



**GROUND
INVESTIGATIONS
IRELAND**

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Ground Investigations Ireland

Mill Marsh Road, Co. Meath

Ground Investigation Report

DOCUMENT CONTROL SHEET

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CONTENTS

| | | |
|------|-------------------------------------|---|
| 1.0 | Preamble..... | 3 |
| 2.0 | Overview..... | 3 |
| 2.1. | Background..... | 3 |
| 2.2. | Purpose and Scope | 3 |
| 3.0 | Subsurface Exploration | 4 |
| 3.1. | General | 4 |
| 3.2. | Trial Pits..... | 4 |
| 3.3. | Soakaway Testing | 4 |
| 4.0 | Ground Conditions..... | 5 |
| 4.1. | General | 5 |
| 5.0 | Recommendations & Conclusions | 6 |
| 5.1. | General | 6 |
| 5.2. | Soakaway Design | 6 |

APPENDICES

| | |
|------------|-----------------------|
| Appendix 1 | Site Location Plan |
| Appendix 2 | Trial Pit Records |
| Appendix 3 | Soakaway Test Results |

1.0 Preamble

On the instructions of DBFL Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd. in December 2017 at the site of the proposed housing development on Mill Marsh Road, Co. Meath.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently greenfield/overgrown/occupied by industrial/commercial buildings and is situated in the centre of Monaghan Town. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 6 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a 7T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil
- Cohesive Deposits
- Granular Deposits

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m BGL.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Topsoil and were described typically as *brown mottled orange slightly gravelly sandy CLAY with occasional cobbles* overlying a *brown slightly sandy slightly gravelly CLAY with occasional cobbles*. At location SA03 the composition of the soil is slightly different and is described as *grey or grey brown slightly sandy silty CLAY*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

GRANULAR DEPOSITS: The granular deposits were encountered at the base of the cohesive deposits and in SA03 were described as *Grey brown slightly gravelly clayey fine to medium SAND*.

WEATHERED BEDROCK: In SA01 and SA02 presumed weathered rock was encountered which was digable with the large excavator to a depth of up to 0.20m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as angular gravel and cobbles of Limestone however there was some variability in the fracture spacing and the ease at which the excavator could progress.

5.0 Recommendations & Conclusions

5.1. General

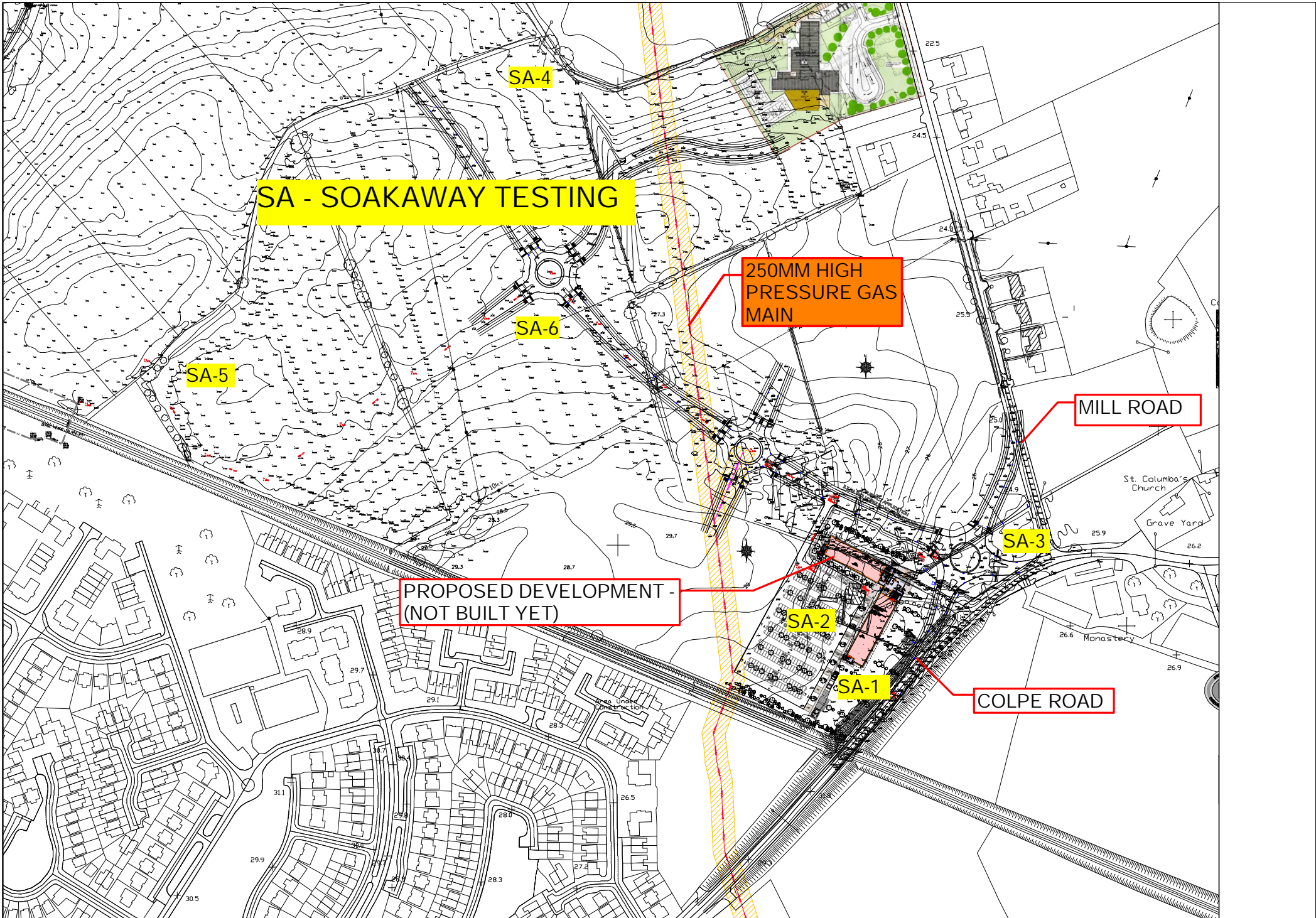
The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Soakaway Design

At the locations of SA01, SA02, SA04, SA05 and SA06 the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. At location SA03 ground water and surface water from the surrounding area filled the test pit to 0.5m BGL in a short period of time (40 minutes). These locations are therefore not recommended as suitable for soakaway design and construction.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



SA - SOAKAWAY TESTING

SA-4

250MM HIGH
PRESSURE GAS
MAIN

SA-6

MILL ROAD

SA-5

PROPOSED DEVELOPMENT -
(NOT BUILT YET)

St. Columba's
Church
Grave Yard

SA-3

SA-2

COLPE ROAD

SA-1

Monastery

APPENDIX 2 – Trial Pit Records



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Site
Mill Marsh Road, Co. Meath

Trial Pit Number
SA01

| | | | | |
|--|---|----------------------------|--|---------------------------------|
| Machine : 7T JCB Method : Trial Pit | Dimensions L X W 1.9m X 0.5m | Ground Level (mOD) | Client DBFL | Job Number 7353-01-18 |
| | Location 312397.4 E 274283.4 N | Dates 09/01/2018 | Project Contractor Ground Investigations Ireland | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 0.50-0.80 | B | | | | (0.30) | Dark brown sandy slightly gravelly TOPSOIL | | |
| | | | | | 0.30 | Firm brown mottled orange slightly gravelly sandy CLAY with occasional sub rounded cobbles | | |
| | | | | | (0.50) | | | |
| | | | | | 0.80 (0.20) | Presumed ROCK or Boulder recovered as angular gravel and cobble sized fragments | | |
| | | | | | 1.00 | Complete at 1.00m | | |

| | | | |
|---|--|--------------------------------------|------------------------|
| Plan . | Remarks Slight seepage of groundwater encountered at 1.0m BGL Trial Pit Stable Trial Pit backfilled on completion | | |
| | <table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By GK</td> <td>Figure No. 7353-01-18.SA03</td> </tr> </table> | Scale (approx) 1:25 | Logged By GK |
| Scale (approx) 1:25 | Logged By GK | Figure No. 7353-01-18.SA03 | |



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Site
Mill Marsh Road, Co. Meath

Trial Pit Number
SA02

| | | | | |
|--|---|----------------------------|--|---------------------------------|
| Machine : 7T JCB Method : Trial Pit | Dimensions L X W 1.6m X 0.5m | Ground Level (mOD) | Client DBFL | Job Number 7353-01-18 |
| | Location 312372 E 274336 N | Dates 09/01/2018 | Project Contractor Ground Investigations Ireland | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 1.00 | B | | | | 0.22 | Dark brown sandy slightly gravelly TOPSOIL | | |
| | | | | | 0.88 | Firm brown slightly gravelly sandy CLAY with occasional sub rounded cobbles | | |
| | | | | | 1.10 | Firm to stiff brown mottled grey sandy gravelly CLAY with occasional sub rounded cobbles and rare boulders | | |
| | | | | | 1.85 1.90 | Presumed ROCK or Boulder | | |
| | | | | | | Complete at 1.90m | | |

| | | | |
|---|--|--------------------------------------|------------------------|
| Plan . | Remarks Slight seepage of groundwater encountered at 1.9m BGL Trial Pit Stable Trial Pit backfilled on completion | | |
| | <table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By GK</td> <td>Figure No. 7353-01-18.SA03</td> </tr> </table> | Scale (approx) 1:25 | Logged By GK |
| Scale (approx) 1:25 | Logged By GK | Figure No. 7353-01-18.SA03 | |



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Site
Mill Marsh Road, Co. Meath
Trial Pit Number
SA03

| | | | | |
|--|--|----------------------------|--|---------------------------------|
| Machine : 7T JCB Method : Trial Pit | Dimensions L X W 1.9m X 0.45m | Ground Level (mOD) | Client DBFL | Job Number 7353-01-18 |
| | Location 312545.3 E 274404.3 N | Dates 09/01/2018 | Project Contractor Ground Investigations Ireland | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 1.00-1.30 | B | | | | (0.25) | Dark brown sandy slightly gravelly TOPSOIL | | |
| | | | | | 0.25 | Soft to firm dark brown slightly sandy slightly gravelly CLAY | | |
| | | | | | (0.35) | | | |
| | | | | | 0.60 | Firm grey brown slightly sandy silty CLAY | | |
| | | | | | (0.30) | | | |
| | | | | | 0.90 | Firm grey slightly sandy CLAY with occasional very clayey sand lenses | | |
| | | | | | 1.30 | Brown slightly gravelly clayey fine to medium SAND with some clay lenses | | |
| | | | | | (0.70) | | | |
| | | | | | 2.00 | Complete at 2.00m | | |

| | |
|-------------|---|
| Plan | Remarks |
| . | Trial Pit filled with water to 0.4m BGL in 40 minutes |
| . | Trial pit becomes unstable after 1.3m BGL |
| . | Trial Pit backfilled on completion |
| . | |
| . | |
| . | |
| . | |
| . | |
| . | |
| | Scale (approx) 1:25 |
| | Logged By GK |
| | Figure No. 7353-01-18.SA03 |



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Site
Mill Marsh Road, Co. Meath

Trial Pit Number
SA04

| | | | | |
|--|--|----------------------------|--|---------------------------------|
| Machine : 7T JCB Method : Trial Pit | Dimensions L X W 1.8m X 0.47m | Ground Level (mOD) | Client DBFL | Job Number 7353-01-18 |
| | Location 312122.3 E 274830 N | Dates 09/01/2018 | Project Contractor Ground Investigations Ireland | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 1.00-1.50 | B | | | | 0.22 | Dark brown sandy slightly gravelly TOPSOIL | | |
| | | | | | 0.88 | Firm orange mottled brown slightly gravelly sandy CLAY with occasional clayey sandy gravelly lenses | | |
| | | | | | 1.10 | Firm to stiff brown mottled grey sandy gravelly CLAY with occasional sub rounded cobbles and rare boulders | | |
| | | | | | 1.80 | Complete at 1.80m | | |

| | | | |
|---|--|--------------------------------------|------------------------|
| Plan . | Remarks Slight seepage of groundwater encountered at 1.8m BGL Trial Pit Stable Trial Pit backfilled on completion | | |
| | <table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By GK</td> <td>Figure No. 7353-01-18.SA03</td> </tr> </table> | Scale (approx) 1:25 | Logged By GK |
| Scale (approx) 1:25 | Logged By GK | Figure No. 7353-01-18.SA03 | |



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Site
Mill Marsh Road, Co. Meath

Trial Pit Number
SA05

Machine : 7T JCB
Method : Trial Pit

Dimensions
L X W
1.7m X 0.5m

Ground Level (mOD)

Client
DBFL

Job Number
7353-01-18

Location
311836.8 E 274541.6 N

Dates
09/01/2018

Project Contractor
Ground Investigations Ireland

Sheet
1/1

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 1.00-1.30 | B | | | | (0.20) | Dark brown sandy slightly gravelly TOPSOIL | | |
| | | | | | 0.20 | Firm orange mottled brown slightly gravelly sandy CLAY with occasional sub rounded cobbles | | |
| | | | | | (0.50) | | | |
| | | | | | 0.70 | Soft to firm brown slightly sandy silty CLAY | | |
| | | | | (0.40) | 1.10 | Firm to stiff brown sandy gravelly CLAY with occasional sub rounded cobbles | | |
| | | | | (0.50) | 1.60 | Complete at 1.60m | | |

Plan

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |

Remarks

Slight seepage of groundwater encountered at 1.6m BGL
Trial Pit Stable
Trial Pit backfilled on completion

| | | |
|-------------------------------|------------------------|--------------------------------------|
| Scale (approx) 1:25 | Logged By GK | Figure No. 7353-01-18.SA03 |
|-------------------------------|------------------------|--------------------------------------|



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Site
Mill Marsh Road, Co. Meath

Trial Pit Number
SA06

Machine : 7T JCB
Method : Trial Pit

Dimensions
L X W
2.0m X 0.5m

Ground Level (mOD)

Client
DBFL

Job Number
7353-01-18

Location
312131.5 E 274595.7 N

Dates
09/01/2018

Project Contractor
Ground Investigations Ireland

Sheet
1/1

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| | | | | | (0.20) | Dark brown sandy slightly gravelly TOPSOIL | | |
| | | | | | 0.20 | Firm brown slightly gravelly sandy CLAY with occasional sub rounded cobbles | | |
| | | | | | (1.10) | | | |
| | | | | | 1.30 | Firm to stiff brown slightly gravelly sandy CLAY with occasional sub rounded to sub angular cobbles and boulders | | |
| | | | | | (0.90) | | | |
| | | | | | 2.20 | Complete at 2.20m | | |

Plan

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . |

Remarks

Slight seepage of groundwater encountered at 2.0m BGL
Trial Pit Stable
Trial Pit backfilled on completion

| | | |
|-------------------------------|------------------------|--------------------------------------|
| Scale (approx) 1:25 | Logged By GK | Figure No. 7353-01-18.SA03 |
|-------------------------------|------------------------|--------------------------------------|

Mill Marsh Road – Soakaway Pit Photographs

SA01





SA02





SA03





SA04





SA05





SA06





APPENDIX 3 – Soakaway Test Results

SA01

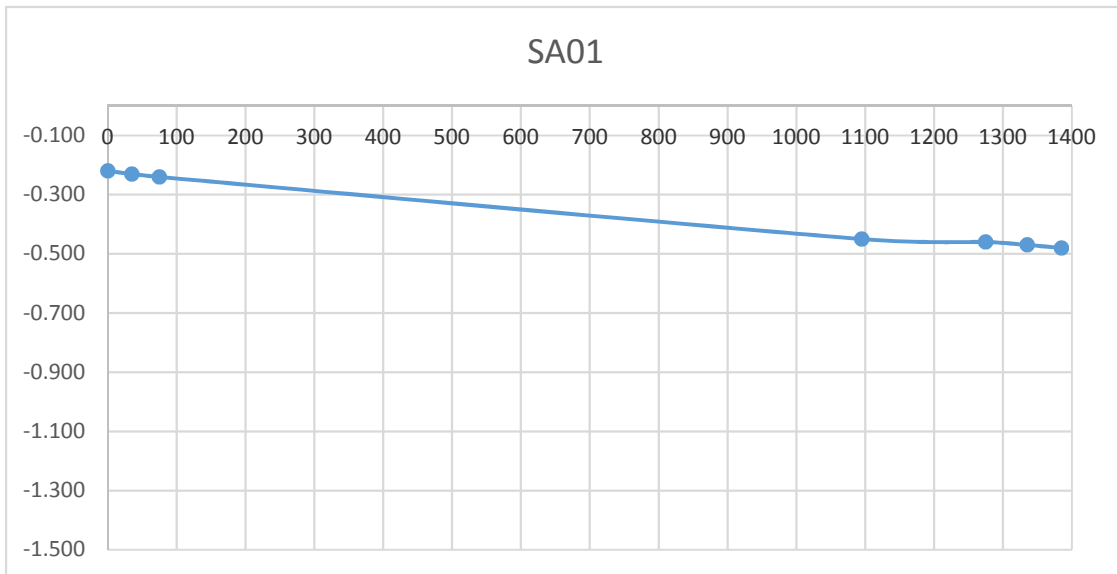
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.9m x 0.50m 1.0m (L x W x D)

| Date | Time | Water level (m bgl) |
|------------|------|------------------------|
| 09/01/2018 | 0 | -0.220 |
| 09/01/2018 | 35 | -0.230 |
| 10/01/2018 | 75 | -0.240 |
| 10/01/2018 | 1095 | -0.450 |
| 10/01/2018 | 1275 | -0.460 |
| 10/01/2018 | 1335 | -0.470 |
| 10/01/2018 | 1385 | -0.480 |

***Soakaway failed - Pit backfilled**

| Start depth | Depth of Pit | Diff | 75% full | 25%full |
|-------------|--------------|-------|----------|---------|
| 0.22 | 1.900 | 1.680 | 0.64 | 1.48 |



SA02

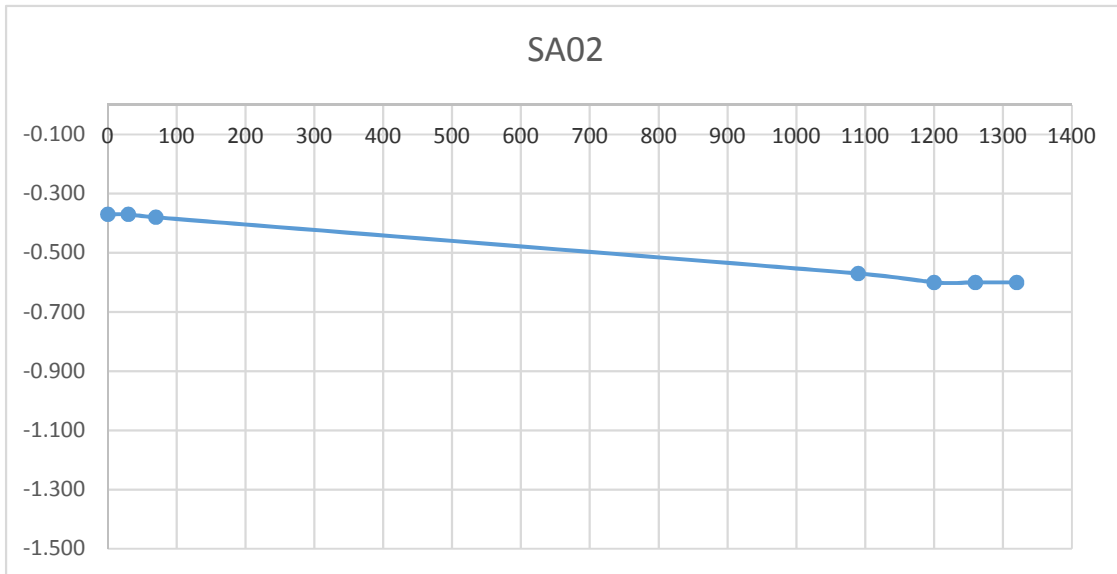
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.6m x 0.40m 1.9m (L x W x D)

| Date | Time | Water level (m bgl) |
|------------|------|------------------------|
| 09/01/2018 | 0 | -0.370 |
| 09/01/2018 | 30 | -0.370 |
| 10/01/2018 | 70 | -0.380 |
| 10/01/2018 | 1090 | -0.570 |
| 10/01/2018 | 1200 | -0.600 |
| 10/01/2018 | 1260 | -0.600 |
| 10/01/2018 | 1320 | -0.600 |
| 10/01/2018 | 1380 | -0.600 |

***Soakaway failed - Pit backfilled**

| Start depth | Depth of Pit | Diff | 75% full | 25%full |
|-------------|--------------|-------|----------|---------|
| 0.37 | 1.900 | 1.530 | 0.7525 | 1.5175 |



SA03

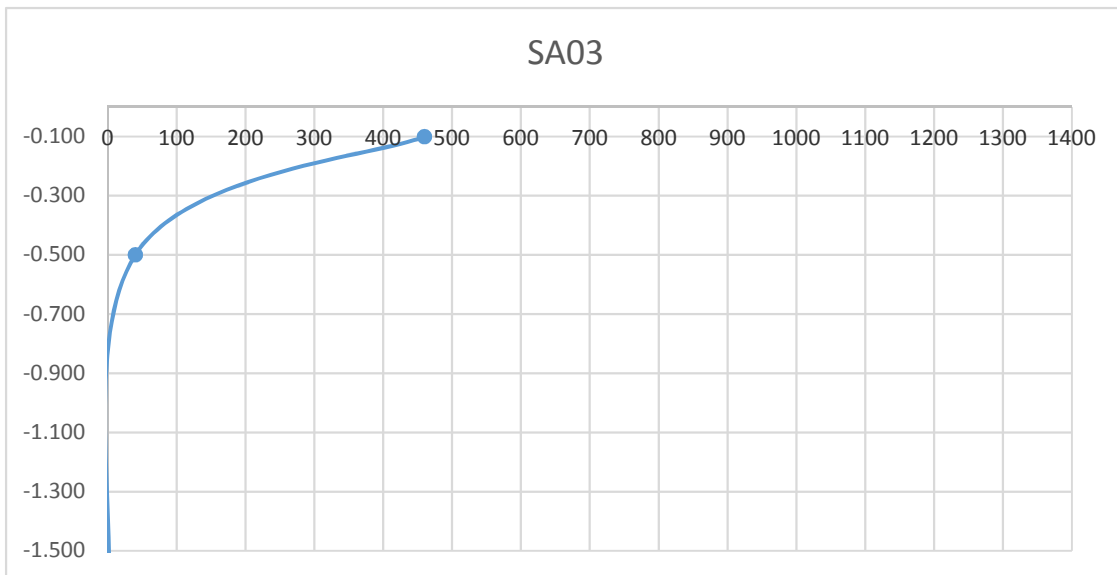
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.9m x 0.45m x 2.0m (L x W x D)

| Date | Time | Water level (m bgl) |
|------------|------|------------------------|
| 09/01/2018 | 0 | -1.800 |
| 09/01/2018 | 40 | -0.500 |
| 09/01/2018 | 460 | -0.100 |

| Start depth | Depth of Pit | Diff | 75% full | 25%full |
|-------------|--------------|-------|----------|---------|
| 1.80 | 1.900 | 0.100 | 1.825 | 1.875 |

***Soakaway failed - Pit backfilled**



Groundwater filled Trial pit over time



SA04

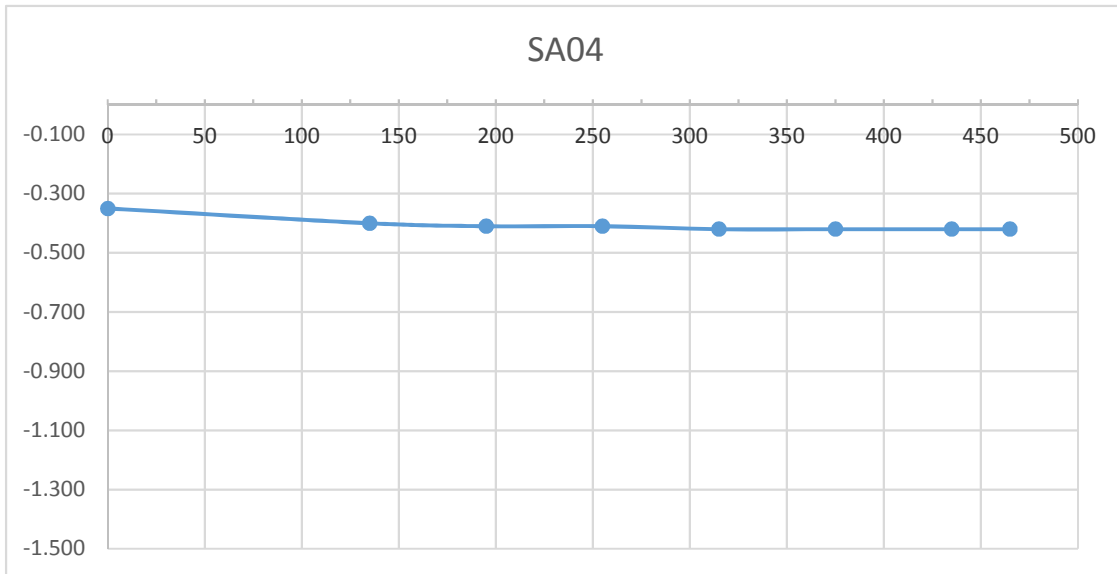
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.9m x 0.50m 1.0m (L x W x D)

| Date | Time | Water level (m bgl) |
|------------|------|------------------------|
| 10/01/2018 | 0 | -0.350 |
| 10/01/2018 | 135 | -0.400 |
| 10/01/2018 | 195 | -0.410 |
| 10/01/2018 | 255 | -0.410 |
| 10/01/2018 | 315 | -0.420 |
| 10/01/2018 | 375 | -0.420 |
| 10/01/2018 | 435 | -0.420 |
| 10/01/2018 | 465 | -0.420 |

***Soakaway failed - Pit backfilled**

| Start depth | Depth of Pit | Diff | 75% full | 25%full |
|-------------|--------------|-------|----------|---------|
| 0.22 | 1.900 | 1.680 | 0.64 | 1.48 |



SA05

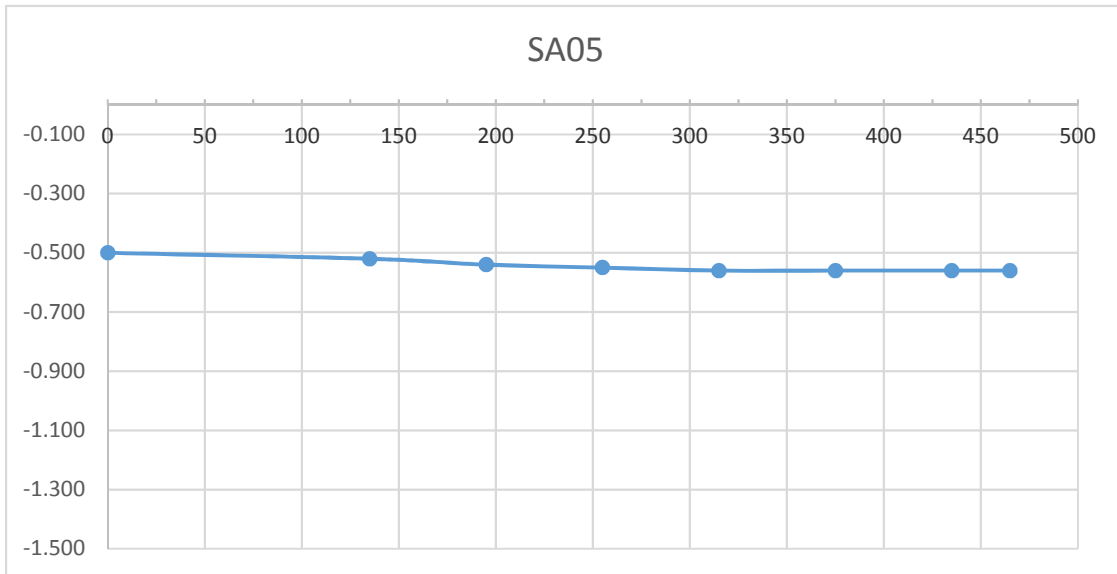
Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 1.6m x 0.50m 1.6m (L x W x D)

| Date | Time | Water level (m bgl) |
|------------|------|------------------------|
| 10/01/2018 | 0 | -0.500 |
| 10/01/2018 | 135 | -0.520 |
| 10/01/2018 | 195 | -0.540 |
| 10/01/2018 | 255 | -0.550 |
| 10/01/2018 | 315 | -0.560 |
| 10/01/2018 | 375 | -0.560 |
| 10/01/2018 | 435 | -0.560 |
| 10/01/2018 | 465 | -0.560 |

***Soakaway failed - Pit backfilled**

| Start depth | Depth of Pit | Diff | 75% full | 25%full |
|-------------|--------------|-------|----------|---------|
| 0.50 | 1.600 | 1.100 | 0.775 | 1.325 |



SA06

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.0m x 0.50m 2.2m (L x W x D)

| Date | Time | Water level (m bgl) |
|------------|------|------------------------|
| 10/01/2018 | 0 | -0.700 |
| 10/01/2018 | 130 | -0.720 |
| 10/01/2018 | 190 | -0.740 |
| 10/01/2018 | 250 | -0.760 |
| 10/01/2018 | 310 | -0.780 |
| 10/01/2018 | 370 | -0.790 |
| 10/01/2018 | 430 | -0.800 |
| 10/01/2018 | 490 | -0.800 |

***Soakaway failed - Pit backfilled**

| Start depth | Depth of Pit | Diff | 75% full | 25%full |
|-------------|--------------|-------|----------|---------|
| 0.30 | 2.200 | 1.900 | 0.775 | 1.725 |

