

**Environmental  
Geotechnical  
Specialists**



# PHASE 2 GEO-ENVIRONMENTAL REPORT

job number	date
site address	
written by	
checked by	
issued by	

**Rogers Geotechnical Services Ltd**

**Telephone** 0843 50 666 87 **Fax** 0843 51 599 30

**Email** [enquiries@rogersgeotech.co.uk](mailto:enquiries@rogersgeotech.co.uk)

**www.**[rogersgeotech.co.uk](http://rogersgeotech.co.uk)

Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley,  
Huddersfield, West Yorkshire HD8 8LU.



GEO-TECHNICAL  
ENVIRONMENTAL



## Contents

		Page
1.	Introduction	2
2.	Limitations	2
3.	Desk Study	2
4.	Fieldworks	2
4.1	Windowless Sample Boreholes	3
4.2	Dynamic Probes	3
5.	Geology	3
6.	Strata Conditions	4
6.1	General Strata	4
6.2	Groundwater	4
7.	Insitu Testing	5
7.1	Dynamic Penetration Tests	5
8.	Laboratory Testing - Geotechnical	5
8.1	Geotechnical Properties	6
9.	Laboratory Testing - Environmental	6
10.	Discussion of Ground Conditions - Geotechnical	6
10.1	Foundations	7
10.2	Ground-floors	8
10.3	Hard-standing Areas	8
10.4	Effect of Sulphates	8
11.	Discussion of Ground Conditions - Environmental	9
11.1	Discussion of Test Results	9
11.1.1	Soil Samples	9
11.2	Site Specific Risk Assessment	10
11.2.1	Approach	10
11.2.2	Conceptual Ground Model and Risk Assessment	10
11.3	Remediation Strategy	14
11.3.1	General Approach to Construction	14
11.4	Fill Materials	15
12.	Recommendations for Further Work	16
13.	References	17



## Appendices

- |    |                         |
|----|-------------------------|
| 1. | Site Plan               |
| 2. | Borehole Records        |
| 3. | Dynamic Probing Records |
| 4. | Laboratory Testing      |
| 5. | Fill Screening Values   |



# Report on a Phase 2 Geo-environmental Investigation

Location: **Dr Challoner's High School**  
Cokes Lane, Little Chalfont, Amersham, HP7 9QB

For: **Dr Challoner's High School**

Consultants: **Lindsay Baxter Design Ltd**

Report No. **C475/20/E/695**

Report date: **March 2020**

For and on behalf of **Rogers Geotechnical Services Ltd**

**Rob Palmer** MSc FGS ACIEH  
Senior Geo-environmental Engineer

**Charlotte Mason** BSc FGS  
Geo-environmental Engineer

## Report Summary<sup>1</sup>

Item	Comments	Section
Development	Construction of an extension to an existing school building.	1.
Geology	Superficial geology – Head. Solid geology – Seaford Chalk Formation and Newhaven Chalk Formation	5.
Strata Conditions	Predominantly cohesive soils with variable sand and gravel content. Significant thickness of sand revealed at WS02.	6.
Groundwater	None encountered during investigation.	6.2
Foundation Design	Traditional shallow foundations.	10.1
Effect of Sulphates	DC-1 concrete.	10.4
Contamination	None detected.	11.

<sup>1</sup> This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.



## 1. Introduction

---

It is understood that the site is to be developed by the construction of an extension to the existing school building. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This investigation also takes into consideration the risk of any contamination present. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

## 2. Limitations

---

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

## 3. Desk Study

---

A Phase 1 Desk Study has been undertaken by Rogers Geotechnical Services (RGS) and the results were presented as report number C475/20/E/694 in February 2020. This report has been used extensively during the current intrusive investigation.

## 4. Fieldworks

---

The fieldworks were undertaken on the 18<sup>th</sup> February 2020 and included the following:

- Four windowless sample boreholes.
- Three dynamic probes.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

### 4.1 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm for



subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015 and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

## 4.2 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the  $N_{100}$  values. The results of the dynamic penetration tests are tabulated and presented as bar charts of  $N_{100}$  values versus depth in Appendix 3.

## 5. Geology

The available published geological data for the site has been examined and the following table presents the anticipated geology.

**Table 1: Geological Data for the Site**

Strata Type	Strata Name <sup>2</sup>	Previous Name <sup>3</sup>	Description <sup>3</sup>
Superficial Geology	Head	-	Head is poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep, mantling a hillslope and deposited by solifluction and gelifluction processes. Polymict deposit: comprises gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material.
Solid Geology	Seaford Chalk Formation and Newhaven Chalk Formation	-	Chalk with flints. With discrete marl seams, nodular chalk, sponge-rich and flint seams throughout. Typology of flints and incidence of marl seams is important for correlation.

<sup>2</sup> Sources: British Geological Survey (NERC) Map Sheet 255; Beaconfield; Solid and Drift Edition, and Geology of Britain Viewer [online resource from [www.bgs.ac.uk](http://www.bgs.ac.uk)]

<sup>3</sup> Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from [www.bgs.ac.uk](http://www.bgs.ac.uk)]



## 6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

**Table 2: Generalised Strata Profile**

Depth m below ground level to underside of layer	Strata Type	Positions Encountered	Groundwater Strikes m below ground level
0.05	TOPSOIL	All	-
0.4 – 0.6	MADE GROUND (Cohesive)	All	-
1.2	Silty CLAY	WS01	-
2.0 – +4.0	Slightly sandy silty CLAY	WS01 & WS04	-
0.9 – +4.0	Sandy gravelly slightly silty CLAY	All	-
+2.7	Silty very gravelly SAND	WS02	-

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated

### 6.1 General Strata

The results of the investigation have revealed that that beneath a thin capping of cohesive made ground (ranging in thickness between 0.4m and 0.6m) the soils beneath the new extension show substantial vertical and lateral variability.

In general, these soils predominantly comprise sandy gravelly slightly silty clays. However, horizons of slightly sandy silty clay were encountered within the profile in WS01 and WS04. Whilst these soils were observed to be relatively competent at 1.2m within WS03, comparable competencies were not encountered until depths of 1.8m and 2.0m within WS04 and WS01, respectively. Additionally, at WS02 a significant thickness of sand was revealed that is not present within any of the other boreholes.

In light of the data obtained, it is reasoned that the soils established do not represent head deposits or the upper weathered fraction of the underlying Chalk Formation. In light of the variability encountered, it is reasoned that these soils resemble an unmapped member of superficial soils. As such further variability of soil conditions across the site.

### 6.2 Groundwater

No groundwater strikes were observed during the site investigation. However, it should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike, moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.



## 7. Insitu Testing

### 7.1 Dynamic Penetration Tests

Dynamic penetration tests were undertaken adjacent to the windowless sample borehole positions. A summary of the results is presented below:

**Table 3: Summary of Dynamic Penetration Tests**

Position	Blows/100mm			Refusal type (Effective/ Abrupt) <sup>4</sup>	Comments
	0 - 2	3 - 10	10+		
	Depth to which blow count range was observed (m)				
DP1	1.8 11	7.3 13	13.4	Effective	Low blow counts recorded to 1.8m, followed by moderate but variable results to 7.3m. From this depth, a zone of lower blows are recorded to 11m, whereupon blow counts increase until effective refusal.
DP2	0.4	15	15.5	Effective	Moderate but variable blow count recorded throughout until effective refusal encountered.
DP3	1.4	2.5 4.2 20	3.5 5.3	Maximum rods	Low blow counts recorded to 1.3m, followed by moderate and high results to 20m.

## 8. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- |  |                                    |
|--|------------------------------------|
| ▪ Moisture content determinations        | BS 1377: 1990: Pt2: 3.2            |
| ▪ Index properties (1 point)             | BS 1377: 1990: Pt2: 4.4, 5.3 & 5.4 |
| ▪ Linear shrinkage                       | BS 1377: 1990: Pt2: 6.3            |
| ▪ Particle size distribution (Wet sieve) | BS 1377: 1990: Pt2: 9.2            |
| ▪ Sedimentation by pipette               | BS 1377: 1990: Pt2: 9.4            |
| ▪ Soluble sulphate content               | BS 1377: 1990: Pt3: 5              |
| ▪ pH value                               | BS 1377: 1990: Pt3: 9              |

The test results are presented in Appendix 4 and are summarised below:

**Table 4: Summary of Geotechnical Test Results**

Test type	Number of tests	Range of results		Comments
Moisture content	8	18% to 26%		Generally reducing with depth.
Index properties (1 Point)	3	LL	43 to 70%	Clay of intermediate to high plasticity. Consistency index 0.8 to 1.0 NHBC Class – Medium to High
		PL	17 to 24%	
		PI	26 to 46%	
		LS	14 to 18%	

<sup>4</sup> Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.





Particle size distribution (Wet sieve)	1	Gravel Sand Silt/Clay	33% 59% 9%	Uniformly graded brown silty very gravelly SAND. Uniformity coefficient 5.9 Curvature coefficient 1.3
Particle size distribution (Wet sieve and sedimentation)	2	Gravel Sand Silt Clay	44% and 63% 27% and 43% 1% and 2% 10% and 11%	Uniformly graded very sandy very gravelly silty CLAY Uniformity coefficient 1100 Curvature coefficient 2.6
Soluble sulphate & pH	3	SO <sub>4</sub> pH	0.043 – 0.087g/l 8.1 – 8.4	DS1 concrete classification.

## 8.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

**Table 5: Summary of Geotechnical Properties**

Property	Range of values	Comments
Volume change potential (NHBC)	Medium to High	Silty clay with variable sand and gravel content.
Shear strength parameters (at foundation level)	$c_u$ 50kN/m <sup>2</sup>	Based on dynamic probes, logging descriptions and consistency indices.
Concrete classification	DC1	Brownfield ground locations (Static water)

## 9. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr<sup>VI</sup>, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN<sup>-</sup> and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO<sub>4</sub><sup>2-</sup>.
- Asbestos Screen.

This testing was undertaken by Chemtest Ltd and the results of all of the chemical testing are presented in Appendix 4 of this report.

## 10. Discussion of Ground Conditions - Geotechnical

It is understood that the site is to be developed by the construction of extension to the existing school. At the time of writing this report the precise layout and method of construction is not known, thus the discussion below is of a generalised nature.



## 10.1 Foundations

It cannot be recommended that foundations be constructed directly within the topsoil, made ground or soft cohesive soils revealed at this site. These soils are present in a weak and variable condition such that excessive total and or differential settlement could occur under moderately light surface loading.

The results of the investigation have revealed that the soils at the near surface are variable in terms of vertical as well as lateral extent. For instance, at WS02 a significant thickness of sand was revealed that is not present within any of the other boreholes. Furthermore, competent cohesive soils were found at 1.2m within WS03, whereas such soils were not encountered until depths of 1.8m and 2.0m within WS04 and WS01, respectively.

In light of the above information, it is suggested that a pragmatic approach be taken to foundation design for the new extension. In general, it is considered that the above mentioned competent cohesive soils will provide a suitable bearing stratum, provided that the foundations are placed within soil generally described as being present in at least a firm insitu condition. It is considered that strip or spread foundations constructed within this material, at a minimum depth of say 1.8m, could be designed assuming an allowable increase in stress given in the following table:

**Table 6: Allowable Increase in Stress**

Foundation Type		Strip Footings			Spread Footings		
Foundation Breadth	B (m)	0.6	0.9	1.2	1.0	2.0	3.0
Foundation Depth	D (m)	1.8			1.8		
Allowable increase in stress	(kN/m <sup>2</sup> )	125	120	115	140	125	120

The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 50kN/m<sup>2</sup> at the foundation depths. Settlements at the above loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place.

It should be appreciated that in this instance, the cohesive soils beneath the site has been found to possess volume change potential under the guidance of the NHBC standards. Therefore, it is will be necessary to ensure that foundations placed within this cohesive soil, which was found to have a high volume change potential, are designed in accordance with the Chapter 4.2 of the NHBC standards<sup>5</sup>.

It should be noted that the above mentioned allowable increase in stresses will also be adequate for foundations placed upon granular soils. However, it should be appreciated that differential movement, albeit limited, may occur between foundations placed on both granular and cohesive soils.

Furthermore, this investigation has not included an assessment of the foundations of the existing structure. Therefore, cognisance should be taken that whilst the existing structure is likely to have undergone some settlement which by now is expected to have ceased, the extensions will undergo some settlement after construction. In view of this, some differential settlement between the existing and new structures should be anticipated and suitable construction joints should be considered in design.

<sup>5</sup> NHBC Standards, Chapter 4.2, *Building near trees*



Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period of time then a blinding layer of lean-mix concrete should be placed in the excavation bases. This expedient will reduce softening or loosening of the sub-grade due to the ingress of surface water.

Should seepages of groundwater be encountered it is considered that they could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

## 10.2 Ground-floors

In light of the made ground and weak near surface soils, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

Further to the above, due to the volume change potential at the site, should the floor be placed within the zone of influence of any existing, or proposed, trees and shrubs, an allowance for soil volume change should be included. Further guidance is available in the NHBC standards, however, soil volume change can typically be catered for by providing a suitable void or utilise proprietary materials beneath the floor slab.

## 10.3 Hard-standing Areas

It is considered that any hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of <2% could be employed in the pavement design<sup>6</sup>. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

## 10.4 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2<sup>7</sup>, which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents

<sup>6</sup> Table 11.1, *Reproduction of TRRL Report LR1132 (1984)*, Smith (2006), Smith's Elements of Soil Mechanics, 8<sup>th</sup> ed.

<sup>7</sup> Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*



recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-1 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1<sup>8</sup>, which can be found in Part D, *Specifying concrete for general cast-in-situ use*, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

## 11. Discussion of Ground Conditions - Environmental

### 11.1 Discussion of Test Results

It is understood that the existing school building is to be developed by the construction of an extension. Considering the site sensitivity, screening values for a residential without plant uptake end use have been employed within the below analysis.

#### 11.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 1.2% and 5.0%. On this basis, it is considered that the screening values associated with 1% SOM should be adopted, as these represent the more onerous values. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website<sup>9</sup> and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 4. These results indicate the following:

**Table 7: Summary of Contaminated Areas**

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential without plant uptake)
WS01	0.15 – 0.25	PAHs (Chrysene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene)
WS03	0.25 – 0.4	PAHs (indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene)
WS04	0.5 – 0.6	PAHs (dibenz(a,h)anthracene, benzo(g,h,i)perylene)

Concentrations of chromium<sup>VI</sup>, phenols (total) and total petroleum hydrocarbons (aliphatic C5 to C21; aromatic C5 to C12) were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soils samples tested.

<sup>8</sup> Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

<sup>9</sup> <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>



It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion<sup>10</sup>. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

**Table 8: Summary of Areas Contaminated by PAHs & TPHs**

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential without Plant Uptake)
WS01	0.15 – 0.25	None
WS03	0.25 – 0.4	None
WS04	0.5 – 0.6	None

On the basis of the above information, the results of the investigation have concluded that the site is generally uncontaminated for the proposed end use.

## 11.2 Site Specific Risk Assessment

### 11.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency<sup>11</sup> advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.<sup>12</sup> This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'<sup>13</sup>

### 11.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 9. Sources of contamination include the following:

<sup>10</sup> Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 1% SOM, Residential without home grown produce land use, 23.06.17.

<sup>11</sup> R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.

<sup>12</sup> The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

<sup>13</sup> See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.



**On-site – Made Ground.**

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

- |                   |   |
|-------------------|---|
| <b>N/A -</b>      | A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.                         |
| <b>Low -</b>      | A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.                              |
| <b>Moderate -</b> | The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary |
| <b>High -</b>     | The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.       |

The results of the risk assessment are presented in Table 9.





Table 9: Conceptual Site Model and Site Specific Risk Assessment

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	Yes – whilst some contamination is present, the concentrations revealed are below the appropriate SSV's for the site.	Low	Whilst no significant contamination was revealed, good construction practices should still be maintained.  See section 11.3 for further details.
	End User	Yes – whilst some contamination is present, the concentrations revealed are below the appropriate SSV's for the site.	Low	
	Neighbours	Yes – whilst some contamination is present, the concentrations revealed are below the appropriate SSV's for the site. Furthermore, neighbours do not directly adjoin the site.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from soils which contain some low levels of contamination.	Low	Whilst no significant contamination was revealed, good construction practices should still be maintained.  See section 11.3 for further details.
	End User	Yes – dust may be derived from contaminated soils. However, the concentrations revealed are below the appropriate SSV's for the site.	Low	
	Neighbours	Yes – dust may be derived from soils which contain some low levels of contamination.	Low	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	No further action required.
	End User	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	
	Neighbours	Yes – whilst some contamination is present, the concentrations revealed are not considered to be significant. Furthermore, neighbours do not directly adjoin the site.	Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – limited gas sources were identified within the Phase One Desk Study. Moreover, no significant thicknesses of made ground or on site gas sources have been identified during the site investigation.	Low	No further action required.
	End User		Low	
	Neighbours		Low	



Spillage/loss/run off direct to receiving water	Controlled Waters	No – no controlled surface waters indicated within 250m.	N/A	No further action required.
Migration via permeable unsaturated strata	Controlled Waters	Yes – there is a Principal aquifer present within the solid geology beneath the site. Moreover, the overlying superficial geology is classified as Secondary A Aquifer. Notwithstanding, contamination is not significant or anticipated to be significantly mobile.	Low	
Run off via drainage/sewers etc	Controlled Waters	Yes – however, contamination is not significant and underlain by predominantly cohesive soils of low permeability	Low	
Direct contact with contaminated soils	Plants	Yes – some soft landscaping areas present, however these are anticipated to comprise grass only. Moreover, contamination is not significant or anticipated to be significantly mobile.	Low	
Uptake via root system			Low	
Direct contact with contaminated soils	Building Materials	Yes – slightly elevated levels of PAH's may represent a risk to plastic water pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1s.	Low to Moderate (plastic services)	Please see section 11.3 for information on good building practice.
Direct contact with contaminated groundwater			Low (buried concrete)	
Exposure to Radon	Operative End User	No – not in a radon affected area (as per desk study).	N/A	The publication BR211 states that no protection measures are necessary.





### 11.3 Remediation Strategy

Whilst no significant chemical contamination was revealed, good practices should still be maintained. In addition, , careful inspection of the sub-grade should be made during the ground-works. Should areas of contamination be detected then works should be halted and the advice of a geotechnical specialist be sought.

#### 11.3.1 General Approach to Construction

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the fundamental principles of identifying potentially contaminated soils and the hazards of working with such soils (not identified by the ground investigation).
- Personal hygiene facilities, including washing and messing, must be provided and site operatives be encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- Any suspected stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust and cross contamination of imported fill.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required on all development areas. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

#### Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Any redundant services revealed at this site should be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development should be carefully inspected to ensure that they are serviceable.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research



(UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'.

- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1 and the concrete design class DC-1.

#### 11.4 Fill Materials

It should also be appreciated that any fill material, either site-won or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.

Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3882: 2015.
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing
- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG<sup>14</sup> documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 10: Validation Sampling and Testing		
Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone (to confirm the inert nature of the material)	Standard metals/metalloids (As, Cd, Cr, Cr <sup>VI</sup> , Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m <sup>3</sup>	Standard metals/metalloids as above plus PAH (16 USEPA) and Asbestos
Greenfield/ Manufactured Soils	The greater of a minimum of 3 or 1 per 250m <sup>3</sup>	Standard metals/metalloids as above plus PAH (16 USEPA) and Asbestos
Brownfield/ Screened Soils	The greater of a minimum of 6 or 1 per 100m <sup>3</sup>	Standard metals/metalloids as above plus PAH (16 USEPA), TPH (CWG banded) and Asbestos Any additional analysis dependant on the history of the donor site.

The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

<sup>14</sup> YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V3.3 Appendix 1a, October 2016.

**Table 11: Fill Screening Values**

Contaminant	Screening Value (Residential without Plant Uptake) (mg/kg)		Reference
	1% SOM	6% SOM	
As	39.9	37	Atrisk <sup>SOIL</sup> SSVs
Cd	149	149	Atrisk <sup>SOIL</sup> SSVs
Cr(VI)	20.5	20.5	Atrisk <sup>SOIL</sup> SSVs
Cu	9060	9060	Atrisk <sup>SOIL</sup> SSVs
Hg	10	20.3	Atrisk <sup>SOIL</sup> SSVs
Ni	188	188	Atrisk <sup>SOIL</sup> SSVs
Pb	313	313	Atrisk <sup>SOIL</sup> SSVs
V	357	357	Atrisk <sup>SOIL</sup> SSVs
Zn	47000	47000	Atrisk <sup>SOIL</sup> SSVs

Please see summary sheet within Appendix 5 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

## 12. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Discussions with ground work contractors in relation to the requirement for testing of materials to be disposed off-site (Waste Acceptance Criteria) and the suitability of imported materials.
- Discussions with service providers regarding suitable materials for pipe work given the nature of chemical determinands found within the soils on site.
- Detailed design of the sub-structure.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.



## 13. References

---

- British Geological Survey (NERC) (2020), BGS, Keyworth.
  - Geology of Britain Viewer:  
([http://maps.bgs.ac.uk/geologyviewer\\_google/googleviewer.html](http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html))
  - Lexicon of Named Rock Units:  
(<http://www.bgs.ac.uk/lexicon/>)
- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-2: *Geotechnical investigation and testing – Field testing, Part 2: Dynamic Probing*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-3: *Geotechnical investigation and testing – Field testing, Part 3: Standard penetration test*, B.S.I., London.
- British Standards Institution (2015) BS5930: *Code of practice for site investigations*, B.S.I., London.
- British Standards Institution (2011), BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.
- British Standards Institution (2017) BS EN ISO 14688: *Geotechnical investigation and testing – Identification and classification of soil*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground, BRE Press, Garston.
  - Part C: *Assessing the aggressive chemical environment*.
  - Part D: *Specifying concrete for general cast-in-situ use*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.



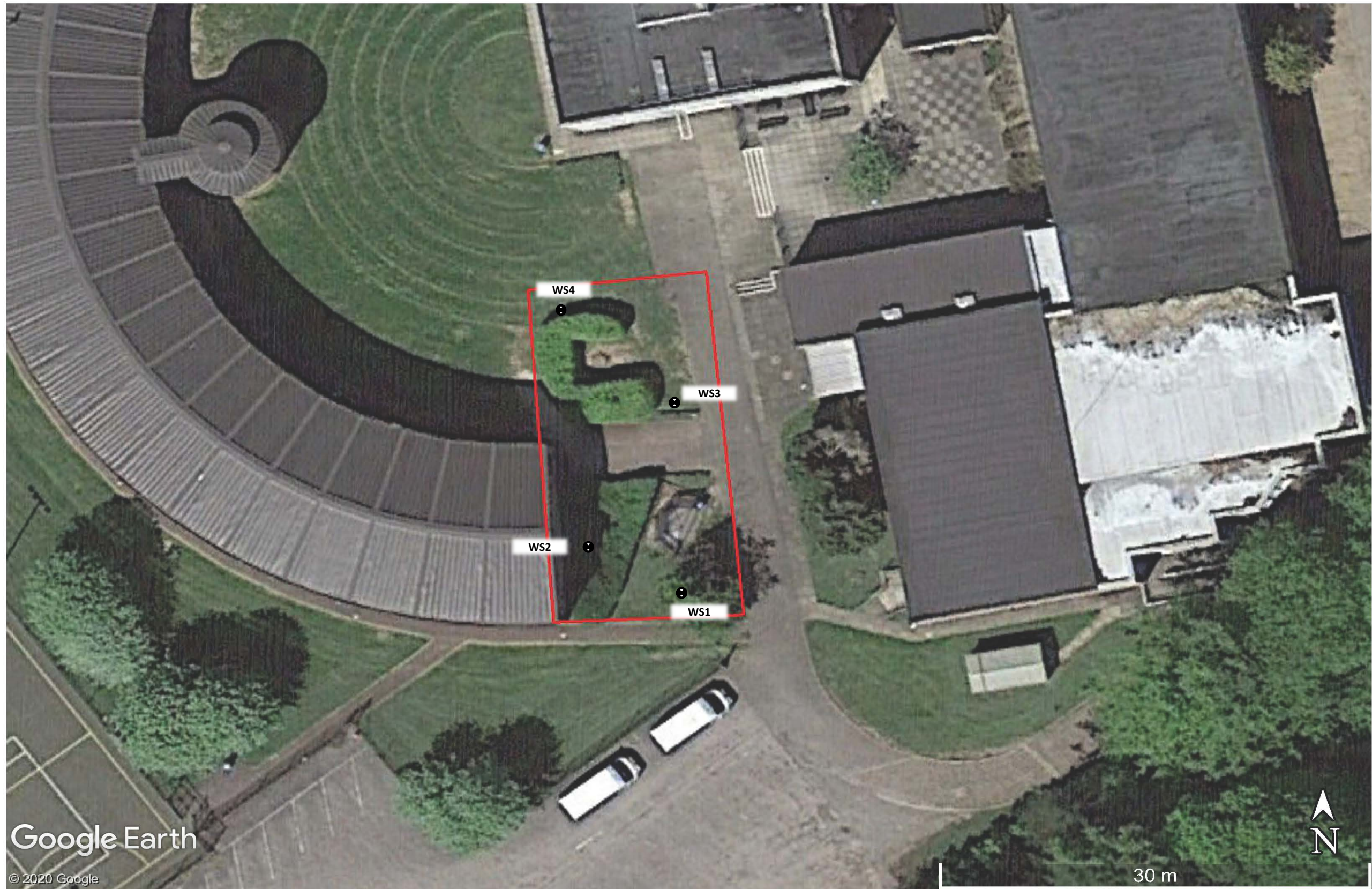
---

## Appendix 1

### Site Plan

---





**Notes:**  
Investigation positions approximated from site operative's notes.



**Rogers Geotechnical Services Ltd**  
Offices 1 & 2, Barncliffe  
Business Park,  
Near Bank,  
Shelley,  
Huddersfield,  
HD8 8LU  
**Telephone:** 0843 50 66 87  
**www.rogersgeotech.co.uk**

**Client:**  
Lindsay Baxter Design

**Job Number:**  
C475/20/E/695

**Project Details:**  
Dr Challoner's High School

**Scale:** Not to scale - reference only







---

## Appendix 2

### Borehole Records

---



# Borehole Log

Borehole No.

**WS01**

Sheet 1 of 1

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

Hole Type  
WLSLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
				87	100		0.05			TOPSOIL (Greyish brown sandy CLAY/ SILT).	
		0.80	D				0.60			MADE GROUND (Greyish brown gravelly silty CLAY. Gravel is sub-angular and angular fine and medium brick clinker and flint).	1
		1.40	D	75	100		1.20			Soft to firm orange silty CLAY with occasional roots.	
		2.10 - 2.50	D				2.00			Soft to firm and firm orange slightly sandy silty CLAY. Sand is fine.	2
				65	100					Stiff orange sandy gravelly slightly silty CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded of flint and quartz.	3
				55	95		4.00			End of Borehole at 4.00m	4
											5
											6
											7
											8
											9
											10

Remarks







# Borehole Log

Borehole No.

**WS02**

Sheet 1 of 1

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

Hole Type  
WLSLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB




Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		1.40 - 1.60	D	87	100		0.05			TOPSOIL (Greyish brown sandy CLAY/ SILT).	
							0.50			MADE GROUND (Soft greyish brown CLAY (Possibly reworked)).	
				75	100		0.90			Soft to firm and firm orange slightly sandy gravelly silty CLAY. Sand is fine. Gravel is sub-angular to rounded of flint and quartz.	1
				65	100					Medium dense orangish brown silty very gravelly fine to coarse SAND. Gravel is sub-angular to rounded of flint and quartz.	2
							2.70			End of Borehole at 2.70m	3
											4
											5
											6
											7
											8
											9
											10

Remarks





# Borehole Log

Borehole No.

**WS03**

Sheet 1 of 1

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

Hole Type  
WLSLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.80	D	87	100		0.05			TOPSOIL (Greyish brown sandy CLAY/ SILT).	
		1.40 - 1.70	D	75	100		0.40			MADE GROUND (Greyish brown silty CLAY with rare gravel of brick clinker and flint).	
				65	100		1.20			Soft to firm orangish brown slightly sandy slightly gravelly silty CLAY. Sand is fine. Gravel is rounded fine and medium of flint.	1
							3.00			Stiff orange slightly sandy gravelly slightly silty CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded of flint and quartz.	2
										End of Borehole at 3.00m	3
											4
											5
											6
											7
											8
											9
											10

Remarks





# Borehole Log

Borehole No.

**WS04**

Sheet 1 of 1

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

Hole Type  
WLSLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
							0.05			TOPSOIL (Greyish brown sandy CLAY/ SILT).	
		0.80	D				0.60			MADE GROUND (Soft greyish brown gravelly CLAY. Gravel is angular fine to coarse flint (Possibly reworked)).	
		1.20	D							Soft to firm orangish brown slightly sandy slightly gravelly silty CLAY. Sand is fine. Gravel is sub-angular to rounded fine and medium of flint.	1
		1.80	D				1.80			Firm to stiff orange slightly sandy silty CLAY.	2
		2.40	D								3
		2.80	D								4
							4.00			End of Borehole at 4.00m	4
											5
											6
											7
											8
											9
											10

Remarks





---

## Appendix 3

### Dynamic Probing Records

---



# Probe Log

Probe No.

**DP01**

Sheet 1 of 2

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

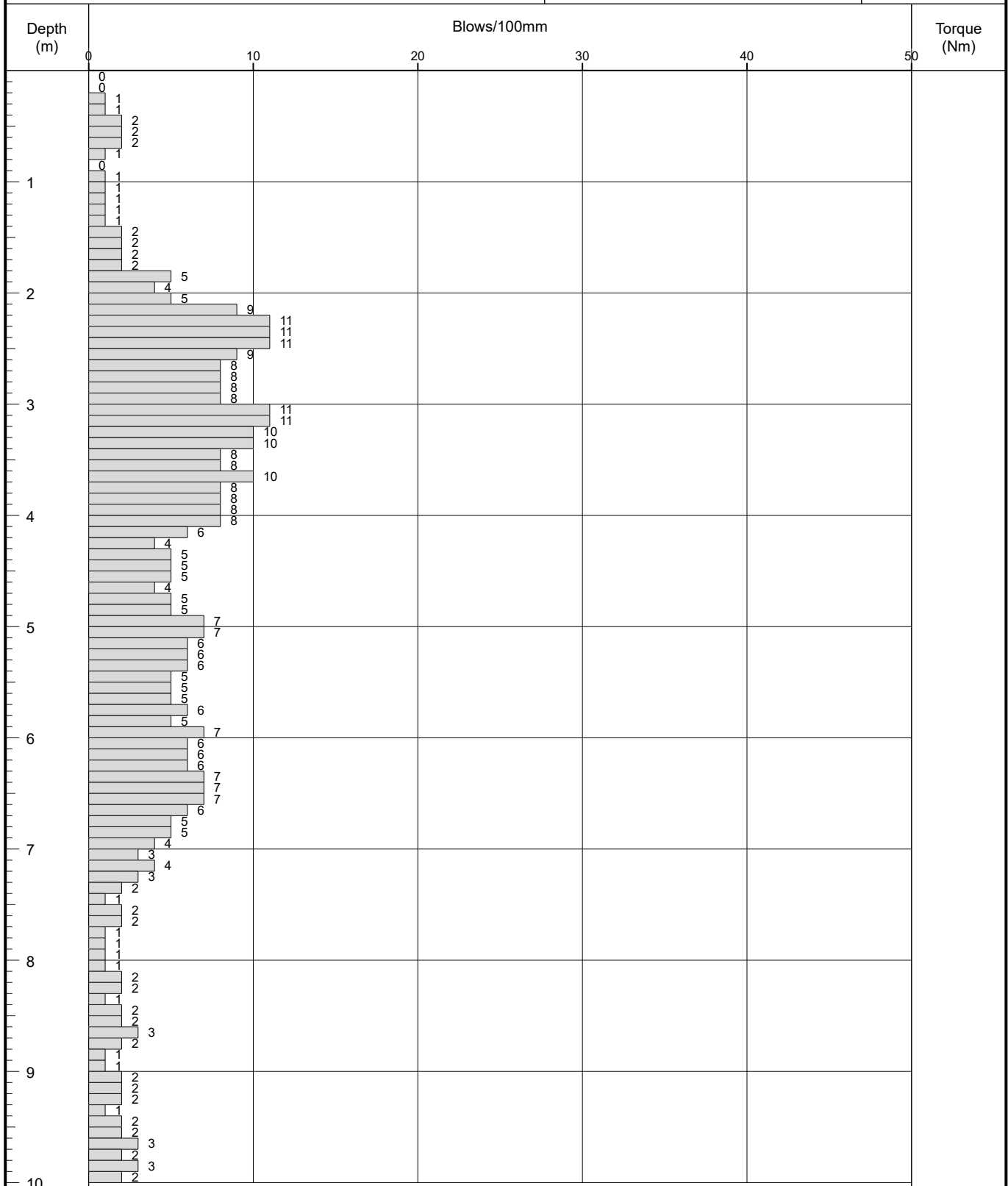
Hole Type  
DCPLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
AB

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 13.4m

Probe Type DPSH-B





# Probe Log

Probe No.

**DP01**

Sheet 2 of 2

Project Name: Dr Challoners High School

Project No.

C475/20/E/695

Co-ords:

Hole Type

DCP

Location: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale

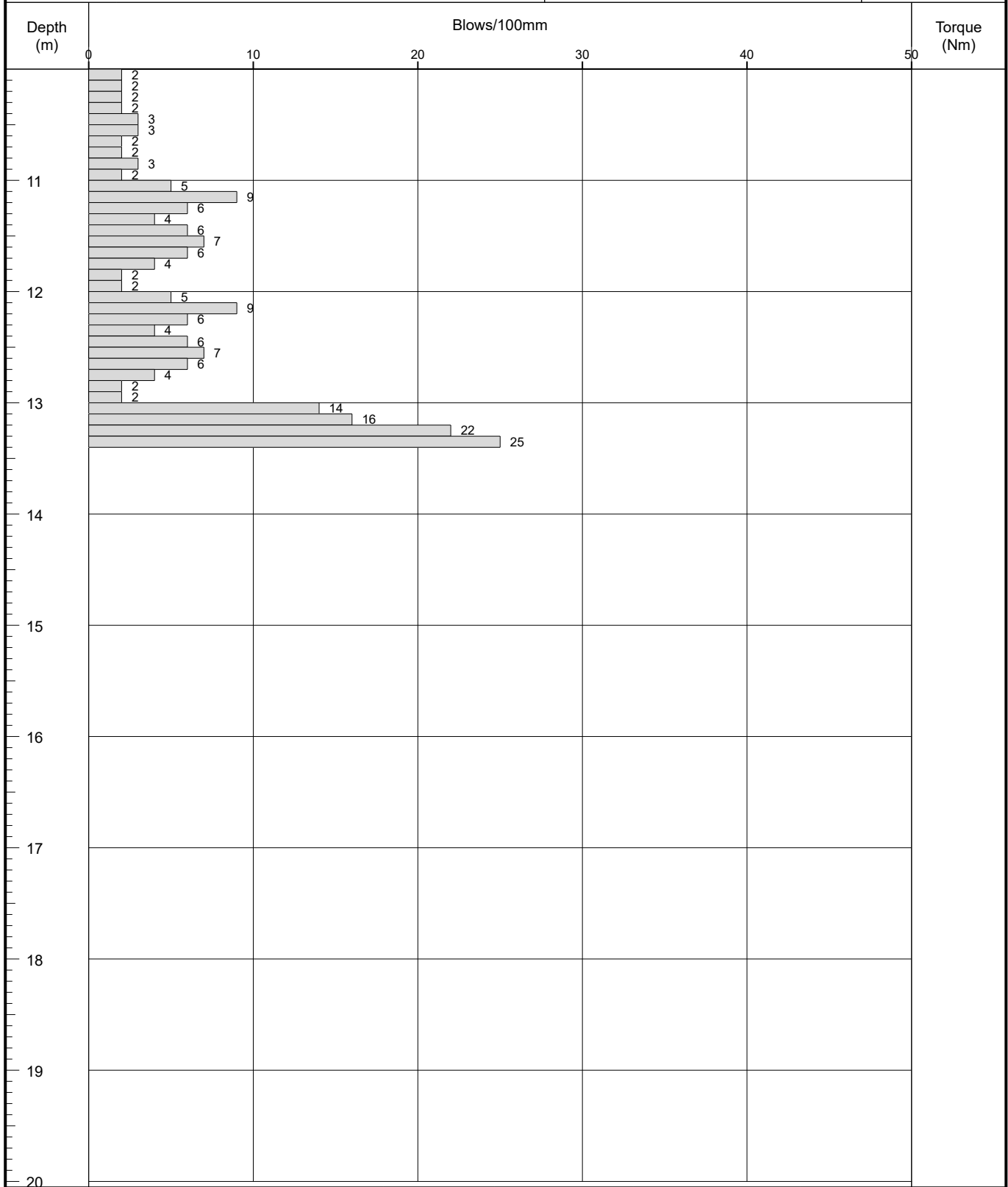
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By

AB



Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 13.4m

Probe Type DPSH-B





# Probe Log

Probe No.

**DP02**

Sheet 1 of 2

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

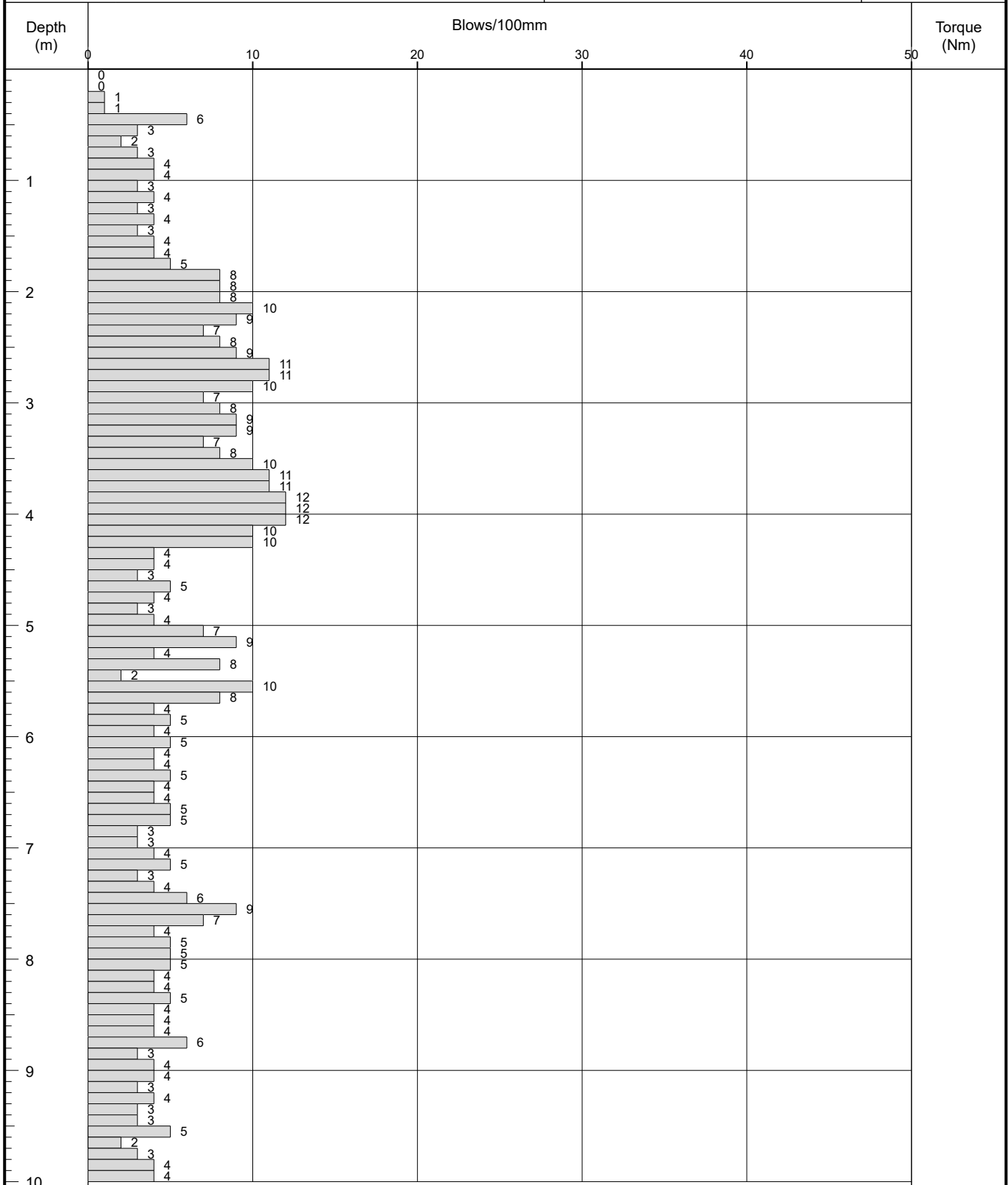
Hole Type  
DCPLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
AB

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 15.6m

Probe Type DPSH-B





# Probe Log

Probe No.

**DP02**

Sheet 2 of 2

Project Name: Dr Challoners High School

Project No.  
C475/20/E/695

Co-ords:

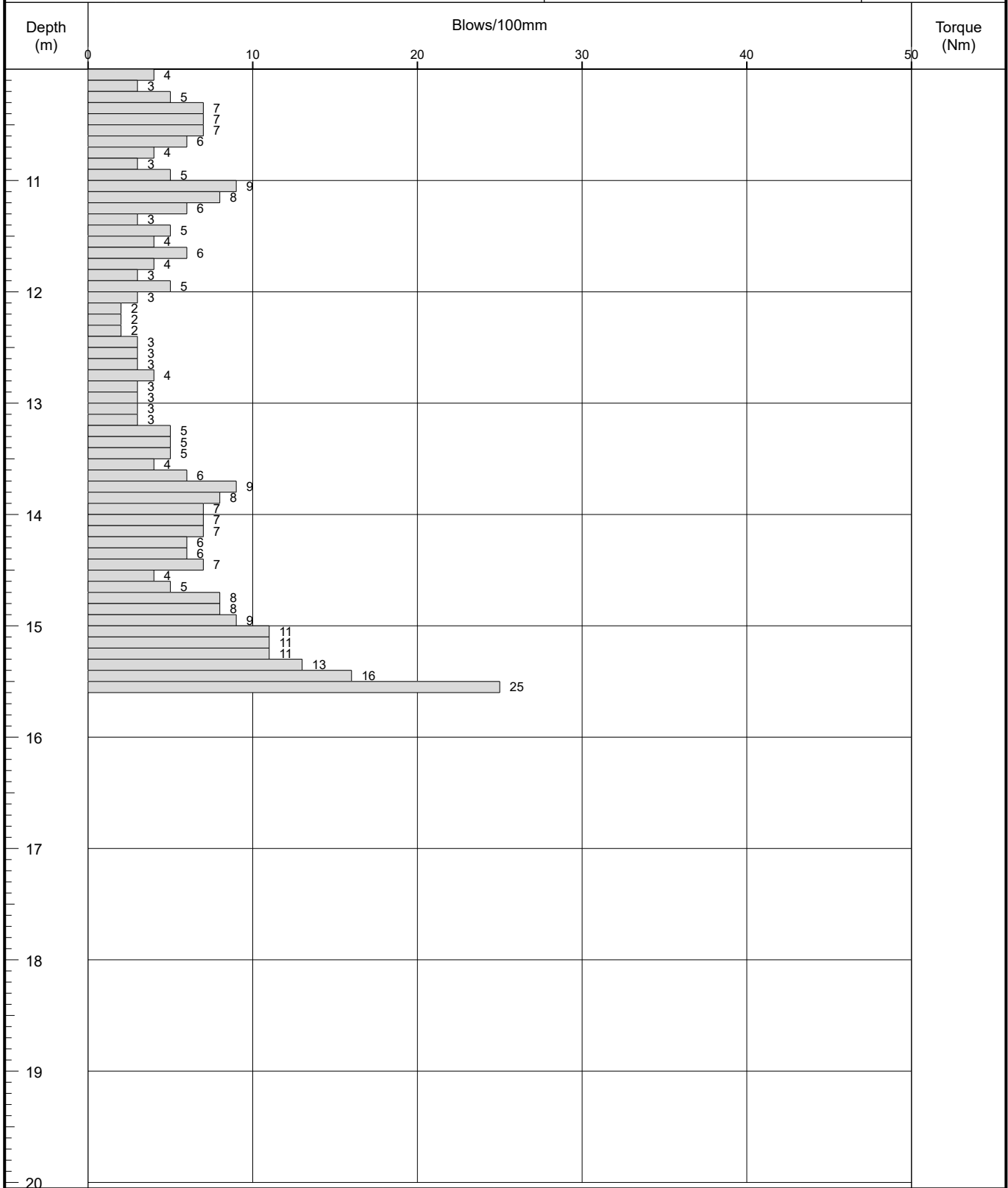
Hole Type  
DCPLocation: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale  
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By  
AB

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 15.6m

Probe Type DPSH-B







# Probe Log

Probe No.

**DP03**

Sheet 1 of 2

Project Name: Dr Challoners High School

Project No.

C475/20/E/695

Co-ords:

Hole Type

DCP

Location: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale

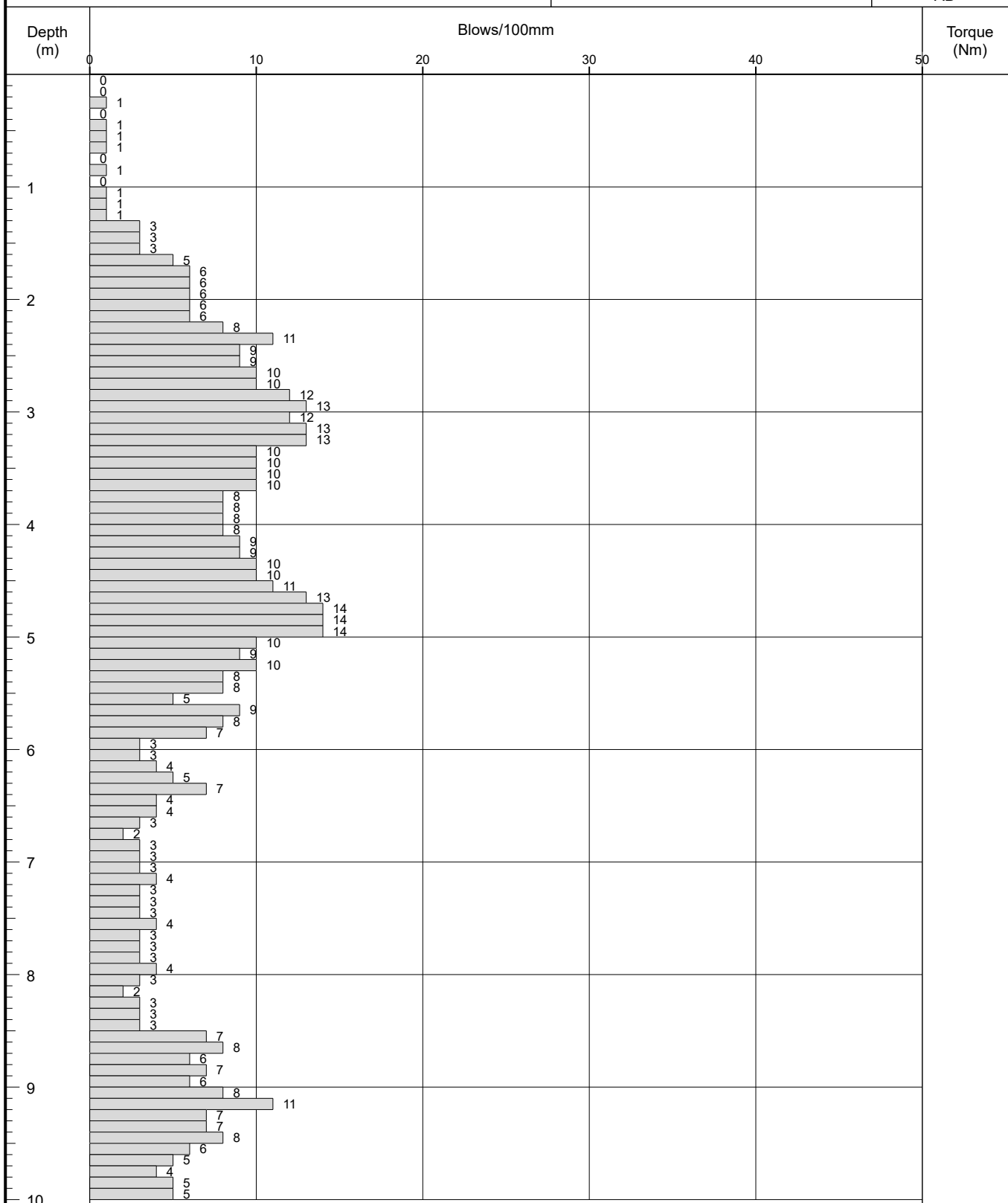
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By

AB



Remarks:

Probes terminated at 20m.

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 20m

Probe Type DPSH-B





# Probe Log

Probe No.

**DP03**

Sheet 2 of 2

Project Name: Dr Challoners High School

Project No.

C475/20/E/695

Co-ords:

Hole Type

DCP

Location: Dr Challoners High School, Cokes Lane, , Little Chalfont,  
Amersham, , HP7 9QB

Level:

Scale

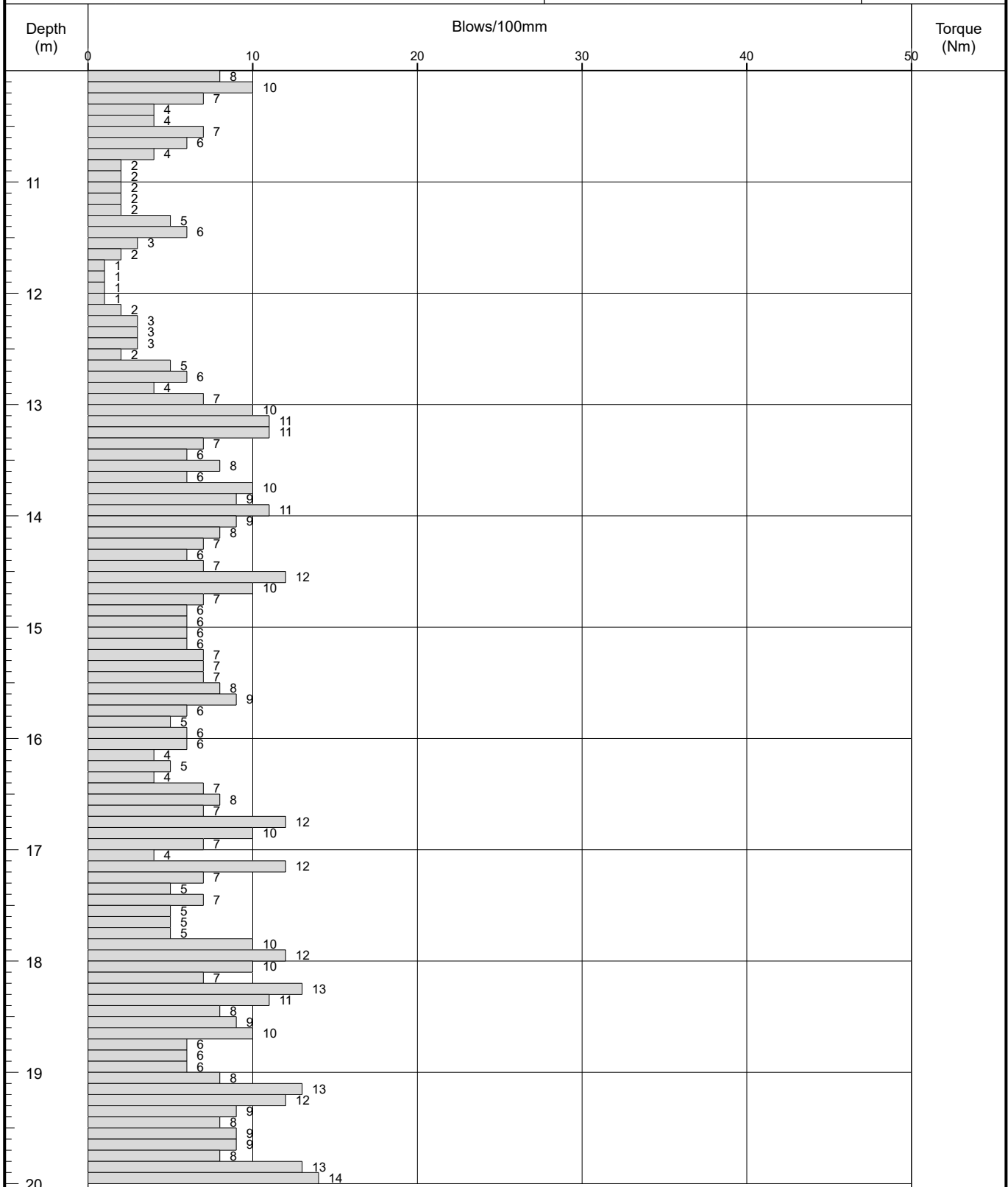
1:50

Client: Lindsay Baxter Design Ltd

Dates: 18/02/2020

Logged By

AB



Remarks:

Probes terminated at 20m.

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 20m

Probe Type DPSH-B





---

## Appendix 4

### Laboratory Testing

---

**Environmental  
Geotechnical  
Specialists**



# LABORATORY REPORT

job number	client ref
site address	client address
consultant	
date scheduled	date issued
issued by	job title

**Rogers Geotechnical Services Ltd Telephone 01484 607 977**  
**Email [jude.norcliffe@rogersgeotech.co.uk](mailto:jude.norcliffe@rogersgeotech.co.uk) [www.rogersgeotech.co.uk](http://www.rogersgeotech.co.uk)**  
Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley,  
Huddersfield, West Yorkshire HD8 8LU.



GEO TECHNICAL  
ENVIRONMENTAL



8948

Environmental  
Geotechnical  
Specialists



## Schedule of UKAS Accredited Laboratory Tests

		Accredited (A)	Unaccredited (U)
<b>1. CLASSIFICATION OF SOIL</b>		<b>BS 1377-2:1990</b>	
<b>1.1 Moisture content determination</b>			
i) Oven drying	Pt 2 : 3.2	A	
ii) Saturation m/c of chalk	Pt 2 : 3.3		U
<b>1.2 Index Properties</b>			
i) Liquid limit – cone penetrometer	Pt 2 : 4.3	A	
ii) Plastic limit	Pt 2 : 5.3	A	
iii) Shrinkage limit	Pt 2 : 6.3		U
iv) Linear shrinkage	Pt 2 : 6.5	A	
<b>1.3 Particle Density</b>			
i) Gas jar	Pt 2 : 8.2		U
ii) Large pyknometer	Pt 2 : 8.3		U
iii) Small pyknometer	Pt 2 : 8.4		U
<b>1.4 Density Tests</b>			
i) Linear measurement	Pt 2 : 7.2	A	
ii) Immersion in water	Pt 2 : 7.3		U
iii) Water displacement	Pt 2 : 7.4		U
iv) Sand replacement	Pt 9 : 2.1, 2.2		U
v) Core cutter	Pt 9 : 2.4		U
<b>1.5 Particle Size Distribution</b>			
i) Dry Sieve	Pt 2 : 9.2	A	
ii) Wet Sieve	Pt 2 : 9.3	A	
iii) Sedimentation by pipette	Pt 2 : 9.4	A	
iv) Sedimentation by hydrometer	Pt 2 : 9.5		U
<b>2. CHEMICAL TESTS</b>		<b>BS 1377-3:2018</b>	
ii) Mass loss on ignition	Pt 3 : 4		U
<b>3. COMPACTION RELATED TESTS</b>		<b>BS 1377-4:1990</b>	
<b>3.1 Dry density/moisture relationship</b>			
i) 2.5kg rammer – 1 litre mould	Pt 4 : 3		U
- CBR mould	Pt 4 : 3		U
ii) 4.5kg rammer – 1 litre mould	Pt 4 : 3		U
- CBR mould	Pt 4 : 3		U
<b>3.2 Moisture Condition Value</b>			
i) Single point test	Pt 4 : 5.4		U
ii) MCV/moisture content relationship	Pt 4 : 5.5		U
<b>3.3 California Bearing Ratio</b>			
i) Undisturbed sample	Pt 5 : 7		U
ii) Recompacted sample	Pt 5 : 7		U
iii) Soaked, inc measurement of swell	Pt 5 : 7		U
<b>4. COMPRESSIBILITY OF SOIL</b>		<b>BS 1377-5:1990</b>	
i) One dimensional consolidation	Pt 5 : 3		U
ii) Swelling pressure test	Pt 5 : 3		U
<b>5. SHEAR STRENGTH OF SOIL</b>		<b>BS 1377-7:1990</b>	
i) Hand shear vane	Makers instructions		U
ii) Shear box (100mm square sample)	BS 1377 : Pt 7 : 4		U
iii) Triaxial – quick undrained	BS 1377 : Pt 7 : 8, 9		U
<b>6. PERMEABILITY</b>			
i) Falling head	K. H. Head Vol 2		U
ii) Constant head	BS 1377 : Pt 6 : 6		U
iii) Triaxial cell	BS 1377 : Pt 6 : 6		U
<b>7. ROCK TESTS</b>			
<b>7.1 Classification Tests</b>			
i) Natural moisture content	-		U
ii) Saturated moisture content	-		U
iii) Natural density	-		U
iv) Porosity	-		U
<b>7.2 Strength Tests</b>			
i) Point load index	ISRM '85		U
ii) Uniaxial compression test	ISRM '81		U

GEOTECHNICAL  
ENVIRONMENTAL



# GEOTECHNICAL LAB RESULTS

GEOTECHNICAL  
ENVIRONMENTAL



Blank Page

GEOTECHNICAL  
ENVIRONMENTAL

		Summary of Classification Test Results												
Project No. C475/20/E/695		Project Name Dr Challoners High School												
Hole No.	Sample				Soil Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Remarks
	Ref	Top	Base	Type		bulk Mg/m3	dry							
WS01	1	0.80		D	Orange silty CLAY.			25.0						
WS01	2	1.40		D	Orange slightly sandy silty CLAY.			18.0	99	43 -1pt	17	26		
WS03	1	0.80		D	Orange slightly sandy slightly gravelly silty CLAY.			22.0	92	46 -1pt	17	29		
WS04	1	0.80		D	Orange slightly sandy slightly gravelly silty CLAY.			26.0						
WS04	2	1.20		D	Orange slightly sandy slightly gravelly silty CLAY.			20.0						
WS04	3	1.80		D	Orange slightly sandy silty CLAY.			23.0	99	70 -1pt	24	46		
WS04	4	2.40		D	Orange slightly sandy silty CLAY.			22.0						
WS04	5	2.80		D	Orange slightly sandy silty CLAY.			20.0						
All tests performed in accordance with BS1377:1990 unless specified otherwise														
Key								Date Printed		Approved By		Table		
Density test								03/06/2020		Jude		1		
Linear measurement unless :												sheet		
wd - water displacement												1		
wi - immersion in water														



					Linear Shrinkage - Summary of Results				
Project No. C475/20/E/695					Project Name Dr Challoners High School				
Hole No.	Sample				Soil Description	Material <425µm %	Preparation	Linear Shrinkage %	Date Tested
	Ref	Top	Base	Type					
WS01	2	1.40		D	Orange slightly sandy silty CLAY.	99	Specimen prepared from natural material	14	02/03/2020
WS03	1	0.80		D	Orange slightly sandy slightly gravelly silty CLAY.	92	Specimen prepared from natural material	14	28/02/2020
WS04	3	1.80		D	Orange slightly sandy silty CLAY.	99	Specimen prepared from natural material	18	02/03/2020
Remarks:									
Notes Tests performed in accordance with BS 1377 : Part 2 : 1990, clause 6.5 unless annotated otherwise						Date Printed 03/06/2020		Approved By Jude	
								Table Sheet 2 1	



Rogers Geotechnical Services Ltd.  
Offices 1&2,  
Barncliffe Business Park,  
Near Bank, Shelley,  
Huddersfield,  
HD8 8LU

## Classification of Index Properties

C475/20/E/695

Project Name: Dr Challoners High School

B.S 1377: Part 2: 1990: 3.2, 4 and 5

Fig. 3  
Sheet. 1

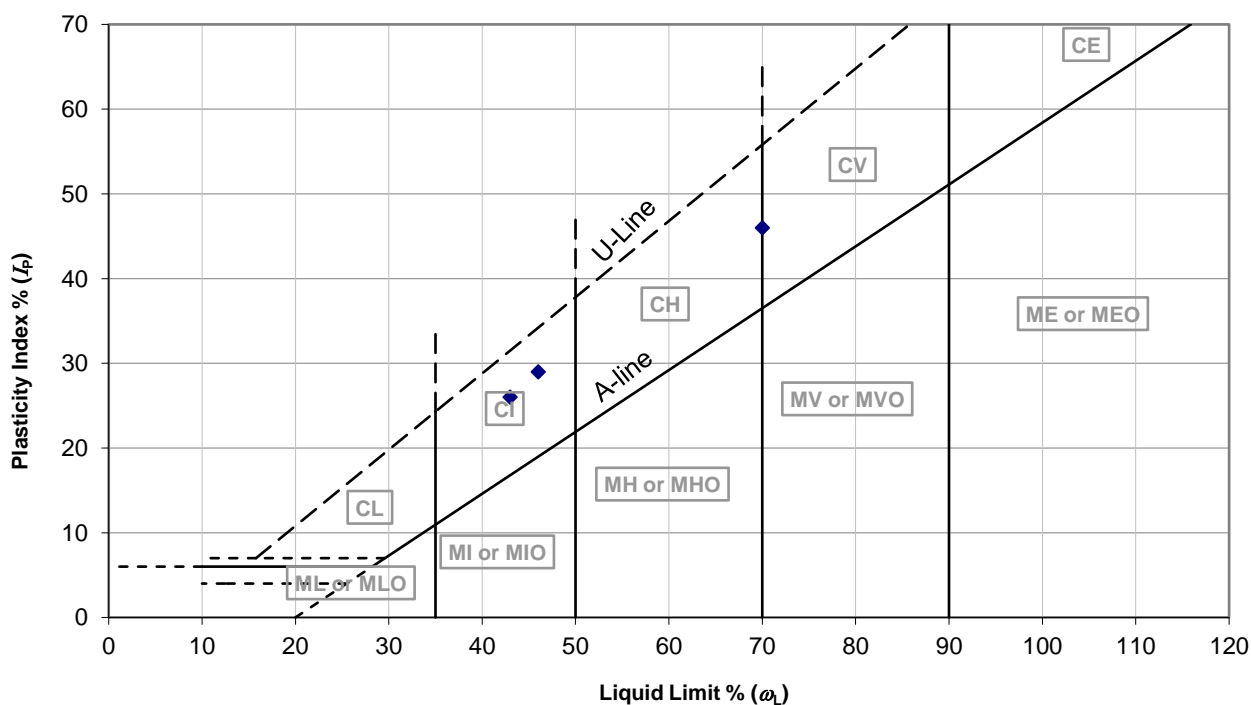
Location: Dr Challoners High School

Input By: Jude

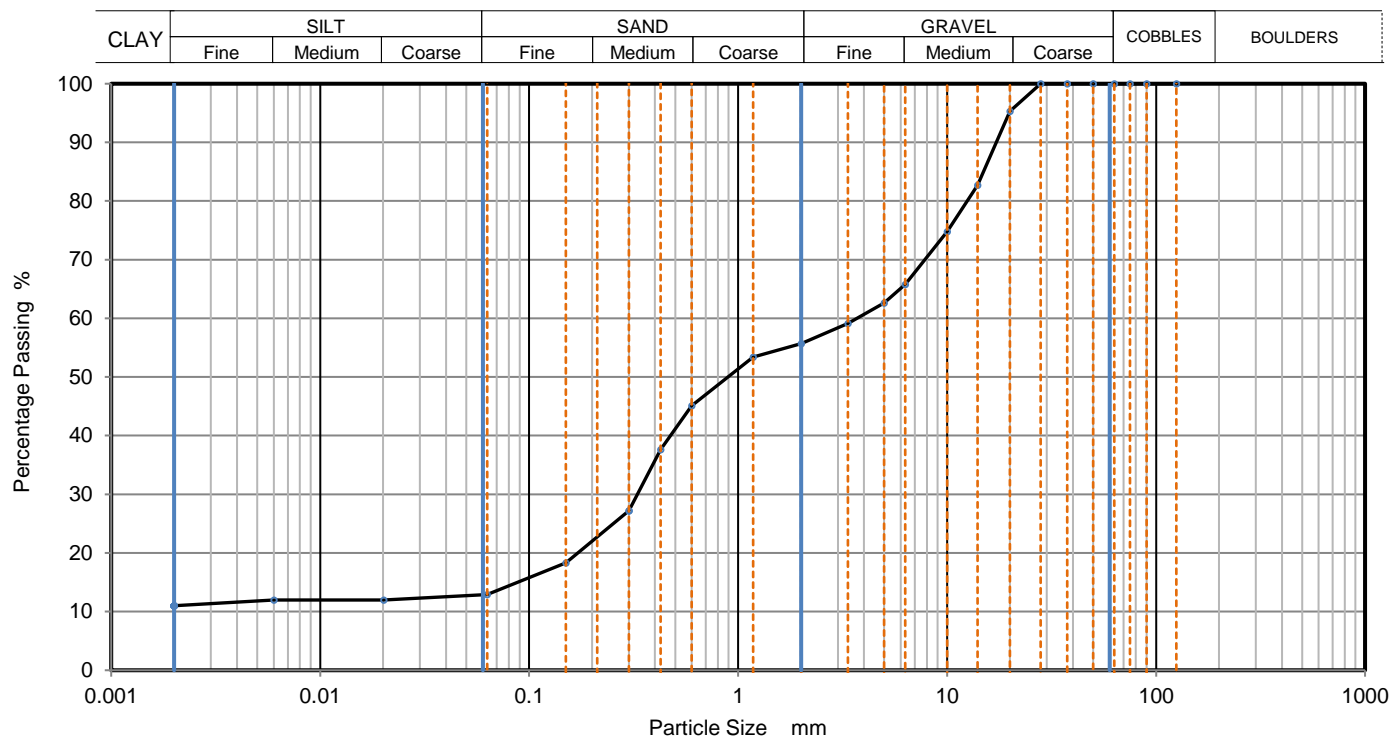
Client: Dr Challoners High School.

Check By: Jude

Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (wL) (%)	Plastic Limit (wP) (%)	Plasticity Index (IP) (%)	Retained by 425mm (%)	Modified (w) (w') (%)	Modified (IP) (IP') (%)	Liquidity/ Consistency		Casagrande Class	N.H.B.C Class (%)
									(IL) (%)	(IC) (%)		
WS01	1.40	18	43	17	26	1	18	26	0.0	1.0	C I	MEDIUM
WS03	0.80	22	46	17	29	8	24	27	0.2	0.8	C I	MEDIUM
WS04	1.80	23	70	24	46	1	23	46	0.0	1.0	C V	HIGH



<b>PARTICLE SIZE DISTRIBUTION</b>				Job Ref	<b>C475/20/E/695</b>
				Borehole/Pit No.	WS01
Site Name	Dr Challoners High School			Sample No.	3
Soil Description	Orange slightly sandy gravelly CLAY/SILT.			Depth, m	2.10
Specimen Reference	D3	Specimen Depth	2.1 m	Sample Type	D
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.4			KeyLAB ID	RGS_202002272



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0201	12
90	100	0.0060	12
75	100	0.0020	11
63	100		
50	100		
37.5	100		
28	100		
20	95		
14	83		
10	75		
6.3	66		
5	63		
3.35	59		
2	56		
1.18	53		
0.6	45	Particle density (assumed) 2.65 Mg/m3	
0.425	38		
0.3	27		
0.15	18		
0.063	13		

Dry Mass of sample, g

2220

Sample Proportions	% dry mass
Very coarse	0
Gravel	44
Sand	43
Silt	2
Clay	11

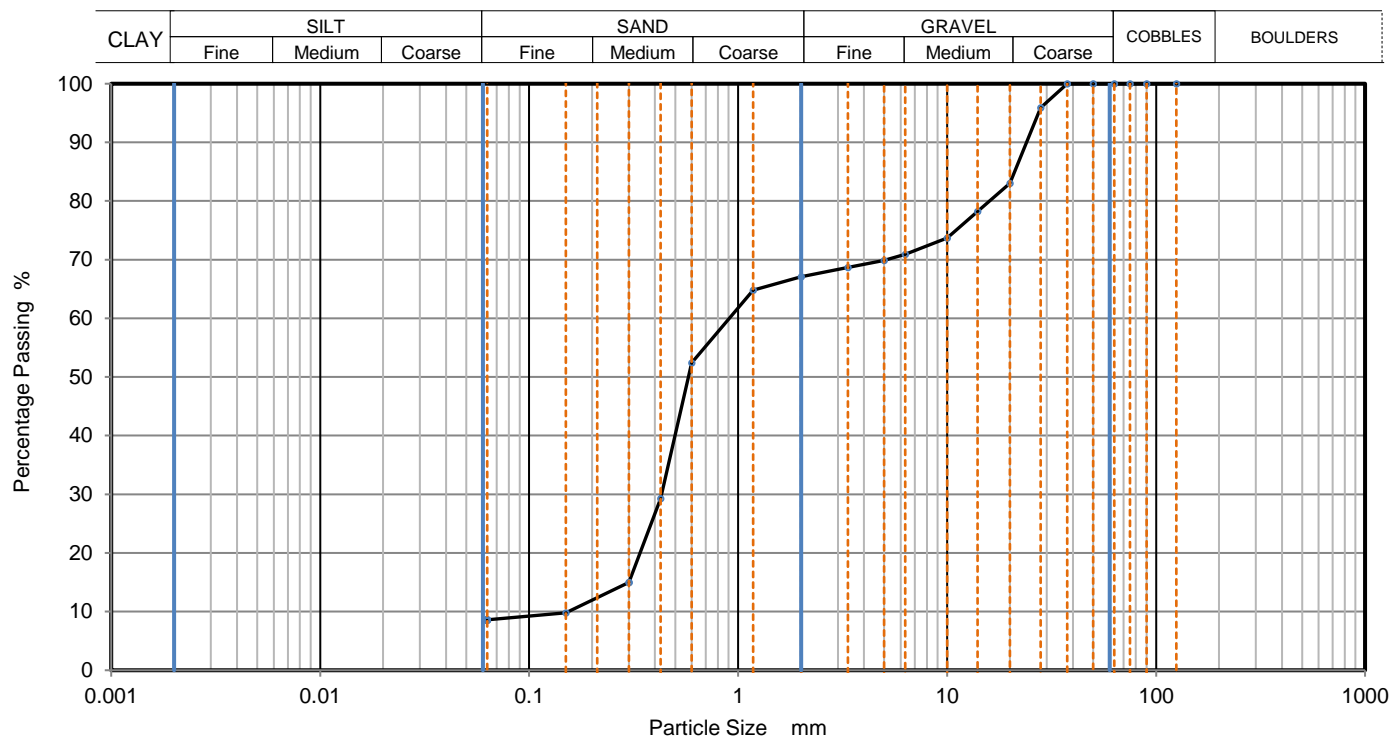
Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	<b>Fig 4</b> Sheet 1
Harry	Jude	Jude	06/03/2020	

<b>PARTICLE SIZE DISTRIBUTION</b>				Job Ref	<b>C475/20/E/695</b>
				Borehole/Pit No.	WS02
Site Name	Dr Challoners High School			Sample No.	1
Soil Description	Orangish brown silty very gravelly SAND.			Depth, m	1.40
Specimen Reference	D1	Specimen Depth	1.4 m	Sample Type	D
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	RGS_202002273



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	96		
20	83		
14	78		
10	74		
6.3	71		
5	70		
3.35	69		
2	67		
1.18	65		
0.6	52		
0.425	29		
0.3	15		
0.15	10		
0.063	9		

Dry Mass of sample, g

850

Sample Proportions	% dry mass
Very coarse	0
Gravel	33
Sand	59
Fines <0.063mm	9

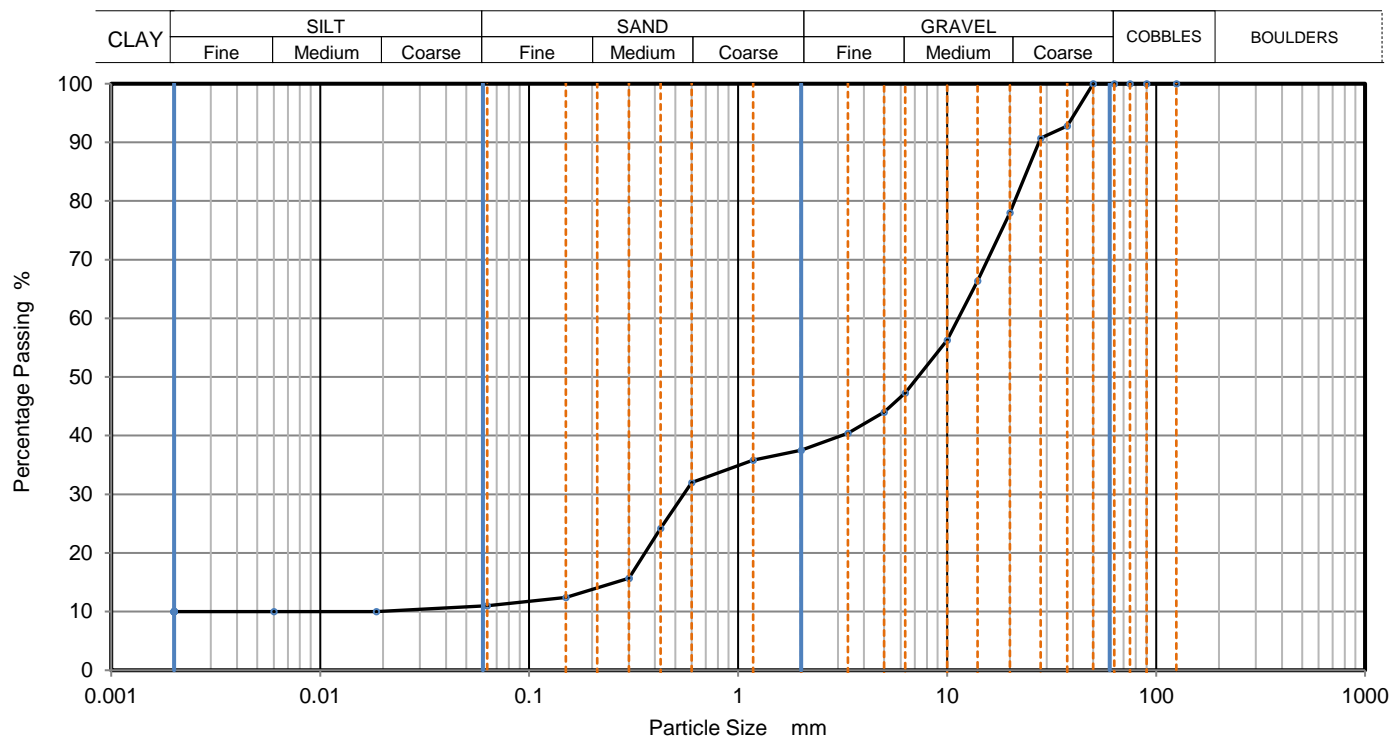
Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	5.9
Curvature Coefficient	1.3

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	<b>Fig 4</b> Sheet 2
Harry	Jude	Jude	06/03/2020	

<b>PARTICLE SIZE DISTRIBUTION</b>				Job Ref	<b>C475/20/E/695</b>
				Borehole/Pit No.	WS03
Site Name	Dr Challoners High School			Sample No.	2
Soil Description	Orangish brown sandy gravelly CLAY/SILT.			Depth, m	1.40
Specimen Reference	D2	Specimen Depth	1.4 m	Sample Type	D
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.4			KeyLAB ID	RGS_202002275



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0186	10
90	100	0.0060	10
75	100	0.0020	10
63	100		
50	100		
37.5	93		
28	91		
20	78		
14	66		
10	56		
6.3	47		
5	44		
3.35	40		
2	38		
1.18	36		
0.6	32	Particle density (assumed) 2.65 Mg/m3	
0.425	24		
0.3	16		
0.15	12		
0.063	11		

Dry Mass of sample, g

1756

Sample Proportions	% dry mass
Very coarse	0
Gravel	63
Sand	27
Silt	1
Clay	10

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	1100
Curvature Coefficient	2.6

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	<b>Fig 4</b> Sheet 3
Harry	Jude	Jude	06/03/2020	



# ENVIRONMENTAL LAB RESULTS

GEOTECHNICAL  
ENVIRONMENTAL



Blank Page

GEOTECHNICAL  
ENVIRONMENTAL

# Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C475/20/E/695			<div>A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a</div> <div><div>KEY</div><div><div>Exceeds SSV</div><div>Exceeds 2017, Below 2015</div><div>Below limit of detection (LOD)</div></div></div>							
Job Name	Dr Challoners High School										
Date	27/02/2020			Sample Location		WS1	WS3	WS4			
Client	Dr Challoner's High School			Depth Top		0.15	0.25	0.50			
				Depth Base		0.25	0.40	0.60			
Determinand	Units	Ref	LOD	Residential Without Plant Uptake 6%							
				Atrisk 2015 (No Free Product)	Atrisk 2017						
Cadmium	mg/kg	C	0.10		149	0.15	< 0.10	< 0.10			
Chromium (Hexavalent)	mg/kg	B/C	0.5	20.5	3.62	< 0.50	< 0.50	< 0.50			
Copper	mg/kg	A+	0.50		9060	33	11	9.6			
Mercury	mg/kg	A/D	0.10		20.3	0.16	0.13	< 0.10			
Nickel	mg/kg	A+	0.50		188	25	8.2	7.7			
Lead	mg/kg	C	0.50		313	74	48	31			
Zinc	mg/kg	A+	0.50		47000	63	42	24			
Vanadium	mg/kg	A+	5.0		357	39	24	26			
Arsenic	mg/kg	C	1.0		39.9	12	9.0	10			
Selenium	mg/kg	A	0.20		595	0.39	0.23	0.22			
Cyanide (Free)	mg/kg	A	0.50		34	0.50	0.70	< 0.50			
Total Phenols	mg/kg	A	0.30		519	< 0.30	< 0.30	< 0.30			
Naphthalene	mg/kg	A+	0.10		13.1	0.42	0.58	< 0.10			
Acenaphthylene	mg/kg		0.10			0.97	0.40	< 0.10			
Acenaphthene	mg/kg	A+	0.10	6730	937	0.39	0.35	< 0.10			
Fluorene	mg/kg	A+	0.10		4860	0.47	0.69	< 0.10			
Phenanthrene	mg/kg		0.10			6.2	2.9	0.95			
Anthracene	mg/kg	A+	0.10		37700	0.87	0.88	0.29			
Fluoranthene	mg/kg	A+	0.10		5050	10	3.0	1.3			
Pyrene	mg/kg	A+	0.10		3780	9.9	2.4	1.6			
Benzo[a]anthracene	mg/kg	A	0.10	9.04	9.04	3.5	1.3	0.53			
Chrysene	mg/kg	A	0.10	1010	2.64	5.2	1.7	0.64			
Benzo[b]fluoranthene	mg/kg	A	0.10	10.3	7.29	5.3	1.4	0.66			
Benzo[k]fluoranthene	mg/kg	A	0.10	104	4.12	2.6	0.77	0.25			
Benzo[a]pyrene	mg/kg	B/C	0.10	5.34	2.21	4.2	1.0	0.64			
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.10	10.3	0.368	3.2	0.93	0.36			
Dibenz(a,h)Anthracene	mg/kg	A	0.10	1.03	0.0236	0.90	0.61	0.17			
Benzo[g,h,i]perylene	mg/kg	A	0.10	104	0.112	2.6	0.55	0.23			
Total Of 16 PAH's	mg/kg		2.0			57	20	7.6			
Aliphatic TPH >C5-C6	mg/kg	A+	1.0		371	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C6-C8	mg/kg	A+	1.0	1240	768	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C8-C10	mg/kg	A+	1.0		205	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	1190	297	< 1.0	< 1.0	< 1.0			



# Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet						
Job Number	C475/20/E/695			<p>A = WS Atkins PLC, Atrisk Soil Screening Values.  A+ = Values updated June 2017.  A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound.  B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report.  C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter.  D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a</p>						
Job Name	Dr Challoners High School			<p><b>KEY</b></p> <p><span style="background-color: #f8d7da; border: 1px solid #f5c6cb; display: inline-block; width: 15px; height: 10px;"></span> Exceeds SSV</p> <p><span style="background-color: #fff3cd; border: 1px solid #ffeeba; display: inline-block; width: 15px; height: 10px;"></span> Exceeds 2017, Below 2015</p> <p><span style="background-color: #d4edda; border: 1px solid #c3e6cb; display: inline-block; width: 15px; height: 10px;"></span> Below limit of detection (LOD)</p>						
Date	27/02/2020			Sample Location	WS1	WS3	WS4			
Client	Dr Challoner's High School			Depth Top	0.15	0.25	0.50			
				Depth Base	0.25	0.40	0.60			
Determinand	Units	Ref	LOD	Residential Without Plant Uptake 6%						
Aliphatic TPH >C12-C16	mg/kg	A+	1.0	2710	925	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C16-C21	mg/kg	A+	1.0		212000	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	mg/kg	A+	1.0		212000	64	< 1.0	< 1.0		
Aliphatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0		
Total Aliphatic Hydrocarbons	mg/kg		5.0			64	< 5.0	< 5.0		
Aromatic TPH >C5-C7	mg/kg	A+	1.0		3.32	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	mg/kg	A+	1.0		3860	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	mg/kg	A+	1.0		332	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	mg/kg	A+	1.0		1550	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	mg/kg	A+	1.0	2710	925	5.9	< 1.0	< 1.0		
Aromatic TPH >C16-C21	mg/kg	A+	1.0		1930	17	< 1.0	< 1.0		
Aromatic TPH >C21-C35	mg/kg	A+	1.0		1930	270	< 1.0	< 1.0		
Aromatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons	mg/kg		5.0			300	< 5.0	< 5.0		
Total Petroleum Hydrocarbons	mg/kg		10.0			360	< 10	< 10		
pH			N/A			8.1	8.2	8.4		
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	g/l		0.010			0.087	0.043	0.066		
ACM Type			N/A			-	-	-		
Asbestos Identification	%		0.001			No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
ACM Detection Stage			N/A			-	-	-		
Moisture	%		0.020			15	13	6.5		
Soil Colour			N/A			Brown,	Brown,	Brown,		
Other Material			N/A			Stones,	Stones, Roots,	Stones,		
Soil Texture			N/A			Clay,	Clay,	Clay,		
Sulphate (Total)	%		0.010			0.099	0.054	0.068		
Organic Matter	%		0.40			5.0	1.6	1.2		



2183



# Final Report

---

**Report No.:** 20-06396-1  
**Initial Date of Issue:** 09-Mar-2020  
**Client** Rogers Geotechnical Services Ltd  
**Client Address:** Unit 4, Barncliffe Business Park  
Near Bank  
Shelley  
Huddersfield  
West Yorkshire  
HD8 8LU  
**Contact(s):** Jude Norcliffe  
**Project** C475/20/E/695 Dr Challoners High School

<b>Quotation No.:</b>		<b>Date Received:</b>	28-Feb-2020
<b>Order No.:</b>	0637	<b>Date Instructed:</b>	28-Feb-2020
<b>No. of Samples:</b>	3		
<b>Turnaround (Wkdays):</b>	7	<b>Results Due:</b>	09-Mar-2020
<b>Date Approved:</b>	09-Mar-2020		

**Approved By:**

**Details:** Darrell Hall, Director

---

## Results - Soil

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				20-06396	20-06396	20-06396
Quotation No.:	Chemtest Sample ID.:				977775	977776	977777
	Client Sample ID.:				D	D	D
	Sample Location:				WS1	WS3	WS4
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.15	0.25	0.50
	Bottom Depth (m):				0.25	0.40	0.60
	Date Sampled:				27-Feb-2020	27-Feb-2020	27-Feb-2020
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD			
Cadmium	M	2450	mg/kg	0.10	0.15	< 0.10	< 0.10
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Copper	U	2450	mg/kg	0.50	33	11	9.6
Mercury	M	2450	mg/kg	0.10	0.16	0.13	< 0.10
Nickel	M	2450	mg/kg	0.50	25	8.2	7.7
Lead	M	2450	mg/kg	0.50	74	48	31
Zinc	U	2450	mg/kg	0.50	63	42	24
Vanadium	U	2450	mg/kg	5.0	39	24	26
Arsenic	M	2450	mg/kg	1.0	12	9.0	10
Selenium	M	2450	mg/kg	0.20	0.39	0.23	0.22
Cyanide (Free)	M	2300	mg/kg	0.50	0.50	0.70	< 0.50
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30
Naphthalene	M	2700	mg/kg	0.10	0.42	0.58	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	0.97	0.40	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	0.39	0.35	< 0.10
Fluorene	M	2700	mg/kg	0.10	0.47	0.69	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	6.2	2.9	0.95
Anthracene	M	2700	mg/kg	0.10	0.87	0.88	0.29
Fluoranthene	M	2700	mg/kg	0.10	10	3.0	1.3
Pyrene	M	2700	mg/kg	0.10	9.9	2.4	1.6
Benzo[a]anthracene	M	2700	mg/kg	0.10	3.5	1.3	0.53
Chrysene	M	2700	mg/kg	0.10	5.2	1.7	0.64
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	5.3	1.4	0.66
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	2.6	0.77	0.25
Benzo[a]pyrene	M	2700	mg/kg	0.10	4.2	1.0	0.64
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	3.2	0.93	0.36
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.90	0.61	0.17
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	2.6	0.55	0.23
Total Of 16 PAH's	M	2700	mg/kg	2.0	57	20	7.6
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	64	< 1.0	< 1.0

## Results - Soil

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				20-06396	20-06396	20-06396
Quotation No.:	Chemtest Sample ID.:				977775	977776	977777
	Client Sample ID.:				D	D	D
	Sample Location:				WS1	WS3	WS4
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.15	0.25	0.50
	Bottom Depth (m):				0.25	0.40	0.60
	Date Sampled:				27-Feb-2020	27-Feb-2020	27-Feb-2020
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>			
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	64	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	5.9	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	17	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	270	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	300	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	360	< 10	< 10
pH	M	2010		4.0	8.1	8.2	8.4
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	M	2120	g/l	0.010	0.087	0.043	0.066
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	15	13	6.5
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	Stones, Roots,	Stones, Roots,	Stones,
Soil Texture	N	2040		N/A	Clay,	Clay,	Clay,
Sulphate (Total)	M	2430	%	0.010	0.099	0.054	0.068
Organic Matter	M	2625	%	0.40	5.0	1.6	1.2

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

## **Report Information**

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

---

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



## End of Report

GEOTECHNICAL  
ENVIRONMENTAL



---

## Appendix 5

### Fill Screening Values

---



**Rogers Geotechnical Services Ltd.**

### Atkins ATRISK Soil Screening Values (SSVs) - Residential Without Plant Uptake Landuse

Tox Data Report No.	Compound	Residential without Homegrown Produce Landuse (mg/kg)				Reference
	<i>Metals</i>	SOM: 1%		SOM: 6%		
3	Cadmium	149		149		C
4	Chromium VI	3.62	20.5	3.62	20.5	B/C
	Copper	9060		9060		A+
7	Mercury	10.00		20.30		A/D
8	Nickel	188		188		A+
	Lead	313		313		C
	Zinc	47000		47000		A+
	Vanadium	357		357		A+
	<i>Semi and Non Metals</i>					
1	Arsenic	39.9		37		C
10	Selenium	595		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	262		1200		A
	<i>Poly Aromatic Hydrocarbons</i>	Free product	No free product	Free product	No free product	
20	Napthalene	0.851		13.1		A+
	Acenaphthene	156	2680	937	6730	A+
	Fluorene	124	3260	4860		A+
	Anthracene	3.48	34300	37700		A+
	Fluoranthene	4880		5050		A+
	Pyrene	3650		3780		A+
	Benzo(a)anthracene	1.71	5.42	9.04		A
2	Chrysene	0.44	852	2.64	1010	A
2	Benzo(b)fluoranthene	1.22	9.68	7.29	10.3	A
2	Benzo(k)fluoranthene	0.686	99.7	4.12	104	A
2	Benzo(a)pyrene	2.17	5.33	2.21	5.34	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.949	0.0236	1.03	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	9.53	0.368	10.3	A
2	Benzo(g,h,i)perylene	0.0187	102	0.112	104	A
	<i>Petroleum Hydrocarbons</i>					
	Aliphatic C5-C6	42.9		371		A+
	Aliphatic C6-C8	99.6		768	1240	A+
	Aliphatic C8-C10	13.9		205		A+
	Aliphatic C10-C12	49.9	81.8	297	1190	A+
	Aliphatic C12-C16	20.9	385	925	2710	A+
	Aliphatic C16-C21	212000		212000		A+
	Aliphatic C21-C35	212000		212000		A+
	Aromatic C5-C7 (Benzene)	0.31		3.32		A+
	Aromatic C7-C8 (Toluene)	312		3860		A+
	Aromatic C8-C10	22.7		332		A+
	Aromatic C10-C12	139		1550		A+
	Aromatic C12-C16	155	703	925	2710	A+
	Aromatic C16-C21	1930		1930		A+
	Aromatic C21-C35	1930		1930		A+
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						