	SCALE: 1:800 @ A1	ISSUE DATE: 7/11/2018
			REVISION: D01 - DRAFT FOR COMMENT	

Legend:

ERT Profile

Seismic Refraction Profile

ERT Colour Scale

0 1.5 2.5 4 6 10 16 25 40 64 103 165 264 422 676 1081 1729

Geophysical Interpretation

Overburden
- Landfill Material
- Sandy Gravelly CLAY
- Sandy GRAVEL

Bedrock
- SANDSTONE
- Highly Weathered SANDSTONE / MUDSTONE

APPENDIX A: EXPLORATORY LOGS AND PHOTOGRAPHIC RECORDS

BH11
BH11A
BH SI07
BH SI08
BH SI09
BH SI10
TP01
TP02
TP03
TP04
TP05
TP06
TP07
TP08
TP09
TP10
TP11
TP12
TP13
TP14
TP15
TP16
TP17
TP18

KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

**	Drillers Description
Friable	Easily crumbled

SAMPLES

U( )	Undisturbed 102mm diameter sample, ( ) denotes number of blows to drive sampler
U( )F, U( )P	F- not recovered, P-partially recovered
U38	Undisturbed 38mm diameter sample
P(F), (P)	Piston sample - disturbed
B	Bulk sample - disturbed
D	Jar Sample - disturbed
W	Water Sample
CBR	California Bearing Ratio mould sample
ES	Chemical Sample for Contamination Analysis
SPTLS	Standard Penetration Test S lump sample from split sampler

CORE RECOVERY AND ROCK QUALITY

TCR	Total Core Recovery (% of Core Run)
SCR	Solid Core Recovery (length of core having at least one full diameter as % of core run)
RQD	Rock Quality Designation (length of solid core greater than 100mm as % of core run)

Where there is insufficient space for the TCR, SCR and RQD, the results may be found in the remarks column

If	Fracture Spacing in mm (Minimum/Average/Maximum) NI - non intact, NR - no recovery
AZCL	Assumed Zone of Core Loss
NI	Non intact

GROUNDWATER

▽	Groundwater strike
▼	Groundwater level after standing period
Date/Water	Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date

INSITU TESTING

S	Standard Penetration Test - split barrel sampler
C	Standard Penetration Test - solid 60° cone
SW	Self Weight Penetration
Ivp, HVp (R)	In Situ Vane Test, Hand Vane Test (R) demonstrates remoulded strength
K(F), (C), (R), (P)	Permeability Test
HP	Hand Penetrometer Test

MEASURED PROPERTIES

N	Standard Penetration Test - blows required to drive 300mm after seating drive
x/y	Denotes x blows for y mm within the Standard Penetration Test
x*/y	Denotes x blows for y mm within the seating drive
c_u	Undrained Shear Strength (kN/m^2)
CBR	California Bearing Ratio

ROTARY DRILLING SIZES

Index Letter	Nominal Diameter (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: AK Logged By: N/A	Borehole No. **BH SI07** Sheet 1 of 1

Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:** 275284E - 325268N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:** 125.93m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:** 24/08/2018	24/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: CLAY.
							1.50	124.43		Open hole boring. Driller described: Clayey GRAVEL.
							3.60	122.33		Open hole boring. Driller described: Rock.
							4.00	121.93		End of Borehole at 4.000m

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
0.50				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
4.00	131	131

Equipment: Deltabase 520

Method: Compressed air mist.

Remarks:

BH SI07 terminated at 4.0m bgl, required depth. 90mm dia standpipe installed. Response zone from 1.0m bgl to 4.0m bgl. 19mm standpipe installed. Response zone from 1.00m to 2.60m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	24/08/2018 08:00	0.00	Start of shift.
0.5	24/08/2018 18:00	4.00	End of borehole.

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: AK	Borehole No.
	Logged By: N/A	**BH SI08**
		Sheet 1 of 1

Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275164E - 325151N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	124.11m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	27/08/2018	27/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: PEAT.
							1.30	122.81		Open hole boring. Driller described: (MADE GROUND) Peaty CLAY with waste material.
							2.80	121.31		Open hole boring. Driller described: Clayey GRAVEL.
							3.90	120.21		Open hole boring. Driller described: Rock.
							4.20	119.91		End of Borehole at 4.200m

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
3.60				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
4.20	131	131

Equipment: Deltabase 520

Method: Compressed air mist.

Remarks:

BH SI08 terminated at 4.20m bgl, required depth. 90mm dia. standpipe installed. Response zone from 1.50m to 2.0m bgl. 19mm dia. standpipe installed. Response zone from 1.50m to 2.0m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	27/08/2018 08:00	0.00	Start of shift.
2.9	27/08/2018 18:00	4.20	End of borehole.

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Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:** 275086E - 325310N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:** 125.43m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:** 27/08/2018	27/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: GRAVEL with boulder content.
							1.30	124.13		Open hole boring. Driller described: Clayey GRAVEL with boulder content.
							2.40	123.03		Open hole boring. Driller described: Rock.
							2.60	122.83		End of Borehole at 2.600m

1 2 3 4 5 6 7 8 9

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
2.60	131	131

Equipment: Deltabase 520

Method: Compressed air mist.

Remarks:

BH SI09 terminated at 2.60m bgl, required depth. 90mm dia. standpipe installed. Response zone from 0.5m to 1.90m bgl. 19mm dia. standpipe installed. Response zone from 0.5m to 1.90m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	27/08/2018 08:00	0.00	Start of shift.
Dry	27/08/2018 18:00	2.60	End of borehole.

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	Logged By: N/A	**BH SI10**
		Sheet 1 of 1

Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275191E - 325346N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	124.45m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	28/08/2018	28/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: GRAVEL with boulder content.
							1.10	123.35		Open hole boring. Driller described: Landfill material.
							4.20	120.25		Open hole boring. Driller described: PEAT.
							5.80	118.65		End of Borehole at 5.800m

1 2 3 4 5 6 7 8 9

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
5.80	131	131

Equipment: Deltabase 520

Method: Compressed air mist.

Remarks:

BH SI10 terminated at 5.80m bgl, required depth. 90mm dia. standpipe installed. Response zone from 1.50m to 4.20m bgl. 19mm dia. standpipe installed. Response zone from 1.50m to 4.20m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	28/08/2018 08:00	0.00	Start of shift.
Dry	28/08/2018 18:00	5.80	End of borehole.

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Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275272E - 325770N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	125.60m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	21/08/2018	22/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: CLAY with boulder content.
							4.50	121.10		Open hole boring. Driller described: CLAY.
							6.00	119.60		Open hole boring. Driller described: Clayey GRAVEL.
							7.50	118.10		Open hole boring. Driller described: Clayey SAND
							9.00	116.60		

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
5.60				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
22.00	131	131

Equipment: Deltabase 520.

Method: Compressed air mist.

Remarks:

BH11 terminated at 22.0m bgl, required depth. 90mm dia. standpipe installed. Response zone from 17.00m to 2.0m bgl. 19mm dia. standpipe installed,. Response zone from 17.00m to 22.00m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	21/08/2018 08:00	0.00	Start of shift.
16.9	21/08/2018 18:00	17.00	End of shift.
1.3	22/08/2018 08:00	17.00	Start of shift.
1.3	22/08/2018 18:00	22.00	End of borehole.

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Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275272E - 325770N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	125.60m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	21/08/2018	22/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
										Open hole boring. Driller described: Clayey GRAVEL.	10
							10.50	115.10		Open hole boring. Driller described: Sandy CLAY.	11
							12.00	113.60		Open hole boring. Driller described: CLAY with boulder content.	12, 13, 14, 15, 16
							17.00	108.60		Open hole boring. Driller described: Rock.	17, 18

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
5.60				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
22.00	131	131

Equipment: Deltabase 520.

Method: Compressed air mist.

Remarks:

BH11 terminated at 22.0m bgl, required depth. 90mm dia. standpipe installed. Response zone from 17.00m to 2.0m bgl. 19mm dia. standpipe installed,. Response zone from 17.00m to 22.00m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	21/08/2018 08:00	0.00	Start of shift.
16.9	21/08/2018 18:00	17.00	End of shift.
1.3	22/08/2018 08:00	17.00	Start of shift.
1.3	22/08/2018 18:00	22.00	End of borehole.

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Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275272E - 325770N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	125.60m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	21/08/2018	22/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
										Open hole boring. Driller described: Rock.	19
											20
											21
							22.00	103.60		End of Borehole at 22.000m	22
											23
											24
											25
											26
											27

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
5.60				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
22.00	131	131

Equipment: Deltabase 520.

Method: Compressed air mist.

Remarks:

BH11 terminated at 22.0m bgl, required depth. 90mm dia. standpipe installed. Response zone from 17.00m to 2.0m bgl. 19mm dia. standpipe installed,. Response zone from 17.00m to 22.00m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	21/08/2018 08:00	0.00	Start of shift.
16.9	21/08/2018 18:00	17.00	End of shift.
1.3	22/08/2018 08:00	17.00	Start of shift.
1.3	22/08/2018 18:00	22.00	End of borehole.

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Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275274E - 325771N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	125.52m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	23/08/2018	23/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: CLAY with boulder content.
							1.50	124.02		Open hole boring. Driller described: Sandy CLAY with boulder content.
							4.50	121.02		Open hole boring. Driller described: CLAY.
							6.00	119.52		Open hole boring. Driller described: CLAY with boulder content.
							7.50	118.02		Open hole boring. Driller described: Clayey GRAVEL.
							9.00	116.52		

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
5.50				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
9.50	131	131

Equipment: Deltabase 520

Method: Compressed air mist.

Remarks:

BH11A terminated at 9.50m bgl, required depth. 90mm dia. standpipe installed. Response zone from 5.0m to 8.5m bgl. 19mm dia. standpipe installed. Response z\one from 5.0m to 8.5m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	23/08/2018 08:00	0.00	Start of shift.
0.5	23/08/2018 18:00	9.50	End of borehole.

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Project Name:	Scotch Corner Landfill	**Project No.** P18175	**Co-ords:**	275274E - 325771N	**Hole Type** Rotary open hole
Location:	Castleblaney, Co. Monaghan		**Level:**	125.52m OD	**Scale** 1:50
Client:	Monaghan County Council		**Dates:**	23/08/2018	23/08/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Open hole boring. Driller described: CLAY.
							9.50	116.02		End of Borehole at 9.500m

10
11
12
13
14
15
16
17
18

Groundwater:

Struck, m	Rose to	After, min	Sealed	Comment
5.50				See shift data.

Hole Information:

Hole Depth (m)	Hole Dia (mm)	Casing Dia (mm)
9.50	131	131

Equipment: Deltabase 520

Method: Compressed air mist.

Remarks:

BH11A terminated at 9.50m bgl, required depth. 90mm dia. standpipe installed. Response zone from 5.0m to 8.5m bgl. 19mm dia. standpipe installed. Response z\one from 5.0m to 8.5m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	23/08/2018 08:00	0.00	Start of shift.
0.5	23/08/2018 18:00	9.50	End of borehole.

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Trial Pit No
TP01
Sheet 1 of 1

Project Name: Scotch Corner Landfill	**Project No.** P18175	**Co-ords:** 275022E - 325416N **Level:** 124.76m OD	**Date** 21/09/2018
Location: Castleblaney, Co. Monaghan		**Dimensions (m):** 2.90 × 1.10	**Scale** 1:25
Client: Monaghan County Council		**Depth:** 4.30m BGL	**Logged** PH

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
							(TOPSOIL) Sandy SILT. Sand is fine to coarse.
				0.30	124.46		(MADE GROUND) PEAT
				1.50	123.26		(MADE GROUND) Grey brown, slightly sandy sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.
				3.00	121.76		(MADE GROUND) Landfill material. Plastic, glass, metal and paper.
	3.50	ENV					
				3.80	120.96		PEAT
				4.30	120.46		End of Pit at 4.300m

1 2 3 4 5

Stability: Good.
Plant: 13t tracked excavator.
Backfill: Arisings.
Groundwater: 3.80m: Fast flow rate.
Remarks: TP01 terminated at 4.30m bgl, required depth. Natural ground encountered.