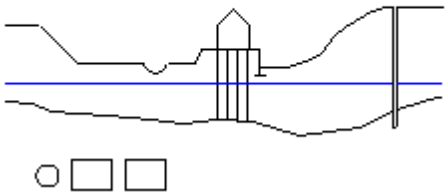
**peter cowsill ltd.**
Consulting Engineering Geologists



*11a Leygate View*
*New Mills*
*High Peak*
*SK22 3EF*
*Tel: 01663 744580*
*peter@petercowsillltd.co.uk*

- **Watford Bridge Ind. Est. Proposed New Unit, New Mills.**
- **Interpretative Ground Investigation Report**
- **November 2015**

| Status | Prepared by | Date |
|---|---|---|
| Draft | P Cowsill | November 2015 |
| Signature |  | |

***Architect:***
SJ Design Ltd
The Old Co-Op
Church Street.
Hayfield
SK22 2JE

***Client:***
GT Electrical
2 Woodside Street
New Mills
SK22 3HF

CONTENTS



APPENDICES

## 1. INTRODUCTION

1.1 *Objectives*

We have been briefed by Architects SJ Design Ltd., on behalf of their client GT Electrical, to conduct an intrusive ground investigation at the Watford Bridge development plot. It is our understanding that the aim of the investigation is to assess ground conditions prior to the construction of a new lightweight industrial unit. This structure is to be built between the existing, modern Unit 8 and the older Unit 5 on the estate. We have not been provided with floor loads or structural loads.

1.2 *Site Description*

The plot lies within the valley of the River Sett which flows around the site to the NW in the form of a meander. The ground slopes generally down to the NW towards the river but the topography has been changed over the years to accommodate a number of buildings. To the SE the ground rises to a disused railway line, now the Sett Valley Trail.

1.2.1 The plot has been raised recently by up to 3m of fill which we understand to have been excavated from the adjacent plot. The ground slopes generally down to the NW so that the adjacent Unit 8 is at the level of the top of the plot. A metalled access road runs along the northern boundary serving a traditionally built brick industrial building to the NW (Unit 5), which is at a lower elevation.

1.2.2 To the south the ground level is lower and the difference in ground level is managed by an informal block retaining wall. The lower ground is part of the external areas of the adjacent industrial unit, operated by Environ, which deals with aspects of landfill gas management. The retaining structure is inadequate for the height difference of up to approximately 3m such that tension cracks are evident within the plot, indicating movement. We understand that the developer considers this retaining structure to be the responsibility of Environ. A site location plan is included in Appendix A.

1.3 *Previous Investigation*

We have been provided with a Phase 1 ground investigation report produced by Sutcliffe Investigations in March 2015. The contents of this report are not repeated here. The recommendations made are essentially that the potential for the presence of shallow coal mine workings should be investigated, along with the potential for contamination associated with past usage of the plot and the Watford Bridge industrial Estate in which it sits. We include 2 No. selected historical maps culled from this report to set the site history in context (Appendix B).

1.4 *Planning*

Planning permission has been granted by the High Peak Borough Council (application No. HPK/2015/0065). The conditions of this consent include a requirement to investigate coal mining issues, by rotary drilling, and contamination issues. The conditions include a requirement for remediation and validation if necessary.

1.5 *Scope of the Works*

1.5.1 The scope of exploratory works, as agreed with SJ Design Ltd originally consisted of 2 No.cable percussive boreholes with follow on rotary open hole drilling, supported by machine dug trial pits to explore historic features and recover samples for chemical testing. In practice the site had been raised with fill materials such that trial pitting would not be sufficiently deep to assess the original ground conditions and features to a useful extent. It was realised prior to commencement that a piled solution would probably be necessary due the thickness of made ground. Therefore, an additional cable percussive borehole (BH2) would be valuable to provide parameters for pile design over a sufficiently large area of the site including the NW end where the former Mill race might be present. Positions of the boreholes are shown in Appendix C.

1.5.2 Samples were retained from the cable percussive boreholes for soils laboratory testing and for chemical analyses of the made ground.

1.5.3 Rotary open hole drilling was undertaken in BH1 and BH3 from the base of each cable percussive borehole. Water flush was used in accordance with the requirements of the Coal Authority. Prior permission was obtained from the Coal Authority for the drilling work (Appendix E).

1.5.4 Upon completion of the exploratory holes the samples were removed from site and sent for laboratory testing.

## 2. PUBLISHED GEOLOGY

2.1 The geology was reported in the Phase 1 report and was confirmed by our own inspection of the British Geological Survey maps:

| Sheet No. | Name | Scale | Survey date | Layer |
|---|---|---|---|---|
| 99 | Chapel-en-le-Frith | 1:50,000 | 1948/61 | Solid |
| 99 | Chapel-en-le-Frith | 1:50,00 | 1948/61 | Drift |

Table 1

2.2 *Made Ground*

The BGS map show that this area is free from mapped made ground.

2.3 *Drift Geology*

Alluvium is mapped on the site with Glacial Till on either side of the valley, which might suggest the presence of Glacial Till beneath the alluvium.

2.4 *Solid Geology*

The solid geology is mapped as strata belonging to the Westphalian A, Coal Measures which comprise a sequence of mudstones, sandstones and coal seams. More specifically the estimated position of the Red Ash coal seam shows it sub-cropping beneath the drift on the industrial estate immediately SW of the proposed structure. Sandstone is anticipated below the seam and argillaceous rocks above it. The seam dips to the NE such that its depth would be expected to be greater in BH3 than BH1, the seams in this area being normally less than 1.0m thick.

2.5 *Online Data*

The BGS online resources sometimes yield more up-to-date terminology and mapping. This source of data indicates a culvert discharging to the River Sett with a mix of surface water and mine drainage from the Ollersett Mine adit next to the A6015 Hayfield Road. The online mapping is in agreement with the 1:50,000 sheets.

## 3. FIELDWORK

3.1 The fieldwork was undertaken between 22nd September 2015 and 27th October 2015. Initially this consisted of 3 No. cable percussive boreholes. This type of drilling rig progresses boreholes by recovering soil in cable tools, such as a shell or clay cutter, and advancing casing as the boring progresses. Samples are recovered either as small disturbed samples, larger bag samples, or relatively undisturbed U100 samples; obtained by driving a 100m internal diameter sample tube into the base of the borehole and withdrawing it with the sample trapped inside. Insitu standard penetration tests (SPTs) are also conducted to assess

the density of the soils insitu. This involves driving a 37.5mm split spoon sampler with a standard drop hammer for 450mm in 75mm increments with the blow counts recorded for each stage. The blow counts for the first 150mm are ignored as seating blows, and the numbers of blows used to drive the remaining 300m are recorded as the “N” value.

3.2 The depth of BH1 reached 16.9m BGL having passed through 3.2m of Made Ground followed by 1.3m of very low strength clay to 4.5m depth. At 4.5m the strength increased substantially and this is thought to be the boundary between alluvium and Glacial Till. The Glacial Till persisted to 16.3m where mudstone was identified and interpreted as insitu. Water was encountered at 13.2m, rising to 2.1m in 20 minutes, and reaching a maximum of only 0.2m below ground level.

3.3 Rotary open hole (unsampled) drilling was then used to continue the borehole to a depth of 27.6m. No broken ground was observed and no flush loss experienced.

3.4 BH2 was progressed through 4.4m of Made Ground, which consisted mainly of clay; a further 2.3m of ground comprising mainly sand was encountered and which was also suspected of being Made Ground. Between 6.7 and 8.7mBGL firm gravelly clay was proven and considered to be Glacial Till. This was followed by Laminated Clay with silt partings and low gravel content, probably of Glacial Lacustrine origin. After a further 1.0m of Glacial Till, sandstone was found at 12.5m depth and proved to 13.62m. Water was first struck within the suspected Made Ground at 3.8m depth

3.5 The final cable percussive borehole, BH3, identified Made Ground to 5.8m before Glacial Till to 10.7m depth. 4.0m of Laminated Clay also thought to be Glacial Lacustrine origin, took the hole to 14.7m, where water was struck, and Glacial Till encountered and penetrated by 16.4m when it gave way to gravel and cobbles. Rock was identified at 17.3m and could only be productively drilled for a further 0.3m. Water rose to a maximum level of 0.6m below ground level suggesting that prior to the placement of the Made Ground the water at depth would have been flowing artesian.

3.6 Rotary follow on drilling took this borehole to a final depth of 28m without identifying any broken rock or experiencing any loss of flush. The rock was described as sandstone and mudstone by the driller.

3.7

| | Depth to boundary (m) | | |
|---|---|---|---|
| | Base of Made Ground | Base of Drift | Base of Hole |
| BH1 | 3.2 | 16.3 | 27.6 |
| BH2 | 6.7 | 12.5 | 13.62 |
| BH3 | 5.8 | 17.3 | 28 |

Table 2.

3.8 Following drilling, standpipe piezometers were installed in BH1 and BH3. These were fitted with gas taps to allow monitoring of ground gases. The response lengths were 1.0m to 9.9mBGL in BH1, and 18.3 m to 28mBGL in BH3.

3.9 After the investigation the standpipe piezometers were monitored for gas and groundwater levels on three occasions. The full results are given in section 7 below.

3.10 The fieldwork was completed in general accordance with BS1377, Methods of Test for Soils for Civil Engineering Purposes, 1990, and BS5930, Code of Practice for Site Investigation, 1999. Samples were logged in general accordance with BS EN ISO 14688-1:2002 / 14689:2003.

3.11 The position of the exploratory holes is shown Appendix C. The logs of the boreholes are in Appendix D.

## 4.0 LABORATORY TESTING

4.1 *Soils Laboratory testing*

The testing was undertaken at Professional Soils Laboratory Ltd, a UKAS accredited laboratory, with tests being conducted according to BS 1377.1990. Testing comprised:

- 3 No. Atterberg limits tests to determine plasticity of example soils.
- 3 No. quick undrained multistage triaxial tests.
- 4 No. Particle size distribution tests.

4.2 *Chemical Analyses*

Analyses were conducted at Jones Environmental Laboratory, also a UKAS accredited facility, at Deeside.

4.3 The results of the soil laboratory testing are included in Appendix F and the chemical analyses in Appendix G

## 5.0 GEOTECHNICAL COMMENT

5.1 *Foundations*

5.1.1 The foundation options for this site are complicated by a number of factors:

- The presence of Made Ground above the level of surrounding ground.
- The low strength of the upper layers of natural ground.
- The variable depth to rock head.
- The poor bearing capacity of the alluvial soils.

5.1.2 The Made Ground is not suitable for foundations due to the lack of compaction, and variability in the nature and density of the material. Methods of improving such poor ground are available but the small scale of the site, its elevated position, and the presence of a retaining structure all render these methods more difficult and likely to be uneconomic.

5.1.3 The existing retaining structure between the plot and the adjacent Environ site is constructed of interlocking concrete blocks and is not suitable for the height and nature of ground retained. The wall is leaning and tension cracks are present sub-parallel to the wall indicating that failure has commenced. Any further loads imposed on the ground would destabilise the structure further. It is suggested that the retaining wall be replaced with a properly designed wall prior to the commencement of any works. It is understood that the current scheme calls for the floor slab to be at the ground level of the E end of the plot in order to coincide with the access road level. The floor level of the building increases in height above the access road along the N side towards the river. The existing side slopes of the raised ground are steep and in the long term are likely to be unstable. It will, therefore, be necessary to either regrade the side slopes to angles of approximately 20 degrees or to construct retaining structures along the northeast and northwest sides of the proposed building as well as to replace the existing retaining walls..

5.1.4 In order to assess the improvement in ground quality with depth the results of Standard Penetration Tests and triaxial tests have been plotted against depth, see Appendix H. “N” values from SPT tests can be approximately compared to shear strength by multiplying the “N” value by a factor of 5 (Stroud and Butler). The SPT tests in the rock were unable to penetrate to the full test depth and, where blow counts exceed 50, these are taken as refusals.

5.1.5 The SPT tests show a very wide scatter of results such that, at any depth, the range of values is around 20, translating to approximately 100kPa variation in shear strengths.

5.1.6 It will be necessary to transfer foundation loads down to the natural ground. This could be achieved by piling, of which there are three broad options are available - these include vibro-stone columns, driven piles and bored piles.

a) Vibro stone columns involve relatively heavy plant and the target depth for the columns would be difficult to define due to the varying depth of made ground and the variable quality of the alluvial soils. The retaining walls needed to support the ground would also have to be capable of resisting the vibration induced by the vibroflot. A substantial piling mat would be needed to provide a safe working area for a vibro-piling rig.

b) Bored piles would provide a satisfactory technical solution with the advantage that they could be taken down to the rock at the varying depths across the site and would be of high capacity. The equipment required to install bored piles can also be relatively light and vibration free. The greatest disadvantage is the cost of the piles. This leads to the use of a small number of piles at structural nodes with loads being transferred to the piles by spanning. This inevitably leads to increased structural costs in the floor construction and might only be technically viable if floor loads are expected to be light. If bored piles were used it would be reasonable to take all piles to rock to provide relatively consistent settlement properties.

c) Driven piles would be viable but generally it is preferred that all the piles for a structure will be founded in similar material. It is not ideal for loads to be taken onto rock at one end and terminate in the Glacial Till elsewhere, as this can lead to differential settlement. Piles could all be taken to rock but this would involve some hard driving through Glacial Till and, potentially, gravel and cobbles. With piles up to 18m long driving forces will be higher as will mast height; this larger plant would require a more robust piling mat to eliminate the risk of rig toppling. This method would produce high capacity piles and, in a similar manner to the bored pile option, would call for fewer piles and greater structural spans. Another option would be to adopt relatively small diameter and short, say 10m, piles, all terminating in the drift deposits. This would require a greater number of piles and allow a piled raft of light construction since spans would be less. Even if loads are anticipated to be low a higher floor capacity might add value to the building if sold in the future. Another advantage of driven piles is that they may be driven to a “set”, consisting of the amount of penetration per blow with the piling hammer, and which gives reassurance that the required capacity has been realised, particularly if backed up by dynamic testing. This method should be subject to a minimum length to ensure that piles do not stop on obstructions with poor ground present beneath. A further advantage of the piled raft approach is that deviation of piles due to obstructions are more easily dealt with

as less precision is required than for piling at structural nodes. The driven pile approach does not generate any spoil for removal.

5.1.7 *Pile Capacities*

Piles taken down to rock, whether as driven or bored piles, are likely to be limited by the structural capacities of the piles rather than the ground. For piles driven into the drift deposits it will be necessary to assume a ground model. Taking the worst case conditions where Made Ground is thickest, the following model could be used for design:

1. 0.0m - 6.7m Made Ground cu = 0.0 kPa (nominal)
2. 6.7m - 10m Glacial Till average cu =100 kPa
3. 10m - 12.5m Glacial Till cu =120 kPa
4. 12.5 - 17.3m Rock.

The Made Ground, in this case, is not suitable as a formation but is not expected to settle significantly in the future without application of further load. It does not contain significant organic material and minimal risk of consolidation settlement due to groundwater lowering is perceived. It is not, therefore, considered necessary to allow for negative skin friction being applied from these soils. It is considered reasonable to assume no positive skin friction. If we assume piles are only taken to 10m, then a 250mm driven steel pile with a circular section could be expected to have an allowable bearing capacity of 104kN, and a square 250mm, section concrete pile could accommodate an allowable load of 132.5kN. These estimates are conservative as they assume no contribution from any of the Made Ground, whereas, in practice, the deeper made ground would be expected to contribute a small positive skin friction. Driving test piles to a set might prove that greater capacities are feasible thereby reducing the number of piles needed. Driven piles would be less likely to generate problems, due to the artesian water levels that are found in the natural drift and rock, than would be the case with other methods.

5.2 *Mining*

5.2.1 No recent mining activity has been active in this area with the most recent activity near the Thornsett Primary School where old adits were reworked during World War II. These workings were in the hillside above the Sett Valley. Old workings are normally by partial extraction rather than long wall mining. Rooms and roadways, therefore, can remain open for a very long time before gradually collapsing, which the produces upward migrating cavities that can appear at surface in the form of crown holes. It is considered highly unlikely that coal workings would be present beneath the plot since, in this area, the coal workings tend to be found in the hillsides rather than the valley bottoms and were mainly small concerns by mining standards. The shallow workings would have been difficult to work beneath the substantial thickness of drift. It would have been a high risk operation to work shallow seams in the

valleys even if accessed from the valley sides and if the deeper seams were worked then risk of subsidence would be minimal. For the same reasons the presence of shafts beneath the site is considered to be very unlikely.

5.2.2 The rotary drilling did not intercept any coal seams or mining voids within the 10m of rotary drilling. As an approximate guide; if a coal seam is covered by rock ten times the seam thickness the migration of collapsing voids would not be expected to reach surface. In this case seam thicknesses are below 1m and, therefore, no risk of crown hole development is present.

5.3 *Concrete in Aggressive Ground*

In order to assess whether or not this ground is liable to be aggressive towards buried concrete, 5 No. samples have been subjected to chemical analyses. The results of these are reproduced in Appendix G within the chemical analyses. The soluble sulphate and pH test results are summarised in Table 3.

| | **Depth (m)** | **Soluble sulphate mg/l as SO4** | **pH** |
|---|---|---|---|
| BH1 | 2.5 | 129.8 | 8.28 |
| BH1 | 2.45-3.0 | 313.5 | 8.28 |
| BH2 | 1.45-2.0 | 131.4 | 9.38 |
| BH3 | 1.45-2.0 | 202.6 | 7.78 |
| BH3 | 14.7 | 10.72 | 7.51 |

Table 3.

The results of these tests were compared to guidance published in the BRE SD1 (Building Research Establishment – Special Digest 1). Based on the results above an appropriate Design Sulphate (DS) class of DS-1 is obtained and Aggressive Chemical Environment for Concrete (ACEC) class of AC-1 or AC-1s if the groundwater can be considered static.

## 6. ENVIRONMENTAL

6.1 The planning condition 7 calls for a risk assessment of the nature and extent of any contamination. In accordance with CLR11 “Model Procedures for the Management of Land Contamination, this requires:

- An assessment of the scale and nature of contamination.
- An assessment of the risk to various receptors.
- Proposals for remediation if required.

The system involves the identification of a contaminated source, a route by which contamination can travel and a receptor.

6.2 At this site the Phase 1 study identified potential sources of contamination, these included filled ground, heating systems, a Mill Race, and unknown previous industrial use on the site. Land adjacent has been identified as including an engraving works, print works, tanks, and a saw mill.

6.3 The relevant legislation is the Environmental Protection Act 1990, for which new statutory Guidance was issued in 2012. The first stage in the risk assessment process is to identify whether or not contamination is present. In the absence of contamination the pathway and receptors cease to be relevant. Chemical analyses have been conducted on five samples from the boreholes. The results of these analyses are tabled in Appendix G. The results of these analyses are then compared to published parameters and, if contamination is found, a site specific assessment of contaminant levels might be required. Guidance has evolved since the 1980's and is available in the form of soil guidance values (SGV) published by the Environment Agency and based on specific toxicological data and assumed uptakes.

6.4 The CLEA protocols were also used in the Generic Assessment Criteria (GAC) which included a greater number of contaminants than were available in the SGVs. More recently a DEFRA research project (SP1010), has developed another set of guidelines known as the Category 4 Screening Levels (C4SL). These remain conservative but set slightly higher concentrations of toxins than the SGV and GAC values, using the description "low risk of toxicological concern" rather than "significant possibility of Significant Harm" which had previously been used for SGV derivation. This document only addressed 6 No. substances. For all of these sets of guidance different land uses are considered, including residential, allotments, public open space and commercial. A Tier 1 assessment compares these guidance values with results of chemical analyses to determine whether or not a contamination risk is present.

6.5 The appropriate SGV, GAC and C4SL guidance levels are reproduced with the analyses in Appendix G. None of the determinands exceed these criteria. This Tier 1 assessment shows that the site does not constitute contaminated land. As no source is present the potential pathways and receptors require no further consideration from the human health perspective which is normally the limiting receptor.

6.6 Although it is not necessary to consider pathways, it is, however, worthy of note that the proposed scheme will cover most of the land which is currently exposed with impermeable cover, thereby reducing potential contact by receptors to the ground, and reducing any leaching that may have taken place whilst the ground had no cover.

6.7 As with any previously used land, sensible precautions should still be taken by ground workers, such as, not eating, smoking or drinking whilst working on the ground, and maintaining high standards of hygiene. If, during the works, any unexpected conditions arise, such as, patches of oily or tarry soil, unusually coloured soils, unusual odours or buried containers then further advice should be sought.

## 7.0 GROUND GASES

7.1 The standpipes installed in BH1 and BH3 have been monitored for water level and for the concentration of hazardous gases. Three sets of readings have been taken and are reproduced below:

| Date | Atmos. Press. (Mb) | BH No. | Gas Conc. % Vol | | | | ppm | | Water Depth (mBGL) | Flow l/min |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | CH4 | CO2 | O2 | N2 | H2S | CO | | |
| 2 Nov 15 | 997 | 1 | 1.8 | 2.9 | 8.0 | 87.2 | 0.0 | 2.8 | 3.21 | 0.0 |
| 2 Nov 15 | 997 | 3 | 0.0 | 0.0 | 21.4 | 78.5 | 0.0 | 0.0 | -0.16 | 0.0 |
| 11 Nov 15 | 991 | 1 | 0.0 | 0.5 | 19.6 | 79.8 | 0.0 | 0.0 | 3.36 | 0.0 |
| 11 Nov 15 | 991 | 3 | Artesian | | | | | | -0.16 | |
| 18 Nov 15 | 997 | 1 | 0.0 | 0.3 | 20.4 | 79.2 | 0.0 | 0.0 | 3.35 | 0.0 |
| 18 Nov 15 | 997 | 3 | Artesian | | | | | | -0.16 | |

Table 4.

7.2 It was found on the first visit that BH3 was showing artesian water at 0.16m above ground level. On subsequent visits readings were not taken due to the minimal air gap and the risk of damaging the instrument. The maximum readings in BH1 were those taken on the first visit with a methane content of 1.8% compared to a lower explosive limit of 5% in normal air. This was associated with depleted oxygen and elevated carbon dioxide. This suggests degradation of organic material both in anaerobic and aerobic conditions. A small quantity of carbon monoxide was also detected. Subsequent readings showed no hazardous gases present, suggesting that these may have been trapped in the soil matrix and, once vented during testing, were not replaced over the time scale involved. The flow rates throughout were zero so that no positive flow of gas was detected.

7.3 It is possible that with repeated monitoring of the gas levels over a period of months, or using a continuous recorder, that the gas risk could be discounted. The cost of this exercise and the delays involved may make it more viable to incorporate simple gas defensive measures.

7.4 For the purposes of risk assessment CIRIA, R149 refers to characteristic situations based on gas concentrations. This uses a gas screening value, as a product of the gas concentration and the flow rate. In this case flow is zero placing the plot in Characteristic Situation 1,

however, CIRIA, C665, suggests that if the methane concentration is greater than 1% Characteristic Situation 2 should be applied. With a maximum concentration of 1.8% this caveat applies here.

7.5 For a building with a commercial end use, C665 suggests that where a reinforced concrete slab is present, a 1200 gauge polythene layer will be sufficient protection. Seams should be taped rather than lapped and service openings in the flor slab sealed.

7.6 Due to the presence of artesian water BH3 should be grouted prior to the foundations being constructed.

## 8.0 SUMMARY

8.1 For moderately loaded conventional structures foundations loads will need to be transferred to the natural ground at depth.

8.2 Driven piles are likely to be an economic and viable technical solution although other methods of piling would be effective.

8.3 Before work on foundations commences it is expected to be necessary for retaining walls around the plot to be constructed, including replacing the existing over stressed structures.

8.4 No significant contamination has been identified; if any unexpected conditions are encountered during the works further advice should be sought.

.

8.5 No special precautions are called for to protect concrete foundations from chemical attack.

8.6 Risks of mining subsidence are minimal.

8.7 A very small risk of hazardous gas is present and can be dealt with by basic measures.

8.8 Artesian water has been identified which could make bored piles difficult to construct.

Signed

Peter Cowsill MSc CGeol CEng MIMMM FGS
Registered UK Ground Engineering Advisor

**References**

British Geological Survey 1:50,000 Sheet 99.

Stroud M.A. and Butler F. G. 1975The standard Penetration Test and the Engineering Properties of Glacial Materials.

Tomlinson M.J. 1994 Pile Design and Construction Practice.

Environment Agency 2004, CLR 11. Model Procedures for the Management of Land Contamination

Environment Agency Dates various, CLEA Soil Guidance Values for range of substances.

LQM and CIEH 2007 Generic Risk Assessment Criteria for Human Health Risk Assessment. 1st Ed.

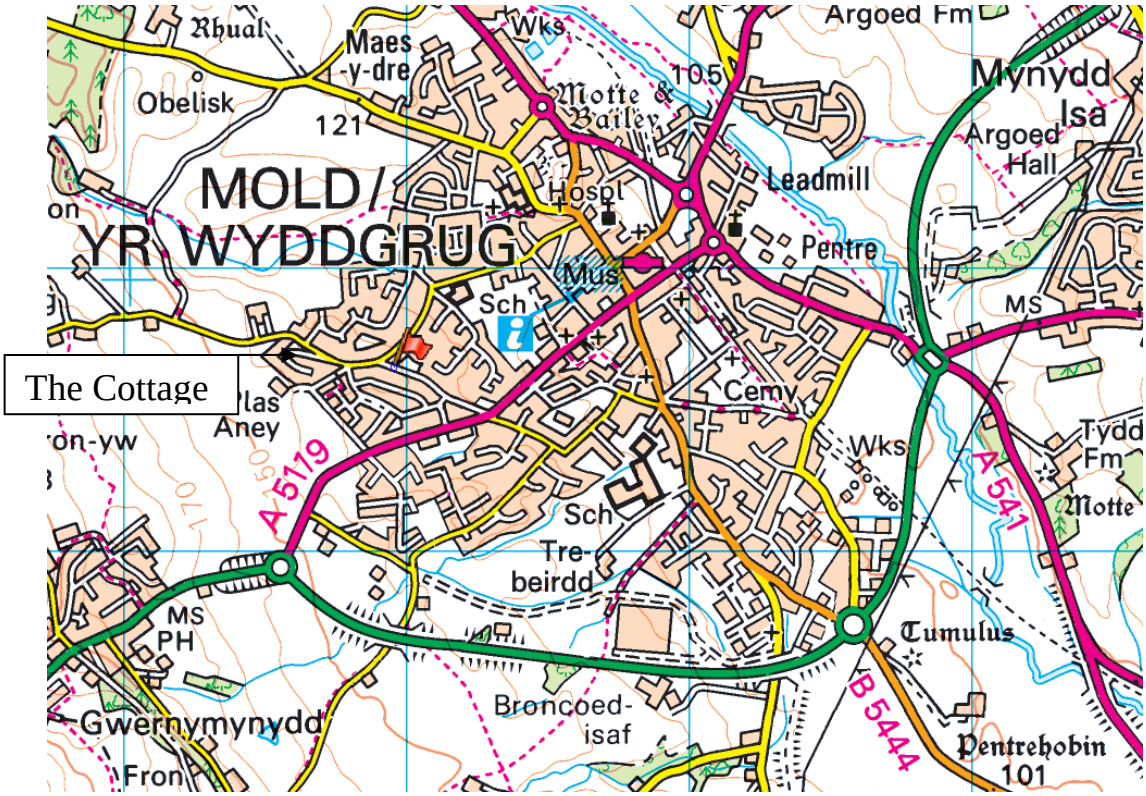
LQM and CIEH 2009 Generic Risk Assessment Criteria for Human Health Risk Assessment.2nd Ed.

Ciria, 2007, C665, Assessing risks posed by hazardous ground gases to buildings.

CIRIA, 1996, R149, Assessing risks posed by hazardous ground gases.

# APPENDIX A

# SITE LOCATION PLAN




**Site Location Plan (***reproduced with permission of HM Ordnance Survey)***.**

# APPENDIX B

# HISTORICAL MAPS


GroundSure
ENVIRONMENTAL INSIGHT

**Site Details:**

GEORGE POOLE & CO,
WATFORD BRIDGE ROAD,
HIGH PEAK, SK22 4HJ

**Client Ref:** 5486_DB_LG27044
**Report Ref:** GS-1830679
**Grid Ref:** 400486, 386324

**Map Name:** National Grid

**Map date:** 1995

**Scale:** 1:2,500

**Printed at:** 1:2,500

N
W E
S

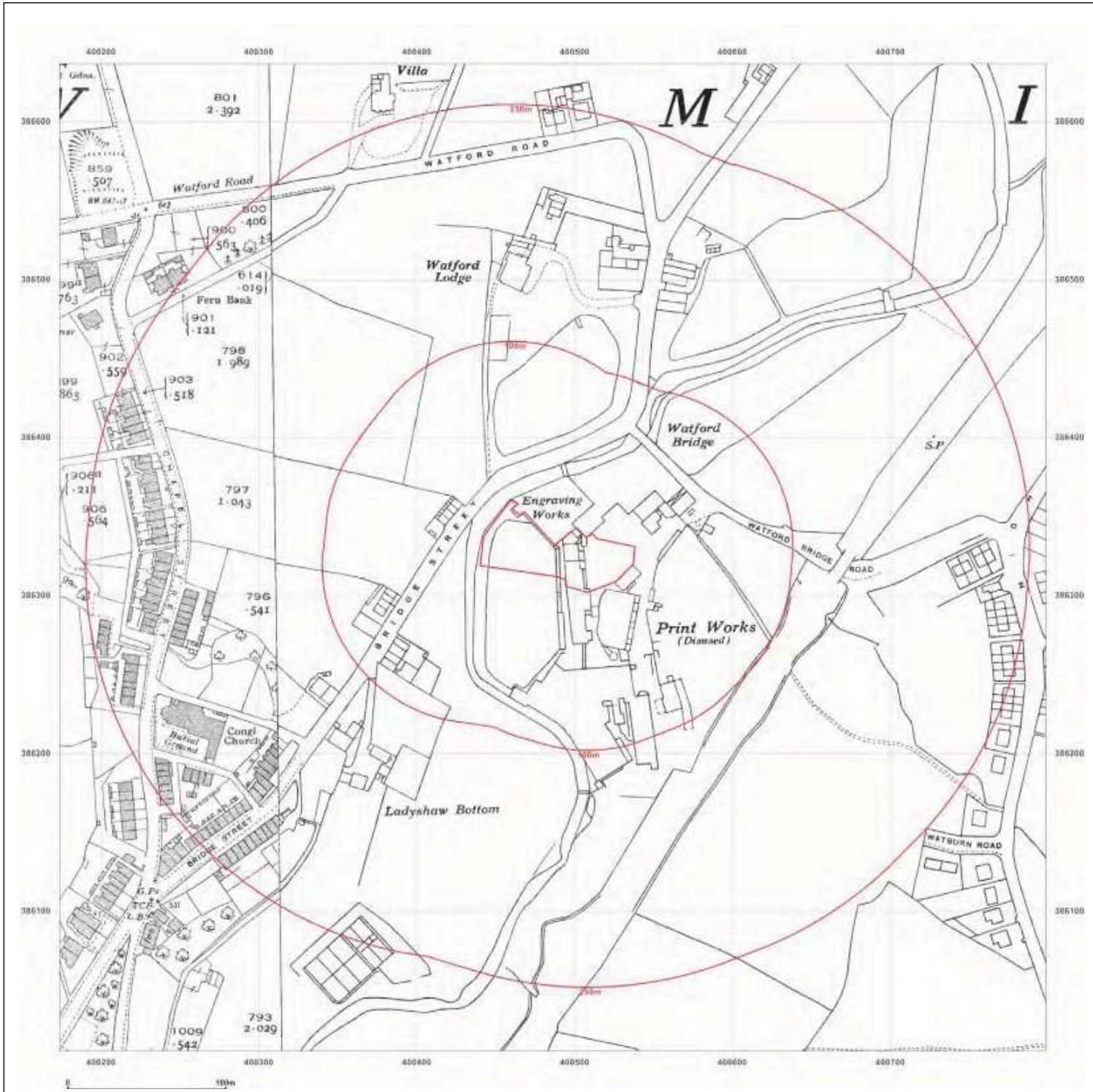
Ordnance Survey Licensed Partner

Produced by
GroundSure Environmental Insight
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com



Production date: 05 January 2015

To view map legend click here *Legend*




GroundSure
ENVIRONMENTAL INSIGHT

**Site Details:**

GEORGE POOLE & CO,
WATFORD BRIDGE ROAD,
HIGH PEAK, SK22 4HJ

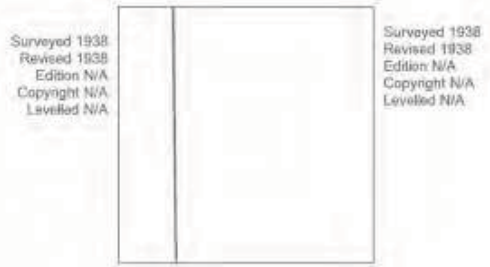
**Client Ref:** 5486_DB_LG27044
**Report Ref:** GS-1830679
**Grid Ref:** 400486, 386324

**Map Name:** County Series

**Map date:** 1938

**Scale:** 1:2,500

**Printed at:** 1:2,500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W: www.groundsure.com

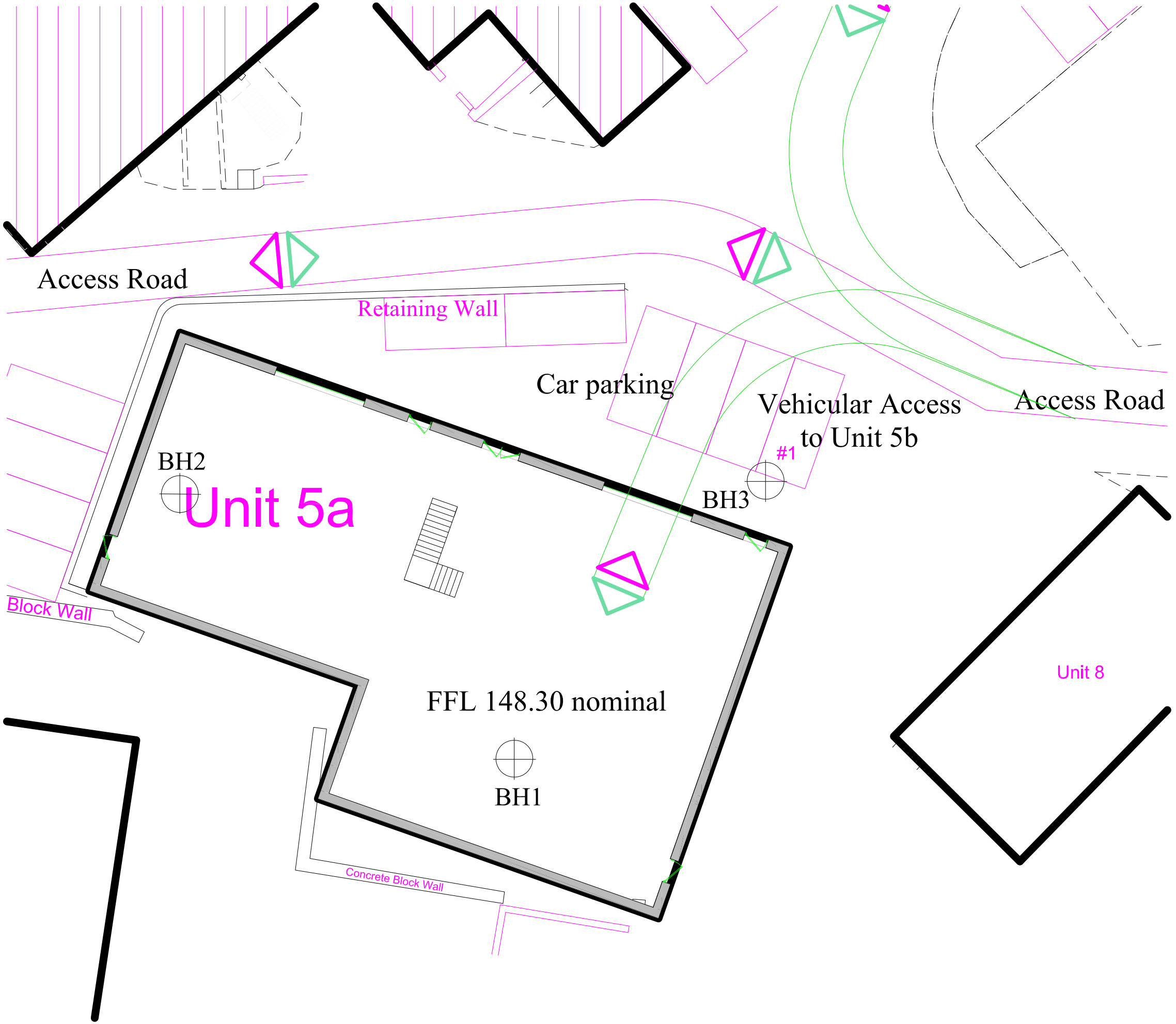


Production date: 05 January 2015

To view map legend click here *Legend*

# APPENDIX C

# EXPLORATORY HOLE LOCATION PLAN




Legend

**Job:** Watford Bridge

**Client:** GT Electric

**Drawing Title:**
Borehole Location Plan

**Version:** Vers 1L.

| Appendix: | Date 6th November 2015 |
|---|---|
| Scale | Job No. 2014/35 |

peter cowsill ltd.

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Engineering
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# APPENDIX D

# EXPLORATORY HOLE LOGS

# Peter Cowsill Ltd

| Site | Borehole Number |
|---|---|
| Watford Bridge | BH1 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Cable Percussion | 150mm cased to 16.90m | | SJ Architects | 2014-35 |

| Location | Dates | Engineer | Sheet |
|---|---|---|---|
| | 22/09/2015-27/10/2015 | | 1/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.00-1.00 | B | | | 22/09/2015: | | | MADE GROUND: Very loose to loose dark brown slightly gravelly clayey fine to coarse sand with pockets of clay and a low cobble content. Gravel is fine to coarse angular to subrounded including timber, ash, clayware, concrete and brick fragments. | | |
| | | | | 22/09/2015: | | | | | |
| 0.50 | E | | | | | | | | |
| 1.00-1.45 | CPT N=2 | 1.00 | DRY | 1,0/0,1,0,1 | | | | | |
| 1.00-1.45 | B | | | | | | | | |
| 1.45-2.00 | D | | | | | (3.20) | | | |
| 1.50 | E | | | | | | | | |
| 2.00-2.45 | CPT N=5 | 2.00 | DRY | 1,0/1,1,2,1 | | | | | |
| 2.00-2.45 | B | | | | | | | | |
| 2.45-3.00 | D | | | | | | | | |
| 2.50 | E | | | | | | | | |
| 3.00-3.45 | CPT N=7 | 3.00 | DRY | 1,0/1,2,2,2 | | | | | |
| 3.00-3.45 | B | | | | | 3.20 | Very soft to soft brown mottled orange and dark grey slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded including siltstone, sandstone and quartzite. | | |
| 3.45-4.00 | D | | | | | | | | |
| 3.50 | E | | | | | (1.30) | | | |
| 4.00-4.45 | SPT N=3 | 4.00 | DRY | 1,0/0,1,1,1 | | | | | |
| 4.00-4.45 | B | | | | | | | | |
| 4.50 | E | | | | | 4.50 | | | |
| 4.50 | D | | | | | | Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to rounded including mudstone, siltstone, sandstone and quartzite. | | |
| 4.50-4.95 | U | | DRY | 60 blows | | | | | |
| 4.95-5.50 | D | | | | | | | | |
| 5.50-5.95 | SPT N=26 | 5.50 | DRY | 1,4/7,6,6,7 | | | | | |
| 5.50-5.95 | B | | | | | | | | |
| 5.50-5.95 | D | | | | | | | | |
| 5.95-6.50 | D | | | | | | | | |
| 6.50-6.95 | SPT N=29 | 6.20 | DRY | 2,4/6,7,8,8 | | | | | |
| 6.50-6.95 | B | | | | | | | | |
| 6.50-6.95 | D | | | | | | | | |
| 6.95-7.50 | D | | | | | | | | |
| 7.50-7.95 | SPT N=28 | 7.50 | DRY | 2,5/6,7,7,8 | | | | | |
| 7.50-7.95 | B | | | | | | | | |
| 7.95-8.50 | D | | | | | | | | |
| | 0 0 | | | 22/09/2015:DRY | | | | | |
| | | | | 23/09/2015: | | (8.70) | | | |
| 8.50-8.95 | U | | DRY | 47 blows | | | | | |
| 8.95-9.10 | D | | | 23/09/2015:DRY | | | | | |
| 9.10-9.50 | D | | | | | | | | |
| | | | | 23/09/2015: | | | | | |
| 9.50-9.95 | SPT N=23 | 9.20 | DRY | 2,4/5,5,6,7 | | | | | |
| 9.50-9.95 | B | | | | | | | | |

**Remarks**
Bentonite seals GL-1.0m and 9.0-27.4m
Gravel response 1.0-9.0m
50mm standpipe installed to 9m
**= Driller's description
Rotary casing installed to 16.90m to allow continuation by rotary openhole methods.
Rotary open hole to 27.6m

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH1

# Peter Cowsill Ltd

| Site | Borehole Number |
|---|---|
| Watford Bridge | BH1 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Cable Percussion | 150mm cased to 16.90m | | SJ Architects | 2014-35 |

| Location | Dates | Engineer | Sheet |
|---|---|---|---|
| | 22/09/2015-27/10/2015 | | 2/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 9.95-10.50 | D | | | | | | | | |
| 10.50-10.95 | U | | DRY | 38 blows | | | | | |
| 10.95-11.50 | D | | | | | | | | |
| 11.50-11.95 | U | | DRY | 35 blows | | (8.70) | | | |
| 11.95-12.50 | D | | | | | | | | |
| 12.50-12.95 | D | | | | | | | | |
| 12.50-12.95 | SPT N=22 | 12.20 | DRY | 2,2/3,5,6,8 | | | At 12.50m, locally thinly laminated. | | |
| 12.50-12.95 | B | | | | | | | | |
| | | | | | | 13.20 | | | ▼1 |
| 13.20-13.65 | B | | | Fast inflow(1) at 13.20m, no rise after 20 mins. | | (0.10) | Dense brown slightly silty medium to coarse SAND. | | |
| 13.20-13.65 | D | | | | | 13.30 | | | |
| 13.65-14.20 | D | | | | | (0.30) | Very soft to soft laminated brown slightly sandy CLAY. | | |
| 13.20-13.65 | SPT N=35 | 13.20 | 2.10 | 2,4/8,11,8,8 | | 13.60 | Very stiff brown slightly gravelly CLAY with a low cobble content. Gravel is fine to coarse subangular to rounded including mudstone. | | |
| 14.20-14.44 | B | | | | | | | | |
| 14.20-14.64 | SPT 50/285 | 14.20 | 3.00 | 5,4/5,10,16,19 | | | | | |
| 14.20-14.44 | D | | | | | | | | |
| 14.44-15.20 | D | | | | | (2.70) | | | |
| 15.20-15.65 | B | | | | | | | | |
| 15.20-15.65 | SPT N=33 | 15.20 | 3.60 | 4,6/7,9,8,9 | | | | | |
| 15.20-15.65 | D | | | | | | | | |
| 15.65-16.20 | D | | | | | | | | |
| 16.20-16.63 | B | | | | | | | | |
| 16.20-16.63 | SPT 50/280 | 16.20 | 4.50 | 7,8/10,11,14,15 | | 16.30 | | | |
| 16.20-16.63 | D | | | | | | Extremely weak dark grey MUDSTONE (recovered as gravel and cobbles). | | |
| 16.63-16.90 | D | | | 25/50 | | (0.60) | | | |
| 16.90-16.97 | TCR / SCR | RQD | FI | CPT 25*/30 | | 16.90 | | | |
| 16.90 | | | | 50/35 | | | Dark grey MUDSTONE** | | |
| | | | | 23/09/2015:5.70m | | | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH1

# Peter Cowsill Ltd

| | | | |
|---|---|---|---|
| **Site** Watford Bridge | | | **Borehole Number** BH1 |
| **Machine :** Comaccio<br>**Flush :** Water<br>**Core Dia :**<br>**Method :** Open hole | **Casing Diameter** 150mm cased to 16.90m | **Ground Level (mOD)** | **Client** SJ Architects | **Job Number** 2014-35 |
| | **Location** | **Dates** 22/09/2015-27/10/2015 | **Engineer** | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | (10.70) | | | |
| 27.60 | | | | | | | 27.60 | Complete at 27.60m | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH1

# Peter Cowsill Ltd

| Site | Borehole Number |
|---|---|
| Watford Bridge | BH2 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Cable Percussion | 150mm cased to 13.50m | | SJ Architects | 2014-35 |

| Location | Dates | Engineer | Sheet |
|---|---|---|---|
| | 01/01/2015 | | 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.00-1.00 | D | | | | | | MADE GROUND: Firm to stiff brown slightly gravelly sandy clay with a low cobble content and pockets of fine to coarse sand. Gravel is fine to coarse angular to subangular including ash, concrete and brick fragments. | | |
| 1.00-1.45 | CPT N=11 | 1.00 | DRY | 1,2/3,2,2,4 | | | At 1.00m, firm. | | |
| 1.00-1.45 | B | | | | | | | | |
| 1.45-2.00 | D | | | | | | | | |
| 2.00-2.45 | CPT N=7 | 2.00 | DRY | 1,2/2,1,2,2 | | | Below 2.00m, soft. | | |
| 2.00-2.45 | B | | | | | (4.40) | | | |
| 2.45-3.00 | D | | | | | | | | |
| 3.00-3.45 | CPT N=7 | 3.00 | DRY | 1,0/1,1,3,2 | | | | | |
| 3.00-3.45 | B | | | | | | | | |
| 3.45-4.00 | D | | | | | | | | |
| | | | | Medium inflow(1) at 3.80m, no rise after 20 mins. | | | | | ▼1 |
| 4.00-4.45 | B | | | | | | At 4.00m, firm | | |
| 4.00-4.45 | CPT N=12 | 4.00 | 3.80 | 2,2/2,3,3,4 | | | | | |
| | | | | | | 4.40 | | | |
| 4.45-5.00 | D | | | | | | MADE GROUND: Medium dense dark greyish brown clayey gravelly fine to coarse sand. Gravel is fine to coarse angular to subangular of various lithologies. | | |
| 5.00-5.45 | CPT N=14 | 5.00 | 4.40 | 1,2/2,3,4,5 | | | | | |
| 5.00-5.45 | B | | | | | | | | |
| 5.30-6.00 | B | | | | | | | | |
| 5.45-6.00 | D | | | | | (2.30) | | | |
| 6.00-6.45 | CPT N=7 | 6.00 | 0.30 | 3,4/2,1,2,2 | | | | | |
| 6.00-6.50 | B | | | | | | | | |
| | | | | | | 6.70 | | | |
| 6.70-7.00 | D | | | | | | Firm becoming stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded including mudstone, sandstone and quartzite. | | |
| 7.00-7.45 | SPT N=15 | 7.00 | 0.20 | 1,2/3,3,4,5 | | | | | |
| 7.00-7.45 | D | | | | | | | | |
| 7.00-7.50 | B | | | | | | | | |
| 7.50-8.00 | D | | | | | | | | |
| | | | | | | (2.00) | | | |
| 8.00-8.45 | SPT N=20 | 8.00 | DRY | 1,2/3,5,6,6 | | | | | |
| 8.00-8.45 | B | | | | | | | | |
| 8.00-8.45 | D | | | | | | | | |
| 8.50-9.00 | D | | | | | | | | |
| | | | | | | 8.70 | | | |
| 9.00-9.45 | U | | 0.30 | 61 blows | | | Firm thinly laminated greyish brown slightly gravelly CLAY with silty dusting on laminations. Gravel is fine to coarse subangular to subrounded of mudstone. | | |
| 9.50-9.95 | SPT N=11 | 9.50 | 0.30 | 1,2/2,3,3,3 | | | | | |
| 9.50-9.95 | D | | | | | | | | |
| 9.50-10.00 | B | | | | | | | | |

**Remarks**
.Borehole backfilled with arisings on completion.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.**
2014-35.BH2

# Peter Cowsill Ltd

| Site | Borehole Number |
|---|---|
| Watford Bridge | BH2 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Cable Percussion | 150mm cased to 13.50m | | SJ Architects | 2014-35 |

| Location | Dates | Engineer | Sheet |
|---|---|---|---|
| | 01/01/2015 | | 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 10.00-10.50 | D | | | | | | | | |
| 10.50-10.95 | U | | 0.40 | 54 blows | | (2.80) | | | |
| 11.00-11.50 | D | | | | | | | | |
| 11.50-11.95 | SPT N=20 | 11.50 | 0.50 | 1,3/4,5,5,6 | | 11.50 | Stiff greyish brown slightly sandy slightly gravelly CLAY with a low cobble content. Gravel is fine to coarse subangular to rounded including mudstone and sandstone. | | |
| 11.50-11.95 | D | | | | | | | | |
| 11.50-12.00 | B | | | | | (1.00) | | | |
| 12.00-12.50 | D | | | | | | | | |
| 12.50-12.95 | U | | 0.50 | 70 blows | | 12.50 | Extremely weak yellowish brown fine to coarse grained SANDSTONE (recovered as sand and gravel). | | |
| 12.80 | W | | | | | | | | |
| 13.00-13.50 | B | | | 10/06/2015:3.70m | | (1.12) | | | |
| | | | | 10/06/2015: | | | | | |
| | | | | 10/06/2015:9.50m | | 13.62 | | | |
| 13.50-13.62 | CPT 25*/100 50/20 | 13.50 | 3.70 | 02/10/2015: 15,10/50 02/10/2015: | | | Complete at 13.62m | | |
| | | | | 02/10/2015: | | | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH2

# Peter Cowsill Ltd

| Site | Borehole Number |
|---|---|
| Watford Bridge | BH3 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Cable Percussion | 150mm cased to 17.60m | | SJ Architects | 2014-35 |

| Location | Dates | Engineer | Sheet |
|---|---|---|---|
| | 22/09/2015-26/10/2015 | | 1/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.00-1.00 | D | | | | | | MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand with occasional pockets of clay. Gravel is fine to coarse angular to subrounded including sandstone, ash, wood and brick fragments. | | |
| 1.00-1.45 | CPT N=24 | 1.00 | DRY | 2,4/6,5,6,7 | | | Below 1.00m, medium dense. | | |
| 1.00-1.45 | B | | | | | (2.80) | | | |
| 1.45-2.00 | D | | | | | | | | |
| 2.00-2.45 | CPT N=19 | 2.00 | DRY | 2,4/4,4,5,6 | | | Below 2.00m, brown with a low cobble content. | | |
| 2.00-2.45 | B | | | | | | | | |
| 2.80 | D | | | | | 2.80 | | | |
| 2.80-3.25 | U | | DRY | 60 blows | | | POSSIBLE MADE GROUND: Firm to stiff greyish brown mottled orange and dark grey slightly gravelly sandy clay. Gravel is fine to coarse angular to subrounded including sandstone and slate. | | |
| 3.25-3.80 | D | | | | | | | | |
| 3.80-4.25 | CPT N=26 | 3.80 | DRY | 2,4/5,8,7,6 | | | | | |
| 3.80-4.25 | B | | | | | | | | |
| 4.25-4.80 | D | | | | | (3.00) | | | |
| 4.80-5.25 | U | | DRY | 80 blows | | | | | |
| 5.25-5.80 | D | | | | | | | | |
| 5.80-6.25 | SPT N=23 | 5.80 | DRY | 4,4/5,5,6,7 | | 5.80 | | | |
| 5.80-6.25 | B | | | | | | Firm becoming stiff brown slightly sandy slightly gravelly CLAY with a low cobble content. Gravel is fine to coarse subangular to rounded including mudstone and sandstone. | | |
| 6.25-6.80 | D | | | | | | | | |
| 6.80-7.25 | B | | | | | | | | |
| 6.80-7.25 | U | | DRY | 80 blows | | | | | |
| 7.30-7.75 | CPT N=29 | 7.30 | DRY | 6,6/6,7,8,8 | | | | | |
| 7.30-7.75 | B | | | | | | | | |
| 7.75-8.30 | D | | | | | | | | |
| 8.30-8.75 | U | | DRY | 70 blows | | (4.90) | | | |
| 8.75-8.90 | D | | | | | | | | |
| 8.90-9.30 | D | | | | | | | | |
| 9.30-9.75 | SPT N=16 | 9.30 | DRY | 1,2/3,4,4,5 | | | | | |
| 9.30-9.75 | B | | | | | | | | |
| 9.30-9.75 | D | | | | | | | | |
| 9.75-10.30 | D | | | | | | | | |

0 0

**Remarks**
Bentonite seals 14.0-18.3
gravel response 18.3 to 28.0m
50mm pipe installed to 28.0m
Rotary casing installed to 17.60m to allow continuation by rotary openhole methods.
Rotary openhole to 28m
** = driller's description

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH3

# Peter Cowsill Ltd

| Site | Borehole Number |
|---|---|
| Watford Bridge | BH3 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Cable Percussion | 150mm cased to 17.60m | | SJ Architects | 2014-35 |

| Location | Dates | Engineer | Sheet |
|---|---|---|---|
| | 22/09/2015-26/10/2015 | | 2/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 10.30-10.75 | U | | DRY | 66 blows | | (4.90) | | | |
| | | | | | | 10.70 | Soft to firm laminated brown CLAY with silty dusting on laminations. | | |
| 10.75-10.90 | D | | | | | | | | |
| 10.90-11.30 | D | | | | | | | | |
| 11.30-11.75 | U | | DRY | 37 blows | | | | | |
| 11.75-11.90 | D | | | | | | | | |
| 11.90-12.30 | D | | | | | | | | |
| 12.30-12.75 | B | | | | | | | | |
| 12.30-12.75 | SPT N=12 | 12.30 | DRY | 1,2/2,3,3,4 | | | | | |
| 12.30-12.75 | D | | | | | | | | |
| 12.75-13.30 | D | | | | | (4.00) | | | |
| 13.30-13.75 | U | | DRY | 50 blows | | | | | |
| 13.75-13.90 | D | | | | | | | | |
| 13.90-14.30 | D | | | | | | | | |
| 14.30-14.75 | B | | | | | | | | |
| 14.30-14.75 | SPT N=32 | 14.30 | DRY | 2,3/4,4,5,19 | | | | | |
| 14.30-14.75 | D | | | | | | | | |
| | | | | | | 14.70 | At 14.70m, band of sand and gravel. | | ▼1 |
| 14.70 | W | | | Fast inflow(1) at 14.70m, no rise after 20 mins. | | | Stiff brown slightly sandy slightly gravelly CLAY with a low to medium cobble content. Gravel is fine to coarse subangular to subrounded including mudstone and sandstone. | | |
| 14.75-15.30 | D | | | | | | At 15.30m, very stiff. | | |
| 15.30-15.75 | B | | | | | | | | |
| 15.30-15.75 | CPT N=32 | 15.30 | 12.00 | 2,6/7,8,8,9 | | (1.70) | | | |
| 15.75-16.30 | D | | | | | | | | |
| 16.30-16.67 | B | | | | | | | | |
| 16.30-16.67 | CPT 50/220 | 16.30 | 12.80 | 6,8/10,14,26 | | | | | |
| | | | | | | 16.40 | Brown sandy fine to coarse angular to subangular GRAVEL and COBBLES of sandstone bound in a clay matrix. | | |
| 16.67-17.30 | D | | | | | (0.90) | | | |
| 17.30-17.60 | D | | | 10/02/2015:0.60m | | 17.30 | | | |
| | | | | | | (0.30) | Extremely weak yellowish brown fine to coarse grained SANDSTONE (recovered as sand and gravel). | | |
| | | | | 10/02/2015: | | 17.60 | | | |
| 17.30-17.34 | CPT 25*/15 50/20 | 17.30 | 0.60 | 25/50 10/02/2015:1.10m | | | Yellow brown SANDSTONE** | | |
| 17.60-17.63 | CPT 25*/10 50/20 | 17.60 | 1.10 | 25/50 | | | | | |
| | | | | 25/09/2015: 25/09/2015: | | | | | |
| | | | | 25/09/2015: 25/09/2015:DRY | | (2.20) | | | |
| | | | | 29/09/2015: 29/09/2015:DRY | | | | | |
| | | | | 29/09/2015: 29/09/2015:12.80m | | | | | |
| 19.80 | TCR / SCR | RQD | FI | | | 19.80 | Dark grey MUDSTONE with occasional thin sandstone | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH3

# Peter Cowsill Ltd

| | | | |
|---|---|---|---|
| **Site** Watford Bridge | | | **Borehole Number** BH3 |
| **Machine :** Comaccio<br>**Flush :** Water<br>**Core Dia :**<br>**Method :** Open Hole | **Casing Diameter** 150mm cased to 17.60m | **Ground Level (mOD)** | **Client** SJ Architects | **Job Number** 2014-35 |
| | **Location** | **Dates** 22/09/2015-26/10/2015 | **Engineer** | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | band** | | |
| | 0 | | | | | | (8.20) | | | |
| 28.00 | | | | | | | 28.00 | Complete at 28.00m | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | TB |

**Figure No.** 2014-35.BH3

# APPENDIX E

# COAL AUTHORITY PERMIT

The Coal Authority

**Permit Reference Number 10956**

# Permission to Enter or Disturb Coal Authority Mining Interests

**Name and Address of Permit Holder:**

*GT Electrical*
*2 Woodside Street*
*New Mills*
*NEWTOWN*
*SK22 2JE*

**Site Location:**

*Watford Bridge Industrial Estate*
*Watford Bridge Road*
*New Mills*
*Derbyshire*

**This certificate hereby grants the above named Permit Holder permission to carry out :-**

***Investigation of shallow coal seams/mine workings by 2 boreholes***

**within the Authority's mining interests at the identified site location for the period of 12 months from the effective date shown below. The granting of this Permission does not constitute advice given by the Authority in relation to the proposed operations. It is the Applicant's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.**

Signed: 

Effective Date: 15 July 2015

For and on behalf of The Director of Operations at the Coal Authority

***Nominated Representative: Paul Hobson, Licensing and Permissions Manager;***
***The Coal Authority, Licensing & Permits Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG***
***E-Mail: paulhobson@coal.gov.uk***

# APPENDIX G

CHEMICAL ANALYSES

# Jones Environmental Laboratory

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4225

| | |
|---|---|
| **Attention :** | Peter Cowsill |
| **Date :** | 2nd November, 2015 |
| **Your reference :** | |
| **Our reference :** | Test Report 15/14669 Batch 1 |
| **Location :** | Watford Industrial Estate |
| **Date samples received :** | 13th October, 2015 |
| **Status :** | Final report |
| **Issue :** | 1 |

Seventeen samples were received for analysis on 13th October, 2015 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Bruce Leslie**
**Project Co-ordinator**

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

***JE Job No.:*** 15/14669

**SOILS**

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

**WATERS**

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

**DEVIATING SAMPLES**

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

**SURROGATES**

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

**DILUTIONS**

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

| | |
|---|---|
| # | ISO17025 (UKAS) accredited - UK. |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| ++ | Result outside calibration range, results should be considered as indicative only and are not accredited. |
| * | Analysis subcontracted to a Jones Environmental approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |
| AA | x5 Dilution |

**Client Name:** Peter Cowsill Ltd
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| J E Sample No. | 3-4 | 5-6 | 7-8 | 11 | 12 | 20-21 | 24 | 26 | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH1 | BH1 | BH1 | BH1 | BH1 | BH2 | BH2 | BH3 | | | | | |
| Depth | 1.50 | 2.50 | 3.50 | 2.45-3.00 | 16.20-16.630 | 4.00 | 1.45-2.00 | 1.45-2.00 | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J | V J | V J | T | T | V J | T | T | | | | | |
| Sample Date | <> | <> | <> | <> | <> | <> | <> | <> | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | |
| Date of Receipt | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | | | | | |
| Arsenic # | 54.9 | - | 15.8 | - | - | 60.4 | - | - | | | <0.5 | mg/kg | TM30/PM15 |
| Barium # | 239 | - | 55 | - | - | 227 | - | - | | | <1 | mg/kg | TM30/PM15 |
| Beryllium | 1.2 | - | 0.7 | - | - | 1.2 | - | - | | | <0.5 | mg/kg | TM30/PM15 |
| Cadmium # | 0.5 | - | <0.1 | - | - | 2.5 | - | - | | | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | 80.9 | - | 64.2 | - | - | 92.9 | - | - | | | <0.5 | mg/kg | TM30/PM15 |
| Copper # | 218 | - | 20 | - | - | $649_{AA}$ | - | - | | | <1 | mg/kg | TM30/PM15 |
| Lead # | 370 | - | 41 | - | - | 323 | - | - | | | <5 | mg/kg | TM30/PM15 |
| Mercury # | 0.1 | - | <0.1 | - | - | 0.1 | - | - | | | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | 30.4 | - | 15.9 | - | - | 30.0 | - | - | | | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | <1 | - | <1 | - | - | 1 | - | - | | | <1 | mg/kg | TM30/PM15 |
| Vanadium | 44 | - | 24 | - | - | 52 | - | - | | | <1 | mg/kg | TM30/PM15 |
| Water Soluble Boron # | 1.6 | - | 0.5 | - | - | 2.0 | - | - | | | <0.1 | mg/kg | TM74/PM32 |
| Zinc # | 280 | - | 67 | - | - | 500 | - | - | | | <5 | mg/kg | TM30/PM15 |
| | | | | | | | | | | | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | <0.04 | - | <0.04 | - | - | <0.04 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | 0.07 | - | <0.03 | - | - | 0.04 | - | - | | | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | <0.05 | - | <0.05 | - | - | <0.05 | - | - | | | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | 0.05 | - | <0.04 | - | - | <0.04 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | 0.53 | - | <0.03 | - | - | 0.43 | - | - | | | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | 0.22 | - | <0.04 | - | - | 0.40 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | 1.80 | - | <0.03 | - | - | 1.98 | - | - | | | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | 1.57 | - | <0.03 | - | - | 1.55 | - | - | | | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | 0.81 | - | <0.06 | - | - | 1.00 | - | - | | | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | 1.08 | - | <0.02 | - | - | 0.88 | - | - | | | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | 1.61 | - | <0.07 | - | - | 1.33 | - | - | | | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | 1.13 | - | <0.04 | - | - | 0.82 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene # | 0.72 | - | <0.04 | - | - | 0.54 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | 0.16 | - | <0.04 | - | - | 0.11 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | 0.66 | - | <0.04 | - | - | 0.48 | - | - | | | <0.04 | mg/kg | TM4/PM8 |
| PAH 16 Total | 10.4 | - | <0.6 | - | - | 9.6 | - | - | | | <0.6 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | 1.16 | - | <0.05 | - | - | 0.96 | - | - | | | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | 0.45 | - | <0.02 | - | - | 0.37 | - | - | | | <0.02 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | 109 | - | 100 | - | - | 96 | - | - | | | <0 | % | TM4/PM8 |
| | | | | | | | | | | | | | |
| Methyl Tertiary Butyl Ether # | <2 | - | <2 | - | - | <2 | - | - | | | <2 | ug/kg | TM15/PM10 |
| Benzene # | 4 | - | <3 | - | - | <3 | - | - | | | <3 | ug/kg | TM15/PM10 |
| Toluene # | 26 | - | <3 | - | - | <3 | - | - | | | <3 | ug/kg | TM15/PM10 |
| Ethylbenzene # | <3 | - | <3 | - | - | <3 | - | - | | | <3 | ug/kg | TM15/PM10 |
| p/m-Xylene # | <5 | - | <5 | - | - | <5 | - | - | | | <5 | ug/kg | TM15/PM10 |
| o-Xylene # | <3 | - | <3 | - | - | <3 | - | - | | | <3 | ug/kg | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 134 | - | 116 | - | - | 94 | - | - | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 130 | - | 139 | - | - | 98 | - | - | | | <0 | % | TM15/PM10 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Peter Cowsill Ltd
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| J E Sample No. | 3-4 | 5-6 | 7-8 | 11 | 12 | 20-21 | 24 | 26 | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | BH1 | BH1 | BH1 | BH1 | BH1 | BH2 | BH2 | BH3 | | | | | |
| **Depth** | 1.50 | 2.50 | 3.50 | 2.45-3.00 | 16.20-16.630 | 4.00 | 1.45-2.00 | 1.45-2.00 | | | | | |
| **COC No / misc** | | | | | | | | | | | | | |
| **Containers** | V J | V J | V J | T | T | V J | T | T | | | | | |
| **Sample Date** | <> | <> | <> | <> | <> | <> | <> | <> | | | | | |
| **Sample Type** | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | | | |
| **Batch Number** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | |
| **Date of Receipt** | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | 13/10/2015 | | | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <0.1 | - | <0.1 | - | - | <0.1 | - | - | | | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | <0.1 | - | <0.1 | - | - | <0.1 | - | - | | | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | <0.1 | - | <0.1 | - | - | 0.4 | - | - | | | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | <0.2 | - | <0.2 | - | - | <0.2 | - | - | | | <0.2 | mg/kg | TM5/PM16 |
| >C12-C16 # | <4 | - | <4 | - | - | <4 | - | - | | | <4 | mg/kg | TM5/PM16 |
| >C16-C21 # | <7 | - | <7 | - | - | 11 | - | - | | | <7 | mg/kg | TM5/PM16 |
| >C21-C35 # | 85 | - | <7 | - | - | 133 | - | - | | | <7 | mg/kg | TM5/PM16 |
| Total aliphatics C5-35 | 85 | - | <19 | - | - | 144 | - | - | | | <19 | mg/kg | TM5/TM36/PM12/PM16 |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 | <0.1 | - | <0.1 | - | - | <0.1 | - | - | | | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 | <0.1 | - | <0.1 | - | - | <0.1 | - | - | | | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | <0.1 | - | <0.1 | - | - | <0.1 | - | - | | | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 | <0.2 | - | <0.2 | - | - | <0.2 | - | - | | | <0.2 | mg/kg | TM5/PM16 |
| >EC12-EC16 | 6 | - | <4 | - | - | 25 | - | - | | | <4 | mg/kg | TM5/PM16 |
| >EC16-EC21 | 54 | - | <7 | - | - | 495 | - | - | | | <7 | mg/kg | TM5/PM16 |
| >EC21-EC35 | 261 | - | <7 | - | - | 994 | - | - | | | <7 | mg/kg | TM5/PM16 |
| Total aromatics C5-35 | 321 | - | <19 | - | - | 1514 | - | - | | | <19 | mg/kg | TM5/TM36/PM12/PM16 |
| Total aliphatics and aromatics(C5-35) | 406 | - | <38 | - | - | 1658 | - | - | | | <38 | mg/kg | TM5/TM36/PM12/PM16 |
| Natural Moisture Content | 22.7 | - | 21.7 | - | - | 38.2 | - | - | | | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | <0.3 | - | <0.3 | - | - | 1.7 | - | - | | | <0.3 | mg/kg | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) # | - | 0.1298 | - | 0.3135 | 0.0096 | - | 0.1341 | 0.2026 | | | <0.0015 | g/l | TM38/PM20 |
| Chromium III | 80.9 | - | 64.2 | - | - | 91.2 | - | - | | | <0.5 | mg/kg | NONE/NONE |
| pH # | - | 8.28 | - | 8.28 | 8.32 | - | 9.38 | 7.78 | | | <0.01 | pH units | TM73/PM11 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Peter Cowsill Ltd **VOC Report :** **Solid**
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

| J E Sample No. | 3-4 | 7-8 | 20-21 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH1 | BH1 | BH2 | | | | | | | | | |
| Depth | 1.50 | 3.50 | 4.00 | | | | | | | Please see attached notes for all abbreviations and acronyms | | |
| COC No / misc | | | | | | | | | | | | |
| Containers | V J | V J | V J | | | | | | | | | |
| Sample Date | <> | <> | <> | | | | | | | | | |
| Sample Type | Soil | Soil | Soil | | | | | | | | | |
| Batch Number | 1 | 1 | 1 | | | | | | | | | |
| Date of Receipt | 13/10/2015 | 13/10/2015 | 13/10/2015 | | | | | | | LOD/LOR | Units | Method No. |
| VOC MS | | | | | | | | | | | | |
| Dichlorodifluoromethane | <2 | <2 | <2 | | | | | | | <2 | ug/kg | TM15/PM10 |
| Methyl Tertiary Butyl Ether # | <2 | <2 | <2 | | | | | | | <2 | ug/kg | TM15/PM10 |
| Chloromethane # | 22 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Vinyl Chloride | <2 | <2 | <2 | | | | | | | <2 | ug/kg | TM15/PM10 |
| Bromomethane | <1 | <1 | <1 | | | | | | | <1 | ug/kg | TM15/PM10 |
| Chloroethane # | <2 | <2 | <2 | | | | | | | <2 | ug/kg | TM15/PM10 |
| Trichlorofluoromethane # | <2 | <2 | <2 | | | | | | | <2 | ug/kg | TM15/PM10 |
| 1,1-Dichloroethene (1,1 DCE) # | <6 | <6 | <6 | | | | | | | <6 | ug/kg | TM15/PM10 |
| Dichloromethane (DCM) # | 133 | 16 | <7 | | | | | | | <7 | ug/kg | TM15/PM10 |
| trans-1-2-Dichloroethene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1-Dichloroethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| cis-1-2-Dichloroethene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 2,2-Dichloropropane | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| Bromochloromethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Chloroform # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,1-Trichloroethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1-Dichloropropene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Carbon tetrachloride # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2-Dichloroethane # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| Benzene # | 4 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Trichloroethene (TCE) # | <3 | 12 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,2-Dichloropropane # | <6 | <6 | <6 | | | | | | | <6 | ug/kg | TM15/PM10 |
| Dibromomethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Bromodichloromethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| cis-1-3-Dichloropropene | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| Toluene # | 26 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| trans-1-3-Dichloropropene | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,2-Trichloroethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Tetrachloroethene (PCE) # | <3 | <3 | 213 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,3-Dichloropropane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Dibromochloromethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,2-Dibromoethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Chlorobenzene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,1,2-Tetrachloroethane | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Ethylbenzene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| p/m-Xylene # | <5 | <5 | <5 | | | | | | | <5 | ug/kg | TM15/PM10 |
| o-Xylene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Styrene | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Bromoform | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Isopropylbenzene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,2,2-Tetrachloroethane # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| Bromobenzene | <2 | <2 | <2 | | | | | | | <2 | ug/kg | TM15/PM10 |
| 1,2,3-Trichloropropane # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| Propylbenzene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 2-Chlorotoluene | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,3,5-Trimethylbenzene # | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| 4-Chlorotoluene | <3 | <3 | <3 | | | | | | | <3 | ug/kg | TM15/PM10 |
| tert-Butylbenzene # | <5 | <5 | <5 | | | | | | | <5 | ug/kg | TM15/PM10 |
| 1,2,4-Trimethylbenzene # | <6 | <6 | <6 | | | | | | | <6 | ug/kg | TM15/PM10 |
| sec-Butylbenzene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 4-Isopropyltoluene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,3-Dichlorobenzene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,4-Dichlorobenzene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| n-Butylbenzene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2-Dichlorobenzene # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2-Dibromo-3-chloropropane # | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2,4-Trichlorobenzene # | <7 | <7 | <7 | | | | | | | <7 | ug/kg | TM15/PM10 |
| Hexachlorobutadiene | <4 | <4 | <4 | | | | | | | <4 | ug/kg | TM15/PM10 |
| Naphthalene | <27 | <27 | <27 | | | | | | | <27 | ug/kg | TM15/PM10 |
| 1,2,3-Trichlorobenzene # | <7 | <7 | <7 | | | | | | | <7 | ug/kg | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 134 | 116 | 94 | | | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 130 | 139 | 98 | | | | | | | <0 | % | TM15/PM10 |

**Client Name:** Peter Cowsill Ltd
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **J E Sample No.** | 27-28 | | | | | | | | | | | | |
| **Sample ID** | BH3 | | | | | | | | | | | | |
| **Depth** | 14.70 | | | | | | | | | | | | |
| **COC No / misc** | | | | | | | | | | | | | |
| **Containers** | T | | | | | | | | | | | | |
| **Sample Date** | <> | | | | | | | | | | | | |
| **Sample Type** | Ground Water | | | | | | | | | | | | |
| **Batch Number** | 1 | | | | | | | | | | | | |
| **Date of Receipt** | 13/10/2015 | | | | | | | | | | | | |
| Sulphate # | 10.72 | | | | | | | | | | | <0.05 | mg/l | TM38/PM0 |
| pH # | 7.51 | | | | | | | | | | | <0.01 | pH units | TM73/PM0 |

Please see attached notes for all abbreviations and acronyms

**JE Job No:** 15/14669

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| PM4 | Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377. | PM0 | No preparation is required. | | | | |
| TM4 | Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | | | AR | Yes |
| TM4 | Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | Yes | | AR | Yes |
| TM5 | Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID. | PM16 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | | | AR | Yes |
| TM5 | Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID. | PM16 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | Yes | | AR | Yes |
| TM5/TM36 | TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID.<br>TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. | PM12/PM16 | CWG GC-FID | | | AR | Yes |
| TM15 | Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | AR | Yes |
| TM15 | Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | AR | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | | | AD | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | Yes | | AD | Yes |

**JE Job No:** 15/14669

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | AR | Yes |
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | AR | Yes |
| TM38 | Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1 | PM0 | No preparation is required. | Yes | | | |
| TM38 | Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1 | PM20 | Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker. | Yes | | AD | Yes |
| TM38 | Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1 | PM20 | Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker. | Yes | | AR | Yes |
| TM73 | Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser. | PM0 | No preparation is required. | Yes | | | |
| TM73 | Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser. | PM11 | Extraction of as received solid samples using one part solid to 2.5 parts deionised water. | Yes | | AR | No |
| TM74 | Analysis of water soluble boron (20:1 extract) by ICP-OES. | PM32 | Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio. | Yes | | AD | Yes |
| NONE | No Method Code | NONE | No Method Code | | | AR | Yes |
| | | | | | | | |

# Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
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Peter Cowsill Ltd
11a Laygate View
New Mills
High Peak
SK22 3EF

4225

| | |
|---|---|
| **Attention :** | Peter Cowsill |
| **Date :** | 2nd November, 2015 |
| **Your reference :** | |
| **Our reference :** | Test Report 15/14669 Batch 2 |
| **Location :** | Watford Industrial Estate |
| **Date samples received :** | 23rd October, 2015 |
| **Status :** | Final report |
| **Issue :** | 1 |

Three samples were received for analysis on 23rd October, 2015 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Bruce Leslie**
**Project Co-ordinator**

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

***JE Job No.:*** 15/14669

**SOILS**

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

**WATERS**

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

**DEVIATING SAMPLES**

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

**SURROGATES**

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

**DILUTIONS**

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**ABBREVIATIONS and ACRONYMS USED**

| | |
|---|---|
| # | ISO17025 (UKAS) accredited - UK. |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| ++ | Result outside calibration range, results should be considered as indicative only and are not accredited. |
| * | Analysis subcontracted to a Jones Environmental approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |

**Client Name:** Peter Cowsill Ltd
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

| J E Sample No. | 31-32 | 33-34 | | | | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH3 | BH3 | | | | | | | | | | | |
| Depth | 2.00 | 3.00 | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J | V J | | | | | | | | | | | |
| Sample Date | <> | <> | | | | | | | | | | | |
| Sample Type | Soil | Soil | | | | | | | | | | | |
| Batch Number | 2 | 2 | | | | | | | | | | | |
| Date of Receipt | 23/10/2015 | 23/10/2015 | | | | | | | | | | | |
| Arsenic # | 8.0 | 6.4 | | | | | | | | | <0.5 | mg/kg | TM30/PM15 |
| Barium # | 53 | 142 | | | | | | | | | <1 | mg/kg | TM30/PM15 |
| Beryllium | 0.9 | 1.2 | | | | | | | | | <0.5 | mg/kg | TM30/PM15 |
| Cadmium # | 0.3 | 0.4 | | | | | | | | | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | 67.9 | 54.8 | | | | | | | | | <0.5 | mg/kg | TM30/PM15 |
| Copper # | 28 | 33 | | | | | | | | | <1 | mg/kg | TM30/PM15 |
| Lead # | 25 | 19 | | | | | | | | | <5 | mg/kg | TM30/PM15 |
| Mercury # | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | 26.3 | 34.1 | | | | | | | | | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | <1 | <1 | | | | | | | | | <1 | mg/kg | TM30/PM15 |
| Vanadium | 18 | 29 | | | | | | | | | <1 | mg/kg | TM30/PM15 |
| Water Soluble Boron # | 0.3 | 0.4 | | | | | | | | | <0.1 | mg/kg | TM74/PM32 |
| Zinc # | 226 | 85 | | | | | | | | | <5 | mg/kg | TM30/PM15 |
| | | | | | | | | | | | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | <0.03 | <0.03 | | | | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | <0.05 | <0.05 | | | | | | | | | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | <0.03 | <0.03 | | | | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | <0.03 | <0.03 | | | | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | <0.03 | <0.03 | | | | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | <0.06 | <0.06 | | | | | | | | | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | <0.02 | <0.02 | | | | | | | | | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | <0.07 | <0.07 | | | | | | | | | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | <0.04 | <0.04 | | | | | | | | | <0.04 | mg/kg | TM4/PM8 |
| PAH 16 Total | <0.6 | <0.6 | | | | | | | | | <0.6 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | <0.05 | <0.05 | | | | | | | | | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | <0.02 | <0.02 | | | | | | | | | <0.02 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | 100 | 105 | | | | | | | | | <0 | % | TM4/PM8 |
| | | | | | | | | | | | | | |
| Methyl Tertiary Butyl Ether # | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| Benzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Toluene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Ethylbenzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| p/m-Xylene # | <5 | <5 | | | | | | | | | <5 | ug/kg | TM15/PM10 |
| o-Xylene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 114 | 102 | | | | | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 126 | 98 | | | | | | | | | <0 | % | TM15/PM10 |
| | | | | | | | | | | | | | |

**Client Name:** Peter Cowsill Ltd
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

| J E Sample No. | 31-32 | 33-34 | | | | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH3 | BH3 | | | | | | | | | | | |
| Depth | 2.00 | 3.00 | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J | V J | | | | | | | | | | | |
| Sample Date | <> | <> | | | | | | | | | | | |
| Sample Type | Soil | Soil | | | | | | | | | | | |
| Batch Number | 2 | 2 | | | | | | | | | | | |
| Date of Receipt | 23/10/2015 | 23/10/2015 | | | | | | | | | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | <0.2 | <0.2 | | | | | | | | | <0.2 | mg/kg | TM5/PM16 |
| >C12-C16 # | <4 | <4 | | | | | | | | | <4 | mg/kg | TM5/PM16 |
| >C16-C21 # | <7 | <7 | | | | | | | | | <7 | mg/kg | TM5/PM16 |
| >C21-C35 # | <7 | <7 | | | | | | | | | <7 | mg/kg | TM5/PM16 |
| Total aliphatics C5-35 | <19 | <19 | | | | | | | | | <19 | mg/kg | TM5/TM36/PM12/PM16 |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | <0.1 | <0.1 | | | | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 | <0.2 | <0.2 | | | | | | | | | <0.2 | mg/kg | TM5/PM16 |
| >EC12-EC16 | <4 | <4 | | | | | | | | | <4 | mg/kg | TM5/PM16 |
| >EC16-EC21 | <7 | <7 | | | | | | | | | <7 | mg/kg | TM5/PM16 |
| >EC21-EC35 | <7 | <7 | | | | | | | | | <7 | mg/kg | TM5/PM16 |
| Total aromatics C5-35 | <19 | <19 | | | | | | | | | <19 | mg/kg | TM5/TM36/PM12/PM16 |
| Total aliphatics and aromatics(C5-35) | <38 | <38 | | | | | | | | | <38 | mg/kg | TM5/TM36/PM12/PM16 |
| Natural Moisture Content | 6.8 | 11.5 | | | | | | | | | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | <0.3 | <0.3 | | | | | | | | | <0.3 | mg/kg | TM38/PM20 |
| Chromium III | 67.9 | 54.8 | | | | | | | | | <0.5 | mg/kg | NONE/NONE |

**Client Name:** Peter Cowsill Ltd **VOC Report :** **Solid**
**Reference:**
**Location:** Watford Industrial Estate
**Contact:** Peter Cowsill
**JE Job No.:** 15/14669

| J E Sample No. | 31-32 | 33-34 | | | | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH3 | BH3 | | | | | | | | | | | |
| Depth | 2.00 | 3.00 | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J | V J | | | | | | | | | | | |
| Sample Date | <> | <> | | | | | | | | | | | |
| Sample Type | Soil | Soil | | | | | | | | | | | |
| Batch Number | 2 | 2 | | | | | | | | | | | |
| Date of Receipt | 23/10/2015 | 23/10/2015 | | | | | | | | | | | |
| VOC MS | | | | | | | | | | | | | |
| Dichlorodifluoromethane | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| Methyl Tertiary Butyl Ether # | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| Chloromethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Vinyl Chloride | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| Bromomethane | <1 | <1 | | | | | | | | | <1 | ug/kg | TM15/PM10 |
| Chloroethane # | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| Trichlorofluoromethane # | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| 1,1-Dichloroethene (1,1 DCE) # | <6 | <6 | | | | | | | | | <6 | ug/kg | TM15/PM10 |
| Dichloromethane (DCM) # | <7 | 21 | | | | | | | | | <7 | ug/kg | TM15/PM10 |
| trans-1-2-Dichloroethene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1-Dichloroethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| cis-1-2-Dichloroethene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 2,2-Dichloropropane | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| Bromochloromethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Chloroform # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,1-Trichloroethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1-Dichloropropene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Carbon tetrachloride # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2-Dichloroethane # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| Benzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Trichloroethene (TCE) # | 13 | 11 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,2-Dichloropropane # | <6 | <6 | | | | | | | | | <6 | ug/kg | TM15/PM10 |
| Dibromomethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Bromodichloromethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| cis-1-3-Dichloropropene | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| Toluene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| trans-1-3-Dichloropropene | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,2-Trichloroethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Tetrachloroethene (PCE) # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,3-Dichloropropane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Dibromochloromethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,2-Dibromoethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Chlorobenzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,1,2-Tetrachloroethane | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Ethylbenzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| p/m-Xylene # | <5 | <5 | | | | | | | | | <5 | ug/kg | TM15/PM10 |
| o-Xylene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Styrene | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Bromoform | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Isopropylbenzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,1,2,2-Tetrachloroethane # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| Bromobenzene | <2 | <2 | | | | | | | | | <2 | ug/kg | TM15/PM10 |
| 1,2,3-Trichloropropane # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| Propylbenzene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 2-Chlorotoluene | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 1,3,5-Trimethylbenzene # | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| 4-Chlorotoluene | <3 | <3 | | | | | | | | | <3 | ug/kg | TM15/PM10 |
| tert-Butylbenzene # | <5 | <5 | | | | | | | | | <5 | ug/kg | TM15/PM10 |
| 1,2,4-Trimethylbenzene # | <6 | <6 | | | | | | | | | <6 | ug/kg | TM15/PM10 |
| sec-Butylbenzene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 4-Isopropyltoluene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,3-Dichlorobenzene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,4-Dichlorobenzene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| n-Butylbenzene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2-Dichlorobenzene # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2-Dibromo-3-chloropropane # | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| 1,2,4-Trichlorobenzene # | <7 | <7 | | | | | | | | | <7 | ug/kg | TM15/PM10 |
| Hexachlorobutadiene | <4 | <4 | | | | | | | | | <4 | ug/kg | TM15/PM10 |
| Naphthalene | <27 | <27 | | | | | | | | | <27 | ug/kg | TM15/PM10 |
| 1,2,3-Trichlorobenzene # | <7 | <7 | | | | | | | | | <7 | ug/kg | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 114 | 102 | | | | | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 126 | 98 | | | | | | | | | <0 | % | TM15/PM10 |

Please see attached notes for all abbreviations and acronyms

**JE Job No:** 15/14669

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| PM4 | Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377. | PM0 | No preparation is required. | | | | |
| TM4 | Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | | | AR | Yes |
| TM4 | Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | Yes | | AR | Yes |
| TM5 | Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID. | PM16 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | | | AR | Yes |
| TM5 | Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID. | PM16 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | Yes | | AR | Yes |
| TM5/TM36 | TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID.<br>TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. | PM12/PM16 | CWG GC-FID | | | AR | Yes |
| TM15 | Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | AR | Yes |
| TM15 | Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | AR | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | | | AD | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | Yes | | AD | Yes |

**JE Job No:** 15/14669

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | AR | Yes |
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | AR | Yes |
| TM38 | Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1 | PM20 | Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker. | Yes | | AR | Yes |
| TM74 | Analysis of water soluble boron (20:1 extract) by ICP-OES. | PM32 | Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio. | Yes | | AD | Yes |
| NONE | No Method Code | NONE | No Method Code | | | AR | Yes |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |

*Jones Environmental Laboratory*

**Report:** **Solid**

**JE Job No:** 15/14669

**Client:** Peter Cowsill Ltd

**Client ref:**

**Location:** Watford Industrial Estate

**Contact** Peter Cowsill

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Sample ID** | BH1 | BH1 | BH2 | BH3 | BH3 | **C4SL** | **GAC** | **SGV** |
| | | | | **Depth** | 1.50 | 3.50 | 4.00 | 2.00 | 3.00 | | | |
| | | | | **COC No / misc** | | | | | | mg/kg | mg/kg | |
| | | | | **Containers** | V J | V J | V J | V J | V J | | | |
| | | | | **Sample Type** | Soil | Soil | Soil | Soil | Soil | | | |
| | | | | **Sampled Date** | <> | <> | <> | <> | <> | | | |
| | | | | **Sample Received Date** | 13/10/2015 | 13/10/2015 | 13/10/2015 | 23/10/2015 | 23/10/2015 | | | |
| | | | | **J E Sample No** | 3-4 | 7-8 | 20-21 | 31-32 | 33-34 | | | |
| | | | | **Batch Number** | 1 | 1 | 1 | 2 | 2 | | | |
| | | | | | | | | | | Assume | 1%organic | |
| **CAS Number** | **Test** | **Method** | **Units** | **LOD** | | | | | | | | |
| 7440-38-2 | Arsenic # | TM30/PM15 | mg/kg | <0.5 | 54.9 | 15.8 | 60.4 | 8 | 6.4 | 640 | | |
| 7440-39-3 | Barium # | TM30/PM15 | mg/kg | <1 | 239 | 55 | 227 | 53 | 142 | | | |
| 7440-41-7 | Beryllium | TM30/PM15 | mg/kg | <0.5 | 1.2 | 0.7 | 1.2 | 0.9 | 1.2 | | 1950 | |
| 7440-43-9 | Cadmium # | TM30/PM15 | mg/kg | <0.1 | 0.5 | <0.1 | 2.5 | 0.3 | 0.4 | 410 | | 230 |
| 7440-47-3 | Chromium # | TM30/PM15 | mg/kg | <0.5 | 80.9 | 64.2 | 92.9 | 67.9 | 54.8 | see | below | CrIV and CrIII |
| 7440-50-8 | Copper # | TM30/PM15 | mg/kg | <1 | 218 | 20 | 649 | 28 | 33 | | 45700 | |
| 7439-92-1 | Lead # | TM30/PM15 | mg/kg | <5 | 370 | 41 | 323 | 25 | 19 | 1100-6000 | | |
| 7439-97-6 | Mercury # | TM30/PM15 | mg/kg | <0.1 | 0.1 | <0.1 | 0.1 | <0.1 | <0.1 | | | 26 |
| 7440-02-0 | Nickel # | TM30/PM15 | mg/kg | <0.7 | 30.4 | 15.9 | 30 | 26.3 | 34.1 | | | 1800 |
| 7782-49-2 | Selenium # | TM30/PM15 | mg/kg | <1 | <1 | <1 | 1 | <1 | <1 | | | 13000 |
| 7440-62-2 | Vanadium | TM30/PM15 | mg/kg | <1 | 44 | 24 | 52 | 18 | 29 | | 4250 | |
| 7440-42-8 | Water Soluble Boron # | TM74/PM32 | mg/kg | <0.1 | 1.6 | 0.5 | 2 | 0.3 | 0.4 | | | |
| 7440-66-6 | Zinc # | TM30/PM15 | mg/kg | <5 | 280 | 67 | 500 | 226 | 85 | | 188000 | |
| | | | | | | | | | | | | |
| | **PAH MS** | | | | | | | | | | | |
| 91-20-3 | Naphthalene # | TM4/PM8 | mg/kg | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | | 200 | |
| 208-96-8 | Acenaphthylene | TM4/PM8 | mg/kg | <0.03 | 0.07 | <0.03 | 0.04 | <0.03 | <0.03 | | 84000 | |
| 83-32-9 | Acenaphthene # | TM4/PM8 | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | | 85000 | |
| 86-73-7 | Fluorene # | TM4/PM8 | mg/kg | <0.04 | 0.05 | <0.04 | <0.04 | <0.04 | <0.04 | | 64000 | |
| 85-01-8 | Phenanthrene # | TM4/PM8 | mg/kg | <0.03 | 0.53 | <0.03 | 0.43 | <0.03 | <0.03 | | 22000 | |
| 120-12-7 | Anthracene # | TM4/PM8 | mg/kg | <0.04 | 0.22 | <0.04 | 0.4 | <0.04 | <0.04 | | 530000 | |
| 206-44-0 | Fluoranthene # | TM4/PM8 | mg/kg | <0.03 | 1.8 | <0.03 | 1.98 | <0.03 | <0.03 | | 23000 | |
| 129-00-0 | Pyrene # | TM4/PM8 | mg/kg | <0.03 | 1.57 | <0.03 | 1.55 | <0.03 | <0.03 | | 54000 | |
| 56-55-3 | Benzo(a)anthracene # | TM4/PM8 | mg/kg | <0.06 | 0.81 | <0.06 | 1 | <0.06 | <0.06 | | 90 | |
| 218-01-9 | Chrysene # | TM4/PM8 | mg/kg | <0.02 | 1.08 | <0.02 | 0.88 | <0.02 | <0.02 | | 140 | |
| | Benzo(bk)fluoranthene # | TM4/PM8 | mg/kg | <0.07 | 1.61 | <0.07 | 1.33 | <0.07 | <0.07 | | 140 | |
| 50-32-8 | Benzo(a)pyrene # | TM4/PM8 | mg/kg | <0.04 | 1.13 | <0.04 | 0.82 | <0.04 | <0.04 | 76 | | |
| 193-39-5 | Indeno(123cd)pyrene # | TM4/PM8 | mg/kg | <0.04 | 0.72 | <0.04 | 0.54 | <0.04 | <0.04 | | 60 | |
| 53-70-3 | Dibenzo(ah)anthracene # | TM4/PM8 | mg/kg | <0.04 | 0.16 | <0.04 | 0.11 | <0.04 | <0.04 | | 13 | |
| 191-24-2 | Benzo(ghi)perylene # | TM4/PM8 | mg/kg | <0.04 | 0.66 | <0.04 | 0.48 | <0.04 | <0.04 | | 650 | |
| | PAH 16 Total | TM4/PM8 | mg/kg | <0.6 | 10.4 | <0.6 | 9.6 | <0.6 | <0.6 | | | |
| 205-99-2 | Benzo(b)fluoranthene | TM4/PM8 | mg/kg | <0.05 | 1.16 | <0.05 | 0.96 | <0.05 | <0.05 | | 100 | |
| 207-08-9 | Benzo(k)fluoranthene | TM4/PM8 | mg/kg | <0.02 | 0.45 | <0.02 | 0.37 | <0.02 | <0.02 | | 140 | |
| | PAH Surrogate % Recovery | TM4/PM8 | % | <0 | 109 | 100 | 96 | 100 | 105 | | | |

*Jones Environmental Laboratory*

**Report:** **Solid**

**JE Job No:** 15/14669

**Client:** Peter Cowsill Ltd

**Client ref:**

**Location:** Watford Industrial Estate

**Contact** Peter Cowsill

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Sample ID** | BH1 | BH1 | BH2 | BH3 | BH3 | **C4SL** | **GAC** | **SGV** |
| | | | | **Depth** | 1.50 | 3.50 | 4.00 | 2.00 | 3.00 | | | |
| | | | | **COC No / misc** | | | | | | mg/kg | mg/kg | |
| | | | | **Containers** | V J | V J | V J | V J | V J | | | |
| | | | | **Sample Type** | Soil | Soil | Soil | Soil | Soil | | | |
| | | | | **Sampled Date** | <> | <> | <> | <> | <> | | | |
| | | | | **Sample Received Date** | 13/10/2015 | 13/10/2015 | 13/10/2015 | 23/10/2015 | 23/10/2015 | | | |
| | | | | **J E Sample No** | 3-4 | 7-8 | 20-21 | 31-32 | 33-34 | | | |
| | | | | **Batch Number** | 1 | 1 | 1 | 2 | 2 | | | |
| | | | | | | | | | | Assume | 1%organic | |
| **CAS Number** | **Test** | **Method** | **Units** | **LOD** | | | | | | | | |
| | **VOC MS** | | | | | | | | | | | |
| 75-71-8 | Dichlorodifluoromethane | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | | |
| 1634-04-4 | Methyl Tertiary Butyl Ether # | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | | |
| 74-87-3 | Chloromethane # | TM15/PM10 | ug/kg | <3 | 22 | <3 | <3 | <3 | <3 | | | |
| 75-01-4 | Vinyl Chloride | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | 0.063 | |
| 74-83-9 | Bromomethane | TM15/PM10 | ug/kg | <1 | <1 | <1 | <1 | <1 | <1 | | | |
| 75-00-3 | Chloroethane # | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | | |
| 75-69-4 | Trichlorofluoromethane # | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | | |
| 75-35-4 | 1,1-Dichloroethene (1,1 DCE) # | TM15/PM10 | ug/kg | <6 | <6 | <6 | <6 | <6 | <6 | | | |
| 75-09-2 | Dichloromethane (DCM) # | TM15/PM10 | ug/kg | <7 | 133 | 16 | <7 | <7 | 21 | | | |
| 156-60-5 | trans-1-2-Dichloroethene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | 0.5 | |
| 75-34-3 | 1,1-Dichloroethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 156-59-2 | cis-1-2-Dichloroethene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | 0.71 | |
| 594-20-7 | 2,2-Dichloropropane | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 74-97-5 | Bromochloromethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 67-66-3 | Chloroform # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | 110 | |
| 71-55-6 | 1,1,1-Trichloroethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | 700 | |
| 563-58-6 | 1,1-Dichloropropene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 56-23-5 | Carbon tetrachloride # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | 3 | |
| 107-06-2 | 1,2-Dichloroethane # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 71-43-2 | Benzene # | TM15/PM10 | ug/kg | <3 | 4 | <3 | <3 | <3 | <3 | 98 | | |
| 79-01-6 | Trichloroethene (TCE) # | TM15/PM10 | ug/kg | <3 | <3 | 12 | <3 | 13 | 11 | | 12 | |
| 78-87-5 | 1,2-Dichloropropane # | TM15/PM10 | ug/kg | <6 | <6 | <6 | <6 | <6 | <6 | | | |
| 74-95-3 | Dibromomethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 75-27-4 | Bromodichloromethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 10061-01-5 | cis-1-3-Dichloropropene | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 108-88-3 | Toluene # | TM15/PM10 | ug/kg | <3 | 26 | <3 | <3 | <3 | <3 | | | 4400 |
| 10061-02-6 | trans-1-3-Dichloropropene | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 79-00-5 | 1,1,2-Trichloroethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 127-18-4 | Tetrachloroethene (PCE) # | TM15/PM10 | ug/kg | <3 | <3 | <3 | 213 | <3 | <3 | | 130 | |
| 142-28-9 | 1,3-Dichloropropane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 124-48-1 | Dibromochloromethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 106-93-4 | 1,2-Dibromoethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 108-90-7 | Chlorobenzene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | 59 | |

*Jones Environmental Laboratory*

**Report:** **Solid**

**JE Job No:** 15/14669

**Client:** Peter Cowsill Ltd

**Client ref:**

**Location:** Watford Industrial Estate

**Contact** Peter Cowsill

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Sample ID** | BH1 | BH1 | BH2 | BH3 | BH3 | **C4SL** | **GAC** | **SGV** |
| | | | | **Depth** | 1.50 | 3.50 | 4.00 | 2.00 | 3.00 | | | |
| | | | | **COC No / misc** | | | | | | mg/kg | mg/kg | |
| | | | | **Containers** | V J | V J | V J | V J | V J | | | |
| | | | | **Sample Type** | Soil | Soil | Soil | Soil | Soil | | | |
| | | | | **Sampled Date** | <> | <> | <> | <> | <> | | | |
| | | | | **Sample Received Date** | 13/10/2015 | 13/10/2015 | 13/10/2015 | 23/10/2015 | 23/10/2015 | | | |
| | | | | **J E Sample No** | 3-4 | 7-8 | 20-21 | 31-32 | 33-34 | | | |
| | | | | **Batch Number** | 1 | 1 | 1 | 2 | 2 | | | |
| | | | | | | | | | | Assume | 1%organic | |
| **CAS Number** | **Test** | **Method** | **Units** | **LOD** | | | | | | | | |
| 630-20-6 | 1,1,1,2-Tetrachloroethane | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | 290 | |
| 100-41-4 | Ethylbenzene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | 2800 |
| | p/m-Xylene # | TM15/PM10 | ug/kg | <5 | <5 | <5 | <5 | <5 | <5 | | | |
| 95-47-6 | o-Xylene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 100-42-5 | Styrene | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 75-25-2 | Bromoform | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 98-82-8 | Isopropylbenzene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 79-34-5 | 1,1,2,2-Tetrachloroethane # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 108-86-1 | Bromobenzene | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | | |
| 96-18-4 | 1,2,3-Trichloropropane # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 103-65-1 | Propylbenzene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 95-49-8 | 2-Chlorotoluene | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 108-67-8 | 1,3,5-Trimethylbenzene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 106-43-4 | 4-Chlorotoluene | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 98-06-6 | tert-Butylbenzene # | TM15/PM10 | ug/kg | <5 | <5 | <5 | <5 | <5 | <5 | | | |
| 95-63-6 | 1,2,4-Trimethylbenzene # | TM15/PM10 | ug/kg | <6 | <6 | <6 | <6 | <6 | <6 | | | |
| 135-98-8 | sec-Butylbenzene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 99-87-6 | 4-Isopropyltoluene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 541-73-1 | 1,3-Dichlorobenzene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | 2100 | |
| 106-46-7 | 1,4-Dichlorobenzene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 104-51-8 | n-Butylbenzene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 95-50-1 | 1,2-Dichlorobenzene # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | 2100 | |
| 96-12-8 | 1,2-Dibromo-3-chloropropane # | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | | |
| 120-82-1 | 1,2,4-Trichlorobenzene # | TM15/PM10 | ug/kg | <7 | <7 | <7 | <7 | <7 | <7 | | 230 | |
| 87-68-3 | Hexachlorobutadiene | TM15/PM10 | ug/kg | <4 | <4 | <4 | <4 | <4 | <4 | | 1.98 | |
| 91-20-3 | Naphthalene | TM15/PM10 | ug/kg | <27 | <27 | <27 | <27 | <27 | <27 | | | |
| 87-61-6 | 1,2,3-Trichlorobenzene # | TM15/PM10 | ug/kg | <7 | <7 | <7 | <7 | <7 | <7 | | 110 | |
| 2037-26-5 | Surrogate Recovery Toluene D8 | TM15/PM10 | % | <0 | 134 | 116 | 94 | 114 | 102 | | | |
| 460-00-4 | Surrogate Recovery 4-Bromofluorobenzene | TM15/PM10 | % | <0 | 130 | 139 | 98 | 126 | 98 | | | |
| | | | | | | | | | | | | |
| 1634-04-4 | Methyl Tertiary Butyl Ether # | TM15/PM10 | ug/kg | <2 | <2 | <2 | <2 | <2 | <2 | | | |
| 71-43-2 | Benzene # | TM15/PM10 | ug/kg | <3 | 4 | <3 | <3 | <3 | <3 | 98 | | |
| 108-88-3 | Toluene # | TM15/PM10 | ug/kg | <3 | 26 | <3 | <3 | <3 | <3 | | | |
| 100-41-4 | Ethylbenzene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| | p/m-Xylene # | TM15/PM10 | ug/kg | <5 | <5 | <5 | <5 | <5 | <5 | | | |

*Jones Environmental Laboratory*

**Report:** **Solid**

**JE Job No:** 15/14669

**Client:** Peter Cowsill Ltd

**Client ref:**

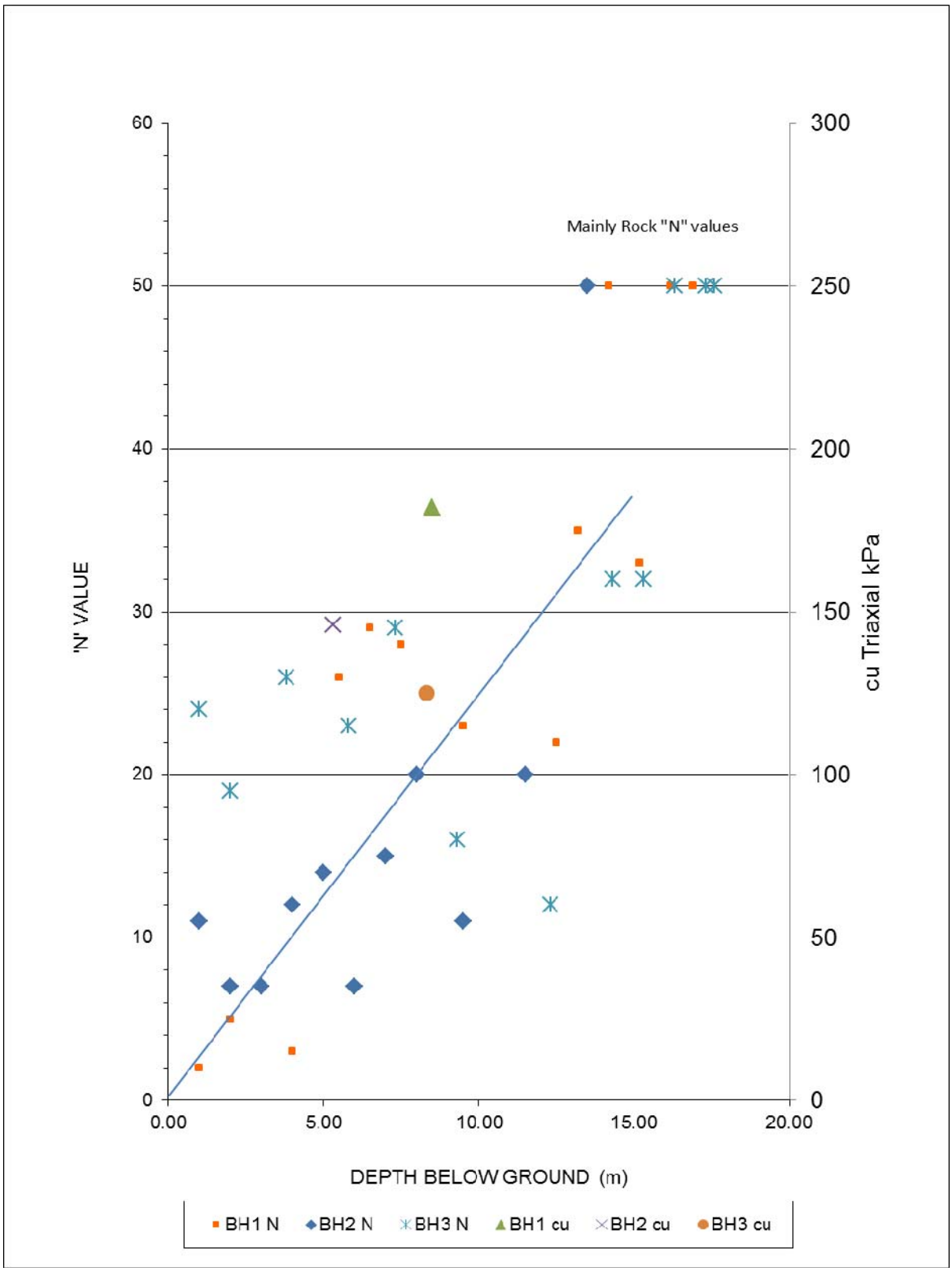
**Location:** Watford Industrial Estate

**Contact** Peter Cowsill

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Sample ID** | BH1 | BH1 | BH2 | BH3 | BH3 | **C4SL** | **GAC** | **SGV** |
| | | | | **Depth** | 1.50 | 3.50 | 4.00 | 2.00 | 3.00 | | | |
| | | | | **COC No / misc** | | | | | | mg/kg | mg/kg | |
| | | | | **Containers** | V J | V J | V J | V J | V J | | | |
| | | | | **Sample Type** | Soil | Soil | Soil | Soil | Soil | | | |
| | | | | **Sampled Date** | <> | <> | <> | <> | <> | | | |
| | | | | **Sample Received Date** | 13/10/2015 | 13/10/2015 | 13/10/2015 | 23/10/2015 | 23/10/2015 | | | |
| | | | | **J E Sample No** | 3-4 | 7-8 | 20-21 | 31-32 | 33-34 | | | |
| | | | | **Batch Number** | 1 | 1 | 1 | 2 | 2 | | | |
| | | | | | | | | | | Assume | 1%organic | |
| **CAS Number** | **Test** | **Method** | **Units** | **LOD** | | | | | | | | |
| 95-47-6 | o-Xylene # | TM15/PM10 | ug/kg | <3 | <3 | <3 | <3 | <3 | <3 | | | |
| 2037-26-5 | Surrogate Recovery Toluene D8 | TM15/PM10 | % | <0 | 134 | 116 | 94 | 114 | 102 | | | |
| 460-00-4 | Surrogate Recovery 4-Bromofluorobenzene | TM15/PM10 | % | <0 | 130 | 139 | 98 | 126 | 98 | | | |
| | **TPH CWG** | | | | | | | | | | | |
| | **Aliphatics** | | | | | | | | | | | |
| | >C5-C6 # | TM36/PM12 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | 95.3 | |
| | >C6-C8 # | TM36/PM12 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | 242 | |
| | >C8-C10 | TM36/PM12 | mg/kg | <0.1 | <0.1 | <0.1 | 0.4 | <0.1 | <0.1 | | 65.9 | |
| | >C10-C12 # | TM5/PM16 | mg/kg | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | | 29900 | |
| | >C12-C16 # | TM5/PM16 | mg/kg | <4 | <4 | <4 | <4 | <4 | <4 | | 29900 | |
| | >C16-C21 # | TM5/PM16 | mg/kg | <7 | <7 | <7 | 11 | <7 | <7 | | 617000 | |
| | >C21-C35 # | TM5/PM16 | mg/kg | <7 | 85 | <7 | 133 | <7 | <7 | | 617000 | |
| | Total aliphatics C5-35 | TM5/TM36/PM12/PM16 | mg/kg | <19 | 85 | <19 | 144 | <19 | <19 | | | |
| | **Aromatics** | | | | | | | | | | | |
| | >C5-EC7 | TM36/PM12 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | 26.9 | |
| | >EC7-EC8 | TM36/PM12 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | 30.4 | |
| | >EC8-EC10 # | TM36/PM12 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | 107 | |
| | >EC10-EC12 | TM5/PM16 | mg/kg | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | | 625 | |
| | >EC12-EC16 | TM5/PM16 | mg/kg | <4 | 6 | <4 | 25 | <4 | <4 | | 12200 | |
| | >EC16-EC21 | TM5/PM16 | mg/kg | <7 | 54 | <7 | 495 | <7 | <7 | | 9190 | |
| | >EC21-EC35 | TM5/PM16 | mg/kg | <7 | 261 | <7 | 994 | <7 | <7 | | 9250 | |
| | Total aromatics C5-35 | TM5/TM36/PM12/PM16 | mg/kg | <19 | 321 | <19 | 1514 | <19 | <19 | | 9250 | |
| | Total aliphatics and aromatics(C5-35) | TM5/TM36/PM12/PM16 | mg/kg | <38 | 406 | <38 | 1658 | <38 | <38 | | | |
| | Natural Moisture Content | PM4/PM0 | % | <0.1 | 22.7 | 21.7 | 38.2 | 6.8 | 11.5 | | | |
| 18540-29-9 | Hexavalent Chromium # | TM38/PM20 | mg/kg | <0.3 | <0.3 | <0.3 | 1.7 | <0.3 | <0.3 | 49 | | |
| | Sulphate as SO4 (2:1 Ext) # | TM38/PM20 | g/l | <0.0015 | NA | NA | NA | | | | | |
| 16065-83-1 | Chromium III | NONE/NONE | mg/kg | <0.5 | 80.9 | 64.2 | 91.2 | 67.9 | 54.8 | | 30400 | |
| | pH # | TM73/PM11 | pH units | <0.01 | NA | NA | NA | | | | | |

# APPENDIX H

STRENGTH/DENSITY PLOT


Mainly Rock "N" values
'N' VALUE
cu Triaxial kPa
DEPTH BELOW GROUND (m)
0
10
20
30
40
50
60
0
50
100
150
200
250
300
0.00
5.00
10.00
15.00
20.00
BH1 N
BH2 N
BH3 N
BH1 cu
BH2 cu
BH3 cu

# APPENDIX F

## SOIL LABORATORY TESTING RESULTS

PSL
Professional Soils Laboratory

# LABORATORY REPORT

UKAS TESTING
4043

**Contract Number: PSL15/4979**

Client's Reference: Report Date: 22 October 2015

Client Name: Peter Cowsill Ltd
11A Leygate View
New Mills
High Peak
Stockport
SK22 3EF

**For the attention of: Peter Cowsill**

Contract Title: Watford Bridge

Date Received: 13/10/2015
Date Commenced: 13/10/2015
Date Completed: 22/10/2015

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**



Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
M Beastall (Laboratory Manager)

D Lambe (Senior Technician)
S Royle (Senior Technician)



**5 – 7 Hexthorpe Road, Hexthorpe,**
**Doncaster DN4 0AR**
**tel: +44 (0)844 815 6641**
**fax: +44 (0)844 815 6642**
**e-mail: rgunson@prosoils.co.uk**
**awatkins@prosoils.co.uk**

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Depth m | Description of Sample |
|---|---|---|---|---|
| BH1 | | D | 4.00 | Brown slightly gravelly very sandy CLAY. |
| BH1 | | U | 8.50 | Very stiff brown gravelly very sandy CLAY. |
| BH1 | | U | 11.50 | Stiff brown slightly gravelly slightly sandy CLAY. |
| BH2 | | B | 5.30 | Dark brown very sandy slightly silty GRAVEL. |
| BH2 | | B | 9.50 | Brown mottled grey slightly sandy CLAY. |
| BH2 | | D | 7.50 | Brown gravelly very sandy CLAY. |
| BH3 | | D | 4.25 | Brown slightly gravelly very sandy CLAY. |
| BH3 | | U | 8.30 | Stiff brown slightly gravelly very sandy CLAY. |
| BH3 | | B | 14.75 | Brown very gravelly slightly sandy CLAY. |
| BH3 | | B | 16.30 | Brown very sandy clayey GRAVEL with some cobbles. |
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PSL
Professional Soils Laboratory

| Compiled by | Date | Checked by | Date | Approved by | Date |
|---|---|---|---|---|---|
| | 22/10/15 | | 22/10/15 | | 22/10/15 |

**WATFORD BRIDGE.**

**Contract No:** PSL15/4979

**Client Ref:**

# SUMMARY OF SOIL CLASSIFICATION TESTS

**(B.S. 1377 : PART 2 : 1990)**

| Hole Number | Sample Number | Sample Type | Depth m | Moisture Content % Clause 3.2 | Bulk Density $Mg/m^3$ Clause 7.2 | Dry Density $Mg/m^3$ Clause 7.2 | Particle Density $Mg/m^3$ Clause 8.2 | Liquid Limit % Clause 4.3/4.4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | % Passing .425mm | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH1 | | D | 4.00 | 18 | | | | 36 | 17 | 19 | 91 | Intermediate plasticity CI. |
| BH2 | | D | 7.50 | 18 | | | | 32 | 16 | 16 | 79 | Low plasticity CL. |
| BH3 | | D | 4.25 | 13 | | | | 27 | 14 | 13 | 88 | Low plasticity CL. |
| | | | | | | | | | | | | |
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**SYMBOLS : NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

PSL
Professional Soils Laboratory

| Compiled by | Date | Checked by | Date | Approved by | Date |
|---|---|---|---|---|---|
| | 22/10/15 | | 22/10/15 | | 22/10/15 |

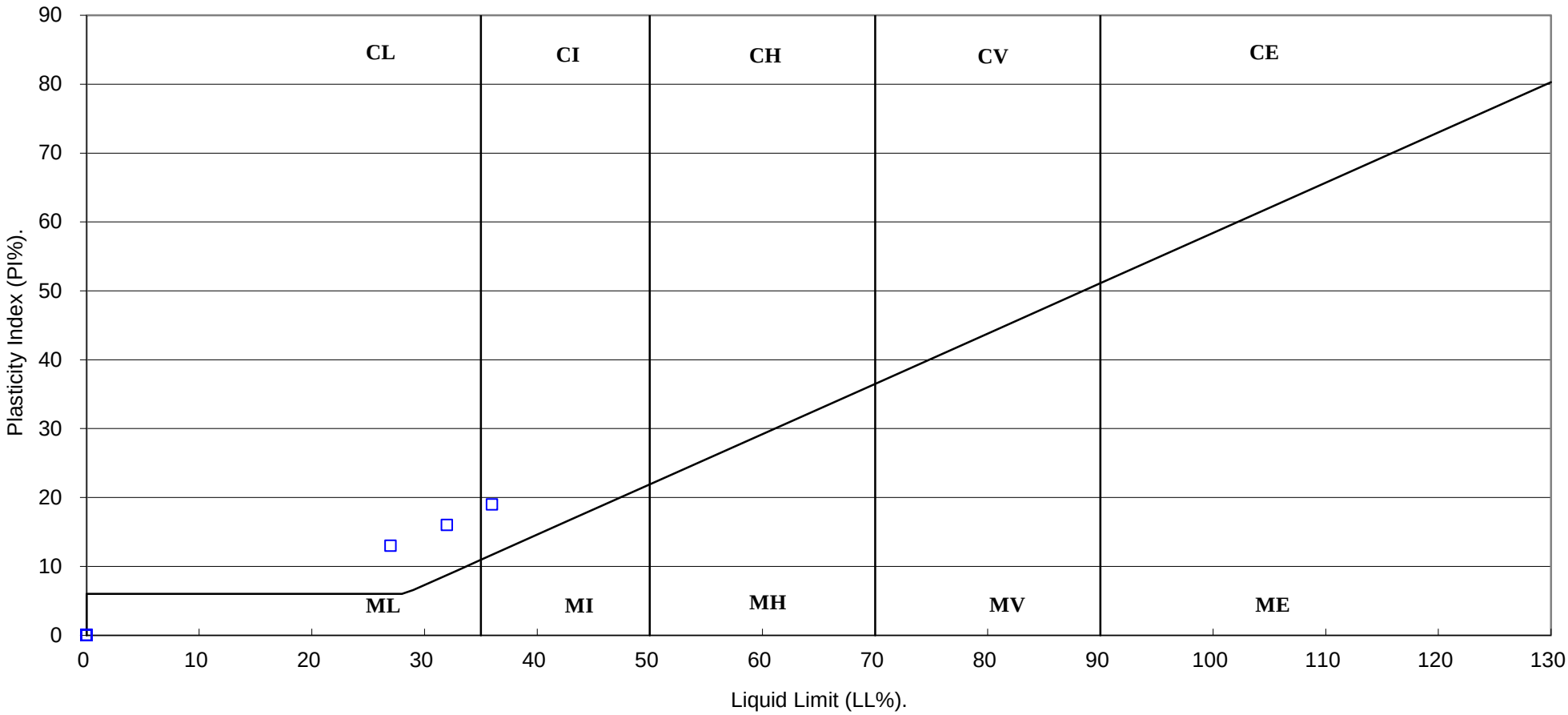
**WATFORD BRIDGE.**

**Contract No:** **PSL15/4979**

**Client Ref:**

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

**(B.S.5930 : 1999)**




| | | | | | | |
|---|---|---|---|---|---|---|
| PSL Professional Soils Laboratory | **Compiled by** | **Date** | **Checked by** | **Date** | **Approved by** | **Date** |
| | | 22/10/15 | | 22/10/15 | | 22/10/15 |
| | **WATFORD BRIDGE.** | | | | **Contract No:** | **PSL15/4979** |
| | | | | | **Client Ref:** | |

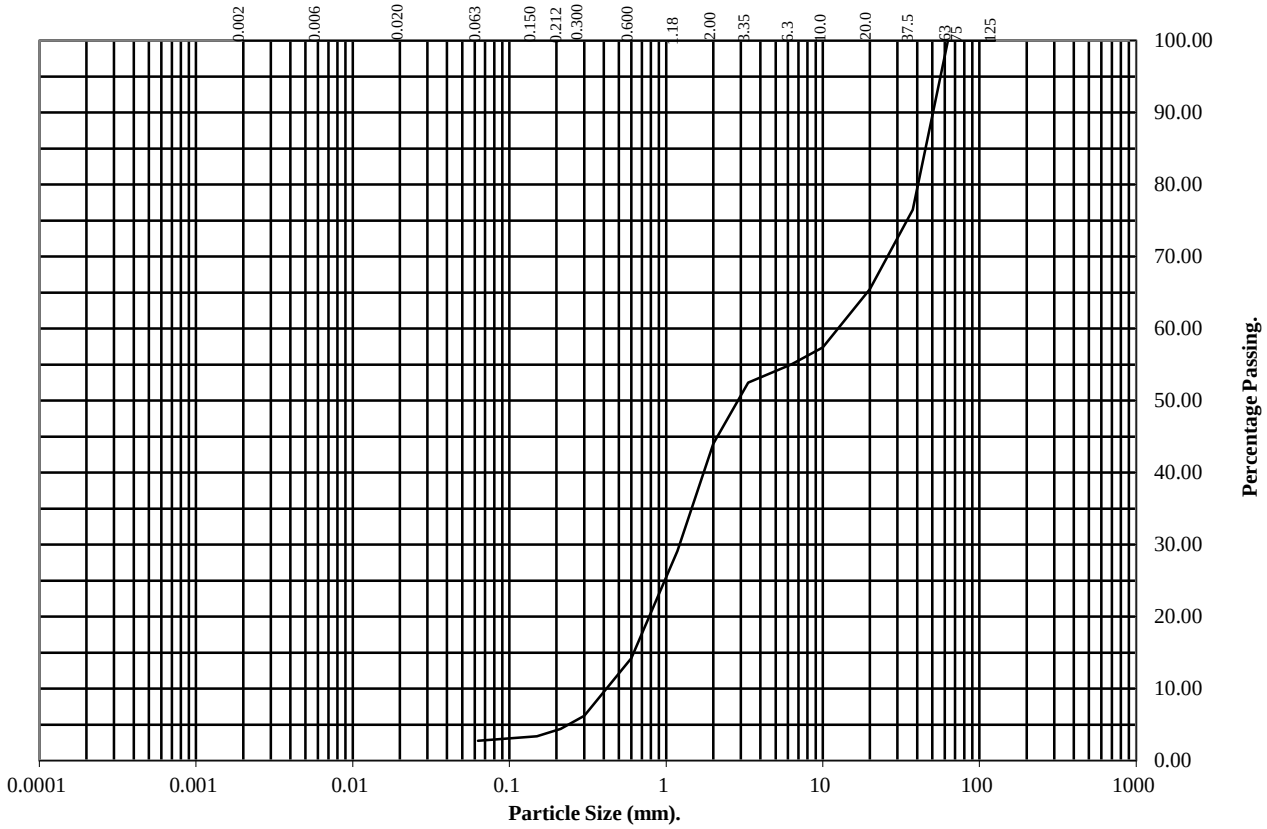
# Particle Size Distribution Test

**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH2** **Depth (m):** **5.30**

**Sample Number:** **Sample Type:** **B**




| BS Test Sieve | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 77 |
| 20 | 65 |
| 10 | 57 |
| 6.3 | 55 |
| 3.35 | 52 |
| 2 | 44 |
| 1.18 | 29 |
| 0.6 | 14 |
| 0.3 | 6 |
| 0.212 | 4 |
| 0.15 | 3 |
| 0.063 | 3 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 56 |
| Sand | 41 |
| Silt / Clay | 3 |

**Remarks:**
See summary of soil descriptions.

| Checked By | Date | Approved By | Date |
|---|---|---|---|
| | 22/10/15 | | 22/10/15 |

| | | |
|---|---|---|
| PSL Professional Soils Laboratory | **WATFORD BRIDGE.** | **Contract No.: PSL15/4979** |

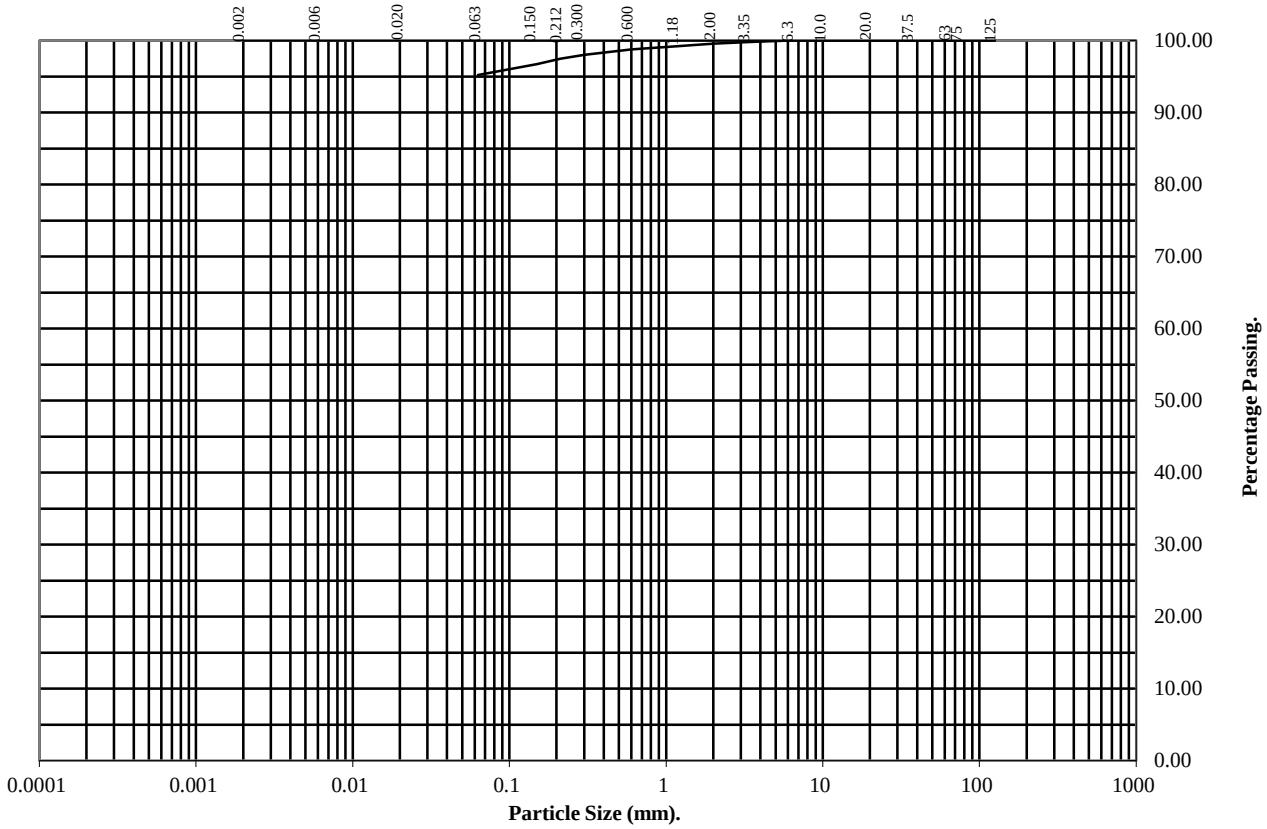
# Particle Size Distribution Test

**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH2** **Depth (m):** **9.50**

**Sample Number:** **Sample Type:** **B**




| BS Test Sieve | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 100 |
| 6.3 | 100 |
| 3.35 | 100 |
| 2 | 100 |
| 1.18 | 99 |
| 0.6 | 99 |
| 0.3 | 98 |
| 0.212 | 97 |
| 0.15 | 97 |
| 0.063 | 95 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 5 |
| Silt / Clay | 95 |

**Remarks:**
See summary of soil descriptions.

| Checked By | Date | Approved By | Date |
|---|---|---|---|
| | 22/10/15 | | 22/10/15 |

| | | |
|---|---|---|
| PSL Professional Soils Laboratory | **WATFORD BRIDGE.** | **Contract No.: PSL15/4979** |

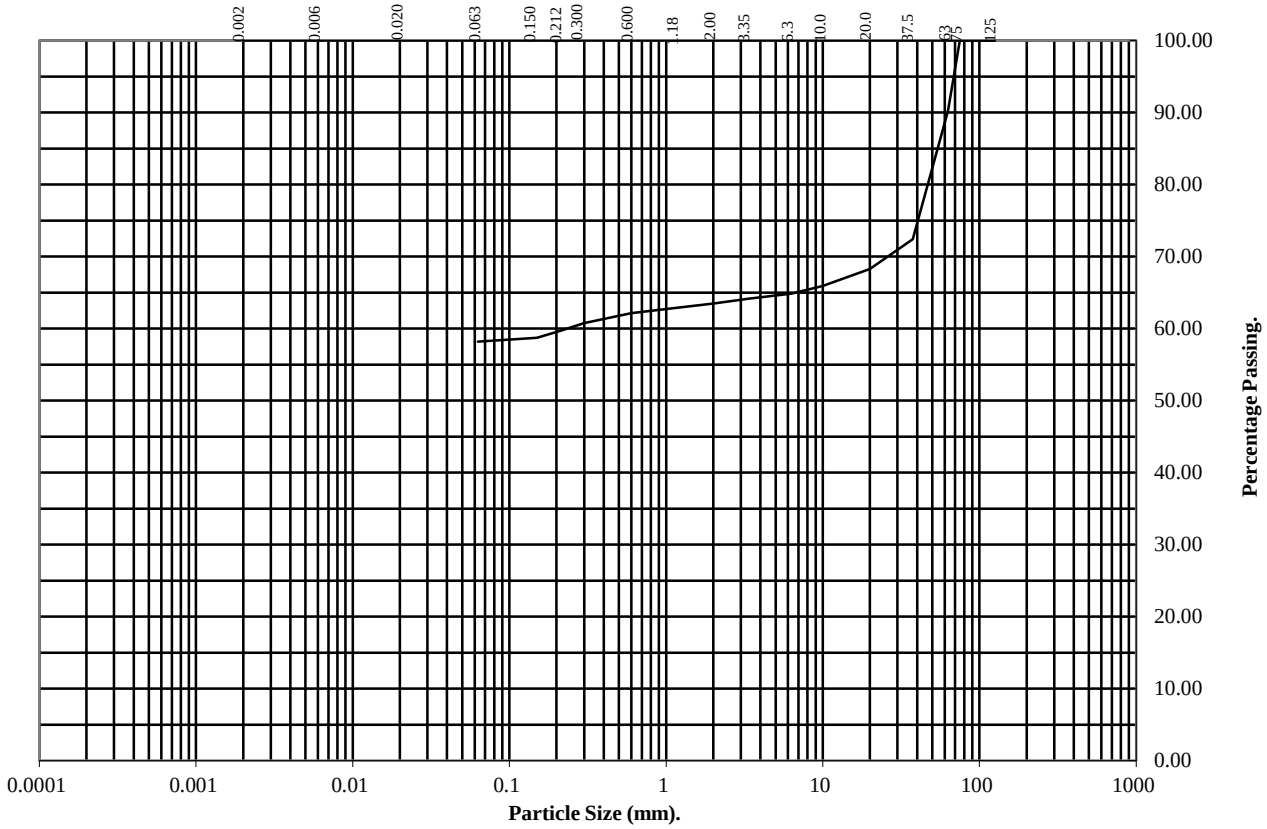
# Particle Size Distribution Test

**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH3** **Depth (m):** **14.75**

**Sample Number:** **Sample Type:** **B**




| BS Test Sieve | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 90 |
| 37.5 | 72 |
| 20 | 68 |
| 10 | 66 |
| 6.3 | 65 |
| 3.35 | 64 |
| 2 | 63 |
| 1.18 | 63 |
| 0.6 | 62 |
| 0.3 | 61 |
| 0.212 | 60 |
| 0.15 | 59 |
| 0.063 | 58 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 10 |
| Gravel | 27 |
| Sand | 5 |
| Silt / Clay | 58 |

**Remarks:**

See summary of soil descriptions.

| Checked By | Date | Approved By | Date |
|---|---|---|---|
| | 22/10/15 | | 22/10/15 |

| | | |
|---|---|---|
| PSL Professional Soils Laboratory | **WATFORD BRIDGE.** | **Contract No.: PSL15/4979** |

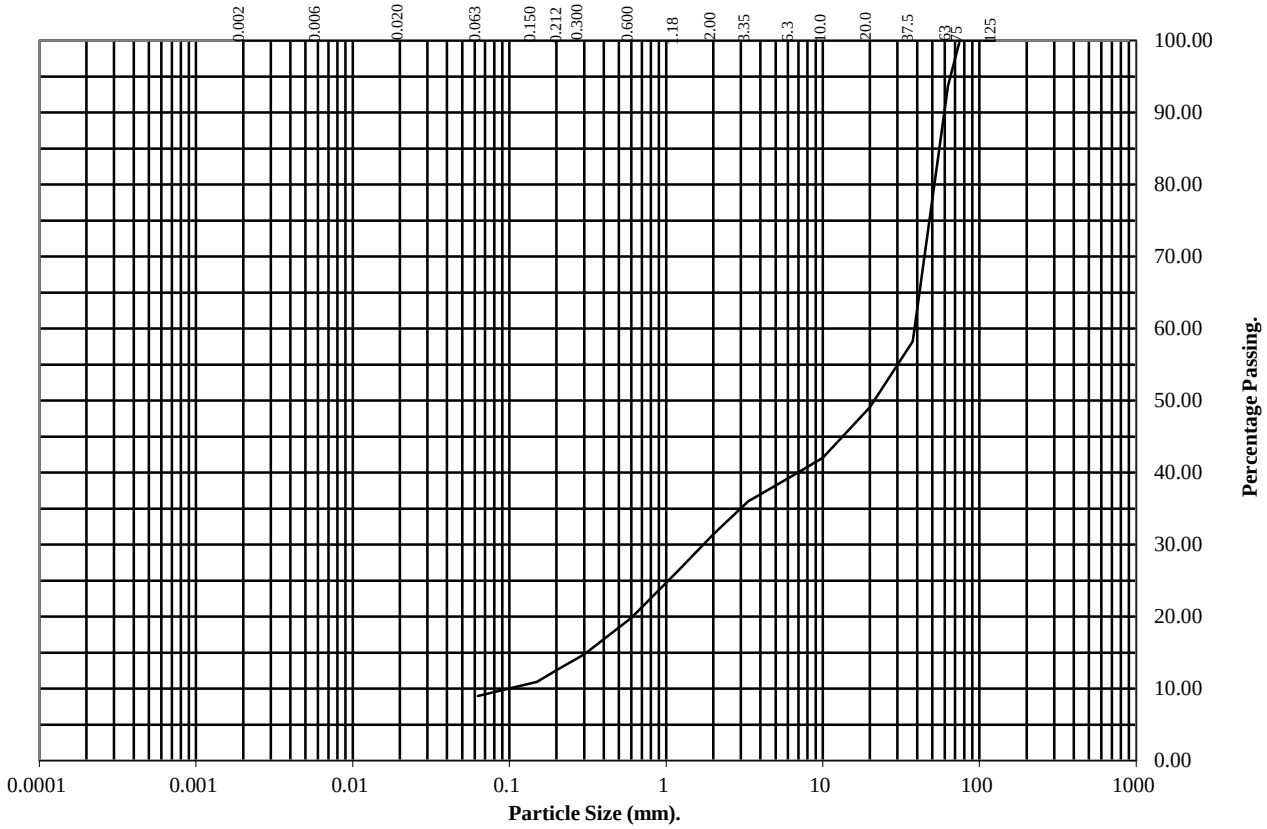
# Particle Size Distribution Test

**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH3** **Depth (m):** **16.30**

**Sample Number:** **Sample Type:** **B**




| BS Test Sieve | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 94 |
| 37.5 | 58 |
| 20 | 49 |
| 10 | 42 |
| 6.3 | 39 |
| 3.35 | 36 |
| 2 | 31 |
| 1.18 | 26 |
| 0.6 | 20 |
| 0.3 | 15 |
| 0.212 | 13 |
| 0.15 | 11 |
| 0.063 | 9 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 6 |
| Gravel | 63 |
| Sand | 22 |
| Silt / Clay | 9 |

**Remarks:**

See summary of soil descriptions.

| Checked By | Date | Approved By | Date |
|---|---|---|---|
| | 22/10/15 | | 22/10/15 |

| | | |
|---|---|---|
| PSL Professional Soils Laboratory | **WATFORD BRIDGE.** | **Contract No.: PSL15/4979** |

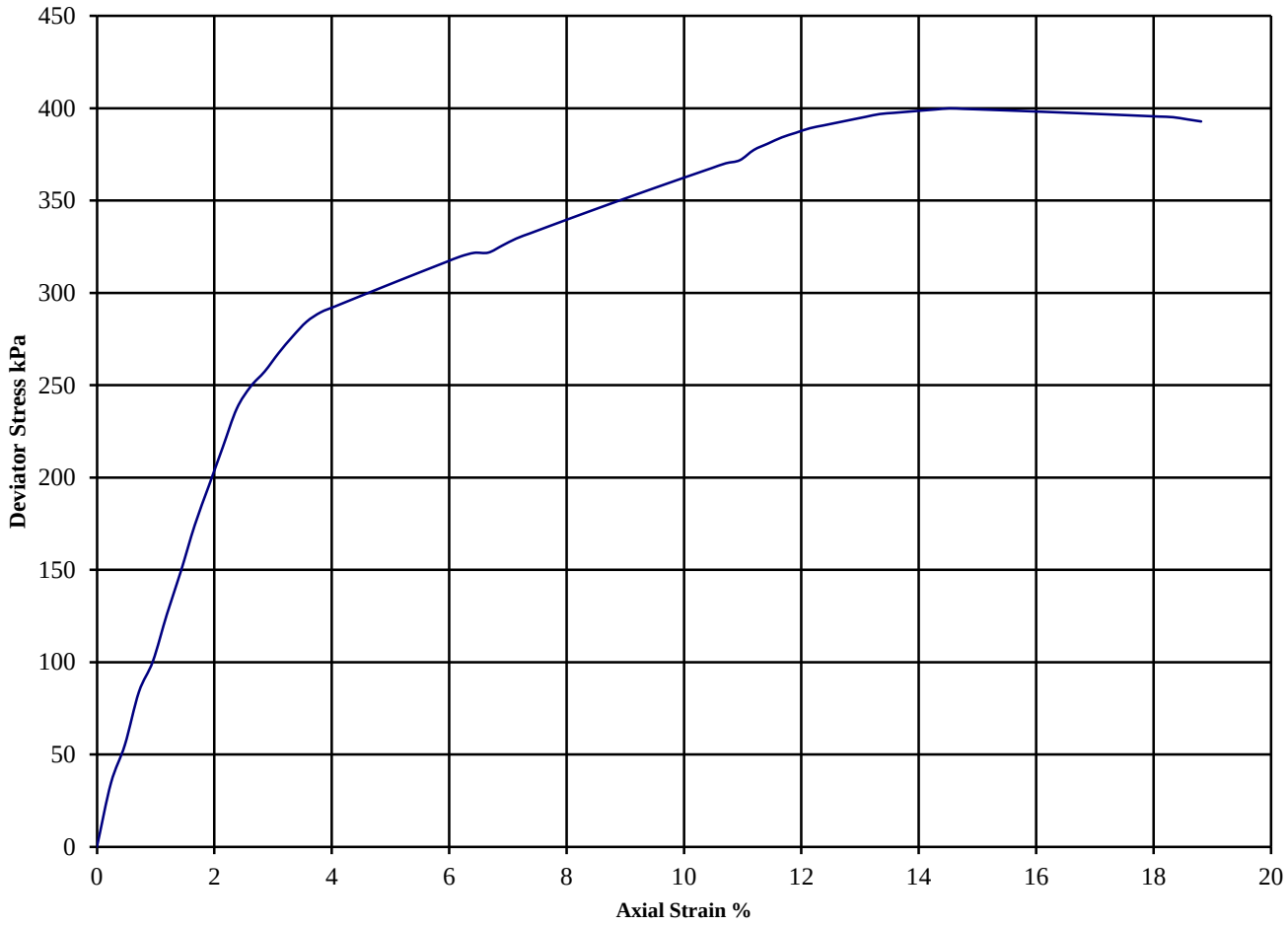
# Undrained Shear Strength in Triaxial Compression

**without measurement of Pore Pressure**

**B.S. 1377 : Part7 : Clause 9 : 1990**

**Hole Number:** BH1 **Depth (m):** 8.50

**Sample Number:** **Sample Type:** U




| Diameter (mm): | | 102 | Height (mm): | | 210 | Test: | 100mm Multistage | | |
|---|---|---|---|---|---|---|---|---|---|
| Specimen | Moisture Content (%) | Bulk Density (Mg/m3) | Dry Density (Mg/m3) | Cell Pressure (kPa) $\theta_3$ | Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$ | Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$ | Failure Strain (%) | Mode of Failure | Remarks |
| | | | | | | | | | Sample taken from top of tube |
| | | | | | | | | | Rate of strain = 1.9 %/min |
| | | | | | | | | | Latex Membrane used 0.2 mm thickness |
| | | | | | | | | | Membrane Correction applied (kPa) |
| A | 12 | 2.23 | 1.99 | 75 | 322 | 161 | 6.4 | | 0.36 0.35 0.34 |
| | | | | 150 | 372 | 186 | 11.0 | | See summary of soil descriptions. |
| | | | | 250 | 400 | 200 | 14.5 | Plastic | **Checked** **Date** **Approved** **Date** |
| | | | | | | | | | 22/10/15 22/10/15 |

PSL Professional Soils Laboratory

**WATFORD BRIDGE.**

**Contract No: PSL15/4979**

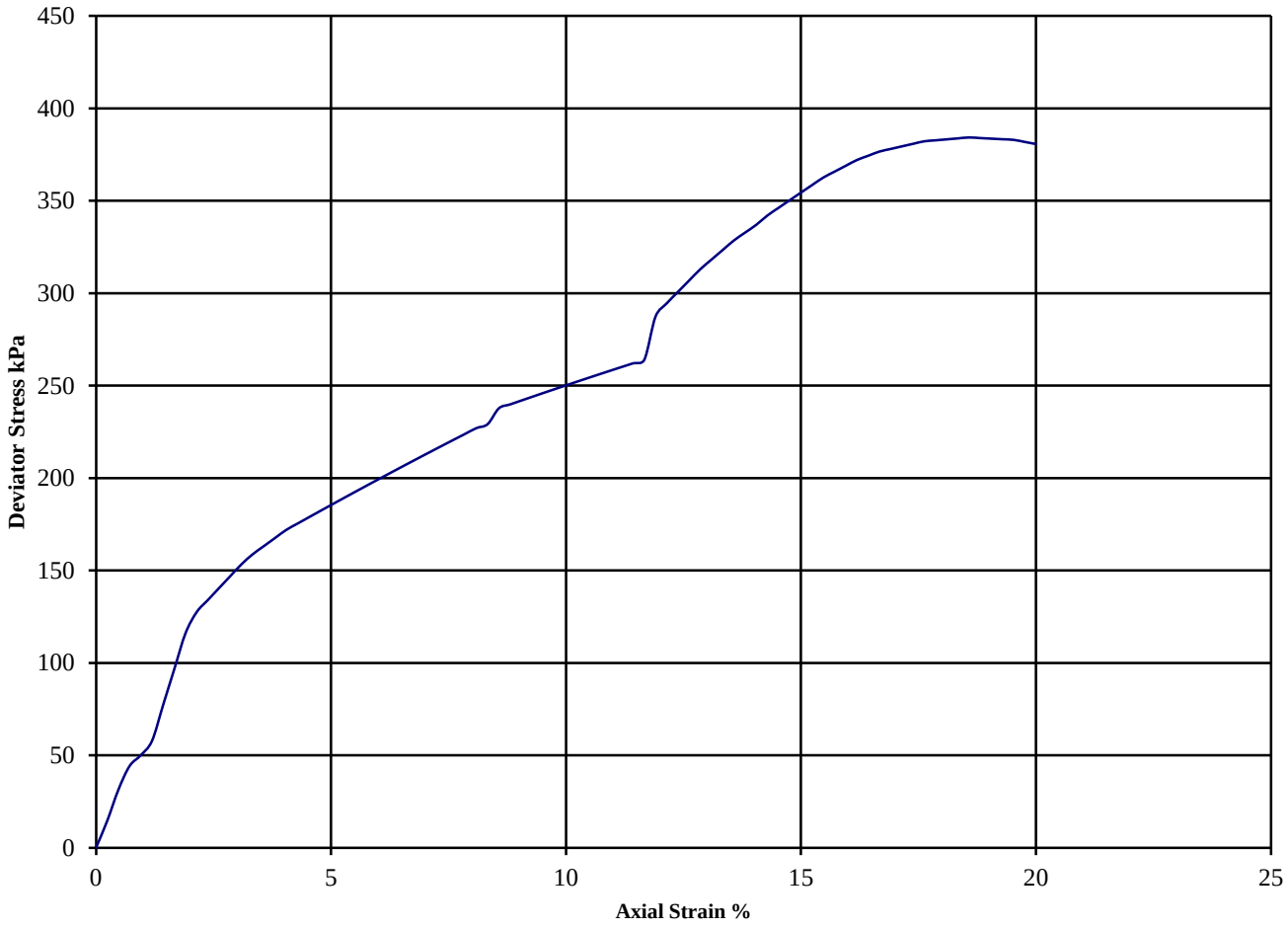
# Undrained Shear Strength in Triaxial Compression

**without measurement of Pore Pressure**

**B.S. 1377 : Part7 : Clause 9 : 1990**

**Hole Number:** **BH1** **Depth (m):** **11.50**

**Sample Number:** **Sample Type:** **U**




| Diameter (mm): | | 102 | Height (mm): | | 210 | Test: | 100mm Multistage | | |
|---|---|---|---|---|---|---|---|---|---|
| Specimen | Moisture Content (%) | Bulk Density (Mg/m3) | Dry Density (Mg/m3) | Cell Pressure (kPa) $\theta_3$ | Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$ | Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$ | Failure Strain (%) | Mode of Failure | Remarks |
| | | | | | | | | | Sample taken from top of tube |
| | | | | | | | | | Rate of strain = 1.9 %/min |
| | | | | | | | | | Latex Membrane used 0.2 mm thickness |
| | | | | | | | | | Membrane Correction applied (kPa) |
| A | 27 | 2.00 | 1.58 | 75 | 229 | 115 | 8.3 | | 0.36 0.35 0.34 |
| | | | | 150 | 264 | 132 | 11.7 | | See summary of soil descriptions. |
| | | | | 250 | 384 | 192 | 18.6 | Plastic | **Checked** **Date** **Approved** **Date** |
| | | | | | | | | | 22/10/15 22/10/15 |

| | | |
|---|---|---|
| PSL Professional Soils Laboratory | **WATFORD BRIDGE.** | **Contract No: PSL15/4979** |

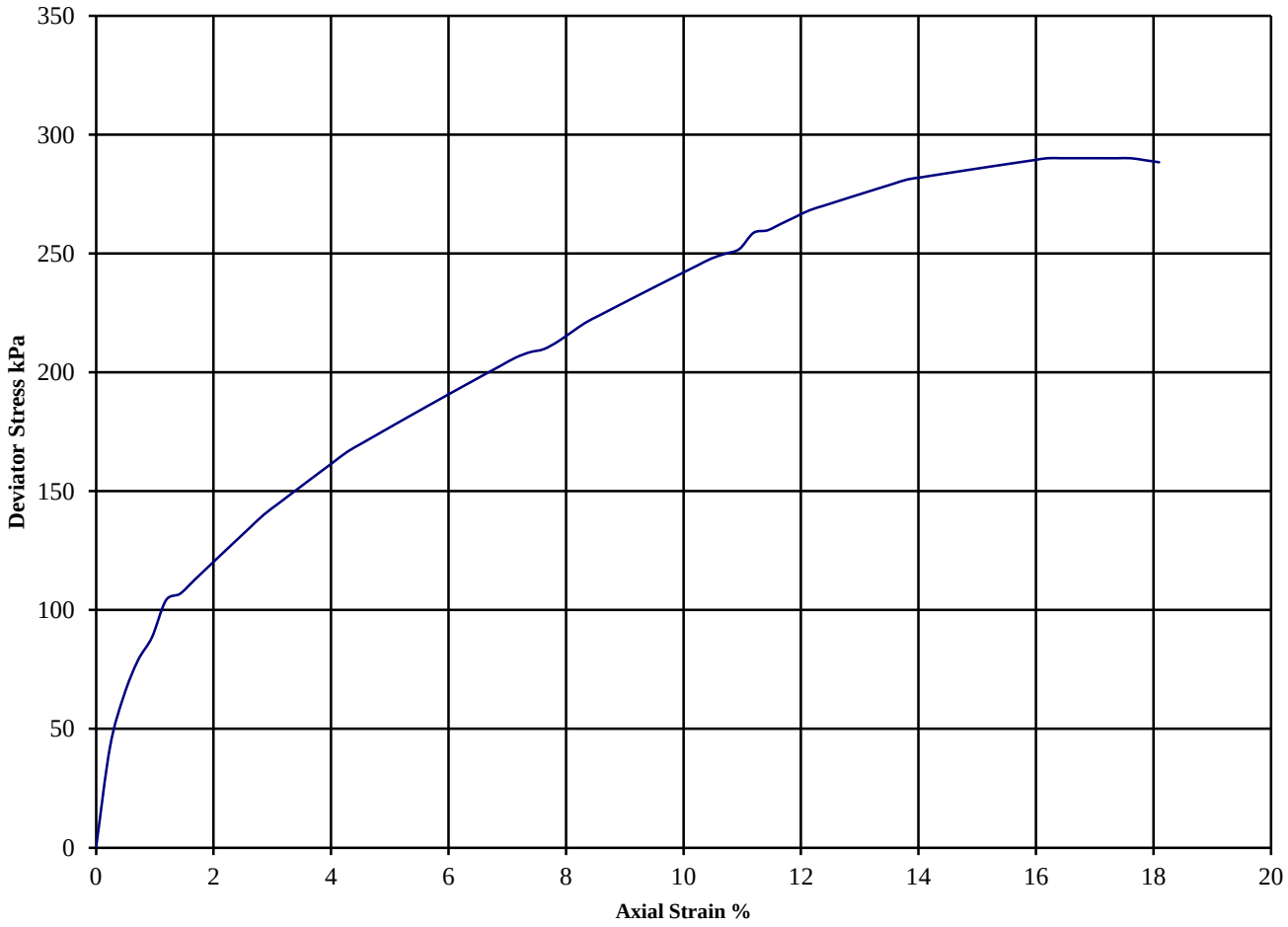
# Undrained Shear Strength in Triaxial Compression

**without measurement of Pore Pressure**

**B.S. 1377 : Part7 : Clause 9 : 1990**

**Hole Number:** **BH3** **Depth (m):** **8.30**

**Sample Number:** **Sample Type:** **U**




| Diameter (mm): | | 102 | Height (mm): | | 210 | Test: | 100mm Multistage | | |
|---|---|---|---|---|---|---|---|---|---|
| Specimen | Moisture Content (%) | Bulk Density (Mg/m3) | Dry Density (Mg/m3) | Cell Pressure (kPa) $\theta_3$ | Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$ | Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$ | Failure Strain (%) | Mode of Failure | Remarks |
| | | | | | | | | | Sample taken from top of tube |
| | | | | | | | | | Rate of strain = 1.9 %/min |
| | | | | | | | | | Latex Membrane used 0.2 mm thickness |
| | | | | | | | | | Membrane Correction applied (kPa) |
| A | 12 | 2.20 | 1.96 | 50 | 208 | 104 | 7.4 | | 0.36 0.35 0.34 |
| | | | | 100 | 252 | 126 | 11.0 | | See summary of soil descriptions. |
| | | | | 200 | 290 | 145 | 16.9 | Plastic | **Checked** **Date** **Approved** **Date** |
| | | | | | | | | | 22/10/15 22/10/15 |

**PSL**
**Professional Soils Laboratory**

**WATFORD BRIDGE.**

**Contract No:**
**PSL15/4979**

**PSL**
**Professional Soils Laboratory**

# TEST AMENDMENT NOTICE

(Please tick boxes as appropriate)

From: B. EATON To: PETER COWSILL (SJ ARCHITECTS)

Date: 19 / 10 /2015 Laboratory Ref:

Contract Number: PSL15/4979. Location: WATFORD BRIDGE

✓ BH o TP Sample Number 3 Depth (m): 2.80 - 3.25

Sample Type: ✓ U o B o D o W o P o C

Test/s:

The above sample cannot be tested for the following reasons:

- o The Sample has not been received
- o There is insufficient material for BS1377:1990 testing
  Maximum Grain Size (Minimum 10%): o Fine o Medium o Coarse
  Sample Mass (kg):
  Required Mass (kg):
- o The Sample has been previously tested. .....
- o The Sample has been misplaced in the Laboratory
- ✓ The Sample is unsuitable for testing because: IT IS EXTREMLY BRITTLE AND COLLAPSED ON EXTRUSION.

Please advise action required:

- o Perform original test on the following alternative Sample:
  o BH o TP Sample Number: Depth (m)
  Sample Type: o U o B oD oW oP o C
- o Combine original Sample with the following Sample:
  o BH o TP Sample Number: Depth (m)
  Sample Type: o U o B oD oW oP o C
- o Perform the following alternative test/s on the original Sample:
- o Perform non-standard test on material available
  (Written Confirmation is required from the Client).
- o Take no further action.

Signed Date

(Project Engineer) .....