

# Appendix 2

## Priority Geotechnical Reports

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**SCOTCH CORNER LANDFILL  
GROUND INVESTIGATION  
GEOPHYSICAL SURVEY  
REPORT No. P18175\_Gp\_Rp\_D01**



## REPORT CONTROL SHEET

|                                 |  |      |               |                   |          |                 |
|---------------------------------|--|------|---------------|-------------------|----------|-----------------|
| <b>Client</b>                   | Monaghan County Council                      |      |               |                   |          |                 |
| <b>Engineer Representative</b>  | Fehily Timoney & Company                     |      |               |                   |          |                 |
| <b>Project Name</b>             | SCOTCH CORNER LANDFILL- GROUND INVESTIGATION |      |               |                   |          |                 |
| <b>Document Name</b>            | Ground Investigation Draft Report            |      |               |                   |          |                 |
| <b>Project Number</b>           | P18175_Gp                                    |      |               |                   |          |                 |
| <b>This Report Comprises of</b> | 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).

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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             | 4.4                 | 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.

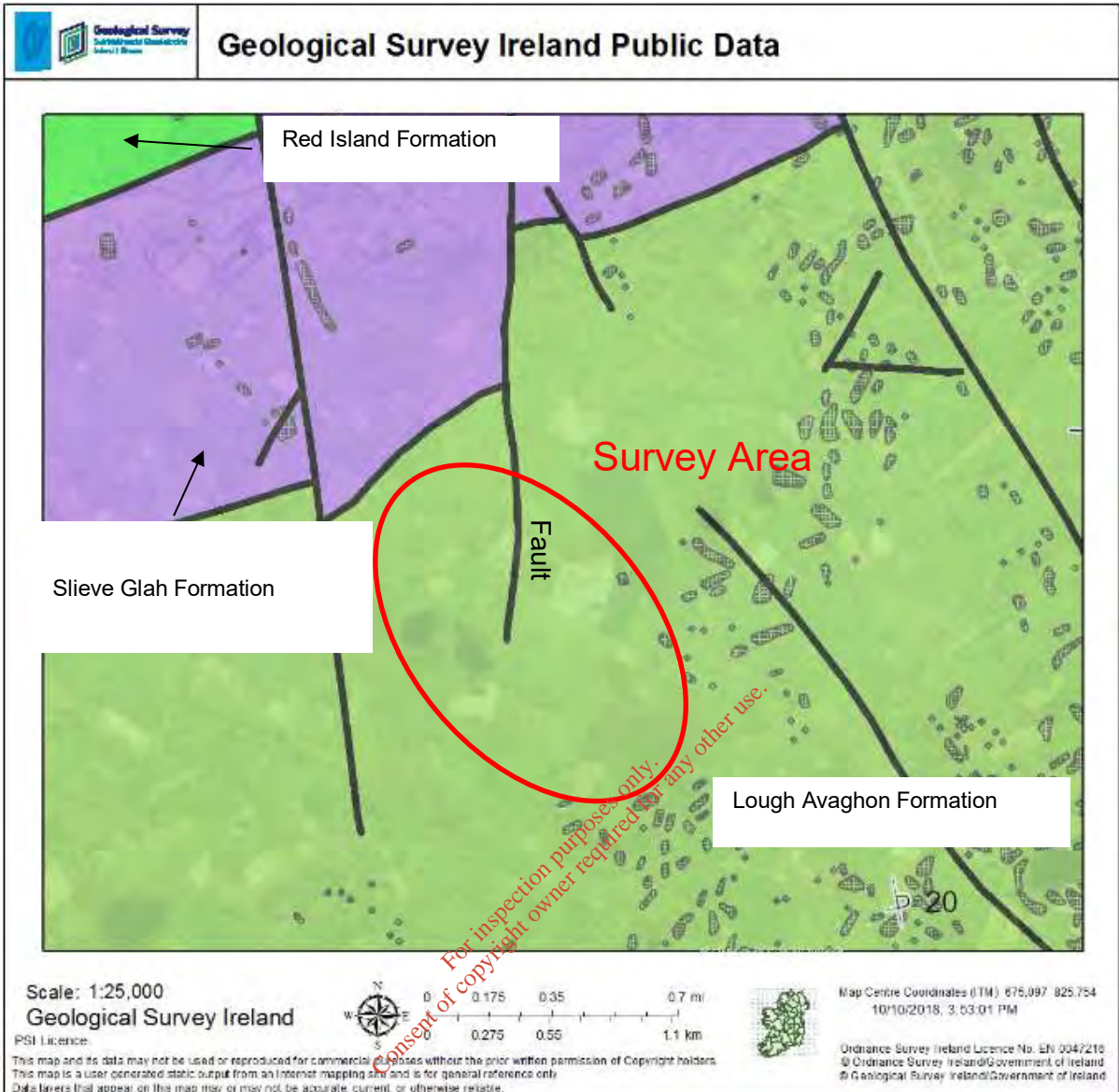


Figure A.3: GSI 100k Bedrock Geology Map of the site.

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.

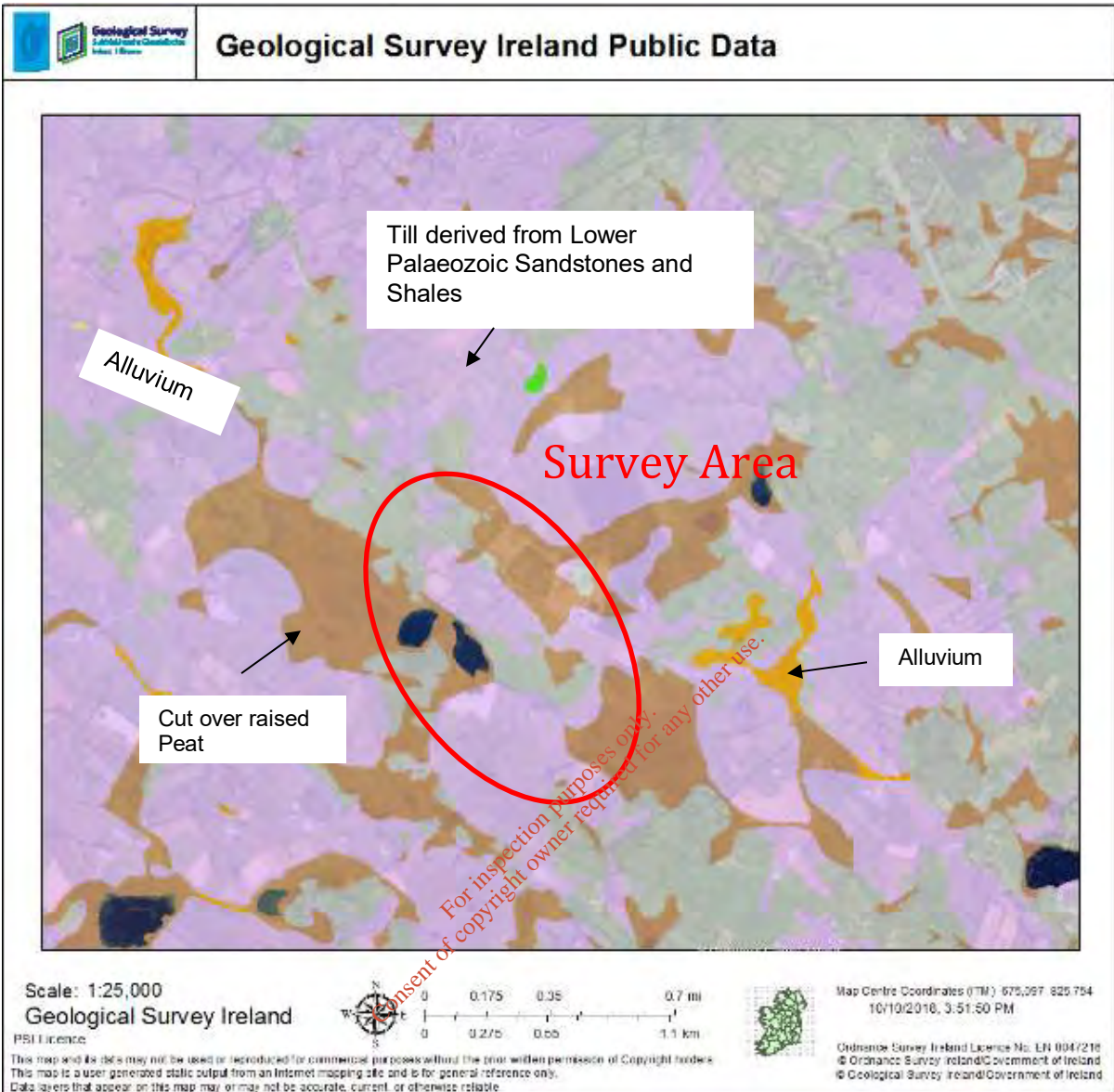


Figure A.4: Quaternary Sediments Map of the site.

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 21<sup>st</sup> August and the 21<sup>st</sup> 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        |

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### 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   |

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

|  |  |
|--|--|
| <br>GRAVEL Backfill to installation/ borehole | <br>ARISINGS Backfill                   |
| <br>uPVC slotted pipe                         | <br>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 15<sup>th</sup> through 18<sup>th</sup> 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 or 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.

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## 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

| <b>Drawing Number</b> | <b>Description</b>                 | <b>Scale</b> |
|-----------------------|------------------------------------|--------------|
| P18175_GP_D01         | Location Map                       | 1:1000 at A1 |
| P18175_GP_D02         | Cross Sections and Interpretations | 1:800 at A1. |

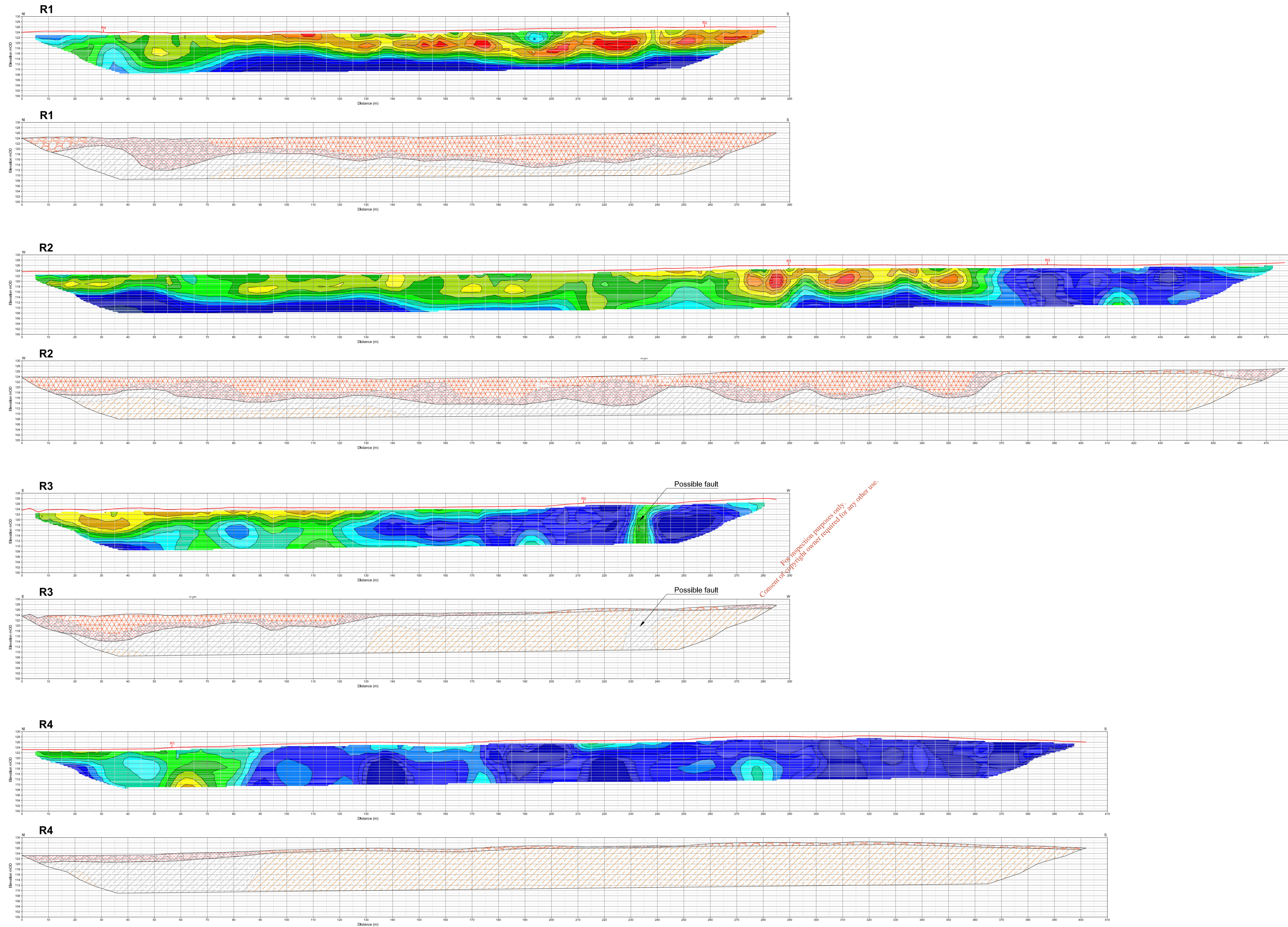
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FIGURE 1: LOCATION MAP SHOWING GEOPHYSICAL PROFILE LOCATIONS  
SCALE: 1:1000



|  |   |  |                                   |                                     |   |  |  |                               |                                  |
|--|---|--|-----------------------------------|-------------------------------------|---|--|--|-------------------------------|----------------------------------|
| <p>PROJECT:<br/>GROUND INVESTIGATIONS<br/>AT SCOTCH CORNER<br/>HISTORIC LANDFILL,<br/>MONAGHAN</p> | <p>CONSULTING ENGINEERS:<br/>FEHILY TIMONEY &amp;<br/>COMPANY</p> | <p>JOB NUMBER:<br/>P18175</p>            | <p>DRAWN BY:<br/>PB</p>           | <p>APPROVED:<br/>GH</p>             | <p>Legend:</p> <p>ERT Profile</p> <p>Seismic Refraction Profile</p> <p>ERT Colour Scale</p> | <p>Geophysical Interpretation</p> <p>Overburden</p> <ul style="list-style-type: none"> <li>Landfill Material</li> <li>Sandy Gravelly CLAY</li> <li>Sandy GRAVEL</li> </ul> <p>Bedrock</p> <ul style="list-style-type: none"> <li>SANDSTONE</li> <li>Highly Weathered SANDSTONE / MUDSTONE</li> </ul> |  |                               |                                  |
| <p>Sheet Title:<br/>LOCATION MAP</p>   | <p>SURVEYED BY:<br/>PRIORITY GEOTECHNICAL<br/>LTD.</p>            | <p>DRAWING NUMBER:<br/>P18175_GP_D01</p> | <p>COORDINATE SYSTEM:<br/>ITM</p> | <p>VERTICAL DATUM:<br/>OD Malin</p> |   |  |  | <p>SCALE:<br/>1:1000 @ A1</p> | <p>ISSUE DATE:<br/>7/11/2018</p> |
| <p>REVISION:<br/>D01 - DRAFT FOR COMMENT</p>   |   |  |                                   |                                     |   |  |  |                               |                                  |

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



PROJECT:  
GROUND INVESTIGATIONS  
AT SCOTCH CORNER  
HISTORIC LANDFILL,  
MONAGHAN

CONSULTING ENGINEERS:  
FEHILY TIMONEY &  
COMPANY

JOB NUMBER:  
P18175

DRAWN BY:  
PB

APPROVED:  
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

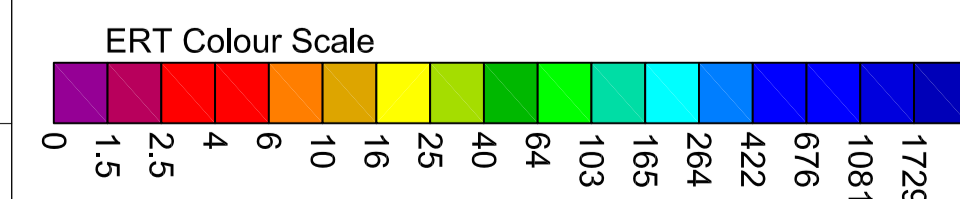
SCALE:  
1:800 @ A1

ISSUE DATE:  
7/11/2018

REVISION:  
D01 - DRAFT FOR COMMENT

Legend:

ERT Profile  
Seismic Refraction Profile



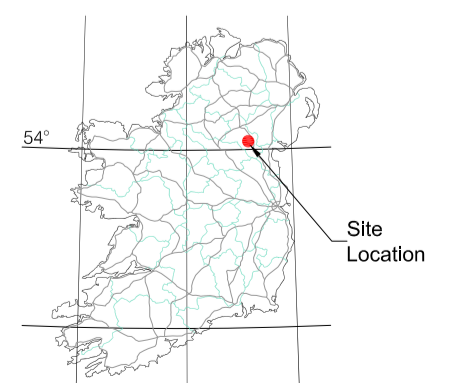
Geophysical Interpretation

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    |

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# 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  
lf 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<sup>2</sup>)  
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  |





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**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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description                                 |   |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|---|---|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |   |   |
|      | ▼                |           |                          |            |     |     |                     |             |        | Open hole boring. Driller described: CLAY.          | 1 |
|      |                  |           |                          |            |     |     | 1.50                | 124.43      |        | Open hole boring. Driller described: Clayey GRAVEL. | 2 |
|      |                  |           |                          |            |     |     | 3.60                | 122.33      |        | Open hole boring. Driller described: Rock.          | 3 |
|      |                  |           |                          |            |     |     | 4.00                | 121.93      |        | End of Borehole at 4.000m                           | 4 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 5 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 6 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 7 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 8 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 9 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------|----------------|----------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> | Deltabase 520  |                      |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)   | <b>Method:</b> | Compressed air mist. |
| 0.50                |         |            |        | See shift data.          | 4.00           | 131           | 131               |                |                      |

|  |                    |                    |                                      |                   |                                     |
|--|--------------------|--------------------|--------------------------------------|-------------------|-------------------------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>                         | <b>Hole Depth</b> | <b>Remarks</b>                      |
|  |                    | 0.5                | 24/08/2018 08:00<br>24/08/2018 18:00 | 0.00<br>4.00      | Start of shift.<br>End of borehole. |



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**Drilled By:**  
 AK  
**Logged By:**  
 N/A

Borehole No.  
**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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description  |   |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|--|---|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |  |   |
|      |                  |           |                          |            |     |     | 1.30                | 122.81      |        | Open hole boring. Driller described: PEAT.   | 1 |
|      |                  |           |                          |            |     |     | 2.80                | 121.31      |        | Open hole boring. Driller described: (MADE GROUND) Peaty CLAY with waste material. | 2 |
|      |                  |           |                          |            |     |     | 3.90                | 120.2       |        | Open hole boring. Driller described: Clayey GRAVEL.                                | 3 |
|      |                  |           |                          |            |     |     | 4.20                | 119.9       |        | Open hole boring. Driller described: Rock.   | 4 |
|      |                  |           |                          |            |     |     |                     |             |        | End of Borehole at 4.200m  | 5 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 6 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 7 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 8 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 9 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------|----------------|----------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> | Deltabase 520  |                      |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)   | <b>Method:</b> | Compressed air mist. |
| 3.60                |         |            |        | See shift data.          | 4.20           | 131           | 131               |                |                      |

|   |                    |                    |                                      |                   |                                     |
|---|--------------------|--------------------|--------------------------------------|-------------------|-------------------------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>                         | <b>Hole Depth</b> | <b>Remarks</b>                      |
|   |                    | 2.9                | 27/08/2018 08:00<br>27/08/2018 18:00 | 0.00<br>4.20      | Start of shift.<br>End of borehole. |



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**Drilled By:**  
AK  
**Logged By:**  
N/A

Borehole No.  
**BH SI09**  
 Sheet 1 of 1

**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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description  |   |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|--|---|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |  |   |
|      |                  |           |                          |            |     |     | 1.30                | 124.13      |        | Open hole boring. Driller described: GRAVEL with boulder content.        | 1 |
|      |                  |           |                          |            |     |     | 2.40                | 123.03      |        | Open hole boring. Driller described: Clayey GRAVEL with boulder content. | 2 |
|      |                  |           |                          |            |     |     | 2.60                | 122.83      |        | Open hole boring. Driller described: Rock.<br>End of Borehole at 2.600m  | 3 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 4 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 5 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 6 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 7 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 8 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 9 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|---------------------------------|-------------------------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> Deltabase 520 |                                     |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)                 | <b>Method:</b> Compressed air mist. |
|                     |         |            |        | None encountered.        | 2.60           | 131           | 131                             |                                     |

|   |                    |                    |                                      |                   |                                     |
|---|--------------------|--------------------|--------------------------------------|-------------------|-------------------------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>                         | <b>Hole Depth</b> | <b>Remarks</b>                      |
|   |                    | Dry                | 27/08/2018 08:00<br>27/08/2018 18:00 | 0.00<br>2.60      | Start of shift.<br>End of borehole. |



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**Drilled By:**  
AK  
**Logged By:**  
N/A

Borehole No.  
**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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description   |   |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|---|---|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |   |   |
|      |                  |           |                          |            |     |     | 1.10                | 123.35      |        | Open hole boring. Driller described: GRAVEL with boulder content. | 1 |
|      |                  |           |                          |            |     |     | 4.20                | 120.25      |        | Open hole boring. Driller described: Landfill material.           | 2 |
|      |                  |           |                          |            |     |     | 5.80                | 118.65      |        | Open hole boring. Driller described: PEAT.                        | 5 |
|      |                  |           |                          |            |     |     |                     |             |        | End of Borehole at 5.800m   | 6 |

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|---------------------|---------|------------|--------|-------------------|--------------------------|---------------|-----------------|-------------------|----------------------|
| <b>Groundwater:</b> |         |            |        |                   | <b>Hole Information:</b> |               |                 | <b>Equipment:</b> | Deltabase 520        |
| Struck, m           | Rose to | After, min | Sealed | Comment           | Hole Depth (m)           | Hole Dia (mm) | Casing Dia (mm) | <b>Method:</b>    | Compressed air mist. |
|                     |         |            |        | None encountered. | 5.80                     | 131           | 131             |                   |                      |

|   |                    |                    |                                      |                   |                                     |
|---|--------------------|--------------------|--------------------------------------|-------------------|-------------------------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>                         | <b>Hole Depth</b> | <b>Remarks</b>                      |
|   |                    | Dry                | 28/08/2018 08:00<br>28/08/2018 18:00 | 0.00<br>5.80      | Start of shift.<br>End of borehole. |



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**Drilled By:**  
AK  
**Logged By:**  
N/A

Borehole No.  
**BH11**  
 Sheet 1 of 3

**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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description   |   |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|---|---|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |   |   |
|      |                  |           |                          |            |     |     |                     |             |        | Open hole boring. Driller described: CLAY with boulder content. | 1 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 2 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 3 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 4 |
|      |                  |           |                          |            |     |     | 4.50                | 121.10      |        | Open hole boring. Driller described: CLAY.                      | 5 |
|      |                  |           |                          |            |     |     | 6.00                | 119.60      |        | Open hole boring. Driller described: Clayey GRAVEL.             | 6 |
|      |                  |           |                          |            |     |     | 7.50                | 118.10      |        | Open hole boring. Driller described: Clayey SAND                | 7 |
|      |                  |           |                          |            |     |     | 9.00                | 116.60      |        |   | 8 |
|      |                  |           |                          |            |     |     |                     |             |        |   | 9 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------|----------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> |                      |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)   | Deltabase 520.       |
| 5.60                |         |            |        | See shift data.          | 22.00          | 131           | 131               | Compressed air mist. |

|   |                    |  |                    |                  |                   |                  |
|---|--------------------|--|--------------------|------------------|-------------------|------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> |  | <b>Groundwater</b> | <b>Shift</b>     | <b>Hole Depth</b> | <b>Remarks</b>   |
|   |                    |  | 16.9               | 21/08/2018 08:00 | 0.00              | Start of shift.  |
|   |                    |  | 1.3                | 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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**Drilled By:**  
AK  
**Logged By:**  
N/A

Borehole No.  
**BH11**  
 Sheet 2 of 3

**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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description   |    |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|---|----|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |   |    |
|      |                  |           |                          |            |     |     |                     |             |        | 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 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------|----------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> | Deltabase 520.       |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)   | <b>Method:</b>       |
| 5.60                |         |            |        | See shift data.          | 22.00          | 131           | 131               | Compressed air mist. |

|   |                    |                    |                  |                   |                  |
|---|--------------------|--------------------|------------------|-------------------|------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>     | <b>Hole Depth</b> | <b>Remarks</b>   |
|   |                    | 16.9               | 21/08/2018 08:00 | 0.00              | Start of shift.  |
|   |                    | 1.3                | 21/08/2018 18:00 | 17.00             | End of shift.    |
|   |                    | 1.3                | 22/08/2018 08:00 | 17.00             | Start of shift.  |
|   |                    |                    | 22/08/2018 18:00 | 22.00             | End of borehole. |



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Drilled By: AK  
 Logged By: N/A

Borehole No. **BH11**  
 Sheet 3 of 3

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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description                        |    |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|--|----|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |  |    |
|      |                  |           |                          |            |     |     |                     |             |        | Open hole boring. Driller described: Rock. | 19 |
|      |                  |           |                          |            |     |     | 22.00               | 103.60      |        | End of Borehole at 22.000m                 | 22 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 23 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 24 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 25 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 26 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 27 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------|----------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> |                      |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)   | Deltabase 520.       |
| 5.60                |         |            |        | See shift data.          | 22.00          | 131           | 131               | Compressed air mist. |

|   |                    |                    |                  |                   |                  |
|---|--------------------|--------------------|------------------|-------------------|------------------|
| <b>Remarks:</b><br>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. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>     | <b>Hole Depth</b> | <b>Remarks</b>   |
|   |                    | 16.9               | 21/08/2018 08:00 | 0.00              | Start of shift.  |
|   |                    | 1.3                | 21/08/2018 18:00 | 17.00             | End of shift.    |
|   |                    | 1.3                | 22/08/2018 08:00 | 17.00             | Start of shift.  |
|   |                    |                    | 22/08/2018 18:00 | 22.00             | End of borehole. |



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|                    |              |
|--------------------|--------------|
| <b>Drilled By:</b> | Borehole No. |
| AK                 | <b>BH11A</b> |
| <b>Logged By:</b>  |              |
| N/A                |              |
| Sheet 1 of 2       |              |

|   |                            |                                   |                                    |
|---|----------------------------|-----------------------------------|------------------------------------|
| <b>Project Name:</b> Scotch Corner Landfill | <b>Project No.:</b> P18175 | <b>Co-ords:</b> 275274E - 325771N | <b>Hole Type:</b> Rotary open hole |
|---|----------------------------|-----------------------------------|------------------------------------|

|   |                          |                    |
|---|--------------------------|--------------------|
| <b>Location:</b> Castleblaney, Co. Monaghan | <b>Level:</b> 125.52m OD | <b>Scale:</b> 1:50 |
|---|--------------------------|--------------------|

|  |                          |            |
|--|--------------------------|------------|
| <b>Client:</b> Monaghan County Council | <b>Dates:</b> 23/08/2018 | 23/08/2018 |
|--|--------------------------|------------|

| Well | Water Strike (m) | Depth (m) | Type /Fs (min, max, avg) | Coring (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description   |   |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|---|---|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |   |   |
|      |                  |           |                          |            |     |     | 1.50                | 124.02      |        | Open hole boring. Driller described: CLAY with boulder content.       | 1 |
|      |                  |           |                          |            |     |     | 4.50                | 121.02      |        | Open hole boring. Driller described: Sandy CLAY with boulder content. | 2 |
|      |                  |           |                          |            |     |     | 6.00                | 119.52      |        | Open hole boring. Driller described: CLAY.                            | 5 |
|      |                  |           |                          |            |     |     | 7.50                | 118.02      |        | Open hole boring. Driller described: CLAY with boulder content.       | 6 |
|      |                  |           |                          |            |     |     | 9.00                | 116.52      |        | Open hole boring. Driller described: Clayey GRAVEL.                   | 8 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> Deltabase 520     |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)                     |
| 5.50                |         |            |        | See shift data.          | 9.50           | 131           | 131                                 |
|                     |         |            |        |                          |                |               | <b>Method:</b> Compressed air mist. |

|   |                    |                    |                                      |                   |                                     |
|---|--------------------|--------------------|--------------------------------------|-------------------|-------------------------------------|
| <b>Remarks:</b><br>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 zone from 5.0m to 8.5m bgl. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>                         | <b>Hole Depth</b> | <b>Remarks</b>                      |
|   |                    | 0.5                | 23/08/2018 08:00<br>23/08/2018 18:00 | 0.00<br>9.50      | Start of shift.<br>End of borehole. |





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Drilled By: AK  
 Logged By: N/A

Borehole No. **BH11A**  
 Sheet 2 of 2

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 (%) |     |     | Depth (m) / Fl (/m) | Level (mOD) | Legend | Stratum Description                        |    |
|------|------------------|-----------|--------------------------|------------|-----|-----|---------------------|-------------|--------|--|----|
|      |                  |           |                          | TCR        | SCR | RQD |                     |             |        |  |    |
|      |                  |           |                          |            |     |     | 9.50                | 116.02      |        | Open hole boring. Driller described: CLAY. |    |
|      |                  |           |                          |            |     |     |                     |             |        | End of Borehole at 9.500m                  | 10 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 11 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 12 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 13 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 14 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 15 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 16 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 17 |
|      |                  |           |                          |            |     |     |                     |             |        |  | 18 |

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|---------------------|---------|------------|--------|--------------------------|----------------|---------------|-------------------|----------------------|
| <b>Groundwater:</b> |         |            |        | <b>Hole Information:</b> |                |               | <b>Equipment:</b> |                      |
| Struck, m           | Rose to | After, min | Sealed | Comment                  | Hole Depth (m) | Hole Dia (mm) | Casing Dia (mm)   | Deltabase 520        |
| 5.50                |         |            |        | See shift data.          | 9.50           | 131           | 131               | Compressed air mist. |

|   |                    |                    |                                      |                   |                                     |
|---|--------------------|--------------------|--------------------------------------|-------------------|-------------------------------------|
| <b>Remarks:</b><br>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 zone from 5.0m to 8.5m bgl. | <b>Shift Data:</b> | <b>Groundwater</b> | <b>Shift</b>                         | <b>Hole Depth</b> | <b>Remarks</b>                      |
|   |                    | 0.5                | 23/08/2018 08:00<br>23/08/2018 18:00 | 0.00<br>9.50      | Start of shift.<br>End of borehole. |



|   |                            |   |                         |
|---|----------------------------|---|-------------------------|
| <b>Project Name:</b> Scotch Corner Landfill | <b>Project No.:</b> P18175 | <b>Co-ords:</b> 275022E - 325416N<br><b>Level:</b> 124.76m OD | <b>Date:</b> 21/09/2018 |
|---|----------------------------|---|-------------------------|

|   |                        |                    |
|---|------------------------|--------------------|
| <b>Location:</b> Castleblaney, Co. Monaghan | <b>Dimensions (m):</b> | <b>Scale:</b> 1:25 |
|---|------------------------|--------------------|

|  |                         |                  |
|--|-------------------------|------------------|
| <b>Client:</b> Monaghan County Council | <b>Depth:</b> 4.30m BGL | <b>Logged PH</b> |
|--|-------------------------|------------------|

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description   |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|---|
|                         | Depth (m)                 | Type | Results |           |              |        |   |
|                         |                           |      |         | 0.30      | 124.46       |        | (TOPSOIL) Sandy SILT. Sand is fine to coarse.   |
|                         |                           |      |         |           |              |        | (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 |   |
|                         |                           |      |         | 4.30      | 120.46       |        | End of Pit at 4.300m  |

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|                                      |  |
|--------------------------------------|--|
| <b>Stability:</b> Good.              | <b>Groundwater:</b> 3.80m: Fast flow rate. |
| <b>Plant:</b> 13t tracked excavator. |  |
| <b>Backfill:</b> Arisings.           |  |

**Remarks:** TP01 terminated at 4.30m bgl, required depth. Natural ground encountered.



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|                     |   |  |
|---------------------|---|--|
| <b>Number:</b> TP01 | <b>Project</b> Scotch Corner Landfill<br><b>Project No</b> P18175<br><b>Engineer</b> Fehily Timoney & Company |  |
|---------------------|---|--|



**Number:**

**TP01**

**Project  
Project No  
Engineer**

Scotch Corner Landfill  
P18175  
Fehily Timoney & Company



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Trial Pit No  
**TP02**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275075E - 325378N  
**Level:** 125.80m OD      **Date:** 21/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 3.20

**Client:** Monaghan County Council      **Depth:** 4.70m BGL      **Scale:** 1:25  
**Logged PH**

| Water<br>Strike &<br>Backfill | Samples & In Situ Testing |      |         | Depth<br>(m) | Level<br>(m OD) | Legend | Stratum Description   |
|-------------------------------|---------------------------|------|---------|--------------|-----------------|--------|---|
|                               | Depth (m)                 | Type | Results |              |                 |        |   |
| ▼                             |                           |      |         | 0.30         | 125.50          |        | (TOPSOIL) Brown, SILT.  |
|                               |                           |      |         |              |                 |        | (MADE GROUND) PEAT  |
|                               |                           |      |         | 2.50         | 123.30          |        | (MADE GROUND) Grey brown, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. |
|                               |                           |      |         | 3.80         | 122.00          |        | (MADE GROUND) Landfill material. Plastic, glass and cables.   |
|                               |                           |      |         | 4.70         | 121.10          |        | End of Pit at 4.700m  |

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**Stability:** Good.      **Groundwater:** 3.60m: Steady flow rate.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP02 terminated at 4.7m bgl, maximum reach of excavator.



**Number:**

**TP02**

**Project  
Project No  
Engineer**

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Number:

TP02

**Project**  
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Trial Pit No  
**TP03**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275052E - 325349N  
**Level:** 125.63m OD      **Date:** 21/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 2.50

**Client:** Monaghan County Council      **Depth:** 1.10m BGL

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description   |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|---|
|                         | Depth (m)                 | Type | Results |           |              |        |   |
| ▼                       |                           |      |         | 0.70      | 124.93       |        | Brown grey, slightly clayey slightly sandy GRAVEL with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular. Cobbles are angular to sub-angular, 63-200mm dia. |
|                         |                           |      |         | 1.10      | 124.53       |        | Blue grey, slightly clayey sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular. Cobbles are angular to sub-angular, 63-200mm dia.            |
|                         |                           |      |         |           |              |        | End of Pit at 1.100m  |

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**Stability:** Good.      **Groundwater:** 0.7m: Fast flow rate.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP03 terminated at 1.1m bgl, assumed bedrock.





**Number:**

**TP03**

**Project**  
**Project No**  
**Engineer**

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**Number:**

**TP03**

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Trial Pit No  
**TP04**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275154E - 325360N  
**Level:** 123.52m OD      **Date:** 21/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 2.90

**Client:** Monaghan County Council      **Depth:** 4.50m BGL      **Scale:** 1:25  
**Logged PH**

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description   |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|---|
|                         | Depth (m)                 | Type | Results |           |              |        |   |
|                         |                           |      |         | 0.10      | 123.42       |        | (TOPSOIL)   |
|                         |                           |      |         |           |              |        | (MADE GROUND) Grey brown, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. |
|                         |                           |      |         | 1.10      | 122.42       |        | (MADE GROUND) Landfill material. Plastic, metal, cables and glass. Strong odour noted.  |
|                         |                           |      |         |           |              |        |   |
|                         |                           |      |         | 4.30      | 119.22       |        |   |
|                         |                           |      | 4.50    | 119.02    |              |        | End of Pit at 4.500m  |

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**Stability:** Good.      **Groundwater:** 3.5m: Fast flow rate.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP04 terminated at 4.5m bgl, required depth.



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**Number:**

**TP04**

**Project  
Project No  
Engineer**

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**Number:**

**TP04**

**Project  
Project No  
Engineer**

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Trial Pit No  
**TP05**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275196E - 325344N  
**Level:** 124.60m OD      **Date:** 21/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 1.10 x 3.00

**Client:** Monaghan County Council      **Depth:** 3.10m BGL      **Scale:** 1:25  
**Logged PH**

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend                  | Stratum Description   |
|-------------------------|---------------------------|------|---------|-----------|--------------|-------------------------|---|
|                         | Depth (m)                 | Type | Results |           |              |                         |   |
| ▼                       |                           |      |         | 0.10      | 124.50       | [Cross-hatched pattern] | (MADE GROUND) Grey, sandy GRAVEL.   |
|                         |                           |      |         | 0.90      | 123.70       |                         | (MADE GROUND) Brown grey, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. |
|                         |                           |      |         | 3.10      | 121.50       |                         | (MADE GROUND) Landfill material. Cement blocks, glass, cables and plastic.  |
|                         |                           |      |         |           |              |                         | End of Pit at 3.100m  |

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**Stability:** Good.      **Groundwater:** 2.6m: Steady flow rate.  
**Plant:** 13t tracked excator.  
**Backfill:** Arisings.

**Remarks:** TP05 terminated at 3.1m bgl, boulder/ bedrock obstruction.



**Number:**

**TP05**

**Project  
Project No  
Engineer**

Scotch Corner Landfill  
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**Number:**

**TP05**

**Project**  
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Trial Pit No  
**TP06**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275092E - 325300N  
**Level:** 125.45m OD      **Date:** 20/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 1.10 x 2.90

**Client:** Monaghan County Council      **Depth:** 2.50m BGL      **Scale:** 1:25  
**Logged PH**

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend               | Stratum Description  |   |
|-------------------------|---------------------------|------|---------|-----------|--------------|----------------------|--|---|
|                         | Depth (m)                 | Type | Results |           |              |                      |  |   |
| ▼                       |                           |      |         | 0.10      | 125.35       |                      | (TOPSOIL)  |   |
|                         |                           |      |         | 1.00      | 124.45       |                      | (MADE GRUND) Blue grey, sandy GRAVEL with high cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular. Cobbles are angular to sub-angular, 63-200mm dia. Boulders are angular to sub-angular, 200-300mm dia. | 1 |
|                         |                           |      |         | 1.90      | 123.55       |                      | (MADE GRUND) Landfill material. Plastic, timber and glass.   |   |
|                         |                           |      |         | 2.10      | 123.35       |                      | Brown, SILT with roots. (Possible old Topsoil layer)   | 2 |
|                         |                           |      |         | 2.50      | 122.95       |                      | Grey, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.  | 3 |
|                         |                           |      |         |           |              | End of Pit at 2.500m | 4  |   |
|                         |                           |      |         |           |              |                      | 5  |   |

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**Stability:** Good.      **Groundwater:** 1.00m: Fast flow rate.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP06 terminated at 2.50m bgl, required depth. Natural ground encountered.



Number:

TP06

**Project**  
**Project No**  
**Engineer**

Scotch Corner Landfill  
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Number:

TP06

**Project**  
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Trial Pit No  
**TP07**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275071E - 325247N  
**Level:** 126.66m OD      **Date:** 20/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 2.50  
 1.10

**Client:** Monaghan County Council      **Depth:** 0.35m BGL      **Logged PH**

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description   |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|---|
|                         | Depth (m)                 | Type | Results |           |              |        |   |
|                         |                           |      |         | 0.10      | 126.56       |        | (MADE GROUND) Bituminous surfacing with gravel content.   |
|                         |                           |      |         | 0.30      | 126.36       |        | Brown, sandy SILT. Sand is fine to coarse.  |
|                         |                           |      |         | 0.35      | 126.31       |        | COBBLES and BOULDERS. Cobbles are angular to sub-angular, 63-200mm dia. Boulders are angular to sub-angular, 200-350mm dia. |
|                         |                           |      |         |           |              |        | End of Pit at 0.350m  |

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**Stability:** Moderate.      **Groundwater:** None encountered.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP07 terminated at 0.35m bgl, assumed bedrock obstruction.

# Photographic Record



**Number:**

**TP07**

**Project**  
**Project No**  
**Engineer**

Scotch Corner Landfill  
P18175  
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**Number:**

**TP07**

**Project  
Project No  
Engineer**

Scotch Corner Landfill  
P18175  
Fehily Timoney & Company



Priority Geotechnical Ltd.  
 Tel: 021 4631600  
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 www.prioritygeotechnical.ie

Trial Pit No  
**TP08**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275128E - 325121N  
**Level:** 123.94m OD      **Date:** 20/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 3.00

**Client:** Monaghan County Council      **Depth:** 3.00m BGL      **Scale:** 1:25  
**Logged PH**

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description  |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|--|
|                         | Depth (m)                 | Type | Results |           |              |        |  |
|                         |                           |      |         | 0.50      | 123.44       |        | (MADE GROUND) PEAT with rootlets.  |
|                         |                           |      |         |           |              |        | (MADE GROUND) Landfill material. Grey CLAY with plastic, metal, wood and wire. |
|                         | 1.50                      | ENV  |         | 2.10      | 121.84       |        | PEAT   |
|                         |                           |      |         | 3.00      | 120.94       |        | End of Pit at 3.000m   |

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**Stability:** Moderate.      **Groundwater:** 2.10m: Fast flow rate.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP08 terminated at 3.0m bgl, required depth.



Number:

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Trial Pit No  
**TP09**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275149E - 325160N  
**Level:** 124.07m OD      **Date:** 20/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 2.50

**Client:** Monaghan County Council      **Depth:** 3.00m BGL      **Scale:** 1:25  
**Logged PH**

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description   |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|---|
|                         | Depth (m)                 | Type | Results |           |              |        |   |
|                         |                           |      |         | 0.50      | 123.57       |        | (MADE GROUND) Grey, slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular to sub-rounded, 63-200mm dia. |
|                         |                           |      |         |           |              |        | (MADE GROUND) Landfill Material. CLAY with plastic, wood, metal, cables, textile and glass.   |
|                         |                           |      |         | 2.50      | 121.57       |        | Grey, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.   |
|                         |                           |      |         | 3.00      | 121.07       |        | End of Pit at 3.000m  |

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**Stability:** Moderate.      **Groundwater:** 2.10m: Fast flow rate.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP09 terminated at 3.0m bgl, required depth. Natural ground encountered.



**Number:**

**TP09**

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Trial Pit No  
**TP10**  
 Sheet 1 of 1

**Project Name:** Scotch Corner Landfill      **Project No.:** P18175      **Co-ords:** 275274E - 325135N  
**Level:** 127.40m OD      **Date:** 20/09/2018

**Location:** Castleblaney, Co. Monaghan      **Dimensions (m):** 2.70

**Client:** Monaghan County Council      **Depth:** 3.80m BGL      **Scale:** 1:25  
**Logged:** PH

| Water Strike & Backfill | Samples & In Situ Testing |      |         | Depth (m) | Level (m OD) | Legend | Stratum Description  |
|-------------------------|---------------------------|------|---------|-----------|--------------|--------|--|
|                         | Depth (m)                 | Type | Results |           |              |        |  |
|                         |                           |      |         |           |              |        | Brown, PEAT with roots and tree stumps.  |
|                         |                           |      |         | 3.30      | 124.10       |        | Grey, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. |
|                         |                           |      |         | 3.80      | 123.60       |        | End of Pit at 3.800m   |

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**Stability:** Good.      **Groundwater:** None encountered.  
**Plant:** 13t tracked excavator.  
**Backfill:** Arisings.

**Remarks:** TP10 terminated at 3.80m bgl, required depth.



**Number:**

**TP10**

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**Number:**

**TP10**

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