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# Geo-Environmental Assessment

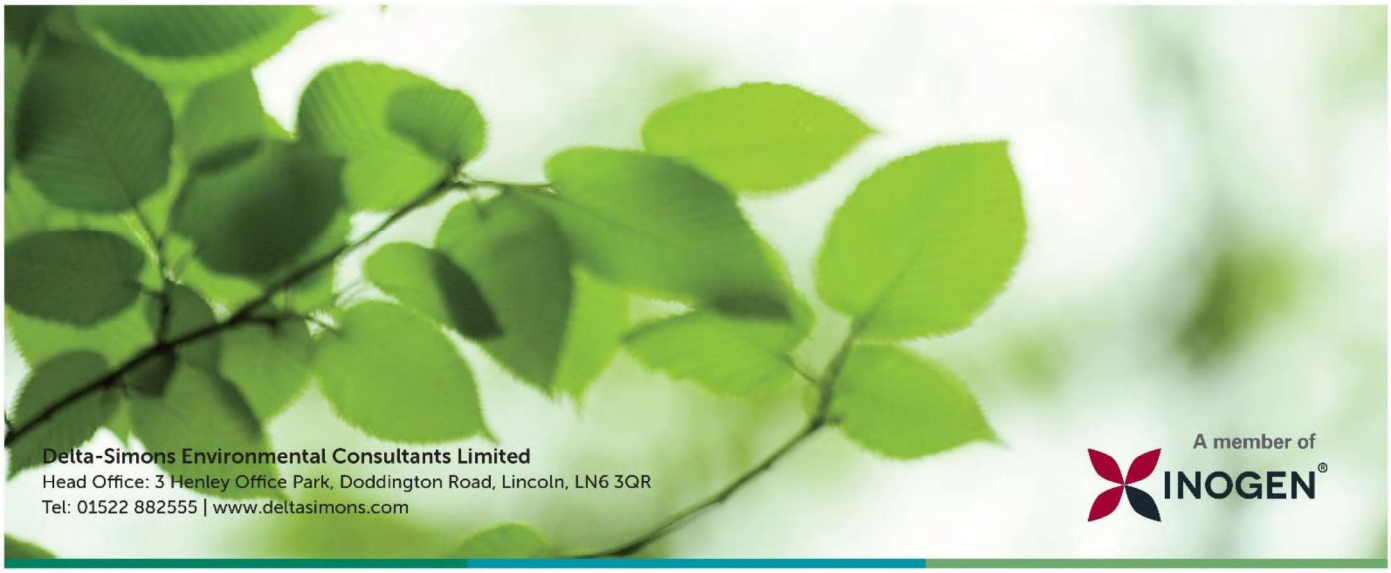
## Spalding Academy, Neville Avenue, Spalding

Presented to **Lincolnshire County Council**

Issued: November 2020

Delta-Simons Project No. 20-1718.01

deltasimons



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# Report Details

| | |
|---|---|
| **Client** | Lincolnshire County Council |
| **Report Title** | Geo-Environmental Assessment |
| **Site Address** | Spalding Academy, Neville Avenue, Spalding, PE11 2EJ |
| **Project No.** | 20-1718.01 |
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| Issue No. | Status | Issue Date | Comments | Author | Technical Review | Authorised |
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# 1.0 Introduction

## 1.1 Appointment

Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Lincolnshire County Council (the "Client") to prepare a Geo-Environmental Assessment for land at Spalding Academy, Neville Avenue, Spalding, PE11 2EJ (the "Site").

## 1.2 Context & Purpose

The aim of the study was to complete a Geo-Environmental assessment of the proposed likely development area. The investigation has obtained information regarding ground conditions, from which risks to end-users, the environment and structures have been assessed, with mitigation measures suggested where necessary.

The investigation has also gathered geotechnical information to inform comment on the preliminary design of foundations and infrastructure. The report provides recommendations for further work (where appropriate) based on the findings of the investigation.

It is understood that the Site is proposed for the development of a two-storey teaching block. There are currently three options/areas under consideration as detailed on the Proposed Development Plan included as Drawing 1. It is understood that Option 1 in the eastern area of the Site is the preferred option at this stage. No additional landscaped areas are proposed.

## 1.3 Scope of Works

The scope of the investigation and layout of this report has been designed with consideration of guidance on Land Contamination: Risk Management pages of the GOV.UK web pages, the relevant requirements of the National Planning Policy Framework 2019 (NPPF) (paragraphs 170 & 178-180)[1] and the Planning Practice Guidance (Land Affected by Contamination)[2].

The project was carried out to an agreed brief as set out in Delta-Simons' proposal dated September 2020. The scope of works is outlined in Section 3.2.1.

Specific sections of this report may generally follow guidance set out in Eurocode 7 for a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007. Eurocode 7 includes specific guidance on the number and spacing of investigation positions, methods of investigation and sample quality to be achieved which may not have been met by this investigation. The report also includes information which may support a Geotechnical Design Report (GDR) as defined in BS EN 1997-1:2004; however, unless otherwise explicitly stated, the investigation has not been undertaken in accordance with Eurocode 7 and the preliminary geotechnical interpretation, assessments, risk register and recommendations presented within this report may not meet the full requirements of a GDR.

## 1.4 Existing Information

Delta-Simons has previously undertaken a Preliminary Risk Assessment (PRA) for the Site:

- Preliminary Geo-Environmental Risk Assessment, Spalding Academy, Neville Avenue, Spalding, Delta-Simons Project No. 20-1718.01, dated October 2020.

For full details of the Site and environmental setting the previous PRA should be read in conjunction with this report. A summary of the current Site status, environmental setting and key historical features is presented in Section 2.1.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf
[2] https://www.gov.uk/guidance/land-affected-by-contamination

## 1.5 Limitations

The assessment is limited to the issues agreed within the proposal for the works. Notes on limitations associated with this assessment are provided in Appendix A. In addition, the following specific limitations apply to this assessment;

- Intrusive locations were set out to avoid services; and
- The proposed development is yet to be finalised as such intrusive locations were set out to achieve coverage of all three option areas.

# 2.0 Site Details

## 2.1 Site Setting

Delta-Simons has previously undertaken a PRA for the Site, which should be read in conjunction with this Report. A brief summary of the pertinent information is provided below.

| | | | |
|---|---|---|---|
| **Co-ordinates** | Centred approximately at National Grid Reference 525640, 322480. | Elevation | 6.0 m AOD |
| | | Area | 0.14 Ha |
| **Site Location** | The Site is located in the southern area of the current Spalding Academy, off Neville Avenue, Spalding. | | |
| **Current Site Use** | Delta-Simons undertook a Site visit on 16th October 2020. Given the active nature of the school, photographs were not permitted. A Site Layout Plan is included as Figure 2. Relevant Features observed or reported on-Site area described below.<br><u>*Option 1*</u><br>It is understood from a Site representative that this area has historically be used for teaching brick laying skills, however, has not been in use for a number of years. Numerous piles of bricks were noted.<br>The surfacing generally comprised concrete hardstanding with areas of bare vegetated ground in the south and west.<br>A small wooden shed was present in the north eastern corner; however, access was not afforded.<br>A number of underground services were noted in the northern area comprising an electrical supply and two water taps.<br>The Site was bound by metal fencing along all boundaries with access afforded via a gate along the northern boundary.<br><u>*Option 2 and 3*</u><br>These areas comprised a mixture of asphalt hardstanding and grassed soft landscaping in the western and southern areas.<br>Both areas were open to the surrounding school.<br>All three options areas were generally flat and in accordance with the local topography.<br>The surrounding area generally comprised the wider Spalding Academy, including educational facility buildings to the north, playing fields to the south and residential properties to the west and south east. | | |
| **Proposed Development** | It is understood that the Site is proposed for the development of a two-storey teaching block comprising a number of classrooms. There are currently three options/areas under consideration as detailed on the Proposed Development Plan included as Drawing 1. | | |
| **Environmental Setting** | From the British Geological Survey online viewer, the Site is indicated as being underlain by Superficial Tidal Flat Deposits (Clay and Silt). The underlying bedrock is mapped as the Oxford Clay Formation (Mudstone). Given the current development, Made Ground is likely to be present.<br>The EA classify the superficial Tidal Flat Deposits and the Oxford Clay bedrock as Unproductive Strata. The EA data also indicates that the Site is not in a designated groundwater Source Protection Zone (SPZ). According to the Envirocheck Report, | | |

| | |
|---|---|
| | there are no licensed abstraction records from groundwater located within 1 km of the Site.<br><br>Exeter Drain is located approximately 10 m west of Option 2 and an unnamed land drain is located approximately 10 m east of Option 1. In addition, Coronation Channel is located approximately 220 m south east of Option 1. The wider area is dominated by a series of land drains.<br><br>Historic mapping indicates that all three areas comprised likely agricultural land prior to forming part of the wider school by the late 1950's. An infilled swimming pool is located between the Option 1 and Option 2 development area. |
| **Summary of Previous Reports** | Delta-Simons has previously undertaken a PRA for the Site;<br><br>▲ Preliminary Geo-Environmental Risk Assessment, Spalding Academy, Neville Avenue, Spalding, Delta-Simons Project No. 20-1718.01, dated October 2020.<br><br>Potential sources of contamination were limited to potential Made Ground associated with historical development and demolition, organic materials within the underlying natural superficial deposits and the potential for on and off-Site infilled land.<br><br>An environmental investigation was recommended to assess the nature and composition of soils at the Site for geotechnical and environmental information. Including a ground gas risk assessment. |
| **Key Contaminants and Initial CSM Aspects** | The Site has historically been in agricultural use prior to forming part of the wider school.<br><br>Potential sources of contamination include;<br><br>▲ Potential Made Ground/infill materials beneath the Site associated with historical development and demolition;<br><br>▲ Organic material within natural superficial Tidal Flat Deposits; and<br><br>▲ Infilled land including a pond, swimming pool and land drains.<br><br>Potential sources of ground gas have been identified as the Site associated with potential Made Ground and organic material within natural deposits.<br><br>The Site overlies Unproductive Strata with respect to the superficial and bedrock geologies. The Site is not located within a SPZ.<br><br>There is uncertainty because unrecorded potentially contaminative activities could have taken place. |

# 3.0 Site Investigation

## 3.1 Intrusive Investigation

Delta-Simons undertook intrusive investigation works from 26th to 29th November 2020 to assess the potential linkages identified in the outline conceptual model (see Section 2.2 above) and to provide geotechnical information.

### 3.1.1 Health & Safety Considerations

A utilities clearance specialist attended the Site on 26th November 2020 to trace services on and around the Site prior to excavation of exploratory hole locations.

An initial assessment of the Site identified a low risk in relation to Unexploded Ordnance (UXO) and so no specific precautionary measures were required for the works.

Future Contractors should undertake their own assessment of UXO risk in relation to their specific proposed scope of works.

## 3.2 Scope of Ground Investigation and Rationale

### 3.2.1 Scope

The ground investigation comprised the following items:

- Utilities clearance exercise undertaken by Midland Survey Ltd;
- Supervision of all works by a Delta-Simons Geo-Environmental engineer. All intrusive locations were logged in general accordance with BS 5930:2015+A1:2020 Code of Practice for Site Investigations;
- Drilling of 5 No. dynamic sampler boreholes (DS101 to DS105) to a maximum depth of 3.00 m bgl;
- Drilling of 2 No. rotary boreholes (BH101 and BH102) to a maximum depth of 25.00 m bgl;
- Falling head tests within borehole hand pits (DS101 and DS105);
- Installation of 2 No. boreholes as groundwater and ground gas monitoring wells (BH101 and DS104); and
- Completion of 3 No. groundwater and ground gas monitoring rounds within installed wells.

### 3.2.2 Rationale

| Location | Rationale | Key Contaminants of Concern |
|---|---|---|
| BH101, BH102, DS101 to DS105 | To provide coverage of all three proposed development options. | Asbestos, heavy metals, Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAHs) |
| BH101 and DS104 | To enable groundwater and ground gas monitoring. | Hazardous ground gas |

## 3.3 Ground Investigation Factual Data

The investigation locations were surveyed in by the appointed surveying contractor to an accuracy of approximately +/- 0.1m. An approximate intrusive location plan is presented as Figure 2.

Delta-Simons engineer verified borehole logs are presented as Appendix B, the SPT Calibration Certificates, in accordance with *BS EN ISO 22476-3:2005 (incorporating corrigendum No. 1 2007), Geotechnical investigation and testing - Field testing - Part 3: Standard penetration test for SPT trip hammers* are provided in Appendix B.

## 3.4 In-Situ Testing and Sampling

SPT tests were undertaken in dynamic sampler boreholes at 1.00 m intervals and 1.50 m intervals within the rotary boreholes. The results of these tests are presented in the borehole logs included as Appendix B.

Sampling comprised disturbed tub and jar samples as detailed on the borehole logs.

## 3.5 Geotechnical Laboratory Testing

A selection of soil samples were submitted to the UKAS accredited laboratory for a range of geotechnical testing, the results of which are included in Appendix C.

The programme of geotechnical testing undertaken on samples obtained from the natural soils is presented within the table below. The purpose of the laboratory testing was to assess the classification properties of the soils encountered in order to inform the outline geotechnical design advice.

| Analysis | No. Tested | Rationale |
|---|---|---|
| Moisture content | 17 | To enable geotechnical assessment of cohesive soils |
| Plastic and liquid limits | 7 | To enable geotechnical assessment of cohesive soils |
| Particle size distribution | 8 | To enable geotechnical assessment of granular soils |
| Remoulded CBR compaction testing | 2 | For preliminary roadway design. |

## 3.6 Environmental Sampling, In-Situ Testing and Laboratory Analysis

Soils collected for laboratory analysis were placed in a variety of containers appropriate to the anticipated testing suite. Samples were stored in accordance with Delta-Simons' quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination. Records of the samples taken as part of the Site investigation works, including their depths and location, are included within the exploratory hole records in Appendix B.

Samples analysed for environmental purposes were placed in chilled cool boxes on site and transported to the laboratory for analysis on completion of the site investigation works/groundwater sampling visit.

The rationale for chemical analysis is presented in the table below and the results of the chemical laboratory testing are included in Appendix D.

| Analytes | No. of Samples Tested | Rationale |
|---|---|---|
| | Soil | |
| Asbestos | 7 | Common potential contaminant - Analysed in all samples of Made Ground. |
| As, Cd, Cu, Cr, Hg, Pb, Ni, Zn, speciated Polycyclic Aromatic Hydrocarbons (PAH) | 10 | Potential contaminants of concern, common to many sites. |
| Total Petroleum Hydrocarbons, Criteria Working Group Method (TPHCWG), Benzene, Toluene, Ethylbenzene and Xylene (BTEX) | 10 | Potential contaminants of concern, common to many sites. |
| pH, sulphate | 12 | To assess potential for chemical attack on buried concrete. |
| Total Organic Carbon (TOC) | 12 | To allow comparison of potentially elevated contaminants against their relevant assessment criteria. |

## 3.7 Monitoring Programme

Three rounds of groundwater level and ground gas monitoring were undertaken between 4th November and 17th November 2020. Measurements of the depth to groundwater within the monitoring wells were taken using an electronic dip meter. The groundwater level monitoring sheets are included as Appendix E.

To characterise the ground gas regime at the site, an infrared gas meter was used to measure gas flow, concentrations of carbon dioxide (CO2), methane (CH4) and oxygen (O2) in percentage by volume. Initial and steady state concentrations were recorded. The atmospheric pressure before and during monitoring, together with the weather conditions, was recorded. All monitoring results obtained to date together with the temporal conditions are contained within Appendix E.

# 4.0 Ground Summary

## 4.1 Introduction

The sections below summarise the ground and groundwater conditions encountered during the site investigation.

## 4.2 Ground Model

A summary of the observed ground conditions at the Site is provided below.

| Summary of Observed Ground Conditions | | | | |
|---|---|---|---|---|
| **Strata** | **Typical Strata Description** | **Depth Range of Strata Base (m)** | **Maximum Proven Thickness (m)** | **Comments** |
| Made Ground | Made Ground was identified in all locations. Concrete/macadam underlain by gravelly sand was identified within BH101, DS102, DS103, DS104 and DS105. Sandy silty topsoil was identified within DS101 and DS105. | *0.25-0.50* | *0.50* | *Geotextile membrane noted at the base of the Made Ground within DS103 and DS104.* |
| Tidal Flat Deposits | Variable very soft sandy gravelly organic clays and silts were identified beneath the Made Ground. Loose to medium dense gravelly sands were identified within BH101 and BH102 between depths of 7.00 m bgl and 15.10 m bgl. | *20.60- 21.00* | *20.75* | *Very low resistance to penetration noted above approximately 12.00 m bgl.* |
| Oxford Clay Formation | Weathered weak grey clayey siltstone and silty mudstone of the Oxford Clay Formation was identified at depth below the Tidal Flat Deposits. | *Not Proven* | *4.40* | - |

## 4.3 Visual and Olfactory Evidence of Contamination - Soils

No visual or olfactory evidence of potential gross contamination was observed during the investigation.

## 4.4 Groundwater

### 4.4.1 Strikes During Investigations

Groundwater strikes recorded as excavation progressed during the Site investigation range from 0.85 to 2.10 m bgl (1.75 to 0.74 m AOD). The groundwater strikes during drilling are summarised below.

| Exploratory Hole | Water strike during drilling (m bgl) | Water strike during drilling (m AOD) | Stratum |
|---|---|---|---|
| BH101 | 2.10 | 0.74 | Tidal Flat Deposits |
| DS101 | 0.85 | 1.75 | Tidal Flat Deposits |
| DS102 | 1.50 | 1.42 | Tidal Flat Deposits |

### 4.4.2 Levels During Monitoring Programme

Groundwater levels were monitored on three occasions between 4th November and 17th November 2020. Monitoring data is provided in Appendix E and summarised in the table below.

| Exploratory Hole | Response Zone | | Water level during monitoring Max to Min Range | | Stratum |
|---|---|---|---|---|---|
| | m bgl | m AOD | m bgl | m AOD. | |
| BH101 | 1.0 - 5.0 | 2.34 - 0.16 | 1.07 - 1.17 | 1.77 – 1.67 | Tidal Flat Deposits |
| DS104 | 0.5 - 3.0 | 1.84 - 2.16 | 0.96 - 1.12 | 1.88 – 1.72 | Tidal Flat Deposits |

## 4.5 Visual and Olfactory Evidence of Contamination - Groundwater

No visual or olfactory evidence of potential gross contamination was observed during the monitoring events.

## 4.6 Material Properties

The table below summarises the factual material properties based upon the results of in-situ and laboratory test data and where appropriate provides derived geotechnical parameters.

| Parameter | Tidal Flat Deposits | Oxford Clay Formation |
|---|---|---|
| Moisture Content - w | 19% - 58% | - |
| Liquid Limit - wL | 28% - 70% | - |
| Plastic Limit - wP | 17% - 31% | - |
| Plasticity Index - IP | 11% - 39% | - |
| Uncorrected SPT N Value | 0 – 43 | 46 - 50 |
| California Bearing Ratio (CBR) | 0.4% - 0.7% | |

## 4.7 Geochemical Testing

Geochemical analysis was undertaken on 12 soil samples collected from the Tidal Flat Deposits and Oxford Clay and tested for selective contaminants (BRE Special Digest 1:2005 (3rd Edition), Concrete in Aggressive Ground, the results of which are summarised in the table below.

| Tests | No. of Tests | Minimum | Maximum |
|---|---|---|---|
| Soil - pH | 12 | 8.5 | 9.9 |
| Soil - Total Sulphur | 12 | 0.018% | 1.06% |
| Soil – Acid Soluble Sulphate | 12 | 0.024% | 0.145% |
| Soil - Water Soluble Sulphate | 12 | 11 mg/L | 607 mg/L |

## 4.8 Ground Gas Data

Gas monitoring results are presented in Appendix E and are summarised in the table overleaf, a total of three rounds of gas monitoring was undertaken between 4th November and 17th November 2020.

Barometric pressures ranged from 1016mB (visit 3) to 1036mB (visit 1).

| Exploratory Hole | Steady Gas Concentration (%v/v) | | | | | | Steady Flow Rate (l/hr) | | Response Zone (m bgl) | | Stratum | Flooded? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Methane | | Carbon Dioxide | | Oxygen | | | | | | | |
| | Min | Max | Min | Max | Min | Max | Min | Max | From | To | | |
| BH101 | <0.1 | 23.1 | 0.4 | 4.7 | 12.3 | 18.9 | <0.1 | <0.1 | 1.0 | 5.0 | Tidal Flat Deposits | Y (Round 1, only) |
| DS104 | <0.1 | <0.1 | 0.7 | 0.9 | 16.6 | 17.3 | <0.1 | <0.1 | 0.5 | 3.0 | Tidal Flat Deposits | N |

# 5.0 Geotechnical Assessment

## 5.1 Summary of Development Proposals

It is understood that the Site is proposed for the development of a two-storey teaching block. There are currently three options/areas under consideration as detailed on the Proposed Development Plan included as Drawing 1. It is understood that Option 1 in the eastern area of the Site is the preferred option at this stage. No additional landscaped areas are proposed.

At the time of writing, structural and floor loadings and final levels were unknown. Consequently, the information provided below should be treated as preliminary and will be subject to review once a scheme and levels have been finalised.

## 5.2 Foundations

### 5.2.1 Spread Foundations

The Made Ground and shallow Tidal Flat Deposits is considered to be too unpredictable, variable, weak and compressible in its existing condition for conventional shallow foundations at the Site.

### 5.2.2 Volume Change Potential

The volume change potential should be considered in any foundation schedule for structures and services located within the influence zone of trees or bushes (proposed, existing or to be removed) and appropriate precautions and/or founding depths should be designed accordingly. In cohesive soils, foundations will therefore need to be designed in accordance with NHBC Standard Chapter 4.2 '*Building Near Trees*'.

The liquid limit and plasticity index results suggest that the Tidal Flat Deposits have a low to moderate volume change potential.

### 5.2.3 Piling

A piled foundation solution using traditional bored or continuous flight auger (CFA) piles transferring loads to competent geology may be suitable for the expected design loads, utilising both skin friction and end bearing capacity.

The precise method of pile installation and applicability of proprietary systems, diameters and depths required would need to be informed based on the results of this investigation, by discussions with a suitable experienced

Normal static and dynamic load testing (including uplift tests) should be considered to achieve satisfactory quality control/assurance in accordance with good practice.

There will be a requirement for the placement of a suitably engineered piling mat, which should be designed and validated by a suitably qualified and experienced engineer.

### 5.2.4 Floor Slabs

Given the identification of very soft clays and silts to depths of approximately 12.00 m bgl a suspended floor slab is likely to be required, transferring loads to foundations.

## 5.3 Roads and Pavements

Laboratory CBR values of between 0.4% and 0.7% have been reported for the Tidal Flat Deposits. CBR is dependent on the condition of the strata and could be different upon excavation to the formation subject to seasonal conditions. Clay soils are likely to be frost susceptible.

The use of a geotextile is recommended where variable ground conditions are encountered or across changes in strata to protect against potential differential settlement.

## 5.4 Drainage and Soakage Tests

Falling head tests were carried out at two locations (DS101 and DS105) on 27th November 2020. The results are presented in Appendix E and are summarised in the table below.

| Exploratory Hole | Response Stratum | Permeability (m/s) |
|---|---|---|
| DS101 | Tidal Flat Deposits | $5.9 \times 10^{-7}$ |
| DS105 | Tidal Flat Deposits | $3.5 \times 10^{-7}$ |

Surface water drainage to land is unlikely to be feasible given the shallow groundwater and variable cohesive natural materials and the calculated poor permeabilities.

Alternatives such as discharge to an existing facility should be investigated.

## 5.5 Excavations & Obstructions

It is expected that conventional mechanical excavators will readily remove the Made Ground and Tidal Flat Deposits likely to be encountered in shallow excavations although a breaker may be required to remove any existing concrete hardstanding.

All shallow foundation or services excavations at the Site should be considered unstable, therefore, temporary support of all excavations should be considered when excavating on-Site.

## 5.6 Groundwater

Groundwater was identified during intrusive works between depths of 0.85 m bgl and 2.10 m bgl and between 0.96 m bgl and 1.17 m bgl during return monitoring.

Measures to deal with ingress of water are likely to be required in excavations below standing groundwater level or should the excavation be left open for a period of time.

## 5.7 Chemical Attack on Buried Concrete

Water soluble sulphate concentrations were found to be generally low across the Site, however elevated total potential sulphate was recorded, as such given the likely piled foundation solution the Site can be classified as Design Sulphate Class DS-4 and Aggressive Chemical Environment for Concrete AC-4.

# 6.0 Generic Quantitative Risk Assessment

## 6.1 Introduction

The presence of hazardous substances in or on a site is generally only of concern if an actual or potential unacceptable risk exists. Legislation and guidance on the assessment of contaminated sites, consistent with UK best practice, acknowledges the need for a tiered risk-based approach. A Preliminary Risk Assessment is presented in Section 2.1. This section represents a Generic Quantitative Risk Assessment (GQRA) being a comparison of site contaminant levels against Generic Assessment Criteria.

## 6.2 Human Health GQRA

The assessment of risks in relation to human health has been undertaken using Generic Assessment Criteria (GAC) as detailed within the appropriate tables. Risks from soils have been considered. The GAC are predominantly based on long term (chronic) risk to health. However, in the limited circumstances where short-term (acute) risks are more pronounced, these GAC have been utilised to ensure a thorough and conservative initial assessment is undertaken.

The end use scenario adopted for the assessment is a residential without plant uptake end use, considered appropriately conservative based on the proposed educational end-use.

### 6.2.1 Risks from Soil Sources

Based on the proposed use of the Site, the soil chemical data has been compared against a residential without plant uptake end use GAC for 1% soil organic matter (SOM) content.

The laboratory results for contaminants exceeding detection limit compared to their respective GAC are presented in the table below.

The primary exposure pathways considered in the risk assessment are as follows:

- Ingestion of soil and indoor dust and/or oral background exposure;
- Inhalation of dust (background and indoor);
- Direct dermal contact; and
- Inhalation of vapour (background and indoor).

| Contaminant | No. Samples | Max Conc. (mg/kg) | GAC (mg/kg) | GAC Source | No. Exceed GAC | Volatile | Location of Exceedances (depth) = Concentration (mg/kg) | Area of Site of Exceedance |
|---|---|---|---|---|---|---|---|---|
| Asbestos | 7 | Not Detected | Detected | DS | 0 | N | - | - |
| ***Metals and metalloids (only those above laboratory detection limit)*** | | | | | | | | |
| Arsenic | 12 | 18 | 40 | LQM | 0 | N | - | - |
| Cadmium | | 0.6 | 85 | LQM | | N | | |
| Chromium III | | 28 | 910 | LQM | | N | | |
| Copper | | 24 | 7,100 | LQM | | N | | |
| Lead | | 45 | 310 | C4SL | | N | | |
| Nickel | | 23 | 180 | LQM | | N | | |
| Zinc | | 98 | 40,000 | LQM | | N | | |
| ***Polyaromatic Hydrocarbons (only those above laboratory detection limit)*** | | | | | | | | |
| Acenaphthene | 12 | 0.69 | 3,000 | LQM | 0 | Y | - | - |
| Fluorene | | 0.65 | 2,800 | LQM | | Y | | |
| Phenanthrene | | 6.2 | 1,300 | LQM | | N | | |
| Anthracene | | 1.4 | 31,000 | LQM | | N | | |
| Fluoranthene | | 9.6 | 1,500 | LQM | | N | | |
| Pyrene | | 8.44 | 3,700 | LQM | | N | | |
| Benzo[a]anthracene | | 4.2 | 11 | LQM | | N | | |
| Chrysene | | 3.5 | 30 | LQM | | N | | |
| Benzo[b]fluoranthene | | 6.2 | 3.9 | LQM | 1 | N | BH101(0.4-0.45) = 6.2 | Central (Option 1) |
| Benzo[k]fluoranthene | | 1.5 | 110 | LQM | 0 | N | - | - |
| Benzo[a]pyrene | | 4.0 | 3.2 | LQM | 1 | N | BH101(0.4-0.45) = 4.0 | Central (Option 1) |
| Indeno(1,2,3-c,d)pyrene | | 1.5 | 45 | LQM | 0 | N | - | - |
| Dibenz(a,h)anthracene | | 0.42 | 0.31 | LQM | 1 | N | BH101(0.4-0.45) = 0.42 | Central (Option 1) |
| Benzo[g,h,i]perylene | | 1.7 | 360 | LQM | 0 | N | - | - |

| Contaminant | No. Samples | Max Conc. (mg/kg) | GAC (mg/kg) | GAC Source | No. Exceed GAC | Volatile | Location of Exceedances (depth) = Concentration (mg/kg) | Area of Site of Exceedance |
|---|---|---|---|---|---|---|---|---|
| ***Petroleum Hydrocarbons (only those above laboratory detection limit)*** | | | | | | | | |
| Aliphatic TPH >C21-C35 | 12 | 370 | 65,000 | LQM | 0 | N | - | - |
| Aliphatic TPH >C35-C40 | | 240 | 65,000 | LQM | | N | | |
| Aromatic TPH >C12-C16 | | 14 | 1,800 | LQM | | Y | | |
| Aromatic TPH >C16-C21 | | 100 | 1,900 | LQM | | N | | |
| Aromatic TPH >C21-C35 | | 670 | 1,900 | LQM | | N | | |
| Aromatic TPH >C35-C40 | | 320 | 1,900 | LQM | | N | | |
| Total Petroleum Hydrocarbons | | 2,780 | 5,000 | DS | | Y | | |

Notes: Shaded = Maximum concentration exceeds GAC
C4SL = Category 4 Screening Levels (C4SLs) published by DEFRA.
DS = In-house GAC derived by Delta-Simons Environmental Consultants Ltd, 2018.
LQM = Land Quality Management/CIEH S4ULs for Human Health Risk Assessment, 2014.

Heavy metals and TPH have been identified above the laboratory detection limit, however, are not above the applied GAC for a residential without plant uptake end use.

Benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene have been identified above the stringent guidance values within a single sample from BH101 at 0.4-0.45 m bgl. Given this area will be below the proposed building (or be retained in its current use beneath a concrete slab) the risk to current/future Site users encountering contamination is considered very low. Furthermore, the identified concentrations are not considered to be volatile.

Asbestos has not been identified within the samples tested.

The soil analysis results are considered further in the Conceptual Site Model (CSM) presented in Section 8.0 with regard to potential contaminant linkages.

## 6.3 Built Environment

### 6.3.1 Potable Water Supply Pipes

The investigation requirements for the selection of potable water pipe material are set out in UKWIR Report 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (UKWIR, 2010). This report has very specific and onerous investigation requirements and as such the detailed investigation of each utility route was not within the scope of this investigation.

However, given the presence of organic contamination at the Site, it is considered prudent to consider the use of barrier pipe materials.

It should be noted that at the time of this investigation the future routes of water supply pipes had not been established, hence the investigation and sampling strategy is not likely to be considered fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling/analytical strategy may be required at a later date once the route(s) of the supply pipe(s) are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

### 6.3.2 Building Materials

Risks to building materials associated with aggressive ground conditions is addressed in Section 5.7.

## 6.4 Waste Classification

This investigation was not undertaken to classify materials in terms of waste disposal. Where waste disposal is proposed then a specific and detailed investigation in accordance with Environment Agency Guidance WM3 would typically be required.

Should soils be required to be disposed of from Site, the results of the chemical analysis should be forwarded to the proposed receiving facility who will determine whether they will accept the waste from Site. Further investigation in addition to specific waste acceptance criteria (WAC) analysis may be required.

Considering the nature of the materials encountered, more cost efficient and sustainable methods of removing the material should be considered prior to disposal at landfill (e.g. registering with the CL:AIRE Register of Materials) in an attempt to find a site with a requirement for import of materials.

# 7.0 Bulk Ground Gas Risk Assessment

## 7.1 Ground Gas Conceptual Site Model

### 7.1.1 Sources

The Site has historically been in agricultural use prior to forming part of the wider school including the construction and demolition of buildings in the Option 1 and Option 2 areas. The Made Ground was noted to be limited in thickness (maximum 0.50 m bgl) comprising of gravelly sand with brick, concrete and macadam. Given the limited thickness and the low volume of visible putrescible material the Made Ground is not considered a potential source of ground gas.

Organic material was identified within the underlying clays and silts and organic content between 0.4% and 2.8%.

Off-Site potential sources of ground gas include an infilled swimming pool, pond and land drain.

There are no LA, EA or historical landfills within 500 m of the Site.

### 7.1.2 Receptors

The principal receptors under consideration are future occupants. Other receptors include adjacent Site occupiers and future maintenance/construction workers.

### 7.1.3 Pathways

The underlying geology is likely to be of variable permeability with respect to ground gases. The Made Ground is heterogeneous and likely to allow preferential migration locally. The underlying Tidal Flat Deposits are predominantly clay and silts and likely to limit vertical migration from below and also lateral migration.

Based on the above, migration from off-site sources is considered unlikely due to the presence of cohesive Tidal Flat Deposits.

The most significant pathways with respect to future Site users relates to the potential for gases to enter future buildings. At present, no gas protection measures are assumed. Consequently, ingress into dwellings may be possible through voids in the floor including service entry points and cracks.

Future maintenance/construction workers may come into contact with hazardous ground gases via entry into below ground confined spaces such as excavations or service entries/inspection points.

## 7.2 Duration & Extent of Monitoring

Gas monitoring has been undertaken on three occasions between 4th November and 17th November 2020.

Barometric pressures ranged from 1016mB (visit 3) to 1036mB (visit 1).

## 7.3 Ground Gas Risk Assessment

### 7.3.1 Background

Based on the proposed end use as an educational facility, the following documents have been consulted when assessing the gas regime at the site:

- British Standards Institute (BSI, 2015): Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, BS:8485.

The presence of a source of hazardous gas within the ground does not necessarily indicate a risk will be present. Consideration of recorded gas flows together with source concentrations can allow an initial assessment to be made of the potential both for generation and subsequent migration of gas. A Characteristic Situation (CS) is derived from an assessment of the ground gas data and forms the basis of determining mitigation measures.

### 7.3.2 Gas Screening Value (GSV)

The Gas Screening Value (gas concentration as a fraction x maximum recorded steady flow) is used to provide an initial assessment of risks to future site users. The GSVs calculated for the monitoring wells are presented in the following table.

| Location | Maximum Methane (%v/v) | Maximum Carbon Dioxide (%v/v) | Maximum Flow Rate (l/hr) | GSV/Characteristic Situation | | | | Flooded well (Frequency) |
|---|---|---|---|---|---|---|---|---|
| | | | | Methane | | Carbon Dioxide | | |
| | | | | GSV | CS | GSV | CS | |
| BH101 | 23.1 | 4.7 | <0.1 | 0.0231 | CS1 | 0.0047 | CS1 | Y (1/3) |
| DS104 | <0.1 | 0.9 | <0.1 | | | | | N |

In accordance with BSI guidance, and using maximum recorded parameters and the calculated GSV's the proposed development can be classified as a Characteristic Situation (CS2). This is entirely due to the maximum methane concentration having exceeded 1%v/v within BH101 on two of the three monitoring events. It is noted BH101 is located in the area of Option 1. Maximum steady flow rates have been used as part of this assessment given the elevated initial peak flow within BH101 during monitoring rounds 1 and 2 which subsequently fell to <0.1 within 5 seconds and is considered to relate to fluctuations in groundwater levels between monitoring events and associated pressure build up with the monitoring well, which quickly dissipated one opening the gas tap.

## 7.4 Ground Gas Risk Mitigation

The ground gas regime at the Site has been classified as a Characteristic Situation 2 (CS2), where ground gas protection measures are required.

BS:8485 provides a scoring system to determine the appropriate protection measures for a proposed development in accordance with the identified ground gas regime. Table 3 of BS:8485 summarises typical UK building types, which for this development will comprise Type B (public). Table 4 details the points required for the Characteristic Situation, which for CS2 is 3.5. This can be achieved by a combination of the following:

- Structural barriers (Table 5)
- Ventilation (Table 6)
- Gas Membrane (Table 7)

The above should be considered in conjunction with the proposed foundation/floorslab design to achieve the minimum score required within BS:8485.

The above assessment relates solely to future occupants. Given the nature of the ground gas regime at the Site, no further works are considered necessary to protect 3rd parties/surrounding occupiers. Entry to excavations/confined spaces should be restricted to personnel with relevant Confined Spaces training and with prior conformation of atmospheric conditions.

## 7.5 Radon

The Site is in a low probability radon area, as less than 1% of homes are above the action level, and where no radon protection measures are required.

# 8.0 Revised Conceptual Site Model

A revised CSM is presented in the table below, and has been formulated taking into account all of the available data from the Delta-Simons intrusive investigation, suitable for a Site with a proposed educational facility.

| Revised Conceptual Site Model | | | | |
|---|---|---|---|---|
| **Source** | **Pathways** | **Receptor** | **Matrix Assessment** | **Mitigation** |
| Marginally elevated concentration of PAHs within BH101 at 0.4-0.45 m bgl.<br>Potential 'Hotspots' of contamination in areas not directly investigated (beneath current building footprints). | Direct contact/ingestion and inhalation of dust and vapours. | Future Site users.<br>Construction/ground workers. | **Low Risk** | Three marginally elevated concentrations of individual PAH compounds have been identified from a single sample at 0.40-0.45 m bgl within BH101. Given this area will be located beneath the proposed building or be retained beneath the existing concrete slab, the risk to future Site users is considered very low. No volatile vapours have been identified.<br>Should areas of landscaping be proposed a clean certified layer of suitable for use topsoil will be required.<br>Any short-term risk would be mitigated by use of PPE and provision of suitable welfare facilities.<br>A "hotspot protocol" should also be in place for the duration of the developments works to help address any suspected contamination identified during groundworks. |
| | Vertical migration of contaminants into groundwater.<br>Lateral migration of contaminants into surface waters. | Controlled Waters. | **Very Low Risk** | As the proposed land use is likely to be predominantly covered in hardstanding, the risk of low level contaminants within the shallow soils migrating into surface and controlled waters is considered very low. The Site is not located in a SPZ. |
| | Uptake via root system. | Plants in landscaped areas. | **Low Risk** | Should landscaping be proposed a clean certified layer of suitable for use topsoil will be required. |
| | Vertical and lateral migration of contaminants | Drinking water supply pipes. | **Low Risk** | Hydrocarbons, especially aromatics and chlorinated solvents, are known to permeate plastic pipes. Low detectable concentrations of hydrocarbons have been identified in the soil and groundwater at the Site, as such, the risk to drinking water supply pipes is low. |

| | | | | |
|---|---|---|---|---|
| | and degradation of pipework. | | | Confirmation should be sought from the local Water Company regarding the requirement for upgraded water supply pipes. |
| Hazardous ground gas. | Vertical and lateral migration of ground gas. | Future Site users. | **Low to Moderate Risk** | Following three rounds of ground gas monitoring elevated methane concentrations have been recorded at a maximum of 23.1%v/v within BH101. Carbon dioxide has been recorded as a maximum concentration of 4.7%v/v and low steady flow rates have been recorded. As such the Site has been classified as a Characteristic Situation 2 (CS2), where ground gas protection measures are required. |

# 9.0 Conclusions & Recommendations

## 9.1 Geotechnical Summary

The Made Ground and shallow Tidal Flat Deposits is considered to be too unpredictable, variable, weak and compressible in its existing condition for conventional shallow foundations at the Site.

A piled foundation solution using traditional bored or continuous flight auger (CFA) piles transferring loads to competent geology may be suitable for the expected design loads, utilising both skin friction and end bearing capacity.

The precise method of pile installation and applicability of proprietary systems, diameters and depths required would need to be informed based on the results of this investigation, by discussions with a suitable experienced

Normal static and dynamic load testing (including uplift tests) should be considered to achieve satisfactory quality control/assurance in accordance with good practice.

There will be a requirement for the placement of a suitably engineered piling mat, which should be designed and validated by a suitably qualified and experienced engineer.

Given the identification of very soft clays and silts to depths of approximately 12.00 m bgl a suspended floor slab is likely to be required, transferring loads to foundations.

Surface water drainage to land is unlikely to be feasible given the shallow groundwater and variable cohesive natural materials and the calculated poor permeabilities ($3.5x10^{-7}$ m/s and $5.9x10^{-7}$ m/s)

Alternatives such as discharge to an existing facility should be investigated.

Water soluble sulphate concentrations were found to be generally low across the Site, however elevated total potential sulphate was recorded, as such given the likely piled foundation solution the Site can be classified as Design Sulphate Class DS-4 and Aggressive Chemical Environment for Concrete AC-4.

## 9.2 Contamination Issues

The investigation has been carried out in order to provide information on the quality of the soil beneath the Site in the context of land contamination and provide information on the ground gas regime beneath the Site for the proposed educational facility end use. The assessment is being completed prior to the proposed redevelopment of the Site.

### 9.2.1 Human Health

Heavy metals and TPHs have been identified above the laboratory detection limit, however, are below the applied residential without plant uptake end use. Benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene have been identified above the stringent guidance values within a single sample from BH101 at 0.4-0.45 m bgl. Given this area will be underneath the proposed building (or be retained in its current use beneath a concrete slab) the risk to current/future Site users coming into contact with the contamination is considered very low.

Should areas of landscaping be proposed a clean certified layer of suitable for use topsoil will be required.

Although no asbestos containing materials (ACM) were identified in the samples analysed, ACM may be present within Made Ground.

Groundworkers and sub-surface maintenance workers should be made aware of the possibility of encountering contaminated soils through toolbox talks and an appropriate protocol to mitigate exposure of the workforce and general public should be in place. The Contractor will need to prepare a risk assessment which identifies a safe system of work to handle the asbestos containing soils which is likely to include asbestos awareness training, a protocol for unexpected finds (should gross asbestos material be identified) as well as safe working procedures such as damping down of excavations and stockpiles in line with general dust generation mitigation. The risk assessment will need to identify the appropriate levels of PPE and/or RPE required. This recommendation should be captured in Site health and safety documentation and in maintenance plans.

Following three rounds of ground gas monitoring elevated methane concentrations have been recorded at a maximum of 23.1%v/v within BH101. Carbon dioxide has been recorded as a maximum concentration of 4.7%v/v and low steady flow rates have been recorded. As such the Site has been classified as a Characteristic Situation 2 (CS2), where ground gas protection measures are required.

### 9.2.2 Controlled Waters

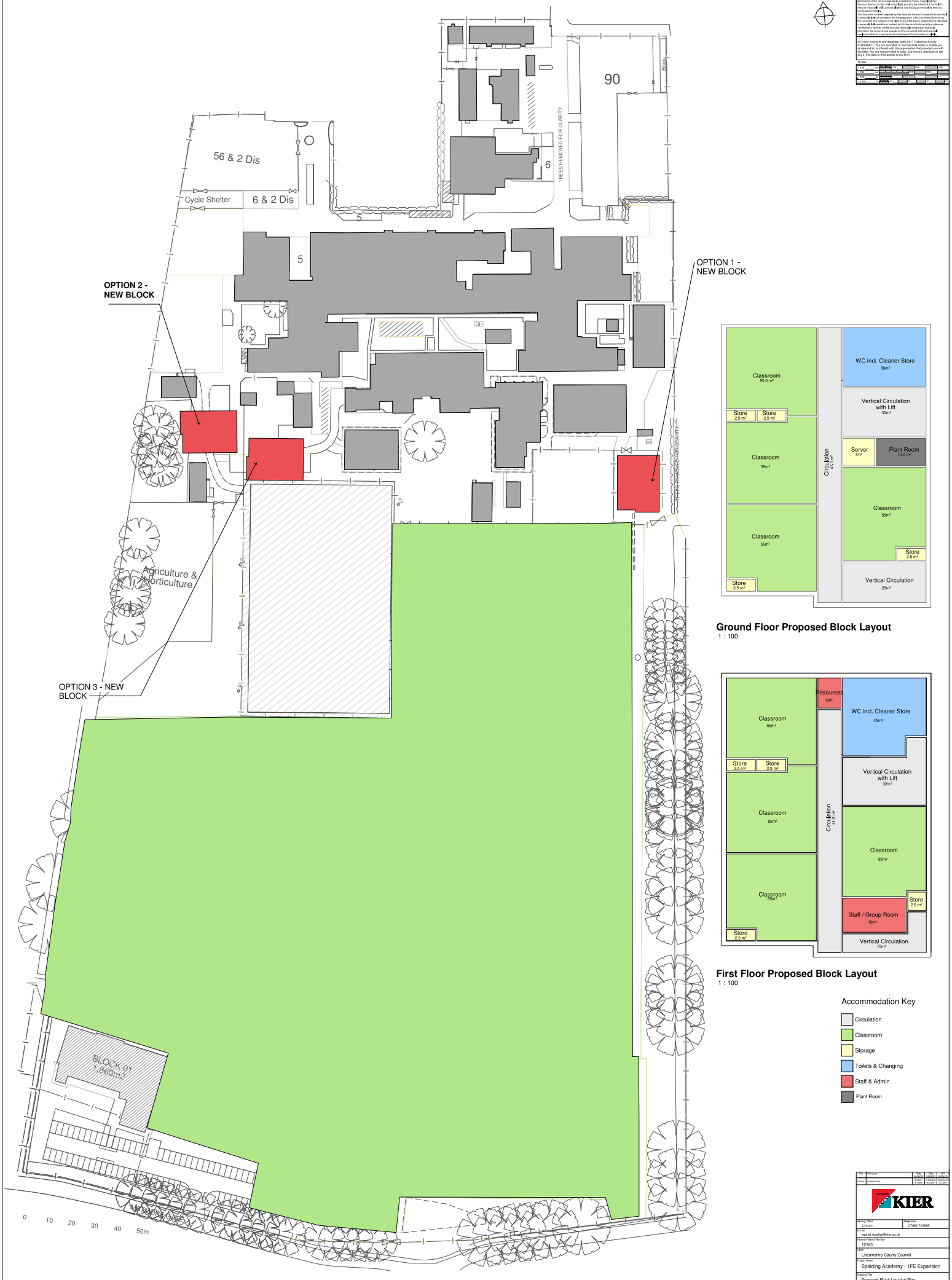
As the proposed land use is likely to be predominantly covered in hardstanding, the risk of pollutants within the shallow soils migrating into surface waters and controlled waters is considered very low. Additionally, the underlying cohesive Tidal Flat Deposits will limit migration, therefore, it is considered that no further action is required.

## 9.3 Recommendations for Supplementary Work

Based on the findings of this report, the following recommendations for supplementary works are as follows;

- Waste classification has not been undertaken as part of the scope of works, should it be proposed to dispose of materials from the Site then specific additional investigations may be needed to classify the materials in accordance with current regulatory requirements. Specific testing for the presence of coal tar may be required in the Option 2 and 3 areas to inform on waste disposal;
- Prior to redevelopment, a Remediation Method Statement (RMS) should be produced, detailing the remedial requirements for the Site;
- Should any topsoil be imported to the Site as part of proposed landscaping works, this should be tested to confirm it is suitable for use within the proposed development. Depths of topsoil for each area should be agreed within the RMS;
- Ground gas protection measures are required as the Site has been classified as a Characteristic Situation 2 (CS2), full details should be provided within the RMS;
- Additional, unidentified localised areas of contamination may exist at the Site and an appropriate 'hotspot' protocol should be in place for groundworkers to act upon should such contamination be identified during the construction process;
- As with all brownfield development sites, groundworkers who are required to perform sub-surface work at the Site should be made aware of the known contaminants in soil and groundwater and the possibility of encountering additional localised low levels of contamination. Therefore, good standards of personal hygiene should be observed, and appropriate levels of PPE utilised where necessary;
- Confirmation should be sought from the Local Water Authority as to whether they will require upgraded pipework to be installed for new service installations.
- Prior to occupation of the development, a Remediation Verification Report will be required to satisfy the Local Planning Authority that all required remedial measures have been implemented.

# Drawing 1 – Proposed Development Plan




**Proposed Options Site Block Plan**
1 : 500




**Ground Floor Proposed Block Layout**
1 : 100




**First Floor Proposed Block Layout**
1 : 100

**Accommodation Key**

- Circulation
- Classroom
- Storage
- Toilets & Changing
- Staff & Admin
- Plant Room

NOTES
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Scales:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1:1250 | A4 | | | 1:200 | A4 | | |
| 1:500 | A4 | | | 1:100 | A4 | | |
| 1:500 | A3 | | | 1:50 | A3 | | |
| 1:1000 | A3 | | | 1:50 | A1 | | |

| P01 | First Issue | Rob Mosley 24/09/20 | Ben Mosley 24/09/20 |
|---|---|---|---|
| Revision | Amendment | Drawn & Date | Checked & Date | Approved & Date |

KIER

| | |
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| Issuing Office: Lincoln | Telephone: 07892 702655 |
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| Kiers Project Number: 12345 | |
| Client: Lincolnshire County Council | |
| Project Name: Spalding Academy - 1FE Expansion | |
| Drawing Title: Proposed Block Location Plan | |

| Scale | Original Size | RIBA 3/11 Stage | |
|---|---|---|---|
| As indicated | A0 | Stage 0 | |
| Date | Drawn | Checked | Approved |
| 24/09/20 | RMa | RMo | NR |
| Drawing Number | | | Status |
| XXXXX-DBS-XX-XX-DR-A-SK002 | | | S0 |
| Project Code | Originator | Volume | Level | Type | Number | | Revision P01 |

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# Figure 1 – Site Location Map




Scale: 1 / 500,000 @ A4

LEGEND

Site Boundary

N

CHESTNUT AVENUE
HALMER PADDOCK
LBERT STREET
CULPINS CL
JUNIPER CRESCENT
MAPLE GROVE
FIELDS AVENUE
LOW ROAD
AVEBURY GARDENS
NEVILLE AVENUE
INGLEBY CT
RANTON CT
HALMER GATE
HALMER GARDENS
CLEVELAND CL
KIRBY CT
HELMSLEY WAY
EXETER DRIVE
GRANGE DR
Education Facility
River Welland
BIRCH GROVE
Education Facility
MATMORE GATE
MULBERRY WY
FINLAY CL
THORNTON ROAD
MATMORE CLOSE
CAMERON DR
BOWDITCH ROAD
MORUS CL
WOODFIELD CLOSE
HEATHFIELD AVENUE
PO

Scale: 1 / 5,000 @ A4

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deltasimons
Environment - Health & Safety - Sustainability

TITLE:
Site Location Map
Spalding Academy
Spalding

| | |
|---|---|
| DRAWN BY: JR | SCALE: To Scale@A4 |
| CHECKED BY: PH | REVISION: 1 |
| DATE: 20th October 2020 | |

PROJECT NO: 20-1718

FIGURE NO: 1

# Figure 2 – Approximate Intrusive Location Plan




deltasimons
Environment - Health & Safety - Sustainability

TITLE:
Approximate Intrusive Location Pan
Spalding Academy
Spalding

| | | | |
|---|---|---|---|
| DRAWN BY: JR | SCALE: Not to Scale | PROJECT NO: 20-1718.01 |
| CHECKED BY: PH | REVISION: 1 | FIGURE NO: 2 |
| DATE: 29th October 2020 | | |

# Appendix A – Limitations

# Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Due to the evolving regulatory climate specific to Per Fluoro Alkyl Substances (PFAS), the scope of works is not intended to be conclusive as it relates to the identification of any PFAS related issues. While Delta-Simons may advise its Client if Delta-Simons becomes aware of the use of PFAS at the subject property, Delta-Simons makes no representation nor accepts any liability that any or all PFAS issues have been identified and/or revealed to its client through its scope of work, as presented herein.

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# Appendix B – Borehole Logs

# KEY TO BOREHOLE AND TRIAL PIT LOGS

## MATERIAL LEGENDS

| | | | | | |
|---|---|---|---|---|---|
| | Topsoil | | Made Ground | | Bituminous Material |
| | Concrete | | Clay | | Silt |
| | Sand | | Gravel | | Peat |
| | Cobbles | | Boulders | | Mudstone |
| | Siltstone | | Sandstone | | Limestone |
| | Chalk | | Coal | | Breccia |
| | Conglomerate | | Igneous | | Metamorphic |
| | Pyroclastic (volcanic ash) | | Gypsum | | Shale |
| | Ironstone | | Bedrock (Unidentified) | | Void |

## INSTALLATION/BACKFILL LEGENDS

| | | | | | |
|---|---|---|---|---|---|
| | Sand | | Gravel | | Bentonite/Grout |
| | Arisings | | Concrete | | Plain Pipe |
| | Slotted Pipe | | | | |

*Legend symbols in general accordance with BS 5930:1999+A2:2010 and standard industry practice.*


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# KEY TO BOREHOLE AND TRIAL PIT LOGS

## SAMPLE TYPES

| | |
|---|---|
| **ACM** | Asbestos Containing Material Sample |
| **B** | Bulk Disturbed Sample |
| **BLK** | Block Sample |
| **C** | Core Sample |
| **CBR** | Undisturbed Sample for California Bearing Ratio Test – 154mm diameter |
| **D** | Disturbed Sample - Tub |
| **ES** | Soil Sample for Environmental Testing |
| **EW** | Water Sample for Environmental Testing |
| **G** | Gas Sample |
| **U** | Undisturbed Driven Tube Sample – 70/102mm diameter, 450mm long |
| **W** | Water Sample |

## TEST TYPES

| | |
|---|---|
| **CPT** | Cone Penetrometer Test ($kN/m^2$) |
| **FID** | Flame Ionisation Detector Test (ppm) |
| **HV** | In-Situ Hand Sheer Vane Test ($kN/m^2$) |
| **PID** | Photoionisation Detector Test (ppm) |
| **SPT (S)** | Standard Penetration Test – Split Spoon Sampler |
| **SPT (C)** | Standard Penetration Test – Solid 60 Degree Cone |

## CORE DETAILS

| | |
|---|---|
| **If** | Fracture Spacing (mm) – Minimum, Average, Maximum |
| **NI** | Non-Intact where >25 fracture spacings per metre |
| **TCR** | Total Core Recovery (%) |
| **SCR** | Solid Core Recovery (%) |
| **RQD** | Rock Quality Designation (%) |
| **AF** | Air Flush Return (%) |
| **WF** | Water Flush Return (%) |

## WATER COLUMN DETAILS

| | |
|---|---|
|  | Water Strike |
|  | Water Level |


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Environment - Health & Safety - Sustainability

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Project No: 20-1718.01 | Hole ID: BH101 | Page: 1 of 3

Project: Spalding Academy

# Rotary Auger Borehole Log

Date: 26/10/2020 - 27/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water Strike | Sample Depth (m) | Sample Type | Sample Ref | Test Depth (m) | Test Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Concrete. | | 0.13 | 2.71 | | | | | | | | |
| MADE GROUND: Light yellowish brown gravelly fine to coarse SAND. Gravel is sub-rounded fine to coarse limestone. | | 0.25 | 2.59 | | | 0.20 - 0.25 | ES | | | | |
| | | | | | | 0.40 - 0.45 | ES | | | | |
| Very soft grey slightly sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to medium flint. Occasional organic material. (TIDAL FLAT DEPOSITS) | | | | | | 1.20 - 1.65 | D | | 1.20 | SPT(S) N=0 (1,0/0,0,0,0) | |
| | | | | | 2.10 ▼ | | | | | | |
| | | | | | | 2.50 - 2.70 | B | | | | |
| | | | | | | 3.20 - 3.65 | D | | 3.20 | SPT(S) N=4 (1,1/1,1,1,1) | |
| | | | | | | 3.50 - 3.55 | D | | | | |
| | | 4.25 | -1.41 | | | | | | | | |
| Very soft dark grey to black organic CLAY. (TIDAL FLAT DEPOSITS) | | 4.50 | -1.66 | | | 4.50 - 4.95 | D | | 4.50 | SPT(S) N=2 (1,0/0,1,1,0) | |
| Very soft grey slightly sandy gravelly silty CLAY. Sand is fine. Gravel is sub-angular fine to medium flint. Occasional orgnaic material. (TIDAL FLAT DEPOSITS) | | | | | | 5.00 - 5.50 | B | | | | |
| | | | | | | 5.30 - 5.35 | D | | | | |
| | | | | | | 5.50 - 5.55 | D | | | | |
| | | 5.80 | -2.96 | | | 5.85 - 5.90 | D | | 6.00 | SPT(S) N=0 (1,0/0,0,0,0) | |
| Very soft dark grey to black slightly gravelly organic sandy CLAY.Gravel is sub-angular fine to medium flint. Sand is fine to coarse. (TIDAL FLAT DEPOSITS) | | | | | | 6.00 - 6.45 | D | | | | |
| | | | | | | 7.50 - 7.95 | D | | 7.50 | SPT(S) N=0 (1,0/0,0,0,0) | |
| | | | | | | 8.00 - 8.50 | B | | | | |
| | | | | | | 9.00 - 9.45 | D | | 9.00 | SPT(S) N=3 (1,0/1,1,0,1) | |
| | | | | | | 10.00 - 10.50 | B | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Groundwater encountered at 2.10 m bgl.4. Installed with a 63 mm HDPE standpipe to 5.00 m bgl.

**Water Level Observations**

| Date | Time | Strike | Duration | Standing | Chiselling Depth (m) | Chiselling Time (h:m) |
|---|---|---|---|---|---|---|
| 26/10/2020 | | 2.10 m | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale (m): |
|---|---|---|---|---|---|---|---|
| E525734.34 N322485.21 | 2.84 | Delta Drilling | Comacchio GEO 300 | SW | JR | PH | 1:52 |

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Project No: 20-1718.01 | Hole ID: BH101 | Page: 2 of 3

Project: Spalding Academy

# Rotary Auger Borehole Log

Date: 26/10/2020 - 27/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water Strike | Sample Details: Depth (m) | Sample Details: Type | Sample Details: Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Very soft dark grey to black slightly gravelly organic sandy CLAY.Gravel is sub-angular fine to medium flint. Sand is fine to coarse. (TIDAL FLAT DEPOSITS) | | | | | | 10.50 - 10.95 | D | | 10.50 | SPT(S) N=8 (1,3/2,2,2,2) | |
| | | 11.00 | -8.16 | | | | | | | | |
| Loose brown gravelly fine to medium SAND. Gravel is rounded fine flint. (TIDAL FLAT DEPOSITS) | | | | | | 12.00 - 12.45 | D | | 12.00 | SPT(S) N=8 (1,1/2,2,2,2) | |
| | | | | | | | | | 13.50 | SPT(S) N=17 (2,3/4,4,5,4) | |
| | | 15.10 | -12.26 | | | 15.00 - 15.45 | D | | 15.00 | SPT(S) N=15 (2,3/4,3,4,4) | |
| Stiff grey slightly gravelly sandy very clayey SILT. Gravel is rounded fine chalk. Sand is fine to coarse. Rare sub-angular cobbles of mixed lithologies. (TIDAL FLAT DEPOSITS) | | | | | | 15.10 - 15.60 | B | | | | |
| | | | | | | 16.50 - 16.95 | D | | 16.50 | SPT(S) N=29 (2,3/4,4,8,13) | |
| | | | | | | 18.00 - 18.45 | D | | 18.00 | SPT(S) N=41 (3,5/6,9,10,16) | |
| | | | | | | 18.00 - 18.50 | B | | | | |
| | | | | | | 19.00 - 19.45 | D | | 19.00 | SPT(S) N=43 (5,10/10,11,10,12) | |
| | | | | | | 20.00 - 20.50 | B | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Groundwater encountered at 2.10 m bgl.4. Installed with a 63 mm HDPE standpipe to 5.00 m bgl.

**Water Level Observations**

| Date | Time | Strike | Duration | Standing | Chiselling: Depth (m) | Chiselling: Time (h:m) |
|---|---|---|---|---|---|---|
| 26/10/2020 | | 2.10 m | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale (m): |
|---|---|---|---|---|---|---|---|
| E525734.34 N322485.21 | 2.84 | Delta Drilling | Comacchio GEO 300 | SW | JR | PH | 1:52 |

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Project No: 20-1718.01 | Hole ID: BH101 | Page: 3 of 3

Project: Spalding Academy

# Rotary Auger Borehole Log

Date: 26/10/2020 - 27/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water Strike | Sample Details: Depth (m) | Sample Details: Type | Sample Details: Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stiff grey slightly gravelly sandy very clayey SILT. Gravel is rounded fine chalk. Sand is fine to coarse. Rare sub-angular cobbles of mixed lithologies. (TIDAL FLAT DEPOSITS) | | 21.00 | -18.16 | | | | | | | | |
| Weak grey very silty MUDSTONE/ very clayey SILTSTONE. (OXFORD CLAY FORMATION) | | | | | | 21.00 - 21.50 | B | | | | |
| | | | | | | 21.50 - 21.91 | D | | 21.50 | SPT(S) N=50 (9,12/50 for 255mm) | |
| | | | | | | 23.00 - 23.44 | D | | 23.00 | SPT(S) N=50 (8,12/50 for 285mm) | |
| | | | | | | 24.50 - 25.00 | B | | | | |
| | | 25.00 | -22.16 | 219 | | 25.00 - 25.39 | D | | 25.00 | SPT(S) N=50 (10,12/50 for 235mm) | |
| Borehole complete at 25.00m bgl. | | | | | | | | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Groundwater encountered at 2.10 m bgl.4. Installed with a 63 mm HDPE standpipe to 5.00 m bgl.

Water Level Observations

| Date | Time | Strike | Duration | Standing | Chiselling: Depth (m) | Chiselling: Time (h:m) |
|---|---|---|---|---|---|---|
| 26/10/2020 | | 2.10 m | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale (m): |
|---|---|---|---|---|---|---|---|
| E525734.34 N322485.21 | 2.84 | Delta Drilling | Comacchio GEO 300 | SW | JR | PH | 1:52 |

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Project No: 20-1718.01 | Hole ID: BH102 | Page: 1 of 3

Project: Spalding Academy

# Rotary Auger Borehole Log

Date: 28/10/2020 - 29/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water Strike | Sample Details: Depth (m) | Sample Details: Type | Sample Details: Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Dark brown sandy gravelly SILT. Sand is fine to medium. Gravel is sub-angular fine to coarse limestone and concrete. Rare concrete cobbles. | | 0.20 | 2.73 | | | | | | | | |
| MADE GROUND: Soft dark brown sandy gravelly SILT. Gravel is sub-angular fine to coarse limestone. | | 0.50 | 2.43 | | | 0.30 - 0.35 | ES | | | | |
| Soft orangish brown sandy SILT. Sand is fine. (TIDAL FLAT DEPOSITS) | | | | | | 0.60 - 0.65 | ES | | | | |
| | | | | | | 1.20 - 1.65 | D | | 1.20 | SPT(S) N=2 (1,1/0,1,0,1) | |
| | | | | | | 1.50 - 1.55 | ES | | | | |
| | | 2.00 | 0.93 | | | 1.50 - 2.00 | B | | | | |
| Very soft grey SILT. (TIDAL FLAT DEPOSITS) | | | | | | 2.50 - 2.95 | D | | 2.50 | SPT(S) N=4 (1,1/1,1,1,1) | |
| | | | | | | 2.50 - 3.00 | B | | | | |
| | | | | | | 4.00 - 4.45 | D | | 4.00 | SPT(S) N=5 (1,1/1,1,1,2) | |
| | | | | | | 5.00 - 5.50 | D | | | | |
| | | | | | | 5.50 - 5.95 | D | | 5.50 | SPT(S) N=3 (1,1/1,0,1,1) | |
| | | 7.00 | -4.07 | | | | | | | | |
| Medium dense slightly gravelly medium SAND with occasional shell fragments. Gravel is sub-rounded fine to medium flint. (TIDAL FLAT DEPOSITS) | | | | | | 7.00 - 7.45 | D | | 7.00 | SPT(S) N=19 (2,3/3,4,5,7) | |
| | | | | | | 7.50 - 7.90 | D | | | | |
| | | 8.30 | -5.37 | | | | | | | | |
| Soft brown CLAY. (TIDAL FLAT DEPOSITS) | | | | | | 8.50 - 8.95 | D | | 8.50 | SPT(S) N=4 (1,1/1,1,1,1) | |
| | | 9.00 | -6.07 | | | | | | | | |
| Soft grey CLAY. (TIDAL FLAT DEPOSITS) | | | | | | 9.00 - 9.50 | B | | | | |
| | | | | | | 10.00 - 10.45 | D | | 10.00 | SPT(S) N=5 (1,1/1,2,1,1) | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Borehole remained dry upon completion.4. Backfilled with arisings.

| Water Level Observations | | | | | Chiselling | |
|---|---|---|---|---|---|---|
| Date | Time | Strike | Duration | Standing | Depth (m) | Time (h:m) |
| | | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale (m): |
|---|---|---|---|---|---|---|---|
| E525553.33 N322483.86 | 2.93 | Delta Drilling | Comacchio GEO 300 | SW | JR | PH | 1:52 |

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Project No: 20-1718.01 | Hole ID: BH102 | Page: 2 of 3

Project: Spalding Academy

# Rotary Auger Borehole Log

Date: 28/10/2020 - 29/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water Strike | Sample Details: Depth (m) | Sample Details: Type | Sample Details: Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Soft grey CLAY. (TIDAL FLAT DEPOSITS) | | | | | | 12.00 - 12.45 | D | | 12.00 | SPT(S) N=37 (4,12/8,8,8,13) | |
| | | 12.20 | -9.27 | | | | | | | | |
| Medium dense grey gravelly SAND. Gravel is sub-rounded fine to medium flint. (TIDAL FLAT DEPOSITS) | | | | | | | | | | | |
| | | 13.50 | -10.57 | 219 | | 13.50 - 13.95 | D | | 13.50 | SPT(S) N=34 (2,5/8,10,8,8) | |
| Firm brownish grey slightly gravelly sandy very clayey SILT. Gravel is rounded fine chalk. Sand is fine to coarse. Rare sub-angular cobbles of mixed lithologies. (TIDAL FLAT DEPOSITS) | | | | | | 13.50 - 14.00 | B | | | | |
| | | | | | | | | | 15.00 | SPT(S) N=18 (2,5/5,4,5,4) | |
| | | | | | | 16.50 - 16.95 | D | | 16.50 | SPT(S) N=19 (5,5/4,5,4,6) | |
| | | | | | | 17.00 - 17.50 | B | | | | |
| | | | | | | 18.00 - 18.45 | D | | 18.00 | SPT(S) N=20 (5,4/5,5,5,5) | |
| | | | | | | 20.00 - 20.45 | D | | 20.00 | SPT(S) N=23 (1,3/5,5,5,8) | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Borehole remained dry upon completion.4. Backfilled with arisings.

| Water Level Observations | | | | | Chiselling | |
|---|---|---|---|---|---|---|
| Date | Time | Strike | Duration | Standing | Depth (m) | Time (h:m) |
| | | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale (m): |
|---|---|---|---|---|---|---|---|
| E525553.33 N322483.86 | 2.93 | Delta Drilling | Comacchio GEO 300 | SW | JR | PH | 1:52 |

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Project: Spalding Academy

# Rotary Auger Borehole Log

Date: 28/10/2020 - 29/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water Strike | Sample Details: Depth (m) | Sample Details: Type | Sample Details: Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Firm brownish grey slightly gravelly sandy very clayey SILT. Gravel is rounded fine chalk. Sand is fine to coarse. Rare sub-angular cobbles of mixed lithologies. (TIDAL FLAT DEPOSITS) | | | | | | | | | | | |
| | | 20.60 | -17.67 | | | 20.60 - 21.00 | B | | | | |
| Weak grey very silty MUDSTONE/ very clayey SILTSTONE. (OXFORD CLAY FORMATION) | | | | | | | | | 21.00 | SPT(S) N=46 (8,10/12,12,11,11) | |
| | | | | | | 23.00 - 23.40 | D | | 23.00 | SPT(S) N=50 (2,9/50 for 250mm) | |
| | | | | | | 24.50 - 25.00 | B | | | | |
| | | 25.00 | -22.07 | | | 25.00 - 25.38 | D | | 25.00 | SPT(S) N=50 (8,11/50 for 230mm) | |
| Borehole complete at 25.00m bgl. | | | | | | | | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Borehole remained dry upon completion.4. Backfilled with arisings.

| Water Level Observations | | | | | Chiselling | |
|---|---|---|---|---|---|---|
| Date | Time | Strike | Duration | Standing | Depth (m) | Time (h:m) |
| | | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale (m): |
|---|---|---|---|---|---|---|---|
| E525553.33 N322483.86 | 2.93 | Delta Drilling | Comacchio GEO 300 | SW | JR | PH | 1:52 |

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Project No: 20-1718.01 | Hole ID: DS101 | Page: 1 of 1

Project: Spalding Academy

# Dynamic Sampler Log

Date: 28/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m bgl) | Strata Thickness (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water | Sample Details: Depth (m) | Sample Details: Type & Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Brown slightly sandy SILT. Sand is fine. Rootlets throughout. (TOPSOIL) | | 0.15 | (0.15) | 2.45 | | | 0.10 - 0.15 | ES | | | |
| MADE GROUND: Orangish brown gravelly fine to coarse SAND. Gravel is sub-angular fine to coarse limestone. | | 0.25 | (0.10) | 2.35 | | | 0.30 - 0.35 | ES | | | |
| Very soft greyish brown clayey SILT. (TIDAL FLAT DEPOSITS) | | | | | | 0.85 ▼ | 0.40 - 0.60 | B | 1.20 | SPT(S) N=4 (1,1/1,1,1,1) | |
| | | | (1.95) | | | | 1.40 - 1.45 | D | | | |
| | | 2.20 | | 0.40 | | | | | 2.00 | SPT(S) N=0 (1,1/0,0,0,0) | |
| Very soft grey sandy clayey SILT. Organic rootlets throughout. (TIDAL FLAT DEPOSITS) | | | | | | | 2.50 - 2.55 | D | | | |
| | | | (0.80) | | | | | | | | |
| | | 3.00 | | -0.40 | | | | | 3.00 | SPT(S) N=0 (1,0/0,0,0,0) | |
| Borehole complete at 3.00 m bgl. | | | | | | | | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Groundwater encountered at 0.85 m bgl.4. Falling head test undertaken in hand pit. 5. Backfilled with arisings.

| Water Strike | | | Water Level | | Borehole Diameter | |
|---|---|---|---|---|---|---|
| Date | Depth (m) | Remarks | Duration (min) | Depth | Depth Base | Diameter |
| 28/10/2020 | 0.85 | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale: |
|---|---|---|---|---|---|---|---|
| E525725.50 N322491.57 | 2.60 | Delta Drilling | Premier 110 | JR | PH | PH | 1:30 |

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Project No: 20-1718.01 | Hole ID: DS102 | Page: 1 of 1

Project: Spalding Academy

# Dynamic Sampler Log

Date: 28/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m bgl) | Strata Thickness (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water | Sample Details: Depth (m) | Sample Details: Type & Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Concrete. | | 0.12 | (0.12) | 2.80 | | | | | | | |
| MADE GROUND: Orangish brown gravelly fine to coarse SAND. Gravel is sub-angular fine to coarse limestone. | | 0.25 | (0.13) | 2.67 | | | 0.15 - 0.20 | ES | | | |
| Soft dark brown to black slightly sandy organic CLAY. Rare sub-rounded medium flint gravel. (TIDAL FLAT DEPOSITS) | | | (1.75) | | | | 0.40 - 0.45 | ES | | | |
| | | | | | | | 1.20 - 1.25 | D | 1.20 | SPT(S) N=4 (1,1/1,1,1,1) | |
| | | | | | | 1.50 ▼ | | | | | |
| | | 2.00 | | 0.92 | | | | | 2.00 | SPT(S) N=1 (1,1/0,0,1,0) | |
| Very soft dark brown to black sandy gravelly organic clayey SILT. Gravel is sub-rounded fine to medium flint. Sand is fine to coarse. (TIDAL FLAT DEPOSITS) | | | (1.00) | | | | 2.50 - 2.70 | B | | | |
| | | | | | | | 2.80 - 2.85 | D | | | |
| | | 3.00 | | -0.08 | | | | | 3.00 | SPT(S) N=1 (1,0/1,0,0,0) | |
| Borehole complete at 3.00 m bgl. | | | | | | | | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Groundwater encountered at 1.50 m bgl.4. Backfilled with arisings.

| Water Strike | | | Water Level | | Borehole Diameter | |
|---|---|---|---|---|---|---|
| Date | Depth (m) | Remarks | Duration (min) | Depth | Depth Base | Diameter |
| 28/10/2020 | 1.50 | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale: |
|---|---|---|---|---|---|---|---|
| E525739.01 N322473.80 | 2.92 | Delta Drilling | Premier 110 | JR | PH | PH | 1:30 |

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Project No: 20-1718.01 | Hole ID: DS103 | Page: 1 of 1

Project: Spalding Academy

# Dynamic Sampler Log

Date: 28/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m bgl) | Strata Thickness (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water | Sample Details: Depth (m) | Sample Details: Type & Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Macadam. | | 0.16 | (0.16) | 2.70 | | | 0.10 - 0.15 | ES | | | |
| MADE GROUND: Brown gravelly fine to coarse SAND. Gravel is sub-angular fine to coarse flint, brick and macadam. Geotextile membrane at base. | | 0.43 | (0.27) | 2.43 | | | 0.20 - 0.22 | ES | | | |
| Very soft orangish brown slightly sandy SILT. Sand is fine. (TIDAL FLAT DEPOSITS) | | | (1.97) | | | | 0.60 - 0.65 | ES | | | |
| | | | | | | | 1.00 - 1.20 | B | 1.20 | SPT(S) N=8 (1,2/2,2,2,2) | |
| | | | | | | | 1.80 - 1.85 | D | 2.00 | SPT(S) N=2 (1,0/1,0,1,0) | |
| | | 2.40 | | 0.46 | | | | | | | |
| Very soft grey slightly silty sandy CLAY. Sand is fine. Rare organic rootlets. (TIDAL FLAT DEPOSITS) | | | (0.60) | | | | 2.80 - 2.85 | D | | | |
| | | 3.00 | | -0.14 | | | | | 3.00 | SPT(S) N=0 (1,0/0,0,0,0) | |
| Borehole complete at 3.00 m bgl. | | | | | | | | | | | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Borehole remained dry upon completion.4. Backfilled with arisings.

| Water Strike | | | Water Level | | Borehole Diameter | |
|---|---|---|---|---|---|---|
| Date | Depth (m) | Remarks | Duration (min) | Depth | Depth Base | Diameter |
| | | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale: |
|---|---|---|---|---|---|---|---|
| E525583.86 N322473.74 | 2.86 | Delta Drilling | Premier 110 | JR | PH | PH | 1:30 |

deltasimons
Environment - Health & Safety - Sustainability

Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 20-1718.01 | Hole ID: DS104 | Page: 1 of 1

Project: Spalding Academy

# Dynamic Sampler Log

Date: 28/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m bgl) | Strata Thickness (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water | Sample Details: Depth (m) | Sample Details: Type & Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Macadam. | | 0.15 | (0.15) | 2.69 | | | 0.05 - 0.10 | ES | | | |
| MADE GROUND: Brown gravelly fine to coarse SAND. Gravel is sub-angular fine to coarse flint, brick and macadam. Geotextile membrane at base. | | 0.39 | (0.24) | 2.45 | | | 0.20 - 0.25 | ES | | | |
| Very soft orangish brown slightly sandy SILT. Sand is fine. (TIDAL FLAT DEPOSITS) | | 2.20 | (1.81) | 0.64 | | | 0.50 - 0.55 | ES | | | |
| | | | | | | | 1.20 - 1.25 | D | 1.20 | SPT(S) N=4 (1,1/1,1,1,1) | |
| | | | | | | | 1.80 - 1.85 | D | | | |
| | | | | | | | | | 2.00 | SPT(S) N=0 (1,0/0,0,0,0) | |
| Very soft grey clayey very silty fine SAND. Sand is fine. Rare organic rootlets. (TIDAL FLAT DEPOSITS) | | 3.00 | (0.80) | -0.16 | | | 2.40 - 2.60 | B | | | |
| Borehole complete at 3.00 m bgl. | | | | | | | | | 3.00 | SPT(S) N=2 (1,1/1,1,0,0) | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. Borehole remained dry upon completion.4. Installed with a 63 mm HDPE standpipe to 3.00 m bgl.

| Water Strike | | | Water Level | | Borehole Diameter | |
|---|---|---|---|---|---|---|
| Date | Depth (m) | Remarks | Duration (min) | Depth | Depth Base | Diameter |
| | | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale: |
|---|---|---|---|---|---|---|---|
| E525564.60 N322470.05 | 2.84 | Delta Drilling | Premier 110 | JR | PH | PH | 1:30 |

deltasimons
Environment - Health & Safety - Sustainability

Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 20-1718.01 | Hole ID: DS105 | Page: 1 of 1

Project: Spalding Academy

# Dynamic Sampler Log

Date: 28/10/2020 | Client: Lincolnshire County Council

| Description of Strata | Legend | Strata Depth (m bgl) | Strata Thickness (m) | Reduced Level (mAOD) | Casing Diameter (mm) | Water | Sample Details: Depth (m) | Sample Details: Type & Ref | Test Details: Depth (m) | Test Details: Results | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MADE GROUND: Brown slightly sandy SILT. Sand is fine. Rootlets throughout. (TOPSOIL) | | 0.10 | (0.10) | 3.02 | | | 0.10 - 0.15 | ES | | | |
| MADE GROUND: Dark brown sandy gravelly SILT. Sand is fine to medium. Gravel is sub-angular fine to coarse limestone and concrete. Rare concrete cobbles. | | 0.50 | (0.40) | 2.62 | | | 0.50 - 0.55 | ES | | | |
| | | | | | | | 0.60 - 0.80 | B | | | |
| Very soft light grey slightly sandy SILT. Sand is fine. (TIDAL FLAT DEPOSITS) | | | | | | | | | 1.20 | SPT(S) N=3 (1,1/1,0,1,1) | |
| | | | (2.00) | | | | 1.50 - 1.55 | D | | | |
| | | | | | | | | | 2.00 | SPT(S) N=0 (1,0/0,0,0,0) | |
| | | 2.50 | | 0.62 | | | | | | | |
| Very soft dark grey sandy organic CLAY. Rootlets throughout. (TIDAL FLAT DEPOSITS) | | | (0.50) | | | | 2.60 - 2.65 | D | | | |
| | | 3.00 | | 0.12 | | | | | | | |
| Borehole complete at 3.00 m bgl. | | | | | | | | | 3.00 | SPT(S) N=2 (1,2/1,1,0,0) | |

**Remarks:**
1. Engineer verified logged in general accordance to BS 5930:2015+A1:2020.2. Area CAT scanned prior to excavation.3. A groundwater strike could not be identified due to the falling head test undertaken in the hand pit. 4. Backfilled with arisings.

| Water Strike | | | Water Level | | Borehole Diameter | |
|---|---|---|---|---|---|---|
| Date | Depth (m) | Remarks | Duration (min) | Depth | Depth Base | Diameter |
| | | | | | | |

| Coordinates: | Elevation (mAOD): | Drilled By: | Plant Used: | Logged: | Checked: | Approved: | Scale: |
|---|---|---|---|---|---|---|---|
| E525542.65 N322486.22 | 3.12 | Delta Drilling | Premier 110 | JR | PH | PH | 1:30 |

# Appendix C – Geotechnical Analysis Results

# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 26/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 09/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

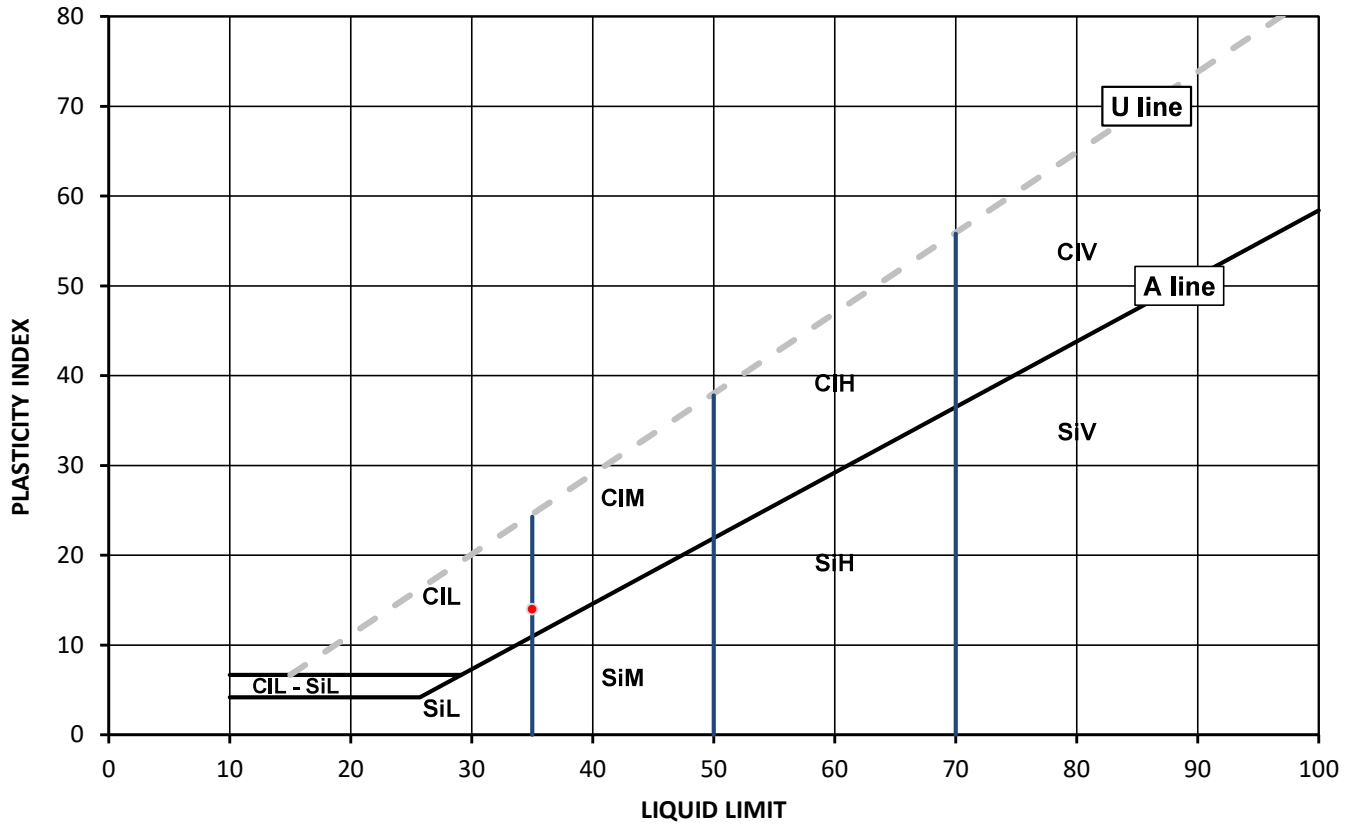
*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670504 | Depth Top [m]: | 3.50 |
| Hole No.: | BH101 | Depth Base [m]: | 3.55 |
| Sample Reference: | Not Given | Sample Type: | D |
| Soil Description: | Brownish grey very sandy CLAY | | |

Sample Preparation: Tested in natural condition

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 33 | 35 | 21 | 14 | 100 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



**Date Reported:** 13/11/2020

**GF 236.10**

# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 26/10/2020
Date Received: 30/10/2020
Date Tested: 09/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

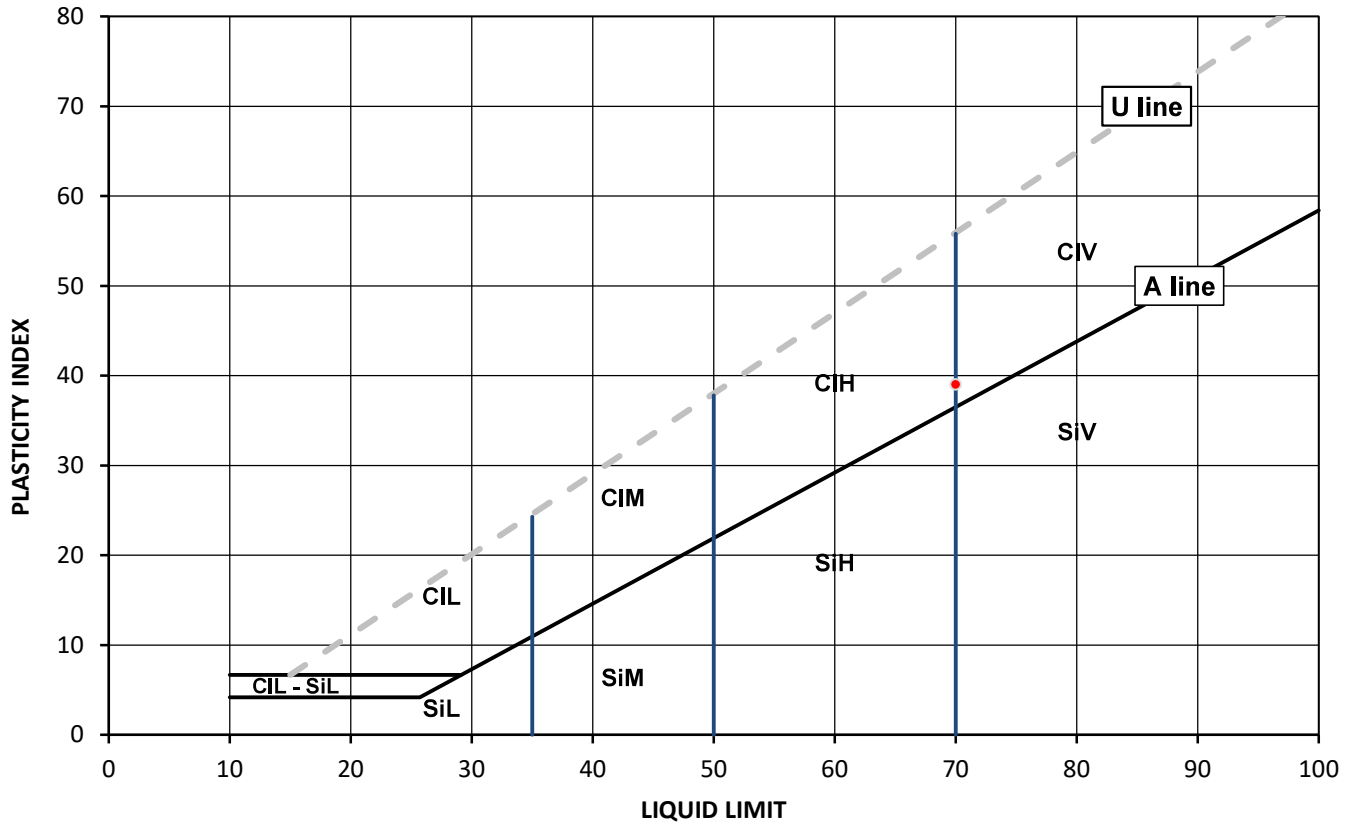
**Test Results:**

Laboratory Reference: 1670505
Hole No.: BH101
Sample Reference: Not Given
Soil Description: Brownish grey slightly gravelly CLAY

Depth Top [m]: 4.50
Depth Base [m]: 4.95
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 39 | 70 | 31 | 39 | 99 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

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# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Delta-Simons

Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR

Contact: Jessica Rowe

Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 26/10/2020
Date Received: 30/10/2020
Date Tested: 09/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

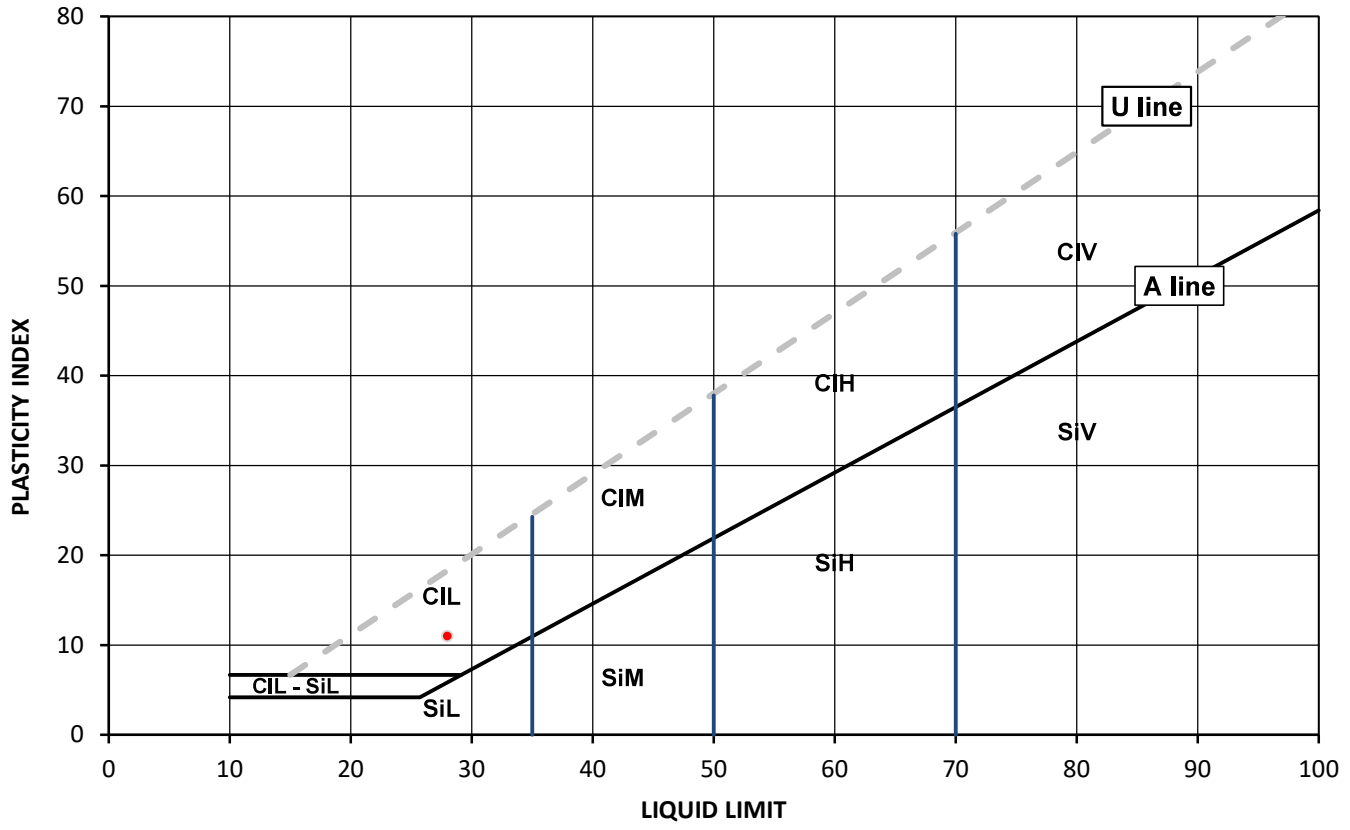
**Test Results:**

Laboratory Reference: 1670506
Hole No.: BH101
Sample Reference: Not Given
Soil Description: Greyish brown slightly gravelly very sandy CLAY

Depth Top [m]: 10.50
Depth Base [m]: 10.95
Sample Type: D

Sample Preparation: Tested after washing to remove >425um

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 21 | 28 | 17 | 11 | 71 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
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**Date Reported:** 13/11/2020

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# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 28/10/2020
Date Received: 30/10/2020
Date Tested: 09/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

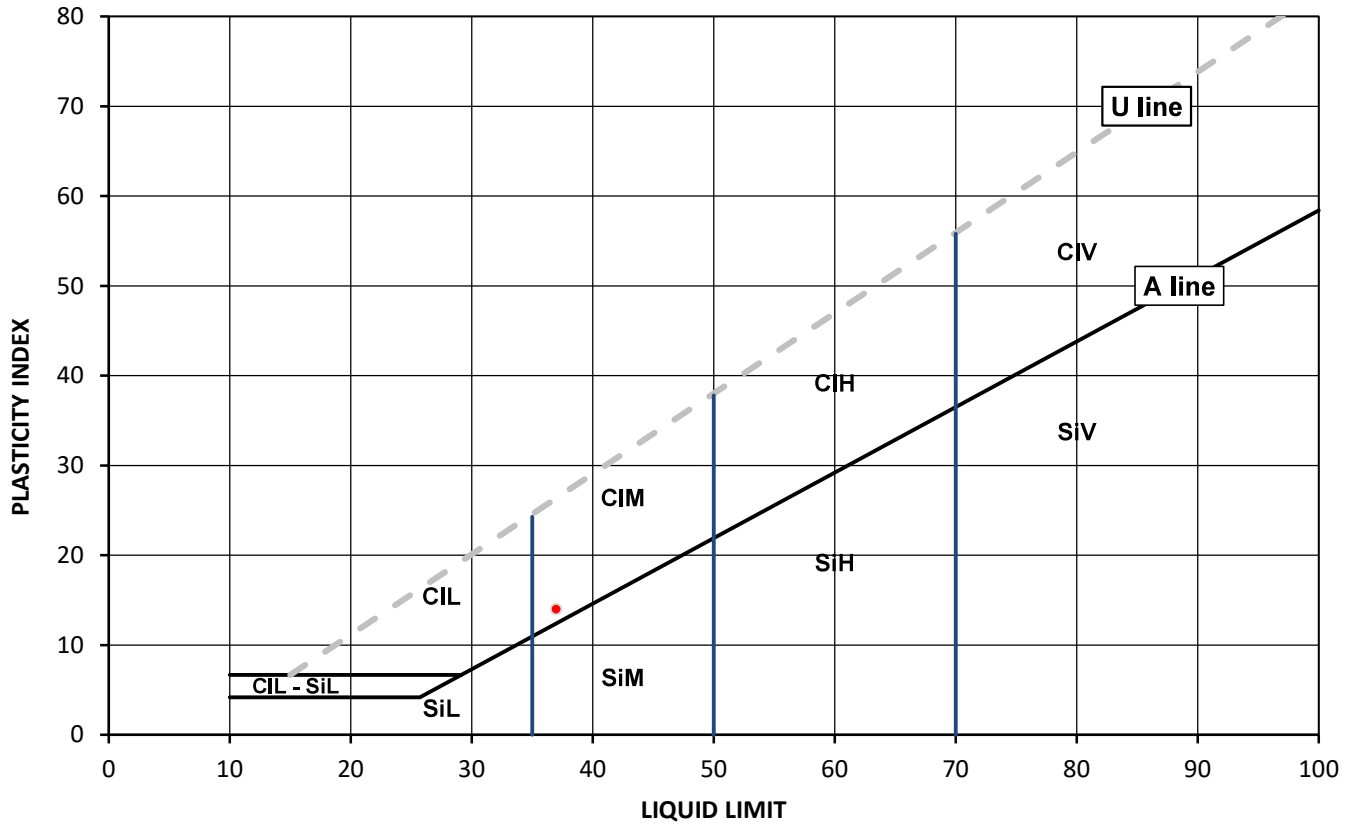
**Test Results:**

Laboratory Reference: 1670511
Hole No.: DS102
Sample Reference: Not Given
Soil Description: Dark brown slightly gravelly very sandy CLAY

Depth Top [m]: 1.20
Depth Base [m]: 1.25
Sample Type: D

Sample Preparation: Tested after washing to remove >425um

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 29 | 37 | 23 | 14 | 90 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

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# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 28/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 09/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

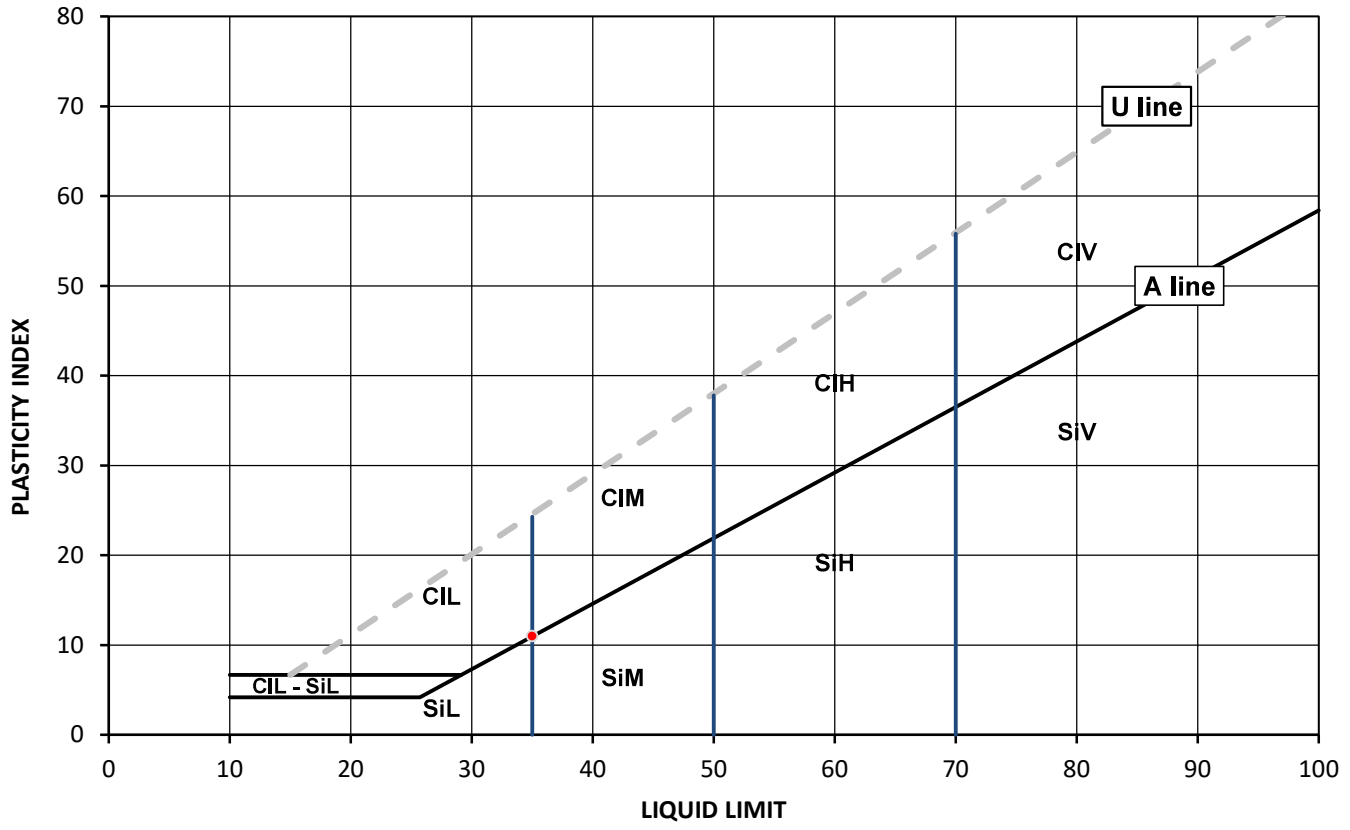
*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670513 | Depth Top [m]: | 2.80 |
| Hole No.: | DS103 | Depth Base [m]: | 2.85 |
| Sample Reference: | Not Given | Sample Type: | D |
| Soil Description: | Brown slightly silty very sandy CLAY | | |

Sample Preparation: Tested in natural condition

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 27 | 35 | 24 | 11 | 100 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

**Signed:** Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

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# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Delta-Simons

Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR

Contact: Jessica Rowe

Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 28/10/2020
Date Received: 30/10/2020
Date Tested: 09/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

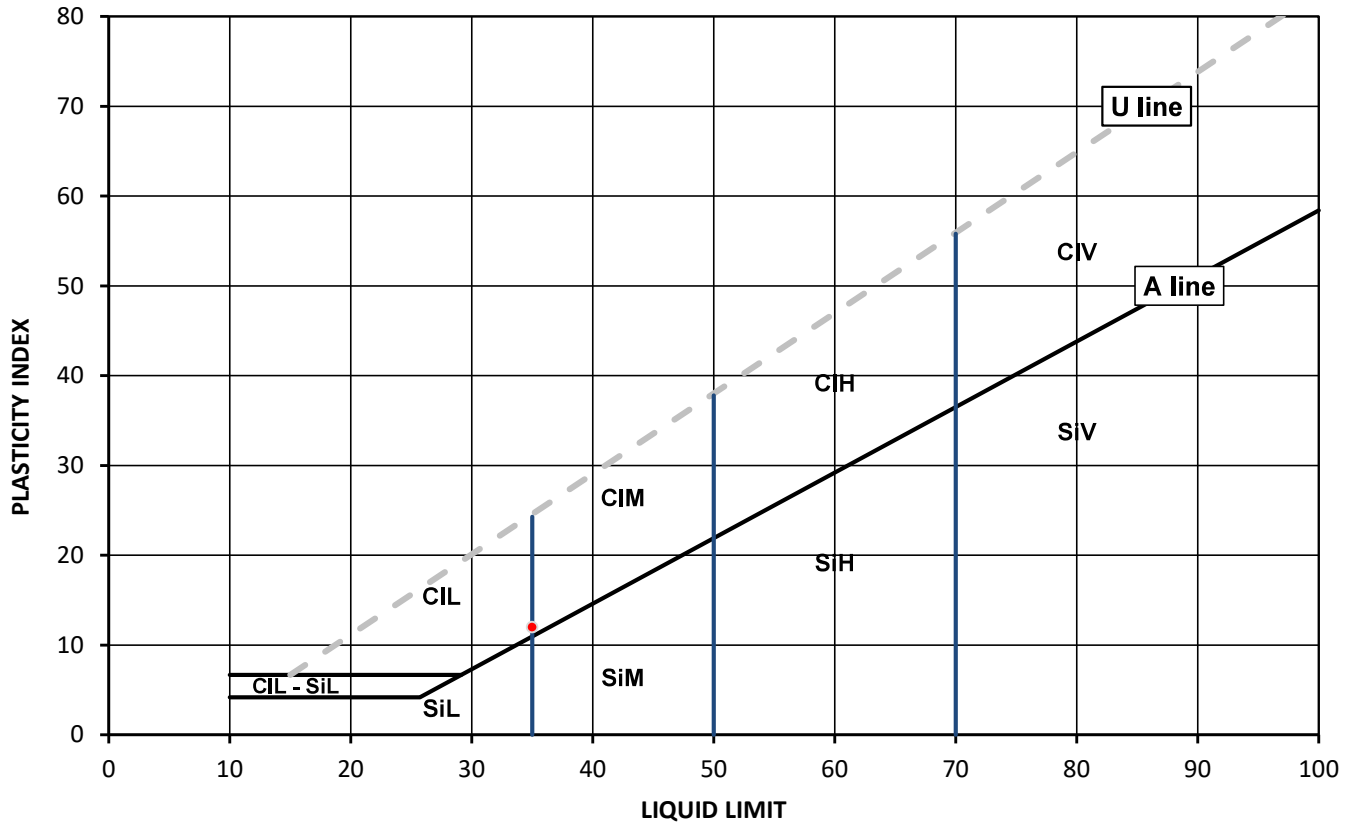
**Test Results:**

Laboratory Reference: 1670516
Hole No.: DS105
Sample Reference: Not Given
Soil Description: Brownish slightly gravelly very sandy CLAY

Depth Top [m]: 2.60
Depth Base [m]: 2.65
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 30 | 35 | 23 | 12 | 99 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 236.10**

# TEST CERTIFICATE

## Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 28/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

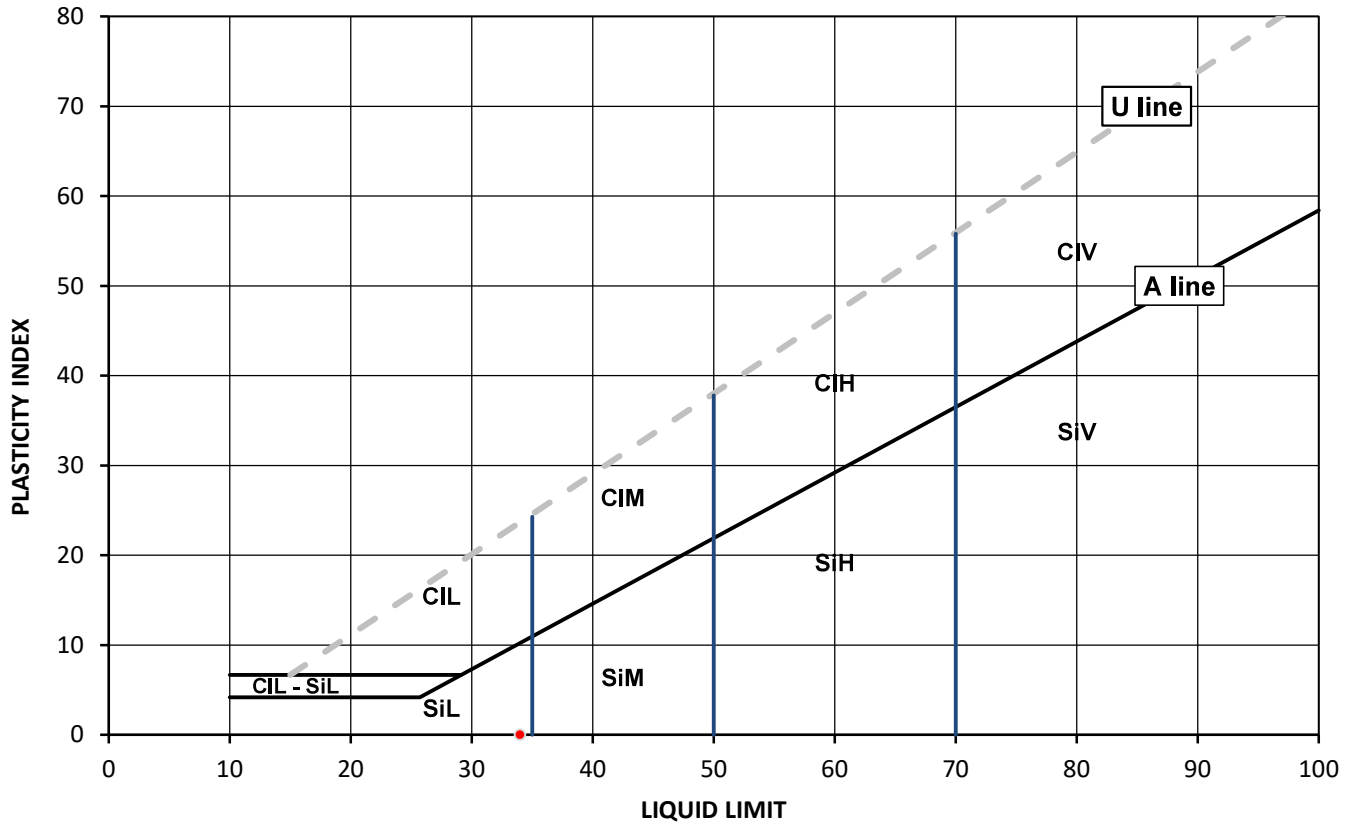
**Test Results:**

Laboratory Reference: 1670517
Hole No.: BH102
Sample Reference: Not Given
Soil Description: Brown slightly clayey SILT

Depth Top [m]: 2.50
Depth Base [m]: 3.00
Sample Type: B

Sample Preparation: Tested after washing to remove >425um

| As Received Moisture Content [ W ] % | Liquid Limit [ WL ] % | Plastic Limit [ Wp ] % | Plasticity Index [ Ip ] % | % Passing 425µm BS Test Sieve |
|---|---|---|---|---|
| 30 | 34 | NP | NP | 100 |




Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

| | | Plasticity | | Liquid Limit |
|---|---|---|---|---|
| Cl | Clay | L | Low | below 35 |
| Si | Silt | M | Medium | 35 to 50 |
| | | H | High | 50 to 70 |
| | | V | Very high | exceeding 70 |
| | | O | Organic | append to classification for organic material ( eg ClHO ) |

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks: NP - non plastic

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 236.10**

# SUMMARY REPORT

## Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: Delta-Simons

Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR

Contact: Jessica Rowe

Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 26/10 - 29/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

### Test results

| Laboratory Reference | Hole No. | Sample | | | | Description | Remarks | Moisture Content [ W ] | Water Content [ W ] | Atterberg | | | | Density | | | Total Porosity# | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Reference | Depth Top m | Depth Base m | Type | | | % | % | % Passing 425um % | WL % | Wp % | Ip % | bulk Mg/m3 | dry Mg/m3 | PD Mg/m3 | % | | |
| 1670503 | BH101 | Not Given | 2.50 | 2.80 | B | Brown gravelly very sandy clayey SILT | | 28 | | | | | | | | | | | |
| 1670504 | BH101 | Not Given | 3.50 | 3.55 | D | Brownish grey very sandy CLAY | Atterberg 4 Point | 33 | | 100 | 35 | 21 | 14 | | | | | | |
| 1670505 | BH101 | Not Given | 4.50 | 4.95 | D | Brownish grey slightly gravelly CLAY | Atterberg 4 Point | 39 | | 99 | 70 | 31 | 39 | | | | | | |
| 1670507 | BH101 | Not Given | 8.00 | 8.50 | B | Brown slightly gravelly sandy clayey SILT | | 82 | | | | | | | | | | | |
| 1670506 | BH101 | Not Given | 10.50 | 10.95 | D | Greyish brown slightly gravelly very sandy CLAY | Atterberg 4 Point | 21 | | 71 | 28 | 17 | 11 | | | | | | |
| 1670508 | BH101 | Not Given | 18.00 | 18.50 | B | Grey slightly gravelly sandy very clayey SILT | | 20 | | | | | | | | | | | |
| 1670509 | BH101 | Not Given | 21.00 | 21.50 | B | Grey slightly sandy very silty CLAY | | 19 | | | | | | | | | | | |
| 1670517 | BH102 | Not Given | 2.50 | 3.00 | B | Brown slightly clayey SILT | Atterberg 4 Point | 30 | | 100 | 34 | NP | NP | | | | | | |
| 1670518 | BH102 | Not Given | 13.50 | 14.00 | B | Brown slightly gravelly sandy very clayey SILT | | 19 | | | | | | | | | | | |
| 1670519 | BH102 | Not Given | 20.60 | 21.00 | B | Grey slightly sandy very clayey SILT | | 19 | | | | | | | | | | | |

Note: # Non accredited; NP - Non plastic

Comments:

Signed: Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 238.12**

# SUMMARY REPORT

## Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: Delta-Simons

Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR

Contact: Jessica Rowe

Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 28/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

### Test results

| Laboratory Reference | Hole No. | Sample | | | | Description | Remarks | Moisture Content [ W ] | Water Content [ W ] | Atterberg | | | | Density | | | Total Porosity# | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Reference | Depth Top | Depth Base | Type | | | | | % Passing 425um | WL | Wp | Ip | bulk | dry | PD | | | |
| | | | m | m | | | | % | % | % | % | % | % | Mg/m3 | Mg/m3 | Mg/m3 | % | | |
| 1670511 | DS102 | Not Given | 1.20 | 1.25 | D | Dark brown slightly gravelly very sandy CLAY | Atterberg 4 Point | 29 | | 90 | 37 | 23 | 14 | | | | | | |
| 1670512 | DS102 | Not Given | 2.50 | 2.80 | B | Brown sandy gravelly clayey SILT | | 58 | | | | | | | | | | | |
| 1670513 | DS103 | Not Given | 2.80 | 2.85 | D | Brown slightly silty very sandy CLAY | Atterberg 4 Point | 27 | | 100 | 35 | 24 | 11 | | | | | | |
| 1670514 | DS104 | Not Given | 2.40 | 2.60 | B | Brown clayey very silty SAND | | 27 | | | | | | | | | | | |
| 1670516 | DS105 | Not Given | 2.60 | 2.65 | D | Brownish slightly gravelly very sandy CLAY | Atterberg 4 Point | 30 | | 99 | 35 | 23 | 12 | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

Note: # Non accredited; NP - Non plastic

Comments:

**Signed:** Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 238.12**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 26/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

Laboratory Reference: 1670503
Hole No.: BH101
Sample Reference: Not Given
Sample Description: Brown gravelly very sandy clayey SILT
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 2.50
Depth Base [m]: 2.80
Sample Type: B




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0630 | 50 |
| 300 | 100 | 0.0508 | 42 |
| 150 | 100 | 0.0373 | 29 |
| 125 | 100 | 0.0265 | 27 |
| 90 | 100 | 0.0191 | 21 |
| 75 | 100 | 0.0140 | 19 |
| 63 | 100 | 0.0017 | 10 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 98 | | |
| 10 | 96 | | |
| 6.3 | 93 | | |
| 5 | 91 | | |
| 3.35 | 89 | Particle density | (assumed) |
| 2 | 87 | 2.65 | Mg/m3 |
| 1.18 | 85 | | |
| 0.6 | 83 | | |
| 0.425 | 82 | | |
| 0.3 | 80 | | |
| 0.212 | 78 | | |
| 0.15 | 73 | | |
| 0.063 | 50 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 13.20 |
| Sand | 36.70 |
| Silt | 39.00 |
| Clay | 11.10 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 20 |
| D60 | mm | 0.0915 |
| D30 | mm | 0.038 |
| D10 | mm | |
| Uniformity Coefficient | | > 54 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

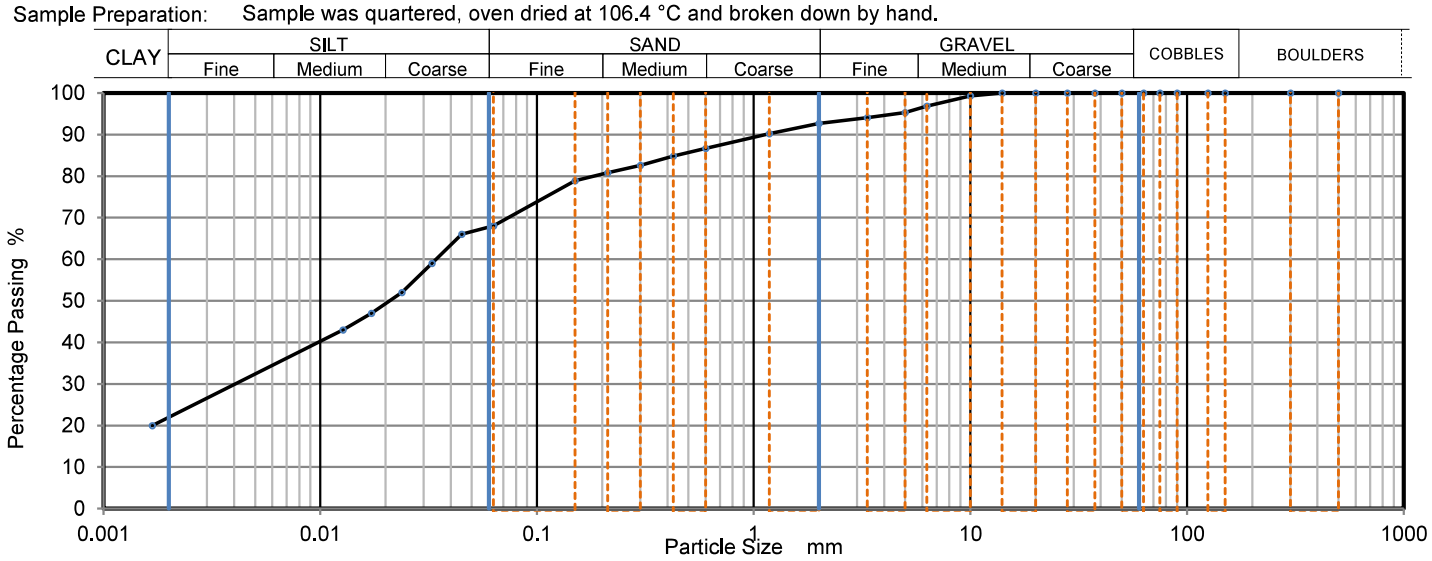
Environmental Science

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 26/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 06/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670507 | Depth Top [m]: | 8.00 |
| Hole No.: | BH101 | Depth Base [m]: | 8.50 |
| Sample Reference: | Not Given | Sample Type: | B |
| Sample Description: | Brown slightly gravelly sandy clayey SILT | | |
| Sample Preparation: | Sample was quartered, oven dried at 106.4 °C and broken down by hand. | | |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0630 | 68 |
| 300 | 100 | 0.0449 | 66 |
| 150 | 100 | 0.0327 | 59 |
| 125 | 100 | 0.0238 | 52 |
| 90 | 100 | 0.0172 | 47 |
| 75 | 100 | 0.0127 | 43 |
| 63 | 100 | 0.0017 | 20 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 99 | | |
| 6.3 | 97 | | |
| 5 | 95 | | |
| 3.35 | 94 | Particle density | (assumed) |
| 2 | 93 | 2.65 | Mg/m3 |
| 1.18 | 90 | | |
| 0.6 | 87 | | |
| 0.425 | 85 | | |
| 0.3 | 83 | | |
| 0.212 | 81 | | |
| 0.15 | 79 | | |
| 0.063 | 68 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 7.30 |
| Sand | 24.70 |
| Silt | 46.30 |
| Clay | 21.70 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 14 |
| D60 | mm | 0.0341 |
| D30 | mm | 0.00412 |
| D10 | mm | |
| Uniformity Coefficient | | > 20 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 26/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

Laboratory Reference: 1670508
Hole No.: BH101
Sample Reference: Not Given
Sample Description: Grey slightly gravelly sandy very clayey SILT
Sample Preparation: Sample was quartered, oven dried at 106.0 °C and broken down by hand.

Depth Top [m]: 18.00
Depth Base [m]: 18.50
Sample Type: B




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0630 | 73 |
| 300 | 100 | 0.0497 | 70 |
| 150 | 100 | 0.0356 | 64 |
| 125 | 100 | 0.0253 | 61 |
| 90 | 100 | 0.0180 | 58 |
| 75 | 100 | 0.0133 | 52 |
| 63 | 100 | 0.0017 | 29 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 97 | | |
| 6.3 | 96 | | |
| 5 | 95 | | |
| 3.35 | 94 | Particle density | (assumed) |
| 2 | 93 | 2.65 | Mg/m3 |
| 1.18 | 91 | | |
| 0.6 | 89 | | |
| 0.425 | 88 | | |
| 0.3 | 86 | | |
| 0.212 | 84 | | |
| 0.15 | 78 | | |
| 0.063 | 73 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 7.40 |
| Sand | 19.90 |
| Silt | 41.80 |
| Clay | 30.90 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 14 |
| D60 | mm | 0.0224 |
| D30 | mm | 0.00184 |
| D10 | mm | |
| Uniformity Coefficient | | > 13 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client: Delta-Simons

Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR

Contact: Jessica Rowe

Site Address: Spalding Academy

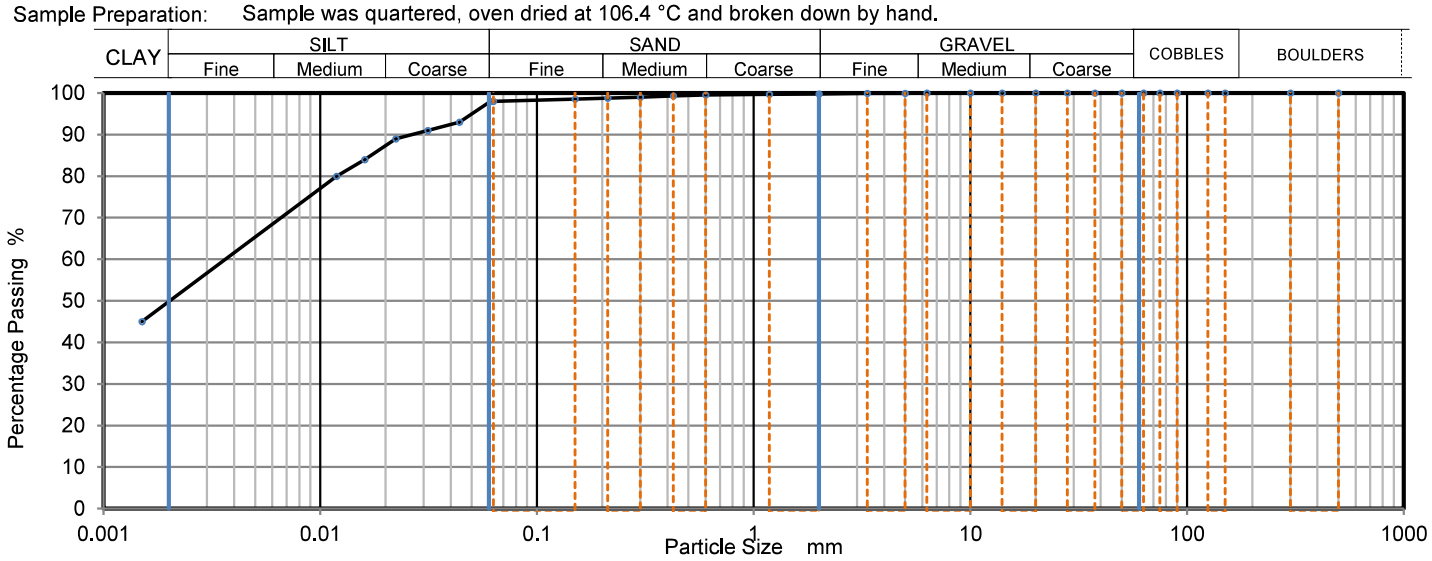
Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 26/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

Laboratory Reference: 1670509
Hole No.: BH101
Sample Reference: Not Given
Sample Description: Grey slightly sandy very silty CLAY
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 21.00
Depth Base [m]: 21.50
Sample Type: B




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0610 | 98 |
| 300 | 100 | 0.0439 | 93 |
| 150 | 100 | 0.0313 | 91 |
| 125 | 100 | 0.0223 | 89 |
| 90 | 100 | 0.0160 | 84 |
| 75 | 100 | 0.0119 | 80 |
| 63 | 100 | 0.0015 | 45 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | Particle density | (assumed) |
| 2 | 100 | 2.65 | Mg/m3 |
| 1.18 | 100 | | |
| 0.6 | 100 | | |
| 0.425 | 99 | | |
| 0.3 | 99 | | |
| 0.212 | 99 | | |
| 0.15 | 99 | | |
| 0.063 | 98 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 0.20 |
| Sand | 2.10 |
| Silt | 47.60 |
| Clay | 50.10 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 6.3 |
| D60 | mm | 0.00364 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | > 2.4 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 28/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 06/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670512 | Depth Top [m]: | 2.50 |
| Hole No.: | DS102 | Depth Base [m]: | 2.80 |
| Sample Reference: | Not Given | Sample Type: | B |
| Sample Description: | Brown sandy gravelly clayey SILT | | |
| Sample Preparation: | Sample was quartered, oven dried at 106.4 °C and broken down by hand. | | |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0630 | 76 |
| 300 | 100 | 0.0500 | 73 |
| 150 | 100 | 0.0358 | 67 |
| 125 | 100 | 0.0260 | 54 |
| 90 | 100 | 0.0186 | 48 |
| 75 | 100 | 0.0137 | 41 |
| 63 | 100 | 0.0016 | 13 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 96 | | |
| 6.3 | 92 | | |
| 5 | 90 | | |
| 3.35 | 89 | Particle density | (assumed) |
| 2 | 88 | 2.65 | Mg/m3 |
| 1.18 | 87 | | |
| 0.6 | 85 | | |
| 0.425 | 84 | | |
| 0.3 | 83 | | |
| 0.212 | 82 | | |
| 0.15 | 81 | | |
| 0.063 | 76 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 12.50 |
| Sand | 11.20 |
| Silt | 60.60 |
| Clay | 15.70 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 14 |
| D60 | mm | 0.0301 |
| D30 | mm | 0.00584 |
| D10 | mm | |
| Uniformity Coefficient | | > 19 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 28/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

Laboratory Reference: 1670514
Hole No.: DS104
Sample Reference: Not Given
Sample Description: Brown clayey very silty SAND
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 2.40
Depth Base [m]: 2.60
Sample Type: B




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0630 | 46 |
| 300 | 100 | 0.0536 | 38 |
| 150 | 100 | 0.0384 | 30 |
| 125 | 100 | 0.0274 | 23 |
| 90 | 100 | 0.0195 | 19 |
| 75 | 100 | 0.0143 | 15 |
| 63 | 100 | 0.0016 | 11 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | Particle density | (assumed) |
| 2 | 100 | 2.65 | Mg/m3 |
| 1.18 | 100 | | |
| 0.6 | 100 | | |
| 0.425 | 100 | | |
| 0.3 | 100 | | |
| 0.212 | 99 | | |
| 0.15 | 99 | | |
| 0.063 | 46 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 0.00 |
| Sand | 54.50 |
| Silt | 33.70 |
| Clay | 11.80 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 3.35 |
| D60 | mm | 0.0798 |
| D30 | mm | 0.0378 |
| D10 | mm | |
| Uniformity Coefficient | | > 50 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

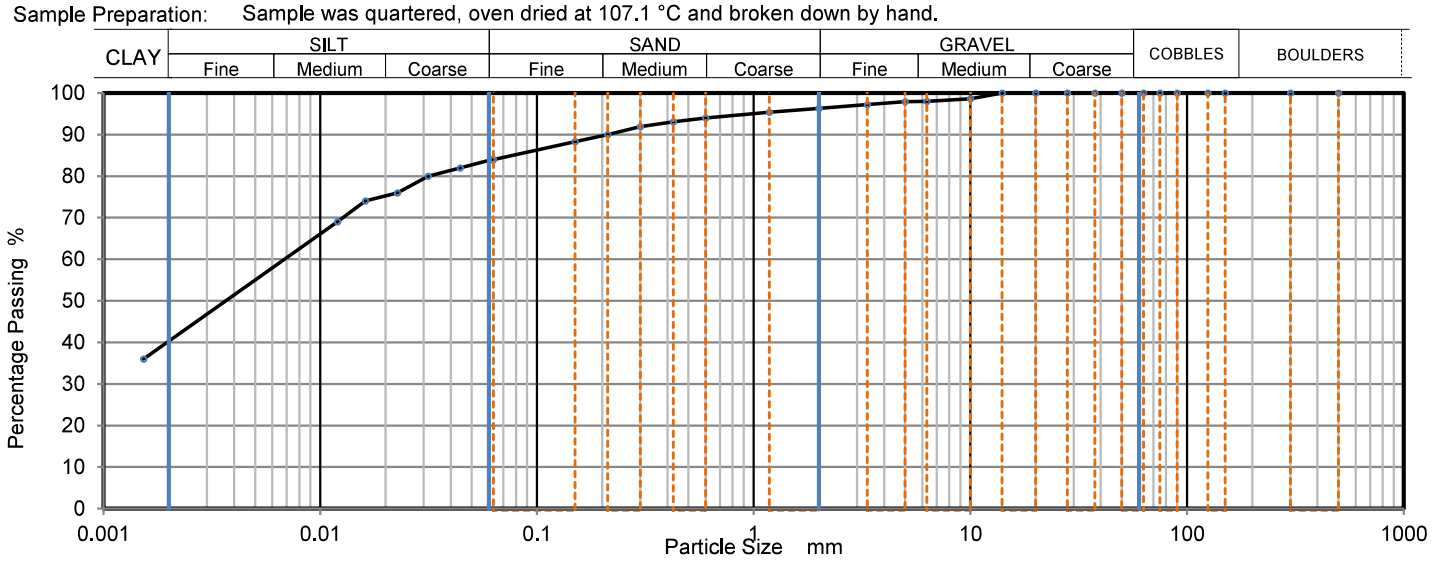
Environmental Science

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 28/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 06/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670518 | Depth Top [m]: | 13.50 |
| Hole No.: | BH102 | Depth Base [m]: | 14.00 |
| Sample Reference: | Not Given | Sample Type: | B |
| Sample Description: | Brown slightly gravelly sandy very clayey SILT | | |
| Sample Preparation: | Sample was quartered, oven dried at 107.1 °C and broken down by hand. | | |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0619 | 84 |
| 300 | 100 | 0.0441 | 82 |
| 150 | 100 | 0.0315 | 80 |
| 125 | 100 | 0.0226 | 76 |
| 90 | 100 | 0.0161 | 74 |
| 75 | 100 | 0.0120 | 69 |
| 63 | 100 | 0.0015 | 36 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 99 | | |
| 6.3 | 98 | | |
| 5 | 98 | | |
| 3.35 | 97 | Particle density | (assumed) |
| 2 | 96 | 2.65 | Mg/m3 |
| 1.18 | 95 | | |
| 0.6 | 94 | | |
| 0.425 | 93 | | |
| 0.3 | 92 | | |
| 0.212 | 90 | | |
| 0.15 | 88 | | |
| 0.063 | 84 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 3.70 |
| Sand | 12.30 |
| Silt | 43.90 |
| Clay | 40.10 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 14 |
| D60 | mm | 0.00675 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | > 4.5 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Delta-Simons
Client Address: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Contact: Jessica Rowe
Site Address: Spalding Academy

Client Reference: 20-1718.01
Job Number: 20-38989
Date Sampled: 29/10/2020
Date Received: 30/10/2020
Date Tested: 06/11/2020
Sampled By: Not Given

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

Laboratory Reference: 1670519
Hole No.: BH102
Sample Reference: Not Given
Sample Description: Grey slightly sandy very clayey SILT
Sample Preparation: Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]: 20.60
Depth Base [m]: 21.00
Sample Type: B




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 500 | 100 | 0.0626 | 99 |
| 300 | 100 | 0.0446 | 96 |
| 150 | 100 | 0.0318 | 93 |
| 125 | 100 | 0.0227 | 91 |
| 90 | 100 | 0.0163 | 86 |
| 75 | 100 | 0.0121 | 81 |
| 63 | 100 | 0.0015 | 43 |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | Particle density | (assumed) |
| 2 | 100 | 2.65 | Mg/m3 |
| 1.18 | 100 | | |
| 0.6 | 100 | | |
| 0.425 | 99 | | |
| 0.3 | 99 | | |
| 0.212 | 99 | | |
| 0.15 | 99 | | |
| 0.063 | 99 | | |

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 0.00 |
| Gravel | 0.20 |
| Sand | 1.20 |
| Silt | 50.70 |
| Clay | 47.90 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 6.3 |
| D60 | mm | 0.00387 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | > 2.6 |
| Curvature Coefficient | | |

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 100.19**

# TEST CERTIFICATE

## Determination of California Bearing Ratio

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Tested in Accordance with: BS 1377-4: 1990: Clause 7

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 28/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 12/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

**Test Results:**

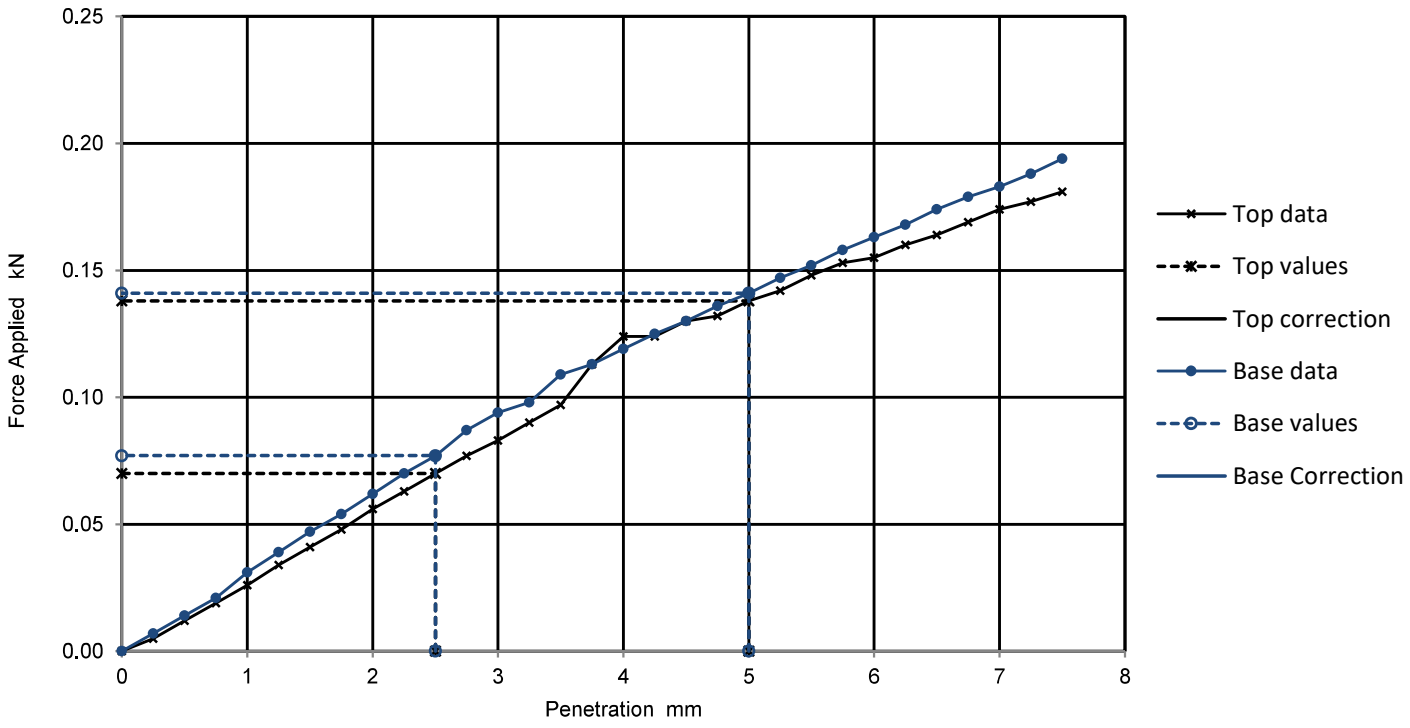
| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670510 | Depth Top [m]: | 0.40 |
| Hole No.: | DS101 | Depth Base [m]: | 0.60 |
| Sample Reference: | Not Given | Sample Type: | B |
| Sample Description: | Greyish brown CLAY | | |

**Specimen Preparation:**

| | | | |
|---|---|---|---|
| Condition | Remoulded | Soaking details | Not soaked |
| Details | Recompacted with specified standard effort using 2.5kg rammer | Period of soaking | days |
| | | Time to surface | days |
| | | Amount of swell recorded | mm |
| Material retained on 20mm sieve removed | 0 % | Dry density after soaking | Mg/m3 |

| | | | | | |
|---|---|---|---|---|---|
| Initial Specimen details | Bulk density | 1.93 | Mg/m3 | Surcharge applied | 8 kg |
| | Dry density | 1.50 | Mg/m3 | | 4.8 kPa |
| | Moisture content | 29 | % | | |

**Force v Penetration Plots**




Results

| | Curve correction applied | CBR Values, % | | | | Moisture Content % |
|---|---|---|---|---|---|---|
| | | 2.5mm | 5mm | Highest | Average | |
| TOP | No | 0.5 | 0.7 | 0.7 | 0.7 | 28 |
| BASE | No | 0.6 | 0.7 | 0.7 | | 27 |

Remarks:

Test/ Specimen specific remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 108.15**

# TEST CERTIFICATE

## Determination of California Bearing Ratio

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Tested in Accordance with: BS 1377-4: 1990: Clause 7

| | | | |
|---|---|---|---|
| Client: | Delta-Simons | Client Reference: | 20-1718.01 |
| Client Address: | 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR | Job Number: | 20-38989 |
| | | Date Sampled: | 28/10/2020 |
| | | Date Received: | 30/10/2020 |
| Contact: | Jessica Rowe | Date Tested: | 12/11/2020 |
| Site Address: | Spalding Academy | Sampled By: | Not Given |

*Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland*

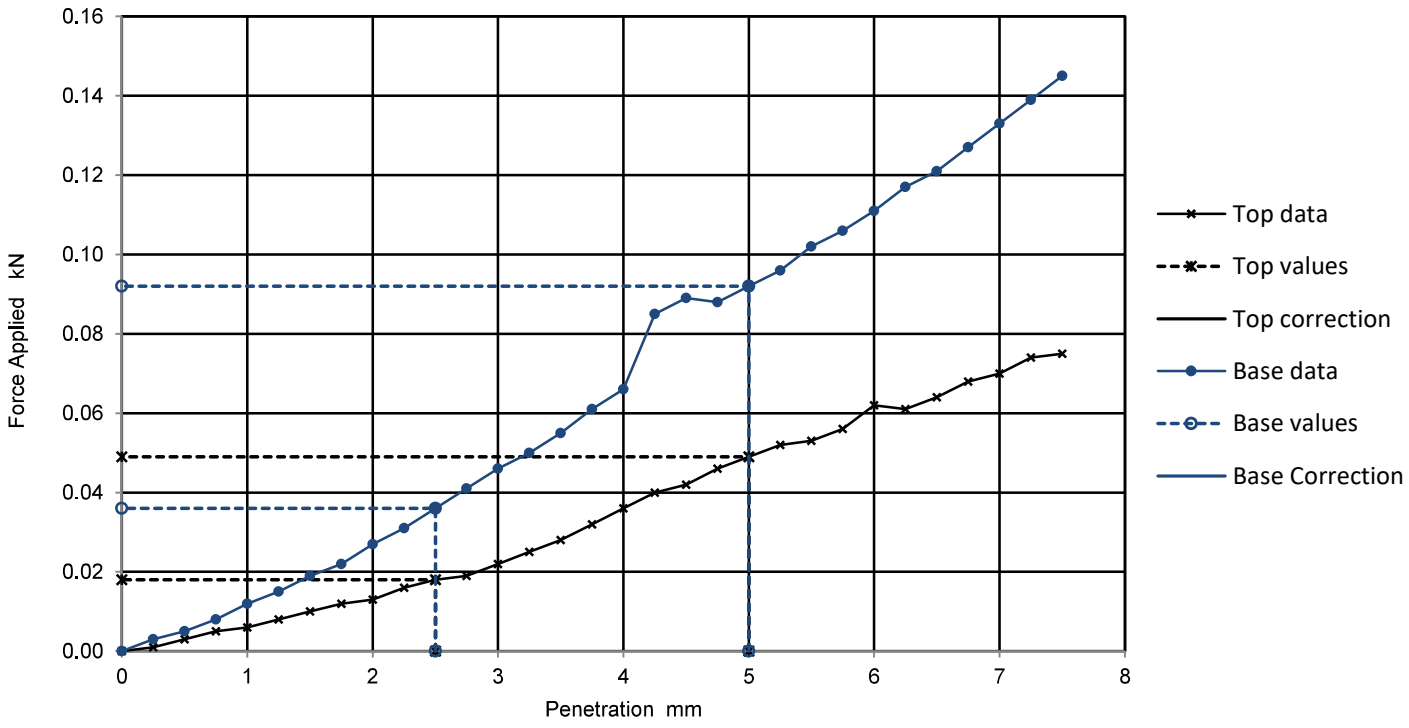
**Test Results:**

| | | | |
|---|---|---|---|
| Laboratory Reference: | 1670515 | Depth Top [m]: | 0.60 |
| Hole No.: | DS105 | Depth Base [m]: | 0.80 |
| Sample Reference: | Not Given | Sample Type: | B |
| Sample Description: | Brown CLAY | | |

**Specimen Preparation:**

| | | | |
|---|---|---|---|
| Condition | Remoulded | Soaking details | Not soaked |
| Details | Recompacted with specified standard effort using 2.5kg rammer | Period of soaking | days |
| | | Time to surface | days |
| | | Amount of swell recorded | mm |
| Material retained on 20mm sieve removed | 3 % | Dry density after soaking | Mg/m3 |
| Initial Specimen details | Bulk density 1.93 Mg/m3 | Surcharge applied | 8 kg |
| | Dry density 1.54 Mg/m3 | | 4.8 kPa |
| | Moisture content 25 % | | |

**Force v Penetration Plots**




Results

| | Curve correction applied | CBR Values, % 2.5mm | 5mm | Highest | Average | Moisture Content % |
|---|---|---|---|---|---|---|
| TOP | No | 0.1 | 0.3 | 0.3 | | 25 |
| BASE | No | 0.3 | 0.5 | 0.5 | | 24 |

Remarks:

Test/ Specimen specific remarks:

**Signed:**

Aleksandra Jurochnik
PL Technical Reviewer
**for and on behalf of i2 Analytical Ltd**

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**Date Reported:** 13/11/2020

**GF 108.15**

# Appendix D – Soil Chemical Analysis Results

**Jessica Rowe**
Delta-Simons
3 Henley Office Park
Doddington Road
Lincoln
LN6 3QR

**e:** jessica.rowe@deltasimons.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 20-38598

| | | | |
|---|---|---|---|
| **Project / Site name:** | Spalding Academy | **Samples received on:** | 29/10/2020 |
| **Your job number:** | 20 1718 01 | **Samples instructed on/ Analysis started on:** | 29/10/2020 |
| **Your order number:** | DS57563 | **Analysis completed by:** | 05/11/2020 |
| **Report Issue Number:** | 1 | **Report issued on:** | 05/11/2020 |
| **Samples Analysed:** | 12 soil samples | | |

**Signed:**

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 20-38598**
**Project / Site name: Spalding Academy**
**Your Order No: DS57563**

| Lab Sample Number | | | | 1668701 | 1668702 | 1668703 | 1668704 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | BH101 | BH101 | BH102 | BH102 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.20-0.25 | 0.40-0.45 | 0.30-0.35 | 1.50-1.65 |
| Date Sampled | | | | 26/10/2020 | 26/10/2020 | 28/10/2020 | 28/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 12 | 15 | 14 | 17 |
| Total mass of sample received | kg | 0.001 | NONE | 1.2 | 1.2 | 1.2 | 0.7 |
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | - | Not-detected | - |

**General Inorganics**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| pH - Automated | pH Units | N/A | MCERTS | - | - | - | 8.6 |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | - | - | - | 440 |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | - | - | - | 0.044 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | - | - | - | 33 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | - | - | - | 0.016 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | - | - | - | 16.3 |
| Total Sulphur | % | 0.005 | MCERTS | - | - | - | 0.02 |
| Organic Matter | % | 0.1 | MCERTS | - | - | - | 1.2 |

**Speciated PAHs**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | - |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | - |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | 0.69 | < 0.05 | - |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | 0.65 | < 0.05 | - |
| Phenanthrene | mg/kg | 0.05 | MCERTS | 0.47 | 6.2 | 0.23 | - |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | 1.4 | < 0.05 | - |
| Fluoranthene | mg/kg | 0.05 | MCERTS | 0.42 | 9.6 | 0.64 | - |
| Pyrene | mg/kg | 0.05 | MCERTS | 0.38 | 8.4 | 0.59 | - |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | 4.2 | 0.44 | - |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 | 3.5 | 0.41 | - |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | 6.2 | 0.63 | - |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | 1.5 | 0.25 | - |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | 4 | 0.41 | - |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | 1.5 | < 0.05 | - |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | 0.42 | < 0.05 | - |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | 1.7 | < 0.05 | - |

**Total PAH**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | 1.27 | 49.8 | 3.6 | - |

**Heavy Metals / Metalloids**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 9.3 | 10 | 16 | - |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 | < 0.2 | < 0.2 | - |
| Chromium (hexavalent) | mg/kg | 1.2 | MCERTS | < 1.2 | < 1.2 | < 1.2 | - |
| Chromium (III) | mg/kg | 1 | NONE | 7.9 | 16 | 28 | - |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | 7.8 | 16 | 28 | - |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 5.2 | 14 | 24 | - |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 4.6 | 29 | 36 | - |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 | - |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 6 | 14 | 23 | - |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 20 | 90 | 88 | - |

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**Analytical Report Number: 20-38598**
**Project / Site name: Spalding Academy**
**Your Order No: DS57563**

| Lab Sample Number | | | | 1668701 | 1668702 | 1668703 | 1668704 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | BH101 | BH101 | BH102 | BH102 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.20-0.25 | 0.40-0.45 | 0.30-0.35 | 1.50-1.65 |
| Date Sampled | | | | 26/10/2020 | 26/10/2020 | 28/10/2020 | 28/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| **Monoaromatics & Oxygenates** | | | | | | | |
| Benzene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| Toluene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| Ethylbenzene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| p & m-xylene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| o-xylene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| MTBE (Methyl Tertiary Butyl Ether) | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| **Petroleum Hydrocarbons** | | | | | | | |
| TPH-CWG - Aliphatic >EC5 - EC6 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| TPH-CWG - Aliphatic >EC6 - EC8 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| TPH-CWG - Aliphatic >EC8 - EC10 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| TPH-CWG - Aliphatic >EC10 - EC12 | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |
| TPH-CWG - Aliphatic >EC12 - EC16 | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 | - |
| TPH-CWG - Aliphatic >EC16 - EC21 | mg/kg | 8 | MCERTS | < 8.0 | < 8.0 | < 8.0 | - |
| TPH-CWG - Aliphatic >EC21 - EC35 | mg/kg | 8 | MCERTS | < 8.0 | 95 | < 8.0 | - |
| TPH-CWG - Aliphatic >EC35 - EC40 | mg/kg | 10 | NONE | < 10 | 40 | < 10 | - |
| TPH-CWG - Aliphatic (EC5 - EC35) | mg/kg | 10 | MCERTS | < 10 | 98 | < 10 | - |
| TPH-CWG - Aromatic >EC5 - EC7 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| TPH-CWG - Aromatic >EC7 - EC8 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| TPH-CWG - Aromatic >EC8 - EC10 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | - |
| TPH-CWG - Aromatic >EC10 - EC12 | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | - |
| TPH-CWG - Aromatic >EC12 - EC16 | mg/kg | 2 | MCERTS | < 2.0 | 14 | < 2.0 | - |
| TPH-CWG - Aromatic >EC16 - EC21 | mg/kg | 10 | MCERTS | < 10 | 100 | < 10 | - |
| TPH-CWG - Aromatic >EC21 - EC35 | mg/kg | 10 | MCERTS | < 10 | 330 | < 10 | - |
| TPH-CWG - Aromatic >EC35 - EC40 | mg/kg | 10 | NONE | < 10 | 110 | < 10 | - |
| TPH-CWG - Aromatic (EC5 - EC35) | mg/kg | 10 | MCERTS | < 10 | 450 | < 10 | - |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | < 10 | 150 | < 10 | - |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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**Analytical Report Number: 20-38598**
**Project / Site name: Spalding Academy**
**Your Order No: DS57563**

| Lab Sample Number | | | | 1668705 | 1668706 | 1668707 | 1668708 |
|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | DS101 | DS101 | DS102 | DS103 |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | 0.10-0.15 | 0.30-0.35 | 0.15-0.20 | 0.20-0.25 |
| **Date Sampled** | | | | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 11 | 15 | 6.4 | 2 |
| Total mass of sample received | kg | 0.001 | NONE | 1.2 | 1.2 | 1.2 | 1.2 |
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | - | Not-detected | Not-detected |
| **General Inorganics** | | | | | | | |
| pH - Automated | pH Units | N/A | MCERTS | - | - | - | - |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | - | - | - | - |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | - | - | - | - |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | - | - | - | - |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | - | - | - | - |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | - | - | - | - |
| Total Sulphur | % | 0.005 | MCERTS | - | - | - | - |
| Organic Matter | % | 0.1 | MCERTS | - | - | - | - |
| **Speciated PAHs** | | | | | | | |
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| **Total PAH** | | | | | | | |
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | < 0.80 | < 0.80 | < 0.80 |
| **Heavy Metals / Metalloids** | | | | | | | |
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 15 | 18 | 7.6 | 4.4 |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Chromium (hexavalent) | mg/kg | 1.2 | MCERTS | < 1.2 | < 1.2 | < 1.2 | < 1.2 |
| Chromium (III) | mg/kg | 1 | NONE | 11 | 16 | 7.5 | 11 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | 11 | 16 | 7.5 | 11 |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 7.5 | 12 | 7.2 | 13 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 17 | 45 | 4.4 | 8.4 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 9.4 | 13 | 7.9 | 12 |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 36 | 57 | 24 | 43 |

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**Analytical Report Number: 20-38598**
**Project / Site name: Spalding Academy**
**Your Order No: DS57563**

| Lab Sample Number | | | | 1668705 | 1668706 | 1668707 | 1668708 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | DS101 | DS101 | DS102 | DS103 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.10-0.15 | 0.30-0.35 | 0.15-0.20 | 0.20-0.25 |
| Date Sampled | | | | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| **Monoaromatics & Oxygenates** | | | | | | | |
| Benzene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Toluene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Ethylbenzene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| p & m-xylene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| o-xylene | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| MTBE (Methyl Tertiary Butyl Ether) | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| **Petroleum Hydrocarbons** | | | | | | | |
| TPH-CWG - Aliphatic >EC5 - EC6 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC6 - EC8 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC8 - EC10 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC10 - EC12 | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >EC12 - EC16 | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| TPH-CWG - Aliphatic >EC16 - EC21 | mg/kg | 8 | MCERTS | < 8.0 | < 8.0 | < 8.0 | < 8.0 |
| TPH-CWG - Aliphatic >EC21 - EC35 | mg/kg | 8 | MCERTS | < 8.0 | < 8.0 | < 8.0 | 300 |
| TPH-CWG - Aliphatic >EC35 - EC40 | mg/kg | 10 | NONE | < 10 | < 10 | < 10 | 200 |
| TPH-CWG - Aliphatic (EC5 - EC35) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | 300 |
| TPH-CWG - Aromatic >EC5 - EC7 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC7 - EC8 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC8 - EC10 | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC10 - EC12 | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aromatic >EC12 - EC16 | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| TPH-CWG - Aromatic >EC16 - EC21 | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >EC21 - EC35 | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | 670 |
| TPH-CWG - Aromatic >EC35 - EC40 | mg/kg | 10 | NONE | < 10 | < 10 | < 10 | 320 |
| TPH-CWG - Aromatic (EC5 - EC35) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | 670 |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | 520 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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**Analytical Report Number: 20-38598**
**Project / Site name: Spalding Academy**
**Your Order No: DS57563**

| Lab Sample Number | | | | 1668709 | 1668710 | 1668711 | 1668712 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | DS103 | DS104 | DS105 | DS105 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.60-0.65 | 0.20-0.25 | 0.10-0.15 | 0.50-0.55 |
| Date Sampled | | | | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 14 | 2.5 | 9 | 18 |
| Total mass of sample received | kg | 0.001 | NONE | 1.2 | 1.2 | 1.2 | 1.2 |
| Asbestos in Soil | Type | N/A | ISO 17025 | - | Not-detected | Not-detected | - |
| **General Inorganics** | | | | | | | |
| pH - Automated | pH Units | N/A | MCERTS | 8.5 | - | - | 8.5 |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | 390 | - | - | 450 |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | 0.039 | - | - | 0.045 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | 43 | - | - | 22 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.021 | - | - | 0.011 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 21.3 | - | - | 11 |
| Total Sulphur | % | 0.005 | MCERTS | 0.017 | - | - | 0.018 |
| Organic Matter | % | 0.1 | MCERTS | 0.7 | - | - | 0.9 |
| **Speciated PAHs** | | | | | | | |
| Naphthalene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.31 | < 0.05 |
| Pyrene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.32 | < 0.05 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.26 | < 0.05 |
| Chrysene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.24 | < 0.05 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.28 | < 0.05 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.17 | < 0.05 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | - | < 0.05 | 0.22 | < 0.05 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | - | < 0.05 | < 0.05 | < 0.05 |
| **Total PAH** | | | | | | | |
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | - | < 0.80 | 1.8 | < 0.80 |
| **Heavy Metals / Metalloids** | | | | | | | |
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 3.9 | 12 | 10 |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | - | < 0.2 | 0.6 | < 0.2 |
| Chromium (hexavalent) | mg/kg | 1.2 | MCERTS | - | < 1.2 | < 1.2 | < 1.2 |
| Chromium (III) | mg/kg | 1 | NONE | - | 14 | 16 | 20 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 14 | 16 | 20 |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 13 | 20 | 11 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 5.1 | 38 | 17 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | - | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 13 | 13 | 17 |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 38 | 98 | 46 |

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**Analytical Report Number: 20-38598**
**Project / Site name: Spalding Academy**
**Your Order No: DS57563**

| Lab Sample Number | | | | 1668709 | 1668710 | 1668711 | 1668712 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | DS103 | DS104 | DS105 | DS105 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.60-0.65 | 0.20-0.25 | 0.10-0.15 | 0.50-0.55 |
| Date Sampled | | | | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| **Monoaromatics & Oxygenates** | | | | | | | |
| Benzene | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| Toluene | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| Ethylbenzene | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| p & m-xylene | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| o-xylene | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| MTBE (Methyl Tertiary Butyl Ether) | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| **Petroleum Hydrocarbons** | | | | | | | |
| TPH-CWG - Aliphatic >EC5 - EC6 | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC6 - EC8 | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC8 - EC10 | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC10 - EC12 | mg/kg | 1 | MCERTS | - | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >EC12 - EC16 | mg/kg | 2 | MCERTS | - | < 2.0 | < 2.0 | < 2.0 |
| TPH-CWG - Aliphatic >EC16 - EC21 | mg/kg | 8 | MCERTS | - | < 8.0 | < 8.0 | < 8.0 |
| TPH-CWG - Aliphatic >EC21 - EC35 | mg/kg | 8 | MCERTS | - | 370 | < 8.0 | < 8.0 |
| TPH-CWG - Aliphatic >EC35 - EC40 | mg/kg | 10 | NONE | - | 240 | < 10 | < 10 |
| TPH-CWG - Aliphatic (EC5 - EC35) | mg/kg | 10 | MCERTS | - | 370 | < 10 | < 10 |
| TPH-CWG - Aromatic >EC5 - EC7 | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC7 - EC8 | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC8 - EC10 | mg/kg | 0.001 | MCERTS | - | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC10 - EC12 | mg/kg | 1 | MCERTS | - | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aromatic >EC12 - EC16 | mg/kg | 2 | MCERTS | - | < 2.0 | < 2.0 | < 2.0 |
| TPH-CWG - Aromatic >EC16 - EC21 | mg/kg | 10 | MCERTS | - | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >EC21 - EC35 | mg/kg | 10 | MCERTS | - | 720 | < 10 | < 10 |
| TPH-CWG - Aromatic >EC35 - EC40 | mg/kg | 10 | NONE | - | 350 | < 10 | < 10 |
| TPH-CWG - Aromatic (EC5 - EC35) | mg/kg | 10 | MCERTS | - | 730 | < 10 | < 10 |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | - | 590 | < 10 | < 10 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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**Analytical Report Number : 20-38598**
**Project / Site name: Spalding Academy**

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description * |
|---|---|---|---|---|
| 1668701 | BH101 | None Supplied | 0.20-0.25 | Light brown sandy clay with gravel. |
| 1668702 | BH101 | None Supplied | 0.40-0.45 | Brown loam and clay with gravel. |
| 1668703 | BH102 | None Supplied | 0.30-0.35 | Brown loam and clay with gravel and vegetation. |
| 1668704 | BH102 | None Supplied | 1.50-1.65 | Brown clay and loam with gravel and vegetation. |
| 1668705 | DS101 | None Supplied | 0.10-0.15 | Brown loam and clay with gravel and vegetation. |
| 1668706 | DS101 | None Supplied | 0.30-0.35 | Brown loam and clay with gravel and vegetation. |
| 1668707 | DS102 | None Supplied | 0.15-0.20 | Brown loam and sand with gravel. |
| 1668708 | DS103 | None Supplied | 0.20-0.25 | Brown loam and sand with gravel. |
| 1668709 | DS103 | None Supplied | 0.60-0.65 | Brown loam and sand with gravel. |
| 1668710 | DS104 | None Supplied | 0.20-0.25 | Brown loam and sand with gravel. |
| 1668711 | DS105 | None Supplied | 0.10-0.15 | Brown loam and clay with gravel and vegetation. |
| 1668712 | DS105 | None Supplied | 0.50-0.55 | Brown clay and loam with gravel. |

**Analytical Report Number : 20-38598**
**Project / Site name: Spalding Academy**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)**

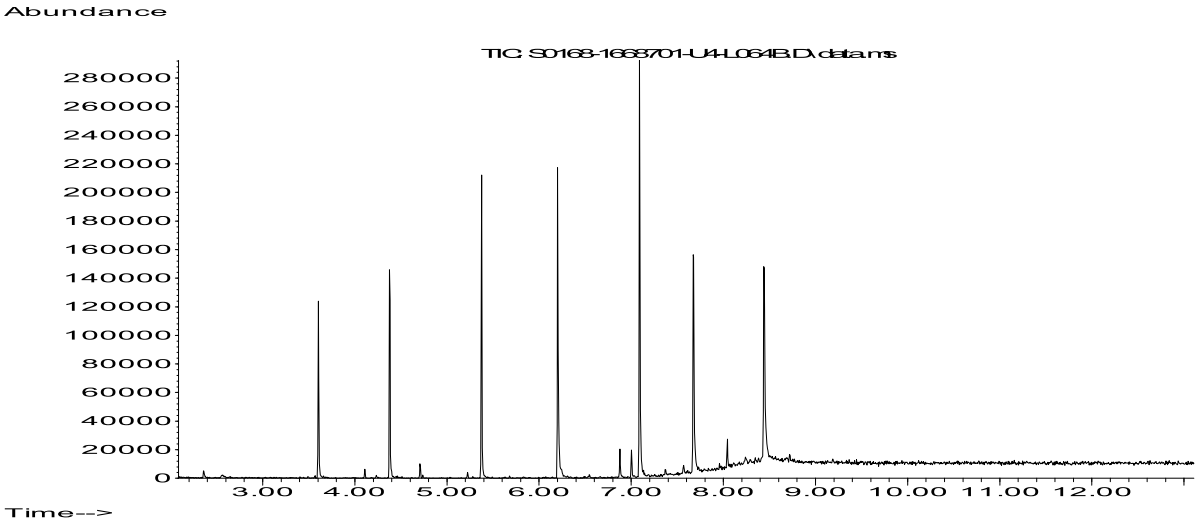
| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Metals in soil by ICP-OES | Determination of metals in soil by aqua-regia digestion followed by ICP-OES. | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil. | L038-PL | D | MCERTS |
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |
| Asbestos identification in soil | Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques. | In house method based on HSG 248 | A001-PL | D | ISO 17025 |
| Hexavalent chromium in soil (Lower Level) | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry. | In-house method | L080-PL | W | MCERTS |
| Moisture Content | Moisture content, determined gravimetrically. (30 oC) | In house method. | L019-UK/PL | W | NONE |
| Organic matter (Automated) in soil | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate. | In house method. | L009-PL | D | MCERTS |
| Speciated EPA-16 PAHs in soil | Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. | In-house method based on USEPA 8270 | L064-PL | D | MCERTS |
| pH in soil (automated) | Determination of pH in soil by addition of water followed by automated electrometric measurement. | In house method. | L099-PL | D | MCERTS |
| Total sulphate (as SO4 in soil) | Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| Stones content of soil | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight. | In-house method based on British Standard Methods and MCERTS requirements. | L019-UK/PL | D | NONE |
| TPH Chromatogram in Soil | TPH Chromatogram in Soil. | In-house method | L064-PL | D | NONE |
| TPH in (Soil) | Determination of TPH bands by HS-GC-MS/GC-FID | In-house method, TPH with carbon banding and silica gel split/cleanup. | L076-PL | D | NONE |
| Cr (III) in soil | In-house method by calculation from total Cr and Cr VI. | In-house method by calculation | L080-PL | W | NONE |
| TPHCWG (Soil) | Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. | In-house method with silica gel split/clean up. | L088/76-PL | W | MCERTS |
| Total Sulphate in soil as % | Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| Total Sulphur in soil as % | Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |

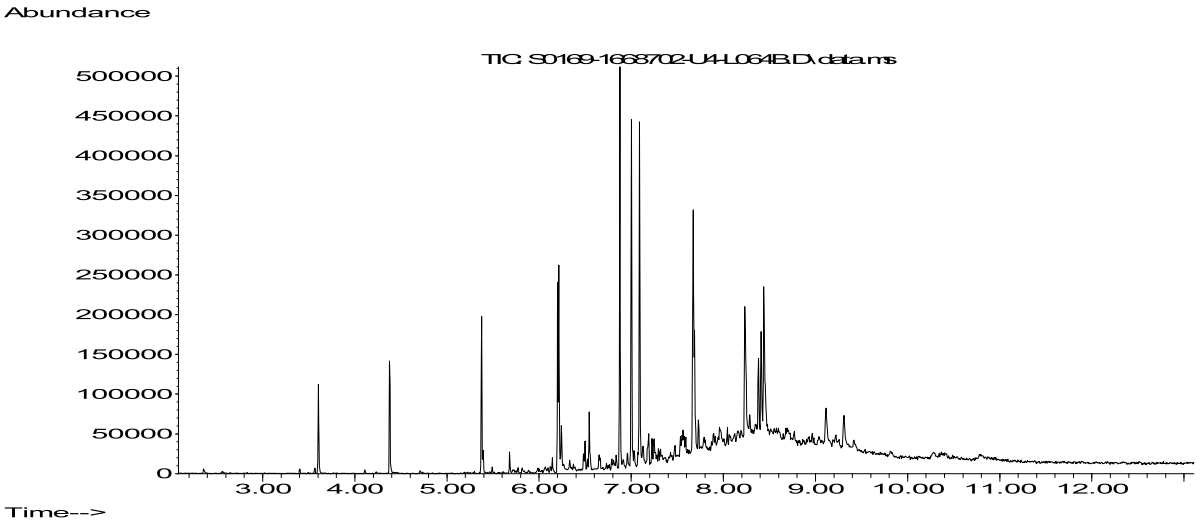
**Analytical Report Number : 20-38598**
**Project / Site name: Spalding Academy**

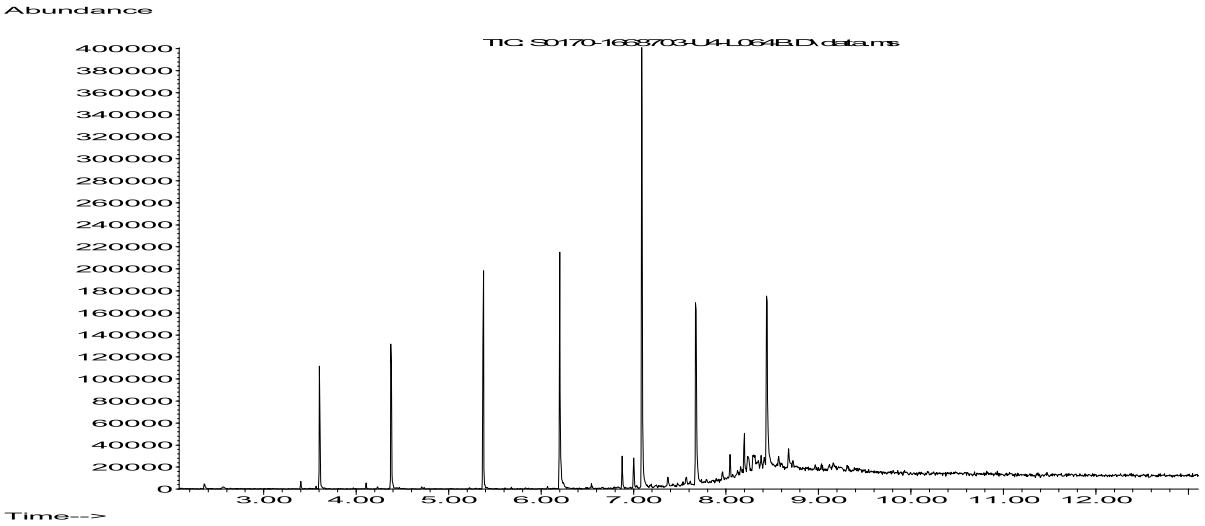
**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)**

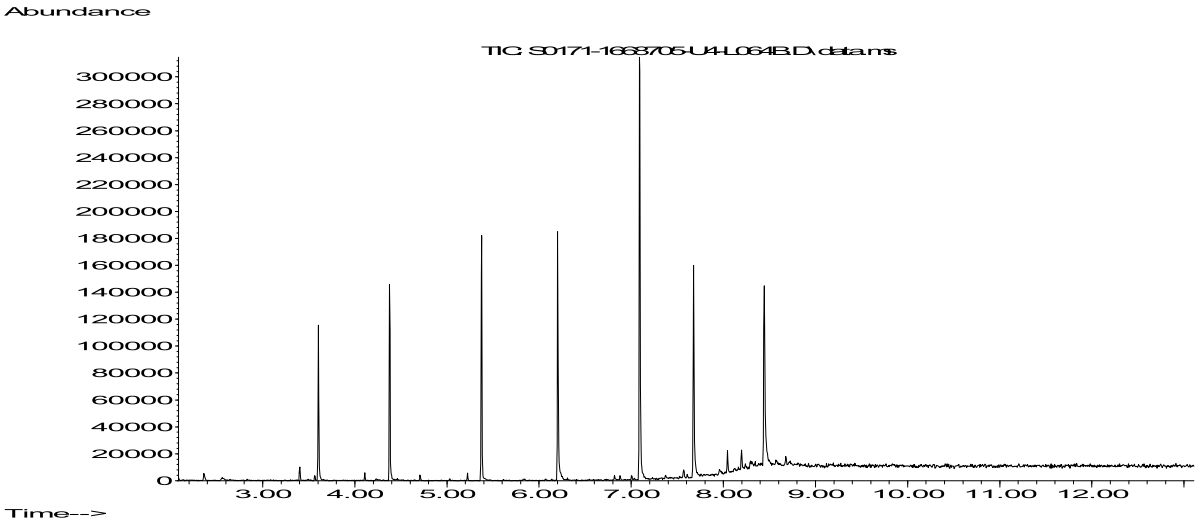
| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| D.O. for Gravimetric Quant if Screen/ID positive | Dependent option for Gravimetric Quant if Screen/ID positive scheduled. | In house asbestos methods A001 & A006. | A006-PL | D | NONE |
| BTEX and MTBE in soil (Monoaromatics) | Determination of BTEX in soil by headspace GC-MS. | In-house method based on USEPA8260 | L073B-PL | W | MCERTS |
| Sulphate, water soluble, in soil | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |

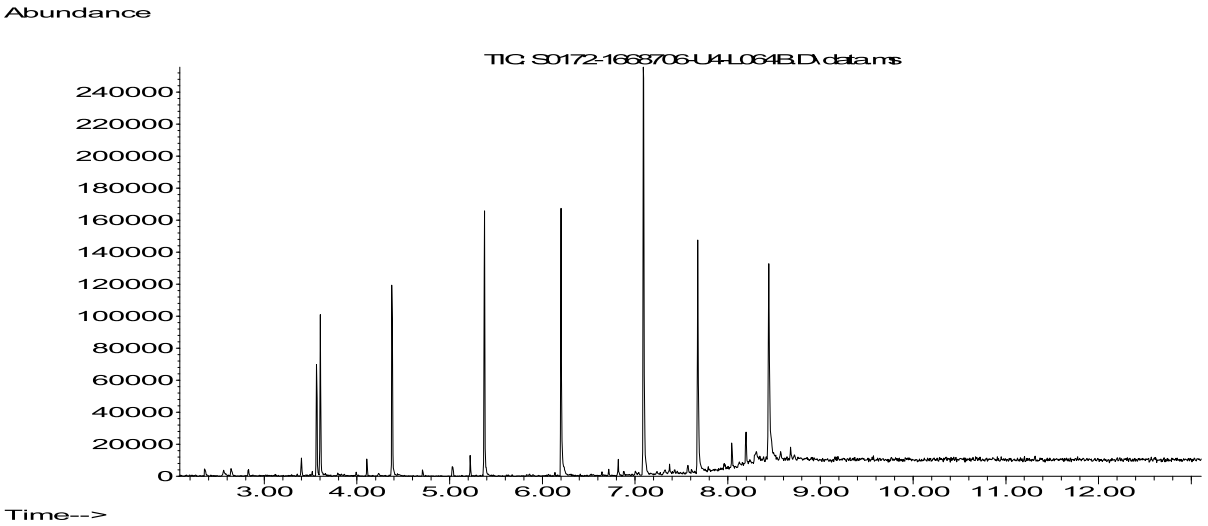
**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

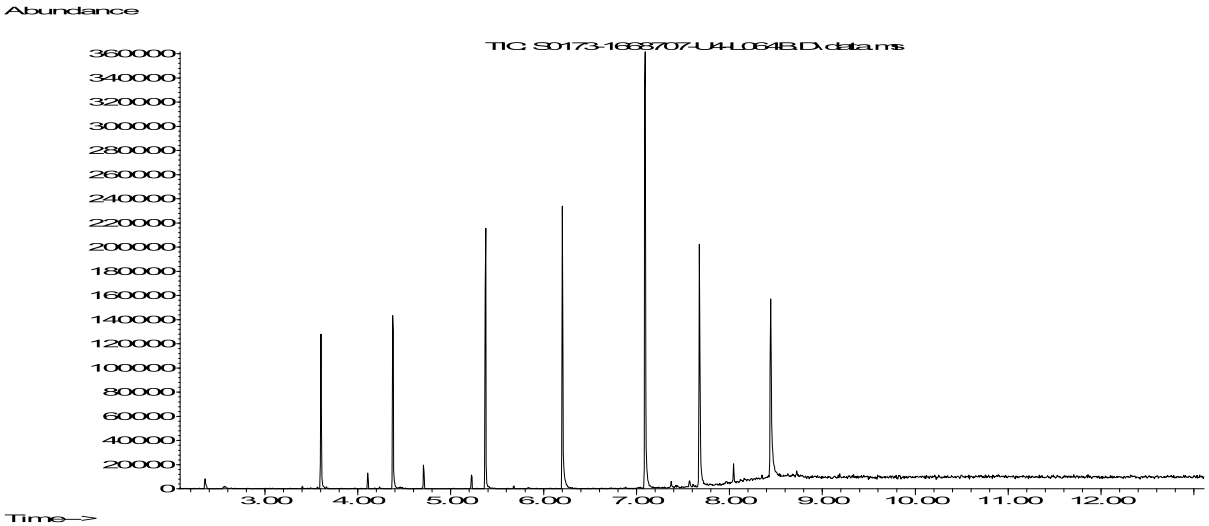

Abundance
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80000
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40000
20000
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3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

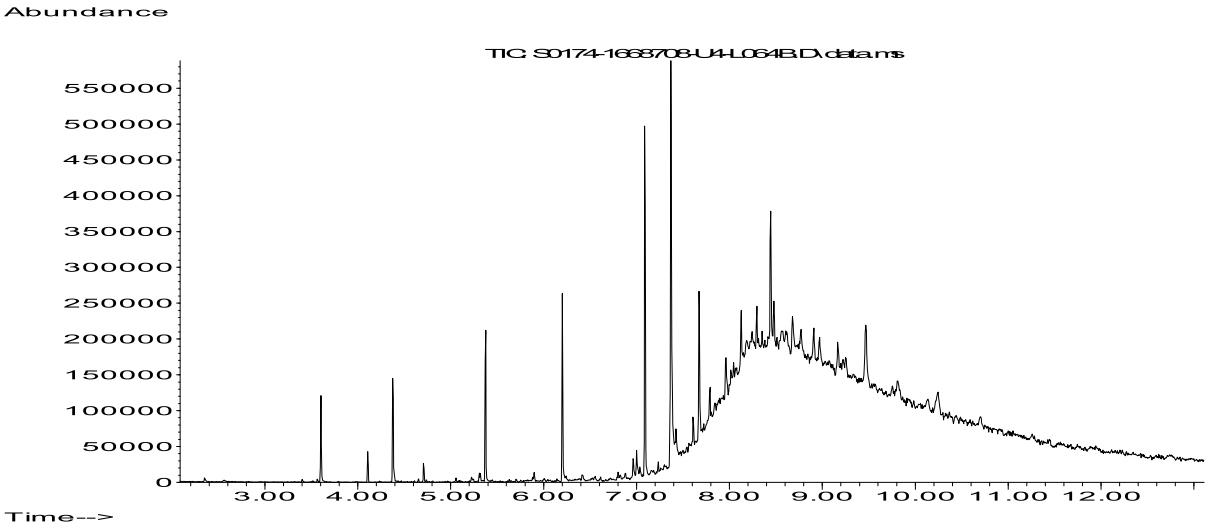

Abundance
TIC: S0169-1668702-U4-L064B.D\data.ms
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

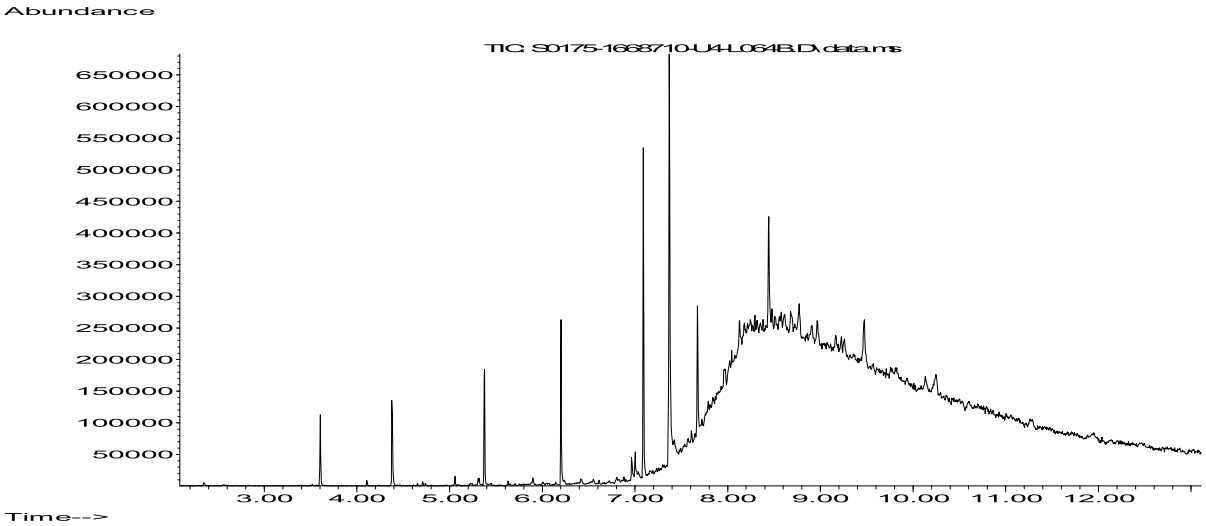

Abundance
TIC: S0170-1668703-U4-L064B.D\data.ms
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380000
360000
340000
320000
300000
280000
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

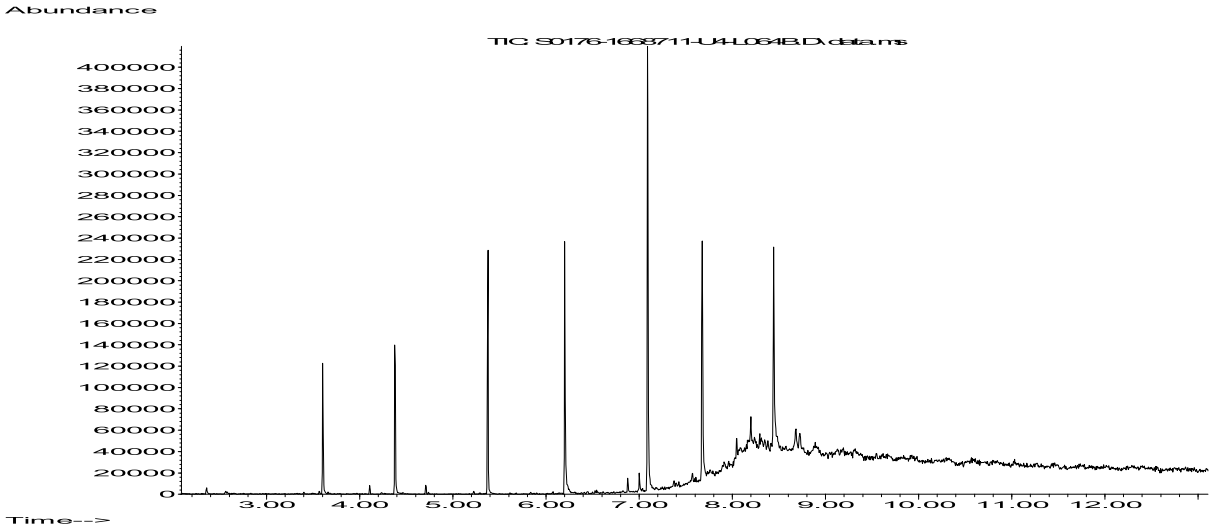

Abundance
TIC: S0171-1668705-U4-L064B.D\data.ms
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280000
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

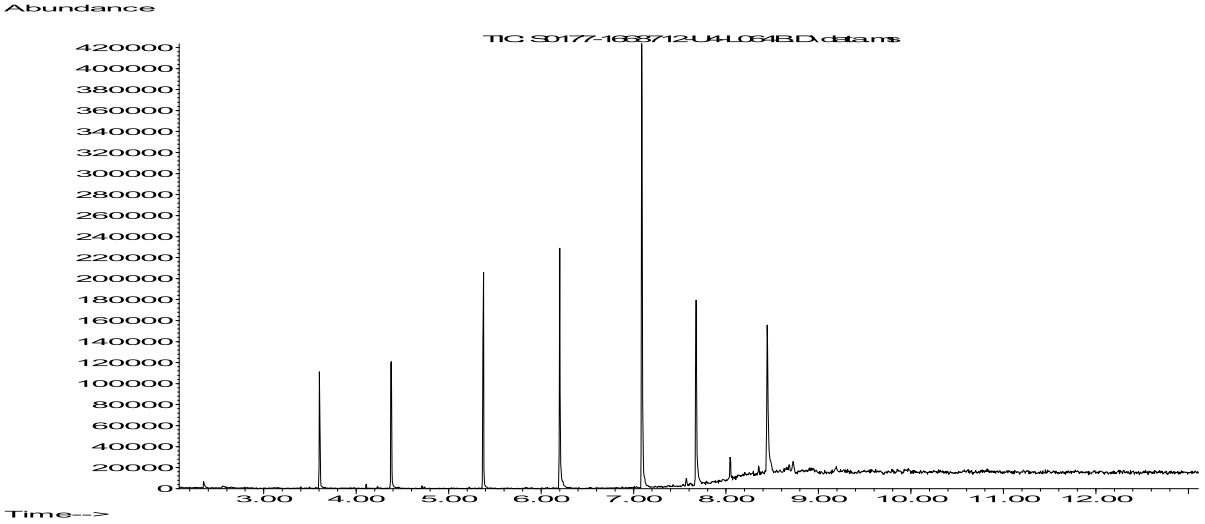

Abundance
TIC: S0172-1668706-U4L064B.D\data.ms
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S0173-1668707-UH-L084B.D\data.ms
360000
340000
320000
300000
280000
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S0174-1668708-UHL064B.D\data.ms
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S0175-1668710-U4-L064B.D\data.ms
650000
600000
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC: S0176-1668711-UH-L064B.D.data.ms
400000
380000
360000
340000
320000
300000
280000
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->


Abundance
TIC S0177-1668712U4L064BD\data.ms
420000
400000
380000
360000
340000
320000
300000
280000
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

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# Analytical Report Number : 20-38992

| | | | |
|---|---|---|---|
| **Project / Site name:** | Spalding Academy | **Samples received on:** | 30/10/2020 |
| **Your job number:** | 20-1718.01 | **Samples instructed on/ Analysis started on:** | 02/11/2020 |
| **Your order number:** | DS57566 | **Analysis completed by:** | 13/11/2020 |
| **Report Issue Number:** | 1 | **Report issued on:** | 13/11/2020 |
| **Samples Analysed:** | 9 soil samples | | |

**Signed:**

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 20-38992**
**Project / Site name: Spalding Academy**
**Your Order No: DS57566**

| Lab Sample Number | | | | 1670529 | 1670530 | 1670531 | 1670532 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | BH101 | BH101 | BH101 | BH101 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 5.85-5.90 | 12.00-12.45 | 18.00-18.45 | 23.00-23.44 |
| Date Sampled | | | | 26/10/2020 | 27/10/2020 | 27/10/2020 | 27/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 32 | 15 | 13 | 14 |
| Total mass of sample received | kg | 0.001 | NONE | 0.7 | 0.7 | 0.7 | 0.7 |

**General Inorganics**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| pH - Automated | pH Units | N/A | MCERTS | 8 | 9.1 | 8.5 | 8.7 |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | 0.145 | 0.065 | 0.064 | 0.1 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | 1200 | 150 | 470 | 580 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.61 | 0.077 | 0.24 | 0.29 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 607 | 77.4 | 236 | 290 |
| Total Sulphur | % | 0.005 | MCERTS | 0.731 | 0.073 | 0.762 | 0.852 |
| Organic Matter | % | 0.1 | MCERTS | 2.8 | 0.5 | 2.7 | 2.8 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number: 20-38992**
**Project / Site name: Spalding Academy**
**Your Order No: DS57566**

| Lab Sample Number | | | | 1670533 | 1670534 | 1670535 | 1670536 |
|---|---|---|---|---|---|---|---|
| Sample Reference | | | | DS103 | BH102 | BH102 | BH102 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 1.00-1.20 | 2.50-2.95 | 9.00-9.50 | 17.00-17.50 |
| Date Sampled | | | | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 19 | 23 | 31 | 13 |
| Total mass of sample received | kg | 0.001 | NONE | 0.7 | 0.7 | 0.7 | 0.7 |

**General Inorganics**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| pH - Automated | pH Units | N/A | MCERTS | 8.8 | 8.5 | 8.8 | 8.7 |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | 0.024 | 0.055 | 0.123 | 0.072 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | 52 | 340 | 1200 | 580 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.026 | 0.17 | 0.59 | 0.29 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 25.8 | 171 | 589 | 291 |
| Total Sulphur | % | 0.005 | MCERTS | 0.018 | 0.095 | 1.06 | 0.772 |
| Organic Matter | % | 0.1 | MCERTS | 0.9 | 0.4 | 3.8 | 2.5 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number: 20-38992**
**Project / Site name: Spalding Academy**
**Your Order No: DS57566**

| | | | | |
|---|---|---|---|---|
| **Lab Sample Number** | | | | 1670537 |
| **Sample Reference** | | | | BH102 |
| **Sample Number** | | | | None Supplied |
| **Depth (m)** | | | | 25.00-25.38 |
| **Date Sampled** | | | | 29/10/2020 |
| **Time Taken** | | | | None Supplied |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | |
| Stone Content | % | 0.1 | NONE | < 0.1 |
| Moisture Content | % | 0.01 | NONE | 13 |
| Total mass of sample received | kg | 0.001 | NONE | 0.5 |

**General Inorganics**

| | | | | |
|---|---|---|---|---|
| pH - Automated | pH Units | N/A | MCERTS | 8.7 |
| Total Sulphate as SO4 | % | 0.005 | MCERTS | 0.108 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | 660 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.33 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 328 |
| Total Sulphur | % | 0.005 | MCERTS | 0.702 |
| Organic Matter | % | 0.1 | MCERTS | 2.5 |

U/S = Unsuitable Sample  I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

**Analytical Report Number : 20-38992**
**Project / Site name: Spalding Academy**

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description * |
|---|---|---|---|---|
| 1670529 | BH101 | None Supplied | 5.85-5.90 | Brown clay and loam with gravel and vegetation. |
| 1670530 | BH101 | None Supplied | 12.00-12.45 | Brown gravelly sand. |
| 1670531 | BH101 | None Supplied | 18.00-18.45 | Brown clay and loam with gravel. |
| 1670532 | BH101 | None Supplied | 23.00-23.44 | Brown clay. |
| 1670533 | DS103 | None Supplied | 1.00-1.20 | Brown clay and loam with gravel and vegetation. |
| 1670534 | BH102 | None Supplied | 2.50-2.95 | Brown clay and sand with gravel. |
| 1670535 | BH102 | None Supplied | 9.00-9.50 | Brown clay and loam. |
| 1670536 | BH102 | None Supplied | 17.00-17.50 | Brown clay with gravel and chalk. |
| 1670537 | BH102 | None Supplied | 25.00-25.38 | Brown clay. |

**Analytical Report Number : 20-38992**
**Project / Site name: Spalding Academy**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |
| Moisture Content | Moisture content, determined gravimetrically. (30 oC) | In house method. | L019-UK/PL | W | NONE |
| Organic matter (Automated) in soil | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate. | In house method. | L009-PL | D | MCERTS |
| pH in soil (automated) | Determination of pH in soil by addition of water followed by automated electrometric measurement. | In house method. | L099-PL | D | MCERTS |
| Stones content of soil | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight. | In-house method based on British Standard Methods and MCERTS requirements. | L019-UK/PL | D | NONE |
| Total Sulphate in soil as % | Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| Total Sulphur in soil as % | Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| Sulphate, water soluble, in soil | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

# Appendix E – Field Monitoring Data/ Falling Head Test Data

| Site Name | Spalding Academy | Job number | 20-1718.01 |
|---|---|---|---|
| Client | Lincolnshire County Council | Recorded by | DD |
| Date (DD/MM/YYYY) | 04/11/2020 | | |
| Gas Analyser | GFM435 (Gas Kit 1-GCEN-LIN) - 12787 | Visit Number | 1 |

| Readings at start | $CH_4$ (% v/v) | <0.1 | $CO_2$ (% v/v) | <0.1 | $O_2$ (% v/v) | 19.3 | $H_2S$ (ppm) | 0 | |
|---|---|---|---|---|---|---|---|---|---|
| General comments | | | | | | | | | |

| WEATHER | Start | End |
|---|---|---|
| Time | 10:10 | 10:30 |
| Weather (dry/rain/snow/ice) | Dry | Dry |
| Pressure (mb) | 1036.00 | 1036.00 |
| Risking/Falling Trend | Rising | |
| Wind Speed (m/s) | 4.72 | 4.72 |
| Wind Dir. (From) | W | W |
| Temperature °c | 6.00 | |
| SWL Measured from | Ground Level | |

| Ref | GROUND GAS | | | | | | | | | | | | | GROUNDWATER | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flow | | $CH_4$ | | $CO_2$ | | $O_2$ | | $H_2S$ | CO | VOC | Differential (Relative) Pressure | Atmos. Pressure | Depth to free product | Depth to water | Depth to base | (e.g. water colour, sheen, odour, damage to well or gas tap, flooded ground etc.)<br>$ For **Depth to water** state<br>**Depth to water or Dry or NR (= Not Recorded - provide reason if monitoring was intended)**<br># For Depth to Product state<br>**ND (= Not detected - product looked for but absent) or NR (= Not Recorded - instrument used unable to detect product)** |
| | l/hr | | % v/v | | % v/v | | % v/v | | ppm | | | mb | mb | m | m | m | |
| | Max | Steady | Max | Steady | Max | Steady | Min | Steady | Max | Max | Max | | | | | | |
| | The formulae require that only numbers, "<0.1" for ground gas and flow or "DRY" for groundwater are entered in the sheet | | | | | | | | | | | | | | | | |
| DS104 | <0.1 | <0.1 | <0.1 | <0.1 | 0.8 | 0.8 | 16.6 | 16.6 | 0.0 | 0.0 | NR | 0.0 | 1036 | NR | 1.07 | 3.03 | |
| BH101 | <0.1 | <0.1 | <0.1 | <0.1 | 0.4 | 0.4 | 18.9 | 18.9 | 0.0 | 0.0 | NR | 0.0 | 1036 | NR | 0.96 | 5.00 | |



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| Site Name | Spalding Academy | Job number | 20-1718.01 |
|---|---|---|---|
| Client | Lincolnshire County Council | Recorded by | JB |
| Date (DD/MM/YYYY) | 10/11/2020 | | |
| Gas Analyser | GFM436 (Gas Kit 4-GSOU-LIN) - 11030 | Visit Number | 2 |

| Readings at start | $CH_4$ (% v/v) | <0.1 | $CO_2$ (% v/v) | <0.1 | $O_2$ (% v/v) | 20.1 | $H_2S$ (ppm) | 0 | |
|---|---|---|---|---|---|---|---|---|---|
| General comments | | | | | | | | | |

| WEATHER | Start | End |
|---|---|---|
| Time | 13.00 | 14.00 |
| Weather (dry/rain/snow/ice) | DRY | DRY |
| Pressure (mb) | 1025.00 | 1024.00 |
| Risking/Falling Trend | STEADY | |
| Wind Speed (m/s) | 2.00 | 2.00 |
| Wind Dir. (From) | SSW | SSW |
| Temperature °c | 13.00 | |
| SWL Measured from | Ground Level | |

| Ref | GROUND GAS | | | | | | | | | | | | | GROUNDWATER | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flow | | $CH_4$ | | $CO_2$ | | $O_2$ | | $H_2S$ | CO | VOC | Differential (Relative) Pressure | Atmos. Pressure | Depth to free product | Depth to water | Depth to base | (e.g. water colour, sheen, odour, damage to well or gas tap, flooded ground etc.)<br>$ For **Depth to water** state<br>**Depth to water or Dry or NR (= Not Recorded - provide reason if monitoring was intended)**<br># For Depth to Product state<br>**ND (= Not detected - product looked for but absent) or NR (= Not Recorded - instrument used unable to detect product)** |
| | l/hr | | % v/v | | % v/v | | % v/v | | ppm | | | | | | | | |
| | Max | Steady | Max | Steady | Max | Steady | Min | Steady | Max | Max | Max | mb | mb | m | m | m | |
| | The formulae require that only numbers, "<0.1" for ground gas and flow or "DRY" for groundwater are entered in the sheet | | | | | | | | | | | | | | | | |
| DS104 | <0.1 | <0.1 | <0.1 | <0.1 | 0.7 | 0.7 | 17.3 | 17.3 | 0 | 0 | NR | 0.0 | 1024 | NR | 1.17 | 2.95 | |
| BH101 | 18.7 | <0.1 | 11.4 | 3.6 | 3.1 | 0.6 | 17.5 | 17.5 | 0 | 0 | NR | 0.0 | 1025 | NR | 1.12 | 5.00 | Flow steadied to <0.1 l/hr after 5 seconds |



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| Site Name | Spalding Academy | Job number | 20-1718.01 |
|---|---|---|---|
| Client | Lincolnshire County Council | Recorded by | DD |
| Date (DD/MM/YYYY) | 17/11/2020 | | |
| Gas Analyser | GFM435 (Gas Kit 1-GCEN-LIN) - 12787 | Visit Number | 3 |

| Readings at start | $CH_4$ (% v/v) | <0.1 | $CO_2$ (% v/v) | <0.1 | $O_2$ (% v/v) | 19.6 | $H_2S$ (ppm) | 0 | |
|---|---|---|---|---|---|---|---|---|---|
| General comments | | | | | | | | | |

| WEATHER | Start | End |
|---|---|---|
| Time | 10:10 | 10:40 |
| Weather (dry/rain/snow/ice) | DRY | DRY |
| Pressure (mb) | 1016.00 | 1016.00 |
| Risking/Falling Trend | Rising | |
| Wind Speed (m/s) | 11.39 | 10.00 |
| Wind Dir. (From) | SW | SW |
| Temperature °c | 12.00 | |
| SWL Measured from | Ground Level | |

| Ref | GROUND GAS | | | | | | | | | | | | | GROUNDWATER | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flow | | $CH_4$ | | $CO_2$ | | $O_2$ | | $H_2S$ | CO | VOC | Differential (Relative) Pressure | Atmos. Pressure | Depth to free product | Depth to water | Depth to base | (e.g. water colour, sheen, odour, damage to well or gas tap, flooded ground etc.)<br>$ For **Depth to water** state<br>**Depth to water or Dry or NR (= Not Recorded - provide reason if monitoring was intended)**<br># For Depth to Product state<br>**ND (= Not detected - product looked for but absent) or NR (= Not Recorded - instrument used unable to detect product)** |
| | l/hr | | % v/v | | % v/v | | % v/v | | ppm | | | | | | | | |
| | Max | Steady | Max | Steady | Max | Steady | Min | Steady | Max | Max | Max | mb | mb | m | m | m | |
| | The formulae require that only numbers, "<0.1" for ground gas and flow or "DRY" for groundwater are entered in the sheet | | | | | | | | | | | | | | | | |
| DS104 | <0.1 | <0.1 | <0.1 | <0.1 | 0.9 | 0.9 | 17.3 | 17.3 | 0.0 | 0.0 | NR | 0.0 | 1016 | NR | 1.09 | 2.93 | |
| BH101 | 18.0 | <0.1 | 23.1 | 23.1 | 4.7 | 4.7 | 12.3 | 12.3 | 0.0 | 0.0 | NR | 0.0 | 1016 | NR | 1.11 | 5.00 | Flow steadied to <0.1 l/hr after 5 seconds |



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# Borehole Falling Head Test

**Location:** DS101

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Spalding Academy | Contractor: | Delta Drilling | Engineer: | JR |
| Location: | DS101 | Plant Used: | Hand tools | Status: | Final |
| Client: | Lincolnshire County Council | Co-ords (X,Y): | 525725, 322491 | Date: | 28/10/2020 |
| Project No: | 20-1718.01 | Level (Z): | 2.6 | Sheet: | 1 of 1 |

General Approach (after *BS 5930:1999*):

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Where :

- $k$ is the permeability of the soil (see rules below)
- $A$ is the cross sectional area of the borehole casing
- $F$ is the intake factor
- $H_1$ is the variable head measured at time $t_1$ after the commencement of the test
- $H_2$ is the variable head measured at time $t_2$ after the commencement of the test

Saturated: Yes

FIELD MEASUREMENTS

| Time (min) | Water Depth (m) | Head (m) |
|---|---|---|
| 0.00 | 0.250 | 0.600 |
| 1.00 | 0.250 | 0.600 |
| 2.00 | 0.250 | 0.600 |
| 3.00 | 0.250 | 0.600 |
| 4.00 | 0.250 | 0.600 |
| 5.00 | 0.250 | 0.600 |
| 10.00 | 0.250 | 0.600 |
| 25.00 | 0.270 | 0.580 |
| 30.00 | 0.270 | 0.580 |
| 60.00 | 0.270 | 0.580 |

INPUT PARAMETERS

| | | |
|---|---|---|
| Borehole Depth | 1.100 | m |
| Casing Depth | 0.000 | m |
| Difference in Length between bottom of casing/borehole, *L* | 1.100 | m |
| Water Depth | 0.850 | m |
| Casing Diameter, *D* | 0.220 | m |
| Cross sectional area of casing, *A* | 0.038 | m |
| Height of casing above ground level | 0.000 | m |
| Approximate long term water table (or base of BH see rules) | 0.850 | m |
| Borehole End Condition (important to get right) | b | |
| *a = Soil flush with bottom at impervious boundary* | | |
| *b= Soil flush with bottom in uniform soil* | | |
| *c = Well point or hole extended at impervious boundary* | | |
| *d = Well point or hole extended in uniform soil* | | |
| *e= Soil in casing with bottom at impervious boundary* | | |
| *f= Soil in casing with bottom in uniform soil* | | |
| Intake factor, *F* | 0.6050 | |
| Variable Head, $H_1$ | 0.600 | m |
| Time, $t_1$ | 0 | min |
| Variable Head, $H_2$ | 0.580 | m |
| Time, $t_2$ | 60 | min |

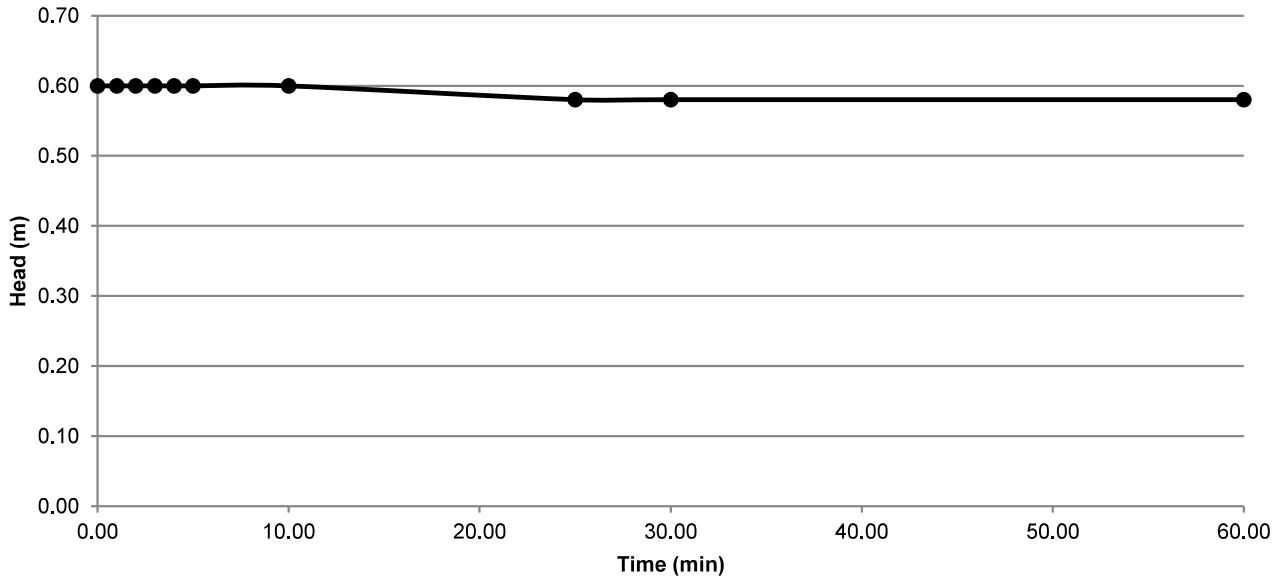
RESULT

***k*** ***sat =*** **5.917E-07** **m/s**

RULES

1. A borehole location MUST be entered to generate *k*.
2. Enter all values in shaded cells: *A*, *F*, *L* and *k* are calculated automatically in the spreadsheet.
3. Head is measured to the base of the BH, or use WL if higher.
4. End conditions referenced in *BS 5930 see notes*. Usually d.
5. If groundwater level is below test, k is not permeability, but a result of the test.
6. Usually t1 =0 and t2=60, input H at these times.

GRAPH






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# Borehole Falling Head Test

**Location:** DS105

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Spalding Academy | Contractor: | Delta Drilling | Engineer: | JR |
| Location: | DS105 | Plant Used: | Hand tools | Status: | Final |
| Client: | Lincolnshire County Council | Co-ords (X,Y): | 525542, 322486 | Date: | 28/10/2020 |
| Project No: | 20-1718.01 | Level (Z): | 3.12 | Sheet: | 1 of 1 |

General Approach (after *BS 5930:1999*):

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Where :

- $k$ is the permeability of the soil (see rules below)
- $A$ is the cross sectional area of the borehole casing
- $F$ is the intake factor
- $H_1$ is the variable head measured at time $t_1$ after the commencement of the test
- $H_2$ is the variable head measured at time $t_2$ after the commencement of the test

Saturated ☐

FIELD MEASUREMENTS

| Time (min) | Water Depth (m) | Head (m) |
|---|---|---|
| 0.00 | 0.500 | 0.500 |
| 1.00 | 0.500 | 0.500 |
| 2.00 | 0.500 | 0.500 |
| 3.00 | 0.500 | 0.500 |
| 4.00 | 0.500 | 0.500 |
| 5.00 | 0.500 | 0.500 |
| 10.00 | 0.500 | 0.500 |
| 20.00 | 0.500 | 0.500 |
| 30.00 | 0.500 | 0.500 |
| 60.00 | 0.510 | 0.490 |

INPUT PARAMETERS

| | | |
|---|---|---|
| Borehole Depth | 1.000 | m |
| Casing Depth | 0.000 | m |
| Difference in Length between bottom of casing/borehole, *L* | 1.000 | m |
| Water Depth | | m |
| Casing Diameter, *D* | 0.220 | m |
| Cross sectional area of casing, *A* | 0.038 | m |
| Height of casing above ground level | 0.000 | m |
| Approximate long term water table (or base of BH see rules) | 1.000 | m |
| Borehole End Condition (important to get right) | b | |
| *a = Soil flush with bottom at impervious boundary* | | |
| *b= Soil flush with bottom in uniform soil* | | |
| *c = Well point or hole extended at impervious boundary* | | |
| *d = Well point or hole extended in uniform soil* | | |
| *e= Soil in casing with bottom at impervious boundary* | | |
| *f= Soil in casing with bottom in uniform soil* | | |
| Intake factor, *F* | 0.6050 | |
| Variable Head, $H_1$ | 0.500 | m |
| Time, $t_1$ | 0 | min |
| Variable Head, $H_2$ | 0.490 | m |
| Time, $t_2$ | 60 | min |

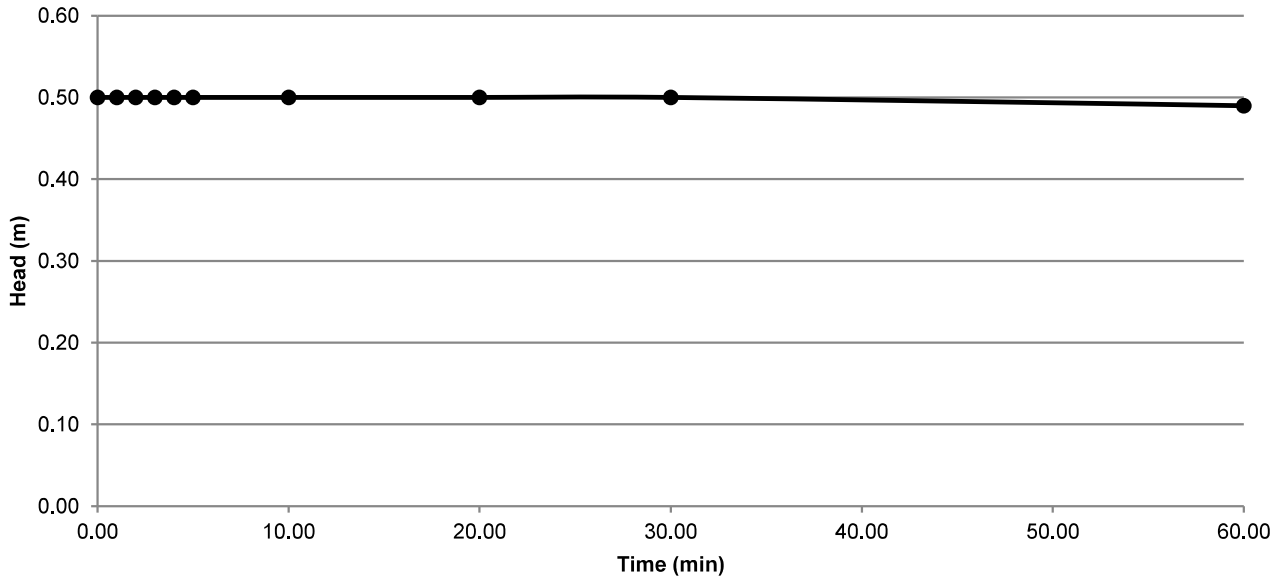
RESULT

***k*** ***unsat =*** **3.526E-07** **m/s**

RULES

1. A borehole location MUST be entered to generate *k*.
2. Enter all values in shaded cells: *A*, *F*, *L* and *k* are calculated automatically in the spreadsheet.
3. Head is measured to the base of the BH, or use WL if higher.
4. End conditions referenced in *BS 5930 see notes*. Usually d.
5. If groundwater level is below test, k is not permeability, but a result of the test.
6. Usually t1 =0 and t2=60, input H at these times.

GRAPH




**Proforma: C130**

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# Appendix F – Risk Definitions

# Contaminated Land Risk Definitions

The following methodology is based on the methodology presented in CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice 2001. It requires the classification of the:

- Magnitude of the potential consequence (severity) of the Risk occurring: and
- Magnitude of the Probability (likelihood) of the Risk occurring.

The classifications are then compared to indicate the risk presented by each pollutant linkage.

**Consequence to Receptor Definition Matrix**

| | Human Health | Controlled Waters | Buildings/Services |
|---|---|---|---|
| **Severe Consequence** | Acute or chronic permanent impact on human health. | Sensitive controlled water pollution ongoing, or just about to occur. | Catastrophic collapse |
| **Medium Consequence** | Chronic permanent impact on human health | Gradual pollution of sensitive controlled water | Degradation of materials |
| **Mild Consequence** | Chronic temporary impact on human health | Gradual pollution of non-sensitive controlled water | Damage to building rendering it unsafe.to occupy (eg foundation damage resulting in instability). |
| **Minor Consequence** | Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). | Slight discoloration of water | Easily repairable effects of damage to buildings, structures and services, i.e discoloration of concrete |

**Probability Definitions**

| Probability | Definition in Context |
|---|---|
| **Higher** | There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.<br>Positive evidence of source, pathway and receptor. |
| **Likely** | There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.<br>Suspect source, pathway, and receptor |
| **Low Likelihood** | There is a pollution linkage and circumstances are possible under which an event could occur.<br>However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term. |
| **Unlikely** | There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term<br>No evidence of hazard, pathway, and receptor |

## Standard Risk Matrix

| | | Consequence/Magnitude of impact | | | |
|---|---|---|---|---|---|
| | | Severe | Medium | Mild | Minor |
| Probability | **High** | Very High | High | Moderate | Moderate/Low |
| | **Likely** | High | Moderate | Moderate/low | Low |
| | **Low Likelihood** | Moderate | Moderate/low | Low | Very Low |
| | **Unlikely** | Moderate/low | Low | Very Low | Very Low |

## Classified risks and likely action

| Significance Level | Definition/Comments |
|---|---|
| **Very High Risk** | There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening.<br>This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.<br>Demonstrable contaminated land situation, highest threat & liability level, urgent action recommended. |
| **High Risk** | Harm is likely to arise to a designated receptor from an identified hazard.<br>Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.<br>Likely contaminated land situation, risk assessment and action recommended. |
| **Moderate** | It is possible that harm could arise to a designated receptor from an identified hazard. However, if is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild<br>Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.<br>Plausible contaminated land situation, risk assessment and possible action recommended. |
| **Low Risk** | It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.<br>Unlikely contaminated land situation, possible risk assessment and possible action. |
| **Very Low Risk** | There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.<br>Negligible risk, no action recommended except vigilance for changes in conditions. |

# Geotechnical Risk Classification

The geohazards listed in the report within Section 4 follow guidance presented in Clayton, C.R.I. (2001) *Managing Geotechnical Risk,* Thomas Telford and the Highways Agency document HD22/08 '*Managing Geotechnical Risk*' (2008) which aims to identify and manage the geotechnical risks associated with a scheme throughout its lifespan, from planning to construction to maintenance.

For each geohazard the probability of the hazard occurring (P) has been considered together with the impact it would have (I) if it were to happen to calculate the risk rating between 1 and 25.

Risks that fall within Moderate, Significant and Severe categories below are considered to be ***substantial*** and are therefore listed within the report.

| **Probability** | **(P)** |
|---|---|
| Very Likely (VLk) | 5 |
| Likely (Lk) | 4 |
| Plausible (P) | 3 |
| Unlikely (U) | 2 |
| Very Unlikely (VU) | 1 |

X

| **Impact** | **(I)** |
|---|---|
| Very High (VH) | 5 |
| High (H) | 4 |
| Medium (M) | 3 |
| Low (L) | 2 |
| Very Low (VL) | 1 |

=

| **(R)** | **Risk** |
|---|---|
| 20 – 25 | Severe |
| 15 – 19 | Substantial |
| 10 – 14 | Moderate |
| 5 – 9 | Minor |
| 1 – 4 | Negligible |