Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists



# 100 and 111 Cyfyng Road, Pantteg

# Ground Investigation Report

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Earth Science Partnership
Consulting Engineers | Geologists | Environmental Scientists
33 Cardiff Road, Taff's Well, CARDIFF, CF15 7RB ☎ 029 2081 3385
enquiries@earthsciencepartnership.com www.earthsciencepartnership.com

# 100 and 111 Cyfyng Road, Pantteg
# Ground Investigation Report

Prepared for:
Neath Port Talbot County Borough Council , Environment, The Quays, Baglan Energy Park, Brunel Way, Briton Ferry, SA11 2GG



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| Revision | Status | Date | Written by | Checked by | Approved by |
|---|---|---|---|---|---|
| 00 | Draft | January 2018 | A Wilding BSc (Hons) MSc FGS | M T Elcock BEng (Hons) FGS | M Eynon BSc MSc CGeol EurGeol FGS Registered Ground Engineering Specialist |
| | | **Signature:** | A. Wilding | | M Eynon |
| **Notes:** | 1. The status of this report is not final and is issued for comment only; as such, it is subject to change therefore it should not be relied up on. For a checked and authorised version please contact the Earth Science Partnership. | | | | |

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# Contents



# Figures

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# 1 Introduction

## 1.1 Background

The Earth Science Partnership Ltd (ESP) have been instructed by Neath Port Talbot County Borough Council (NPTCBC) to undertake Ground Investigations in the gardens behind the properties of 100 and 111 Cyfyng Road, Pantteg. The scope of this investigation has been designed by ESP and has been undertaken in general accordance with the ESP's email proposal dated 20th November 2017.

This report presents the findings of exploratory works within the areas outlined agreed between ESP and NPTCBC.

## 1.2 Objective and scope of works

The objective of the investigation is to provide detail of the ground conditions by handheld window sampling, mackintosh probe testing and the installation of groundwater monitoring wells.

The findings of this investigation will be incorporated into the wider hazard and risk assessment currently being undertaken by the ESP across Pantteg.

# 2 Site Description

## 2.1 The Site

The site comprises the gardens extending south-east from houses 100 and 111 Cyfyng Road. An Investigation Point Plan is shown in Figure 1.

The sites comprise steeply sloped residential gardens consisting of paved areas, grass and flower beds. The area immediately south-east of the investigation area is heavily vegetated and very steeply sloping, access to these areas was not possible due to safety concerns.

## 2.2 Site Geology

The published 1:10560 scale geological map for the area (SN70NE) indicates the site to be underlain bedrock of the Middle Coal Measures Formation comprising siltstone, mudstone, sandstone and coal. Coal crops out upslope and downslope of the site, and bedrock in the area generally dips to around 10° to the south.

# 3 Fieldwork

## 3.1 Boreholes

Eight window sampling boreholes have been constructed to a maximum depth of 2.8m on the 24th and 25th of November, 2017. The window sample records are presented in Appendix A.

At the commencement of the borehole, a service inspection pit was excavated by hand to a depth of 1.2m, with a hydraulic breaker utilised in areas of hard standing.

Handheld window sampling was then advanced from 1.2m, with cores of the material recovered in plastic liners, until refusal of the sampling equipment.

## 3.2 Mackintosh Probe

A mackintosh probe was advanced from the surface, until refusal, adjacent to each borehole position to measure the relative density of the ground encountered. The results of the mackintosh probe holes are presented in Appendix B.

## 3.3 Installations

Upon completion of the boreholes, 5no. 50mm standpipes for groundwater monitoring have been installed as detailed in Table 1 below. To date one monitoring visit has been undertaken, with repeat readings to be carried out in due course.



*Table 1 - Groundwater monitoring well installations*

| Well ID | Installation Type | Date of Installation | Response Zone depth | Response Zone Stratum | Rationale |
|---|---|---|---|---|---|
| WS501 | 50mm standpipe | 23/11/2017 | 0.5 – 2.6m | Made ground and Grade E Weathered Coal Measures | 2 |
| WS504 | 50mm standpipe | 23/11/2017 | 0.5 – 2.7m | Made ground, Colluvium, Grade E Weathered Coal Measures | 2 |
| WS505 | 50mm standpipe | 24/11/2017 | 0.5 – 2.6m | Made Ground and Colluvium | 2 |
| WS507 | 50mm standpipe | 24/11/2017 | 0.5 – 2.5m | Made ground and Grade E Weathered Coal Measures | 2 |
| WS508 | 50mm standpipe | 24/11/2017 | 0.5 – 2.5m | Made Ground and Grade E Weathered Coal Measures | 2 |

**Notes**
1. Details of each monitoring well are presented on the individual borehole records (Appendix A).
2. Well installed in shallow soils.

## 3.4 Geotechnical Testing

Geotechnical laboratory testing was undertaken on samples from the exploratory holes to obtain information on the geotechnical properties on the soils beneath the site.

The following tests were undertaken by a UKAS accredited laboratory on samples selected by ESP in accordance with the methodologies presented in BS1377:1990. The results are presented in Appendix C.

- Natural moisture content.
- Atterberg limits.
- Particle size analysis.
- Immediate shear box testing (Peak shear strength)
- Consolidated drained shear strength (Peak and residual shear strength)

# 4 Ground Conditions

## 4.1 Geology

The borehole constructed has identified the site to generally be underlain by Made Ground, over colluvium and grade E weathered south wales coal measures formation. A summary of the ground conditions encountered is outlined below.

### 4.1.1 Made Ground

Encountered in all window sample boreholes from ground level to a maximum depth of 1.9m as either; very loose black slightly clayey gravel with occasional rootlets and wood fragments, gravel is fine to coarse angular mudstone; loose brown very clayey gravelly sand with rootlets and possible orange slag fragments, gravel is angular fine to coarse sandy siltstone and coal; soft orange mottled black gravelly sandy clay with occasional brick and wood fragments, gravel is fine to coarse angular sandy siltstone and coal.

### 4.1.2 Colluvium

Encountered below the Made Ground in WS502 to WS506 to a maximum depth of 2.60m as a soft orange mottled grey and black very gravelly to gravelly clay. The gravel is fine to coarse subangular sandy siltstone and siltstone.

### 4.1.3 Weathered South Wales Middle Coal Measures Formation Bedrock

Encountered to the base of all boreholes, except WS505, as a loose to medium dense clayey sandy gravel of angular fine to coarse siltstone.



## 4.2 Hydrogeology

Groundwater was not encountered during construction of the boreholes.

Details of the groundwater monitoring undertaken to date is presented in Table 2 below.

*Table 2 - Groundwater Monitoring Results*

| Date | | WS501 | WS504 | WS505 | WS506 | WS508 |
|---|---|---|---|---|---|---|
| 07/12/2017 | Depth of water (m) | Dry | Dry | 1.86 | Dry | Dry |
| | Base of standpipe | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |

# 5 References

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

BRITISH STANDARDS INSTITUTION (BSI). 1990. Methods of Test for Soils for Civil Engineering Purposes. BS1377, Parts 1 to 9, HMSO, London.

Eurocode 7. BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules. British Standards Institution.

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

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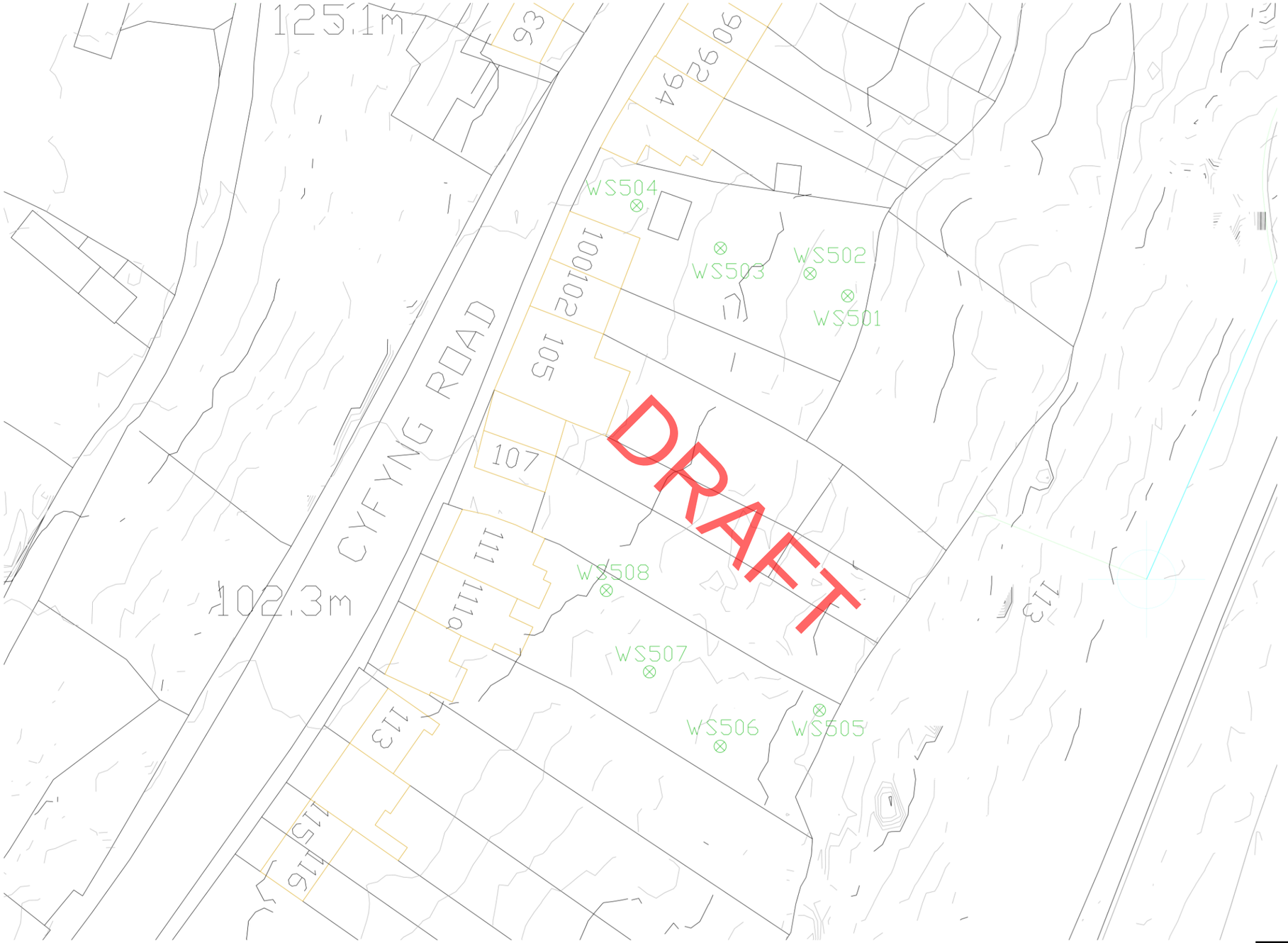
Figure 1 – Investigation Point Plan




esp
ENGINEERS
GEOLOGISTS
SCIENTISTS

**Notes:**

⊗ Window Sampling Investigation Point

**Notes**

Contours from LiDAR data (ESP, 2017) at 2m intervals.

OS base map provided by the client.

**PROJECT:**
**100 & 111 CYFYNG ROAD, PANTTEG LANDSLIP**

**Scale: 1:500 at A3 (Approx.)**

**FIGURE 1: INVESTIGATION POINT PLAN**

**EARTH SCIENCE PARTNERSHIP**
33 Cardiff Road, Taffs Well,
Cardiff CF15 7RB Tel: 029 2081 3385
enquiries@earthsciencepartnership.com

# Appendix A Window Sampler Records

# Earth Science Partnership

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| | | | |
|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | | **WS501** |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | | | |
| **Project No:** 5859e.08 | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Start date:** | 23-11-2017 | **Driller:** | GSTL | **Ground Level:** | 96.00 mOD |
| **End date:** | 23-11-2017 | **Logged by:** | ESP-AW | **Easting:** | 276290 m |
| **Backfill date:** | 23-11-2017 | **Date logged:** | 23-11-2017 | **Northing:** | 208251 m |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.30 | D | | | | | | | Very loose dark brown organic very gravelly silty clayey SAND with roots and rootlets. (MADE GROUND) | | | (0.60) | | |
| | | | | | | | | | | | 0.60 | 95.40 | |
| 0.80 | D | | | | | | | Very soft, becoming firm at 1.5m, orange slightly gravelly slightly sandy CLAY with rootlets and wood fragments. Gravel is fine to coarse angular sandy siltstone and coal. (MADE GROUND - Possible reworked natural) | | | | | |
| 1.00 | D | | | | | | | | | | 1 | | |
| | | | | | | | | | | | (1.20) | | |
| 1.50 | D | | | | | | | | | | | | |
| 1.70 | D | | | | | | | | | | | | |
| | | | | | | | | Loose to medium dense orange brown clayey silty sandy GRAVEL. Gravel is partially weathered fine to coarse angular sandy siltstone. (GRADE E SOUTH WALES MIDDLE COAL MEASURES FORMATION) | | | 1.80 | 94.20 | |
| | | | | | | | | | | | 2 | | |
| | | | | | | | | | | | (0.80) | | |
| 2.60 | D | | | | | | | End of Borehole at 2.600m | | | 2.60 | 93.40 | |
| | | | | | | | | | | | 3 | | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.6m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Groundwater well installed with a response zone between 0.5 to 2.6m.

# Earth Science Partnership

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|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | **WS502** | |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | **Ground Level:** 98.00 mOD | | |
| **Project No:** 5859e.08 | **Easting:** 276288 m | | |
| **Start date:** 23-11-2017 | **Driller:** GSTL | **Northing:** 208255 m | |
| **End date:** 23-11-2017 | **Logged by:** ESP-AW | | |
| **Backfill date:** 23-11-2017 | **Date logged:** 23-11-2017 | | |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Strata Details Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.20 | D | | | | | | | Grass surface over very loose dark brown organic clayey gravelly SAND with roots and rootlets. (MADE GROUND) | | | (0.50) | | |
| | | | | | | | | | | | 0.50 | 97.50 | |
| 0.70 | D | | | | | | | Soft orange mottled black slightly gravelly slightly sandy CLAY with rootlets and occasional brick and wood fragments. Gravel is fine to coarse angular sandy siltstone and coal. (MADE GROUND - Possible reworked natural) | | | | | |
| 1.00 | D | | | | | | | | | | 1 | | |
| | | | | | | | | | | | (1.20) | | |
| 1.40 | D | | | | | | | | | | | | |
| 1.70 | D | | | | | | | Soft to firm orange mottled grey very gravelly CLAY. Gravel is fine to coarse angular sandy siltstone. (Possible COLLUVIUM) | | | 1.70 | 96.30 | |
| 2.00 | D | | | | | | | | | | (0.50) | | |
| | | | | | | | | | | | 2 | | |
| | | | | | | | | Loose orange mottled grey and brown clayey GRAVEL. Gravel is tabular angular fine to coarse siltstone. (GRADE E SOUTH WALES MIDDLE COAL MEASURES FORMATION) | | | 2.20 | 95.80 | |
| | | | | | | | | | | | (0.60) | | |
| | | | | | | | | End of Borehole at 2.800m | | | 2.80 | 95.20 | |
| | | | | | | | | | | | 3 | | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.8m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Borehole backfilled with arisings on completion.

# Earth Science Partnership

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|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | **WS503** | |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | **Ground Level:** 100.00 mOD | | |
| **Project No:** 5859e.08 | **Easting:** 276278 m | | |
| **Start date:** 23-11-2017 | **Driller:** GSTL | **Northing:** 208256 m | |
| **End date:** 23-11-2017 | **Logged by:** ESP-AW | | |
| **Backfill date:** 23-11-2017 | **Date logged:** 23-11-2017 | | |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Paved surface with a sand subbase. (MADE GROUD) | | | (0.20) | 0.20 99.80 | |
| 0.40 | D | | | | | | | Loose brown silty clayey very sandy GRAVEL with rootlets and occasional orange slag fragments. Gravel is fine to coarse angular sandy siltstone and coal. (MADE GROUND) | | | (0.80) | | |
| 0.90 | D | | | | | | | | | | | 1.00 99.00 | |
| 1.10 | D | | | | | | | Very loose orange slightly silty slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (Possible COLLUVIUM) | | | (0.60) | | |
| 1.40 | D | | | | | | | | | | | 1.60 98.40 | |
| 1.70 | D | | | | | | | Loose becoming medium dense orange mottled grey very gravelly clayey silty SAND. Gravel is angular fine to coarse siltstone with some fine to medium angular coal. (Possible COLLUVIUM) | | | | | |
| 2.00 | D | | | | | | | | | | (1.00) | 2 | |
| 2.40 | D | | | | | | | | | | | | |
| | | | | | | | | End of Borehole at 2.600m | | | | 2.60 97.40 | |
| | | | | | | | | | | | | 3 | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.6m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Borehole backfilled with arisings on completion.

# Earth Science Partnership

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|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | | **WS504** |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | | | |
| **Project No:** 5859e.08 | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Start date:** | 23-11-2017 | **Driller:** | GSTL | **Ground Level:** | 103.00 mOD |
| **End date:** | 23-11-2017 | **Logged by:** | ESP-AW | **Easting:** | 276269 m |
| **Backfill date:** | 23-11-2017 | **Date logged:** | 23-11-2017 | **Northing:** | 208261 m |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.20 | D | | | | | | | Grass surface over very loose black slightly clayey gravelly SAND with a low angular tabular mudstone cobble content. Occasional rootlets and wood fragments. Gravel is fine to coarse angular mudstone. (MADE GROUND) | | | (0.40) | | |
| | | | | | | | | | | | 0.40 | 102.60 | |
| | | | | | | | | Very loose brown very clayey sandy GRAVEL with occasional orange slag fragments. Gravel is partially weathered fine to coarse angular siltstone and mudstone. (MADE GROUND) | | | (0.60) | | |
| 0.80 | D | | | | | | | | | | | | |
| | | | | | | | | | | | 1.00 | 102.00 | |
| 1.10 | D | | | | | | | Soft to firm becoming stiff very gravelly CLAY. Gravel is fine to coarse subangular to angular mudstone. (Possible COLLUVIUM) | | | | | |
| 1.40 | D | | | | | | | | | | (1.00) | | |
| 2.00 | D | | | | | | | Loose brown mottled grey very clayey GRAVEL. Gravel is fine to coarse angular mudstone. (GRADE E SOUTH WALES MIDDLE COAL MEASURES) | | | 2.00 | 101.00 | |
| 2.30 | D | | | | | | | | | | (0.70) | | |
| | | | | | | | | End of Borehole at 2.700m | | | 2.70 | 100.30 | |
| | | | | | | | | | | | 3 | | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.7m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Groundwater monitoring well installed with a response zone between 0.5 to 2.7m.

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| | | | |
|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | **WS505** | |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | **Ground Level:** 88.00 mOD | | |
| **Project No:** 5859e.08 | **Easting:** 276288 m | | |
| **Start date:** 24-11-2017 | **Driller:** GSTL | **Northing:** 208210 m | |
| **End date:** 24-11-2017 | **Logged by:** ESP-AW | | |
| **Backfill date:** 24-11-2017 | **Date logged:** 24-11-2017 | | |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Strata Details Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.40 | D | | | | | | | Very loose black organic slightly clayey gravelly SAND with rootlets, occasional brick, ceramic, wood and glass fragments. Rare tin cans present. Gravel is fine to coarse angular coal and siltstone. (MADE GROUND) | | | (1.10) | | |
| 0.70 | D | | | | | | | | | | 1 | | |
| 1.20 | D | | | | | | | | | | 1.10 | 86.90 | |
| 1.50 | D | | | | | | | Soft becoming stiff orange mottled grey and brown very gravelly CLAY. Gravel is fine to coarse subangular to angular siltstone. (Possible COLLUVIUM) | | | (1.50) | | |
| 2.00 | D | | | | | | | | | | 2 | | |
| 2.40 | D | | | | | | | | | | | | |
| | | | | | | | | End of Borehole at 2.600m | | | 2.60 | 85.40 | |
| | | | | | | | | | | | 3 | | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.6m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Groundwater monitoring well installed with a response zone between 0.5 to 2.6m.

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| | | | |
|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | **WS506** | |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | **Ground Level:** 92.00 mOD | | |
| **Project No:** 5859e.08 | **Easting:** 276278 m | | |
| **Start date:** 24-11-2017 | **Driller:** GSTL | **Northing:** 208205 m | |
| **End date:** 24-11-2017 | **Logged by:** ESP-AW | | |
| **Backfill date:** 24-11-2017 | **Date logged:** 24-11-2017 | | |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Strata Details Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.30 | D | | | | | | | Very loose organic slightly gravelly sandy CLAY with roots and rootlets. Rare glass fragments. (MADE GROUND) | | | (0.50) | | |
| | | | | | | | | | | | 0.50 | 91.50 | |
| 0.80 | D | | | | | | | Very soft becoming soft orange brown clayey silty slightly sandy GRAVEL. Gravel is subangular fine to coarse siltstone. (Possible COLLUVIUM) | | | (1.00) | | |
| 1.20 | D | | | | | | | | | | | | |
| 1.40 | D | | | | | | | | | | | | |
| | | | | | | | | Loose becoming medium dense orange and brown mottled grey clayey silty slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (GRADE E SOUTH WALES MIDDLE COAL MEASURES) | | | 1.50 | 90.50 | |
| 2.00 | D | | | | | | | | | | (1.00) | | |
| 2.40 | D | | | | | | | | | | | | |
| | | | | | | | | End of Borehole at 2.500m | | | 2.50 | 89.50 | |
| | | | | | | | | | | | 3 | | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.5m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Borehole backfilled with arising on completion.

# Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

| | | | |
|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | | **WS507** |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | | | |
| **Project No:** 5859e.08 | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Start date:** | 24-11-2017 | **Driller:** | GSTL | **Ground Level:** | 94.00 mOD |
| **End date:** | 24-11-2017 | **Logged by:** | ESP-AW | **Easting:** | 276270 m |
| **Backfill date:** | 24-11-2017 | **Date logged:** | 24-11-2017 | **Northing:** | 208213 m |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.30 | D | | | | | | | Very loose organic slightly clayey gravelly SAND with roots and rootlets. Rare glass fragments. (MADE GROUND) | | | (0.60) | | |
| 0.70 | D | | | | | | | Very loose becoming loose orange mottled grey and black clayey sandy GRAVEL. Gravel is fine to coarse angular siltstone and sandy siltstone. (GRADE E SOUTH WALES MIDDLE COAL MEASURES) | | | 0.60 | 93.40 | |
| 1.10 | D | | | | | | | | | | 1 | | |
| 1.20 - 2.20 | B | | | | | | | | | | (1.90) | | |
| | | | | | | | | | | | 2 | | |
| | | | | | | | | End of Borehole at 2.500m | | | 2.50 | 91.50 | |
| | | | | | | | | | | | 3 | | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.5m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Groundwater monitoring well installed with a response zone between 0.5 to 2.5m.

# Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

| | | | |
|---|---|---|---|
| **Project Name:** 100 and 111 Cyfyng Road | **Drilling method** Handheld Window Sampler | **WS508** | |
| **Site Location:** Cyfyng Road, Pantteg | **Equipment** Handheld Window Sampler | | |
| **Client:** NPTCBC | **Ground Level:** 96.00 mOD | | |
| **Project No:** 5859e.08 | **Easting:** 276266 m | | |
| **Start date:** 24-11-2017 | **Driller:** GSTL | **Northing:** 208221 m | |
| **End date:** 24-11-2017 | **Logged by:** ESP-AW | | |
| **Backfill date:** 24-11-2017 | **Date logged:** 24-11-2017 | | |

| Depth | Sample Type | Sample Class | Test Details Type | Test Details Result | TCR (%) | Water Depth | Casing Depth | Strata Details Description | Strata Details Legend | Water Strikes/ Standing | Depth (Thickness) | Depth mOD | Backfill/ Install-ations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.50 | D | | | | | | | Very loose dark brown organic gravelly slightly clayey SAND with roots and rootlets. Occasional cobble sized bricks and ceramic fragments. Gravel is fine to coarse subangular to angular siltstone. Rare pockets of orange brown gravelly clay. (MADE GROUND) | | | (1.90) 1 | | |
| 1.00 | D | | | | | | | | | | | | |
| 1.20 | B | | | | | | | | | | | | |
| 1.20 - 2.20 | D | | | | | | | | | | | | |
| 2.00 | D | | | | | | | Very loose orange mottled grey and brown very gravelly slightly sandy CLAY. Gravel is fine to coarse angular siltstone. (GRADE E SOUTH WALES MIDDLE COAL MEASURES) | | | 1.90 2 (0.60) | 94.10 | |
| | | | | | | | | End of Borehole at 2.500m | | | 2.50 3 | 93.50 | |



| Progress & Standing Water Levels | | | | | Water Strikes | | | | | | | Chiselling | | | Hole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Hole Depth | Casing Depth | Water Depth | Date | Time | Strike Depth | Casing Depth | Elapsed Minutes | Depth to Water | Depth Sealed | Depth Top | Depth Base | Duration | Hole Depth | Hole Diameter | Casing Diameter | Casing Depth |
| | | | | | | | | | | | | | | | | | | |

## General Remarks

1. Coordinates and elevation interpolated from recent LiDAR data (ESP, 2017) from the area.
2. Hand-dug pit excavated to 1.2m to check location for the presence of services.
3. Borehole excavated utilising hand-held window sampling until refusal at 2.5m.
4. Mackintosh probe carried out adjacent to borehole, see separate sheet for details.
5. Groundwater not encountered during drilling.
6. Groundwater monitoring well installed with a response zone between 0.5 to 2.5m.

# Appendix B Mackintosh Probe Testing Records

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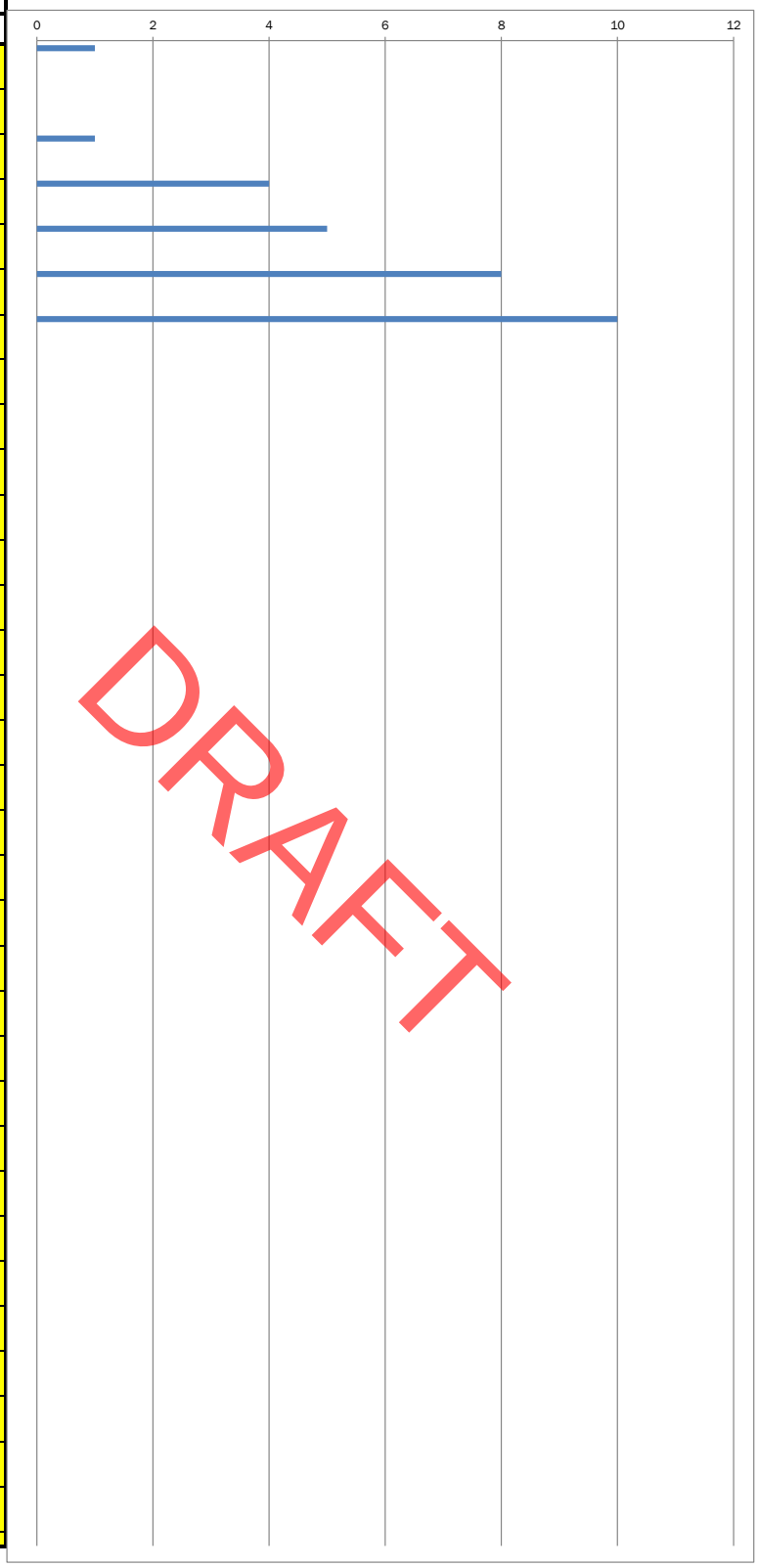
# APPENDIX B - MACKINTOSH PROBE RECORD

# WS501

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 96 mOAD |
| **Site Location:** | Pantteg | **Easting:** | 276290 mE |
| **Client :** | NPTCBC | **Northing:** | 208251 mN |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 3 3 5 | 1 |
| 0.50 | 3 1 | 0 |
| | 1 4 3 | 1 |
| 1.00 | 5 9 | 4 |
| | 17 18 10 | 5 |
| 1.50 | 20 24 | 8 |
| | 22 35 29 | 10 |
| 2.00 | 37 40 | |
| | 35 | |
| 2.50 | | |
| | | |
| 3.00 | | |
| 3.50 | | |
| 4.00 | | |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**






**Anticipated Soils.**
See App A. - WS501 for further detail.

Made ground

Made Ground - Possilbe reworked natural

Grade E South Wales Middle Coal Measures Fromation

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS501 record for detailed description of the ground conditions.
3. Test ended at 2.1m due to refusal of the Mackintosh Probe.

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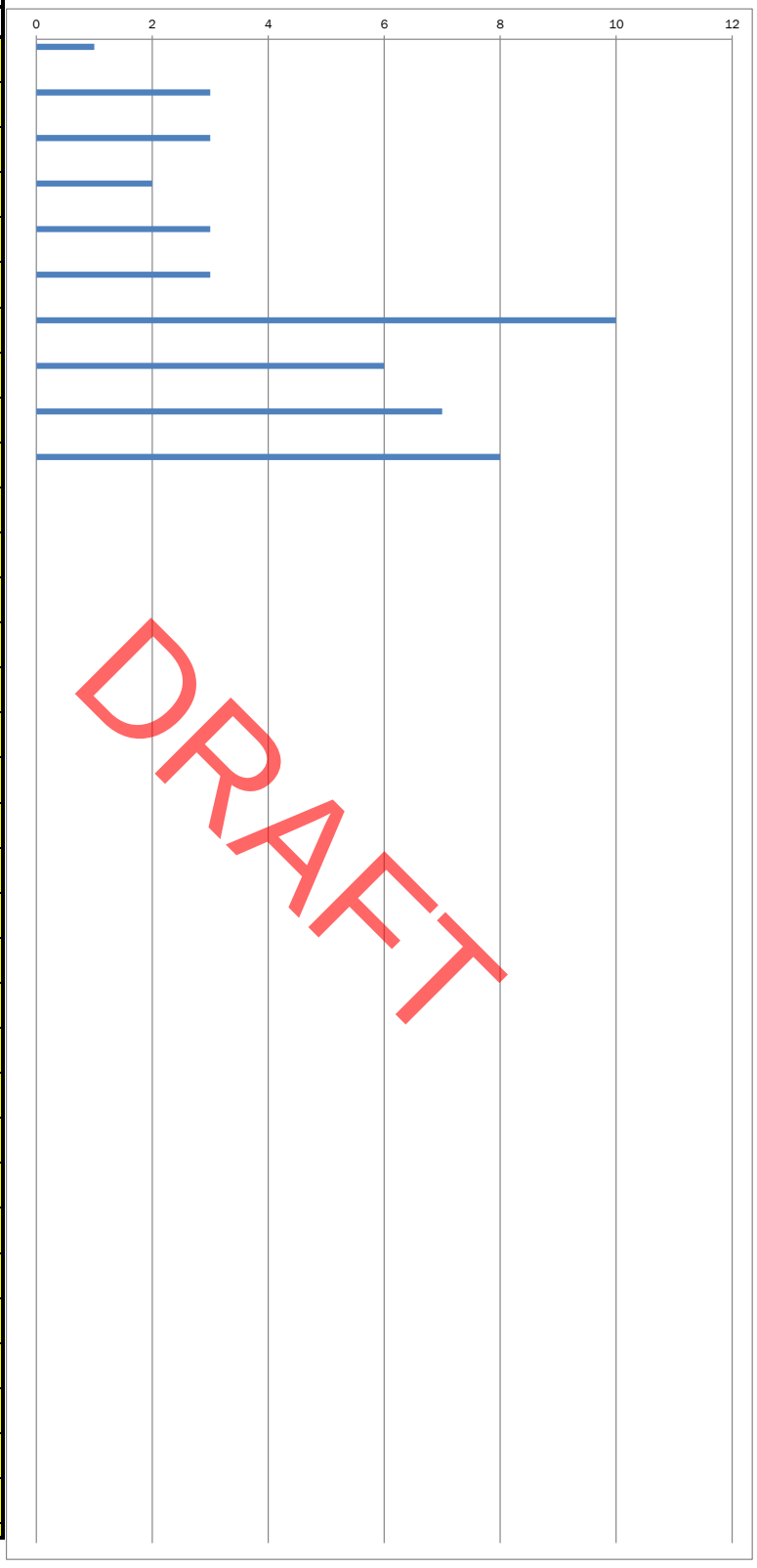
# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 98 |
| **Site Location:** | Pantteg | **Easting:** | 276288 |
| **Client :** | NPTCBC | **Northing:** | 208255 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS502**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 2 3 | 1 |
| 0.50 | 2 8 8 | 3 |
| 1.00 | 14 13 5 11 7 | 3 |
| 1.50 | 8 12 9 13 10 | 2 |
| 2.00 | 12 15 12 28 38 | 3 |
| 2.50 | 44 23 20 21 23 | 10 |
| 3.00 | 25 29 36 50 | 6 |
| 3.50 | | 7 |
| 4.00 | | 8 |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**






**Anticipated Soils.**
See App A. - WS502 for further detail.

- Made Ground
- Made Ground - Possible reworked natural
- Possible Colluvium
- Grade E South Wales Middle Coal Measures Formation

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS502 record for detailed description of the ground conditions.
3. Test ended at 2.9m due to refusal of the Mackintosh Probe.

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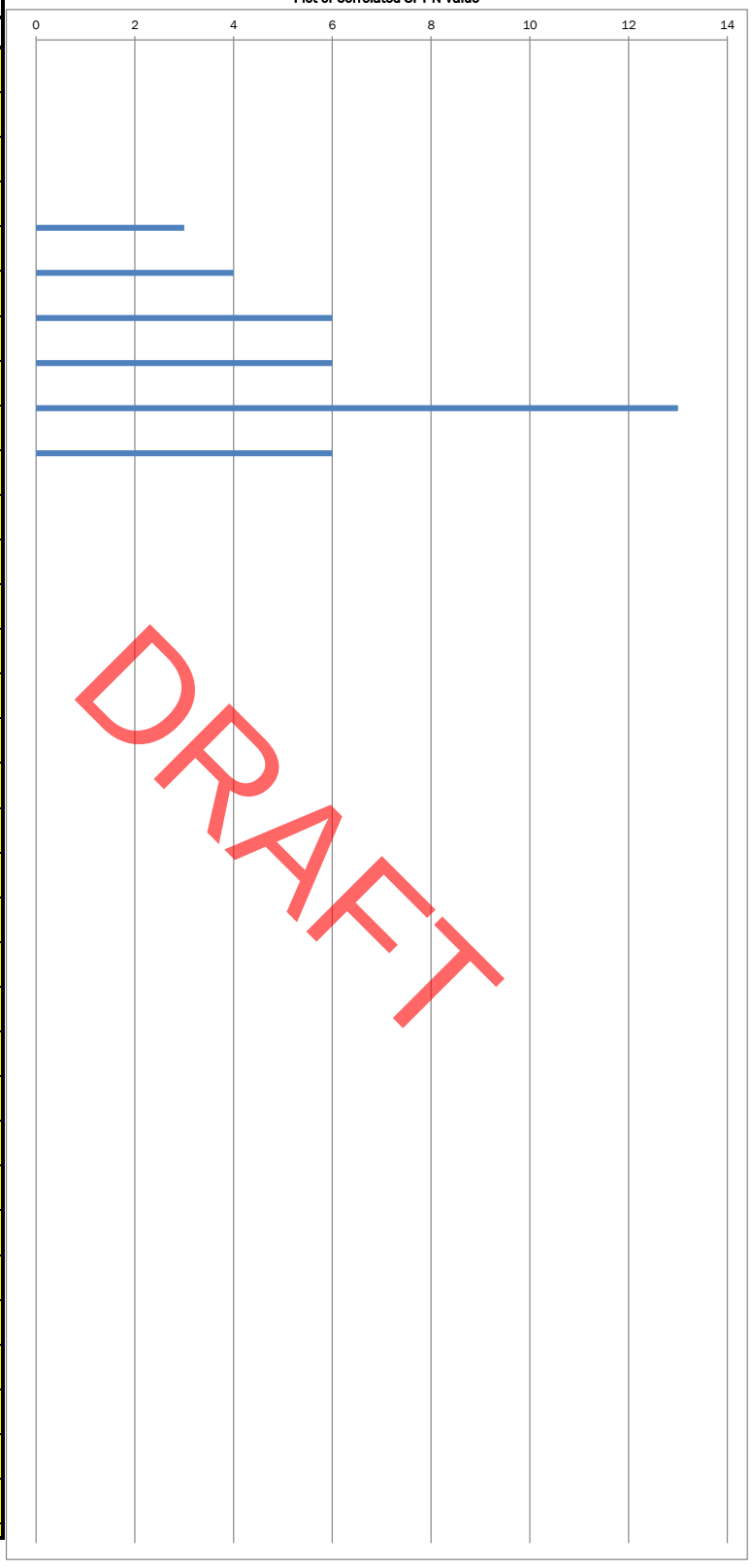
# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 100 |
| **Site Location:** | Pantteg | **Easting:** | 276278 |
| **Client :** | NPTCBC | **Northing:** | 208256 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS503**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | | |
| 0.50 | | |
| 1.00 | | |
| 1.50 | 8 12 19 | 3 |
| | 20 15 | 4 |
| 2.00 | 15 23 18 | 6 |
| | 21 20 | 6 |
| 2.50 | 23 32 | 13 |
| | 55 62 | |
| 3.00 | 70 | 6 |
| 3.50 | | |
| 4.00 | | |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**






**Anticipated Soils.**
See App A. - WS503 for further detail.

- Paved surface
- Made Ground
- Possible Colluvium
- Grade E South Wales Middle Coal Measures Formation

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS503 record for detailed description of the ground conditions.
3. Test ended at 2.8m due to refusal of the Mackintosh Probe.

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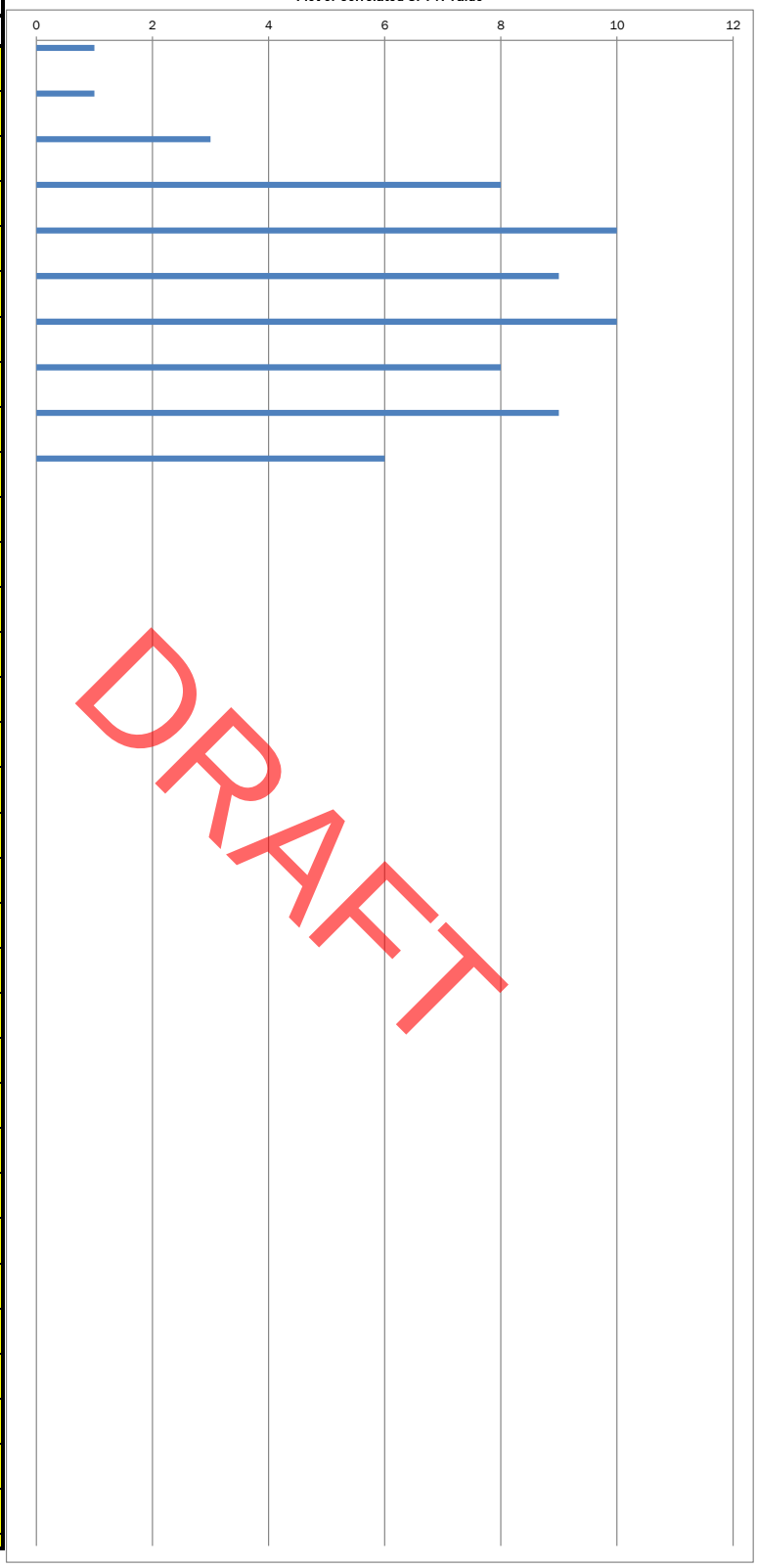
# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 103 |
| **Site Location:** | Pantteg | **Easting:** | 276269 |
| **Client :** | NPTCBC | **Northing:** | 208261 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS504**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 3 2 4 5 5 | 1 |
| 0.50 | 3 2 12 18 25 | 1 |
| 1.00 | 29 30 40 39 38 | 3 |
| 1.50 | 35 45 25 48 30 | 8 |
| 2.00 | 33 25 34 30 34 | 10 |
| 2.50 | 40 30 65 | 9 |
| 3.00 | | 6 |
| 3.50 | | |
| 4.00 | | |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**






**Anticipated Soils.**
See App A. - WS504 for further detail.

Made Ground

Possilbe Colluvium

Grade E South Wales Coal Measures Formation

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS504 record for detailed description of the ground conditions.
3. Test ended at 2.8m due to refusal of the Mackintosh Probe.

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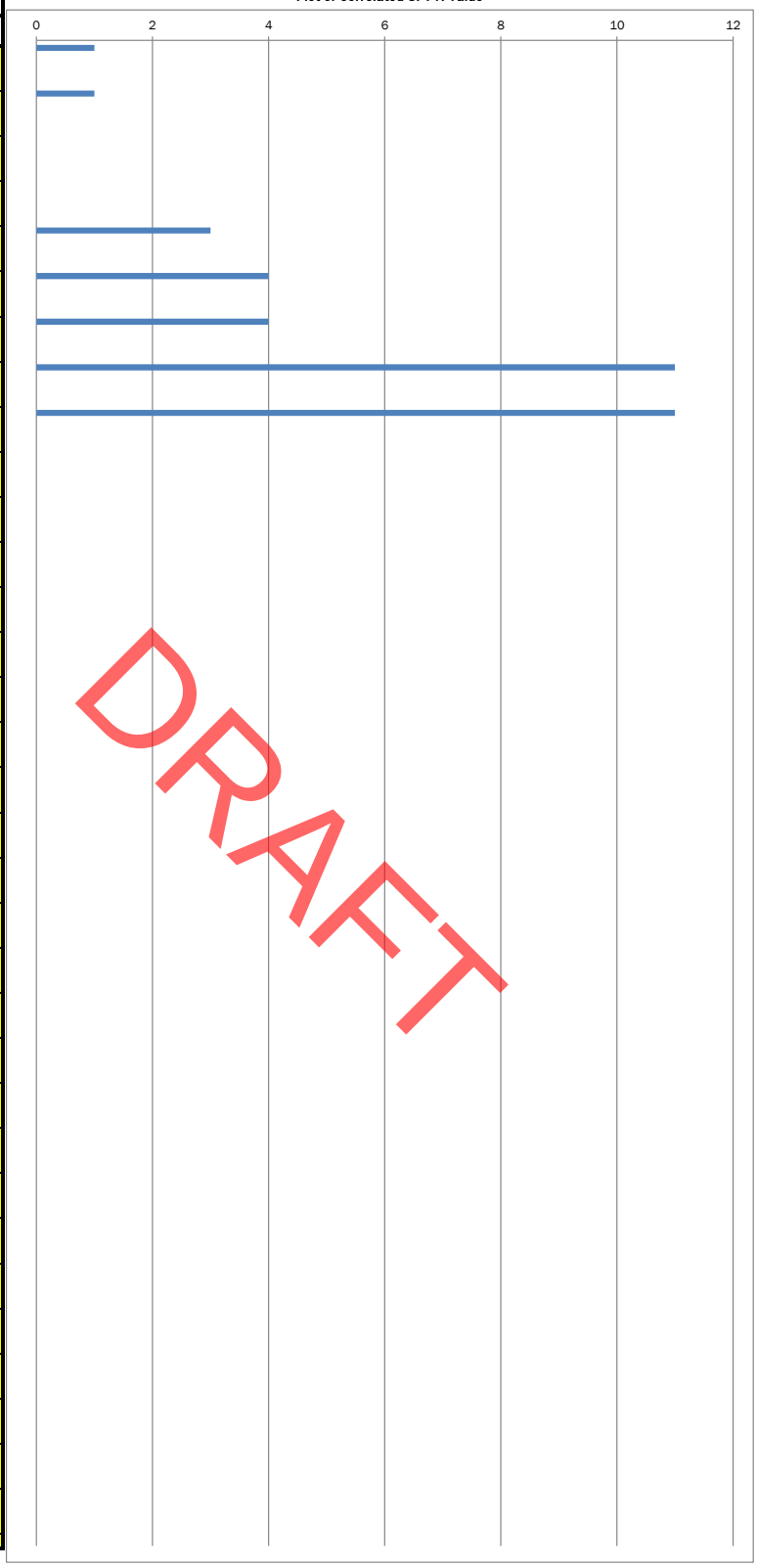
# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 88 |
| **Site Location:** | Pantteg | **Easting:** | 276288 |
| **Client :** | NPTCBC | **Northing:** | 208210 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS505**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 4 3 4 | 1 |
| 0.50 | 4 3 | 1 |
| | 2 1 1 | 0 |
| 1.00 | 2 1 | 0 |
| | 1 2 7 | 3 |
| 1.50 | 15 20 | |
| | 21 15 13 | 4 |
| 2.00 | 15 14 | 4 |
| | 20 37 38 | 11 |
| 2.50 | 50 48 | |
| | 75 | 11 |
| 3.00 | | |
| 3.50 | | |
| 4.00 | | |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**






**Anticipated Soils.**
See App A. - WS505 for further detail.

Made Ground

Possible Colluvium

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS505 record for detailed description of the ground conditions.
3. Test ended at 2.6m due to refusal of the Mackintosh Probe.

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# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 92 |
| **Site Location:** | Pantteg | **Easting:** | 276278 |
| **Client :** | NPTCBC | **Northing:** | 208205 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS506**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 2 3 2 | 1 |
| 0.50 | 2 3 | 1 |
| | 3 8 11 | 2 |
| 1.00 | 7 12 | 3 |
| | 13 10 10 | 3 |
| 1.50 | 10 15 | |
| | 13 14 14 | 4 |
| 2.00 | 25 30 | 12 |
| | 80 34 39 | 9 |
| 2.50 | 30 35 | 13 |
| | 43 65 59 | 5 |
| 3.00 | | |
| 3.50 | | |
| 4.00 | | |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**




**Anticipated Soils.**
See App A. - WS506 for further detail.

Made Ground

Possible Colluvium

Grade E South Wales Middle Coal Measures Formation

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS506 record for detailed description of the ground conditions.
3. Test ended at 2.8m due to refusal of the Mackintosh Probe.

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# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 94 |
| **Site Location:** | Pantteg | **Easting:** | 276270 |
| **Client :** | NPTCBC | **Northing:** | 208213 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS507**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 2 2 2 | 1 |
| 0.50 | 3 2 | 1 |
| 1.00 | 5 11 9 9 11 | 3 |
| 1.50 | 10 7 12 9 16 | 3 |
| 2.00 | 15 12 11 12 12 | 3 |
| 2.50 | 15 14 15 14 10 | 4 |
| 3.00 | 14 16 11 13 18 | 4 |
| 3.50 | 26 59 50 | 12 |
| 4.00 | | |
| 4.50 | | |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**




**Anticipated Soils.**
See App A. - WS507 for further detail.

Made Ground

Grade E South Wales Middle Coal Measures

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS507 record for detailed description of the ground conditions.
3. Test ended at 3.3m due to refusal of the Mackintosh Probe.

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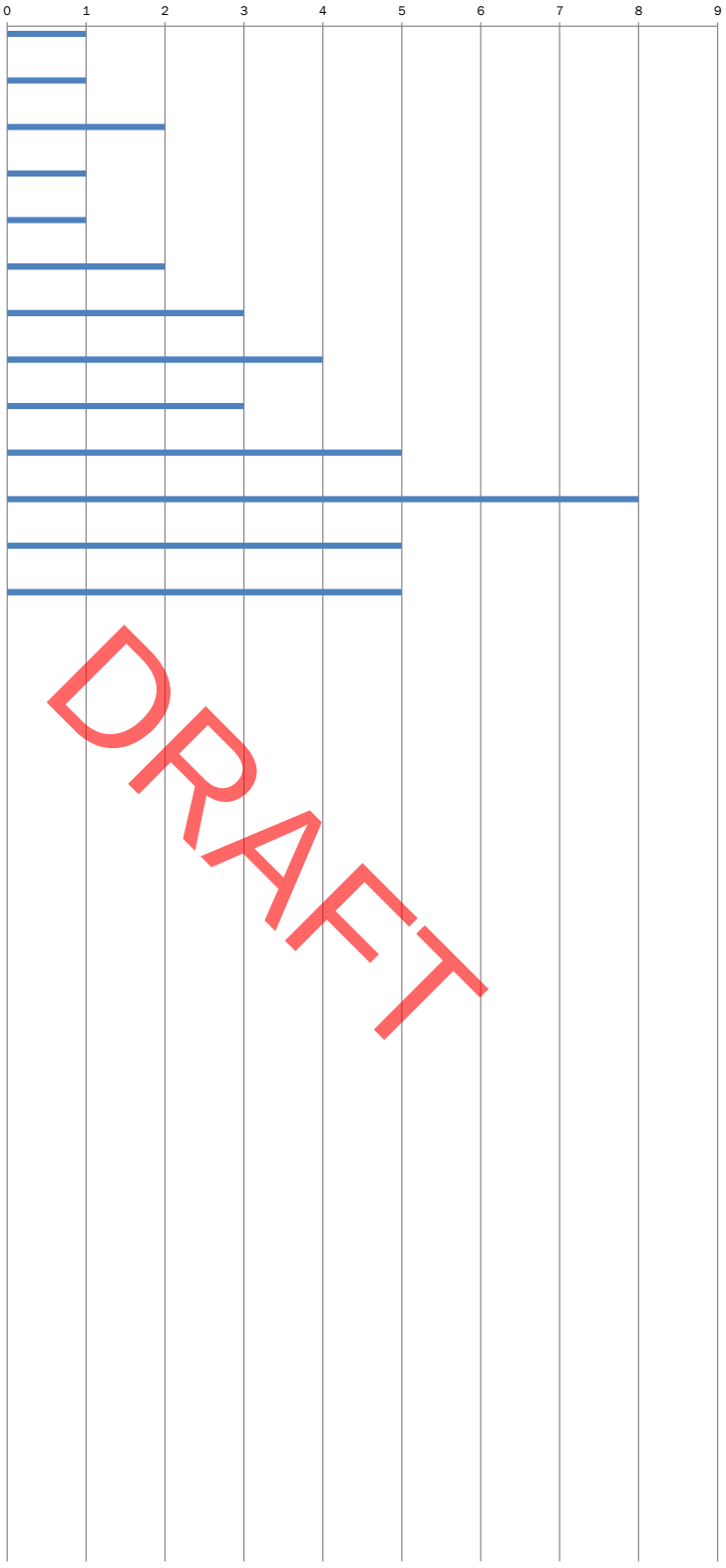
# APPENDIX B - MACKINTOSH PROBE RECORD

| | | | |
|---|---|---|---|
| **Project Name:** | 100 and 111 Cyfyng Road | **Ground Level:** | 96 |
| **Site Location:** | Pantteg | **Easting:** | 276266 |
| **Client :** | NPTCBC | **Northing:** | 208221 |
| **Date of Testing:** | 24/11/2017 | | |
| **Weather:** | Dry and Cold | | |

**WS508**

| Depth (m) | M blows per 100mm per 100mm | Correlated SPT-N Value (per 300mm) |
|---|---|---|
| GL | 1 3 7 5 4 | 1 |
| 0.50 | 5 13 7 6 5 | 1 |
| 1.00 | 7 3 4 4 3 | 2 |
| 1.50 | 5 6 9 10 15 | 1 |
| 2.00 | 11 8 9 25 10 | 2 |
| 2.50 | 9 15 20 16 20 | 3 |
| 3.00 | 30 35 25 20 20 | 3 |
| 3.50 | 20 35 25 | 8 |
| 4.00 | | 5 |
| 4.50 | | 5 |
| 5.00 | | |
| 5.50 | | |
| 6.00 | | |
| 6.50 | | |
| 7.00 | | |
| 7.50 | | |
| 8.00 | | |
| 8.50 | | |
| 9.00 | | |
| 9.50 | | |
| 10.00 | | |

**Plot of Correlated SPT-N Value**






**Anticipated Soils.**
See App A. - WS508 for further detail.

Made Ground

Grade E South Wales Middle Coal Measures Formation

**REMARKS:**

1. Coordinates and elevation inferred from LiDAR data for the area (ESP, 2017)
2. See WS508 record for detailed description of the ground conditions.
3. Test ended at 3.8m due to refusal of the Mackintosh Probe.

# Appendix C Geotechnical Laboratory Results

# Laboratory Report

UKAS TESTING
2788

GSTL
GEO Site & Testing Services Ltd

## Contract Number: 37620

Client Ref: **5859e.08**
Client PO: **6614 (Framework Rates)**

Report Date: **06-01-2018**

Client **Earth Science Partnership**
**33 Cardiff Road**
**Taff's Well**
**Cardiff**
**CF15 7RB**

Contract Title: **Pantteg, Ystalyfera**
For the attention of: **Mat Elcock**

Date Received: **15-12-2017**
Date Commenced: **15-12-2017**
Date Completed: **06-01-2018**

| Test Description | Qty |
|---|---|
| **Moisture Content**<br>1377 : 1990 Part 2 : 3.2 - * UKAS | 8 |
| **4 Point Liquid & Plastic Limit (LL/PL)**<br>1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS | 8 |
| **PSD Wet Sieve method**<br>1377 : 1990 Part 2 : 9.2 - * UKAS | 12 |
| **Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only)**<br>BS1377 : Part 7 :1990 Clause 4 - * UKAS | 1 |
| **Consolidated Drained Peak and Residual Shear Strength - set of 3 60 x 60mm Shear Box Specimens (5 days)**<br>1377 : 1990 Part 7 : 4 - * UKAS | 3 |
| **Disposal of Samples on Project** | 1 |

**Notes:** **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
**# - denotes test carried out by approved contractor**
**@ - denotes non accredited tests**



**Approved Signatories:**
Alex Wynn (Associate Director) - Ben Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager) - Sean Penn (Administrative Assistant)
Vaughan Edwards (Managing Director) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

| GSTL | LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX<br>( BS 1377 : Part 2 : 1990 Method 5 ) | |
|---|---|---|
| Contract Number | **37620** | |
| Site Name | **Pantteg, Ystalyfera** | |
| | | |
| | | |

| WS<br>Window Sample | Sample Number | Sample Type | Depth (m) | | | Moisture Content % | Liquid Limit % | Plastic Limit % | Plasticity index % | Passing .425mm % | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WS501 | | D | 0.30 | - | | 31 | | NP | | 46 | |
| WS501 | | D | 1.00 | - | | 25 | 52 | 22 | 30 | 79 | CH High Plasticity |
| WS502 | | D | 1.00 | - | | 31 | 51 | 26 | 25 | 73 | CH High Plasticity |
| WS503 | | D | 0.40 | - | | 26 | 48 | 36 | 12 | 46 | MI Intermediate Plasticity |
| WS503 | | D | 1.10 | - | | 5.4 | | NP | | 5 | |
| WS506 | | D | 0.30 | - | | 19 | 48 | 17 | 31 | 72 | CI Intermediate Plasticity |
| WS506 | | D | 1.20 | - | | 18 | 46 | 13 | 33 | 34 | CI Intermediate Plasticity |
| WS508 | | D | 0.50 | - | | 35 | 49 | 40 | 9 | 38 | MI Intermediate Plasticity |
| | | | | - | | | | | | | |
| | | | | - | | | | | | | |
| | | | | - | | | | | | | |
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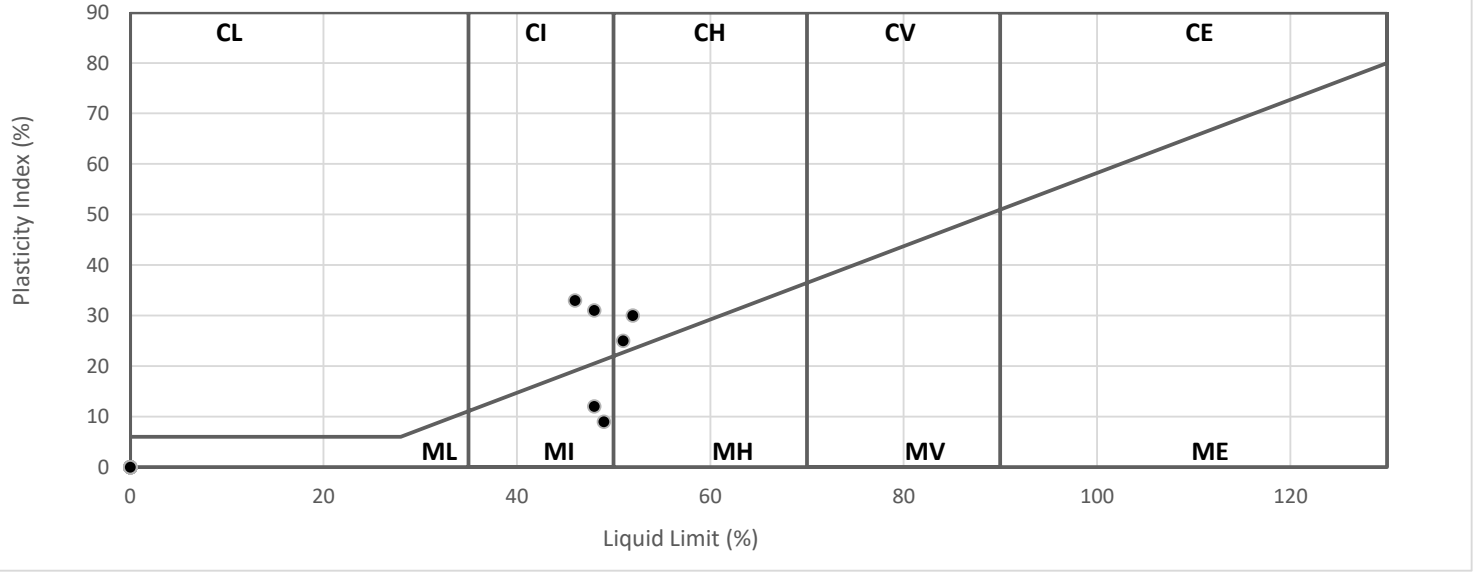
| | | | | - | | | | | | | |
| | | | | - | | | | | | | |
| | | | | - | | | | | | | |

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

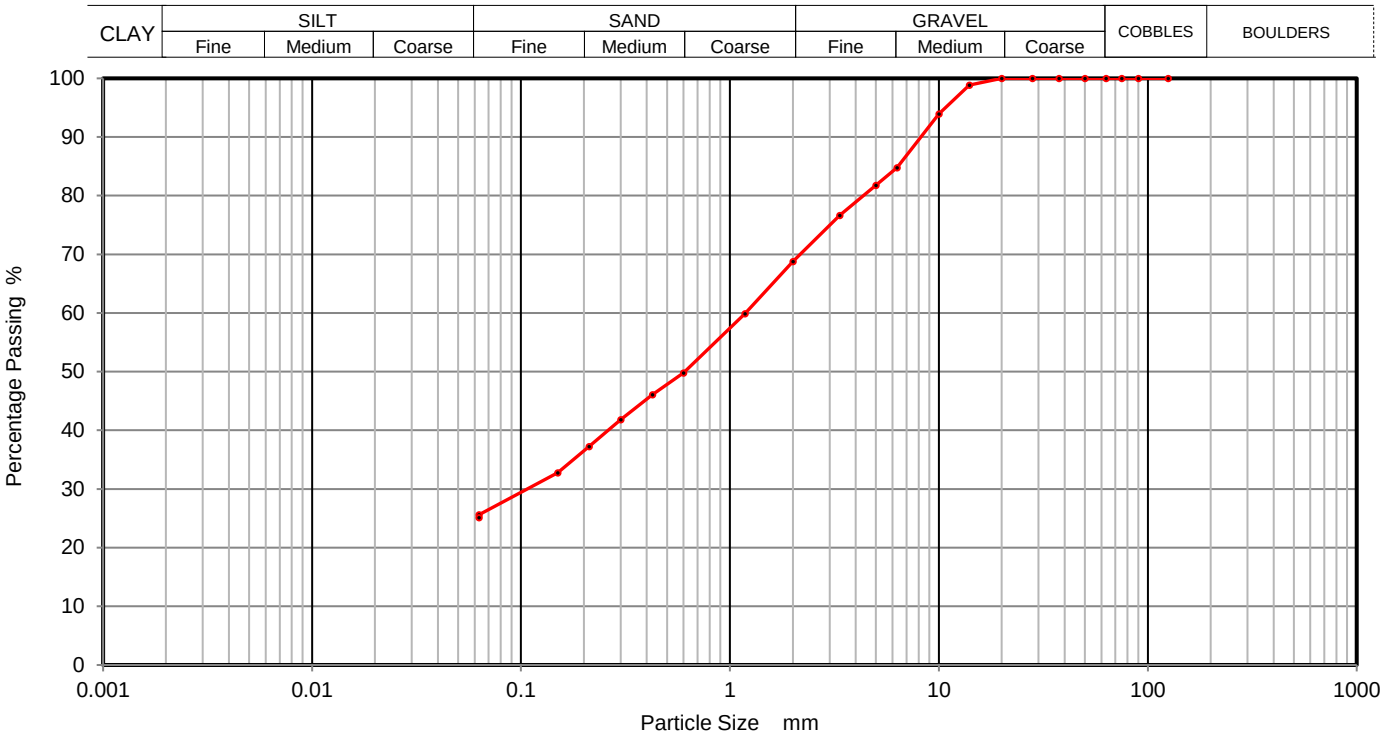
**PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION**
**BS 5930:1999+A2:2010**




| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| DB | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING
2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS501 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown slightly clayey silty fine to medium gravelly fine to coarse SAND | Depth Top | 0.30 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 99 | | |
| 10 | 94 | | |
| 6.3 | 85 | | |
| 5 | 82 | | |
| 3.35 | 77 | | |
| 2 | 69 | | |
| 1.18 | 60 | | |
| 0.6 | 50 | | |
| 0.425 | 46 | | |
| 0.3 | 42 | | |
| 0.212 | 37 | | |
| 0.15 | 33 | | |
| 0.063 | 26 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 31 |
| Sand | 43 |
| Silt and Clay | 26 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

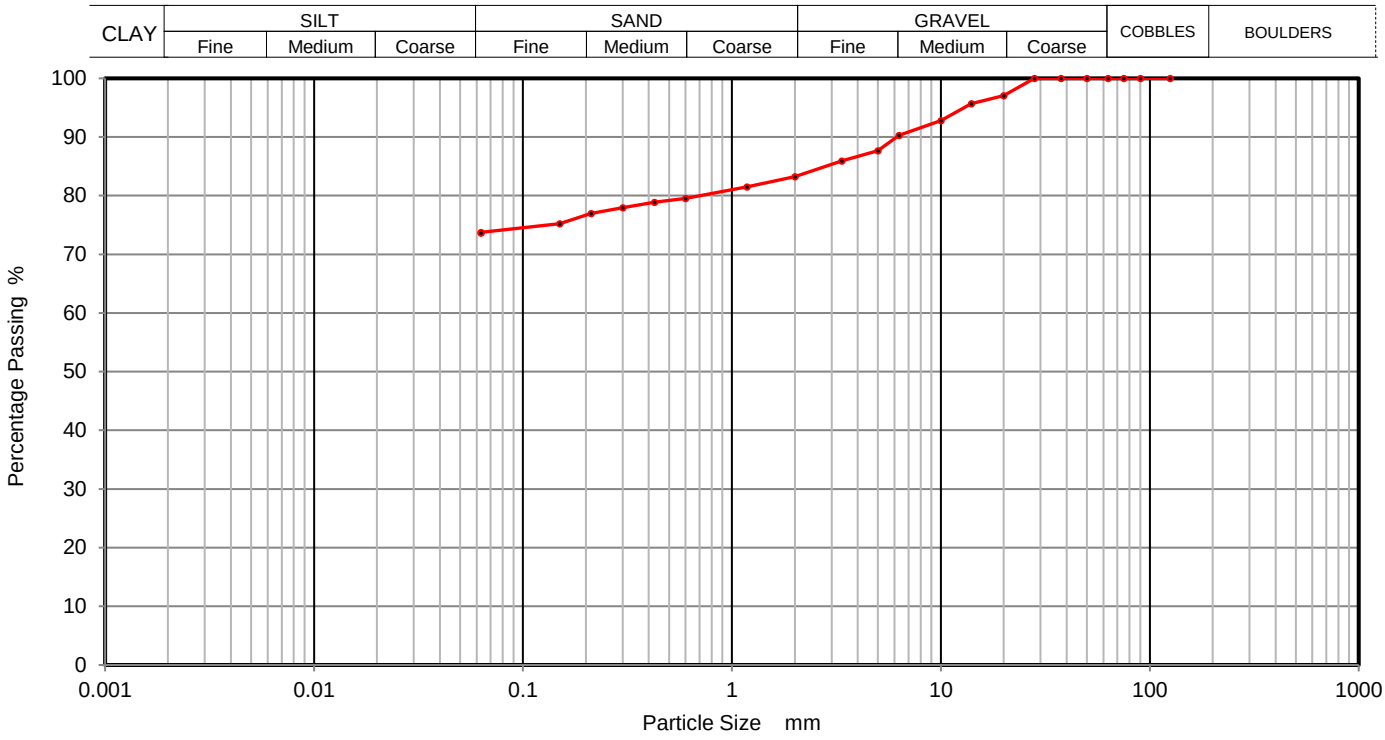
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS501 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown slightly fine to coarse sandy fine to coarse gravelly silty CLAY | Depth Top | 1.00 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 97 | | |
| 14 | 96 | | |
| 10 | 93 | | |
| 6.3 | 90 | | |
| 5 | 88 | | |
| 3.35 | 86 | | |
| 2 | 83 | | |
| 1.18 | 82 | | |
| 0.6 | 80 | | |
| 0.425 | 79 | | |
| 0.3 | 78 | | |
| 0.212 | 77 | | |
| 0.15 | 75 | | |
| 0.063 | 74 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 17 |
| Sand | 9 |
| Silt and Clay | 74 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

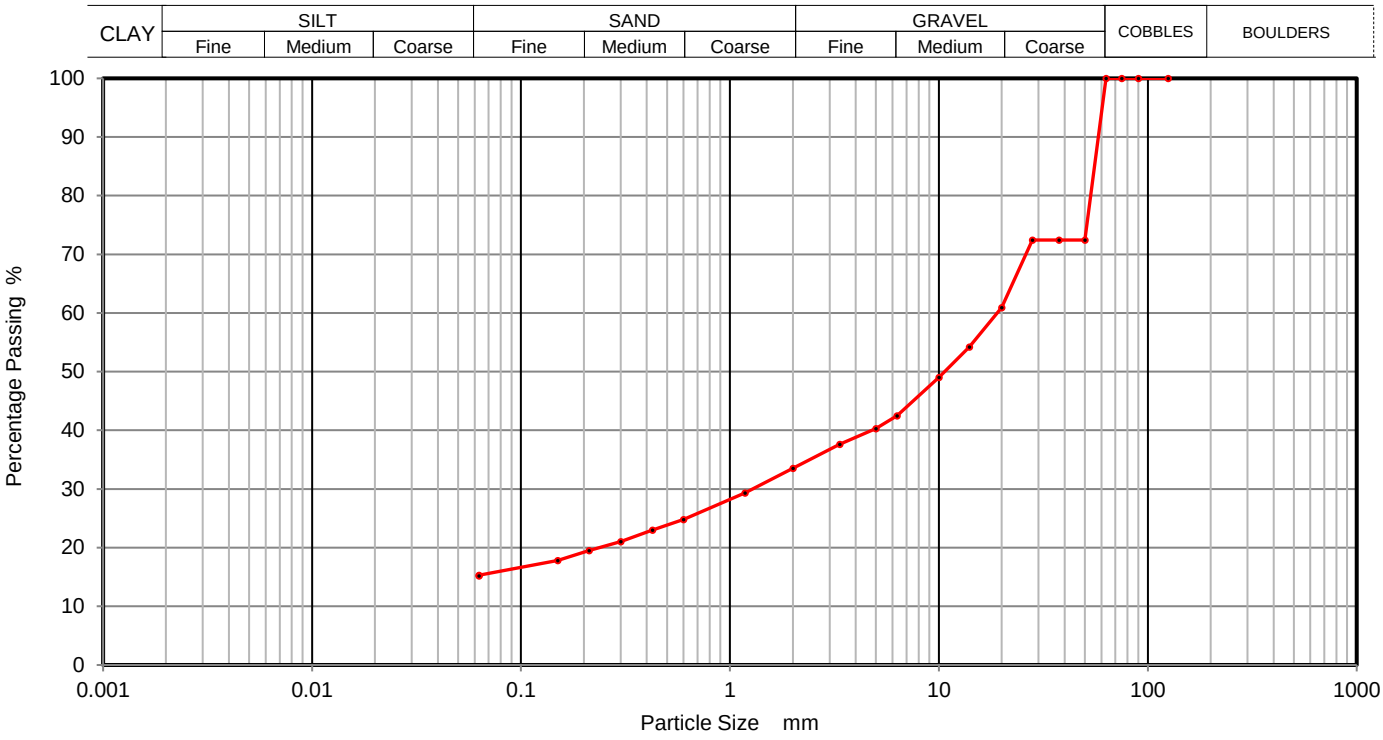
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS501 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown silty fine to coarse sandy fine to coarse GRAVEL | Depth Top | 2.60 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 72 | | |
| 37.5 | 72 | | |
| 28 | 72 | | |
| 20 | 61 | | |
| 14 | 54 | | |
| 10 | 49 | | |
| 6.3 | 42 | | |
| 5 | 40 | | |
| 3.35 | 38 | | |
| 2 | 34 | | |
| 1.18 | 29 | | |
| 0.6 | 25 | | |
| 0.425 | 23 | | |
| 0.3 | 21 | | |
| 0.212 | 20 | | |
| 0.15 | 18 | | |
| 0.063 | 15 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 66 |
| Sand | 19 |
| Silt and Clay | 15 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

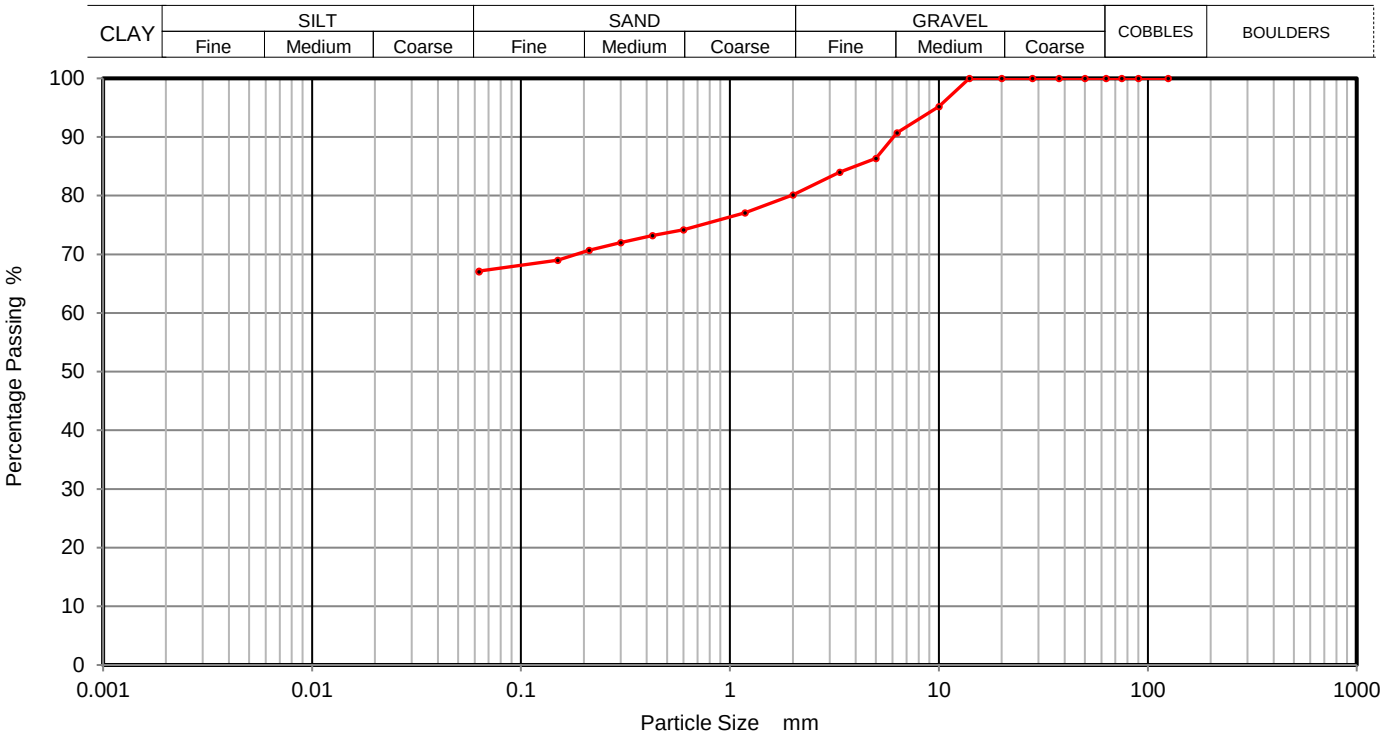
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS502 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown fine to coarse sandy fine to medium gravelly silty CLAY | Depth Top | 1.00 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 95 | | |
| 6.3 | 91 | | |
| 5 | 86 | | |
| 3.35 | 84 | | |
| 2 | 80 | | |
| 1.18 | 77 | | |
| 0.6 | 74 | | |
| 0.425 | 73 | | |
| 0.3 | 72 | | |
| 0.212 | 71 | | |
| 0.15 | 69 | | |
| 0.063 | 67 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 20 |
| Sand | 13 |
| Silt and Clay | 67 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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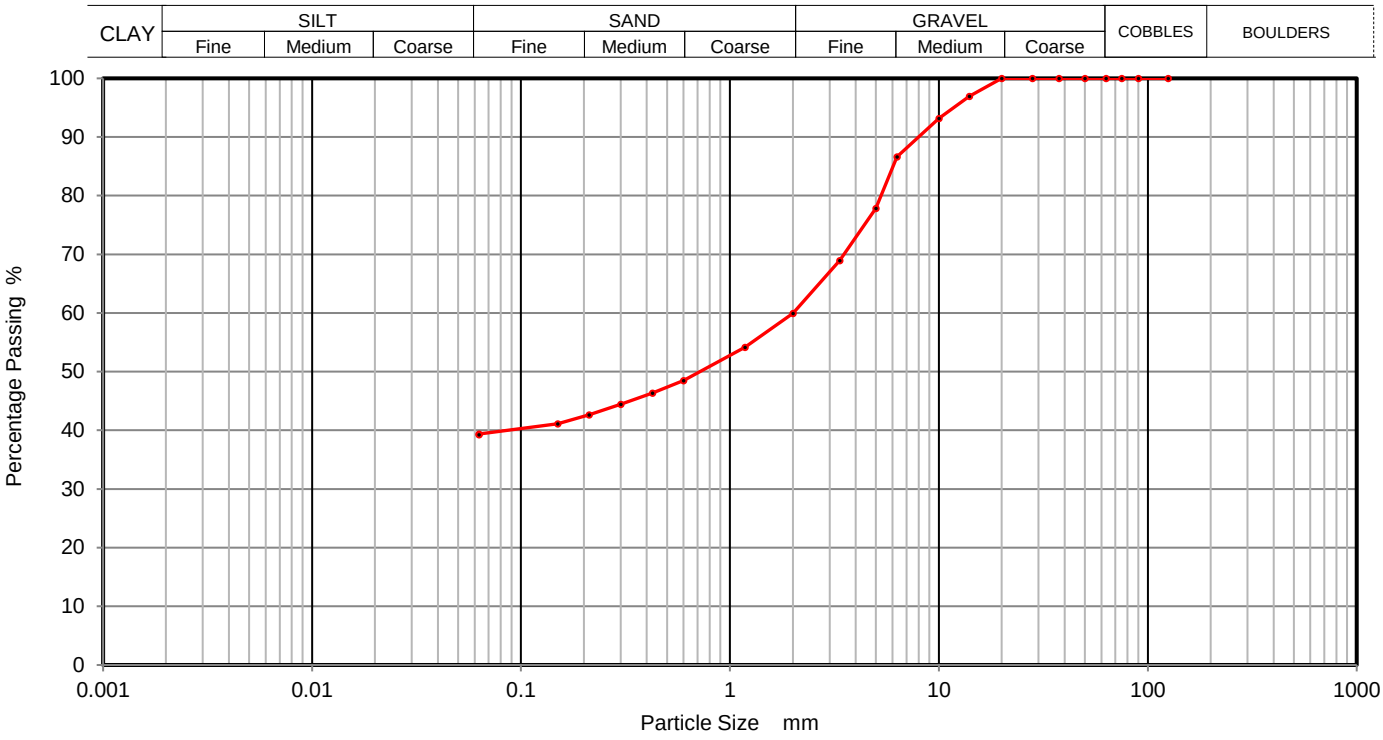
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS503 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown fine to coarse sandy clayey silty fine to medium GRAVEL | Depth Top | 0.40 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 97 | | |
| 10 | 93 | | |
| 6.3 | 87 | | |
| 5 | 78 | | |
| 3.35 | 69 | | |
| 2 | 60 | | |
| 1.18 | 54 | | |
| 0.6 | 48 | | |
| 0.425 | 46 | | |
| 0.3 | 44 | | |
| 0.212 | 43 | | |
| 0.15 | 41 | | |
| 0.063 | 39 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 40 |
| Sand | 21 |
| Silt and Clay | 39 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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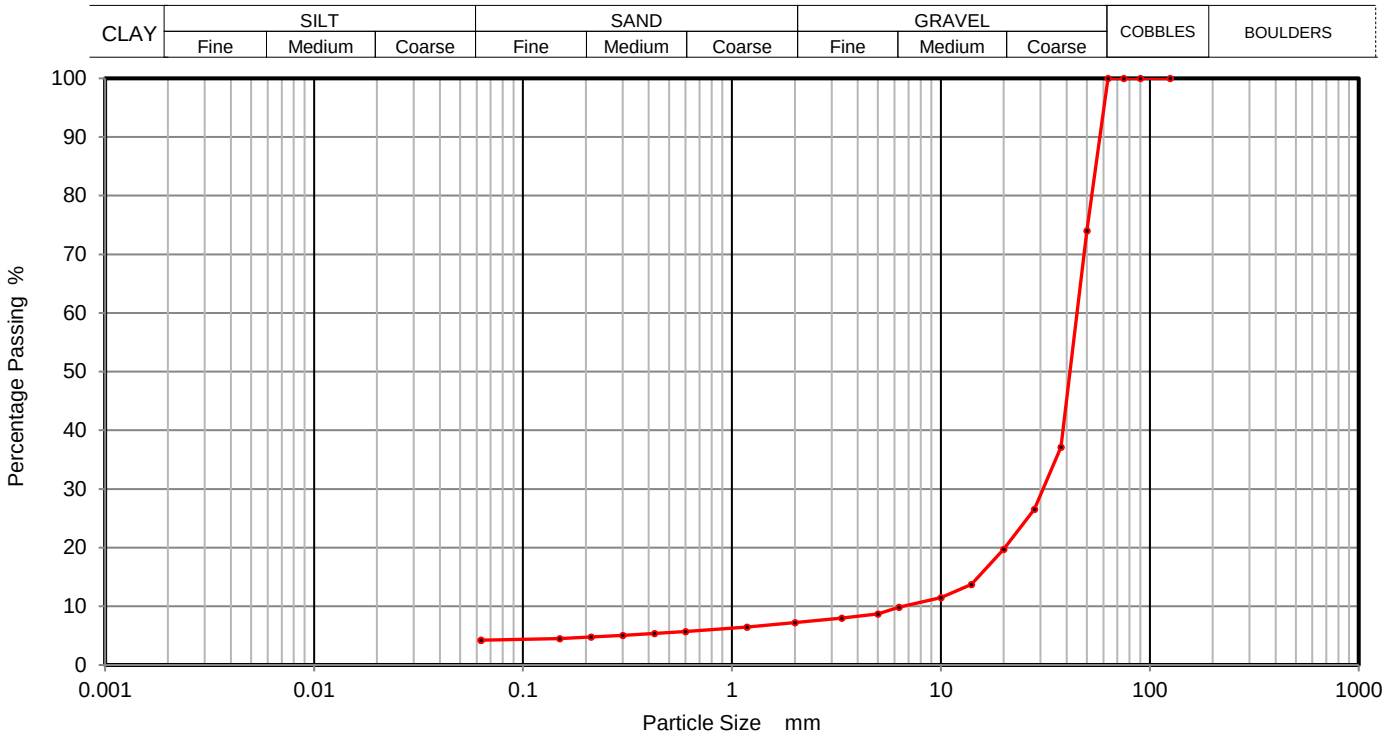
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS503 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown slightly clayey slightly silty slightly fine to coarse sandy fine to coarse GRAVEL | Depth Top | 1.10 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 74 | | |
| 37.5 | 37 | | |
| 28 | 27 | | |
| 20 | 20 | | |
| 14 | 14 | | |
| 10 | 12 | | |
| 6.3 | 10 | | |
| 5 | 9 | | |
| 3.35 | 8 | | |
| 2 | 7 | | |
| 1.18 | 6 | | |
| 0.6 | 6 | | |
| 0.425 | 5 | | |
| 0.3 | 5 | | |
| 0.212 | 5 | | |
| 0.15 | 5 | | |
| 0.063 | 4 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 93 |
| Sand | 3 |
| Silt and Clay | 4 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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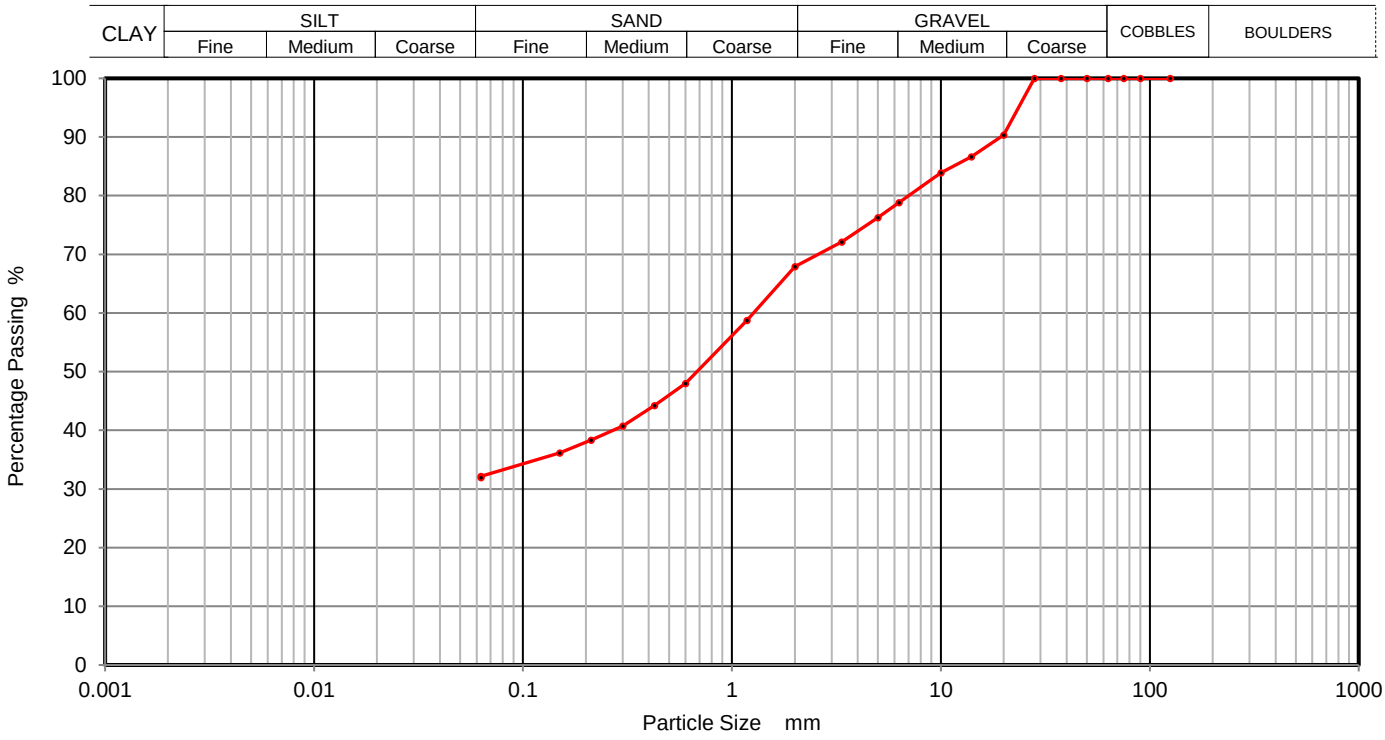
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS503 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown fine to coarse gravelly silty fine to coarse SAND | Depth Top | 2.00 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 90 | | |
| 14 | 87 | | |
| 10 | 84 | | |
| 6.3 | 79 | | |
| 5 | 76 | | |
| 3.35 | 72 | | |
| 2 | 68 | | |
| 1.18 | 59 | | |
| 0.6 | 48 | | |
| 0.425 | 44 | | |
| 0.3 | 41 | | |
| 0.212 | 38 | | |
| 0.15 | 36 | | |
| 0.063 | 32 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 32 |
| Sand | 36 |
| Silt and Clay | 32 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

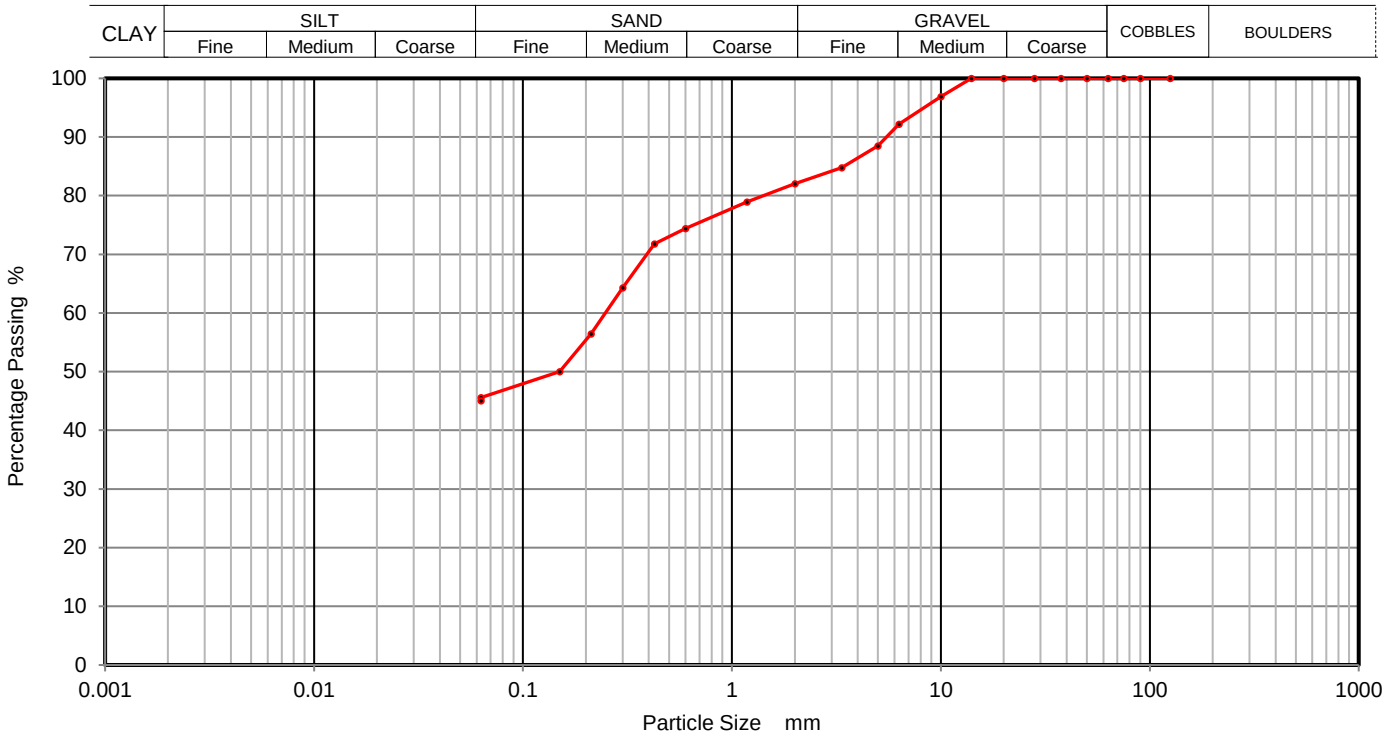
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS506 |
| Site Name | **Pantteg, Ystalyfera** | Sample No. | |
| Soil Description | Brown fine to medium gravelly fine to coarse sandy silty CLAY.(With rootlets) | Depth Top | **0.30** |
| | | Depth Base | |
| | | Sample Type | **D** |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 97 | | |
| 6.3 | 92 | | |
| 5 | 88 | | |
| 3.35 | 85 | | |
| 2 | 82 | | |
| 1.18 | 79 | | |
| 0.6 | 74 | | |
| 0.425 | 72 | | |
| 0.3 | 64 | | |
| 0.212 | 56 | | |
| 0.15 | 50 | | |
| 0.063 | 46 | | |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 18 |
| Sand | 36 |
| Silt and Clay | 46 |
| | |
| | |

| **Grading Analysis** | |
|---|---|
| Uniformity Coefficient | |

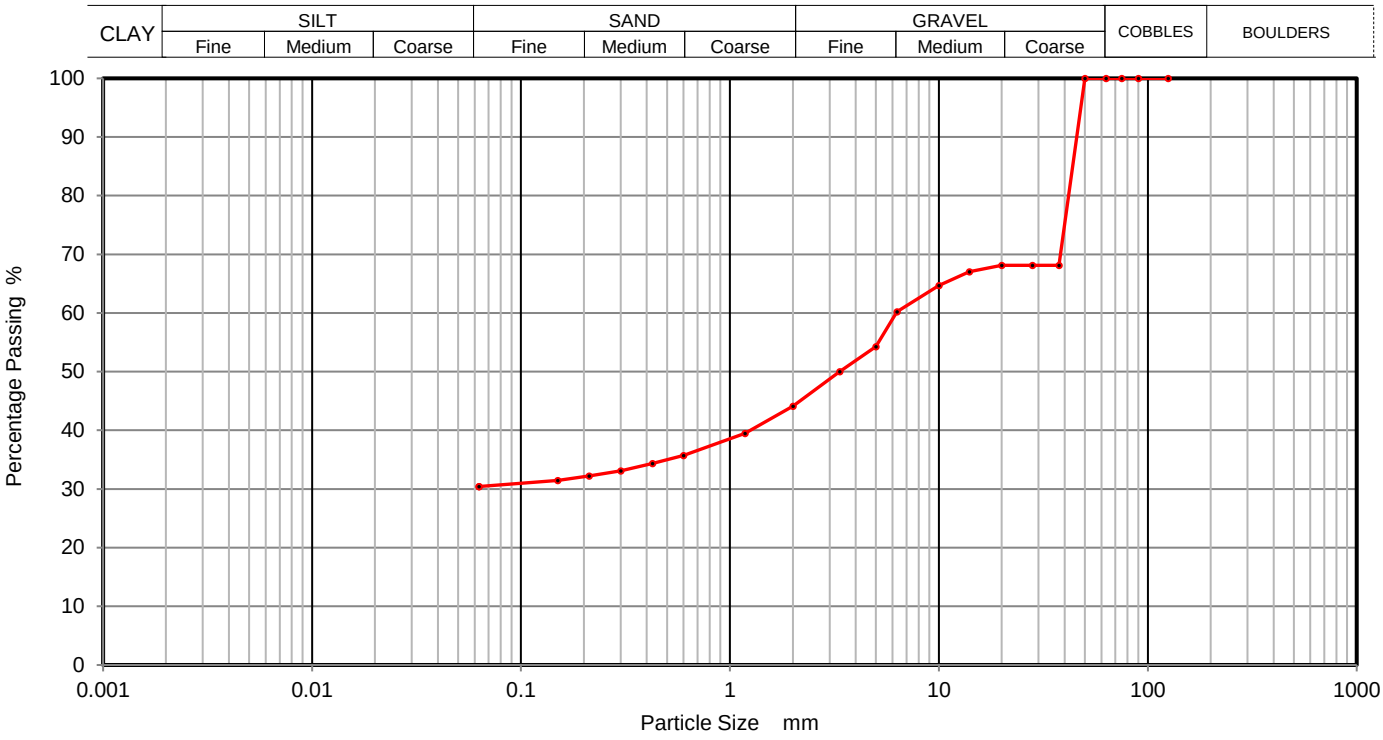
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS506 |
| Site Name | **Pantteg, Ystalyfera** | Sample No. | |
| Soil Description | Brown fine to coarse sandy silty clayey fine to coarse GRAVEL | Depth Top | 1.20 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 68 | | |
| 28 | 68 | | |
| 20 | 68 | | |
| 14 | 67 | | |
| 10 | 65 | | |
| 6.3 | 60 | | |
| 5 | 54 | | |
| 3.35 | 50 | | |
| 2 | 44 | | |
| 1.18 | 39 | | |
| 0.6 | 36 | | |
| 0.425 | 34 | | |
| 0.3 | 33 | | |
| 0.212 | 32 | | |
| 0.15 | 31 | | |
| 0.063 | 30 | | |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 56 |
| Sand | 14 |
| Silt and Clay | 30 |
| | |
| | |

| **Grading Analysis** | |
|---|---|
| Uniformity Coefficient | |

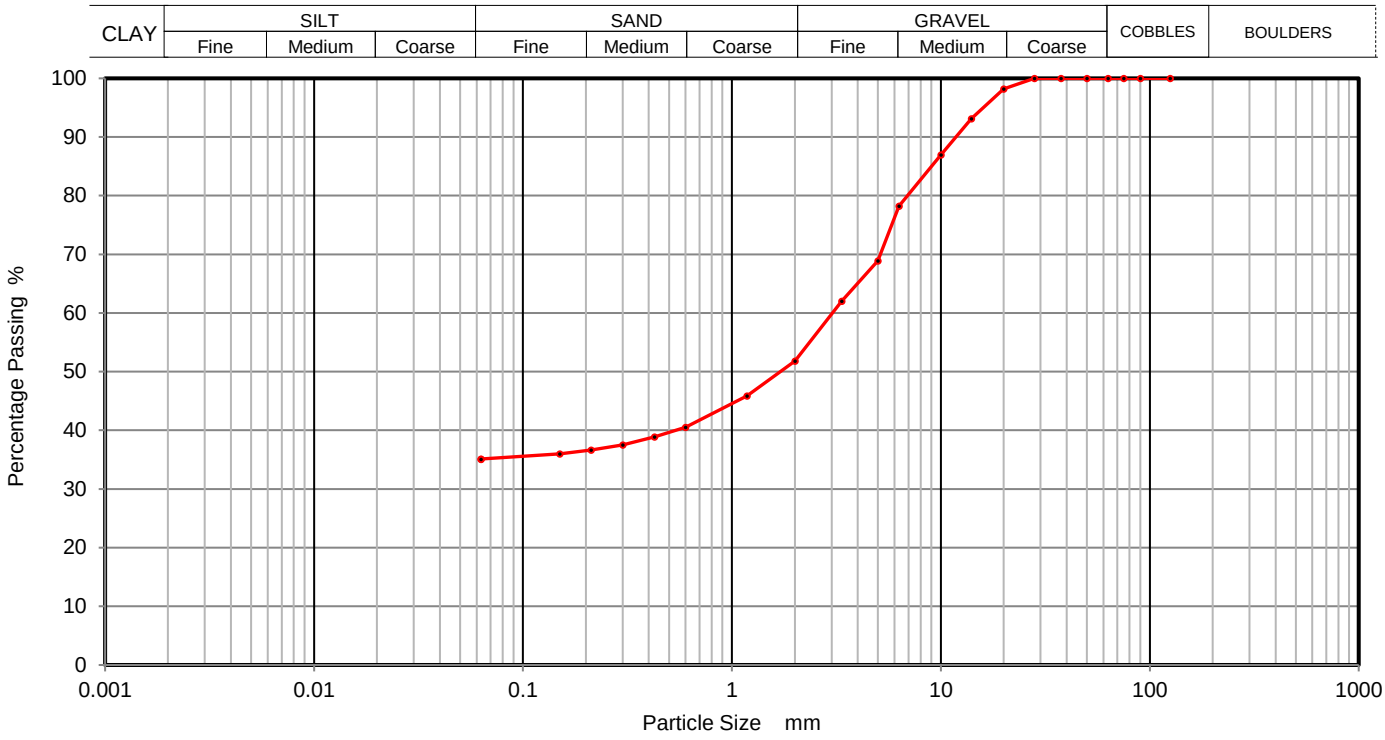
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS506 |
| Site Name | **Pantteg, Ystalyfera** | Sample No. | |
| Soil Description | Brown fine to coarse sandy silty clayey fine to coarse GRAVEL | Depth Top | 2.40 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 98 | | |
| 14 | 93 | | |
| 10 | 87 | | |
| 6.3 | 78 | | |
| 5 | 69 | | |
| 3.35 | 62 | | |
| 2 | 52 | | |
| 1.18 | 46 | | |
| 0.6 | 41 | | |
| 0.425 | 39 | | |
| 0.3 | 38 | | |
| 0.212 | 37 | | |
| 0.15 | 36 | | |
| 0.063 | 35 | | |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 48 |
| Sand | 17 |
| Silt and Clay | 35 |
| | |
| | |

| **Grading Analysis** | |
|---|---|
| Uniformity Coefficient | |

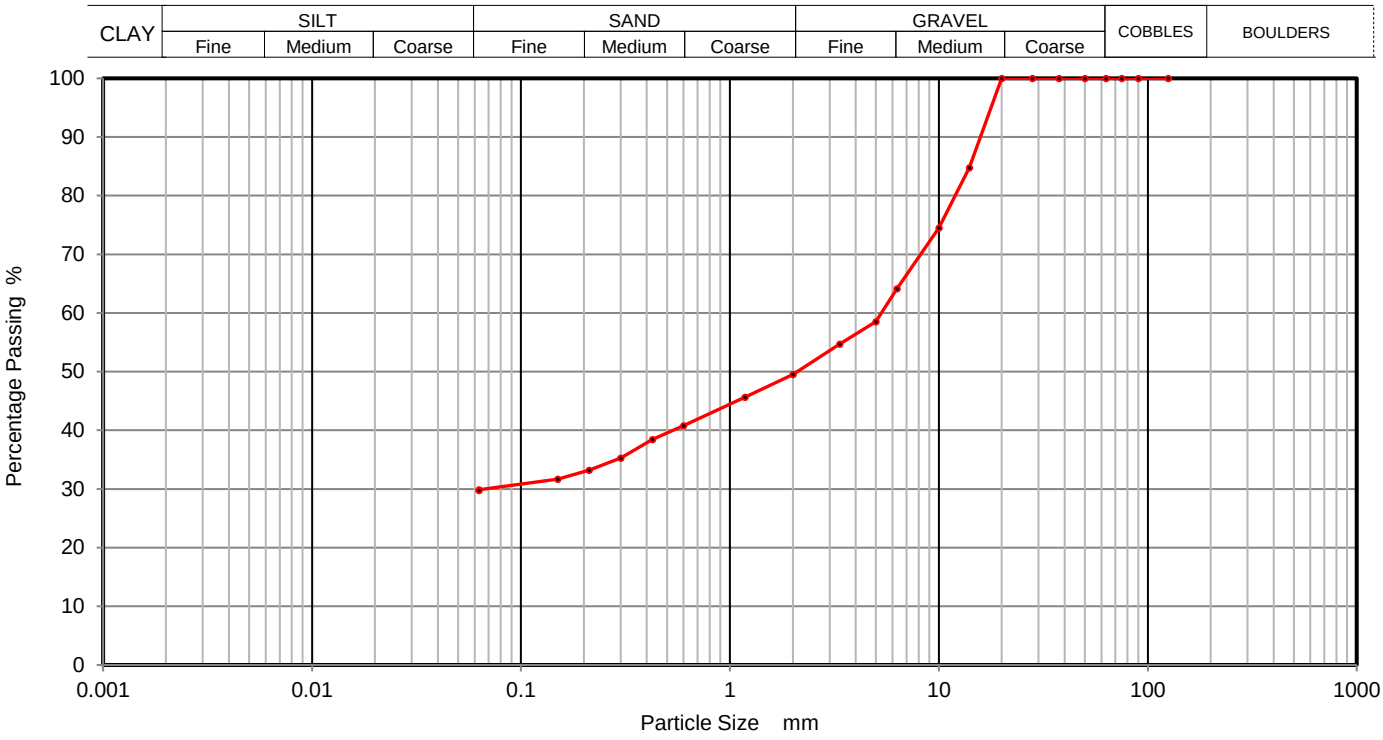
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS508 |
| Site Name | **Pantteg, Ystalyfera** | Sample No. | |
| Soil Description | Brown fine to coarse sandy clayey silty fine to medium GRAVEL | Depth Top | **0.50** |
| | | Depth Base | |
| | | Sample Type | **D** |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 85 | | |
| 10 | 75 | | |
| 6.3 | 64 | | |
| 5 | 59 | | |
| 3.35 | 55 | | |
| 2 | 50 | | |
| 1.18 | 46 | | |
| 0.6 | 41 | | |
| 0.425 | 38 | | |
| 0.3 | 35 | | |
| 0.212 | 33 | | |
| 0.15 | 32 | | |
| 0.063 | 30 | | |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 50 |
| Sand | 20 |
| Silt and Clay | 30 |
| | |
| | |

| **Grading Analysis** | |
|---|---|
| Uniformity Coefficient | |

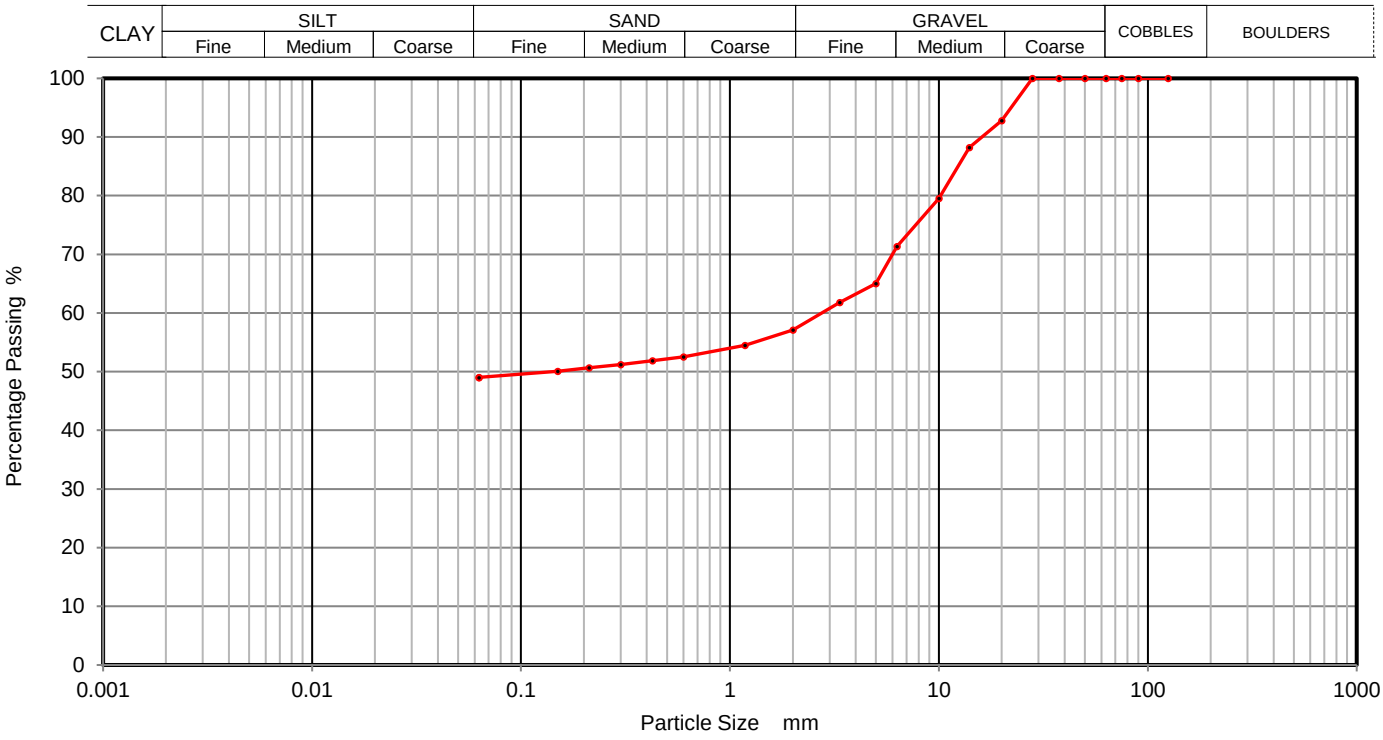
Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

| GSTL | PARTICLE SIZE DISTRIBUTION<br>BS 1377 Part 2:1990<br>Wet Sieve, Clause 9.2 | Contract Number | 37620 |
|---|---|---|---|
| | | Borehole/Pit No. | WS508 |
| Site Name | Pantteg, Ystalyfera | Sample No. | |
| Soil Description | Brown slightly fine to coarse sandy fine to coarse gravelly silty CLAY | Depth Top | 2.00 |
| | | Depth Base | |
| | | Sample Type | D |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0200 | |
| 90 | 100 | 0.0060 | |
| 75 | 100 | 0.0019 | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 93 | | |
| 14 | 88 | | |
| 10 | 80 | | |
| 6.3 | 71 | | |
| 5 | 65 | | |
| 3.35 | 62 | | |
| 2 | 57 | | |
| 1.18 | 54 | | |
| 0.6 | 53 | | |
| 0.425 | 52 | | |
| 0.3 | 51 | | |
| 0.212 | 51 | | |
| 0.15 | 50 | | |
| 0.063 | 49 | | |

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 43 |
| Sand | 8 |
| Silt and Clay | 49 |
| | |
| | |

| Grading Analysis | |
|---|---|
| Uniformity Coefficient | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operators | Checked | 05/01/2018 | Sean Penn | |
|---|---|---|---|---|
| RO/MH | Approved | 06/01/2018 | Ben Sharp | |

UKAS TESTING 2788

# Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

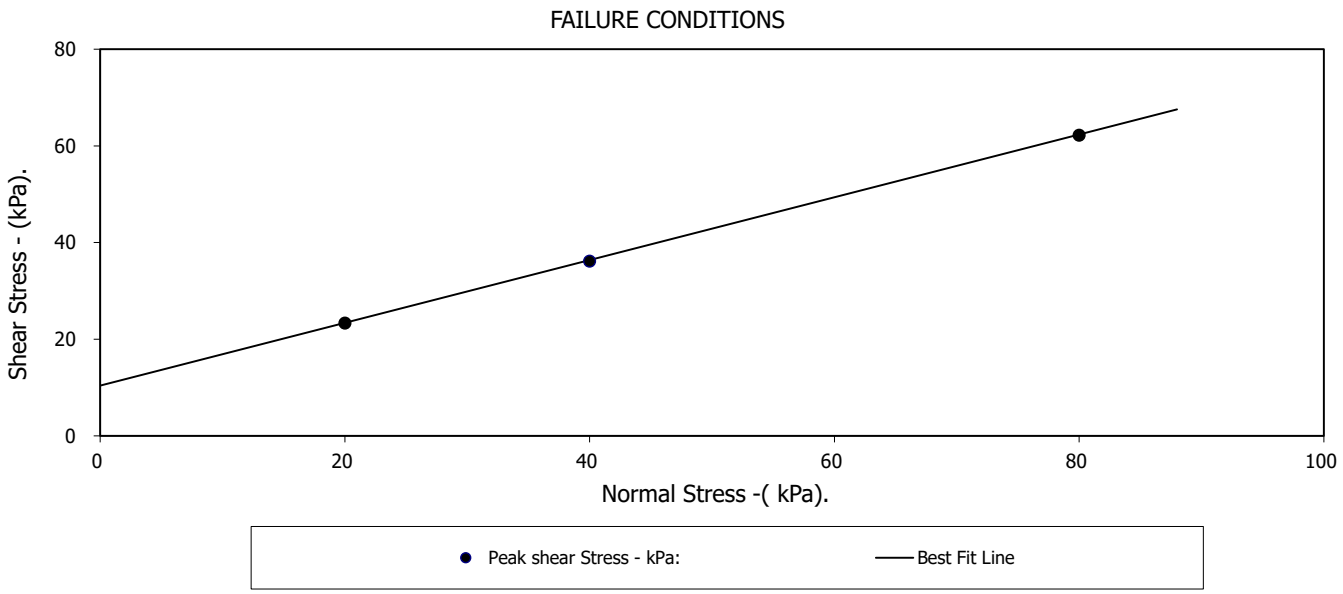
| | | | |
|---|---|---|---|
| Borehole: | WS505 + WS506 | Depth (m) from: | 0.4 + 0.30 |
| Sample Number : | | Depth (m) to: | 0.00 |

| | |
|---|---|
| Sample Type: | B |
| Particle Density - Mg/m3: | 2.65 (Assumed) |
| Specimen Tested: | Submerged, Remoulded material above 2.00mm removed |

Sample Description:
**Black slightly clayey sandy GRAVEL (fine-coarse/angular-subrounded)**

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 23.98 | 23.98 | 23.98 |
| Length - mm: | 60.00 | 60.00 | 60.00 |
| Moisture Content - %: | 8 | 8 | 8 |
| Bulk Density - Mg/m3: | 1.33 | 1.33 | 1.33 |
| Dry Density - Mg/m3: | 1.23 | 1.23 | 1.23 |
| Voids Ratio: | 1.1542 | 1.1486 | 1.1468 |
| Normal Pressure- kPa | 20 | 40 | 80 |
| **Consolidation** | | | |
| Consolidated Height - mm: | 23.89 | 23.56 | 23.23 |
| **Shear** | | | |
| Rate of Strain (mm/min) | 0.625 | 0.625 | 0.625 |
| Strain at peak shear stress (mm) | 4.34 | 5.19 | 5.26 |
| Peak shear Stress - kPa: | 23 | 36 | 62 |

| **PEAK** | |
|---|---|
| Angle of Shearing Resistance:(~~θ~~) | **33.0** |
| Effective Cohesion - kPa: | **10** |

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# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| | | | |
|---|---|---|---|
| Borehole Number: | WS2 | Depth from (m): | 0.70 |
| Sample Number: | | Depth to (m): | 0.00 |

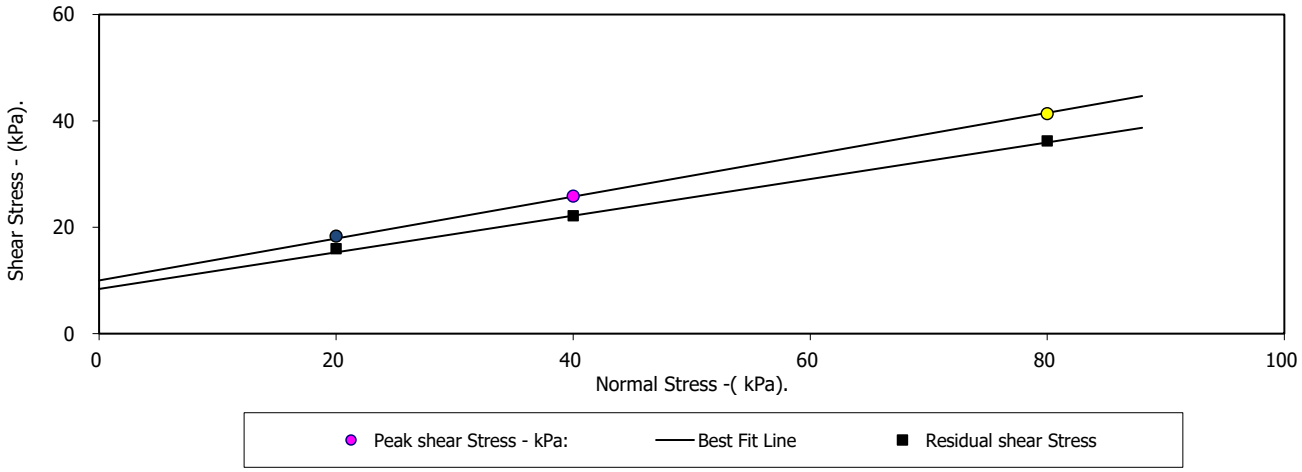
| | |
|---|---|
| Sample Type: D | Remoulded (Light Tamping) material above 2.5mm removed |
| Particle Density - Mg/m3: | 2.65 (Assumed) |
| Specimen Tested: | Submerged |

Sample Description:
**Brown slightly silty slightly gravelly (fine-coarse/angular-subangular) soft CLAY**

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 23.98 | 23.98 | 23.98 |
| Length - mm: | 60.00 | 60.00 | 60.00 |
| Moisture Content - %: | 37 | 37 | 37 |
| Bulk Density - Mg/m3: | 1.77 | 1.78 | 1.78 |
| Dry Density - Mg/m3: | 1.29 | 1.29 | 1.30 |
| Voids Ratio: | 1.0531 | 1.0477 | 1.0451 |
| Normal Pressure- kPa | 20 | 40 | 80 |
| **Consolidation** | | | |
| Consolidated Height - mm: | 23.84 | 23.19 | 22.51 |
| **Shear** | | | |
| Rate of Strain (mm/min) | 0.010 | 0.010 | 0.010 |
| Strain at peak shear stress (mm) | 3.69 | 3.53 | 5.61 |
| Peak shear Stress - kPa: | 18 | 26 | 41 |

| | |
|---|---|
| **PEAK** | |
| Angle of Shearing Resistance:(θ) | **21.5** |
| Effective Cohesion - kPa: | **10** |
| **RESIDUAL** | |
| Angle of Shearing Resistance:(θ) | **19.0** |
| Effective Cohesion - kPa: | **8** |

Failure Conditions

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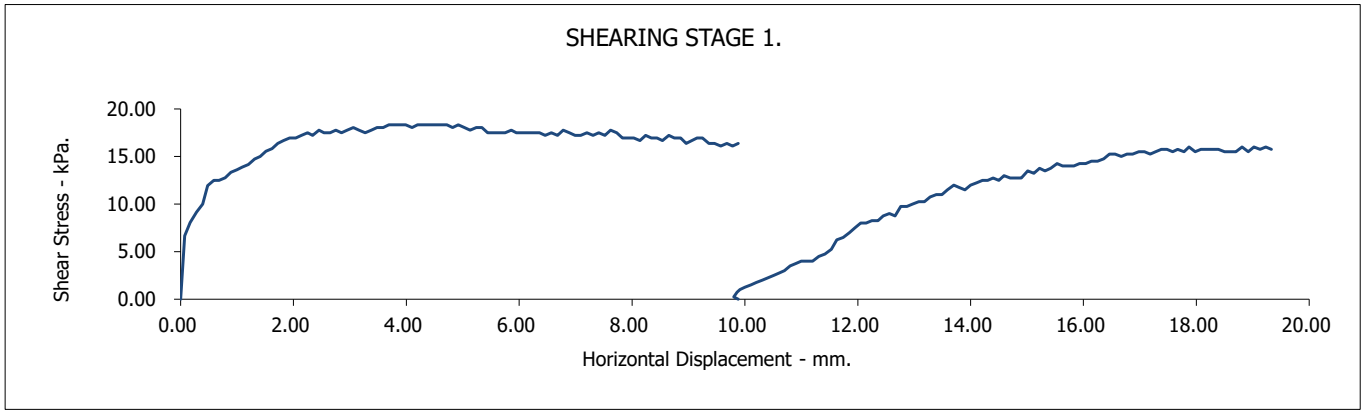
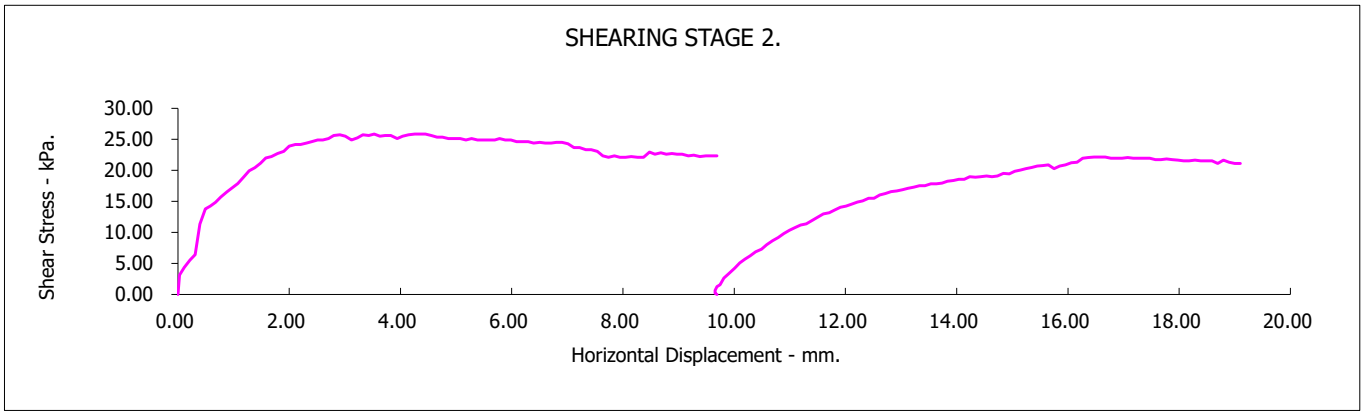
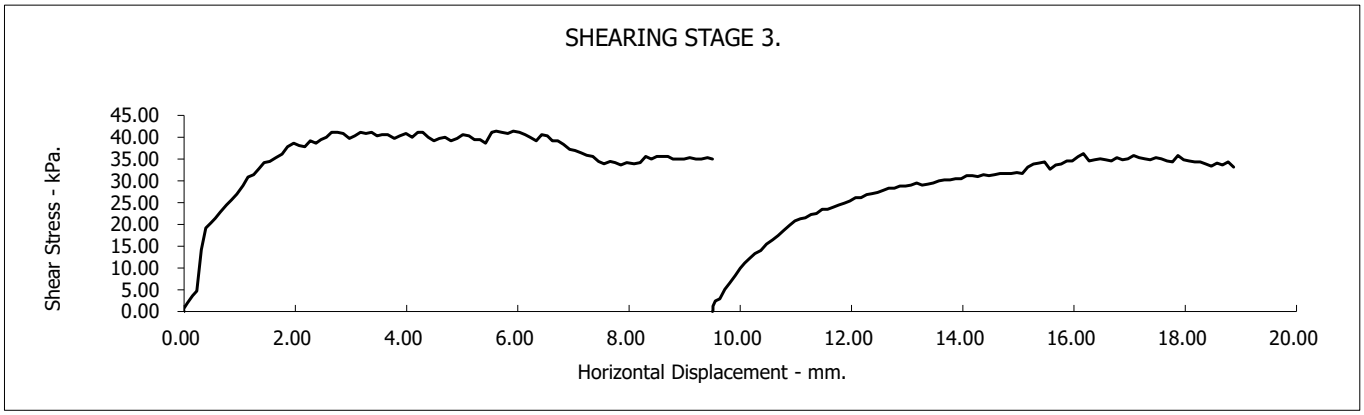
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

Borehole/Sample Number: WS2 Depth (m): 0.70

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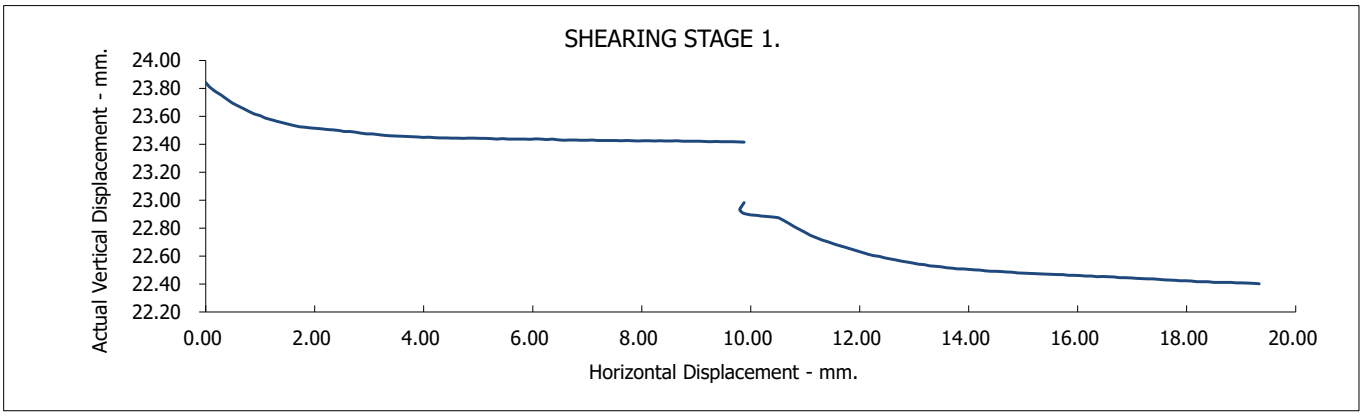
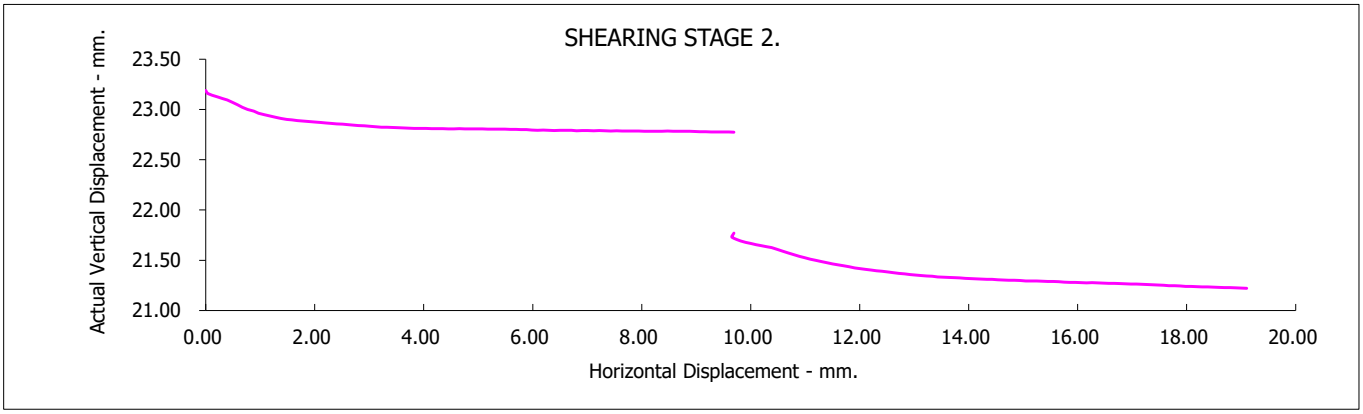
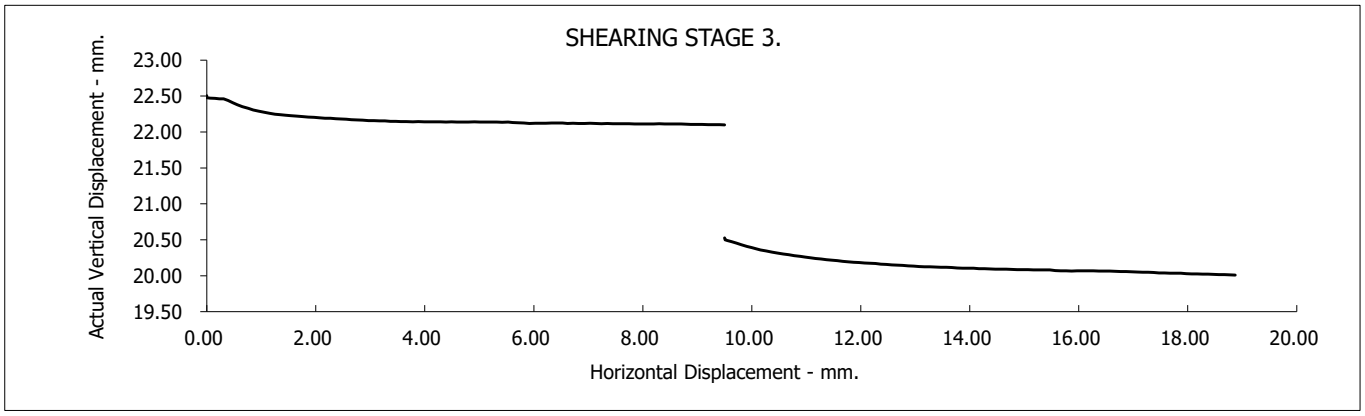
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

Borehole/Sample Number: WS2 Depth (m): 0.70

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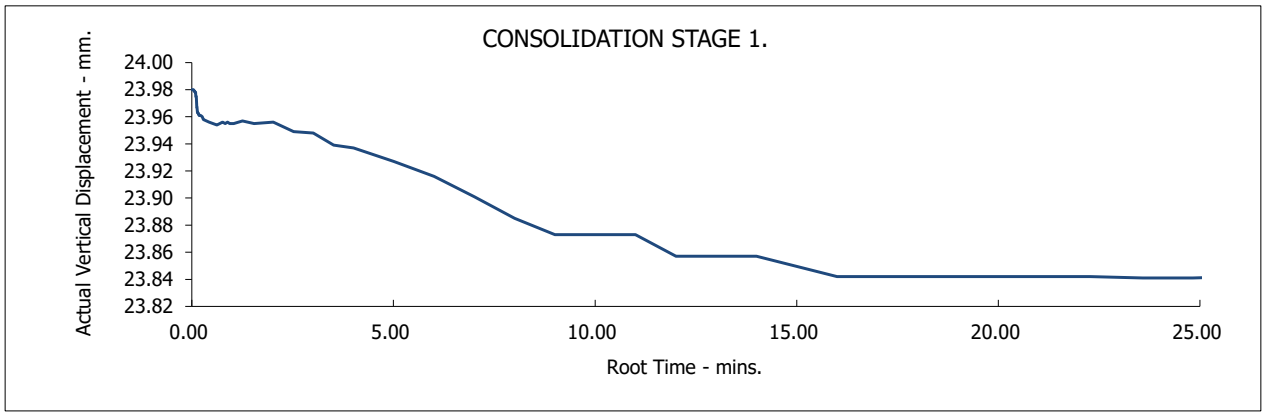
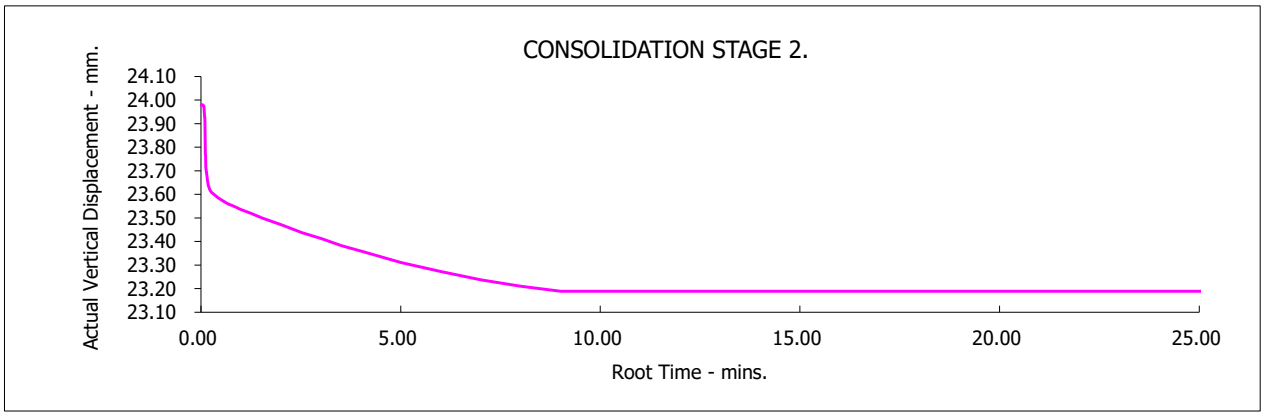
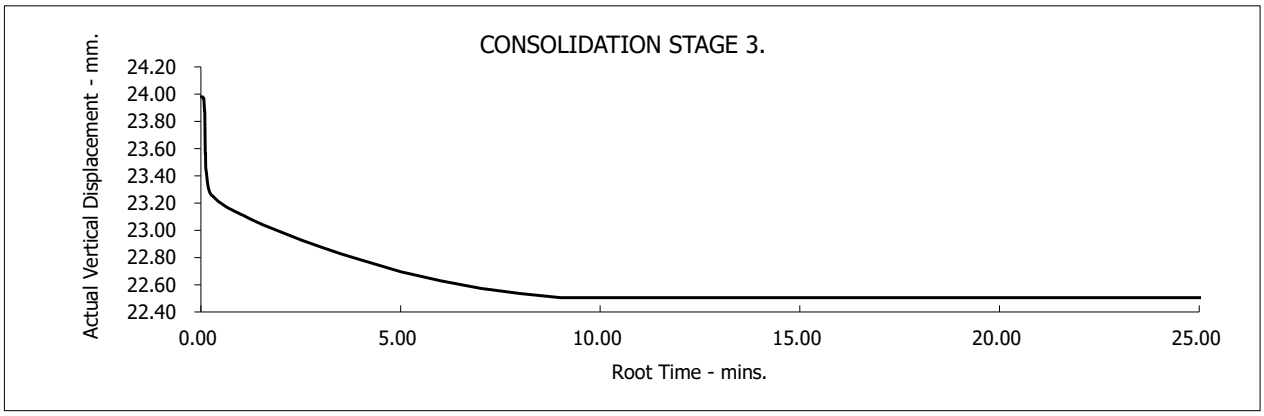
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| Borehole/Sample Number: | WS2 | Depth (m): | 0.70 |
|---|---|---|---|

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# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| | | | |
|---|---|---|---|
| Borehole Number: | WS4 | Depth from (m): | 2.30 |
| Sample Number: | | Depth to (m): | 0.00 |

| | |
|---|---|
| Sample Type: D | Remoulded (Light Tamping) material above 2.5mm removed |
| Particle Density - Mg/m3: | 2.65 (Assumed) |
| Specimen Tested: | Submerged |

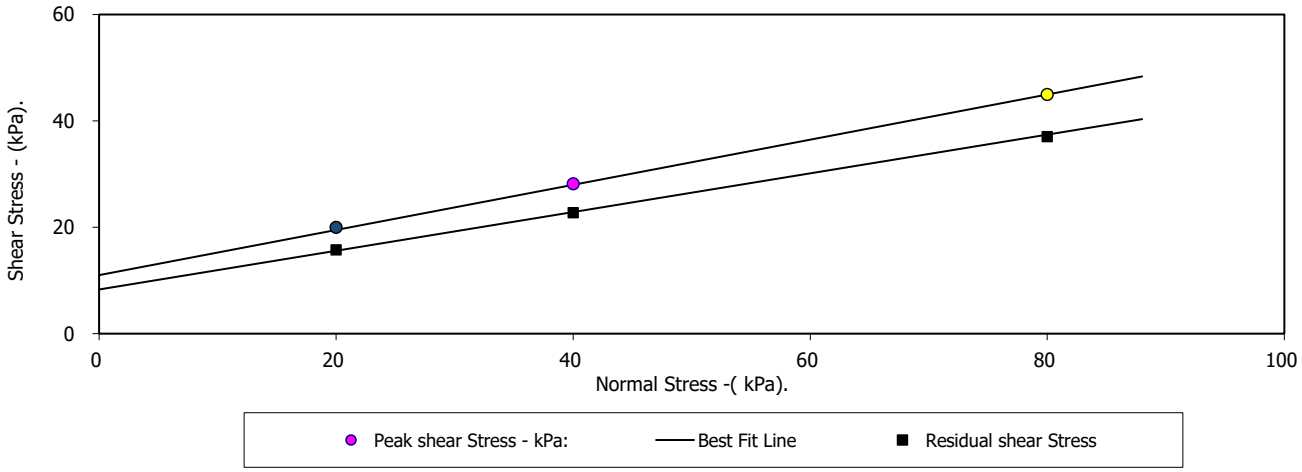
Sample Description:

**Orange brown slightly sandy slightly silty gravelly (fine-coarse/angular-sub angular) soft CLAY**

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 23.98 | 23.98 | 23.98 |
| Length - mm: | 60.00 | 60.00 | 60.00 |
| Moisture Content - %: | 24 | 24 | 24 |
| Bulk Density - Mg/m3: | 1.86 | 1.85 | 1.85 |
| Dry Density - Mg/m3: | 1.49 | 1.49 | 1.49 |
| Voids Ratio: | 0.7762 | 0.7796 | 0.7785 |
| Normal Pressure- kPa | 20 | 40 | 80 |
| **Consolidation** | | | |
| Consolidated Height - mm: | 23.75 | 23.45 | 23.08 |
| **Shear** | | | |
| Rate of Strain (mm/min) | 0.010 | 0.010 | 0.010 |
| Strain at peak shear stress (mm) | 9.21 | 6.47 | 6.22 |
| Peak shear Stress - kPa: | 20 | 28 | 45 |

| | |
|---|---|
| **PEAK** | |
| Angle of Shearing Resistance:(θ) | **23.0** |
| Effective Cohesion - kPa: | **11** |
| **RESIDUAL** | |
| Angle of Shearing Resistance:(θ) | **20.0** |
| Effective Cohesion - kPa: | **8** |

Failure Conditions

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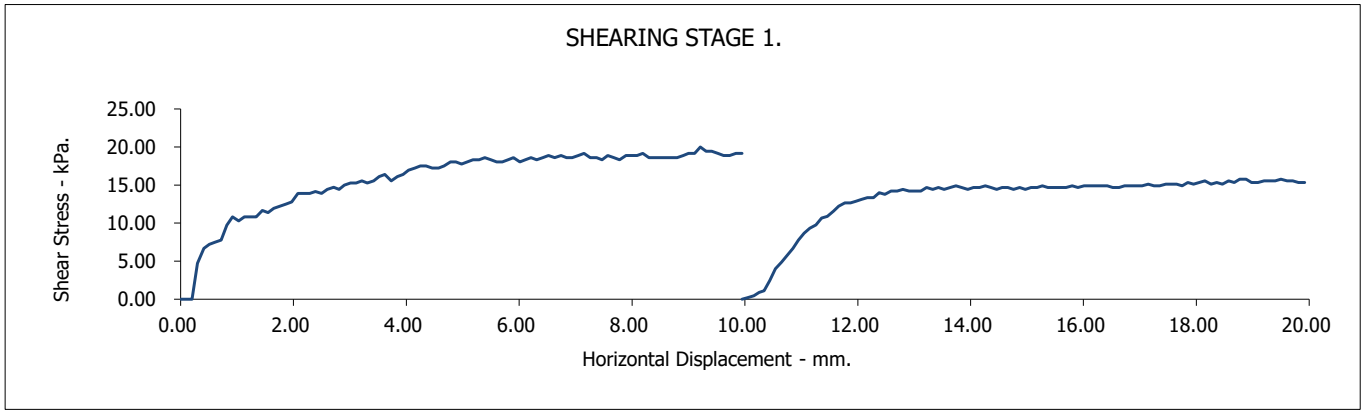
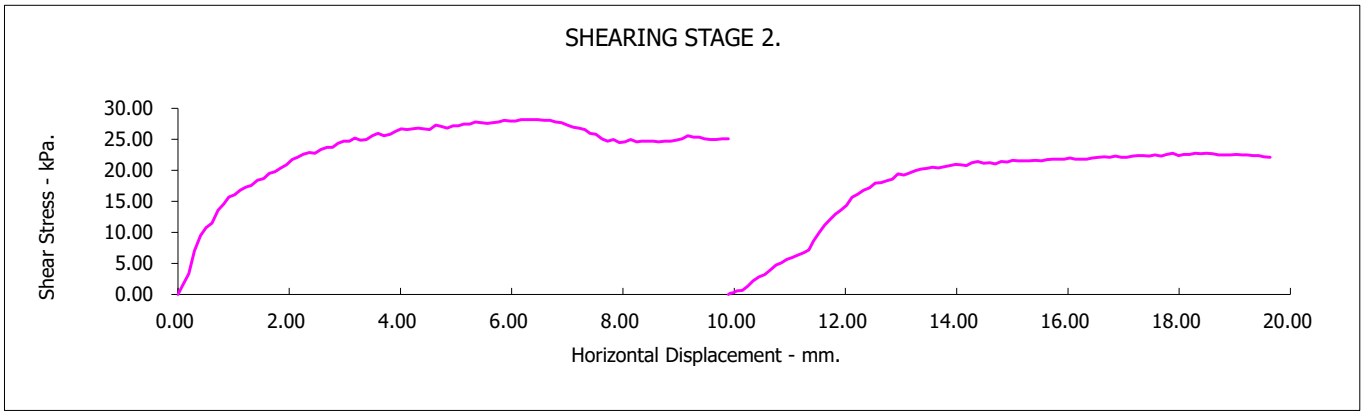
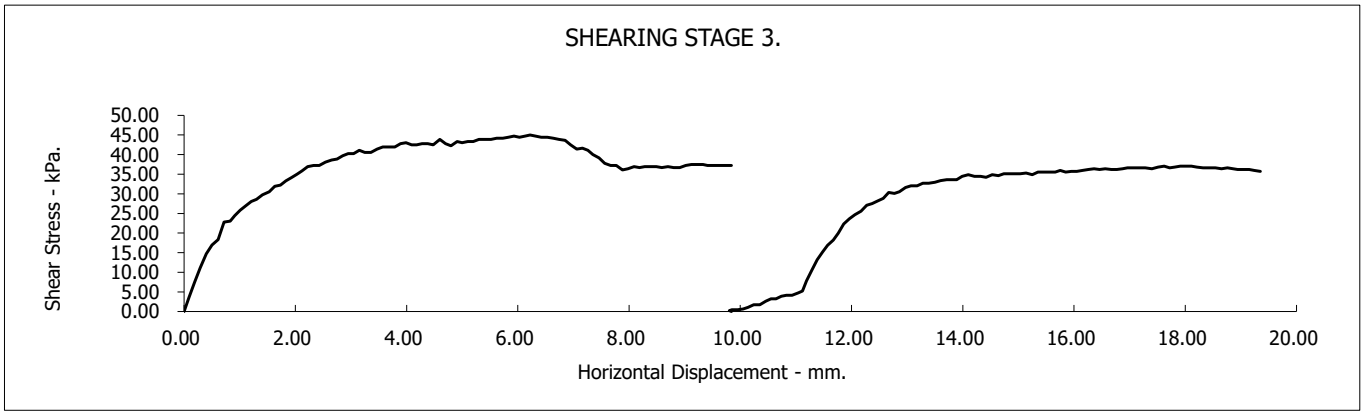
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| Borehole/Sample Number: | WS4 | Depth (m): | 2.30 |
|---|---|---|---|

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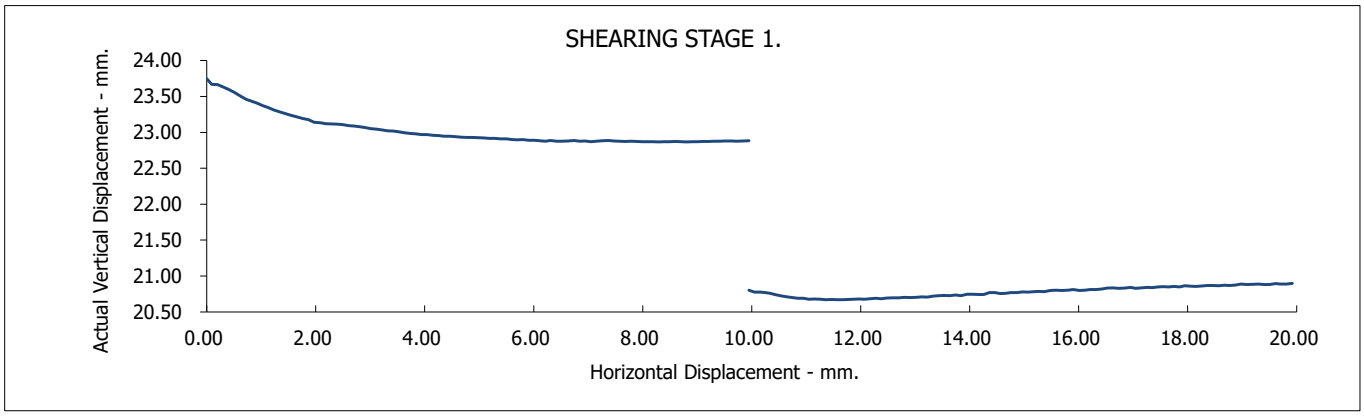
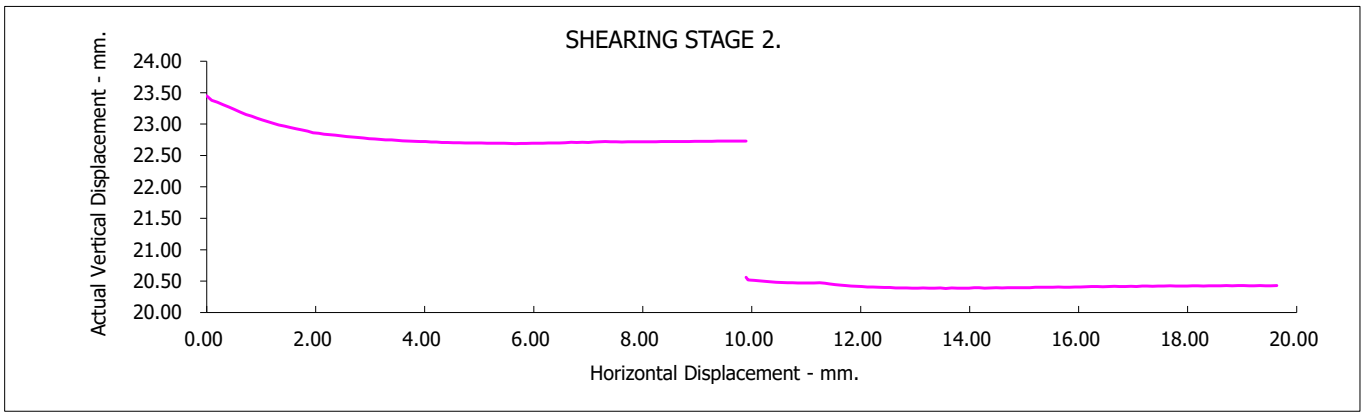
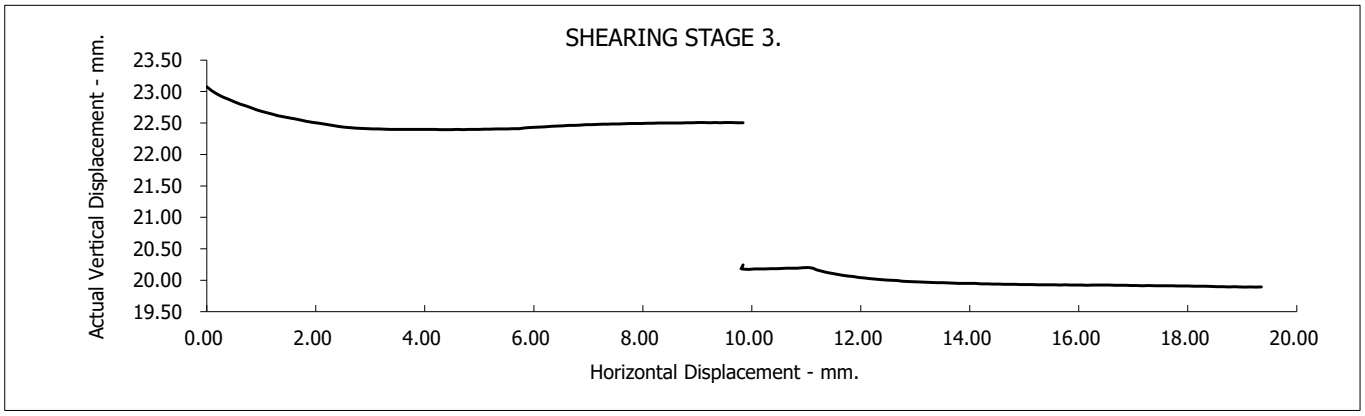
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

Borehole/Sample Number: WS4 Depth (m): 2.30

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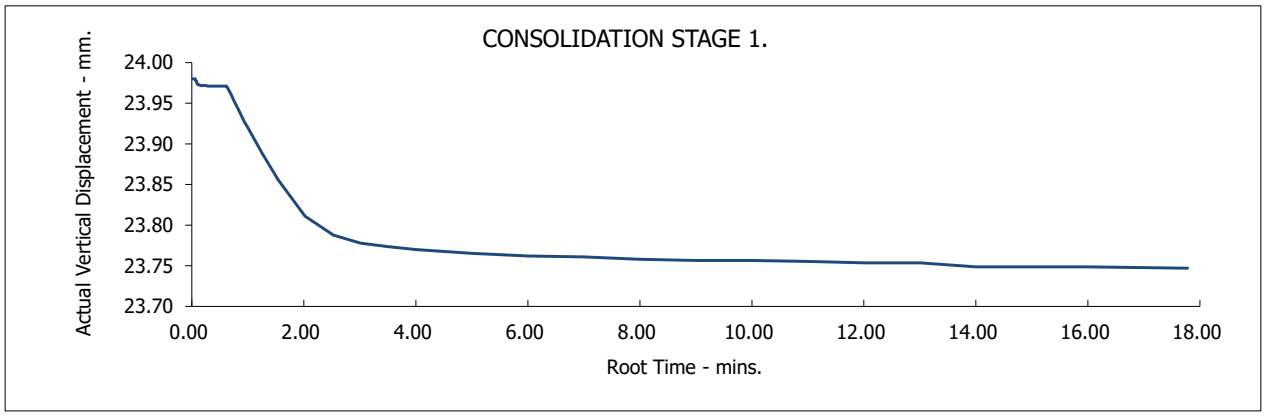
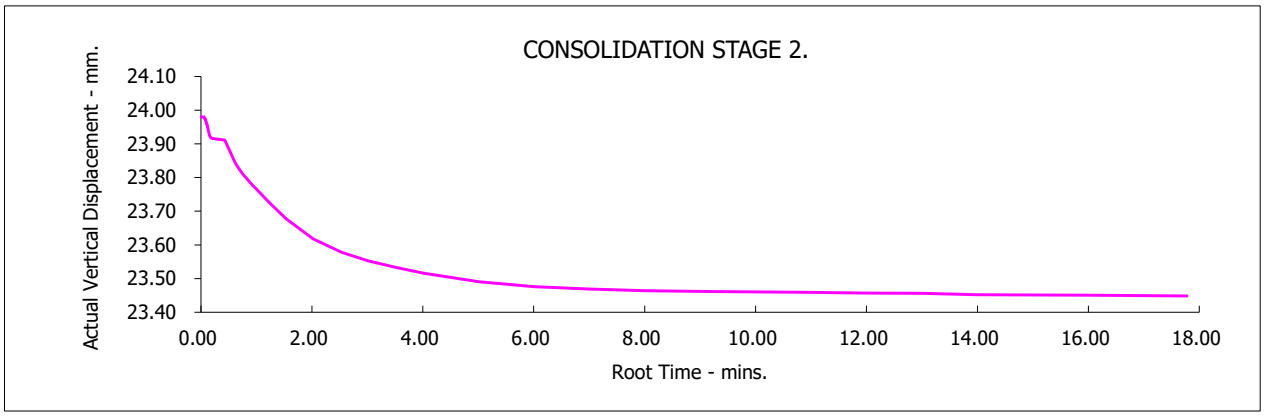
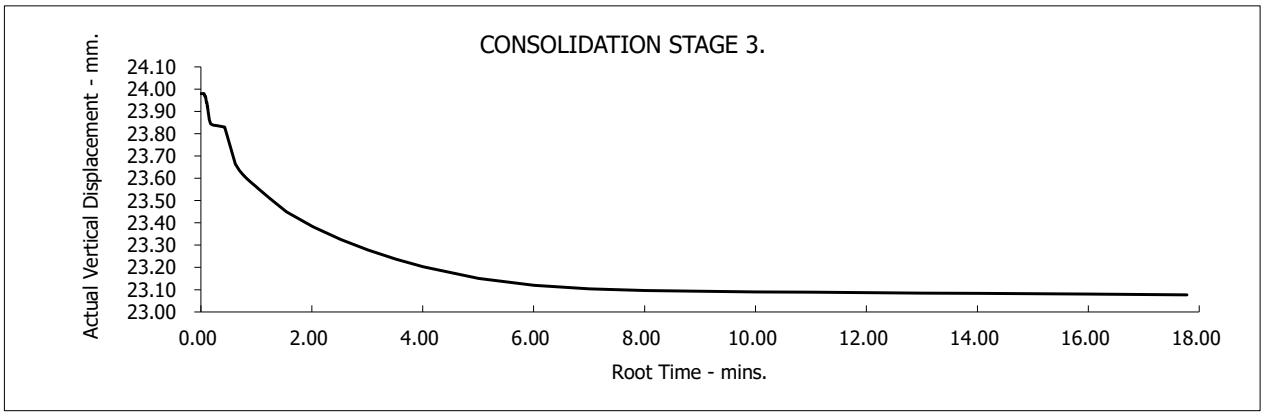
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

Borehole/Sample Number: WS4 Depth (m): 2.30

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# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| | | | |
|---|---|---|---|
| Borehole Number: | WS6 | Depth from (m): | 0.80 |
| Sample Number: | | Depth to (m): | 0.00 |

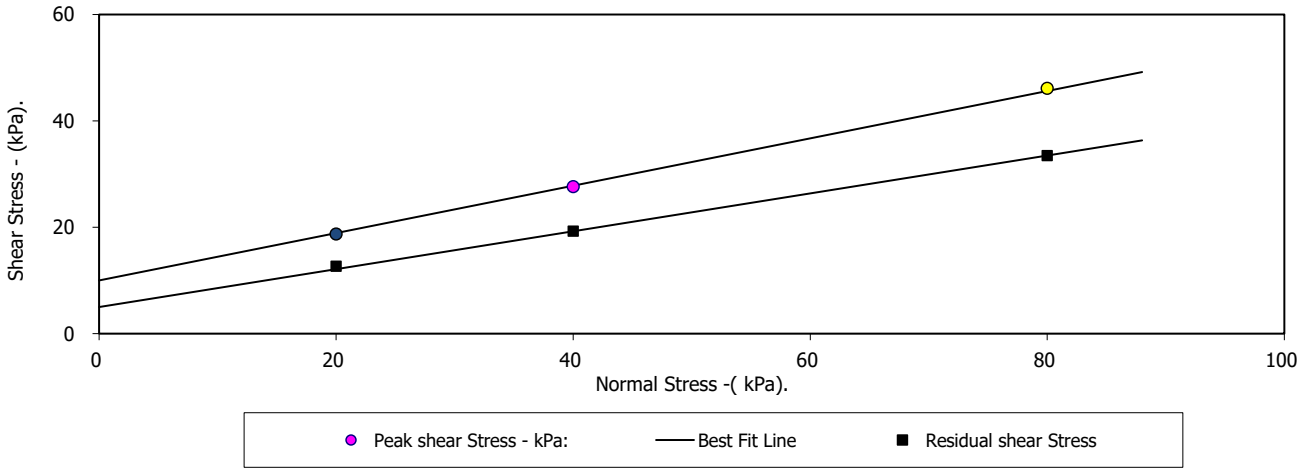
| | |
|---|---|
| Sample Type: D | Remoulded (Light Tamping) material above 2.5mm removed |
| Particle Density - Mg/m3: | 2.65 (Assumed) |
| Specimen Tested: | Submerged |

Sample Description:
**Brown slightly silty gravelly (fine-coarse/angular-subangular) soft CLAY**

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 23.98 | 23.98 | 23.98 |
| Length - mm: | 60.00 | 60.00 | 60.00 |
| Moisture Content - %: | 19 | 19 | 19 |
| Bulk Density - Mg/m3: | 1.91 | 1.92 | 1.91 |
| Dry Density - Mg/m3: | 1.61 | 1.61 | 1.61 |
| Voids Ratio: | 0.6424 | 0.6420 | 0.6429 |
| Normal Pressure- kPa | 20 | 40 | 80 |
| **Consolidation** | | | |
| Consolidated Height - mm: | 23.92 | 23.52 | 23.13 |
| **Shear** | | | |
| Rate of Strain (mm/min) | 0.010 | 0.010 | 0.010 |
| Strain at peak shear stress (mm) | 6.57 | 5.05 | 4.67 |
| Peak shear Stress - kPa: | 19 | 28 | 46 |

| | |
|---|---|
| **PEAK** | |
| Angle of Shearing Resistance:(θ) | **24.0** |
| Effective Cohesion - kPa: | **10** |
| **RESIDUAL** | |
| Angle of Shearing Resistance:(θ) | **19.6** |
| Effective Cohesion - kPa: | **5** |

Failure Conditions

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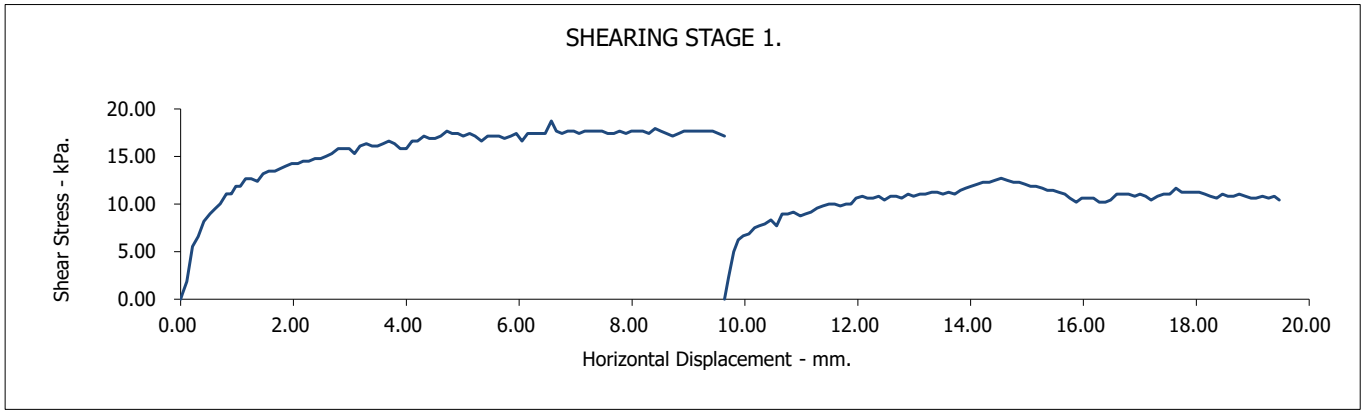
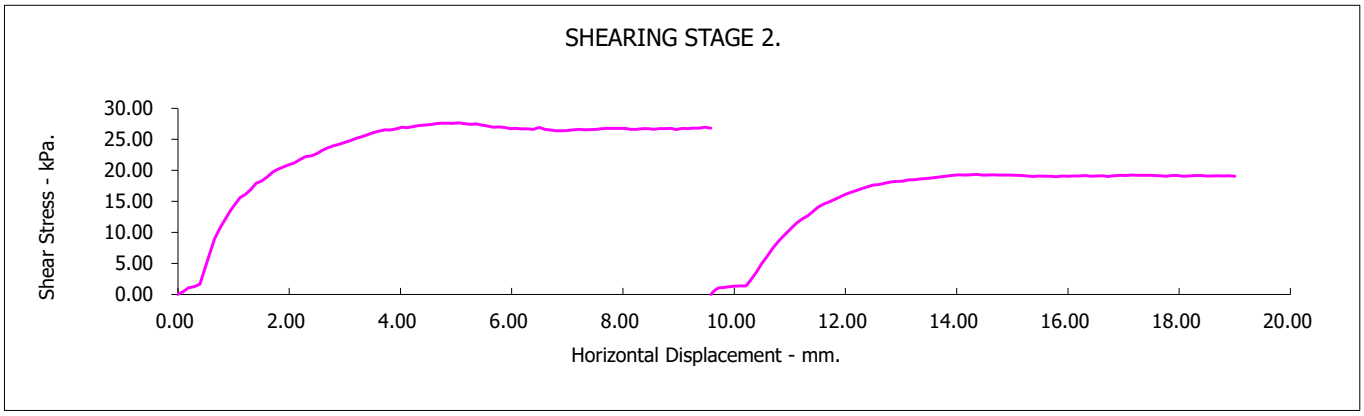
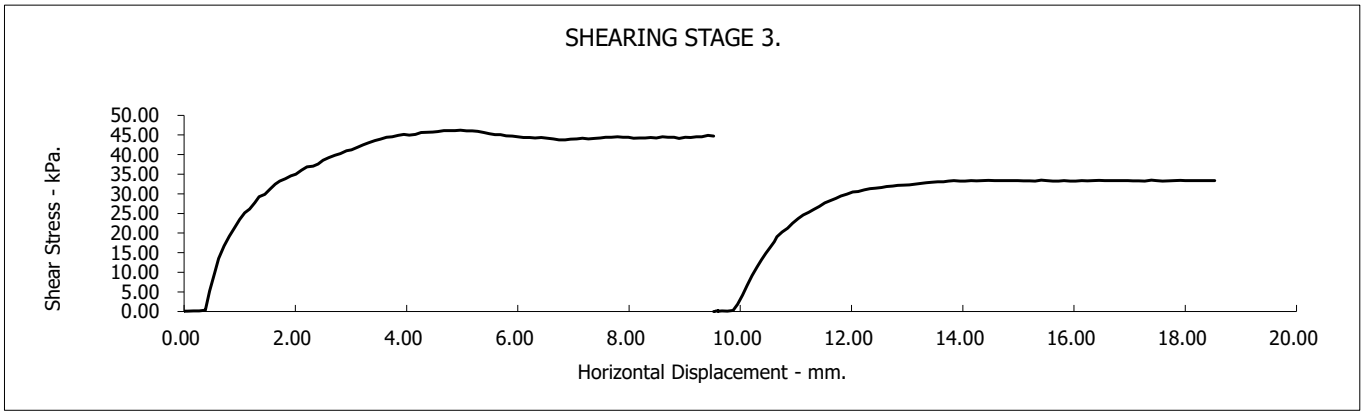
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| Borehole/Sample Number: | WS6 | Depth (m): | 0.80 |
|---|---|---|---|

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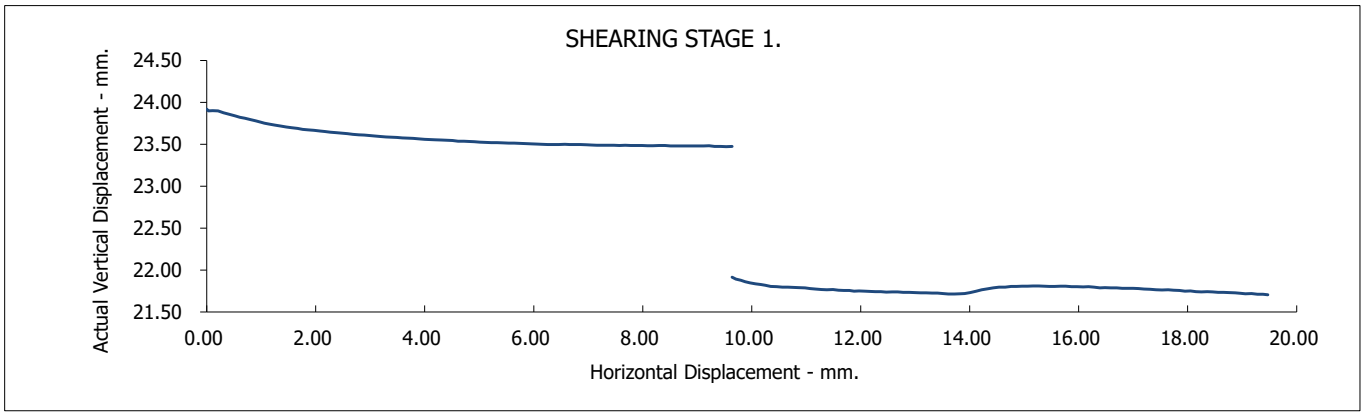
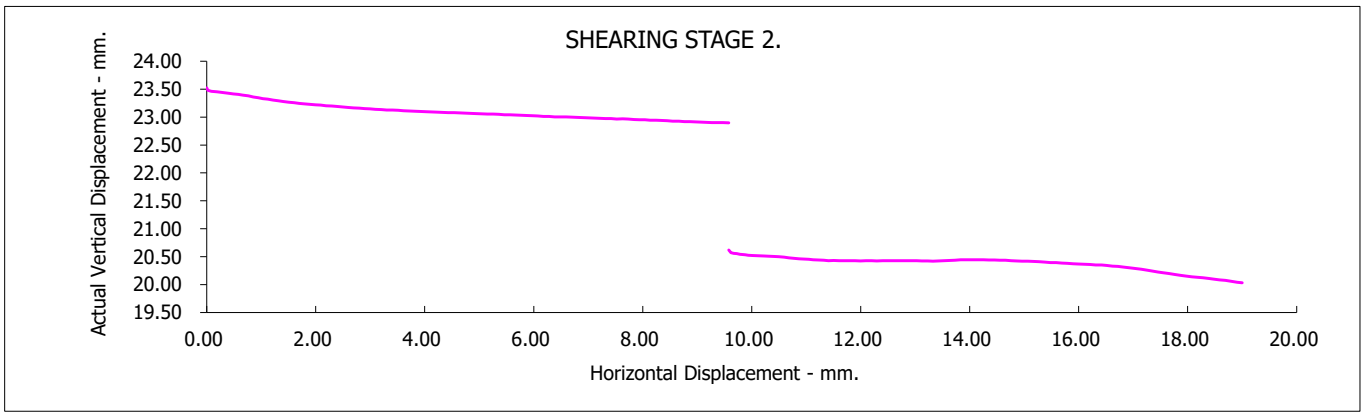
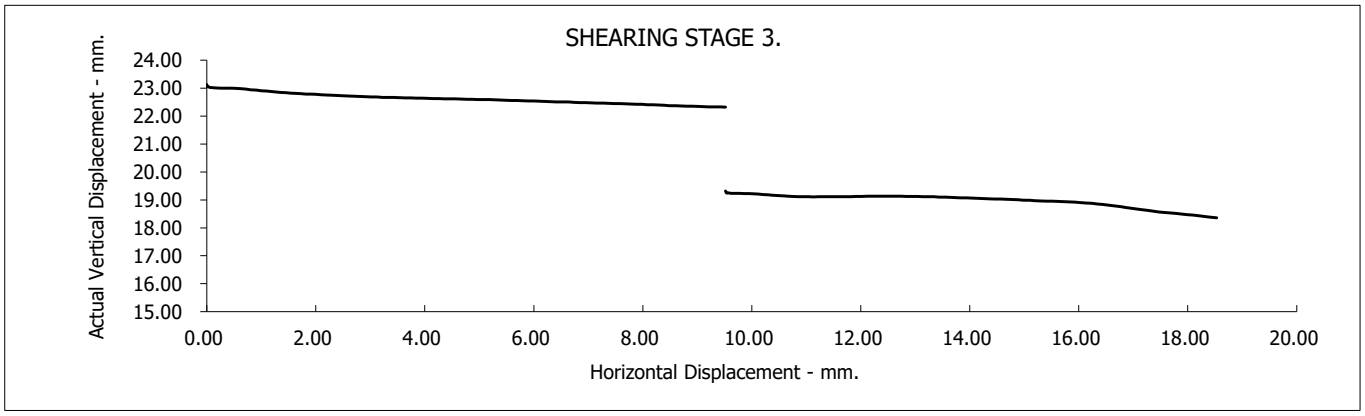
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

| Borehole/Sample Number: | WS6 | Depth (m): | 0.80 |
|---|---|---|---|




**Pantteg, Ystalyfera**

Contract No.:
**37620**

Client Ref Number:
**5859e.08**

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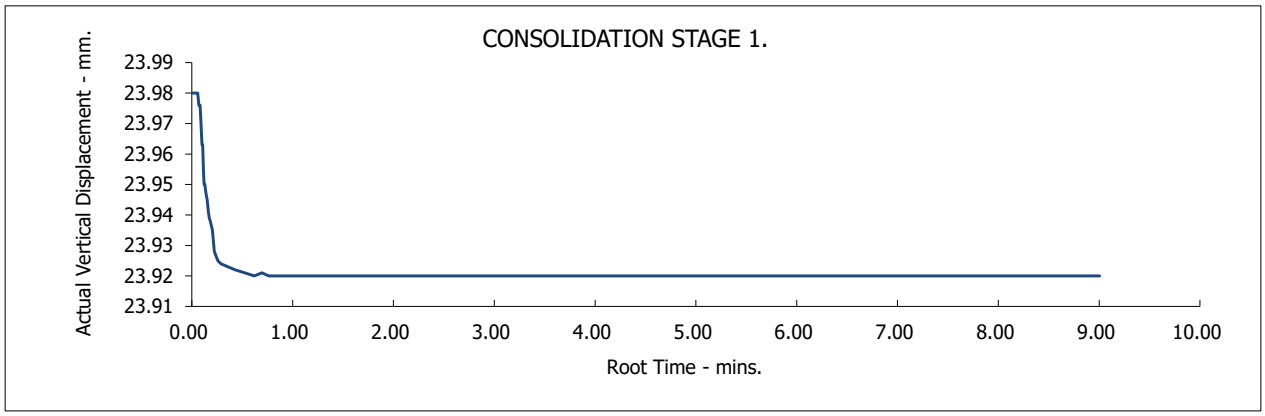
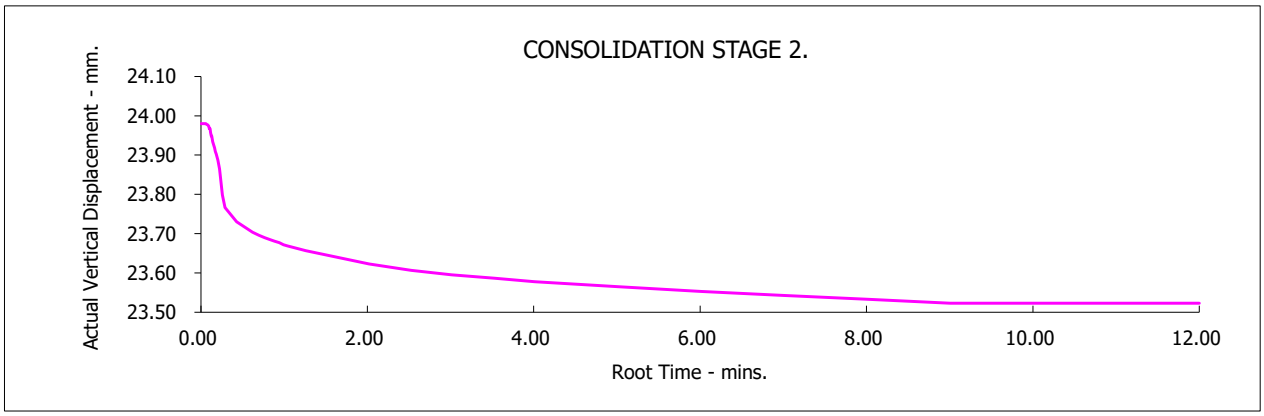
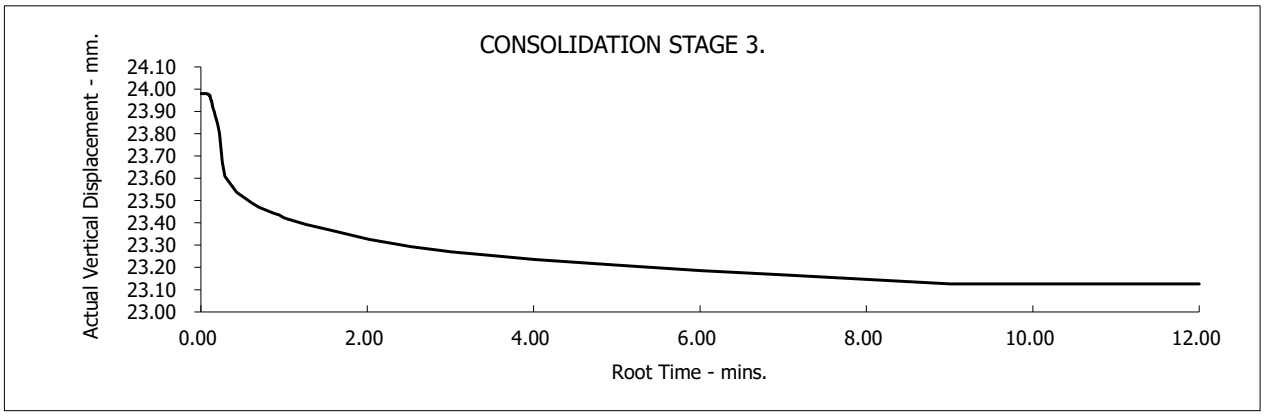
# Test Report: CONSOLIDATED DRAINED PEAK AND RESIDUAL SHEARBOX TEST.

BS1377:Part 7.4.5.5 Shearing: multi-reversal test :1990

Borehole/Sample Number: WS6 Depth (m): 0.80

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