

**REPORT ON  
GROUND INVESTIGATION  
AT  
UNIT B, BIRCH BUSINESS PARK  
HEYWOOD**



### REPORT STATUS SHEET

|                       |                                                                        |
|-----------------------|------------------------------------------------------------------------|
| <b>Client:</b>        | Yeargate Ltd                                                           |
| <b>Report Title:</b>  | Report on Ground Investigation at Unit B, Birch Business Park, Heywood |
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|                      |                                                                                                                                        | Date       | Signed for and on behalf of Applied Geology Limited |
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## 1.0 INTRODUCTION

### 1.1 Objectives and Scope of Investigation

An area of land at Birch Business Park, Heywood (the site) is being considered for redevelopment by Yeagate Ltd (the Client). The proposals for the site comprise demolition of an existing warehouse (Unit B) and construction of a steel portal framed warehouse for B2/B8 usage, with ancillary B1 office space and associated areas of parking/loading bays, servicing areas, associated works/infrastructure and some areas of soft peripheral landscaping.

A Phase 1 Geoenvironmental Risk Assessment was undertaken by Applied Geology on behalf of the Client in September 2016 (Report reference: AG2536-16-AA10), including the current site and the south-eastern portion of Birch Business Park. A summary of the desk study information, including a revised conceptual site model for the current site, is presented within Section 3 and 4 of this report. A Phase II ground investigation (report ref: AG2904-18-AF68, dated November 2018) was undertaken by Applied Geology for the area of land currently occupied by Units L1 and L2 adjacent to the northeast of the site and. Immediately to the west and a Phase II ground investigation (report ref: 2012/80-001-CON-Rev0, dated October 2012) was undertaken by Sub Soil Surveys Ltd. A Phase II ground investigation (report ref: AG3155-20-AK91, dated September 2020) was also undertaken by Applied Geology for the area of land currently occupied by Unit D adjacent to the northeast of the site.

Applied Geology was appointed by Ridge and Partners LLP (the Client's Engineer) to undertake a Phase II ground investigation at Unit B in order to:

- assess the potential for hazardous substances or conditions to exist at the site that might warrant mitigation or remediation appropriate to the intended end use proposed by the Client.
- establish geological conditions and geotechnical parameters to assist in the safe and economic engineering design of the proposed development.
- support Planning Application ref: 21-01489/FUL.

The terms of reference/brief for the works were mutually developed between Ridge and Partners LLP and Applied Geology and are outlined in our proposal (ref. AG21-7897let001) and estimate (ref. AG21-7897-01) dated 18<sup>th</sup> November 2021.

The scope of works undertaken by Applied Geology comprised:

- Ground investigation together with sampling, monitoring and a programme of laboratory testing.
- Assessment and reporting of the results of the works.

Underground service plans for the site were obtained by Applied Geology on 17<sup>th</sup> December 2021. A combined topographical and utility survey drawing (dwg ref: 3640-SHD-00-ZZ-DR-C-0112-RevP2, dated July 2020) was provided by the Engineer and is presented in Appendix A. Service clearance at each exploratory hole location was undertaken by Midland Survey Ltd.

## **1.2 Report Layout**

This report presents a brief description of the site, the desk study data and the factual results of the intrusive investigations carried out. An interpretation of the ground conditions and a discussion/assessment of the findings is presented in the later report text sections. The main text of the report has been produced in a concise format, including the use of data tables to summarise key information where possible. The report should be read in conjunction with the general procedures detailed in Appendix E and General Notes given at the end of the main text, which provide details of investigation techniques, assessment methodology and standards, health & safety and limitations and exceptions of the report. Drawings and factual data including exploratory hole records, and laboratory testing results are presented in the other Appendices.

## **2.0 SITE DESCRIPTION AND PROPOSALS**

### **2.1 Site Description**

The site is located at Birch Business Park, Heywood, approximately 2.6km southwest of Heywood town centre. The Ordnance Survey grid reference for the centre of the site is 384098 408201 as shown on the Site Location Plan, Drawing No AG3353-21-01, in Appendix A.

The site is approximately rectangular in plan shape, with dimensions of approximately 150m by 120m and is relatively flat topographically at 131m AOD, as shown on Drawing No AG3353-21-02 in Appendix A.

A site inspection/walkover was undertaken by Applied Geology on 6<sup>th</sup> January 2022. Access to the site was gained off Moss Hall Road. At the time of the inspection, the site comprised the partially active Unit B warehouse, with loading bays to the west and the disused Unit G in the eastern portion. Several HGV trailers were parked adjacent to the western side of Unit B. Externally, the ground surface comprised loose gravel to the north, soft landscaping to the south, and asphalt associated with an access road immediately to the south. Internally, the ground surface comprised concrete throughout Unit B, and was being used for storage by a data management company. No significant changes had been observed between the time of the September 2016 Phase 1 desk study and January 2022.

The site was bound to the east by the newly developed Unit D, to the north by an open yard with a commercial unit beyond, and to the south and west by approximately 2m high palisade fencing, beyond which was Whittle Lane.

### **2.2 Site Proposals**

The proposals for the site comprise the demolition of the existing Unit B and Unit G warehouse units and construction of a B2/B8 steel portal framed warehouse unit with ancillary B1 office space and associated areas of parking/loading bays, servicing areas, associated works/infrastructure and peripheral soft landscaping. The proposals are shown on the Proposed Site Plan by Fletcher Rae Architects (Dwg ref: 21033\_PL03 Rev P03, dated August 2021), a copy of which is presented in Appendix A.

### 3.0 SUMMARY OF DESK STUDY INFORMATION

#### 3.1 Previous Applied Geology Desk Study

The pertinent findings from the Phase 1 desk study undertaken by Applied Geology (Report ref: AG2536-16-AA10, dated September 2016) are summarised below and amended where relevant for the subject site.

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site History</b>                              | <ul style="list-style-type: none"> <li>• <b>1848</b> – Site and surrounding area shown to comprise open fields. Several ponds are shown across the wider area, the closest being approximately 175m north of the site (no longer shown by 1939).</li> <li>• <b>1980</b> – Site occupied by a building concurrent with the existing/most recent warehouse building on site, with a substation shown adjacent to the western site boundary. Surrounding area to the west has been developed comprising industrial units associated with the Birch Industrial Estate and labelled 'depot'.</li> <li>• <b>2016</b> – At the time of the 2016 Phase 1 desk study walkover, Unit B comprised a warehouse, with areas of soft landscaping to the southern and western boundaries. An area of storage for scaffolding poles was noted to the northern side of the building. At the time of the walkover, Unit B was being used for document storage by a data management company. Prior to this, it is understood that the building was used for storage by a carpet company.</li> <li>• <b>2021</b> – No significant changes.</li> </ul> |
| <b>Anticipated Geology and Ground Conditions</b> | <ul style="list-style-type: none"> <li>• Published BGS Map 'Sheet 85' indicates site underlain by solid geology of the Pennine Lower Coal Measures Formation with overlying drift deposits comprising Glacial Till and Glaciofluvial Ice Contact Deposits. Lacustrine, Head and Glaciofluvial Deposits are shown to be present across the wider area.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Radon</b>                                     | <ul style="list-style-type: none"> <li>• Site is not in a radon affected area, with &lt;1% of homes above the Action Level. No radon protection measures are therefore considered necessary for new properties.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Mining/Quarrying</b>                          | <ul style="list-style-type: none"> <li>• Coal Authority indicates the site to lie within a former Coal Mining Area.</li> <li>• The site is not within a development high risk area.</li> <li>• A Coal Authority Report (Report ref: 51001247491001) for site states that the site is not within a surface area that could be affected by past or present underground mining.</li> <li>• The nearest mine entries are shown to be approximately 700m to the northwest.</li> <li>• Site not in area associated with natural cavity formation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hydrology</b>                                 | <ul style="list-style-type: none"> <li>• Nearest surface watercourse is a tertiary river 250m east of site.</li> <li>• Nearest water feature is an attenuation pond 150m northeast of site.</li> <li>• There are no surface water abstractions within 1.5km.</li> <li>• There is an active licensed discharge approx. 150m northeast of site relating to sewage discharges.</li> <li>• The site is situated outside of any floodplain.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hydrogeology</b>                              | <ul style="list-style-type: none"> <li>• Superficial Glaciofluvial Ice Contact Deposits beneath the site are classified as a Secondary 'A' Aquifer. The Glacial Till is a Secondary 'Undifferentiated' Aquifer. The Solid strata of the Pennine Lower Coal Measures Formation is a Secondary 'A' Aquifer.</li> <li>• There are no groundwater abstractions within 500m of site.</li> <li>• Site is not located within a groundwater Source Protection Zone.</li> <li>• Likely groundwater flow direction is to the northeast, following the topography.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Other Environmental data</b>                  | <ul style="list-style-type: none"> <li>• No landfills or licensed waste sites within 750m of site.</li> <li>• 20 current industrial land usages within 250m. Of relevance to the site is a construction and tool hire yard adjacent to the northern boundary.</li> <li>• No recorded active petrol/fuel sites within 500m of site.</li> <li>• Two recorded pollution incidents within 250m. A Category 3 (minor impact to water) occurred on/near site in 2002 and a Category 3 (minor impact to land and water) 130m to the northwest occurred in 2003.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                             |                                                                                                                                                                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <ul style="list-style-type: none"> <li>The site is located within the Liverpool, Manchester and West Yorkshire Greenbelt (Rochdale District [B]).</li> </ul>                                                                           |
| <b>Geohazards</b>           | <ul style="list-style-type: none"> <li>The risk pertaining to shrink-swell clays, landslides, ground dissolution of soluble rocks, compressible deposits, and running sands are all considered to be very low – negligible.</li> </ul> |
| <b>Railways and Tunnels</b> | <ul style="list-style-type: none"> <li>No existing railways or tunnels are shown to be present on site or within 250m of the site.</li> </ul>                                                                                          |

### 3.2 UXO Risk

Applied Geology commissioned 1<sup>st</sup> Line Defence Ltd to undertake an Express Preliminary UXO Risk Assessment as part of the AG2904-18-AF68 report in 2018. The 1<sup>st</sup> Line Defence report (ref. EP7217-00) indicates that they deem the site to have no significant risk of items of unexploded ordnance (UXO) within the site boundaries and thus no further action was recommended.

### 3.3 Historical Ground Investigation Reports

Sub Soil Surveys Ltd Phase 2 (Ground Investigation) Report No 2012/80-001-CON-Rev0 (October 2012)

The investigation was undertaken for Applied Geology's Client, Yeagate Ltd and the data was provided to Applied Geology to assist with the Phase 2 investigation for Unit D.

This report describes an intrusive geo-environmental investigation carried out on the adjacent site, immediately to the north, where it was proposed to construct an industrial unit with service yard and parking. The ground investigation comprised 2 No Cable Percussive boreholes (Ref: BH1 & BH2), 4 No Driven Continuous Sampling boreholes (Ref: WS1 – WS4), and 1 No Trial Pit (Ref: TP1).

Made Ground was recorded to depths of between 0.2m and 3.0m below ground level (bgl), overlying soft cohesive strata to depths of between 0.7m and 2.3m bgl, which were in turn underlain by firm to stiff Glacial Till. Glaciofluvial Deposits were encountered within WS3 only, between 0.2m and 2.8m bgl (depth not proven). Solid Bedrock of the Pennine Lower Coal Measures Formation was encountered within BH1 and BH2 at depths of 13.1m and 13.3m bgl. Standard Penetration Tests (SPTs) were generally only carried out in the Made Ground and shallow cohesive strata, recording 'N' values of between N=2 and N=12.

Groundwater was encountered at depths of 9.5m and 12.9m bgl during drilling, however, two monitoring visits recorded groundwater levels at between 1.04m and 1.64m bgl in standpipes installed in the Made Ground and shallow natural strata.

Chemical testing was carried out on samples taken within the shallow soils and screened against the relevant human health screening criteria (valid at the time) for a commercial/industrial end-use. No contaminants of concern were detected. Limited leachate testing identified the presence of some PAHs, TPH fractions and high (alkaline) pH values. Groundwater testing was not undertaken.

The results of two ground gas monitoring visits on standpipes installed within the Made Ground and soft cohesive Glacial Till recorded methane concentrations of

between less than detection limit (<0.1%) and 8.2%, a maximum carbon dioxide concentration of 6.8%, and a maximum flow rate of 0.3l/hr.

Sub Soil Surveys Ltd concluded that end bearing piles, placed with the Glacial Till or Pennine Lower Coal Measures Strata would be the most suitable foundation solution. The site was deemed to not pose a risk to end users or Controlled Waters based on a 'Commercial' end use.

Applied Geology Report on Ground Investigation Ref: AG2904-18-AF68 (November 2018)

A combined geotechnical geo-environmental investigation was undertaken for Yeargate Ltd on the adjacent site, immediately to the north, where it was proposed to construct an industrial unit with service yard and parking (existing Unit L1 and L2).

The ground investigation comprised 3No Cable Percussive boreholes (Ref: CP1A to CP3) to depths of between 3m and 15m bgl and 6No machine excavated trial pits to depths of between 1.5m and 3.2m bgl.

Made Ground (up to 3m thickness) was encountered over predominantly granular and generally loose Glaciofluvial Ice Contact Deposits and in places underlain by stiff cohesive Glacial Till. SPTs undertaken in the Glaciofluvial Ice Contact Deposits recorded N values generally between N=3 and N=10 above 10m depth. Below 10m depth, N values ranged between N=14 and N=26.

Groundwater was not encountered during drilling. Subsequent monitoring of standpipe installations on four occasions recorded groundwater between 0.66m and 2.7m bgl.

Although the majority of source-pathway-receptor linkages to potential end users were considered to be effectively broken by the proposed 100% hard cover, a comparison of the results for chemical testing on samples of the Made Ground and natural strata against generic screening criteria for a commercial/industrial end use showed that there were no exceedances. Also, the results of leachate testing on samples of the Made Ground (including Metals, Phenol & PAHs) recorded determinand concentrations below the relevant screening values/less than detection. Based on the test results and proposed development, a low to negligible risk to human health and controlled water receptors was established.

Gas monitoring of installations recorded elevated methane (up to 12% by volume) and carbon dioxide (up to 17.2% by volume). However, flow readings were generally reported at or below the instrument limit of detection (0.1l/h). Characteristic Situation 2 conditions were recommended.

Neither the Made Ground nor the shallow Glaciofluvial Ice Contact Deposits were considered suitable to support conventional strip/trench fill or pad foundations due to the soft and loose nature. As such, a vibro-replacement stone column foundation solution was considered appropriate and it is understood that this was utilised during construction.

### Applied Geology Report on Ground Investigation Ref: AG3155-20-AK91 (September 2020)

A combined geotechnical geo-environmental investigation was undertaken for Yeargate Ltd on the adjacent site, immediately to the south, where it was proposed to construct an industrial unit with service yard and parking (existing Unit D2).

The ground investigation comprised 5 No Cable Percussive boreholes (Ref: CP1 to CP5) to depths of 15.45m bgl and 4 No Driven Continuous Sampling boreholes (ref. DCS1 to DCS4) to 5.45m bgl.

Made Ground (up to 1.3m thickness) was encountered over interbedded granular Glaciofluvial Ice Contact Deposits and cohesive Glacial Till to the base of the boreholes. SPTs undertaken in the cohesive Glaciofluvial Ice Contact Deposits recorded N values generally between N=5 and N=22. SPTs undertaken in the granular Glaciofluvial Ice Contact Deposits recorded N values generally between N=10 and N=29. SPTs undertaken in the cohesive Glacial Till recorded N values generally between N=18 and N=42.

Groundwater was encountered during drilling at all exploratory hole locations, generally in the Glaciofluvial Ice Contact Deposits between depths of 1.1m and 7.5m bgl and locally in the Glacial Till at 5.3m and 5.7m bgl. Subsequent monitoring of standpipe installations on four occasions recorded groundwater between 0.81m and 3.47m bgl.

Although the majority of source-pathway-receptor linkages to potential end users were considered to be effectively broken by the proposed 90% hard cover, a comparison of the results for chemical testing on samples of the Made Ground and natural strata against generic screening criteria for a commercial/industrial end use showed that there were no exceedances. The results of leachate testing on samples of the Made Ground (including Metals, Phenol & PAHs) recorded phenol that marginally exceeded the screening value, in CP3 at 9.2µg/l and CP5 at 9.4µg/l, when compared against the screening value of 7.7µg/l. Based on the test results and proposed development, a low to negligible risk to human health and controlled water receptors was established.

Gas monitoring of installations recorded negligible methane (up to 0.3% by volume), locally slightly elevated carbon dioxide (up to 6.3% by volume) and negligible flow rates. As such, Characteristic Situation 1 conditions were deemed appropriate.

Neither the Made Ground nor the shallow Glaciofluvial Ice Contact Deposits were considered suitable to support conventional strip/trench fill or pad foundations due to the soft and loose nature. As such, a vibro-replacement stone column foundation solution or piled foundation solution was considered appropriate and it is understood that this was utilised during construction.

## **4.0 CONCEPTUAL SITE MODEL**

In developing a Conceptual Site Model for the site, pollutant linkages are determined by identifying likely sources of contamination from previous and current site uses, possible targets such as site users, neighbouring site users and Controlled Waters and linkages between them. The potential sources, receptors and pathways are defined in the following sections:

#### 4.1 Sources

- Made Ground soils on site associated with existing site development.
- On-site or off-site ground gases associated with decomposition of organic material in Made Ground, including historical backfilled pond 175m north of the site.
- Elevated sulphate concentrations in Made Ground or underlying natural strata.
- Possible minor hydrocarbon spillages relating to recent HGV/trailer storage.

#### 4.2 Receptors

Standard receptors to be considered are as follows:

- End users (Human Health);
- Underlying Aquifers (Controlled Waters), including the Superficial Glaciofluvial Ice Contact Deposits and the Solid strata of the Pennine Lower Coal Measures Formation (both Secondary 'A' Aquifers);
- Buried foundation/substructure concrete (Building Materials); and
- Water supply services (Building Materials).

#### 4.3 Pathways

Generic pathways, potentially linking the above sources and receptors, to be considered are as follows:

- Gas migration;
- Human dermal contact;
- Human ingestion via soil directly;
- Human inhalation of dust or vapours;
- Leaching and/or migration through permeable soils (granular Made Ground or Glaciofluvial Ice Contact Deposits); and
- Direct contact with buried concrete/water supply services.

#### 4.4 Source/Pathway/Receptor Linkage and Assessed Risk

Source-pathway-receptor (SPR) linkages are tabulated below together with the qualitatively assessed risk. The risk to ground workers and construction workers is not included here due to the short-term exposure times that they will be subject to and the assumption that good hygiene practices will be adopted on site, together with the appropriate use of relevant PPE/RPE. Comments regarding contamination issues with respect to ground workers and construction workers are included in the health and safety section of the Standard Procedures included as Appendix E.

| Source                                                                                                                 | Pathway                                      | Receptor           | Risk*          |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------|----------------|
| Potential contaminants within Made Ground, including possible minor hydrocarbon spillages associated with HGV parking. | Inhalation, ingestion, dermal contact.       | End users          | Low            |
|                                                                                                                        | Migration and Leaching                       | Secondary Aquifers | Low            |
|                                                                                                                        | Direct contact                               | Water supply pipes | Low            |
| Ground gas from Made Ground or backfilled pond 175m north of the site                                                  | Migration into buildings, service ducts etc. | End users          | Low-Negligible |

| Source                                             | Pathway                                               | Receptor        | Risk*  |
|----------------------------------------------------|-------------------------------------------------------|-----------------|--------|
| (methane, carbon dioxide, poss. VOCs)              |                                                       |                 |        |
| Elevated sulphates in Made Ground or natural soils | Direct contact, leaching and contact with groundwater | Buried concrete | Medium |

**\* Definition of Risk Categories**

Negligible - Contaminants that might have unacceptable impact on key receptors, are unlikely to be present, or, no pathway is envisaged.

Low Risk: Contaminants may be present but are unlikely to be at levels to have unacceptable impact on key receptors, or pathways are likely to be minimal.

Medium Risk: Contaminants are probably present and might have an unacceptable impact on key receptors. Pathways may also be present therefore remedial measures may be necessary to reduce the risks.

High Risk – Contaminants probably or certainly present and pathways are probably also present. Therefore, contaminants are likely to have an unacceptable impact on key receptors and remedial measures are likely to be necessary to reduce the risks to acceptable levels.

## 5.0 GROUND INVESTIGATION WORKS

### 5.1 Fieldwork

The following scope of fieldwork was undertaken:

- 5 No 150mm diameter Cable Percussive boreholes (ref CP1 to CP5) to depths of between 14.65m and 15.45m bgl.
- 5 No Driven Continuous Sampling boreholes (ref. DCS1 to DCS5) to 5.45m bgl.

The borehole records are included in Appendix B along with the SPT calibration certificates.

The locations of the exploratory holes were selected by Ridge and Partners LLP and set out on site by Applied Geology Limited, by trained personnel using a calibrated CAT and Genny in conjunction with the consultation of statutory services drawings. The locations were significantly constrained by the available access on site and the presence of underground supply services. The sampling strategy for the exploratory hole locations was to provide best overall coverage given the access constraints and scope of the investigation, with the DCS boreholes positioned to permit collection of environmental samples. The cable percussion boreholes were positioned to determine the thickness of Made Ground within the footprint of the proposed development, to collect geotechnical samples and to undertake in situ tests and to allow installation of gas/groundwater monitoring standpipes. CP4 was commenced at the surface by concrete coring at 300mm diameter.

The positions of the exploratory holes were defined by taping from identifiable features on the Proposed Site Plan (dwg ref: 21033\_PL03 Rev P03), provided by Ridge and Partners LLP. Surveying and service clearance of each location was undertaken by Midland Survey Ltd. The locations are presented on Drawing No. AG3353-21-02 in Appendix A.

## 5.2 Instrumentation and Monitoring

On completion of boring, 50mm diameter standpipes were installed in selected boreholes as follows, with further details included in the relevant borehole logs in Appendix B:

- CP1, 1.0m to 8.0m below ground level (bgl), in Glaciofluvial Ice Contact Deposits and Glacial Till;
- CP3, 1.0m to 8.0m bgl, in Glaciofluvial Ice Contact Deposits;
- CP4, 2.0m to 8.0m bgl, in Glaciofluvial Ice Contact Deposits and Glacial Till;
- CP5, 1.0m to 8.0m bgl, in Glaciofluvial Ice Contact Deposits.

Washed silica gravel (6-10mm) was used as the filter medium and a 300-micron filter sock was wrapped around the slotted section of the standpipe. Each standpipe was fitted with a push-in bung and single gas tap and was finished with a flush metal cover concreted in place.

Groundwater monitoring visits were undertaken on 4 occasions from 21<sup>st</sup> January to 2<sup>nd</sup> March 2022 including during two periods of low and/or falling atmospheric pressure. Although only a thin layer of Made Ground was encountered across the site and no obvious/significant sources of ground gas have been identified, confirmatory gas monitoring visits were undertaken alongside groundwater level monitoring. Each monitoring well was monitored for concentrations of carbon dioxide, methane, oxygen, VOCs, flow rates and differential pressures and water level. The monitoring results are included in Appendix C.

Falling head permeability tests were undertaken within the standpipes of CP1 and CP5 to provide a preliminary indication of infiltration potential, the results of which are discussed further in Section 8.6.

## 5.3 Laboratory Testing

Geotechnical laboratory testing was scheduled by Applied Geology on selected samples recovered. Testing was carried out at UKAS accredited laboratory Professional Soils Laboratory (PSL) and comprised the following:

- 6 No natural moisture content tests;
- 6 No Atterberg limit tests;
- 4 No particle size distribution tests;
- 4 No quick undrained triaxial tests; and
- 9 No BRE SD1 suite tests.

Chemical testing was scheduled by Applied Geology based upon the desk study, walkover and site observations during the fieldwork. Testing was carried out at UKAS accredited laboratory i2 Analytical and seven samples of the Made Ground were analysed for the following suite of contaminants:

- Selected metals suite [arsenic, boron, beryllium, cadmium, chromium (total, trivalent and hexavalent), copper, lead, mercury, nickel, selenium, vanadium and zinc];
- Speciated (16 US EPA) Polycyclic Aromatic Hydrocarbons (PAH);
- Phenols;

- pH;
- Soluble sulphate;
- Organic matter;
- Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG);
- Benzene, Toulene, Ethylbenzene, and Xylene (BTEX);
- Methyl-tertiary-butyl-ether (MTBE); and
- Asbestos screening.

Three samples of the Made Ground were submitted for leachate analysis, comprising the following suite of contaminants:

- Selected metals suite [arsenic, beryllium, boron, cadmium, total chromium, copper, mercury, nickel, lead, selenium, vanadium, zinc];
- Speciated (16 US EPA) Polycyclic Aromatic Hydrocarbons (PAHs);
- Phenols (total);
- pH;
- Hardness; and
- Total Organic Carbon.

Laboratory test results are included in Appendix D.

## 6.0 GROUND CONDITIONS

### 6.1 Strata Encountered

The ground investigation has identified Made Ground (including hardstanding) to depths of up to 1.4m bgl, overlying granular Glaciofluvial Ice Contact Deposits and cohesive Glacial Till to the base of the boreholes. A concrete slab was present within/adjacent to the existing buildings and Topsoil in the areas of soft landscaping. Bedrock of the Pennine Lower Coal Measures Formation was not encountered. Full details of the strata encountered are given on the borehole records presented in Appendix B. SPT N value results are plotted against depth in Appendix A. A generalised ground profile is presented below to summarise the information.

The findings of this ground investigation are generally in line with the ground conditions previously encountered beneath Units L1 and L2 (by Applied Geology in 2018) and Unit D (by Applied Geology in 2020), both to the northeast of the site.

| Stratum                            | Depth to Top of Strata (m bgl) | Thickness (range) (m) | Comments                                                                        |
|------------------------------------|--------------------------------|-----------------------|---------------------------------------------------------------------------------|
| Hardstanding                       | GL                             | 0.2 – 0.4             | Encountered at locations CP3 and CP4 as asphalt and concrete.                   |
| Topsoil & Made Ground/Topsoil      | GL                             | 0.2 – 0.4             | Encountered at the perimeter of the site.                                       |
| Made Ground                        | GL – 0.4                       | 0.3 – 3.45            | Generally, to depths of between 0.35m and 1.1m bgl. Deepest in CP4 at 3.6m bgl. |
| Glaciofluvial Ice Contact Deposits | 0.2 – 1.4                      | 0.3 – 15.25           | Encountered at all exploratory hole locations. Thickest in CP2, CP3, and CP5.   |

| Stratum      | Depth to Top of Strata (m bgl) | Thickness (range) (m) | Comments                                                                                                           |
|--------------|--------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------|
| Glacial Till | 1.4 - 3.6                      | 0.6 - 8.6             | Encountered only at exploratory hole locations CP1, CP4, CP5, DCS1 and DCS5. Significantly thicker in CP1 and CP4. |

## 6.2 Hardstanding, Made Ground/Topsoil and Topsoil

Hardstanding was encountered adjacent to the existing Unit D building as asphalt (CP3) and Unit G (CP4) as concrete. The hardstanding was encountered from ground level to depth of between 0.3m and 0.4m bgl. At CP3, 0.2m thick concrete was encountered beneath the asphalt.

Made Ground/Topsoil was encountered at two locations, DCS2 and DCS5, from ground level to depths of 0.2m and 0.4m bgl, respectively. The Topsoil/Made Ground generally comprised dark brown silty clayey sand with rare rootlets. The stratum has been described as Made Ground/Topsoil as the presence of Made Ground beneath suggests this soil was placed rather than being naturally derived material.

Natural Topsoil was generally encountered in the soft landscaping to the perimeter of the site from ground level to depths of between 0.2m and 0.3m bgl. The Topsoil generally comprised dark brown clayey sand with frequent rootlets.

## 6.3 Made Ground

Made Ground soils were encountered in CP4 and all DCS locations except DCS4, from depths of between ground level and 0.4m bgl and generally to depths of between 0.35m and 1.1m, achieving thicknesses of between 0.35m and 0.7m. In CP4 however, Made Ground was encountered to 3.6m bgl.

The Made Ground generally comprised dark brown slightly gravelly clayey sand and slightly gravelly sandy clay. The gravel was fine to coarse subangular clinker, brick, and sandstone, with a high cobble content in DCS3. The gravel was fine to coarse subangular to subrounded clinker, brick, and sandstone. Cobbles were angular brick and sandstone.

Three SPTs carried out at depths of 1.2m, 2.0m and 3.0m bgl in the cohesive Made Ground in CP4 recorded 'N' values of 11, 6 and 4 respectively.

## 6.4 Glaciofluvial Ice Contact Deposits

Strata interpreted as Glaciofluvial Ice Contact Deposits were encountered in all exploratory holes as a predominantly granular soil, interbedded with cohesive layers, proven to depths of up to 15.45m bgl, giving proven thicknesses of between 0.2m and 9.9m and penetrations of between 3.25m and 15.25m (i.e. base not proven).

The granular Glaciofluvial Ice Contact Deposits generally comprised medium dense (locally loose) orange brown slightly gravelly clayey silty sand, with gravel of fine to coarse, subangular to rounded mudstone, quartzite and coal.

Four particle size distribution tests undertaken on samples of the granular Glaciofluvial Ice Contact Deposits recorded fines contents of between 9% and 28%, sand contents of between 72% and 91% and gravel contents of <1%, indicating the soil to generally be a slightly gravelly clayey/silty sand, which is in general accordance with the field descriptions.

Fifty SPTs carried out in the granular Glaciofluvial Ice Contact Deposits generally recorded 'N' values of between N=10 and N=39 (medium dense), with nine of the SPTs recording N' values of between N=6 and N=8 (loose). The SPTs generally show an increase in 'N' value with depth, as shown on the SPT versus depth plot in Appendix A. Although N values generally show an increase with depth, three SPTs, undertaken in CP2 at 7.5m and CP5 at 6.0m and 7.5m bgl recorded 'N' values of 6 and 8.

Cohesive layers/lenses of Glaciofluvial Ice Contact Deposits were encountered in DCS2 from 1.6m to 1.8m bgl and from 2.2m to 3.3m bgl, comprising firm to stiff orange-brown clayey silt and silty clay.

The results of a single Atterberg limit test carried out on a sample of the cohesive Glaciofluvial Ice Contact Deposits recorded a plastic limit of 18%, liquid limit of 35%, plasticity indices of 17% (no correction required) and a moisture content of 20%. The results indicate the soil to be clay of intermediate plasticity, with a low volume change potential.

Two SPTs undertaken in the cohesive Glaciofluvial Ice Contact Deposits recorded 'N' values of N=9 and N=10. By applying the empirical relationship between SPT 'N' value, mass shear strength and using a plasticity index of 17% and a corresponding  $f_1$  of 6, this correlates to mass shear strengths of between c.50kN/m<sup>2</sup> and 60kN/m<sup>2</sup> (medium strength).

## **6.5 Glacial Till**

Glacial Till was encountered in some exploratory holes underlying the Made Ground or Glaciofluvial Ice Contact Deposits with boreholes achieving a maximum penetration of 8.6m at CP4. The base of the stratum was not proven. The depth to the top of the Glacial Till was variable across the site, however, it was significantly deeper at CP5 at 12.8m bgl.

The Glacial Till generally comprised firm to stiff, in places becoming very stiff, brown slightly gravelly sandy clay. The gravel comprised fine to coarse, subangular to rounded mudstone, siltstone, and sandstone.

The results of five Atterberg limit tests undertaken on samples of the Glacial Till recorded plastic limits of between 14% and 18%, liquid limits of between 25% and 36%, plasticity indices of between 11% and 18% (corrected to 5% and 18%) and moisture contents of between 13% and 20%. The results indicate the soil to be clay of low to intermediate plasticity, with a low volume change potential.

The results of three quick undrained triaxial tests carried out on samples of the Glacial Till at depths of between 5.0m and 10.5m bgl recorded undrained shear strengths of 56kN/m<sup>2</sup> and 82kN/m<sup>2</sup> (high strength). A single quick undrained triaxial test at 4.0m bgl recorded an undrained shear strength of 12kN/m<sup>2</sup> (very low strength), generally correlating to the soft (SPT value N=4) Glacial Till at 3.0m bgl, however, it is possible

that some sample disturbance or softening due to the water strike at 3.5m may have taken place.

Seventeen SPTs carried out in the Glacial Till recorded 'N' values of generally between N=9 and N=36 generally showing an increase in 'N' value with depth, as shown on the SPT versus depth plot in Appendix A. By applying the empirical relationship of SPT 'N' value, mass shear strength and assuming a plasticity index of 14% and corresponding  $f_1$  of 6, this correlates to mass shear strengths generally between 54kN/m<sup>2</sup> and 210kN/m<sup>2</sup> (medium to very high strength).

## 6.6 Groundwater and Falling Head Tests

Groundwater was encountered during drilling at all exploratory hole locations, generally in the Glaciofluvial Ice Contact Deposits between depths of 2.5m and 8.7m bgl and locally in the Glacial Till at 3.5m. Water was also encountered as a seepage in the Made Ground at 0.8m bgl in DCS3.

Subsequent monitoring of the standpipes between 21<sup>st</sup> January and 2<sup>nd</sup> March 2022 generally recorded resting groundwater levels of between 0.73m and 2.50m bgl (129.38m and 130.99m AOD), showing a general rise over the monitoring period. All of the standpipes were installed within the Glaciofluvial Ice Contact Deposits and Glacial Till, with response zones placed over the range of groundwater strikes encountered during drilling. The monitoring undertaken indicates groundwater flow towards the east.

It should be noted that groundwater levels may vary beyond that observed during the fieldwork period due to seasonal effects throughout the year.

Two variable head permeability tests were undertaken in the standpipe installations of CP1 and CP5, installed in the natural strata of the Glaciofluvial Ice Contact Deposits and Glacial Till. Further discussion is given in Section 8.6.

## 6.7 Ground Gas

Only a relatively thin Made Ground was encountered across the site and no significant on-site sources of ground gas were observed during the site investigation.

Monitoring of the standpipes on four occasions has recorded methane concentrations less than detection limit (0.1% by volume). Carbon dioxide concentrations were recorded between 0.1% and 1.9% by volume. Oxygen concentrations between 18.6% (slightly depleted) and 21.3% (atmospheric) by volume. VOC concentrations were recorded between 1.7ppm and less than the limit of detection (<0.1ppm). Flow readings taken over a three-minute average period recorded flow rates of between 0.2l/hr and less than the limit of detection (<0.1l/hr).

Gas screening values have been calculated for each installation using the highest concentrations and highest flow rates in accordance with CIRIA C665. The GSVs are as follows:

| Stratum          | BH  | Response Zone (m bgl) | Ground water level (m bgl) | Max. Methane (%) | Max. Carbon Dioxide (%) | Max. Steady Flow (l/hr) | GSV Methane (l/hr) | GSV Carbon Dioxide (l/hr) |
|------------------|-----|-----------------------|----------------------------|------------------|-------------------------|-------------------------|--------------------|---------------------------|
| Glacial Deposits | CP1 | 1.0 – 8.0             | 0.73                       | <0.1             | 1.6                     | 0.1                     | 0.0001             | 0.0016                    |
|                  | CP3 | 1.0 – 8.0             | 1.97                       | <0.1             | 1.8                     | 0.2                     | 0.0002             | 0.0036                    |
|                  | CP4 | 2.0 – 8.0             | 1.04                       | <0.1             | 1.4                     | 0.1                     | 0.0001             | 0.0014                    |
|                  | CP5 | 1.0 – 8.0             | 2.21                       | <0.1             | 1.9                     | <0.1                    | 0.0001             | 0.0019                    |

Green highlighted cells indicate CS-1 conditions.

Blue highlighted cells indicate a fully saturated response zone

## 6.8 Contamination

The Made Ground in places contained gravel of clinker, brick, and concrete. However, the soils inspected during the site investigation did not show any visual or olfactory indicators of gross contamination.

## 7.0 GEOENVIRONMENTAL ASSESSMENT

### 7.1 Human Health Risk Assessment

Although some minor areas of soft landscaping are proposed to the perimeter of the new warehouse, the majority of the source-pathway-receptor linkages to potential end users are effectively broken by the large percentage of proposed hard cover. Considering this and the context of the proposed development, there is considered to be a negligible risk to Human Health from potential contaminants in the ground.

A comparison of the chemical test results against generic screening criteria for a commercial/industrial end usage has however been undertaken as the site is to include occupied buildings. The results of the chemical testing on the soils have been assessed as described in Appendix E, based on a proposed commercial/ industrial end usage and assuming 2.5% SOM in the soil. The spreadsheets summarising the laboratory results relative screening values each dataset are presented in Appendix D. In respect of benzo(a)pyrene and other genotoxic PAHs, various PAH ratios have been plotted and compared against data from the Culp et al study and found to be within the same range, therefore the use of the surrogate marker approach is justified.

None of the chemical test results exceeded their corresponding screening criteria.

Measurable concentrations of heavier end hydrocarbon fractions ( $C_{10} - C_{44}$ ) were detected across the site at total TPH concentrations of between 10mg/kg and 990mg/kg, which are probably related to the presence of PAHs, with the maximum TPH corresponding to the maximum PAH concentrations in the sample from DCS5 at 0.6m bgl. It is noted that the Made Ground in this location contains clinker, which probably accounts for the presence of TPH/PAH. All individual fractions were however below their corresponding screening criteria.

Total phenols, BTEX compounds, and MTBE were all recorded below the detection limits.

The asbestos screening tests recorded the presence of chrysotile asbestos in the shallow Made Ground in one of the seven samples. Quantification was conducted on the sample, reporting 0.001% (i.e., the limit of detection). This is considered to be

representative of background concentrations in an urban area and is therefore not considered to be a significant risk to Human Health.

## **7.2 Controlled Waters Risk Assessment**

Leachate testing was carried out on three samples of Made Ground, from DCS1 at 0.2m, DCS3 at 0.5m, and CP4 at 1.0m bgl, recorded concentrations below their relevant screening values and/or less than detection limit. All PAHs recorded values less than the laboratory detection limit (i.e., <0.01µg/l). The spreadsheet summarising the laboratory results and relevant screening criteria of the dataset is presented in Appendix D.

Considering the fact that the proposed redevelopment will mostly comprise hardstanding (which will inhibit the downward leaching of contaminants) and the absence of a Principal Aquifer, there is generally considered to be a negligible risk to Controlled Waters.

## **7.3 Disposal of Soil Arisings**

The results of chemical testing should be used to assist with the classification of the soils for disposal.

The natural soils at the site are likely to be classified as inert, provided they are appropriately segregated from the Made Ground, however, this should be confirmed by the landfill operator. WAC testing would likely be required in any excavated soil if sent to landfill as inert or hazardous waste. The results on the Made Ground encountered across the site generally indicates that the material would likely be classified as non-hazardous if sent for disposal at landfill.

General comments regarding the procedures for the assessment of waste soil for off-site disposal purposes is included in Appendix E.

## **8.0 GEOTECHNICAL ASSESSMENT**

### **8.1 General**

The proposals comprise the demolition of the existing Unit B and Unit G warehouse units and construction of a B2/B8 steel portal framed warehouse unit with ancillary B1 office space and associated areas of parking/loading bays, servicing areas, associated works/infrastructure and peripheral soft landscaping. Proposed column and floor slab loadings have not been provided at the time of writing. The following Sections should therefore be re-assessed once the loading information and performance criteria of the floor slab and external areas are known.

The ground investigation has identified Made Ground to depths of between 0.2m and 1.4m bgl, overlying interbedded granular and cohesive Glaciofluvial Ice Contact Deposits and cohesive Glacial Till. Resting groundwater levels of between 0.73m and 2.50m bgl were recorded within the investigated strata during subsequent monitoring visits.

## 8.2 Foundation Design

It is considered that neither the Made Ground nor the majority of the shallow Glaciofluvial Ice Contact Deposits at the site are suitable to support conventional strip/trench fill or pad foundations due to the soft and loose nature of the strata. As such, a deeper foundation solution is considered warranted.

A vibro replacement stone column foundation solution could be utilised across this area. Allowable bearing pressures of between 100kN/m<sup>2</sup> and 125kN/m<sup>2</sup> are typically achieved for strata improved by stone columns, however, it is recommended that a specialist contractor is consulted to assess the suitability of the soils to be treated and the achievable allowable bearing pressures. It should be noted that the shallow groundwater may affect the design and construction of vibro stone columns. The presence of soft clay (Made Ground) as identified in CP4 (although not under the building footprint) will need to be considered when designing vibro concrete columns due to the low lateral resistance provided by these soils.

Alternatively, a piled foundation solution may be considered, founding within the deeper stiff/medium dense Glacial Till/Glaciofluvial Ice Contact Deposits. An SPT 'N' value versus depth plot is included in Appendix A and should be referred to along with the borehole logs when designing piles. However, attention is drawn to the ground conditions encountered in CP2 and CP5, where lower N values were recorded in the Glaciofluvial Ice Contact Deposits at c.7.5m bgl.

The advice of specialist and experienced piling contractors should be sought in relation to suitable piling techniques and designs for ground conditions at the site. An appropriate number of pile tests should be carried out in order to confirm the load capacities and help economical and detailed pile design.

It should be noted that unless driven piles were used, casing of the Made Ground and Glaciofluvial Ice Contact Deposits would likely be required.

## 8.3 Floor Slab and Gas Protection

It may be feasible to remove the upper layers of the Made Ground and re-engineer the soils to accommodate a lightly loaded floor slab. If the Made Ground soils are to be re-engineered, the sub-formation should be proof rolled and any soft spots removed and replaced with suitable granular fill.

Where a more heavily loaded floor slab is proposed or lower settlements are permissible, it is recommended that vibro ground improvement is extended to also cover the area of the floor slab.

The absence of deep Made Ground on the site and the gas concentrations measured indicate the lack of an identified source of ground gas. Therefore, there is considered to be a negligible risk from ground gas and, subject to approval by the Local Authority, it is considered that the site can be characterised as Situation 1 (CIRIA C665) for which no gas protection measures are considered necessary.

## 8.4 Excavations

Excavations up to c.1.5m deep are envisaged for the foundation excavations (on vibro-improved strata or for pile caps, if utilised) and service trenches. At this depth

excavations are expected to be in a combination of cohesive and granular Made Ground and granular Glaciofluvial Ice Contact Deposits. These materials may be prone to short-term instability and spalling and may need to be graded back to a stable angle or trench support should be provided. Trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions.

Groundwater ingress can be expected potentially from c.0.8m bgl. It is therefore recommended that some provision for obtaining sump pumping equipment is made in order to control any groundwater ingress and possible run off in wet weather conditions.

## **8.5 Pavement Design**

Based on a review laboratory testing carried out, soil type and estimated construction conditions, a long-term (equilibrium) CBR value of 5% is recommended for the granular glacial strata. Due to the inherent variability of the Made Ground, an equilibrium CBR value of <2% is recommended for this stratum.

The Made Ground and Glaciofluvial Ice Contact Deposits are considered frost susceptible due to their high content of fines and should not be present within 450mm of the pavement construction surface.

## **8.6 Soakaways**

Based on the field descriptions and PSD results (i.e., the low content of fines in some areas) and groundwater levels in some parts of the site, the near surface natural strata at the site could be considered as suitable for the use of conventional soakaway drainage. The results of the variable head permeability tests undertaken in CP1 and CP5 indicate a permeability between  $1.0^{-6}$  and  $7.0^{-7}$  m/s. It should however be noted that the permeability testing was undertaken over a range of soil types and depths, including granular strata of the Glaciofluvial Ice Contact Deposits and cohesive Glacial Till. Should infiltration rates be required for design purposes, it is recommended that soakaway testing in full accordance with BRE DG365 is undertaken at specific positions and depths related to proposed soakaway locations. Soakaway design should take account of groundwater levels, which are indicated to be shallow in places.

## **8.7 Buried Concrete and Services**

The results of the testing in the Made Ground soils on site indicate characteristic values as following:

- water soluble sulphate: 0.083g/l;
- total potential sulphate: 0.23%; and
- pH: 6.5.

The results of the testing in the natural glacial soils on site indicate characteristic values as following:

- water soluble sulphate: 0.016g/l;
- total potential sulphate: 0.03%; and
- pH: 5.6.

The results of the sulphate tests carried out have identified the Design Sulphate Class to be DS-1 with the Aggressive Chemical Environment for Concrete (ACEC) being AC-1 as defined by the BRE Special Digest 1, Concrete Aggressive Ground, 2005 for a brownfield site and mobile groundwater regime. Further reference should be made to BRE Special Digest 1 for requirements in respect of types of cement and aggregate to be used and variations in type of concrete construction.

Petroleum hydrocarbon fractions (C<sub>10</sub> to C<sub>44</sub>) were detected in the samples of the Made Ground between concentrations of between 10mg/kg and 990mg/kg total TPH, although as discussed in Section 7.1 is likely attributed to the presence of PAHs and clinker in the Made Ground. No BTEX, MTBEs, phenols, or 'light end' (less than C<sub>10</sub>) petroleum hydrocarbons were detected. This suggests that restrictions on buried water supply pipe materials are unlikely. However, the chosen pipeline materials should be discussed and agreed with the local Water Authority once water supply pipe routes are known.

## **9.0 CONCLUSIONS AND RECOMMENDATIONS**

### **9.1 Geo-environmental**

The risk assessments in Section 7 have established a low risk to Human Health and negligible risk to Controlled Water receptors. The majority of the source-pathway-receptor linkages to potential end users are effectively broken by the hardstanding cover and lack of landscaping across the site. The highest concentrations of PAHs and TPH in the shallow Made Ground are likely due to the presence of clinker in the Made Ground.

It is therefore considered that further assessment or remedial actions are not warranted for this redevelopment.

This report should be submitted to the Local Authority to support Planning Application Ref: 21-01489/FUL and assist with the discharge of relevant Planning Conditions, if imposed.

The chemical test results should be provided to the local water authority via a pipeline risk assessment for the selection of suitable water pipe materials.

### **9.2 Geotechnical**

Based upon the ground conditions encountered at the site, ground improvement or a deeper foundation solution is likely to be required. Possible foundation solutions include ground improvement using vibro replacement columns and piles founded in the underlying competent glacial soils.

If ground bearing floor slabs are required, the Made Ground could either be removed and re-engineered or ground improvement, utilising such as vibro stone columns, could be undertaken. No gas protection measures are considered necessary.

DS-1 and AC-1 conditions are considered appropriate for buried concrete at the site.

Soakaways in shallow granular soils are potentially feasible subject to further assessment and confirmation of groundwater levels. Soakaway tests in accordance

with BRE 365 should be undertaken at specific locations if soakaways drainage is required.

Once column and floor slab loadings and performance criteria of the floor slab/external areas are known, re-assessment of the foundation and floor slab options should be undertaken.

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## GENERAL NOTES

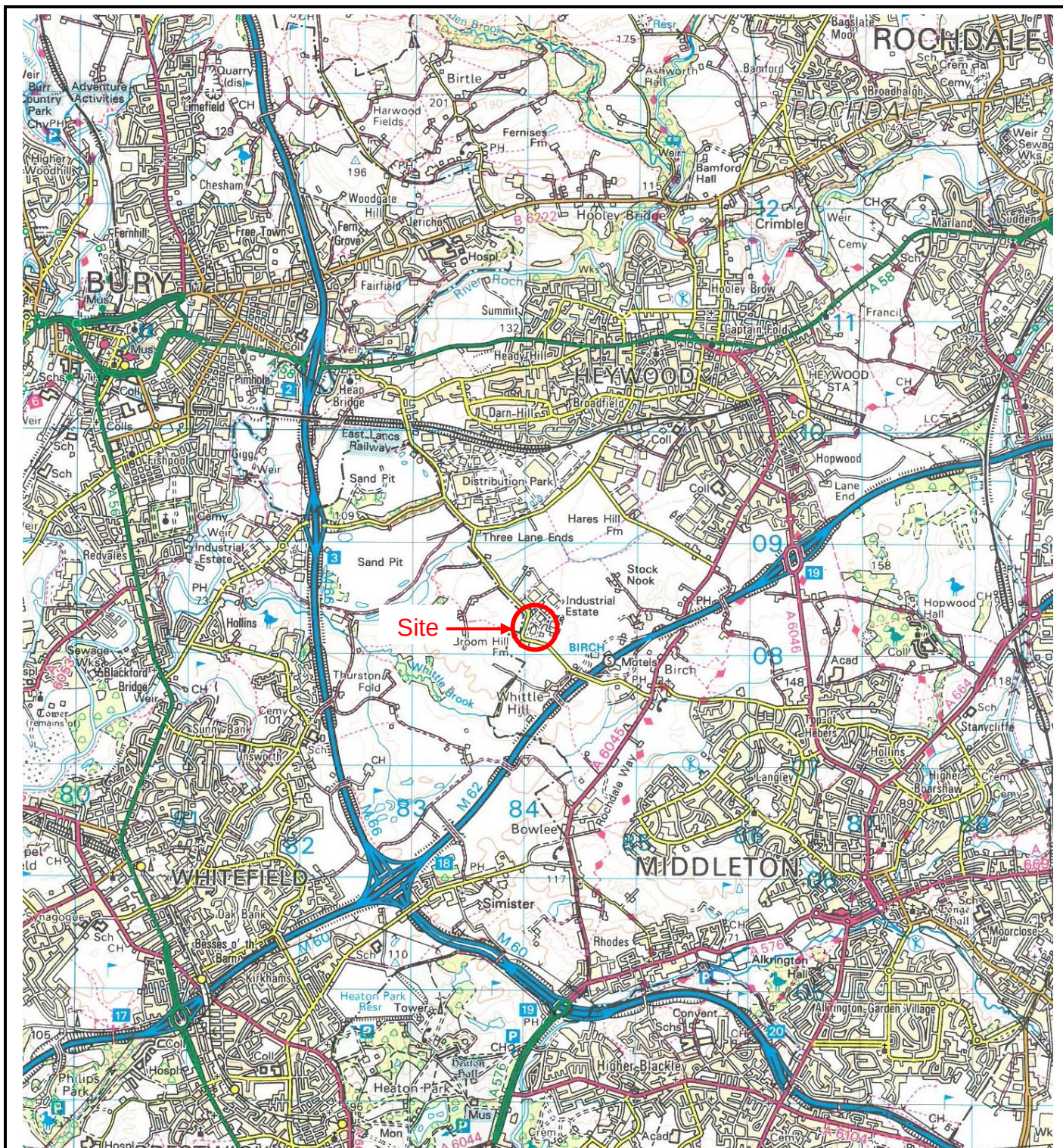
- A) The assessment made in this report is based on the site terrain and ground conditions revealed by the various field investigations undertaken and also any other relevant data for the site including previous site investigation reports (if available) and desk study data. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available. It must be recognised that many of the Environmental Searches obtained during the course of the desk study are often lengthy. Applied Geology have, where appropriate and in the interests of simplicity, only reproduced the summary of the searches within the report. A full copy of all the search data is held at the Applied Geology office and is available for inspection if required.
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- J) Unless specifically stated, the investigation has not taken into account the possible effects of mineral extraction.
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- L) The findings of the geo-environmental risk assessment are based on information obtained from a variety of sources which Applied Geology believe to be correct. Applied Geology cannot and does not guarantee the authenticity or reliability of the information it has relied upon.
- M) The report represents the findings and opinions of experienced geo-environmental consultants. Applied Geology does not provide legal advice and the advice of lawyers may be required.
- N) Conditions at the site are subject to change from the time of the site inspection.
- O) It is possible that researches carried out by Applied Geology, whilst fully appropriate for a phase 1 desk study, failed to indicate the existence of important information sources. Assuming such indicators actually exist, their information could not have been considered in the formulation of Applied Geology findings and opinions.
- P) The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, depends on very many factors in addition to geotechnical considerations and hence its evaluation is outside the scope of this report.
- Q) Applied Geology operates as a Consultancy and does not operate its own laboratory for soil testing, this work being sub contracted to known and respected, generally UKAS accredited, laboratories. Applied Geology can therefore not be held responsible for the testing carried out.

## LIST OF REFERENCES COMMONLY USED BY APPLIED GEOLOGY IN REPORTS

| SECTION/TITLE                                                                                                                                                    | AUTHOR/PUBLICATION                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>LABORATORY TESTING</b>                                                                                                                                        |                                                                       |
| BS 1377-1:2016 Method of Test for Soils for Civil Engineering Purposes                                                                                           | BSI                                                                   |
| <b>SITE WORK</b>                                                                                                                                                 |                                                                       |
| Guidelines for Combined Geoenvironmental and Geotechnical Investigations. Issue 2. March 2006.                                                                   | AGS                                                                   |
| BS 5930:2015. Code of Practice for Ground Investigations                                                                                                         | BSI                                                                   |
| BS 10175:2011 & A1:2013 Code of Practice for the Investigation of Potentially Contaminated Sites                                                                 | BSI                                                                   |
| <b>FOUNDATION DESIGN</b>                                                                                                                                         |                                                                       |
| BS EN 1997-1 Eurocode 7 – Geotechnical Design, Part 1. 2004.                                                                                                     | BSI                                                                   |
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| Paper by M. A. Stroud 'The Standard Penetration Test – its Application and Interpretation' within Thomas Telford/ICE book 'Penetration Testing in the UK'. 1989. | Stroud                                                                |
| BRE Special Digest 1: 2005 Third Edition. Concrete in Aggressive Ground                                                                                          | BRE                                                                   |
| NHBC Standards, Chapter 4.2: Building Near Trees. 2017.                                                                                                          | National House Building Council                                       |
| Engineering in Chalk (C574). 2002.                                                                                                                               | CIRIA                                                                 |
| Engineering in Mercia Mudstone (C570). 2001.                                                                                                                     | CIRIA                                                                 |
| Engineering in Glacial Till (C504). 1999.                                                                                                                        | CIRIA                                                                 |
| <b>GROUND GAS</b>                                                                                                                                                |                                                                       |
| BRE 211 Protecting New Buildings from Radon. 2015.                                                                                                               | BRE                                                                   |
| BS 8485:2015 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.                               | BSI                                                                   |
| Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present. 4 <sup>th</sup> Ed, 2007                                  | NHBC & RSK Group                                                      |
| Assessing Risks Posed by Hazardous Ground Gases to Buildings. C665. 2007.                                                                                        | CIRIA                                                                 |
| Research Bulletin 17. 2012.                                                                                                                                      | CLAIRE                                                                |
| BS 8576:2015 Guidance on Investigations for Ground Gas. Permanent Gases and Volatile Organic Compounds (VOCs)                                                    | BSI                                                                   |
| Guidance on the Use of Plastic Membranes as VOC Vapour Barriers. C748. 2014.                                                                                     | CIRIA                                                                 |
| Remediating and Mitigating Risks from Volatile Organic Compound (VOC) Vapours from Land Affected by Contamination. C716. 2012.                                   | CIRIA                                                                 |
| <b>GROUNDWATER</b>                                                                                                                                               |                                                                       |
| BRE DG 365: Soakaway Design. 2016.                                                                                                                               | BRE                                                                   |
| BS EN ISO 22282-2:2012 Geotechnical Investigation and Testing – Geohydraulic Testing, Part 2. 2012.                                                              | BSI                                                                   |
| <b>CONTAMINATION ASPECTS (Soil &amp; Groundwater)</b>                                                                                                            |                                                                       |
| Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance. 2012.                                                                           | DEFRA                                                                 |
| Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - SP1010. 2014.                                                      | DEFRA                                                                 |
| HPA Contaminated Land Information Sheet – Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons. Version 3. 2010.                                      | HPA                                                                   |
| Cover Systems for Land Regeneration. Thickness of Cover Systems for Contaminated Land. 2004. BR465.                                                              | AGS/BRE                                                               |
| Development of Generic Assessment Criteria for Assessing Vapour Risk to Human Health from Volatile Contaminants in Groundwater. Version 1.0. February 2017.      | SOBRA                                                                 |
| BS 3882:2015 Specification for Topsoil                                                                                                                           | BSI                                                                   |
| The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015. S4UL3159.                                                                                             | Chartered Institute of Environmental Health. Land Quality Management. |
| Generic Assessment Criteria for Human Health Risk Assessment. 2009.                                                                                              | Chartered Institute of Environmental Health. Land Quality Management. |
| Model Procedures for the Management of Contaminated Land. Contaminated Land Report. 11 September 2004.                                                           | DEFRA / Environment Agency                                            |
| The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. February 2005.                                                           | Environment Agency                                                    |
| The Environment Agency's Approach to Groundwater Protection, V1. 2017.                                                                                           | Environment Agency                                                    |
| Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination. 2006.                                                                      | Environment Agency                                                    |
| Guidance for the Safe Development of Housing on Land Affected by Contamination                                                                                   | NHBC                                                                  |
| Sampling Strategies for Contaminated Land. Contaminated Land Research Report no.4. 1994.                                                                         | DoE                                                                   |
| NHBC Standards, Chapter 4.1: Land Quality – Managing Ground Conditions. 2017.                                                                                    | National House Building Council                                       |
| ATRISK <sup>soil</sup> Soil Screening Values. 2017.                                                                                                              | Atkins                                                                |
| CLEA Software (Version 1.071). 2015.                                                                                                                             | Environment Agency                                                    |

|                                                                                                                            |                                                                  |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| The Water Supply (Water Quality) Regulations. 2016.                                                                        | DWI                                                              |
| Prioritisation & Categorisation Procedure for Sites Which May Be Contaminated (CLR Report No6)                             | Department of the Environment, Contaminated Land Research Report |
| Code of Practice for the Investigation & Mitigation of Possible Petroleum-Based Land Contamination. 1993.                  | The Institute of Petroleum                                       |
| Piling & Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. 2001. | Environment Agency                                               |
|                                                                                                                            |                                                                  |
| <b>DISPOSAL OF SOIL</b>                                                                                                    |                                                                  |
|                                                                                                                            |                                                                  |
| Guidance on the Classification and Assessment of Waste. Technical Guidance WM3. 1 <sup>st</sup> Ed. 2015.                  | SEPA, NIEA, Natural Resources Wales & Environment Agency         |
| Waste Sampling and Testing for Disposal to Landfill. 2013.                                                                 | Environment Agency                                               |
|                                                                                                                            |                                                                  |
| <b>BURIED SERVICES</b>                                                                                                     |                                                                  |
|                                                                                                                            |                                                                  |
| Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. (10/WM/03/21). 2011.                      | UK Water Industries Research                                     |
|                                                                                                                            |                                                                  |
| <b>PAVEMENT DESIGN</b>                                                                                                     |                                                                  |
|                                                                                                                            |                                                                  |
| Interim Advice Note 73/06 Rev 1, 2009. Design Guidance for Road Pavement Foundations (Draft HD25)                          | Highways Agency                                                  |
|                                                                                                                            |                                                                  |
| <b>PLANNING</b>                                                                                                            |                                                                  |
|                                                                                                                            |                                                                  |
| DCLG:2012 National Planning Policy Framework and Practice Guidance                                                         | Department for Communities and Local Government                  |
|                                                                                                                            |                                                                  |
| <b>HEALTH &amp; SAFETY ASPECTS</b>                                                                                         |                                                                  |
|                                                                                                                            |                                                                  |
| A Guide for Safe Working on Contaminated Sites (Report 132)                                                                | CIRIA                                                            |
| Protection of Workers and the General Public During the Development of Contaminated Land (HSG66)                           | Health & Safety Executive                                        |
| Construction (Design & Management) Regulations 2015 (CDM)                                                                  | Health & Safety Executive                                        |
| Control of Substances Hazardous to Health Regulations 2002                                                                 | Health & Safety Executive                                        |
| Workplace Exposure Limits. EH40/2005                                                                                       | Health & Safety Executive                                        |
| Trenching Practice. Guidance on Groundwater Control (Report 97)                                                            | CIRIA                                                            |
| Control of Groundwater for Temporary Works (Report 113)                                                                    | CIRIA                                                            |
| Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks. C733. 2014.                                 | CIRIA                                                            |

# **APPENDIX A**



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## APPLIED GEOLOGY

First Floor, Lowton Business Park  
Newton Road  
Lowton St. Mary's  
Warrington  
WA3 2AN

Tel: 01925 738599  
email: admin@appliedgeology.co.uk

Client:

YEARGATE LIMITED

Project:

UNIT B, BIRCH BUSINESS PARK,  
HEYWOOD

Drawn By:

JS

Checked By:

HH

Paper Size:

A4

Scale:

1:50,000

Date:

27.01.2022

NGR:

384098 408201

Title:

SITE LOCATION PLAN

Drawing No:

AG3353-21-01

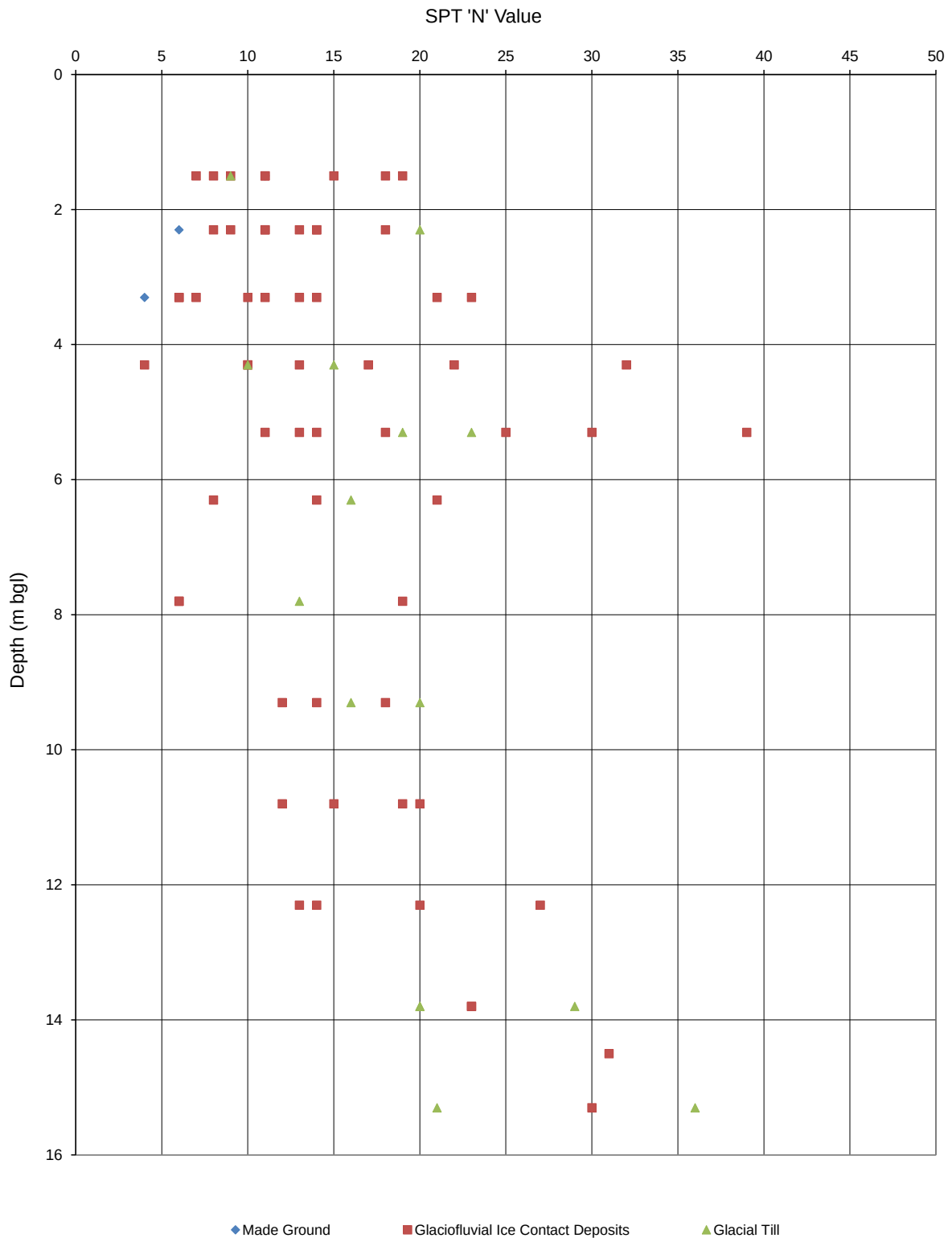
Revision:

0





# Uncorrected SPT 'N' Value versus depth



Notes: 1. Uncorrected N values plotted

|             |                                      |                        |
|-------------|--------------------------------------|------------------------|
| Client:     | Yeargate Ltd                         | <b>APPLIED GEOLOGY</b> |
| Project:    | Unit B, Birch Business Park, Heywood |                        |
| Project No. | AG3353-21                            |                        |

# **APPENDIX B**

# BOREHOLE LOG - CABLE PERCUSSION

CP1

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

1 of 2

**Start** 14/01/2022

**Coordinates** E 384038.58 N 408233.90

**Scale**

1:50

**End** 14/01/2022

**Ground Level** 131.72m AOD

**Total Depth**

15.45m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                         | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| B                  | 0.20      |        |                  | 131.52       | (0.20)                       | Dark brown clayey SAND with frequent rootlets.                                                                                                |        |    |         |
| ES                 | 0.50      |        |                  |              | 0.20                         | (TOPSOIL)                                                                                                                                     |        |    |         |
|                    |           |        |                  |              | (0.80)                       | Dark grey SAND. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                          |        |    |         |
|                    |           |        |                  | 130.72       | 1.00                         |                                                                                                                                               |        |    |         |
| B                  | 1.20      |        |                  |              |                              | Medium dense orange-brown SAND. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                          |        |    |         |
| D                  | 1.20      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 1.20      | N = 15 | 1.20             |              |                              |                                                                                                                                               |        |    |         |
| ES                 | 1.50      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 2.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 2.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 2.00      | N = 14 | 1.50             |              | (2.60)                       |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 3.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 3.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 3.00      | N = 14 | 3.00             |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  | 128.12       | 3.60                         |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              | Stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded sandstone, mudstone and siltstone. (GLACIAL TILL) |        |    |         |
| B                  | 4.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 4.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 4.00      | N = 15 | 4.00             |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 5.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 5.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| UT                 | 5.00      | (73)   |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 5.50      |        |                  |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 6.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 6.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 6.00      | N = 16 | 6.00             |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 7.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| UT                 | 7.50      | (71)   |                  |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 8.00      |        |                  |              | (8.50)                       |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 8.50      |        |                  |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 9.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 9.00      |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 9.00      | N = 20 | 9.00             |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 10.00     |        |                  |              |                              |                                                                                                                                               |        |    |         |

Continued next sheet

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | Drilled: Lundy Site Investigation<br>Logged: HH<br>Checked: PG |
|------------|----|------------------|---------------------|---------|---------|-------|--------|----------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                |
|            |    |                  | 3.60                | 3.00    |         | 3.00  | 3.80   |                                                                |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 15.45m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP1

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

2 of 2

**Start** 14/01/2022

**Coordinates** E 384038.58 N 408233.90

**Scale**

1:50

**End** 14/01/2022

**Ground Level** 131.72m AOD

**Total Depth**

15.45m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                         | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| UT                 | 10.50     | (81)   |                  |              |                              | Stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded sandstone, mudstone and siltstone. (GLACIAL TILL) |        |    |         |
| D                  | 11.00     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 11.50     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 12.00     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 12.00     | N = 13 | 12.00            | 119.62       | 12.10 (0.30)                 | Medium dense brown fine to coarse subangular to subrounded GRAVEL of sandstone and quartzite. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)            |        |    |         |
|                    |           |        |                  | 119.32       | 12.40                        | Very stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. (GLACIAL TILL)       |        |    |         |
| D                  | 13.00     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 13.50     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 13.50     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 13.50     | N = 29 | 13.50            |              | (3.05)                       |                                                                                                                                               |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                               |        |    |         |
| B                  | 14.50     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| D                  | 15.00     |        |                  |              |                              |                                                                                                                                               |        |    |         |
| S                  | 15.00     | N = 36 | 13.50            |              |                              |                                                                                                                                               |        |    |         |
|                    |           |        |                  | 116.27       | 15.45                        | End of Borehole at 15.45m                                                                                                                     |        |    |         |

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | <b>Drilled:</b> Lundy Site Investigation<br><b>Logged:</b> HH<br><b>Checked:</b> PG |
|------------|----|------------------|---------------------|---------|---------|-------|--------|-------------------------------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                                     |
|            |    |                  | 3.60                | 3.00    |         | 3.00  | 3.80   |                                                                                     |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 15.45m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP2

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

1 of 2

**Start** 17/01/2022

**Coordinates** E 384026.76 N 408180.14

**Scale**

1:50

**End** 17/01/2022

**Ground Level** 132.27m AOD

**Total Depth**

15.45m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                                  | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| D                  | 0.00      |        |                  | 132.07       | (0.20)                       | Dark brown clayey SAND with frequent rootlets.                                                                                                                                         |        |    |         |
| ES                 | 0.50      |        |                  |              | 0.20                         | (TOPSOIL)                                                                                                                                                                              |        |    |         |
| ES                 | 1.00      |        |                  | 131.17       | (0.90)                       | Dark brown slightly clayey SAND.<br>(GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                                               |        |    |         |
| B                  | 1.20      |        |                  |              | 1.10                         |                                                                                                                                                                                        |        |    |         |
| D                  | 1.20      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 1.20      | N = 9  | 1.20             |              |                              | Loose to medium dense orange-brown slightly gravelly silty SAND.<br>Gravel is fine to coarse subangular to subrounded sandstone and siltstone.<br>(GLACIOFLUVIAL ICE CONTACT DEPOSITS) |        |    |         |
| B                  | 2.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 2.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 2.00      | N = 11 | 1.50             |              |                              |                                                                                                                                                                                        |        |    |         |
| B                  | 3.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 3.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 3.00      | N = 7  | 3.00             |              |                              |                                                                                                                                                                                        |        |    |         |
| B                  | 4.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 4.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 4.00      | N = 10 | 4.00             |              |                              |                                                                                                                                                                                        |        |    |         |
| B                  | 5.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 5.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 5.00      | N = 14 | 4.50             |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 6.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 6.00      | N = 14 | 5.20             |              |                              | Below 6.00m bgl: frequent coal flecks.                                                                                                                                                 |        |    |         |
| D                  | 7.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| B                  | 7.50      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 7.50      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 7.50      | N = 6  | 7.50             |              |                              |                                                                                                                                                                                        |        |    |         |
| D                  | 8.50      |        |                  |              | (14.35)                      |                                                                                                                                                                                        |        |    |         |
| D                  | 9.00      |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |
| S                  | 9.00      | N = 14 | 9.00             |              |                              | Below 9.00m bgl: medium dense.                                                                                                                                                         |        |    |         |
| D                  | 10.00     |        |                  |              |                              |                                                                                                                                                                                        |        |    |         |

Continued next sheet

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | Drilled: Lundy Site Investigation<br>Logged: HH<br>Checked: PG |
|------------|----|------------------|---------------------|---------|---------|-------|--------|----------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                |
|            |    |                  | 7.30                | 6.00    |         | 7.00  |        |                                                                |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

**Installation:**

**Diameter:** 150mm to 15.45m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP2

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

2 of 2

**Start** 17/01/2022

**Coordinates** E 384026.76 N 408180.14

**Scale**

1:50

**End** 17/01/2022

**Ground Level** 132.27m AOD

**Total Depth**

15.45m

| Sample / Test Type | Depth (m)               | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                               | Legend | GW | Install |
|--------------------|-------------------------|--------|------------------|--------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| B<br>D<br>S        | 10.50<br>10.50<br>10.50 | N = 15 | 10.50            |              |                              | Loose to medium dense orange-brown slightly gravelly silty SAND. Gravel is fine to coarse subangular to subrounded sandstone and siltstone.<br>(GLACIOFLUVIAL ICE CONTACT DEPOSITS) |        |    |         |
| D                  | 11.50                   |        |                  |              |                              |                                                                                                                                                                                     |        |    |         |
| B<br>D<br>S        | 12.00<br>12.00<br>12.00 | N = 14 | 12.00            |              |                              |                                                                                                                                                                                     |        |    |         |
| D                  | 13.00                   |        |                  |              |                              |                                                                                                                                                                                     |        |    |         |
| B<br>D<br>S        | 13.50<br>13.50<br>13.50 | N = 23 | 13.50            |              |                              |                                                                                                                                                                                     |        |    |         |
| D                  | 14.50                   |        |                  |              |                              |                                                                                                                                                                                     |        |    |         |
| D<br>S             | 15.00<br>15.00          | N = 30 | 13.50            |              |                              | Below 15.00m bgl: dense                                                                                                                                                             |        |    |         |
|                    |                         |        |                  | 116.82       | 15.45                        | End of Borehole at 15.45m                                                                                                                                                           |        |    |         |

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | Drilled: Lundy Site Investigation<br>Logged: HH<br>Checked: PG |
|------------|----|------------------|---------------------|---------|---------|-------|--------|----------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                |
|            |    |                  | 7.30                | 6.00    |         | 7.00  |        |                                                                |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

**Installation:**

**Diameter:** 150mm to 15.45m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP3

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeargate Limited

**Sheet**

1 of 2

**Start** 11/01/2022

**Coordinates** E 384101.04 N 408173.16

**Scale**

1:50

**End** 11/01/2022

**Ground Level** 132.09m AOD

**Total Depth**

14.65m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                             | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| ES                 | 0.50      |        |                  | 131.99       | (0.10)                       | Asphalt.                                                                                                                                          |        |    |         |
|                    |           |        |                  | 131.79       | 0.10                         | (MADE GROUND)                                                                                                                                     |        |    |         |
|                    |           |        |                  |              | (0.20)                       | CONCRETE.                                                                                                                                         |        |    |         |
|                    |           |        |                  |              | 0.30                         | (MADE GROUND)                                                                                                                                     |        |    |         |
| ES                 | 1.00      |        |                  |              |                              | Loose orange brown slightly gravelly clayey SAND with rare clay bands. Gravel is fine to medium subangular to subrounded sandstone and quartzite. |        |    |         |
| D                  | 1.20      |        |                  |              |                              | (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                                              |        |    |         |
| S                  | 1.20      | N = 8  | 1.00             |              |                              |                                                                                                                                                   |        |    |         |
| D                  | 2.00      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| S                  | 2.00      | N = 8  | 1.50             |              | (3.70)                       |                                                                                                                                                   |        |    |         |
| D                  | 3.00      |        |                  |              |                              | From 3.00m bgl: medium dense.                                                                                                                     |        |    |         |
| S                  | 3.00      | N = 13 | 3.00             |              |                              |                                                                                                                                                   |        |    |         |
| D                  | 4.00      |        |                  | 128.09       | 4.00                         | Medium dense brown silty SAND.                                                                                                                    |        |    |         |
| S                  | 4.00      | N = 22 | 4.00             |              |                              | (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                                              |        |    |         |
| D                  | 5.00      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| S                  | 5.00      | N = 25 | 4.50             |              |                              |                                                                                                                                                   |        |    |         |
| D                  | 6.00      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| S                  | 6.00      | N = 21 | 6.00             |              |                              |                                                                                                                                                   |        |    |         |
| B                  | 7.00      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| D                  | 7.00      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| S                  | 7.50      | N = 19 | 7.50             |              |                              |                                                                                                                                                   |        |    |         |
| B                  | 8.50      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| D                  | 8.50      |        |                  |              |                              |                                                                                                                                                   |        |    |         |
| S                  | 9.00      | N = 18 | 9.00             |              |                              |                                                                                                                                                   |        |    |         |
|                    |           |        |                  |              | (10.65)                      |                                                                                                                                                   |        |    |         |
| B                  | 10.00     |        |                  |              |                              | Continued next sheet                                                                                                                              |        |    |         |

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | Drilled: Lundy Site Investigation |
|------------|----|------------------|---------------------|---------|---------|-------|--------|-----------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                   |
|            |    |                  | 7.20                | 4.20    |         | 7.00  |        | Logged: HH                        |
|            |    |                  |                     |         |         |       |        | Checked: PG                       |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 14.20m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

**CP3**

AG3353-21

2 of 2

1:50

14.65m

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | <b>Drilled:</b> Lundy Site Investigation<br><br><b>Logged:</b> HH<br><br><b>Checked:</b> PG |
|------------|----|------------------|---------------------|---------|---------|-------|--------|---------------------------------------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                                             |
|            |    |                  | 7.20                | 4.20    |         | 7.00  |        |                                                                                             |

**Diameter:** 150mm to 14.20m

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP4

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

1 of 2

**Start** 11/01/2022

**Coordinates** E 384139.66 N 408146.60

**Scale**

1:50

**End** 11/01/2022

**Ground Level** 131.22m AOD

**Total Depth**

15.45m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                              | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| D                  | 0.25      |        |                  | 131.06       | (0.15)                       | CONCRETE with rebar.                                                                                                               |        |    |         |
| ES                 | 0.40      |        |                  |              | 0.15                         | (MADE GROUND)                                                                                                                      |        |    |         |
|                    |           |        |                  |              | (0.75)                       | Soft brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded brick, sandstone and limestone.         |        |    |         |
|                    |           |        |                  |              |                              | (MADE GROUND)                                                                                                                      |        |    |         |
| D                  | 0.90      |        |                  | 130.32       | 0.90                         | Dark grey slightly clayey sandy fine to coarse angular to subangular                                                               |        |    |         |
| ES                 | 1.00      |        |                  |              | (0.50)                       | GRAVEL. Gravel is brick, sandstone and limestone.                                                                                  |        |    |         |
| S                  | 1.20      | N = 11 |                  |              |                              | (MADE GROUND)                                                                                                                      |        |    |         |
| B                  | 1.40      |        |                  | 129.82       | 1.40                         | Firm becoming soft brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded sandstone and rare brick. |        |    |         |
| ES                 | 1.50      |        |                  |              |                              | (MADE GROUND)                                                                                                                      |        |    |         |
| B                  | 2.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| D                  | 2.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| S                  | 2.00      | N = 6  | 1.70             |              | (2.20)                       |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| B                  | 3.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| D                  | 3.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| S                  | 3.00      | N = 4  | 3.00             |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  | 127.62       | 3.60                         | Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded sandstone, mudstone and siltstone.      |        |    |         |
|                    |           |        |                  |              |                              | (GLACIAL TILL)                                                                                                                     |        |    |         |
| UT                 | 4.00      | (27)   |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| D                  | 4.50      |        |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| B                  | 5.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| D                  | 5.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| S                  | 5.00      | N = 19 | 4.50             |              |                              | From 5.00m bgl: stiff.                                                                                                             |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| B                  | 6.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| UT                 | 6.00      | (29)   |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              | (6.40)                       |                                                                                                                                    |        |    |         |
| D                  | 7.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| B                  | 7.50      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| D                  | 7.50      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| S                  | 7.50      | N = 13 | 7.50             |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| D                  | 8.50      |        |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
| B                  | 9.00      |        |                  |              |                              |                                                                                                                                    |        |    |         |
| S                  | 9.00      | N = 16 | 9.00             |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                    |        |    |         |
|                    |           |        |                  | 121.22       | 10.00                        | Continued next sheet                                                                                                               |        |    |         |

| Chiselling |    |                  | Groundwater Strikes |              |         |              |        | Drilled: Lundy Site Investigation<br>Logged: HH<br>Checked: PG |
|------------|----|------------------|---------------------|--------------|---------|--------------|--------|----------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to      | Remarks | Cased        | Sealed |                                                                |
|            |    |                  | 3.50<br>8.70        | 1.00<br>6.30 |         | 3.00<br>8.50 | 6.00   |                                                                |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 9.45m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

## BOREHOLE LOG - CABLE PERCUSSION

CP4

Project Unit B, Birch Business Park, Heywood

Project No.

AG3353-21

Client Yeargate Limited

Sheet

2 of 2

Start 11/01/2022

Coordinates E 384139.66 N 408146.60

Scale

1:50

End 11/01/2022

Ground Level 131.22m AOD

Total Depth

15.45m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                                                                                                                                                              | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
|                    |           |        |                  |              | (0.50)                       | Sandy CLAY. (Driller's Description).<br>(GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                                                                                                                                                                       |        |    |         |
| D                  | 10.50     |        |                  | 120.72       | 10.50                        |                                                                                                                                                                                                                                                                                                                    |        |    |         |
| C                  | 10.50     | N = 12 | 10.40            | 120.42       | (0.30)<br>10.80              | Medium dense brown sandy fine to coarse subangular to subrounded GRAVEL of mudstone, siltstone and sandstone.<br>(GLACIOFLUVIAL ICE CONTACT DEPOSITS)<br>Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone, mudstone and siltstone.<br>(GLACIAL TILL) |        |    |         |
| UT                 | 12.00     | (14)   |                  |              |                              |                                                                                                                                                                                                                                                                                                                    |        |    |         |
| D                  | 12.45     |        |                  |              |                              |                                                                                                                                                                                                                                                                                                                    |        |    |         |
|                    |           |        |                  |              | (4.65)                       |                                                                                                                                                                                                                                                                                                                    |        |    |         |
| B                  | 13.50     |        |                  |              |                              |                                                                                                                                                                                                                                                                                                                    |        |    |         |
| S                  | 13.50     | N = 20 | 13.30            |              |                              |                                                                                                                                                                                                                                                                                                                    |        |    |         |
|                    |           |        |                  |              |                              |                                                                                                                                                                                                                                                                                                                    |        |    |         |
| S                  | 15.00     | N = 21 | 14.90            |              |                              |                                                                                                                                                                                                                                                                                                                    |        |    |         |
|                    |           |        |                  | 115.76       | 15.45                        | End of Borehole at 15.45m                                                                                                                                                                                                                                                                                          |        |    |         |

| Chiselling |    |                  | Groundwater Strikes |              |         |              |        | Drilled: Lundy Site Investigation<br>Logged: HH<br>Checked: PG |
|------------|----|------------------|---------------------|--------------|---------|--------------|--------|----------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to      | Remarks | Cased        | Sealed |                                                                |
|            |    |                  | 3.50<br>8.70        | 1.00<br>6.30 |         | 3.00<br>8.50 | 6.00   |                                                                |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 9.45m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP5

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

1 of 2

**Start** 14/01/2022

**Coordinates** E 384140.83 N 408198.32

**Scale**

1:50

**End** 14/01/2022

**Ground Level** 131.88m AOD

**Total Depth**

15.00m

| Sample / Test Type | Depth (m) | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                         | Legend | GW | Install |
|--------------------|-----------|--------|------------------|--------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| B                  | 0.00      |        |                  |              |                              | Dark brown clayey SAND with frequent rootlets.                                                                                                                                |        |    |         |
| ES                 | 0.25      |        |                  | 131.48       | (0.40)                       | (TOPSOIL)                                                                                                                                                                     |        |    |         |
| B                  | 0.50      |        |                  |              | 0.40                         |                                                                                                                                                                               |        |    |         |
| ES                 | 0.70      |        |                  |              |                              | Medium dense orange-brown slightly gravelly very clayey SAND. Gravel is fine to coarse subangular to subrounded sandstone and quartzite. (GLACIOFLUVIAL ICE CONTACT DEPOSITS) |        |    |         |
| B                  | 1.20      |        |                  |              | (1.90)                       |                                                                                                                                                                               |        |    |         |
| D                  | 1.20      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| S                  | 1.20      | N = 18 | 1.20             |              |                              |                                                                                                                                                                               |        |    |         |
| B                  | 2.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 2.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| S                  | 2.00      | N = 20 | 1.50             | 129.58       | 2.30                         | Stiff brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded, fine to coarse sandstone and mudstone.                                                          |        |    |         |
|                    |           |        |                  |              | (0.60)                       |                                                                                                                                                                               |        |    |         |
| B                  | 2.80      |        |                  |              |                              | (GLACIAL TILL)                                                                                                                                                                |        |    |         |
| B                  | 3.00      |        |                  | 128.98       | 2.90                         |                                                                                                                                                                               |        |    |         |
| D                  | 3.00      |        |                  |              |                              | Medium dense orange-brown slightly gravelly very clayey SAND. Gravel is fine to coarse subangular to subrounded sandstone and quartzite. (GLACIOFLUVIAL ICE CONTACT DEPOSITS) |        |    |         |
| S                  | 3.00      | N = 21 | 3.00             |              |                              |                                                                                                                                                                               |        |    |         |
| B                  | 4.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 4.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| S                  | 4.00      | N = 17 | 4.00             |              |                              |                                                                                                                                                                               |        |    |         |
| B                  | 5.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 5.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| S                  | 5.00      | N = 18 | 4.50             |              |                              |                                                                                                                                                                               |        |    |         |
| B                  | 6.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 6.00      |        |                  |              |                              | From 6.00m bgl: loose.                                                                                                                                                        |        |    |         |
| S                  | 6.00      | N = 8  | 6.00             |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 7.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| B                  | 7.50      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 7.50      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| S                  | 7.50      | N = 6  | 7.50             |              | (9.90)                       |                                                                                                                                                                               |        |    |         |
| D                  | 8.50      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| B                  | 9.00      |        |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 9.00      |        |                  |              |                              | From 9.00m bgl: medium dense.                                                                                                                                                 |        |    |         |
| S                  | 9.00      | N = 12 | 9.00             |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 10.00     |        |                  |              |                              |                                                                                                                                                                               |        |    |         |

Continued next sheet

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | Drilled: Lundy Site Investigation |
|------------|----|------------------|---------------------|---------|---------|-------|--------|-----------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                   |
|            |    |                  | 5.50                | 3.00    |         | 4.50  |        | Logged: HH                        |
|            |    |                  |                     |         |         |       |        | Checked: PG                       |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 15.00m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# BOREHOLE LOG - CABLE PERCUSSION

CP5

**Project** Unit B, Birch Business Park, Heywood

**Project No.**

AG3353-21

**Client** Yeagate Limited

**Sheet**

2 of 2

**Start** 14/01/2022

**Coordinates** E 384140.83 N 408198.32

**Scale**

1:50

**End** 14/01/2022

**Ground Level** 131.88m AOD

**Total Depth**

15.00m

| Sample / Test Type | Depth (m)                        | Result | Casing Depth (m) | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                         | Legend | GW | Install |
|--------------------|----------------------------------|--------|------------------|--------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| B<br>D<br>S<br>D   | 10.50<br>10.50<br>10.50<br>11.00 | N = 20 | 10.50            |              |                              | Medium dense orange-brown slightly gravelly very clayey SAND. Gravel is fine to coarse subangular to subrounded sandstone and quartzite. (GLACIOFLUVIAL ICE CONTACT DEPOSITS) |        |    |         |
| B<br>D<br>S        | 12.00<br>12.00<br>12.00          | N = 20 | 12.00            |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 13.00                            |        |                  | 119.08       | 12.80                        | Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone, siltstone and mudstone. (GLACIAL TILL)                        |        |    |         |
| B<br>D<br>S        | 13.50<br>13.50<br>13.50          | N = 20 |                  |              | (2.20)                       |                                                                                                                                                                               |        |    |         |
| UT                 | 14.50                            | (100)  |                  |              |                              |                                                                                                                                                                               |        |    |         |
| D                  | 15.00                            |        |                  | 116.88       | 15.00                        | End of Borehole at 15.00m                                                                                                                                                     |        |    |         |

| Chiselling |    |                  | Groundwater Strikes |         |         |       |        | <b>Drilled:</b> Lundy Site Investigation<br><b>Logged:</b> HH<br><b>Checked:</b> PG |
|------------|----|------------------|---------------------|---------|---------|-------|--------|-------------------------------------------------------------------------------------|
| From       | To | Duration (hh:mm) | Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                                     |
|            |    |                  | 5.50                | 3.00    |         | 4.50  |        |                                                                                     |

**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl.

**Installation:** 50mm diameter standpipe installed to 8.00m bgl.

**Diameter:** 150mm to 15.00m

Exploratory hole logs should be read in conjunction with key sheets

**APPLIED GEOLOGY**

# SPT SUMMARY SHEET

**Project:** Unit B, Birch Business Park, Heywood  
**Client:** Yeagate Limited  
**Project No:** AG3353-21

| Borehole No. | Borehole depth (m) | Bottom depth (m) | Casing depth (m) | Water Level (m) | Equipment ref. | Seating Drive |          | Test Drive |             |     |   |          | Test Type | N Value |
|--------------|--------------------|------------------|------------------|-----------------|----------------|---------------|----------|------------|-------------|-----|---|----------|-----------|---------|
|              |                    |                  |                  |                 |                | Blows         | Pen (mm) | Blows      |             |     |   | Pen (mm) |           |         |
| CP1          | 1.20               | 1.65             | 1.20             | Dry             | AR3822         | 2 2           | 75 75    | 3 3 4 5    | 75 75 75 75 | 300 | S | 15       |           |         |
| CP1          | 2.00               | 2.45             | 1.50             | Dry             | AR3822         | 2 1           | 75 75    | 2 3 4 5    | 75 75 75 75 | 300 | S | 14       |           |         |
| CP1          | 3.00               | 3.45             | 3.00             | Dry             | AR3822         | 1 1           | 75 75    | 2 2 4 6    | 75 75 75 75 | 300 | S | 14       |           |         |
| CP1          | 4.00               | 4.45             | 4.00             | Dry             | AR3822         | 2 2           | 75 75    | 3 3 4 5    | 75 75 75 75 | 300 | S | 15       |           |         |
| CP1          | 6.00               | 6.45             | 6.00             | Dry             | AR3822         | 2 2           | 75 75    | 3 3 4 6    | 75 75 75 75 | 300 | S | 16       |           |         |
| CP1          | 9.00               | 9.45             | 9.00             | Dry             | AR3822         | 2 2           | 75 75    | 3 4 6 7    | 75 75 75 75 | 300 | S | 20       |           |         |
| CP1          | 12.00              | 12.45            | 12.00            | Dry             | AR3822         | 2 1           | 75 75    | 1 2 4 6    | 75 75 75 75 | 300 | S | 13       |           |         |
| CP1          | 13.50              | 13.95            | 13.50            | Dry             | AR3822         | 3 4           | 75 75    | 6 6 8 9    | 75 75 75 75 | 300 | S | 29       |           |         |
| CP1          | 15.00              | 15.45            | 13.50            | Dry             | AR3822         | 3 5           | 75 75    | 9 9 9 9    | 75 75 75 75 | 300 | S | 36       |           |         |
| CP2          | 1.20               | 1.65             | 1.20             | 1.00            | AR3822         | 1 2           | 75 75    | 1 2 3 3    | 75 75 75 75 | 300 | S | 9        |           |         |
| CP2          | 2.00               | 2.45             | 1.50             | 1.50            | AR3822         | 1 1           | 75 75    | 2 2 3 4    | 75 75 75 75 | 300 | S | 11       |           |         |
| CP2          | 3.00               | 3.45             | 3.00             | 2.70            | AR3822         | 1 1           | 75 75    | 1 2 2 2    | 75 75 75 75 | 300 | S | 7        |           |         |
| CP2          | 4.00               | 4.45             | 4.00             | 3.50            | AR3822         | 1 2           | 75 75    | 1 2 2 5    | 75 75 75 75 | 300 | S | 10       |           |         |
| CP2          | 5.00               | 5.45             | 4.50             | 4.50            | AR3822         | 2 2           | 75 75    | 2 3 4 5    | 75 75 75 75 | 300 | S | 14       |           |         |
| CP2          | 6.00               | 6.45             | 5.20             | 6.00            | AR3822         | 2 1           | 75 75    | 2 3 4 5    | 75 75 75 75 | 300 | S | 14       |           |         |
| CP2          | 7.50               | 7.95             | 7.50             | 6.00            | AR3822         | 2 1           | 75 75    | 1 1 1 3    | 75 75 75 75 | 300 | S | 6        |           |         |
| CP2          | 9.00               | 9.45             | 9.00             | 6.10            | AR3822         | 2 2           | 75 75    | 2 3 4 5    | 75 75 75 75 | 300 | S | 14       |           |         |
| CP2          | 10.50              | 10.95            | 10.50            | 6.40            | AR3822         | 2 1           | 75 75    | 2 2 5 6    | 75 75 75 75 | 300 | S | 15       |           |         |
| CP2          | 12.00              | 12.45            | 12.00            | 6.90            | AR3822         | 1 1           | 75 75    | 2 3 4 5    | 75 75 75 75 | 300 | S | 14       |           |         |
| CP2          | 13.50              | 13.95            | 13.50            | 7.00            | AR3822         | 2 4           | 75 75    | 5 5 6 7    | 75 75 75 75 | 300 | S | 23       |           |         |
| CP2          | 15.00              | 15.45            | 13.50            |                 | AR3822         | 3 4           | 75 75    | 6 6 8 10   | 75 75 75 75 | 300 | S | 30       |           |         |
| CP3          | 1.20               | 1.65             | 1.00             | Dry             | AR3822         | 1 2           | 75 75    | 2 2 2 2    | 75 75 75 75 | 300 | S | 8        |           |         |
| CP3          | 2.00               | 2.45             | 1.50             | Dry             | AR3822         | 0 1           | 75 75    | 1 2 2 3    | 75 75 75 75 | 300 | S | 8        |           |         |
| CP3          | 3.00               | 3.45             | 3.00             | Dry             | AR3822         | 2 2           | 75 75    | 3 3 3 4    | 75 75 75 75 | 300 | S | 13       |           |         |
| CP3          | 4.00               | 4.45             | 4.00             | Dry             | AR3822         | 22 2          | 75 75    | 5 5 6 6    | 75 75 75 75 | 300 | S | 22       |           |         |
| CP3          | 5.00               | 5.45             | 4.50             | Dry             | AR3822         | 1 2           | 75 75    | 6 6 6 7    | 75 75 75 75 | 300 | S | 25       |           |         |
| CP3          | 6.00               | 6.45             | 6.00             | Dry             | AR3822         | 2 2           | 75 75    | 4 5 6 6    | 75 75 75 75 | 300 | S | 21       |           |         |
| CP3          | 7.50               | 7.95             | 7.50             | 4.20            | AR3822         | 1 2           | 75 75    | 3 4 6 6    | 75 75 75 75 | 300 | S | 19       |           |         |
| CP3          | 9.00               | 9.45             | 9.00             | 4.60            | AR3822         | 2 2           | 75 75    | 3 3 4 8    | 75 75 75 75 | 300 | S | 18       |           |         |
| CP3          | 10.50              | 10.95            | 10.50            | 5.90            | AR3822         | 1 2           | 75 75    | 4 4 4 7    | 75 75 75 75 | 300 | S | 19       |           |         |
| CP3          | 12.00              | 12.45            | 12.00            | 5.10            | AR3822         | 1 2           | 75 75    | 4 5 8 10   | 75 75 75 75 | 300 | S | 27       |           |         |
| CP3          | 13.50              | 13.95            | 13.50            | 6.20            | AR3822         | 2 3           | 75 75    | 4 4 7 8    | 75 75 75 75 | 300 | S | 23       |           |         |
| CP3          | 14.20              | 14.65            | 13.50            | 7.90            | AR3822         | 2 4           | 75 75    | 7 7 8 9    | 75 75 75 75 | 300 | S | 31       |           |         |
| CP4          | 1.20               | 1.65             |                  |                 | AR3822         | 4 16          | 75 75    | 2 2 3 4    | 75 75 75 75 | 300 | S | 11       |           |         |

- Notes:
- 1. Test carried out in general accordance with BS EN ISO 22476-3:2005
  - 2. N values have not been subjected to any correction.
  - 3. Test carried out using split spoon S, or solid cone C.

# SPT SUMMARY SHEET

**Project:** Unit B, Birch Business Park, Heywood  
**Client:** Yeagate Limited  
**Project No:** AG3353-21

| Borehole No. | Borehole depth (m) | Bottom depth (m) | Casing depth (m) | Water Level (m) | Equipment ref. | Seating Drive |          | Test Drive |             |          |   |                | Test Type | N Value |
|--------------|--------------------|------------------|------------------|-----------------|----------------|---------------|----------|------------|-------------|----------|---|----------------|-----------|---------|
|              |                    |                  |                  |                 |                | Blows         | Pen (mm) | Blows      |             | Pen (mm) |   | Total Pen (mm) |           |         |
| CP4          | 2.00               | 2.45             | 1.70             | Dry             | AR3822         | 1 1           | 75 75    | 1 2 1 2    | 75 75 75 75 | 300      | S | 6              |           |         |
| CP4          | 3.00               | 3.45             | 3.00             | Dry             | AR3822         | 1 1           | 75 75    | 1 1 1 1    | 75 75 75 75 | 300      | S | 4              |           |         |
| CP4          | 5.00               | 5.45             | 4.50             | 3.90            | AR3822         | 2 3           | 75 75    | 4 4 5 6    | 75 75 75 75 | 300      | S | 19             |           |         |
| CP4          | 7.50               | 7.95             | 7.50             | Dry             | AR3822         | 2 2           | 75 75    | 2 4 3 4    | 75 75 75 75 | 300      | S | 13             |           |         |
| CP4          | 9.00               | 9.45             | 9.00             | 6.30            | AR3822         | 2 4           | 75 75    | 3 3 4 6    | 75 75 75 75 | 300      | S | 16             |           |         |
| CP4          | 10.50              | 10.95            | 10.40            | 5.00            | AR3822         | 3 3           | 75 75    | 4 3 3 2    | 75 75 75 75 | 300      | C | 12             |           |         |
| CP4          | 13.50              | 13.95            | 13.30            | Dry             | AR3822         | 3 3           | 75 75    | 4 5 5 6    | 75 75 75 75 | 300      | S | 20             |           |         |
| CP4          | 15.00              | 15.45            | 14.90            | Dry             | AR3822         | 2 4           | 75 75    | 4 5 6 6    | 75 75 75 75 | 300      | S | 21             |           |         |
| CP5          | 1.20               | 1.65             | 1.20             |                 | AR3822         | 1 2           | 75 75    | 3 3 6 6    | 75 75 75 75 | 300      | S | 18             |           |         |
| CP5          | 2.00               | 2.45             | 1.50             | 1.60            | AR3822         | 2 3           | 75 75    | 4 5 5 6    | 75 75 75 75 | 300      | S | 20             |           |         |
| CP5          | 3.00               | 3.45             | 3.00             | 2.10            | AR3822         | 2 2           | 75 75    | 3 3 6 9    | 75 75 75 75 | 300      | S | 21             |           |         |
| CP5          | 4.00               | 4.45             | 4.00             | 2.60            | AR3822         | 1 1           | 75 75    | 2 4 5 6    | 75 75 75 75 | 300      | S | 17             |           |         |
| CP5          | 5.00               | 5.45             | 4.50             | 4.10            | AR3822         | 2 3           | 75 75    | 4 4 4 6    | 75 75 75 75 | 300      | S | 18             |           |         |
| CP5          | 6.00               | 6.45             | 6.00             | 3.20            | AR3822         | 2 2           | 75 75    | 2 2 2 2    | 75 75 75 75 | 300      | S | 8              |           |         |
| CP5          | 7.50               | 7.95             | 7.50             | 3.20            | AR3822         | 1 2           | 75 75    | 1 2 1 2    | 75 75 75 75 | 300      | S | 6              |           |         |
| CP5          | 9.00               | 9.45             | 9.00             | 3.90            | AR3822         | 2 3           | 75 75    | 3 2 3 4    | 75 75 75 75 | 300      | S | 12             |           |         |
| CP5          | 10.50              | 10.95            | 10.50            | 4.60            | AR3822         | 2 1           | 75 75    | 4 5 5 6    | 75 75 75 75 | 300      | S | 20             |           |         |
| CP5          | 12.00              | 12.45            | 12.00            | 6.20            | AR3822         | 2 3           | 75 75    | 4 5 5 6    | 75 75 75 75 | 300      | S | 20             |           |         |
| CP5          | 13.50              | 13.95            |                  | Dry             | AR3822         | 2 3           | 75 75    | 3 5 5 7    | 75 75 75 75 | 300      | S | 20             |           |         |
| DCS1         | 1.20               | 1.65             |                  |                 | DART400        | 1 1           | 75 75    | 1 2 2 2    | 75 75 75 75 | 300      | S | 7              |           |         |
| DCS1         | 2.00               | 2.45             |                  |                 | DART400        | 3 2           | 75 75    | 3 4 3 3    | 75 75 75 75 | 300      | S | 13             |           |         |
| DCS1         | 3.00               | 3.45             |                  |                 | DART400        | 1 3           | 75 75    | 4 3 2 2    | 75 75 75 75 | 300      | S | 11             |           |         |
| DCS1         | 4.00               | 4.45             |                  |                 | DART400        | 1 1           | 75 75    | 2 2 2 4    | 75 75 75 75 | 300      | S | 10             |           |         |
| DCS1         | 5.00               | 5.45             |                  |                 | DART400        | 2 2           | 75 75    | 2 3 2 4    | 75 75 75 75 | 300      | S | 11             |           |         |
| DCS2         | 1.20               | 1.65             |                  |                 | DART400        | 3 3           | 75 75    | 3 2 2 2    | 75 75 75 75 | 300      | S | 9              |           |         |
| DCS2         | 2.00               | 2.45             |                  |                 | DART400        | 2 2           | 75 75    | 2 2 3 2    | 75 75 75 75 | 300      | S | 9              |           |         |
| DCS2         | 3.00               | 3.45             |                  |                 | DART400        | 3 2           | 75 75    | 3 3 2 2    | 75 75 75 75 | 300      | S | 10             |           |         |
| DCS2         | 4.00               | 4.45             |                  |                 | DART400        | 3 3           | 75 75    | 3 4 3 3    | 75 75 75 75 | 300      | S | 13             |           |         |
| DCS2         | 5.00               | 5.45             |                  |                 | DART400        | 5 5           | 75 75    | 7 8 7 8    | 75 75 75 75 | 300      | S | 30             |           |         |
| DCS3         | 1.20               | 1.65             |                  |                 | DART400        | 3 3           | 75 75    | 3 3 2 3    | 75 75 75 75 | 300      | S | 11             |           |         |
| DCS3         | 2.00               | 2.45             |                  |                 | DART400        | 3 3           | 75 75    | 4 3 4 3    | 75 75 75 75 | 300      | S | 14             |           |         |
| DCS3         | 3.00               | 3.45             |                  |                 | DART400        | 3 3           | 75 75    | 2 2 1 1    | 75 75 75 75 | 300      | S | 6              |           |         |
| DCS3         | 4.00               | 4.45             |                  |                 | DART400        | 1 1           | 75 75    | 1 1 1 1    | 75 75 75 75 | 300      | S | 4              |           |         |
| DCS3         | 5.00               | 5.45             |                  |                 | DART400        | 2 2           | 75 75    | 3 3 3 4    | 75 75 75 75 | 300      | S | 13             |           |         |

- Notes:
- 1. Test carried out in general accordance with BS EN ISO 22476-3:2005
  - 2. N values have not been subjected to any correction.
  - 3. Test carried out using split spoon S, or solid cone C.

# SPT SUMMARY SHEET

**Project:** Unit B, Birch Business Park, Heywood  
**Client:** Yeagate Limited  
**Project No:** AG3353-21

| Borehole<br>No. | Borehole<br>depth (m) | Bottom<br>depth (m) | Casing<br>depth (m) | Water Level<br>(m) | Equipment<br>ref. | Seating Drive |             | Test Drive |             |          |   |                      | Test Type | N Value |
|-----------------|-----------------------|---------------------|---------------------|--------------------|-------------------|---------------|-------------|------------|-------------|----------|---|----------------------|-----------|---------|
|                 |                       |                     |                     |                    |                   | Blows         | Pen<br>(mm) | Blows      |             | Pen (mm) |   | Total<br>Pen<br>(mm) |           |         |
| DCS4            | 1.20                  | 1.65                |                     |                    | DART400           | 4 4           | 75 75       | 5 5 4 5    | 75 75 75 75 | 300      | S | 19                   |           |         |
| DCS4            | 2.00                  | 2.45                |                     |                    | DART400           | 4 4           | 75 75       | 4 4 5 5    | 75 75 75 75 | 300      | S | 18                   |           |         |
| DCS4            | 3.00                  | 3.45                |                     |                    | DART400           | 4 4           | 75 75       | 6 5 5 7    | 75 75 75 75 | 300      | S | 23                   |           |         |
| DCS4            | 4.00                  | 4.45                |                     |                    | DART400           | 4 6           | 75 75       | 7 7 9 9    | 75 75 75 75 | 300      | S | 32                   |           |         |
| DCS4            | 5.00                  | 5.45                |                     |                    | DART400           | 8 9           | 75 75       | 10 9 10 10 | 75 75 75 75 | 300      | S | 39                   |           |         |
| DCS5            | 1.20                  | 1.65                |                     |                    | DART400           | 2 2           | 75 75       | 3 2 3 3    | 75 75 75 75 | 300      | S | 11                   |           |         |
| DCS5            | 2.00                  | 2.45                |                     |                    | DART400           | 3 2           | 75 75       | 3 2 3 3    | 75 75 75 75 | 300      | S | 11                   |           |         |
| DCS5            | 3.00                  | 3.45                |                     |                    | DART400           | 1 1           | 75 75       | 1 1 2 2    | 75 75 75 75 | 300      | S | 6                    |           |         |
| DCS5            | 4.00                  | 4.45                |                     |                    | DART400           | 2 2           | 75 75       | 2 2 3 3    | 75 75 75 75 | 300      | S | 10                   |           |         |
| DCS5            | 5.00                  | 5.45                |                     |                    | DART400           | 3 3           | 75 75       | 4 6 6 7    | 75 75 75 75 | 300      | S | 23                   |           |         |

Notes:  
1. Test carried out in general accordance with BS EN ISO 22476-3:2005  
2. N values have not been subjected to any correction.  
3. Test carried out using split spoon S, or solid cone C.

**SPT Hammer Energy Test Report**

In accordance with BS EN ISO 22476-3:2005

**ARCHWAY ENGINEERING (UK) LTD**  
**AINLEYS INDUSTRIAL ESTATE**  
**ELLAND**  
**WEST YORKSHIRE**  
**HX5 9JP**

SPT Hammer Ref: AR3822  
Test Date: 12/11/2021  
Report Date: 12/11/2021  
File Name: AR3822.spt  
Test Operator: CM

**Instrumented Rod Data**

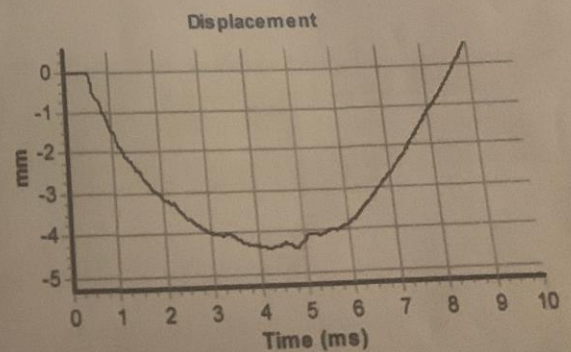
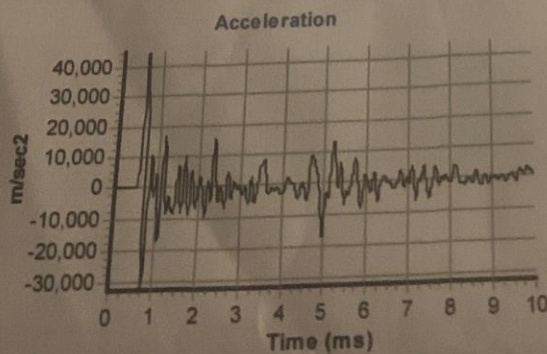
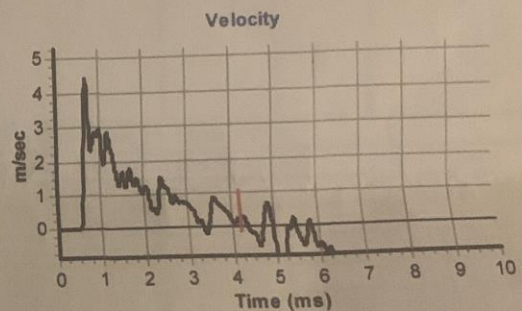
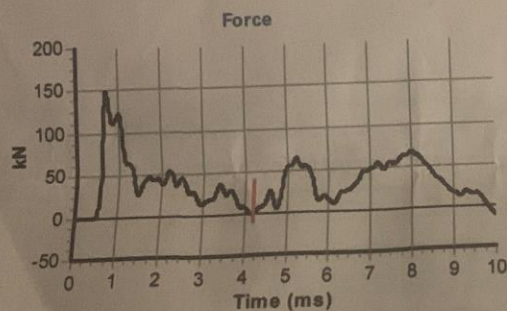
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 7080  
Accelerometer No.2: 11609

**SPT Hammer Information**

Hammer Mass  $m$  (kg): 63.5  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 10.0

**Comments / Location**

KARTER DRILLING - 78070

**Calculations**

Area of Rod A ( $\text{mm}^2$ ): 905  
Theoretical Energy  $E_{\text{theor}}$  (J): 473  
Measured Energy  $E_{\text{meas}}$  (J): 319

**Energy Ratio  $E_r$  (%):** 67

Signed: C. McCUSKEY  
Title: FITTER

The recommended calibration interval is 12 months

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS1

Project

Unit B, Birch Business Park, Heywood

Project No.

AG3353-21

Client

Yeargate Limited

Sheet

1 of 2

Start

10/01/2022

Coordinates

E 384089.56 N 408247.57

Scale

1:25

End

11/01/2022

Ground Level

132.08m AOD

Total Depth

5.45m

| Sample / Test Type | Depth (m) | Result | Dia./ Rec. | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                                                                       | Legend | GW | Install |
|--------------------|-----------|--------|------------|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| ES                 | 0.20      | N = 7  |            | 131.73       | (0.35)                       | Grey fine to coarse angular to subangular sandy GRAVEL with high cobble content. Gravel is sandstone, concrete, brick and wood fragments. Cobbles are subangular to subrounded sandstone. (MADE GROUND)                     |        |    |         |
| D                  | 0.30      |        |            |              | 0.35                         |                                                                                                                                                                                                                             |        |    |         |
| ES                 | 0.50      |        |            |              |                              | Loose orange-brown slightly gravelly silty SAND with high cobble content. Gravel is fine to coarse subangular to subrounded sandstone and siltstone. Cobbles are subangular sandstone. (GLACIOFLUVIAL ICE CONTACT DEPOSITS) |        |    |         |
|                    |           |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 1.00      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 1.20      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| S                  | 1.20      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
|                    |           | N = 13 | 101mm /90% |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 1.80      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 2.00      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| S                  | 2.00      |        |            |              |                              | From 2.00m bgl: medium dense.                                                                                                                                                                                               |        |    |         |
| B                  | 2.30      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
|                    |           | N = 11 | 92mm /80%  |              | (5.10)                       |                                                                                                                                                                                                                             |        |    |         |
| D                  | 3.00      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| S                  | 3.00      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
|                    |           |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 3.70      |        |            |              |                              | From 3.60m to 3.80m bgl: rare peaty pockets.                                                                                                                                                                                |        |    |         |
|                    |           | N = 10 | 79mm /80%  |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 4.00      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| S                  | 4.00      |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
|                    |           |        | 79mm /60%  |              |                              |                                                                                                                                                                                                                             |        |    |         |
|                    |           |        |            |              |                              |                                                                                                                                                                                                                             |        |    |         |
| D                  | 5.00      |        |            |              |                              | Continued next sheet                                                                                                                                                                                                        |        |    |         |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |         |         |       |        | Drilled: Exploration Ltd |
|---------------------|---------|---------|-------|--------|--------------------------|
| Depth Strike        | Rose to | Remarks | Cased | Sealed |                          |
| 3.00                | 3.00    |         |       |        |                          |
|                     |         |         |       |        | Logged: HH               |
|                     |         |         |       |        | Checked: PG              |

# DCS1

**Project No.** AG3353-21

Sheet 2 of 2

Scale 1:25

**Total Depth** 5.45m

**Installation:**  
**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

Exploratory hole logs to be read in conjunction with key sheet

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS2

Project

Unit B, Birch Business Park, Heywood

Client

Yeagate Limited

Start

10/01/2022

End

10/01/2022

Coordinates

E 384025.74 N 408255.22

Ground Level

132.16m AOD

Project No.

AG3353-21

Sheet

1 of 2

Scale

1:25

Total Depth

5.45m

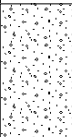
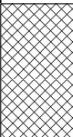
| Sample / Test Type   | Depth (m) | Result | Dia./ Rec.  | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                      | Legend | GW     | Install |  |  |
|----------------------|-----------|--------|-------------|--------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|---------|--|--|
| ES                   | 0.40      | N = 9  |             | 131.96       | (0.20)                       | Dark brown SAND with frequent rootlets. (MADE GROUND/TOPSOIL)                                                                                              |        |        |         |  |  |
|                      |           |        |             |              | 0.20                         | Dark brown clayey slightly gravelly SAND. Gravel is fine to coarse subangular clinker, brick and sandstone. (MADE GROUND)                                  |        |        |         |  |  |
| ES                   | 0.90      |        |             | 131.46       | (0.50)                       |                                                                                                                                                            |        |        |         |  |  |
|                      |           |        |             |              | 0.70                         | Firm orange-brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. (GLACIAL TILL)                   |        |        |         |  |  |
| D S                  | 1.20      |        |             |              | (0.90)                       |                                                                                                                                                            |        |        |         |  |  |
|                      |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
| D                    | 1.80      | N = 9  | 101mm /100% | 130.56       | 1.60                         | Firm orange-brown silty CLAY. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                         |        |        |         |  |  |
|                      |           |        |             | 130.36       | 1.80                         | Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone, mudstone and siltstone. (GLACIAL TILL) |        |        |         |  |  |
| D S                  | 2.00      |        |             | (0.40)       |                              |                                                                                                                                                            |        |        |         |  |  |
|                      |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
| D                    | 2.80      | N = 10 | 92mm /80%   | 129.96       | 2.20                         | Stiff to firm orange-brown silty CLAY. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                |        |        |         |  |  |
|                      |           |        |             | (1.10)       |                              |                                                                                                                                                            |        |        |         |  |  |
| D S                  | 3.00      |        |             |              |                              |                                                                                                                                                            |        | 128.86 | 3.30    |  |  |
|                      |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
| D S                  | 4.00      | N = 13 | 79mm /70%   |              | (2.15)                       |                                                                                                                                                            |        |        |         |  |  |
|                      |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
| D                    | 5.00      |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
|                      |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
|                      |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |
| Continued next sheet |           |        |             |              |                              |                                                                                                                                                            |        |        |         |  |  |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |         |         |       |        | Drilled: Exploration Ltd |
|---------------------|---------|---------|-------|--------|--------------------------|
| Depth Strike        | Rose to | Remarks | Cased | Sealed |                          |
| 4.00                | 4.00    |         |       |        |                          |
|                     |         |         |       |        | Logged: HH               |
|                     |         |         |       |        | Checked: PG              |

# DCS2

|                |                                      |                     |                         |                    |           |
|----------------|--------------------------------------|---------------------|-------------------------|--------------------|-----------|
| <b>Project</b> | Unit B, Birch Business Park, Heywood |                     |                         | <b>Project No.</b> | AG3353-21 |
| <b>Client</b>  | Yeargate Limited                     |                     |                         | <b>Sheet</b>       | 2 of 2    |
| <b>Start</b>   | 10/01/2022                           | <b>Coordinates</b>  | E 384025.74 N 408255.22 | <b>Scale</b>       | 1:25      |
| <b>End</b>     | 10/01/2022                           | <b>Ground Level</b> | 132.16m AOD             | <b>Total Depth</b> | 5.45m     |

| Sample / Test Type | Depth (m) | Result | Dia./ Rec. | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                    | Legend                                                                              | GW | Install                                                                             |
|--------------------|-----------|--------|------------|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------|
| S                  | 5.00      | N = 30 |            |              |                              | Medium dense orange-brown slightly gravelly SAND with rare clay bands. Gravel is fine to medium subangular to subrounded sandstone. (GLACIOFLUVIAL ICE CONTACT DEPOSITS) |  |    |  |
|                    |           |        |            | 126.71       | 5.45                         | End of Borehole at 5.45m                                                                                                                                                 |                                                                                     |    |                                                                                     |

**Installation:**  
**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |         |         |       |        | <b>Drilled:</b> Exploration Ltd<br><br><b>Logged:</b> HH<br><br><b>Checked:</b> PG |
|---------------------|---------|---------|-------|--------|------------------------------------------------------------------------------------|
| Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                                                    |
| 4.00                | 4.00    |         |       |        |                                                                                    |

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS3

Project

Unit B, Birch Business Park, Heywood

Project No.

AG3353-21

Client

Yeargate Limited

Sheet

1 of 2

Start

10/01/2022

Coordinates

E 384010.17 N 408207.61

Scale

1:25

End

10/01/2022

Ground Level

131.88m AOD

Total Depth

5.45m

| Sample / Test Type   | Depth (m) | Result | Dia./ Rec.  | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                                                        | Legend | GW | Install |
|----------------------|-----------|--------|-------------|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---------|
| ES                   | 0.50      |        |             | 131.58       | (0.30)                       | Dark brown clayey SAND with frequent rootlets. (TOPSOIL/MADE GROUND)                                                                                                                                         |        |    |         |
|                      | 0.60      |        |             |              | 0.30                         | Firm dark grey slightly gravelly sandy CLAY with high cobble content. Gravel is fine to coarse subangular to subrounded clinker, brick and sandstone. Cobbles are angular brick and sandstone. (MADE GROUND) |        |    |         |
| D                    | 1.20      | N = 11 |             | 130.98       | 0.90                         | Medium dense brown silty SAND. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)<br><i>Between 0.90m to 1.10m bgl: rare rootlets.</i>                                                                                     |        |    |         |
|                      | 1.40      |        |             |              | (0.90)                       |                                                                                                                                                                                                              |        |    |         |
| D                    | 1.90      | N = 14 | 101mm /100% | 130.08       | 1.80                         | Medium dense grey slightly gravelly silty SAND. Gravel is fine to coarse subangular to subrounded mudstone, quartzite and sandstone. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                    |        |    |         |
|                      | 2.00      |        |             |              |                              |                                                                                                                                                                                                              |        |    |         |
| D                    | 3.00      | N = 6  | 92mm /80%   |              |                              | From 3.00m bgl: loose.                                                                                                                                                                                       |        |    |         |
|                      | 3.00      |        |             |              |                              |                                                                                                                                                                                                              |        |    |         |
| D                    | 3.80      | N = 4  | 79mm /70%   |              | (3.65)                       |                                                                                                                                                                                                              |        |    |         |
|                      | 4.00      |        |             |              |                              |                                                                                                                                                                                                              |        |    |         |
| D                    | 5.00      |        | 79mm /80%   |              |                              |                                                                                                                                                                                                              |        |    |         |
| Continued next sheet |           |        |             |              |                              |                                                                                                                                                                                                              |        |    |         |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |              |         |       |        | Drilled: Exploration Ltd |
|---------------------|--------------|---------|-------|--------|--------------------------|
| Depth Strike        | Rose to      | Remarks | Cased | Sealed |                          |
| 0.80<br>3.00        | 0.80<br>3.00 |         |       |        |                          |
|                     |              |         |       |        | Logged: HH               |
|                     |              |         |       |        | Checked: PG              |

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS3

Project

Unit B, Birch Business Park, Heywood

Client

Yeagate Limited

Start

10/01/2022

End

10/01/2022

Coordinates

E 384010.17 N 408207.61

Ground Level

131.88m AOD

Project No.

AG3353-21

Sheet

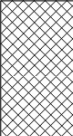
2 of 2

Scale

1:25

Total Depth

5.45m

| Sample / Test Type | Depth (m) | Result | Dia./ Rec. | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                                                           | Legend                                                                              | GW | Install                                                                             |
|--------------------|-----------|--------|------------|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------|
| S                  | 5.00      | N = 13 |            |              |                              | Medium dense grey slightly gravelly silty SAND. Gravel is fine to coarse subangular to subrounded mudstone, quartzite and sandstone. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)<br><i>At 5.00m bgl: medium dense.</i> |  |    |  |
|                    |           |        |            | 126.43       | 5.45                         | End of Borehole at 5.45m                                                                                                                                                                                        |                                                                                     |    |                                                                                     |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |              |         |       |        | Drilled: Exploration Ltd<br><br>Logged: HH<br><br>Checked: PG |
|---------------------|--------------|---------|-------|--------|---------------------------------------------------------------|
| Depth Strike        | Rose to      | Remarks | Cased | Sealed |                                                               |
| 0.80<br>3.00        | 0.80<br>3.00 |         |       |        |                                                               |

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS4

Project

Unit B, Birch Business Park, Heywood

Client

Yeagate Limited

Start

10/01/2022

End

10/01/2022

Coordinates

E 384065.89 N 408163.40

Ground Level

133.05m AOD

Project No.

AG3353-21

Sheet

1 of 2

Scale

1:25

Total Depth

5.45m

| Sample / Test Type   | Depth (m) | Result    | Dia./ Rec. | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                | Legend                                                                                | GW | Install |
|----------------------|-----------|-----------|------------|--------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----|---------|
| ES                   | 0.40      | N = 19    |            | 132.85       | (0.20)                       | Dark brown clayey SAND with frequent rootlets. (TOPSOIL)                                                                                                             |    |    |         |
|                      |           |           |            |              | 0.20                         | Brown clayey SAND.                                                                                                                                                   |    |    |         |
|                      |           |           |            |              | (0.40)                       | (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                                                                 |    |    |         |
| D ES                 | 0.80      |           |            | 132.45       | 0.60                         | Medium dense red-orange slightly gravelly silty SAND. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. (GLACIOFLUVIAL ICE CONTACT DEPOSITS) |   |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| B D S                | 1.20      |           |            | 101mm /100%  | (1.60)                       |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| B S                  | 2.00      |           |            | N = 18       |                              | 130.85                                                                                                                                                               | 2.20                                                                                  |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| D                    | 2.60      | N = 23    | 92mm /80%  |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| D S                  | 3.00      | 79mm /80% |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| D                    | 3.70      | N = 32    |            |              | (3.25)                       |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| D S                  | 4.00      | 79mm /70% |            |              |                              | Below 4m bgl: dense.                                                                                                                                                 |  |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| D                    | 5.00      |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
|                      |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |
| Continued next sheet |           |           |            |              |                              |                                                                                                                                                                      |                                                                                       |    |         |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |         |         |       |        | Drilled: Exploration Ltd |
|---------------------|---------|---------|-------|--------|--------------------------|
| Depth Strike        | Rose to | Remarks | Cased | Sealed |                          |
| 4.00                | 4.00    |         |       |        |                          |
|                     |         |         |       |        | Logged: HH               |
|                     |         |         |       |        | Checked: PG              |

# DCS4

**Project No.** AG3353-21

Sheet 2 of 2

Scale 1:25

**Total Depth** 5.45m

**Installation:**  
**Remarks:** Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

Exploratory hole logs to be read in conjunction with key sheet

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS5

Project

Unit B, Birch Business Park, Heywood

Project No.

AG3353-21

Client

Yeagate Limited

Sheet

1 of 2

Start

10/01/2022

Coordinates

E 384146.92 N 408229.86

Scale

1:25

End

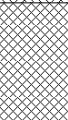
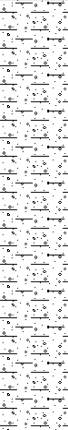
11/01/2022

Ground Level

131.51m AOD

Total Depth

5.45m

| Sample / Test Type   | Depth (m)    | Result | Dia./ Rec. | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                                                 | Legend                                                                              | GW                                                                                    | Install                                                                              |                                                                                                                                                 |                                                                                       |
|----------------------|--------------|--------|------------|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| D<br>ES              | 0.60<br>0.60 | N = 11 |            | 131.11       | (0.40)                       | Dark brown silty clayey SAND with rare rootlets. (TOPSOIL/MADE GROUND)                                                                                                |  |  |  |                                                                                                                                                 |                                                                                       |
|                      |              |        |            |              | 0.40                         | Dark brown-grey slightly clayey slightly gravelly SAND. Gravel is fine to coarse subangular to subrounded sandstone, brick, clinker and wood fragments. (MADE GROUND) |  |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| ES                   | 1.00         |        |            | 130.41       | 1.10                         | Dark brown very clayey SAND with rare rootlets. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)                                                                                  |  |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| D<br>S               | 1.20<br>1.20 |        |            |              | (0.30)                       |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| ES                   | 1.60         |        |            | 130.11       | 1.40                         | Medium dense orange-brown slightly gravelly SAND. Gravel is fine to coarse subangular to subrounded sandstone and quartzite. (GLACIOFLUVIAL ICE CONTACT DEPOSITS)     |  |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
|                      |              |        |            |              |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| D<br>S               | 2.00<br>2.00 |        |            | N = 11       |                              | (2.10)                                                                                                                                                                |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| D                    | 2.50         |        |            |              |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| D<br>S               | 3.00<br>3.00 |        |            | N = 6        |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      | Below 3m bgl: loose.                                                                                                                            |                                                                                       |
| D                    | 3.60         |        |            |              |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| S                    | 4.00         |        |            | N = 10       |                              | 128.01                                                                                                                                                                | 3.50                                                                                |                                                                                       |                                                                                      | Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. (GLACIAL TILL) |  |
|                      |              |        |            |              |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
|                      |              |        |            |              | (1.95)                       |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| S                    | 5.00         | N = 23 |            |              |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |
| Continued next sheet |              |        |            |              |                              |                                                                                                                                                                       |                                                                                     |                                                                                       |                                                                                      |                                                                                                                                                 |                                                                                       |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |         |         |       |        | Drilled: Exploration Ltd<br><br>Logged: HH<br><br>Checked: PG |
|---------------------|---------|---------|-------|--------|---------------------------------------------------------------|
| Depth Strike        | Rose to | Remarks | Cased | Sealed |                                                               |
| 2.50                | 2.50    |         |       |        |                                                               |

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS5

Project

Unit B, Birch Business Park, Heywood

Client

Yeagate Limited

Start

10/01/2022

End

11/01/2022

Coordinates

E 384146.92 N 408229.86

Ground Level

131.51m AOD

Project No.

AG3353-21

Sheet

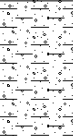
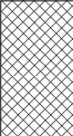
2 of 2

Scale

1:25

Total Depth

5.45m

| Sample / Test Type | Depth (m) | Result | Dia./ Rec. | Level (mAoD) | Strata Depth (thickness) (m) | Description of Strata                                                                                                                           | Legend                                                                              | GW | Install                                                                             |
|--------------------|-----------|--------|------------|--------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------|
|                    |           |        |            | 126.06       | 5.45                         | Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. (GLACIAL TILL) |  |    |  |
|                    |           |        |            |              |                              | End of Borehole at 5.45m                                                                                                                        |                                                                                     |    |                                                                                     |

Installation:  
Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole backfilled with arisings on completion.

| Groundwater Strikes |         |         |       |        | Drilled: Exploration Ltd |
|---------------------|---------|---------|-------|--------|--------------------------|
| Depth Strike        | Rose to | Remarks | Cased | Sealed |                          |
| 2.50                | 2.50    |         |       |        | Logged: HH               |
|                     |         |         |       |        | Checked: PG              |

# SPT Hammer Energy Test Report

In accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD  
AINLEYS INDUSTRIAL ESTATE  
ELLAND  
WEST YORKSHIRE  
HX5 9JP

SPT Hammer Ref: DART400  
Test Date: 21/01/2022  
Report Date: 21/01/2022  
File Name: DART400.spt  
Test Operator: MT

## Instrumented Rod Data

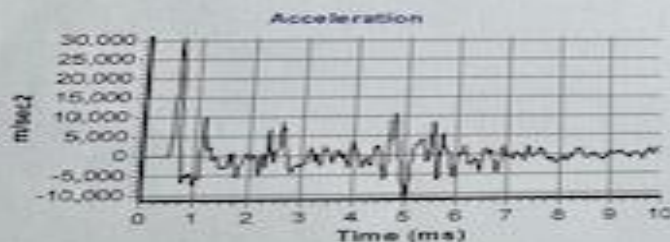
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 7080  
Accelerometer No.2: 11609

## SPT Hammer Information

Hammer Mass  $m$  (kg): 63.5  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 10.0

## Comments / Location

EXPLORATION LTD - 78845



## Calculations

Area of Rod A ( $\text{mm}^2$ ): 905  
Theoretical Energy  $E_{\text{theor}}$  (J): 473  
Measured Energy  $E_{\text{meas}}$  (J): 288

Energy Ratio  $E_r$  (%):

61

Signed: M.TONER  
Title: TRAINEE FITTER

The recommended calibration interval is 12 months

# Exploratory Hole Log Key Sheet

| Sample Test Notation                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  |                   | Backfill Symbols     |                                            | Legend Symbols |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------|----------------------|--------------------------------------------|----------------|------------------|
| <b>D</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Small Disturbed sample           |                   |                      | Sand                                       |                | Topsoil          |
| <b>B</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Bulk Disturbed sample            |                   |                      | Gravel                                     |                | Made Ground      |
| <b>ES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Environmental sample             |                   |                      | Concrete                                   |                | Concrete         |
| <b>U</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Undisturbed U100 sample          |                   |                      | Bentonite                                  |                | Clay             |
| <b>UT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Undisturbed UT100 sample         |                   |                      | Arisings                                   |                | Silt             |
| <b>C</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Core sample                      |                   |                      | Grout                                      |                | Sand             |
| <b>W</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Water sample                     |                   |                      |                                            |                | Gravel           |
| In Situ Test Notation                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  |                   | Installation Symbols |                                            |                | Peat             |
| <b>S</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Standard Penetration Test        |                   |                      | Plain Standpipe                            |                | Cobbles          |
| <b>S (C)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Standard Penetration Test (cone) |                   |                      | Slotted Standpipe                          |                | Boulders         |
| <b>HV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Hand Shear Vane Test             |                   |                      | Piezometer                                 |                | Mudstone         |
| <b>PID</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Photoionization Detector Test    |                   |                      | Vibrating Wire Piezometer                  |                | Siltstone        |
| <b>MEXE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Mexecone Cone Penetrometer Test  |                   |                      | Inclinometer                               |                | Sandstone        |
| <b>PP</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Pocket Penetrometer Test         |                   |                      | Extensometer<br>(with magnet locations)    |                | Limestone        |
| <b>K</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Permeability Test                |                   |                      |                                            |                | Chalk            |
| Results Notation                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                   | Groundwater (GW)     |                                            |                | Coal             |
| <b>Cu</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Shear Strength                   | kN/m <sup>2</sup> |                      | Rise                                       |                | Breccia          |
| <b>N</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SPT N Value                      | -                 |                      | Groundwater Strike -<br>with Recorded Rise |                | Conglomerate     |
| <b>PID</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | VOC Concentration                | ppm               |                      | Strike                                     |                | Shale            |
| <b>( )</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | U/UT Blow Count                  | -                 |                      | Groundwater Strike -<br>No Recorded Rise   |                | Igenous Rock     |
| Rotary Core Notation                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  |                   |                      |                                            |                | Metamorphic Rock |
| <b>TCR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Total Core Recovery              |                   |                      |                                            | <b>NR NR</b>   | No Recovery      |
| <b>SCR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Solid Core Recovery              |                   |                      |                                            | <b>NR NR</b>   | No Recovery      |
| <b>RQD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Rock Quality Designation         |                   |                      |                                            |                |                  |
| <b>FI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Fracture Index                   |                   |                      |                                            |                |                  |
| <b>If</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Fracture Spacing                 |                   |                      |                                            |                |                  |
| <b>NI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Non Intact                       |                   |                      |                                            |                |                  |
| <b>NR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | No Recovery                      |                   |                      |                                            |                |                  |
| <b>NA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Not Applicable                   |                   |                      |                                            |                |                  |
| Ease of Dig                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                  |                   |                      |                                            |                |                  |
| <b>VE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Very Easy                        |                   |                      |                                            |                |                  |
| <b>E</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Easy                             |                   |                      |                                            |                |                  |
| <b>M</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Moderate                         |                   |                      |                                            |                |                  |
| <b>H</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Hard                             |                   |                      |                                            |                |                  |
| <b>VH</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Very Hard                        |                   |                      |                                            |                |                  |
| General Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |                   |                      |                                            |                |                  |
| <p>1. Details of the standpipe/piezometer are given on the log. The 'Install' column shows a graphical representation of the installed including depth of instruments including slotted section or piezometer depth, and backfill details.</p> <p>2. Standard Penetration Test is defined in BS EN ISO 17892. Total N value is shown on the logs, full details of the test increments, equipment references, water and casing levels shown on the SPT Summary Sheet.</p> |                                  |                   |                      |                                            |                |                  |
| <p>Note: Most soils comprise a mixture of particle sizes. The soil type is graphically represented on the log and may be a combination of these symbols.</p>                                                                                                                                                                                                                                                                                                             |                                  |                   |                      |                                            |                |                  |

# **APPENDIX C**

# Ground Gas Monitoring and Flow Results

Project Number: AG3353-21  
Project Name: Unit B, Birch Business Park, Heywood

Date and Time of Monitoring: Friday 21st January 2022 - 10:00  
Phase of Monitoring: 1 of 4

| BH No. | Flow Range (litres/hr over 3 mins) |      |      | Differential Pressure (mb) | Methane % v/v |        | Carbon dioxide % v/v |        | Oxygen % v/v |        | Diameter of installation (mm) | Water level (m bgl) |
|--------|------------------------------------|------|------|----------------------------|---------------|--------|----------------------|--------|--------------|--------|-------------------------------|---------------------|
|        | Max                                | Min  | Avg  |                            | Peak          | Steady | Peak                 | Steady | Min          | Steady |                               |                     |
| CP1    | 0.1                                | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.6                  | 0.6    | 20.9         | 21.2   | 50                            | 0.90                |
| CP3    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.8                  | 1.6    | 20.0         | 20.1   | 50                            | 2.40                |
| CP4    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.4                  | 1.0    | 20.5         | 20.5   | 50                            | 1.40                |
| CP5    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.5                  | 1.5    | 19.7         | 19.7   | 50                            | 2.50                |

Additional gases (if required)

| BH No. | VOCs (ppm) | Carbon Monoxide (ppm) | Hydrogen Sulphide (ppm) | Diameter of installation (mm) |
|--------|------------|-----------------------|-------------------------|-------------------------------|
| CP1    | <0.1       | 12                    | <1                      | 50                            |
| CP3    | <0.1       | <1                    | <1                      | 50                            |
| CP4    | <0.1       | <1                    | <1                      | 50                            |
| CP5    | <0.1       | <1                    | <1                      | 50                            |

| Borehole specific comments/observations |
|-----------------------------------------|
|                                         |
|                                         |
|                                         |
|                                         |

Meterological Data

|                              |              |
|------------------------------|--------------|
| Atmospheric Pressure (mb)    | Start: 1022  |
| Atmospheric Pressure (mb)    | Finish: 1022 |
| Pressure Rising or Falling   | Rising       |
| Weather Conditions           | Drizzle      |
| Atmospheric Oxygen (% vol)   | 21.2         |
| Wind Speed & Direction       | 4 kmph W     |
| Ambient Air Temperature (°C) | 3.0          |

Site Data

|                                                              |               |
|--------------------------------------------------------------|---------------|
| Monitoring Personnel                                         | Hannah Hadwin |
| GPS Instrument                                               |               |
| Gasmeter Serial Number                                       | G503948       |
| PID Serial Number                                            | 110423        |
| Ground Conditions (vegetation stress, visual contamination): |               |
|                                                              |               |

General Notes:

- 1. Instrument specification data and calibration information provided on a separate sheet

# Ground Gas Monitoring and Flow Results

Project Number: AG3353-21

Project Name: Unit B, Birch Business Park, Heywood

Date and Time of Monitoring: Wednesday 26th January 2022 - 10:30

Phase of Monitoring: 2 of 4

| BH No. | Flow Range (litres/hr over 3 mins) |      |      | Differential Pressure (mb) | Methane % v/v |        | Carbon dioxide % v/v |        | Oxygen % v/v |        | Diameter of installation (mm) | Water level (m bgl) |
|--------|------------------------------------|------|------|----------------------------|---------------|--------|----------------------|--------|--------------|--------|-------------------------------|---------------------|
|        | Max                                | Min  | Avg  |                            | Peak          | Steady | Peak                 | Steady | Min          | Steady |                               |                     |
| CP1    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 0.3                  | 0.3    | 21.3         | 21.4   | 50                            | 0.85                |
| CP3    | 0.2                                | 0.1  | 0.1  | 0.00                       | <0.1          | <0.1   | 1.7                  | 1.7    | 19.7         | 19.7   | 50                            | 2.40                |
| CP4    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.2                  | 0.7    | 20.9         | 21.0   | 50                            | 1.45                |
| CP5    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.2                  | 1.1    | 19.5         | 19.5   | 50                            | 2.50                |

## Additional gases (if required)

| BH No. | VOCs (ppm) | Carbon Monoxide (ppm) | Hydrogen Sulphide (ppm) | Diameter of installation (mm) |
|--------|------------|-----------------------|-------------------------|-------------------------------|
| CP1    | <0.1       | <1                    | <1                      | 50                            |
| CP3    | <0.1       | <1                    | <1                      | 50                            |
| CP4    | <0.1       | <1                    | <1                      | 50                            |
| CP5    | <0.1       | 4                     | <1                      | 50                            |

## Borehole specific comments/observations

## Meterological Data

|                              |              |
|------------------------------|--------------|
| Atmospheric Pressure (mb)    | Start: 1022  |
| Atmospheric Pressure (mb)    | Finish: 1022 |
| Pressure Rising or Falling   | Rising       |
| Weather Conditions           | Overcast     |
| Atmospheric Oxygen (% vol)   | 21.2         |
| Wind Speed & Direction       | WSW 19 km/h  |
| Ambient Air Temperature (°C) | 7.0          |

## Site Data

|                                                              |               |
|--------------------------------------------------------------|---------------|
| Monitoring Personnel                                         | Hannah Hadwin |
| GPS Instrument                                               |               |
| Gasmeter Serial Number                                       | G503948       |
| PID Serial Number                                            | 110423        |
| Ground Conditions (vegetation stress, visual contamination): |               |

## General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

**APPLIED GEOLOGY**

# Ground Gas Monitoring and Flow Results

**Project Number:** AG3353-21

**Date and Time of Monitoring:** Friday 4th February 2022 - 11.30

**Project Name:** Unit B, Birch Business Park, Heywood

**Phase of Monitoring:** 3 of 4

| BH No. | Flow Range (litres/hr over 3 mins) |      |      | Differential Pressure (mb) | Methane % v/v |        | Carbon dioxide % v/v |        | Oxygen % v/v |        | Diameter of installation (mm) | Water level (m bgl) |
|--------|------------------------------------|------|------|----------------------------|---------------|--------|----------------------|--------|--------------|--------|-------------------------------|---------------------|
|        | Max                                | Min  | Avg  |                            | Peak          | Steady | Peak                 | Steady | Min          | Steady |                               |                     |
| CP1    | <0.1                               | <0.1 | <0.1 | -0.02                      | <0.1          | <0.1   | 0.2                  | 0.2    | 20.6         | 20.6   | 50                            | 0.73                |
| CP3    | <0.1                               | <0.1 | <0.1 | -0.02                      | <0.1          | <0.1   | 0.1                  | 0.1    | 20.6         | 20.6   | 50                            | 2.30                |
| CP4    | 0.1                                | <0.1 | <0.1 | -0.10                      | <0.1          | <0.1   | 0.1                  | 0.1    | 19.8         | 19.8   | 50                            | 1.21                |
| CP5    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 1.9                  | 1.9    | 18.6         | 18.6   | 50                            | 2.36                |

## Additional gases (if required)

| BH No. | VOCs (ppm) | Carbon Monoxide (ppm) | Hydrogen Sulphide (ppm) | Diameter of installation (mm) |
|--------|------------|-----------------------|-------------------------|-------------------------------|
| CP1    | 0.4        | <1                    | <1                      | 50                            |
| CP3    | 0.3        | <1                    | <1                      | 50                            |
| CP4    | 0.9        | <1                    | <1                      | 50                            |
| CP5    | 0.3        | <1                    | <1                      | 50                            |

| Borehole specific comments/observations |
|-----------------------------------------|
|                                         |
|                                         |
|                                         |
|                                         |

## Meteorological Data

|                              |                        |
|------------------------------|------------------------|
| Atmospheric Pressure (mb)    | Start: 993             |
| Atmospheric Pressure (mb)    | Finish: 995            |
| Pressure Rising or Falling   | Steady                 |
| Weather Conditions           | Sunshine/heavy showers |
| Atmospheric Oxygen (% vol)   | 20.2                   |
| Wind Speed & Direction       | moderate breeze NW     |
| Ambient Air Temperature (°C) | 6.0                    |

## Site Data

|                                                              |                 |
|--------------------------------------------------------------|-----------------|
| Monitoring Personnel                                         | Malcolm McGlone |
| GPS Instrument                                               |                 |
| Gasmeter Serial Number                                       | G506760         |
| PID Serial Number                                            | 108606          |
| Ground Conditions (vegetation stress, visual contamination): |                 |
|                                                              |                 |

## General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

**APPLIED GEOLOGY**

# Ground Gas Monitoring and Flow Results

**Project Number:** AG3353-21

**Date and Time of Monitoring:** Wednesday 2nd March 2022 - 10:00

**Project Name:** Unit B, Birch Business Park, Heywood

**Phase of Monitoring:** 4 of 4

| BH No. | Flow Range (litres/hr over 3 mins) |      |      | Differential Pressure (mb) | Methane % v/v |        | Carbon dioxide % v/v |        | Oxygen % v/v |        | Diameter of installation (mm) | Water level (m bgl) |
|--------|------------------------------------|------|------|----------------------------|---------------|--------|----------------------|--------|--------------|--------|-------------------------------|---------------------|
|        | Max                                | Min  | Avg  |                            | Peak          | Steady | Peak                 | Steady | Min          | Steady |                               |                     |
| CP1    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 0.2                  | 0.2    | 21.0         | 21.0   | 50                            | 0.75                |
| CP3    | <0.1                               | <0.1 | <0.1 | -0.03                      | <0.1          | <0.1   | 1.5                  | 1.5    | 19.9         | 19.9   | 50                            | 1.97                |
| CP4    | 0.1                                | <0.1 | <0.1 | -0.07                      | <0.1          | <0.1   | 1.0                  | 1.0    | 21.0         | 21.0   | 50                            | 1.04                |
| CP5    | <0.1                               | <0.1 | <0.1 | 0.00                       | <0.1          | <0.1   | 0.9                  | 0.9    | 20.1         | 20.1   | 50                            | 2.21                |

## Additional gases (if required)

| BH No. | VOCs (ppm) | Carbon Monoxide (ppm) | Hydrogen Sulphide (ppm) | Diameter of installation (mm) |
|--------|------------|-----------------------|-------------------------|-------------------------------|
| CP1    | 0.6        | <1                    | <1                      | 50                            |
| CP3    | 0.1        | <1                    | <1                      | 50                            |
| CP4    | 1.7        | <1                    | <1                      | 50                            |
| CP5    | 0.9        | <1                    | <1                      | 50                            |

| Borehole specific comments/observations |
|-----------------------------------------|
|                                         |
|                                         |
|                                         |
|                                         |

## Meterological Data

|                              |              |
|------------------------------|--------------|
| Atmospheric Pressure (mb)    | Start: 1019  |
| Atmospheric Pressure (mb)    | Finish: 1020 |
| Pressure Rising or Falling   | Rising       |
| Weather Conditions           | Heavy rain   |
| Atmospheric Oxygen (% vol)   | 20.9         |
| Wind Speed & Direction       | Light breeze |
| Ambient Air Temperature (°C) | 7.0          |

## Site Data

|                                                              |                 |
|--------------------------------------------------------------|-----------------|
| Monitoring Personnel                                         | Malcolm McGlone |
| GPS Instrument                                               |                 |
| Gasmeter Serial Number                                       | G506760         |
| PID Serial Number                                            | 115558          |
| Ground Conditions (vegetation stress, visual contamination): |                 |
|                                                              |                 |

## General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

**APPLIED GEOLOGY**

# Gas Monitoring Equipment Specification and Accuracy Details

## Instrument Specifications

| Instrument     | Atmospheric Pressure Range | Temperature Range                          | Flow Range              | Flow Resolution | Borehole Pressure Range    |
|----------------|----------------------------|--------------------------------------------|-------------------------|-----------------|----------------------------|
| GA5000         | 500-1500 mb +/- 5 mb       | -10°C to + 50°C                            | 0-20 lt/hr +/- 0.3 l/hr | 0.1l/hr         | +.500/-500 mbar +/- 4 mbar |
| Phocheck Tiger | -                          | -20 to + 60°C (Certified to -15 to + 45°C) | -                       | -               | -                          |

## Instrument Accuracy

| Instrument     |                    | Methane                                                      | Lower Explosive Limit | Carbon Dioxide                                               | Oxygen                                  | Volatile Organic Compounds                                                 | Hydrogen Sulphide          | Carbon Monoxide               |
|----------------|--------------------|--------------------------------------------------------------|-----------------------|--------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------|----------------------------|-------------------------------|
| GA5000         | Detection Range    | 0-100%                                                       | -                     | 0 -100%                                                      | 0-25%                                   | NA                                                                         | 0 -50ppm response <30 secs | 0 - 1000ppm response <30 Secs |
|                | Detection Accuracy | ./- 0.5% @ 0 to 70%, ./-1.5% @ 70 to 100% Response < 10 secs | N/A                   | ./- 0.5% @ 0 to 60%, ./-1.5% @ 60 to 100% Response < 10 secs | ./- 1.0% @ 0 to 25%, Response < 20 secs | NA                                                                         | ./- 1.5% FS                | ./- 2% of FS                  |
| Phocheck Tiger | Detection Range    | N/A                                                          | N/A                   | N/A                                                          | N/A                                     | 1 ppb - 10,000 ppm                                                         | N/A                        | N/A                           |
|                | Detection Accuracy | N/A                                                          | N/A                   | N/A                                                          | N/A                                     | +/- 1ppb +/- 5% of actual displayed accuracy +/- One digit Response < 2sec | N/A                        | N/A                           |

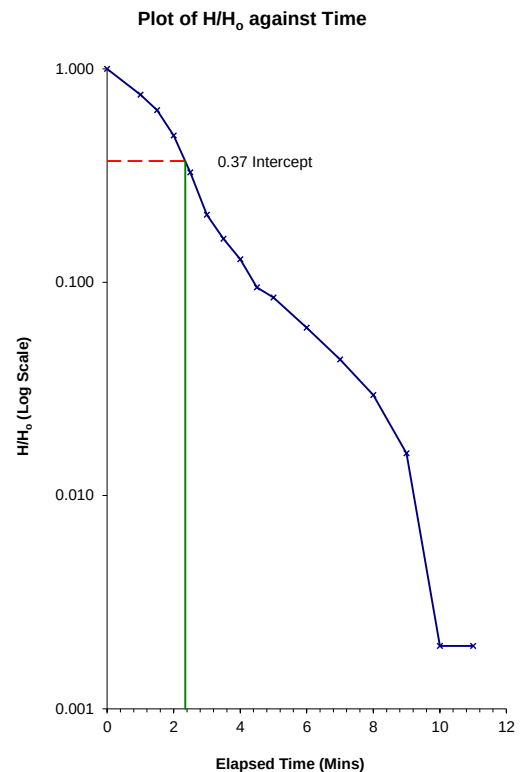
## Calibration Frequency

## Equipment Serial Numbers

|                                                                                                                                                      |                                                           |                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>Instruments are calibrated annually.</p> <p>Details of the instrument calibration certificates and service records are available if required.</p> |                                                           |  |
|                                                                                                                                                      | GA5000 (G503948, G505383, G506760)                        |                                                                                      |
|                                                                                                                                                      | Phocheck Tiger - (T-108308, T-109597, T-109598, T-110423) |                                                                                      |

## Variable Head Permeability Test - Hvorslev Method

| Borehole No.                      | CP1        | Test No.                                       | 1      |
|-----------------------------------|------------|------------------------------------------------|--------|
| Date                              | 04/02/2022 | Type of Test                                   | RH     |
| Operator                          | MM         | Ground level (mOD)                             | 131.72 |
| Diameter of response zone, D (mm) | 150        | Diameter of standpipe,d (mm)                   | 50.00  |
| Top of response zone (mbgl)       | 1.00       | Height of standpipe above GL (m)               | 0.00   |
| Base of response zone (mbgl)      | 8.00       | Water level before test, below top of pipe (m) | 0.73   |

[illegible]

## Permeability Results

### Using BS EN ISO 22282-2 Equation B.7

For when Plot of Time vs Head Ratio go below  $H/H_o = 0.37$

$$k = \frac{r^2 \cdot \ln(L/R)}{2 \cdot L \cdot t_0}$$

Assessed to = 2.35 mins

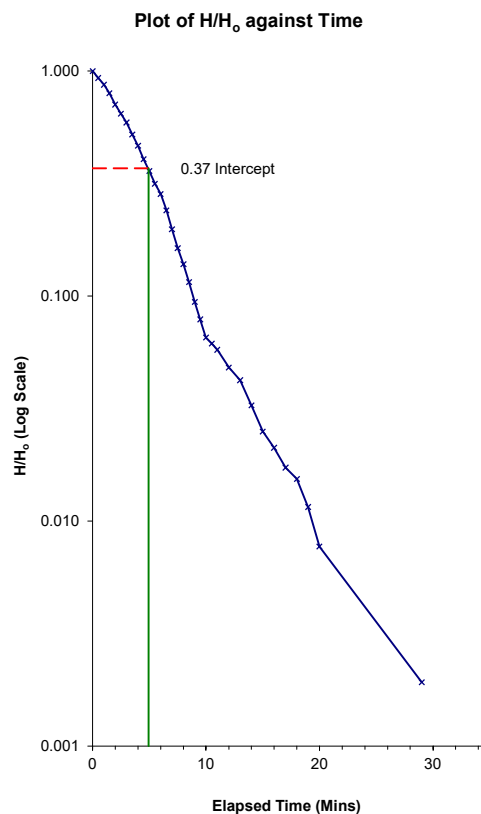
Permeability  $k = 1.4E-06$  m/sec

|             |                                      |                                                                                      |
|-------------|--------------------------------------|--------------------------------------------------------------------------------------|
| Client:     | Yeargate Ltd                         |  |
| Project:    | Unit B, Birch Business Park, Heywood |                                                                                      |
| Project No. | AG3353-21                            |                                                                                      |

# Variable Head Permeability Test - Hvorslev Method

| Borehole No.                      | CP5        | Test No.                                       | 1      |
|-----------------------------------|------------|------------------------------------------------|--------|
| Date                              | 04/02/2022 | Type of Test                                   | RH     |
| Operator                          | MM         | Ground level (mOD)                             | 131.88 |
| Diameter of response zone, D (mm) | 150        | Diameter of standpipe, d (mm)                  | 50.00  |
| Top of response zone (mbgl)       | 1.00       | Height of standpipe above GL (m)               | 0.00   |
| Base of response zone (mbgl)      | 8.00       | Water level before test, below top of pipe (m) | 2.36   |

| Field Data              |                                                    |              |                             |
|-------------------------|----------------------------------------------------|--------------|-----------------------------|
| Elapsed Time (t) (mins) | Depth to water from top of casing or standpipe (m) | Head (H) (m) | Head Ratio H/H <sub>0</sub> |
| 0.00                    | 7.56                                               | -5.20        | 1.000                       |
| 0.50                    | 7.20                                               | -4.84        | 0.931                       |
| 1.00                    | 6.88                                               | -4.52        | 0.869                       |
| 1.50                    | 6.50                                               | -4.14        | 0.796                       |
| 2.00                    | 6.05                                               | -3.69        | 0.710                       |
| 2.50                    | 5.72                                               | -3.36        | 0.646                       |
| 3.00                    | 5.43                                               | -3.07        | 0.590                       |
| 3.50                    | 5.08                                               | -2.72        | 0.523                       |
| 4.00                    | 4.78                                               | -2.42        | 0.465                       |
| 4.50                    | 4.47                                               | -2.11        | 0.406                       |
| 5.00                    | 4.23                                               | -1.87        | 0.360                       |
| 5.50                    | 4.00                                               | -1.64        | 0.315                       |
| 6.00                    | 3.84                                               | -1.48        | 0.285                       |
| 6.50                    | 3.61                                               | -1.25        | 0.240                       |
| 7.00                    | 3.39                                               | -1.03        | 0.198                       |
| 7.50                    | 3.21                                               | -0.85        | 0.163                       |
| 8.00                    | 3.08                                               | -0.72        | 0.138                       |
| 8.50                    | 2.96                                               | -0.60        | 0.115                       |
| 9.00                    | 2.85                                               | -0.49        | 0.094                       |
| 9.50                    | 2.77                                               | -0.41        | 0.079                       |
| 10.00                   | 2.70                                               | -0.34        | 0.065                       |
| 10.50                   | 2.68                                               | -0.32        | 0.062                       |
| 11.00                   | 2.66                                               | -0.30        | 0.058                       |
| 12.00                   | 2.61                                               | -0.25        | 0.048                       |
| 13.00                   | 2.58                                               | -0.22        | 0.042                       |
| 14.00                   | 2.53                                               | -0.17        | 0.033                       |
| 15.00                   | 2.49                                               | -0.13        | 0.025                       |
| 16.00                   | 2.47                                               | -0.11        | 0.021                       |
| 17.00                   | 2.45                                               | -0.09        | 0.017                       |
| 18.00                   | 2.44                                               | -0.08        | 0.015                       |
| 19.00                   | 2.42                                               | -0.06        | 0.012                       |
| 20.00                   | 2.40                                               | -0.04        | 0.008                       |
| 29.00                   | 2.37                                               | -0.01        | 0.002                       |



## Permeability Results

Using BS EN ISO  
22282-2 Equation B.7

For when Plot of Time vs Head Ratio go below H/H<sub>0</sub> = 0.37

$$k = \frac{r^2 \cdot \ln(L/R)}{2 \cdot L \cdot t_0}$$

Assessed to = 4.95 mins

Permeability k = 6.8E-07 m/sec

|             |                                         |                        |
|-------------|-----------------------------------------|------------------------|
| Client:     | Yeagate Ltd                             | <b>APPLIED GEOLOGY</b> |
| Project:    | Unit B, Birch Business Park,<br>Heywood |                        |
| Project No. | AG3353-21                               |                        |

# **APPENDIX D**

SUMMARY OF LEACHATE TEST RESULTS

Site Unit B, Birch Business Park, Heywood  
Job Number AG3353-21  
Type of Water Leachate

| Determinand             | Limit of Detection | Hazardous or Non-Hazardous^ | Sample Identity<br>Depth<br>Sampled Date | DCS1<br>0.2<br>10/01/2022<br>MG | DCS3<br>0.5<br>10/01/2022<br>MG | CP4<br>1.0<br>13/01/2022<br>MG | No. of<br>samples (n) | Waters<br>Screening Value | Source & Justification                                        |
|-------------------------|--------------------|-----------------------------|------------------------------------------|---------------------------------|---------------------------------|--------------------------------|-----------------------|---------------------------|---------------------------------------------------------------|
| pH                      |                    | -                           | -                                        | 8                               | 7.2                             | 7.8                            | 3                     | -                         | -                                                             |
| TOC                     |                    | -                           | mg l <sup>-1</sup>                       | 18.8                            | 10.4                            | 11.9                           | 3                     | -                         | -                                                             |
| Arsenic                 | 1                  | Haz                         | µg l <sup>-1</sup>                       | 13                              | 11                              | 15                             | 3                     | 50                        | WFD Environmental Standard, 2010                              |
| Cadmium                 | 0.08               | Non Haz                     | µg l <sup>-1</sup>                       | 0.16                            | 0.26                            | 0.23                           | 3                     | 5                         | UK Drinking Water Standards (2010)                            |
| Chromium (Total)        | 0.4                | Non Haz                     | µg l <sup>-1</sup>                       | 0.6                             | 2.3                             | 0.9                            | 3                     | 50                        | UK Drinking Water Standards (2010)                            |
| Chromium (III)          | 1                  | Non Haz                     | µg l <sup>-1</sup>                       | 1.0                             | 2.3                             | 1.0                            | 3                     | 50                        | UK Drinking Water Standards (2010)                            |
| Chromium (VI)           | 5                  | Haz                         | µg l <sup>-1</sup>                       | 5.0                             | 5.0                             | 5.0                            | 3                     | 5                         | Detection Limit                                               |
| Copper                  | 0.7                | Non Haz                     | µg l <sup>-1</sup>                       | 14                              | 7.6                             | 9.2                            | 3                     | 2000                      | UK Drinking Water Standards (2010)                            |
| Lead                    | 1                  | Haz                         | µg l <sup>-1</sup>                       | 7.6                             | 7.5                             | 7.9                            | 3                     | 10                        | UK Drinking Water Standards (2010)                            |
| Mercury                 | 0.5                | Haz                         | µg l <sup>-1</sup>                       | 1.8                             | 0.5                             | 0.5                            | 3                     | 6                         | WHO Guidelines for Drinking Water Quality, 4th Edition (2011) |
| Nickel                  | 0.3                | Non Haz                     | µg l <sup>-1</sup>                       | 5.4                             | 4.5                             | 5                              | 3                     | 20                        | UK Drinking Water Standards (2010)                            |
| Selenium                | 4                  | Non Haz                     | µg l <sup>-1</sup>                       | 4.0                             | 4.0                             | 4.0                            | 3                     | 10                        | UK Drinking Water Standards (2010)                            |
| Zinc                    | 0.4                | Non Haz                     | µg l <sup>-1</sup>                       | 13                              | 20                              | 10                             | 3                     | 5000                      | UK Drinking Water Standards (2010)                            |
| Boron                   | 10                 | Non Haz                     | µg l <sup>-1</sup>                       | 24                              | 16                              | 23                             | 3                     | 1000                      | UK Drinking Water Standards (2010)                            |
| Beryllium               | 0.2                | Non Haz                     | µg l <sup>-1</sup>                       | 0.3                             | 0.3                             | 0.2                            | 3                     | 12                        | UK Drinking Water Standards (2010)                            |
| Vanadium                | 1.7                | Non Haz                     | µg l <sup>-1</sup>                       | 5.8                             | 6.8                             | 12                             | 3                     | 20                        | EQS                                                           |
| Sulphate                | 0.1                | Non Haz                     | mg l <sup>-1</sup>                       | 22.2                            | 7.4                             | 7.4                            | 3                     | 250                       | UK Drinking Water Standards (2010)                            |
| Phenol                  | 1                  | Non Haz                     | µg l <sup>-1</sup>                       | 3.2                             | 5.3                             | 3.9                            | 3                     | 7.7                       | WFD Environmental Standard, 2010                              |
| Naphthalene             | 0.01               | Non Haz                     | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection Limit                                               |
| Acenaphthylene          | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Acenaphthene            | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Fluorene                | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Phenanthrene            | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Anthracene              | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Fluoranthene            | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Pyrene                  | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Benzo[a]anthracene      | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Chrysene                | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Benzo[b]fluoranthene    | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Benzo[k]fluoranthene    | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Benzo[a]pyrene          | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection Limit                                               |
| Dibenz(a,h)Anthracene   | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Indeno(1,2,3-c,d)Pyrene | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |
| Benzo[g,h,i]perylene    | 0.01               | Haz                         | µg l <sup>-1</sup>                       | 0.01                            | 0.01                            | 0.01                           | 3                     | 0.01                      | Detection limit                                               |

Key-  
Result exceeds test screening criteria  
Values in bold at the limit of detection

^ Note:

Hazardous and non-hazardous substances determined by JAGDAG (Jan 2017) and published at <http://www.wfduk.org/sites/default/files/Media/170116%20Substance%20Determinationsfinal.pdf>. These are marked in bold.  
For substances not assessed by JAGDAG, Applied Geology has assumed a determination based on our understanding of the behaviour of the chemical. These determinations are highlighted in yellow.

SOIL CHEMICAL RESULTS COMPARED AGAINST SCREENING VALUES FOR HUMAN HEALTH

Site: Unit B, Birch Business Park, Heywood  
Job No: AG3353-21

Land Use: Commercial / Industrial  
Dataset: Made Ground  
Soil Organic Matter (%): 2.5 %

| Exploratory Hole Reference   |             | DCS1                    | DCS2                    | DCS3                    | DCS4                    | DCS5                    | DCS5                 | CP1                     | No. of samples<br>(n) | Commercial /<br>Industrial | Source/Justification             |
|------------------------------|-------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------------------|-------------------------|-----------------------|----------------------------|----------------------------------|
| Depth (m)                    |             | 0.20                    | 0.40                    | 0.50                    | 0.40                    | 0.60                    | 1.00                 | 1.00                    |                       |                            |                                  |
| Strata                       |             | MG                      | MG                      | MG                      | MG                      | MG                      | MG                   | MG                      |                       |                            |                                  |
|                              | Units       |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Organic Matter (%)           | %           | 2.5                     | 5.9                     | 8.1                     | 3.7                     | 4.9                     | 2.9                  | 2.8                     | 7                     |                            |                                  |
| pH                           | pH Units    | 8.4                     | 7.4                     | 6.6                     | 6.5                     | 8.1                     | 7.8                  | 7.7                     | 7                     |                            |                                  |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Arsenic                      | mg/kg       | 8.6                     | 16                      | 27                      | 10                      | 10                      | 11                   | 12                      | 7                     | 640                        | LQM/CIEH S4UL (2015)             |
| Beryllium                    | mg/kg       | 0.55                    | 0.9                     | 1.3                     | 0.77                    | 1.1                     | 1.1                  | 0.68                    | 7                     | 12                         | LQM/CIEH S4UL (2015)             |
| Boron - Total                | mg/kg       | 2.8                     | 2.8                     | 3.7                     | 3.4                     | 4.8                     | 4.3                  | 3.9                     | 7                     | 240000                     | LQM/CIEH S4UL (2015)             |
| Cadmium                      | mg/kg       | 0.4                     | 0.2                     | 0.2                     | 0.2                     | 0.5                     | 0.2                  | 0.2                     | 7                     | 190                        | LQM/CIEH S4UL (2015)             |
| Chromium (total)             | mg/kg       | 19                      | 45                      | 66                      | 16                      | 14                      | 17                   | 27                      | 7                     | 8600                       | LQM/CIEH S4UL (2015)             |
| Chromium - III               | mg/kg       | 17                      | 45                      | 65                      | 16                      | 13                      | 16                   | 26                      | 7                     | 8600                       | LQM/CIEH S4UL (2015)             |
| Chromium (VI) Screen         | mg/kg       | 4                       | 4                       | 4                       | 4                       | 4                       | 4                    | 4                       | 7                     | 33                         | LQM/CIEH S4UL (2015)             |
| Copper                       | mg/kg       | 26                      | 46                      | 74                      | 25                      | 62                      | 56                   | 30                      | 7                     | 68000                      | LQM/CIEH S4UL (2015)             |
| Lead                         | mg/kg       | 57                      | 70                      | 110                     | 44                      | 83                      | 87                   | 50                      | 7                     | 2330                       | C4SL (2014)                      |
| Mercury (Total)              | mg/kg       | 0.3                     | 0.3                     | 0.3                     | 0.3                     | 0.3                     | 0.3                  | 0.3                     | 7                     | 1100                       | LQM/CIEH S4UL (2015)             |
| Nickel                       | mg/kg       | 13                      | 16                      | 26                      | 16                      | 11                      | 22                   | 18                      | 7                     | 980                        | LQM/CIEH S4UL (2015)             |
| Selenium                     | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 12000                      | LQM/CIEH S4UL (2015)             |
| Vanadium                     | mg/kg       | 20                      | 27                      | 38                      | 26                      | 21                      | 28                   | 26                      | 7                     | 9000                       | LQM/CIEH S4UL (2015)             |
| Zinc                         | mg/kg       | 110                     | 110                     | 120                     | 52                      | 110                     | 65                   | 65                      | 7                     | 730000                     | LQM/CIEH S4UL (2015)             |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Naphthalene                  | mg/kg       | 0.05                    | 0.05                    | 0.28                    | 0.05                    | 0.41                    | 0.05                 | 0.05                    | 7                     | 460                        | LQM/CIEH S4UL (2015)             |
| Acenaphthylene               | mg/kg       | 0.05                    | 0.05                    | 0.05                    | 0.05                    | 1.5                     | 0.05                 | 0.05                    | 7                     | 97000                      | LQM/CIEH S4UL (2015)             |
| Acenaphthene                 | mg/kg       | 0.05                    | 0.05                    | 0.37                    | 0.05                    | 4.9                     | 0.42                 | 0.48                    | 7                     | 97000                      | LQM/CIEH S4UL (2015)             |
| Fluorene                     | mg/kg       | 0.05                    | 0.05                    | 0.19                    | 0.05                    | 4.8                     | 0.3                  | 0.41                    | 7                     | 68000                      | LQM/CIEH S4UL (2015)             |
| Phenanthrene                 | mg/kg       | 1                       | 0.23                    | 1.9                     | 0.05                    | 68                      | 3.5                  | 4.5                     | 7                     | 22000                      | LQM/CIEH S4UL (2015)             |
| Anthracene                   | mg/kg       | 0.26                    | 0.05                    | 0.39                    | 0.05                    | 25                      | 1.2                  | 1.1                     | 7                     | 540000                     | LQM/CIEH S4UL (2015)             |
| Fluoranthene                 | mg/kg       | 3.1                     | 0.45                    | 3.2                     | 0.05                    | 160                     | 7.8                  | 13                      | 7                     | 23000                      | LQM/CIEH S4UL (2015)             |
| Pyrene                       | mg/kg       | 3                       | 0.46                    | 2.8                     | 0.05                    | 130                     | 7                    | 12                      | 7                     | 54000                      | LQM/CIEH S4UL (2015)             |
| Benzo[a]anthracene           | mg/kg       | 1.6                     | 0.26                    | 1.6                     | 0.05                    | 81                      | 4.3                  | 5.8                     | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Chrysene                     | mg/kg       | 1.4                     | 0.34                    | 1.7                     | 0.05                    | 59                      | 3.2                  | 5.2                     | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Benzo[b]fluoranthene         | mg/kg       | 1.5                     | 0.29                    | 1.7                     | 0.05                    | 59                      | 3.9                  | 6.2                     | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Benzo[k]fluoranthene         | mg/kg       | 1                       | 0.2                     | 0.78                    | 0.05                    | 33                      | 1.8                  | 3.1                     | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Benzo[a]pyrene               | mg/kg       | 1.7                     | 0.32                    | 1.5                     | 0.05                    | 53                      | 3.8                  | 6.6                     | 7                     | 76                         | C4SL (2014)                      |
| Dibenzo[a,h]anthracene       | mg/kg       | 0.85                    | 0.05                    | 0.74                    | 0.05                    | 24                      | 1.9                  | 3                       | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Indeno[1,2,3-cd]pyrene       | mg/kg       | 0.21                    | 0.05                    | 0.22                    | 0.05                    | 6.4                     | 0.52                 | 0.77                    | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Benzo[g,h,i]perylene         | mg/kg       | 0.98                    | 0.05                    | 0.83                    | 0.05                    | 22                      | 2                    | 3.5                     | 7                     | *                          | Genotoxic PAH see Benzo(a)pyrene |
| Total of 16 PAHs             | mg/kg       | 16.6                    | 2.55                    | 18.2                    | 0.8                     | 731                     | 41.6                 | 65.3                    | 7                     |                            |                                  |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Phenols (Total)              | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 690                        | LQM/CIEH S4UL (2015)             |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Benzene                      | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 47                         | LQM/CIEH S4UL (2015)             |
| Toluene                      | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 110000                     | LQM/CIEH S4UL (2015)             |
| Ethylbenzene                 | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 13000                      | LQM/CIEH S4UL (2015)             |
| m&p Xylene                   | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 14000                      | LQM/CIEH S4UL (2015)             |
| o-Xylene                     | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 15000                      | LQM/CIEH S4UL (2015)             |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Aliphatic TPH >C5-C6         | mg/kg       | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                | 0.001                   | 7                     | 5900                       | LQM/CIEH S4UL (2015)             |
| Aliphatic TPH >C6-C8         | mg/kg       | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                | 0.001                   | 7                     | 17000                      | LQM/CIEH S4UL (2015)             |
| Aliphatic TPH >C8-C10        | mg/kg       | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                | 0.001                   | 7                     | 4800                       | LQM/CIEH S4UL (2015)             |
| Aliphatic TPH >C10-C12       | mg/kg       | 1                       | 1                       | 1                       | 1                       | 1                       | 1                    | 1                       | 7                     | 23000                      | LQM/CIEH S4UL (2015)             |
| Aliphatic TPH >C12-C16       | mg/kg       | 3.3                     | 2                       | 2                       | 2                       | 2                       | 2                    | 2                       | 7                     | 82000                      | LQM/CIEH S4UL (2015)             |
| Aliphatic TPH >C16-C21       | mg/kg       | 8.7                     | 8                       | 8                       | 8                       | 10                      | 8                    | 8                       | 7                     | -                          | -                                |
| Aliphatic TPH >C21-C35       | mg/kg       | 50                      | 8                       | 8                       | 8                       | 57                      | 8                    | 8                       | 7                     | No Risk                    | LQM/CIEH S4UL (2015)             |
| Aliphatic TPH >C35-C44       | mg/kg       | 59                      | 8.4                     | 8.4                     | 8.4                     | 42                      | 8.4                  | 8.4                     | 7                     | No Risk                    | LQM/CIEH S4UL (2015)             |
| Total Aliphatic Hydrocarbons | mg/kg       | 120                     | 10                      | 10                      | 10                      | 110                     | 10                   | 10                      | 7                     |                            |                                  |
| Aromatic TPH >C5-C7          | mg/kg       | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                | 0.001                   | 7                     | 46000                      | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C7-C8          | mg/kg       | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                | 0.001                   | 7                     | 100000                     | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C8-C10         | mg/kg       | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                   | 0.001                | 0.001                   | 7                     | 8100                       | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C10-C12        | mg/kg       | 1                       | 1                       | 1                       | 1                       | 3                       | 1                    | 1                       | 7                     | 28000                      | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C12-C16        | mg/kg       | 2                       | 2                       | 2                       | 2                       | 33                      | 4.5                  | 8.7                     | 7                     | 37000                      | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C16-C21        | mg/kg       | 11                      | 10                      | 13                      | 10                      | 290                     | 22                   | 40                      | 7                     | 28000                      | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C21-C35        | mg/kg       | 47                      | 18                      | 31                      | 10                      | 470                     | 37                   | 63                      | 7                     | 28000                      | LQM/CIEH S4UL (2015)             |
| Aromatic TPH >C35-C44        | mg/kg       | 8.4                     | 8.4                     | 8.4                     | 8.4                     | 88                      | 8.4                  | 8.4                     | 7                     | 28000                      | LQM/CIEH S4UL (2015)             |
| Total Aromatic Hydrocarbons  | mg/kg       | 58                      | 22                      | 44                      | 10                      | 880                     | 63                   | 110                     | 7                     |                            |                                  |
| Total Petroleum Hydrocarbons | mg/kg       | 180                     | 22                      | 44                      | 10                      | 990                     | 63                   | 110                     | 7                     |                            |                                  |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
|                              |             |                         |                         |                         |                         |                         |                      |                         |                       |                            |                                  |
| Asbestos ID                  | Detection   | No Asbestos<br>Detected | No Asbestos<br>Detected | No Asbestos<br>Detected | No Asbestos<br>Detected | No Asbestos<br>Detected | Asbestos<br>Detected | No Asbestos<br>Detected | 0                     |                            | Detection Limit                  |
| Asbestos ID                  | Description | -                       | -                       | -                       | -                       | -                       | Chrysotile           | -                       | 0                     |                            | Detection Limit                  |
| Asbestos Quantity            | %           | -                       | -                       | -                       | -                       | -                       | 0.001                | -                       | 0                     |                            | Detection Limit                  |

Key -  
Value within sample set exceeds screening value  
Statistical value exceeds screening value

LQM/CIEH S4UL Reference No. S4UL3159 (2015)  
Values in **bold** are reported at the laboratory limit of detection  
Benzo(a)pyrene has been used as a 'surrogate marker for genotoxic PAH' as discussed in Appendix E of CL-AIRE SP1010 'Development of C4SL for Assessment of Land Affected by Contamination', December 2013.  
This allows assessment of the combined carcinogenic risk associated with genotoxic PAH using only b(a)p. Genotoxic PAHs include Benz(a)pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(ah)anthracene, Indeno(123cd)pyrene, Benzo(ghi)perylene and have been marked with a \* on the table.



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## **Analytical Report Number : 22-33705**

|                             |                                     |                                                        |            |
|-----------------------------|-------------------------------------|--------------------------------------------------------|------------|
| <b>Project / Site name:</b> | Birch Ind Park - Unit B             | <b>Samples received on:</b>                            | 18/01/2022 |
| <b>Your job number:</b>     | AG3353-21                           | <b>Samples instructed on/<br/>Analysis started on:</b> | 18/01/2022 |
| <b>Your order number:</b>   | 17750                               | <b>Analysis completed by:</b>                          | 27/01/2022 |
| <b>Report Issue Number:</b> | 1                                   | <b>Report issued on:</b>                               | 01/02/2022 |
| <b>Samples Analysed:</b>    | 3 leachate samples - 7 soil samples |                                                        |            |

**Signed:**

*Izabela Wójcik*

Izabela Wójcik  
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

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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.

**Analytical Report Number: 22-33705**  
**Project / Site name: Birch Ind Park - Unit B**  
**Your Order No: 17750**

| Lab Sample Number                       |       |                    |                      | 2140561       | 2140562       | 2140563       | 2140564       | 2140565       |
|-----------------------------------------|-------|--------------------|----------------------|---------------|---------------|---------------|---------------|---------------|
| Sample Reference                        |       |                    |                      | DCS1          | DCS2          | DCS3          | DCS5          | DCS5          |
| Sample Number                           |       |                    |                      | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m)                               |       |                    |                      | 0.20          | 0.40          | 0.50          | 0.60          | 1.00          |
| Date Sampled                            |       |                    |                      | 10/01/2022    | 10/01/2022    | 10/01/2022    | 10/01/2022    | 10/01/2022    |
| Time Taken                              |       |                    |                      | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of detection | Accreditation Status |               |               |               |               |               |
| Stone Content                           | %     | 0.1                | NONE                 | < 0.1         | < 0.1         | < 0.1         | 41            | < 0.1         |
| Moisture Content                        | %     | 0.01               | NONE                 | 12            | 22            | 22            | 14            | 16            |
| Total mass of sample received           | kg    | 0.001              | NONE                 | 0.80          | 0.80          | 0.80          | 0.80          | 0.80          |

| Asbestos in Soil Screen / Identification Name | Type | N/A   | ISO 17025 | -            | -            | -            | -            | Chrysotile |
|-----------------------------------------------|------|-------|-----------|--------------|--------------|--------------|--------------|------------|
| Asbestos in Soil                              | Type | N/A   | ISO 17025 | Not-detected | Not-detected | Not-detected | Not-detected | Detected   |
| Asbestos Quantification (Stage 2)             | %    | 0.001 | ISO 17025 | -            | -            | -            | -            | < 0.001    |
| Asbestos Quantification Total                 | %    | 0.001 | ISO 17025 | -            | -            | -            | -            | < 0.001    |
| Asbestos Analyst ID                           | N/A  | N/A   | N/A       | MWI          | MWI          | MWI          | MWI          | MWI        |

#### General Inorganics

|                                                             |          |         |        |      |        |       |       |       |
|-------------------------------------------------------------|----------|---------|--------|------|--------|-------|-------|-------|
| pH - Automated                                              | pH Units | N/A     | MCERTS | 8.4  | 7.4    | 6.6   | 8.1   | 7.8   |
| Total Sulphate as SO4                                       | %        | 0.005   | MCERTS | -    | 0.047  | -     | 0.118 | 0.041 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1)         | mg/kg    | 2.5     | MCERTS | 250  | 14     | 130   | 600   | 76    |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l      | 0.00125 | MCERTS | 0.12 | 0.0071 | 0.066 | 0.30  | 0.038 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l     | 1.25    | MCERTS | 125  | 7.1    | 65.6  | 299   | 38.0  |
| Water Soluble Chloride (2:1) (leachate equivalent)          | mg/l     | 0.5     | MCERTS | -    | 2.4    | -     | 52    | 5.8   |
| Total Sulphur                                               | %        | 0.005   | MCERTS | -    | 0.028  | -     | 0.078 | 0.029 |
| Organic Matter (automated)                                  | %        | 0.1     | MCERTS | 2.5  | 5.9    | 8.1   | 4.9   | 2.9   |
| Water Soluble Nitrate (2:1) as NO3                          | mg/kg    | 2       | NONE   | -    | 9.1    | -     | 19    | 2.7   |
| Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)    | mg/l     | 5       | NONE   | -    | < 5.0  | -     | 9.3   | < 5.0 |

#### Total Phenols

|                            |       |   |        |       |       |       |       |       |
|----------------------------|-------|---|--------|-------|-------|-------|-------|-------|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
|----------------------------|-------|---|--------|-------|-------|-------|-------|-------|

#### Speciated PAHs

|                        |       |      |        |        |        |        |      |        |
|------------------------|-------|------|--------|--------|--------|--------|------|--------|
| Naphthalene            | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.28   | 0.41 | < 0.05 |
| Acenaphthylene         | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 1.5  | < 0.05 |
| Acenaphthene           | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.37   | 4.9  | 0.42   |
| Fluorene               | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.19   | 4.8  | 0.30   |
| Phenanthrene           | mg/kg | 0.05 | MCERTS | 1.0    | 0.23   | 1.9    | 68   | 3.5    |
| Anthracene             | mg/kg | 0.05 | MCERTS | 0.26   | < 0.05 | 0.39   | 25   | 1.2    |
| Fluoranthene           | mg/kg | 0.05 | MCERTS | 3.1    | 0.45   | 3.2    | 160  | 7.8    |
| Pyrene                 | mg/kg | 0.05 | MCERTS | 3.0    | 0.46   | 2.8    | 130  | 7.0    |
| Benzo(a)anthracene     | mg/kg | 0.05 | MCERTS | 1.6    | 0.26   | 1.6    | 81   | 4.3    |
| Chrysene               | mg/kg | 0.05 | MCERTS | 1.4    | 0.34   | 1.7    | 59   | 3.2    |
| Benzo(b)fluoranthene   | mg/kg | 0.05 | MCERTS | 1.5    | 0.29   | 1.7    | 59   | 3.9    |
| Benzo(k)fluoranthene   | mg/kg | 0.05 | MCERTS | 1.0    | 0.20   | 0.78   | 33   | 1.8    |
| Benzo(a)pyrene         | mg/kg | 0.05 | MCERTS | 1.7    | 0.32   | 1.5    | 53   | 3.8    |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | 0.85   | < 0.05 | 0.74   | 24   | 1.9    |
| Dibenz(a,h)anthracene  | mg/kg | 0.05 | MCERTS | 0.21   | < 0.05 | 0.22   | 6.4  | 0.52   |
| Benzo(ghi)perylene     | mg/kg | 0.05 | MCERTS | 0.98   | < 0.05 | 0.83   | 22   | 2.0    |

#### Total PAH

|                             |       |     |        |      |      |      |     |      |
|-----------------------------|-------|-----|--------|------|------|------|-----|------|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | 16.6 | 2.55 | 18.2 | 731 | 41.6 |
|-----------------------------|-------|-----|--------|------|------|------|-----|------|

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 Project / Site name: Birch Ind Park - Unit B  
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|                                         |       |                    |                      |               |               |               |               |               |
|-----------------------------------------|-------|--------------------|----------------------|---------------|---------------|---------------|---------------|---------------|
| Lab Sample Number                       |       |                    |                      | 2140561       | 2140562       | 2140563       | 2140564       | 2140565       |
| Sample Reference                        |       |                    |                      | DCS1          | DCS2          | DCS3          | DCS5          | DCS5          |
| Sample Number                           |       |                    |                      | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m)                               |       |                    |                      | 0.20          | 0.40          | 0.50          | 0.60          | 1.00          |
| Date Sampled                            |       |                    |                      | 10/01/2022    | 10/01/2022    | 10/01/2022    | 10/01/2022    | 10/01/2022    |
| Time Taken                              |       |                    |                      | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of detection | Accreditation Status |               |               |               |               |               |

#### Heavy Metals / Metalloids

|                                    |       |      |        |       |       |       |       |       |
|------------------------------------|-------|------|--------|-------|-------|-------|-------|-------|
| Arsenic (aqua regia extractable)   | mg/kg | 1    | MCERTS | 8.6   | 16    | 27    | 10    | 11    |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.55  | 0.90  | 1.3   | 1.1   | 1.1   |
| Boron (total)                      | mg/kg | 1    | MCERTS | 2.8   | 2.8   | 3.7   | 4.8   | 4.3   |
| Cadmium (aqua regia extractable)   | mg/kg | 0.2  | MCERTS | 0.4   | < 0.2 | < 0.2 | 0.5   | < 0.2 |
| Chromium (hexavalent)              | mg/kg | 4    | NONE   | < 4.0 | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| Chromium (III)                     | mg/kg | 1    | NONE   | 17    | 45    | 65    | 13    | 16    |
| Chromium (aqua regia extractable)  | mg/kg | 1    | MCERTS | 19    | 45    | 66    | 14    | 17    |
| Copper (aqua regia extractable)    | mg/kg | 1    | MCERTS | 26    | 46    | 74    | 62    | 56    |
| Lead (aqua regia extractable)      | mg/kg | 1    | MCERTS | 57    | 70    | 110   | 83    | 87    |
| Mercury (aqua regia extractable)   | mg/kg | 0.3  | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable)    | mg/kg | 1    | MCERTS | 13    | 16    | 26    | 11    | 22    |
| Selenium (aqua regia extractable)  | mg/kg | 1    | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (aqua regia extractable)  | mg/kg | 1    | MCERTS | 20    | 27    | 38    | 21    | 28    |
| Zinc (aqua regia extractable)      | mg/kg | 1    | MCERTS | 110   | 110   | 120   | 110   | 65    |

|                                 |       |     |      |     |       |     |     |     |
|---------------------------------|-------|-----|------|-----|-------|-----|-----|-----|
| Magnesium (water soluble)       | mg/kg | 5   | NONE | 7.1 | < 5.0 | 7.0 | 8.1 | 5.6 |
| Magnesium (leachate equivalent) | mg/l  | 2.5 | NONE | -   | < 2.5 | -   | 4.1 | 2.8 |

#### Monoaromatics & Oxygenates

|                                    |       |   |        |       |       |       |       |       |
|------------------------------------|-------|---|--------|-------|-------|-------|-------|-------|
| Benzene                            | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Toluene                            | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Ethylbenzene                       | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| p & m-xylene                       | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-xylene                           | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| MTBE (Methyl Tertiary Butyl Ether) | µg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

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| Lab Sample Number                       |       |                    |                      | 2140561       | 2140562       | 2140563       | 2140564       | 2140565       |
|-----------------------------------------|-------|--------------------|----------------------|---------------|---------------|---------------|---------------|---------------|
| Sample Reference                        |       |                    |                      | DCS1          | DCS2          | DCS3          | DCS5          | DCS5          |
| Sample Number                           |       |                    |                      | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m)                               |       |                    |                      | 0.20          | 0.40          | 0.50          | 0.60          | 1.00          |
| Date Sampled                            |       |                    |                      | 10/01/2022    | 10/01/2022    | 10/01/2022    | 10/01/2022    | 10/01/2022    |
| Time Taken                              |       |                    |                      | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of detection | Accreditation Status |               |               |               |               |               |

#### Petroleum Hydrocarbons

|                                                            |       |       |        |         |         |         |         |         |
|------------------------------------------------------------|-------|-------|--------|---------|---------|---------|---------|---------|
| TPH-CWG - Aliphatic >EC5 - EC6 <sub>HS_1D_AL</sub>         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC6 - EC8 <sub>HS_1D_AL</sub>         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC8 - EC10 <sub>HS_1D_AL</sub>        | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aliphatic >EC10 - EC12 <sub>EH_CU_1D_AL</sub>    | mg/kg | 1     | MCERTS | < 1.0   | < 1.0   | < 1.0   | < 1.0   | < 1.0   |
| TPH-CWG - Aliphatic >EC12 - EC16 <sub>EH_CU_1D_AL</sub>    | mg/kg | 2     | MCERTS | 3.3     | < 2.0   | < 2.0   | < 2.0   | < 2.0   |
| TPH-CWG - Aliphatic >EC16 - EC21 <sub>EH_CU_1D_AL</sub>    | mg/kg | 8     | MCERTS | 8.7     | < 8.0   | < 8.0   | 10      | < 8.0   |
| TPH-CWG - Aliphatic >EC21 - EC35 <sub>EH_CU_1D_AL</sub>    | mg/kg | 8     | MCERTS | 50      | < 8.0   | < 8.0   | 57      | < 8.0   |
| TPH-CWG - Aliphatic > EC35 - EC44 <sub>EH_CU_1D_AL</sub>   | mg/kg | 8.4   | NONE   | 59      | < 8.4   | < 8.4   | 42      | < 8.4   |
| TPH-CWG - Aliphatic (EC5 - EC35) <sub>EH_CU+HS_1D_AL</sub> | mg/kg | 10    | MCERTS | 62      | < 10    | < 10    | 69      | < 10    |
| TPH-CWG - Aliphatic (EC5 - EC44) <sub>EH_CU+HS_1D_AL</sub> | mg/kg | 10    | NONE   | 120     | < 10    | < 10    | 110     | < 10    |

|                                                           |       |       |        |         |         |         |         |         |
|-----------------------------------------------------------|-------|-------|--------|---------|---------|---------|---------|---------|
| TPH-CWG - Aromatic >EC5 - EC7 <sub>HS_1D_AR</sub>         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC7 - EC8 <sub>HS_1D_AR</sub>         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC8 - EC10 <sub>HS_1D_AR</sub>        | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC10 - EC12 <sub>EH_CU_1D_AR</sub>    | mg/kg | 1     | MCERTS | < 1.0   | < 1.0   | < 1.0   | 3.0     | < 1.0   |
| TPH-CWG - Aromatic >EC12 - EC16 <sub>EH_CU_1D_AR</sub>    | mg/kg | 2     | MCERTS | < 2.0   | < 2.0   | < 2.0   | 33      | 4.5     |
| TPH-CWG - Aromatic >EC16 - EC21 <sub>EH_CU_1D_AR</sub>    | mg/kg | 10    | MCERTS | 11      | < 10    | 13      | 290     | 22      |
| TPH-CWG - Aromatic >EC21 - EC35 <sub>EH_CU_1D_AR</sub>    | mg/kg | 10    | MCERTS | 47      | 18      | 31      | 470     | 37      |
| TPH-CWG - Aromatic > EC35 - EC44 <sub>EH_CU_1D_AR</sub>   | mg/kg | 8.4   | NONE   | < 8.4   | < 8.4   | < 8.4   | 88      | < 8.4   |
| TPH-CWG - Aromatic (EC5 - EC35) <sub>EH_CU+HS_1D_AR</sub> | mg/kg | 10    | MCERTS | 58      | 22      | 44      | 800     | 63      |
| TPH-CWG - Aromatic (EC5 - EC44) <sub>EH_CU+HS_1D_AR</sub> | mg/kg | 10    | NONE   | 58      | 22      | 44      | 880     | 63      |

|                                                                     |       |    |      |     |    |    |     |    |
|---------------------------------------------------------------------|-------|----|------|-----|----|----|-----|----|
| TPHCWG - Total C5 - C44 Aliphatic & Aromatic <sub>EH_CU+HS_1D</sub> | mg/kg | 10 | NONE | 180 | 22 | 44 | 990 | 63 |
|---------------------------------------------------------------------|-------|----|------|-----|----|----|-----|----|

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

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**Project / Site name: Birch Ind Park - Unit B**  
**Your Order No: 17750**

| <b>Lab Sample Number</b>                        |              |                           |                                 | 2140566       | 2140567       |
|-------------------------------------------------|--------------|---------------------------|---------------------------------|---------------|---------------|
| <b>Sample Reference</b>                         |              |                           |                                 | DCS4          | CP4           |
| <b>Sample Number</b>                            |              |                           |                                 | None Supplied | None Supplied |
| <b>Depth (m)</b>                                |              |                           |                                 | 0.40          | 1.00          |
| <b>Date Sampled</b>                             |              |                           |                                 | 10/01/2022    | 13/01/2022    |
| <b>Time Taken</b>                               |              |                           |                                 | None Supplied | None Supplied |
| <b>Analytical Parameter<br/>(Soil Analysis)</b> | <b>Units</b> | <b>Limit of detection</b> | <b>Accreditation<br/>Status</b> |               |               |
| Stone Content                                   | %            | 0.1                       | NONE                            | < 0.1         | 100           |
| Moisture Content                                | %            | 0.01                      | NONE                            | 17            | 18            |
| Total mass of sample received                   | kg           | 0.001                     | NONE                            | 0.80          | 0.80          |

|                                               |      |       |           |              |              |
|-----------------------------------------------|------|-------|-----------|--------------|--------------|
| Asbestos in Soil Screen / Identification Name | Type | N/A   | ISO 17025 | -            | -            |
| Asbestos in Soil                              | Type | N/A   | ISO 17025 | Not-detected | Not-detected |
| Asbestos Quantification (Stage 2)             | %    | 0.001 | ISO 17025 | -            | -            |
| Asbestos Quantification Total                 | %    | 0.001 | ISO 17025 | -            | -            |
| Asbestos Analyst ID                           | N/A  | N/A   | N/A       | MWI          | MWI          |

#### General Inorganics

|                                                                         |          |         |        |        |       |
|-------------------------------------------------------------------------|----------|---------|--------|--------|-------|
| pH - Automated                                                          | pH Units | N/A     | MCERTS | 6.5    | 7.7   |
| Total Sulphate as SO <sub>4</sub>                                       | %        | 0.005   | MCERTS | 0.028  | -     |
| Water Soluble Sulphate as SO <sub>4</sub> 16hr extraction (2:1)         | mg/kg    | 2.5     | MCERTS | 9.3    | 160   |
| Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent) | g/l      | 0.00125 | MCERTS | 0.0047 | 0.083 |
| Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent) | mg/l     | 1.25    | MCERTS | 4.7    | 82.5  |
| Water Soluble Chloride (2:1) (leachate equivalent)                      | mg/l     | 0.5     | MCERTS | 1.6    | -     |
| Total Sulphur                                                           | %        | 0.005   | MCERTS | 0.021  | -     |
| Organic Matter (automated)                                              | %        | 0.1     | MCERTS | 3.7    | 2.8   |
| Water Soluble Nitrate (2:1) as NO <sub>3</sub>                          | mg/kg    | 2       | NONE   | 4.5    | -     |
| Water Soluble Nitrate (2:1) as NO <sub>3</sub> (leachate equivalent)    | mg/l     | 5       | NONE   | < 5.0  | -     |

#### Total Phenols

|                            |       |   |        |       |       |
|----------------------------|-------|---|--------|-------|-------|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 |
|----------------------------|-------|---|--------|-------|-------|

#### Speciated PAHs

|                        |       |      |        |        |        |
|------------------------|-------|------|--------|--------|--------|
| Naphthalene            | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |
| Acenaphthylene         | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 |
| Acenaphthene           | mg/kg | 0.05 | MCERTS | < 0.05 | 0.48   |
| Fluorene               | mg/kg | 0.05 | MCERTS | < 0.05 | 0.41   |
| Phenanthrene           | mg/kg | 0.05 | MCERTS | < 0.05 | 4.5    |
| Anthracene             | mg/kg | 0.05 | MCERTS | < 0.05 | 1.1    |
| Fluoranthene           | mg/kg | 0.05 | MCERTS | < 0.05 | 13     |
| Pyrene                 | mg/kg | 0.05 | MCERTS | < 0.05 | 12     |
| Benzo(a)anthracene     | mg/kg | 0.05 | MCERTS | < 0.05 | 5.8    |
| Chrysene               | mg/kg | 0.05 | MCERTS | < 0.05 | 5.2    |
| Benzo(b)fluoranthene   | mg/kg | 0.05 | MCERTS | < 0.05 | 6.2    |
| Benzo(k)fluoranthene   | mg/kg | 0.05 | MCERTS | < 0.05 | 3.1    |
| Benzo(a)pyrene         | mg/kg | 0.05 | MCERTS | < 0.05 | 6.6    |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | 3.0    |
| Dibenz(a,h)anthracene  | mg/kg | 0.05 | MCERTS | < 0.05 | 0.77   |
| Benzo(ghi)perylene     | mg/kg | 0.05 | MCERTS | < 0.05 | 3.5    |

#### Total PAH

|                             |       |     |        |        |      |
|-----------------------------|-------|-----|--------|--------|------|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | 65.3 |
|-----------------------------|-------|-----|--------|--------|------|

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 Project / Site name: Birch Ind Park - Unit B  
 Your Order No: 17750

| Lab Sample Number                       |       |                    |                         | 2140566       | 2140567       |
|-----------------------------------------|-------|--------------------|-------------------------|---------------|---------------|
| Sample Reference                        |       |                    |                         | DCS4          | CP4           |
| Sample Number                           |       |                    |                         | None Supplied | None Supplied |
| Depth (m)                               |       |                    |                         | 0.40          | 1.00          |
| Date Sampled                            |       |                    |                         | 10/01/2022    | 13/01/2022    |
| Time Taken                              |       |                    |                         | None Supplied | None Supplied |
| Analytical Parameter<br>(Soil Analysis) | Units | Limit of detection | Accreditation<br>Status |               |               |
| <b>Heavy Metals / Metalloids</b>        |       |                    |                         |               |               |
| Arsenic (aqua regia extractable)        | mg/kg | 1                  | MCERTS                  | 10            | 12            |
| Beryllium (aqua regia extractable)      | mg/kg | 0.06               | MCERTS                  | 0.77          | 0.68          |
| Boron (total)                           | mg/kg | 1                  | MCERTS                  | 3.4           | 3.9           |
| Cadmium (aqua regia extractable)        | mg/kg | 0.2                | MCERTS                  | < 0.2         | < 0.2         |
| Chromium (hexavalent)                   | mg/kg | 4                  | NONE                    | < 4.0         | < 4.0         |
| Chromium (III)                          | mg/kg | 1                  | NONE                    | 16            | 26            |
| Chromium (aqua regia extractable)       | mg/kg | 1                  | MCERTS                  | 16            | 27            |
| Copper (aqua regia extractable)         | mg/kg | 1                  | MCERTS                  | 25            | 30            |
| Lead (aqua regia extractable)           | mg/kg | 1                  | MCERTS                  | 44            | 50            |
| Mercury (aqua regia extractable)        | mg/kg | 0.3                | MCERTS                  | < 0.3         | < 0.3         |
| Nickel (aqua regia extractable)         | mg/kg | 1                  | MCERTS                  | 16            | 18            |
| Selenium (aqua regia extractable)       | mg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| Vanadium (aqua regia extractable)       | mg/kg | 1                  | MCERTS                  | 26            | 26            |
| Zinc (aqua regia extractable)           | mg/kg | 1                  | MCERTS                  | 52            | 65            |
| <b>Magnesium (water soluble)</b>        |       |                    |                         |               |               |
| Magnesium (water soluble)               | mg/kg | 5                  | NONE                    | < 5.0         | < 5.0         |
| <b>Magnesium (leachate equivalent)</b>  |       |                    |                         |               |               |
| Magnesium (leachate equivalent)         | mg/l  | 2.5                | NONE                    | < 2.5         | -             |
| <b>Monoaromatics &amp; Oxygenates</b>   |       |                    |                         |               |               |
| Benzene                                 | µg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| Toluene                                 | µg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| Ethylbenzene                            | µg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| p & m-xylene                            | µg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| o-xylene                                | µg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| MTBE (Methyl Tertiary Butyl Ether)      | µg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |

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 Project / Site name: Birch Ind Park - Unit B  
 Your Order No: 17750

| Lab Sample Number                                          |       |                    |                         | 2140566       | 2140567       |
|------------------------------------------------------------|-------|--------------------|-------------------------|---------------|---------------|
| Sample Reference                                           |       |                    |                         | DCS4          | CP4           |
| Sample Number                                              |       |                    |                         | None Supplied | None Supplied |
| Depth (m)                                                  |       |                    |                         | 0.40          | 1.00          |
| Date Sampled                                               |       |                    |                         | 10/01/2022    | 13/01/2022    |
| Time Taken                                                 |       |                    |                         | None Supplied | None Supplied |
| Analytical Parameter<br>(Soil Analysis)                    | Units | Limit of detection | Accreditation<br>Status |               |               |
| <b>Petroleum Hydrocarbons</b>                              |       |                    |                         |               |               |
| TPH-CWG - Aliphatic >EC5 - EC6 <sub>HS_1D_AL</sub>         | mg/kg | 0.001              | MCERTS                  | < 0.001       | < 0.001       |
| TPH-CWG - Aliphatic >EC6 - EC8 <sub>HS_1D_AL</sub>         | mg/kg | 0.001              | MCERTS                  | < 0.001       | < 0.001       |
| TPH-CWG - Aliphatic >EC8 - EC10 <sub>HS_1D_AL</sub>        | mg/kg | 0.001              | MCERTS                  | < 0.001       | < 0.001       |
| TPH-CWG - Aliphatic >EC10 - EC12 <sub>EH_CU_1D_AL</sub>    | mg/kg | 1                  | MCERTS                  | < 1.0         | < 1.0         |
| TPH-CWG - Aliphatic >EC12 - EC16 <sub>EH_CU_1D_AL</sub>    | mg/kg | 2                  | MCERTS                  | < 2.0         | < 2.0         |
| TPH-CWG - Aliphatic >EC16 - EC21 <sub>EH_CU_1D_AL</sub>    | mg/kg | 8                  | MCERTS                  | < 8.0         | < 8.0         |
| TPH-CWG - Aliphatic >EC21 - EC35 <sub>EH_CU_1D_AL</sub>    | mg/kg | 8                  | MCERTS                  | < 8.0         | < 8.0         |
| TPH-CWG - Aliphatic > EC35 - EC44 <sub>EH_CU_1D_AL</sub>   | mg/kg | 8.4                | NONE                    | < 8.4         | < 8.4         |
| TPH-CWG - Aliphatic (EC5 - EC35) <sub>EH_CU+HS_1D_AL</sub> | mg/kg | 10                 | MCERTS                  | < 10          | < 10          |
| TPH-CWG - Aliphatic (EC5 - EC44) <sub>EH_CU+HS_1D_AL</sub> | mg/kg | 10                 | NONE                    | < 10          | < 10          |

|                                                           |       |       |        |         |         |
|-----------------------------------------------------------|-------|-------|--------|---------|---------|
| TPH-CWG - Aromatic >EC5 - EC7 <sub>HS_1D_AR</sub>         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC7 - EC8 <sub>HS_1D_AR</sub>         | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC8 - EC10 <sub>HS_1D_AR</sub>        | mg/kg | 0.001 | MCERTS | < 0.001 | < 0.001 |
| TPH-CWG - Aromatic >EC10 - EC12 <sub>EH_CU_1D_AR</sub>    | mg/kg | 1     | MCERTS | < 1.0   | < 1.0   |
| TPH-CWG - Aromatic >EC12 - EC16 <sub>EH_CU_1D_AR</sub>    | mg/kg | 2     | MCERTS | < 2.0   | 8.7     |
| TPH-CWG - Aromatic >EC16 - EC21 <sub>EH_CU_1D_AR</sub>    | mg/kg | 10    | MCERTS | < 10    | 40      |
| TPH-CWG - Aromatic >EC21 - EC35 <sub>EH_CU_1D_AR</sub>    | mg/kg | 10    | MCERTS | < 10    | 63      |
| TPH-CWG - Aromatic > EC35 - EC44 <sub>EH_CU_1D_AR</sub>   | mg/kg | 8.4   | NONE   | < 8.4   | < 8.4   |
| TPH-CWG - Aromatic (EC5 - EC35) <sub>EH_CU+HS_1D_AR</sub> | mg/kg | 10    | MCERTS | < 10    | 110     |
| TPH-CWG - Aromatic (EC5 - EC44) <sub>EH_CU+HS_1D_AR</sub> | mg/kg | 10    | NONE   | < 10    | 110     |

|                                                                     |       |    |      |      |     |
|---------------------------------------------------------------------|-------|----|------|------|-----|
| TPHCWG - Total C5 - C44 Aliphatic & Aromatic <sub>EH_CU+HS_1D</sub> | mg/kg | 10 | NONE | < 10 | 110 |
|---------------------------------------------------------------------|-------|----|------|------|-----|

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



**Analytical Report Number:** 22-33705  
**Project / Site name:** Birch Ind Park - Unit B  
**Your Order No:** 17750

## Certificate of Analysis - Asbestos Quantification

### Methods:

#### Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

#### Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

| Sample Number | Sample ID | Sample Depth (m) | Sample Weight (g) | Asbestos Containing Material Types Detected (ACM) | PLM Results | Asbestos by hand picking/weighing (%) | Total % Asbestos in Sample |
|---------------|-----------|------------------|-------------------|---------------------------------------------------|-------------|---------------------------------------|----------------------------|
| 2140565       | DCS5      | 1.00             | 151               | Loose Fibres                                      | Chrysotile  | < 0.001                               | < 0.001                    |

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.



Analytical Report Number: 22-33705  
Project / Site name: Birch Ind Park - Unit B

Your Order No: 17750

|                                             |       |                    |                      |               |               |               |
|---------------------------------------------|-------|--------------------|----------------------|---------------|---------------|---------------|
| Lab Sample Number                           |       |                    |                      | 2140568       | 2140569       | 2140570       |
| Sample Reference                            |       |                    |                      | DCS1          | DCS3          | CP4           |
| Sample Number                               |       |                    |                      | None Supplied | None Supplied | None Supplied |
| Depth (m)                                   |       |                    |                      | 0.20          | 0.50          | 1.00          |
| Date Sampled                                |       |                    |                      | 10/01/2022    | 10/01/2022    | 13/01/2022    |
| Time Taken                                  |       |                    |                      | None Supplied | None Supplied | None Supplied |
| Analytical Parameter<br>(Leachate Analysis) | Units | Limit of detection | Accreditation Status |               |               |               |
|                                             |       |                    |                      |               |               |               |

#### General Inorganics

|                             |          |     |           |      |      |      |
|-----------------------------|----------|-----|-----------|------|------|------|
| pH (automated)              | pH Units | N/A | ISO 17025 | 8.0  | 7.2  | 7.8  |
| Sulphate as SO <sub>4</sub> | mg/l     | 0.1 | ISO 17025 | 22.2 | 7.4  | 7.4  |
| Total Organic Carbon (TOC)  | mg/l     | 0.1 | NONE      | 18.8 | 10.4 | 11.9 |

#### Total Phenols

|                            |      |   |           |     |     |     |
|----------------------------|------|---|-----------|-----|-----|-----|
| Total Phenols (monohydric) | µg/l | 1 | ISO 17025 | 3.2 | 5.3 | 3.9 |
|----------------------------|------|---|-----------|-----|-----|-----|

#### Speciated PAHs

|                        |      |      |           |        |        |        |
|------------------------|------|------|-----------|--------|--------|--------|
| Naphthalene            | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthylene         | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthene           | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Fluorene               | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Phenanthrene           | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Anthracene             | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Fluoranthene           | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Pyrene                 | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(a)anthracene     | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Chrysene               | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(b)fluoranthene   | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(k)fluoranthene   | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(a)pyrene         | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Indeno(1,2,3-cd)pyrene | µg/l | 0.01 | NONE      | < 0.01 | < 0.01 | < 0.01 |
| Dibenz(a,h)anthracene  | µg/l | 0.01 | NONE      | < 0.01 | < 0.01 | < 0.01 |
| Benzo(ghi)perylene     | µg/l | 0.01 | NONE      | < 0.01 | < 0.01 | < 0.01 |

#### Total PAH

|                   |      |     |      |       |       |       |
|-------------------|------|-----|------|-------|-------|-------|
| Total EPA-16 PAHs | µg/l | 0.2 | NONE | < 0.2 | < 0.2 | < 0.2 |
|-------------------|------|-----|------|-------|-------|-------|

#### Heavy Metals / Metalloids

|                       |      |      |           |       |       |       |
|-----------------------|------|------|-----------|-------|-------|-------|
| Arsenic (dissolved)   | µg/l | 1    | ISO 17025 | 13    | 11    | 15    |
| Beryllium (dissolved) | µg/l | 0.2  | ISO 17025 | 0.3   | 0.3   | 0.2   |
| Boron (dissolved)     | µg/l | 10   | ISO 17025 | 24    | 16    | 23    |
| Cadmium (dissolved)   | µg/l | 0.08 | ISO 17025 | 0.16  | 0.26  | 0.23  |
| Chromium (hexavalent) | µg/l | 5    | ISO 17025 | < 5.0 | < 5.0 | < 5.0 |
| Chromium (III)        | µg/l | 5    | NONE      | < 5.0 | < 5.0 | < 5.0 |
| Chromium (dissolved)  | µg/l | 0.4  | ISO 17025 | 3.9   | 4.1   | 2.1   |
| Copper (dissolved)    | µg/l | 0.7  | ISO 17025 | 14    | 7.6   | 9.2   |
| Lead (dissolved)      | µg/l | 1    | ISO 17025 | 7.6   | 7.5   | 7.9   |
| Mercury (dissolved)   | µg/l | 0.5  | ISO 17025 | 1.8   | < 0.5 | < 0.5 |
| Nickel (dissolved)    | µg/l | 0.3  | ISO 17025 | 5.4   | 4.5   | 5.0   |
| Selenium (dissolved)  | µg/l | 4    | ISO 17025 | < 4.0 | < 4.0 | < 4.0 |
| Vanadium (dissolved)  | µg/l | 1.7  | ISO 17025 | 5.8   | 6.8   | 12    |
| Zinc (dissolved)      | µg/l | 0.4  | ISO 17025 | 13    | 20    | 10    |

|                       |      |       |           |     |      |     |
|-----------------------|------|-------|-----------|-----|------|-----|
| Magnesium (dissolved) | mg/l | 0.005 | ISO 17025 | 1.6 | 0.85 | 1.3 |
|-----------------------|------|-------|-----------|-----|------|-----|

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

**Analytical Report Number : 22-33705**

**Project / Site name: Birch Ind Park - Unit B**

\* 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 *                            |
|-------------------|------------------|---------------|-----------|-------------------------------------------------|
| 2140561           | DCS1             | None Supplied | 0.2       | Brown clay and sand with gravel and vegetation. |
| 2140562           | DCS2             | None Supplied | 0.4       | Grey clay with vegetation.                      |
| 2140563           | DCS3             | None Supplied | 0.5       | Grey clay with gravel.                          |
| 2140564           | DCS5             | None Supplied | 0.6       | Grey clay with stones.                          |
| 2140565           | DCS5             | None Supplied | 1         | Grey clay and sand with gravel.                 |
| 2140566           | DCS4             | None Supplied | 0.4       | Grey clay with vegetation.                      |
| 2140567           | CP4              | None Supplied | 1         | Grey clay with stones.                          |

**Analytical Report Number : 22-33705**

**Project / Site name: Birch Ind Park - Unit B**

**Water matrix abbreviations:**

**Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)**

| 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               |
| 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               |
| NRA Leachate Prep                                  | 10:1 extract with de-ionised water shaken for 24 hours then filtered.                                                                                     | In-house method based on National Rivers Authority                                                                      | L020-PL       | W                  | NONE                 |
| 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            |
| Metals by ICP-OES in leachate                      | Determination of metals in leachate by acidification followed by ICP-OES.                                                                                 | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.                                    | L039-PL       | W                  | ISO 17025            |
| Boron in leachate                                  | Determination of boron in leachate. Sample acidified and followed by ICP-OES.                                                                             | In-house method based on MEWAM                                                                                          | L039-PL       | W                  | ISO 17025            |
| Hexavalent chromium in leachate                    | Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.                             | In-house method                                                                                                         | L080-PL       | W                  | ISO 17025            |
| Hexavalent chromium in soil                        | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.     | In-house method                                                                                                         | L080-PL       | W                  | NONE                 |
| Magnesium, water soluble, in soil                  | Determination of water soluble magnesium by extraction with water followed by ICP-OES.                                                                    | In-house method based on TRL 447                                                                                        | L038-PL       | D                  | NONE                 |
| Moisture Content                                   | Moisture content, determined gravimetrically. (30 oC)                                                                                                     | In house method.                                                                                                        | L019-UK/PL    | W                  | NONE                 |
| Monohydric phenols in leachate - LOW LEVEL 1 ug/l  | Determination of phenols in leachate by distillation followed by colorimetry.                                                                             | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)         | L080-PL       | W                  | ISO 17025            |
| Monohydric phenols in soil                         | Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.                                    | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)         | L080-PL       | W                  | MCERTS               |
| Nitrate, water soluble, in soil                    | Determination of nitrate by reaction with sodium salicylate and colorimetry.                                                                              | In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction. | L078-PL       | D                  | NONE                 |
| Speciated EPA-16 PAHs in leachate                  | Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.           | In-house method based on USEPA 8270                                                                                     | L102B-PL      | W                  | NONE                 |
| 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               |
| pH at 20oC in leachate (automated)                 | Determination of pH in leachate by electrometric measurement.                                                                                             | In house method.                                                                                                        | L099B         | W                  | ISO 17025            |

**Analytical Report Number : 22-33705**

**Project / Site name: Birch Ind Park - Unit B**

**Water matrix abbreviations:**

**Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)**

| Analytical Test Name                             | Analytical Method Description                                                                                                                             | Analytical Method Reference                                                                                             | Method number | Wet / Dry Analysis | Accreditation Status |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|----------------------|
| 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 organic carbon in leachate                 | Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.                                                                           | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton                  | L037-PL       | W                  | 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               |
| Cr (III) in soil                                 | In-house method by calculation from total Cr and Cr VI.                                                                                                   | In-house method by calculation                                                                                          | L080-PL       | W                  | NONE                 |
| Cr (III) in leachate                             | 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               |
| 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                 |
| TPHCWG Ali Aro Sum                               | 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                  | NONE                 |
| Asbestos Quantification - Gravimetric            | Asbestos quantification by gravimetric method - in house method based on references.                                                                      | HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).                                                       | A006-PL       | D                  | ISO 17025            |
| Sulphate in leachates                            | Determination of sulphate in leachate by acidification followed by ICP-OES.                                                                               | In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"                                    | L039-PL       | W                  | ISO 17025            |
| 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               |
| 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               |
| 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                 |
| Chloride, water soluble, in soil                 | Determination of Chloride colorimetrically by discrete analyser.                                                                                          | In house method.                                                                                                        | L082-PL       | D                  | MCERTS               |
| Water Soluble Nitrate (leachate equivalent)      | Determination of nitrate by reaction with sodium salicylate and colorimetry.                                                                              | In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction. | L078-PL       | D                  | NONE                 |
| 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               |

**Analytical Report Number : 22-33705**

**Project / Site name: Birch Ind Park - Unit B**

**Water matrix abbreviations:**

**Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|----------------------|-------------------------------|-----------------------------|---------------|--------------------|----------------------|
|----------------------|-------------------------------|-----------------------------|---------------|--------------------|----------------------|

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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

## Information in Support of Analytical Results

### List of HWOL Acronyms and Operators

| Acronym | Descriptions                                                           |
|---------|------------------------------------------------------------------------|
| HS      | Headspace Analysis                                                     |
| MS      | Mass spectrometry                                                      |
| FID     | Flame Ionisation Detector                                              |
| GC      | Gas Chromatography                                                     |
| EH      | Extractable Hydrocarbons (i.e. everything extracted by the solvent(s)) |
| CU      | Clean-up - e.g. by Florisil®, silica gel                               |
| 1D      | GC - Single coil/column gas chromatography                             |
| 2D      | GC-GC - Double coil/column gas chromatography                          |
| Total   | Aliphatics & Aromatics                                                 |
| AL      | Aliphatics                                                             |
| AR      | Aromatics                                                              |
| #1      | EH_2D_Total but with humics mathematically subtracted                  |
| #2      | EH_2D_Total but with fatty acids mathematically subtracted             |
| -       | Operator - understore to separate acronyms (exception for +)           |
| +       | Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total     |



# LABORATORY REPORT



4043

**Contract Number: PSL22/0551**

Report Date: 02 March 2022  
Client's Reference: AG3353-21  
Client Name: Applied Geology Limited  
Unit 23, Abbey Park  
Stareton  
Kenilworth  
Warwickshire  
CV8 2LY

**For the attention of: Hannah Hadwin/Peter Gabrielle**

Contract Title: Birch Ind Park, Unit B  
Date Received: 21/1/2022  
Date Commenced: 21/1/2022  
Date Completed: 2/3/2022

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

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins  
(Director)

R Berriman  
(Quality Manager)

S Royle  
(Laboratory Manager)

L Knight  
(Senior Technician)

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Page 1 of

## SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample                          |
|-------------|---------------|-------------|-------------|--------------|------------------------------------------------|
| CP3         |               | B           | 2.00        |              | Brown very silty SAND.                         |
| CP4         |               | U           | 4.00        |              | Very soft brown very gravelly very sandy CLAY. |
| CP4         |               | D           | 2.00        |              | Brown slightly gravelly very sandy CLAY.       |
| CP4         |               | D           | 5.00        |              | Brown slightly gravelly very sandy CLAY.       |
| CP5         |               | B           | 3.00        |              | Brown very silty SAND.                         |
| DCS2        |               | D           | 2.80        |              | Brown slightly gravelly very sandy CLAY.       |
| DCS4        |               | B           | 1.20        |              | Brown very silty SAND.                         |
| CP1         |               | U           | 5.00        |              | Firm brown slightly gravelly very sandy CLAY.  |
| CP1         |               | U           | 7.50        |              | Firm brown very sandy CLAY.                    |
| CP1         |               | U           | 10.50       |              | Stiff brown slightly gravelly very sandy CLAY. |
| CP2         |               | B           | 2.00        |              | Brown silty SAND.                              |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |
|             |               |             |             |              |                                                |



4043

PSL

Professional Soils Laboratory

AG3353-21 Birch Ind Park, Unit B

**Contract No:**

**PSL22/0551**

**Client Ref:**

**17785**

## SUMMARY OF SOIL CLASSIFICATION TESTS

**(BS1377 : PART 2 : 1990)**

[illegible]

**SYMBOLS : NP : Non Plastic**

**\* : Liquid Limit and Plastic Limit Wet Sieved.**



4043

**PSL**

## Professional Soils Laboratory

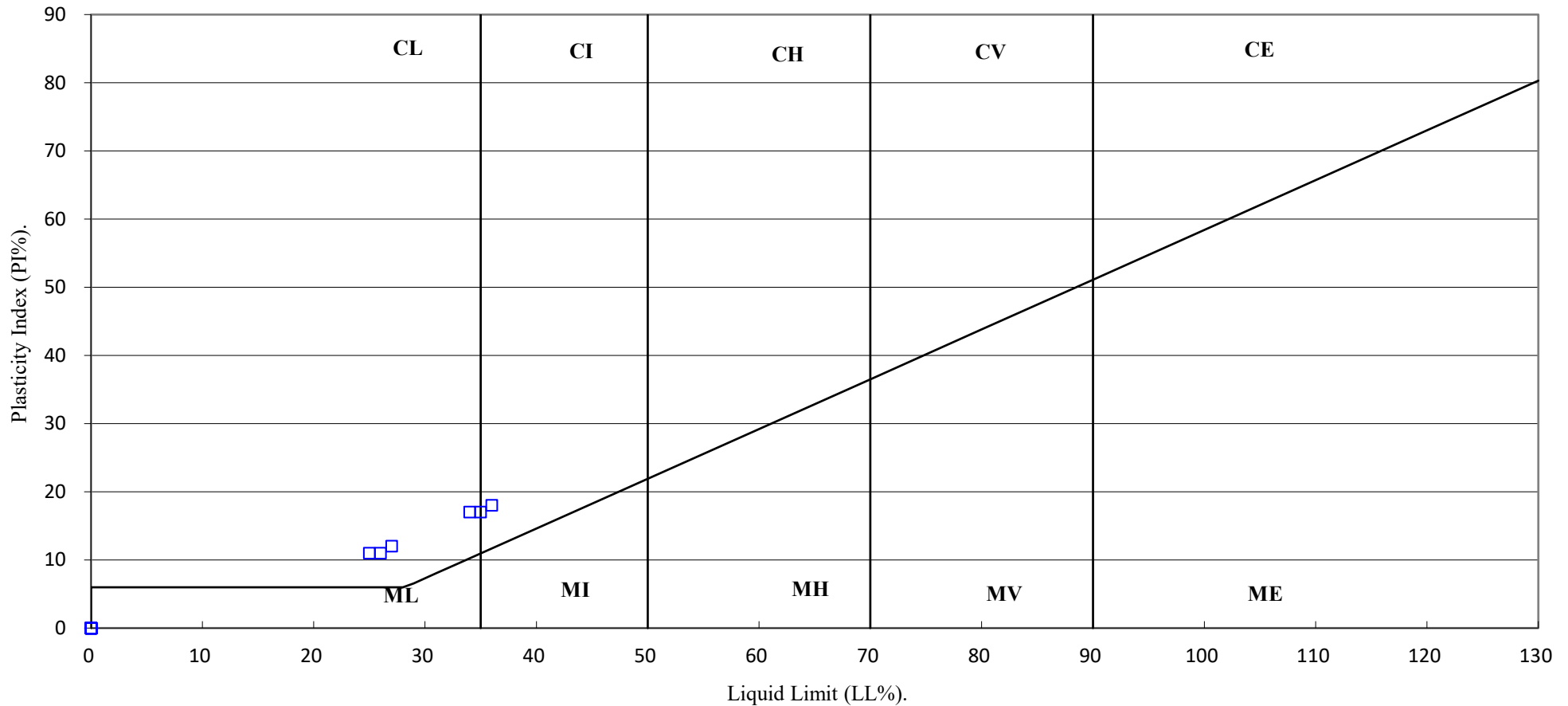
**AG3353-21 Birch Ind Park, Unit B****Contract No:**

PSL22/0551

**Client Ref:**

17785

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

**PSL**

**Professional Soils Laboratory**

AG3353-21 Birch Ind Park, Unit B

**Contract No:**

**PSL22/0551**

**Client Ref:**

**17785**

# PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

CP5

Top Depth (m):

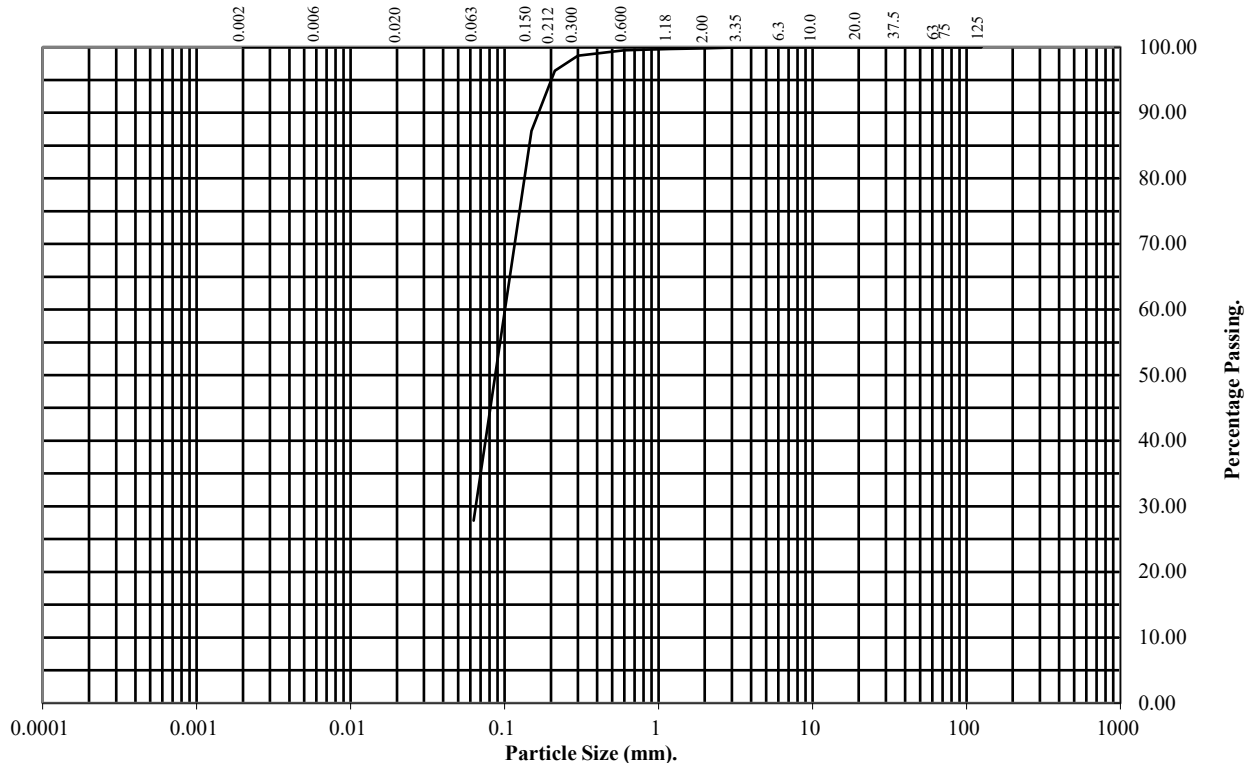
3.00

Sample Number:

Base Depth(m):

Sample Type:

B



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125                | 100                |
| 75                 | 100                |
| 63                 | 100                |
| 37.5               | 100                |
| 20                 | 100                |
| 10                 | 100                |
| 6.3                | 100                |
| 3.35               | 100                |
| 2                  | 100                |
| 1.18               | 100                |
| 0.6                | 100                |
| 0.3                | 99                 |
| 0.212              | 96                 |
| 0.15               | 87                 |
| 0.063              | 28                 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 0                |
| Sand          | 72               |
| Silt/Clay     | 28               |

## Remarks:

See Summary of Soil Descriptions



**PSL**  
Professional Soils Laboratory

AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785

# PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

CP2

Top Depth (m):

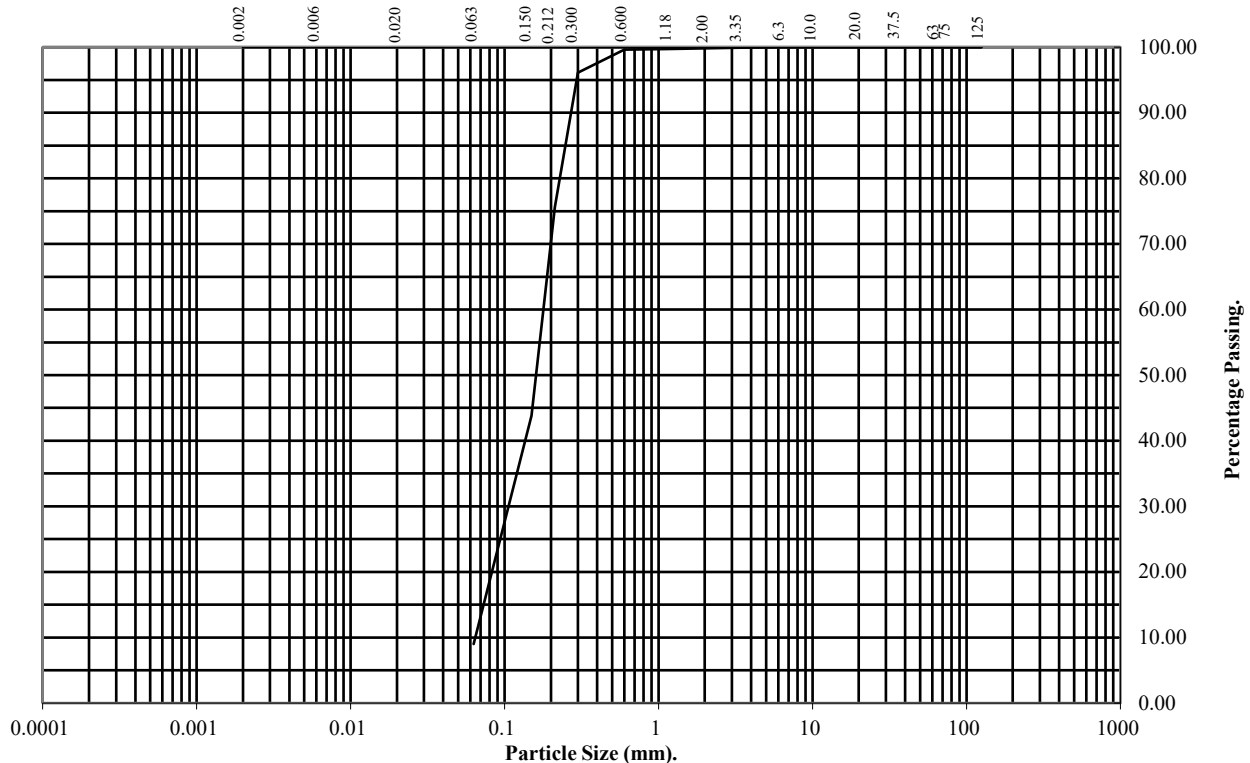
2.00

Sample Number:

Base Depth(m):

Sample Type:

B



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125                | 100                |
| 75                 | 100                |
| 63                 | 100                |
| 37.5               | 100                |
| 20                 | 100                |
| 10                 | 100                |
| 6.3                | 100                |
| 3.35               | 100                |
| 2                  | 100                |
| 1.18               | 100                |
| 0.6                | 100                |
| 0.3                | 96                 |
| 0.212              | 76                 |
| 0.15               | 44                 |
| 0.063              | 9                  |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 0                |
| Sand          | 91               |
| Silt/Clay     | 9                |

## Remarks:

See Summary of Soil Descriptions



**PSL**  
Professional Soils Laboratory

AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785

# PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

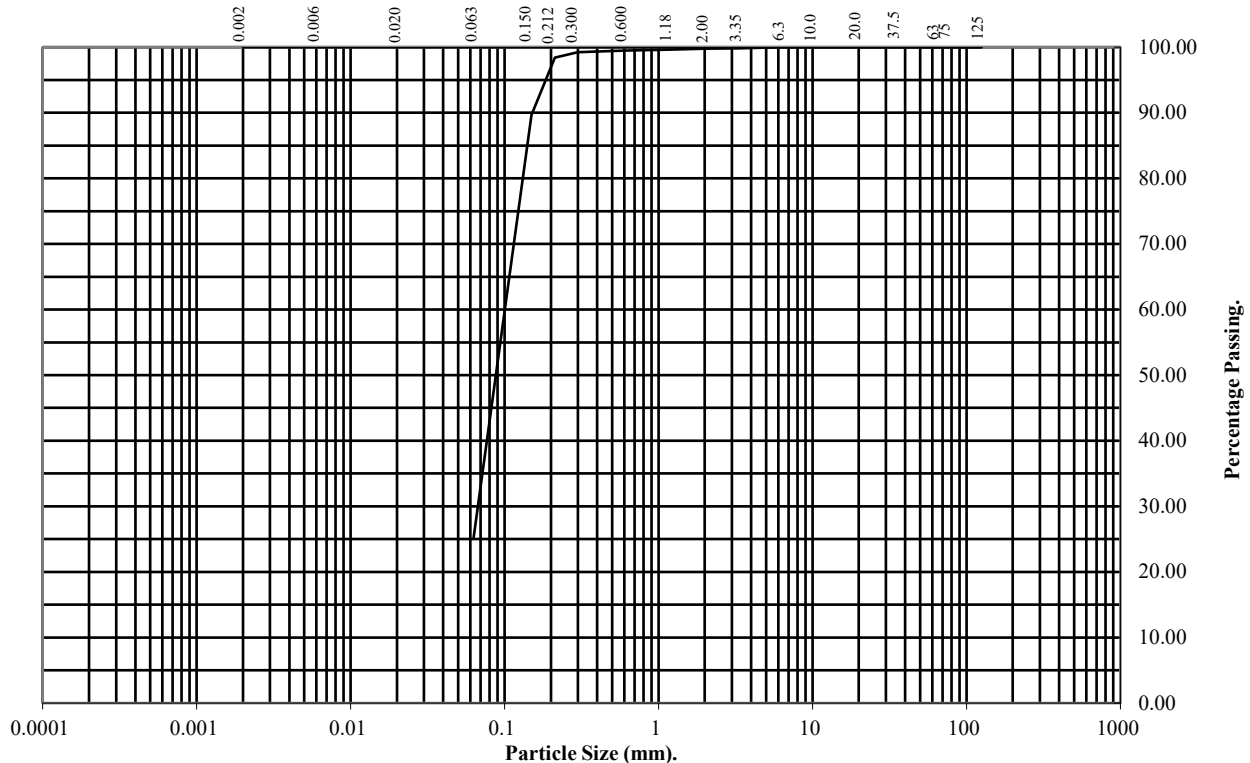
Hole Number: CP3

Top Depth (m): 2.00

Sample Number:

Base Depth(m):

Sample Type: B



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125                | 100                |
| 75                 | 100                |
| 63                 | 100                |
| 37.5               | 100                |
| 20                 | 100                |
| 10                 | 100                |
| 6.3                | 100                |
| 3.35               | 100                |
| 2                  | 100                |
| 1.18               | 100                |
| 0.6                | 99                 |
| 0.3                | 99                 |
| 0.212              | 98                 |
| 0.15               | 90                 |
| 0.063              | 25                 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 0                |
| Sand          | 75               |
| Silt/Clay     | 25               |

## Remarks:

See Summary of Soil Descriptions



**PSL**  
Professional Soils Laboratory

AG3353-21 Birch Ind Park, Unit B

Contract No:  
PSL22/0551  
Client Ref:  
17785

# PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

DCS5

Top Depth (m):

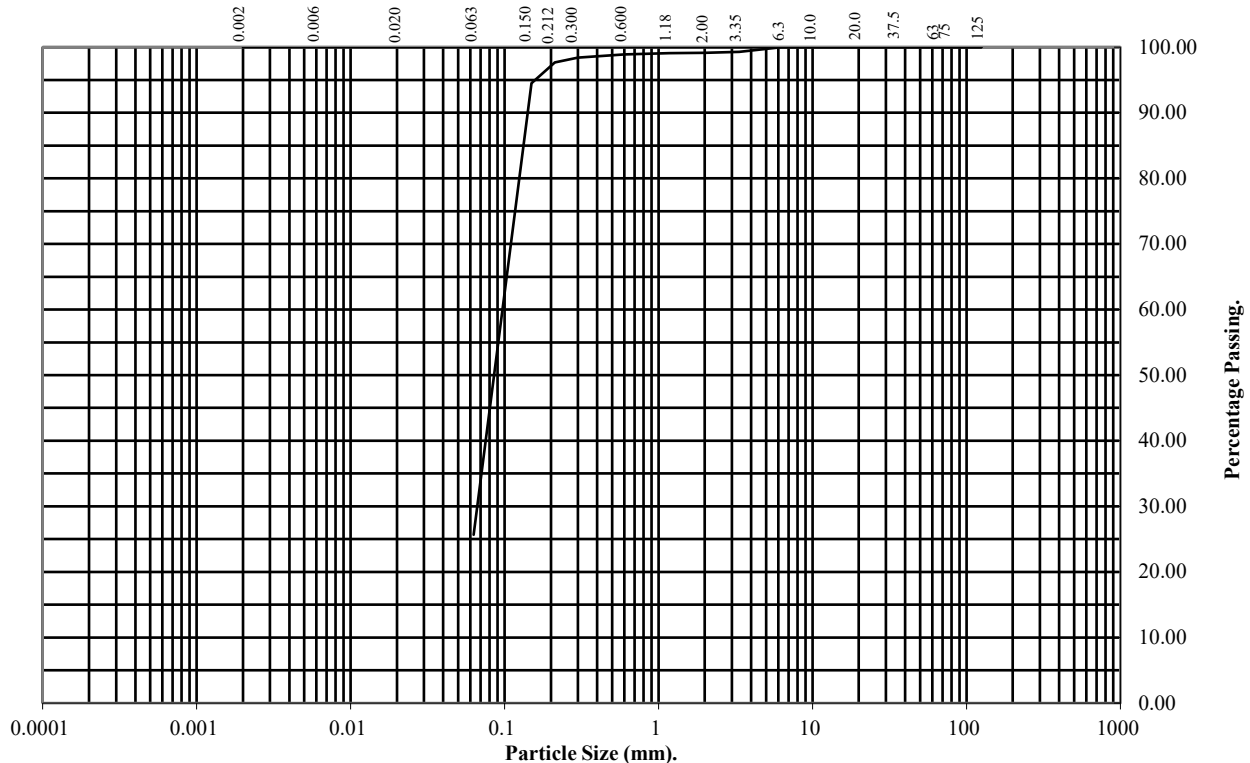
1.20

Sample Number:

Base Depth(m):

Sample Type:

B



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125                | 100                |
| 75                 | 100                |
| 63                 | 100                |
| 37.5               | 100                |
| 20                 | 100                |
| 10                 | 100                |
| 6.3                | 100                |
| 3.35               | 99                 |
| 2                  | 99                 |
| 1.18               | 99                 |
| 0.6                | 99                 |
| 0.3                | 98                 |
| 0.212              | 98                 |
| 0.15               | 95                 |
| 0.063              | 26                 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 1                |
| Sand          | 73               |
| Silt/Clay     | 26               |

## Remarks:

See Summary of Soil Descriptions



**PSL**  
Professional Soils Laboratory

AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785

# UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

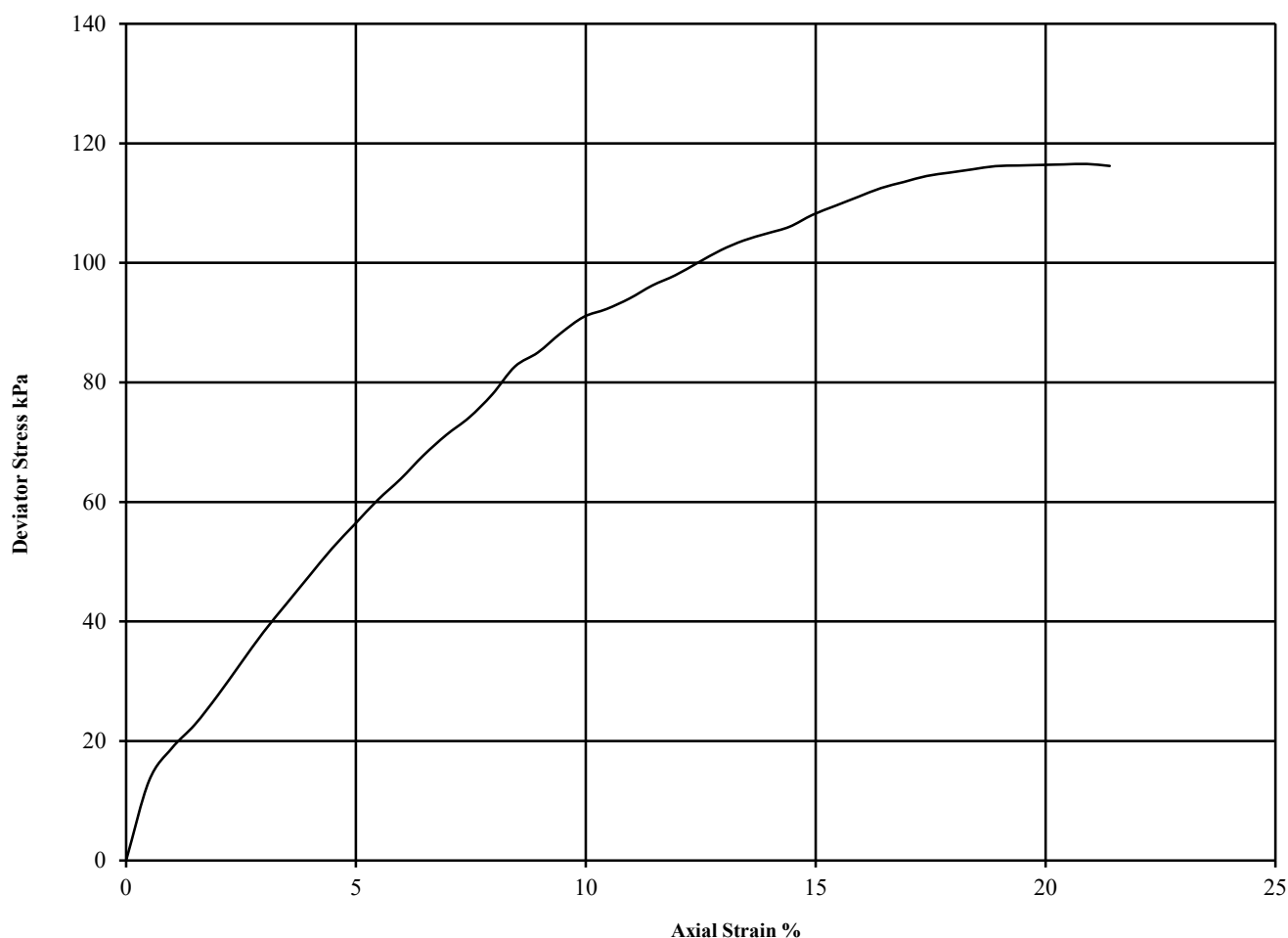
Hole Number: CP 1

Top Depth (m): 5.00

Sample Number:

Base Depth (m):

Sample Type U



| Diameter (mm): |                      | 103                  | Height (mm):        |                     | 207                              | Test:                                | UU Single Stage    |                 | Remarks:                                                                                                                                                                            |
|----------------|----------------------|----------------------|---------------------|---------------------|----------------------------------|--------------------------------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen       | Moisture Content (%) | Bulk Density (Mg/m3) | Dry Density (Mg/m3) | Cell Pressure (kPa) | Corr. Max. Deviator Stress (kPa) | Shear Strength Cu (kPa)              | Failure Strain (%) | Mode of Failure | Undisturbed Sample<br>Sample taken from top of tube<br>Rate of strain = 2 %/min<br>Latex Membrane used 0.2 mm thick,<br>Correction applied 0.33<br>See summary of soil descriptions |
|                |                      |                      |                     | $\theta_3$          | $(\theta_1 - \theta_3)_f$        | $\frac{1}{2}(\theta_1 - \theta_3)_f$ |                    |                 |                                                                                                                                                                                     |
| 1              | 18                   | 2.15                 | 1.82                | 100                 | 117                              | 58                                   | 20.9               | Plastic         |                                                                                                                                                                                     |



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**PSL**

Professional Soils Laboratory

'AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785

# UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

## WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

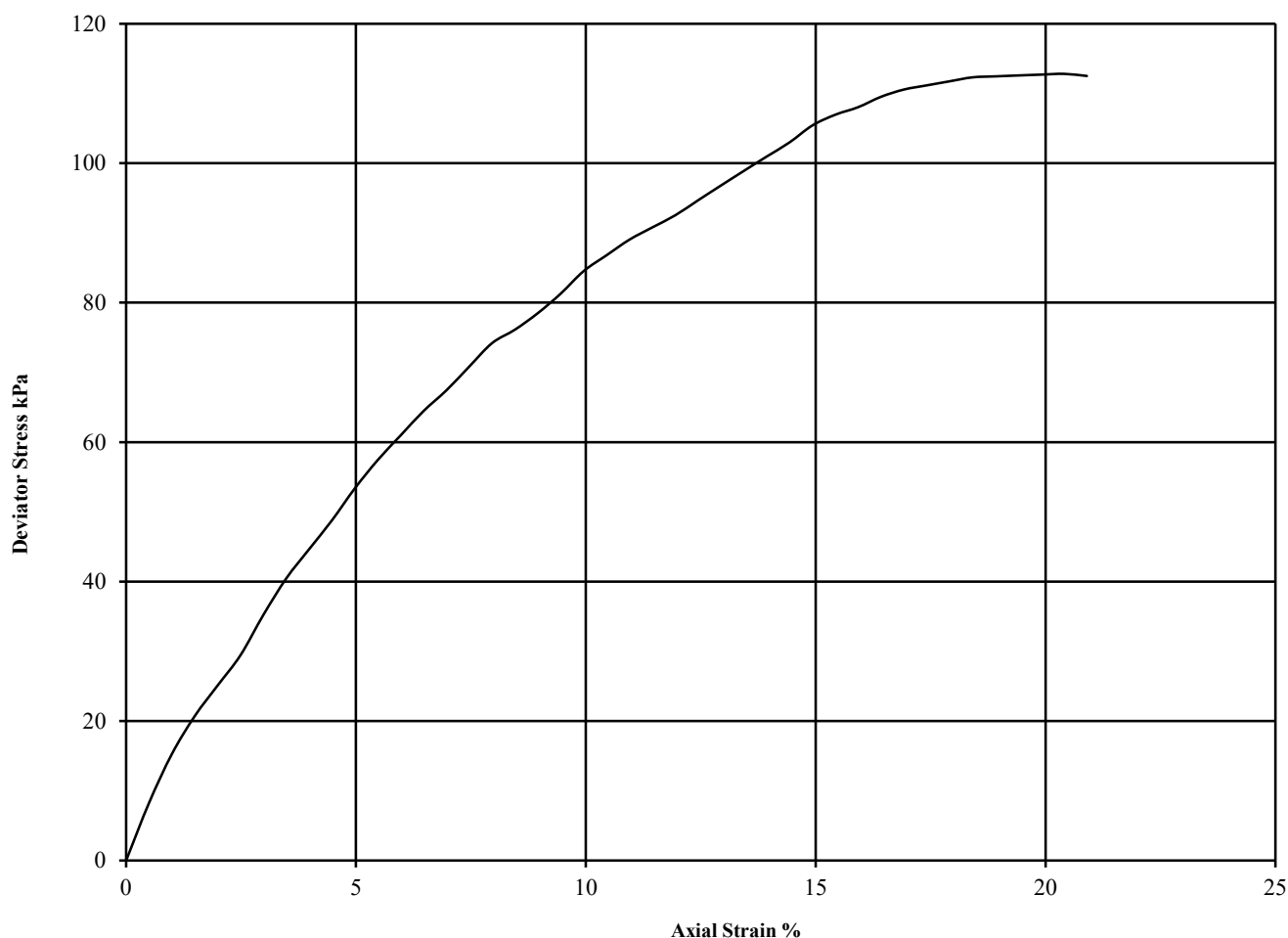
Hole Number: CP 1

Top Depth (m): 7.50

Sample Number:

Base Depth (m):

Sample Type U



| Diameter (mm): |                      | 103                               | Height (mm):                     |                     | 207                              | Test:                                | UU Single Stage    |                 | Remarks:                                                                                                                                                                            |
|----------------|----------------------|-----------------------------------|----------------------------------|---------------------|----------------------------------|--------------------------------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen       | Moisture Content (%) | Bulk Density (Mg/m <sup>3</sup> ) | Dry Density (Mg/m <sup>3</sup> ) | Cell Pressure (kPa) | Corr. Max. Deviator Stress (kPa) | Shear Strength Cu (kPa)              | Failure Strain (%) | Mode of Failure | Undisturbed Sample<br>Sample taken from top of tube<br>Rate of strain = 2 %/min<br>Latex Membrane used 0.2 mm thick,<br>Correction applied 0.33<br>See summary of soil descriptions |
|                |                      |                                   |                                  | $\theta_3$          | $(\theta_1 - \theta_3)_f$        | $\frac{1}{2}(\theta_1 - \theta_3)_f$ |                    |                 |                                                                                                                                                                                     |
| 1              | 17                   | 2.15                              | 1.84                             | 150                 | 113                              | 56                                   | 20.4               | Plastic         |                                                                                                                                                                                     |



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**PSL**

Professional Soils Laboratory

'AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785

# UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

## WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

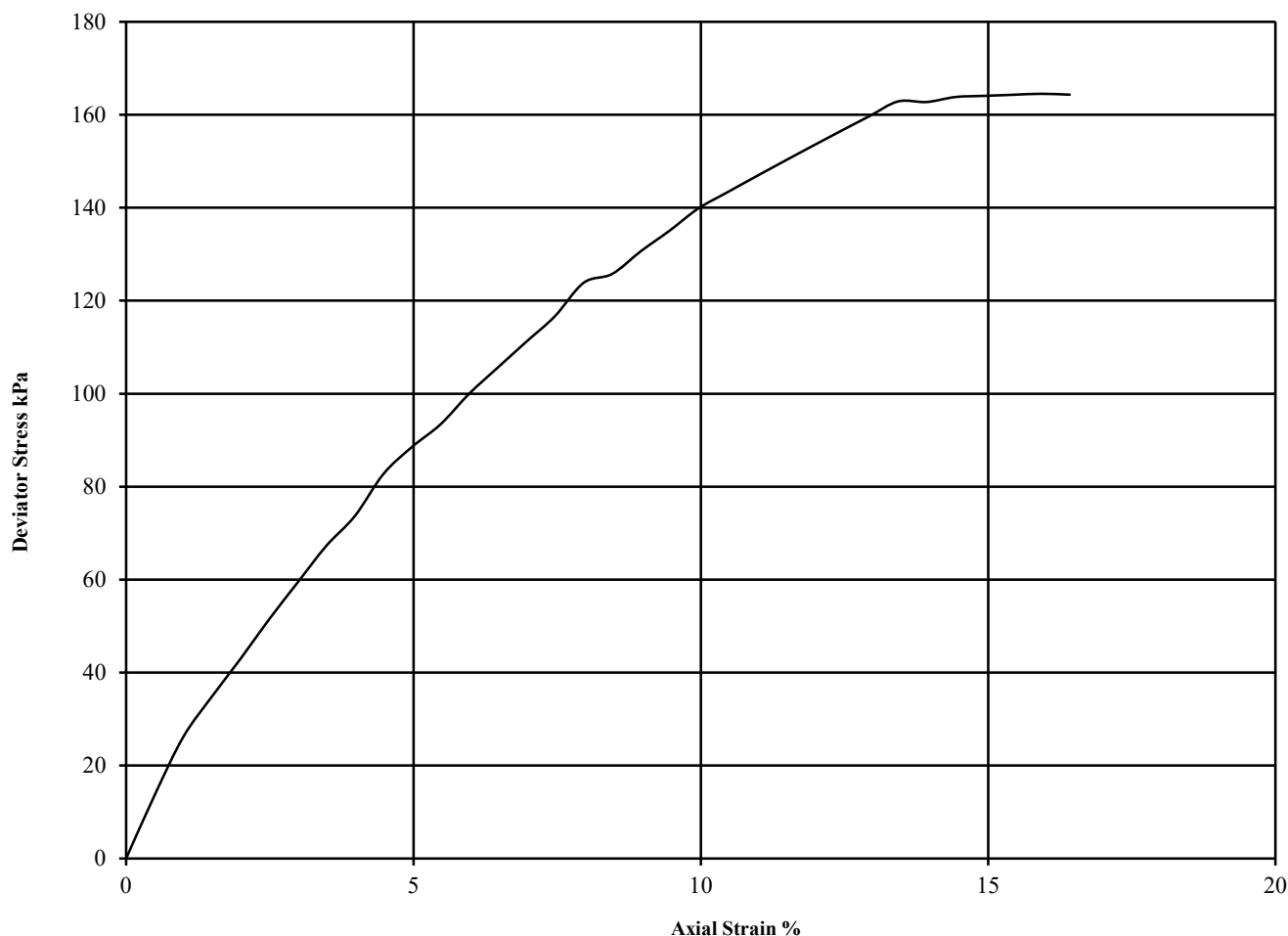
Hole Number: CP 1

Top Depth (m): 10.50

Sample Number:

Base Depth (m):

Sample Type U



| Diameter (mm): |                      | 103                               | Height (mm):                     |                     | 207                              | Test:                                | UU Single Stage    |                 | Remarks:                                                                                                                                                                            |
|----------------|----------------------|-----------------------------------|----------------------------------|---------------------|----------------------------------|--------------------------------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen       | Moisture Content (%) | Bulk Density (Mg/m <sup>3</sup> ) | Dry Density (Mg/m <sup>3</sup> ) | Cell Pressure (kPa) | Corr. Max. Deviator Stress (kPa) | Shear Strength Cu (kPa)              | Failure Strain (%) | Mode of Failure | Undisturbed Sample<br>Sample taken from top of tube<br>Rate of strain = 2 %/min<br>Latex Membrane used 0.2 mm thick,<br>Correction applied 0.34<br>See summary of soil descriptions |
|                |                      |                                   |                                  | $\theta_3$          | $(\theta_1 - \theta_3)_f$        | $\frac{1}{2}(\theta_1 - \theta_3)_f$ |                    |                 |                                                                                                                                                                                     |
| 1              | 18                   | 2.12                              | 1.80                             | 210                 | 165                              | 82                                   | 15.9               | Plastic         |                                                                                                                                                                                     |



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**PSL**  
Professional Soils Laboratory

'AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785

# UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

## WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

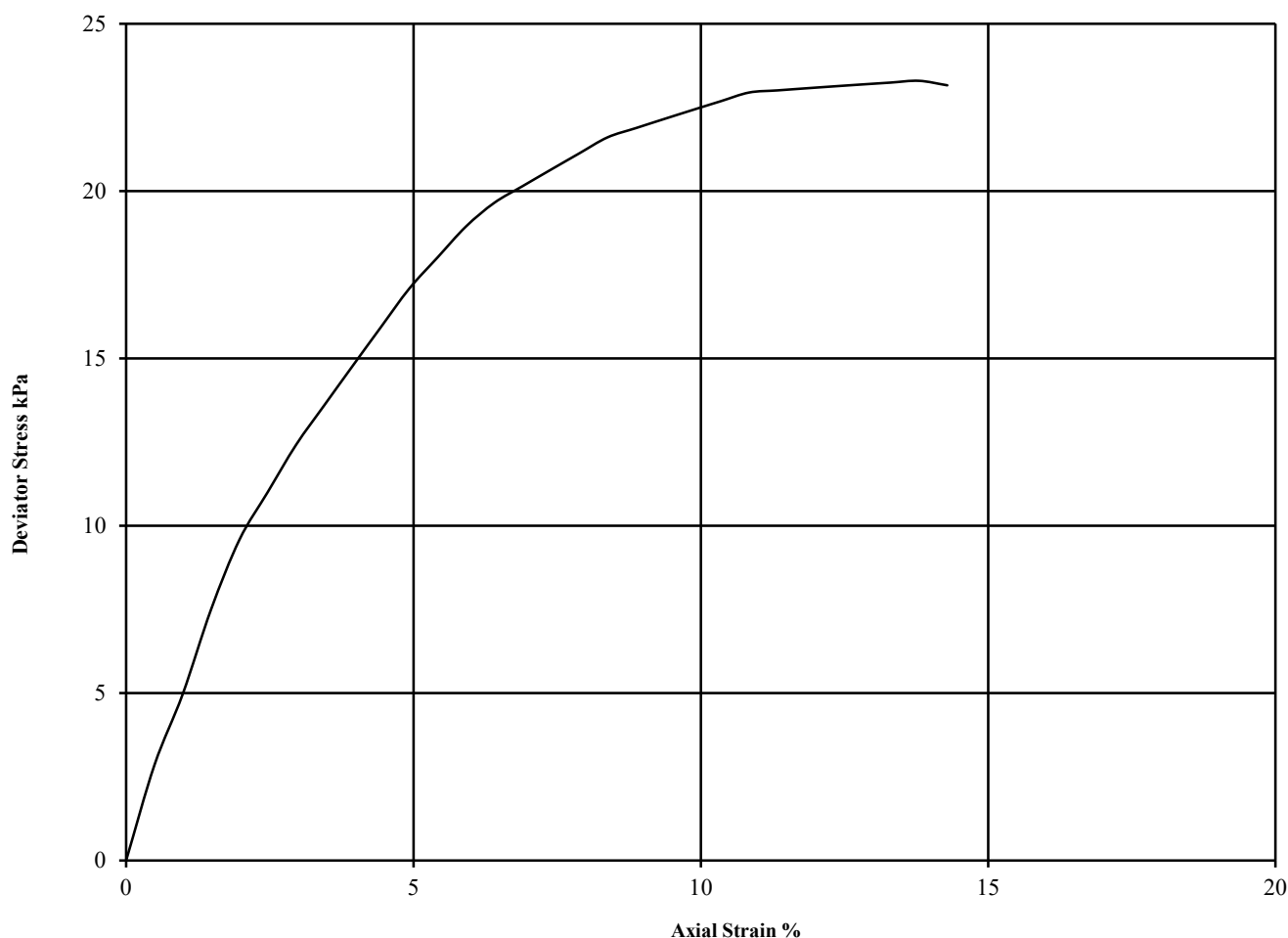
Hole Number: CP 4

Top Depth (m): 4.00

Sample Number:

Base Depth (m): 4.45

Sample Type U



| Diameter (mm): |                      | 102                               | Height (mm):                     |                     | 207                              | Test:                                | UU Single Stage    |                 | Remarks:                                                                                                                                                                            |
|----------------|----------------------|-----------------------------------|----------------------------------|---------------------|----------------------------------|--------------------------------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen       | Moisture Content (%) | Bulk Density (Mg/m <sup>3</sup> ) | Dry Density (Mg/m <sup>3</sup> ) | Cell Pressure (kPa) | Corr. Max. Deviator Stress (kPa) | Shear Strength Cu (kPa)              | Failure Strain (%) | Mode of Failure | Undisturbed Sample<br>Sample taken from top of tube<br>Rate of strain = 2 %/min<br>Latex Membrane used 0.2 mm thick,<br>Correction applied 0.35<br>See summary of soil descriptions |
|                |                      |                                   |                                  | $\theta_3$          | $(\theta_1 - \theta_3)_f$        | $\frac{1}{2}(\theta_1 - \theta_3)_f$ |                    |                 |                                                                                                                                                                                     |
| 1              | 17                   | 2.25                              | 1.92                             | 80                  | 23                               | 12                                   | 13.8               | Plastic         |                                                                                                                                                                                     |



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**PSL**  
Professional Soils Laboratory

'AG3353-21 Birch Ind Park, Unit B

Contract No:

PSL22/0551

Client Ref:

17785



## ANALYTICAL TEST REPORT

**Contract no:** 105613

**Contract name:** AG3353-21, Birch Industrial Park, Unit B

**Client reference:** PSL22/0551

**Clients name:** Professional Soils Laboratory

**Clients address:** 5/7 Hexthorpe Road  
Doncaster  
DN4 0AR

**Samples received:** 08 February 2022

**Analysis started:** 08 February 2022

**Analysis completed:** 14 February 2022

**Report issued:** 14 February 2022

**Key**

|     |                                               |
|-----|-----------------------------------------------|
| U   | UKAS accredited test                          |
| M   | MCERTS & UKAS accredited test                 |
| \$  | Test carried out by an approved subcontractor |
| I/S | Insufficient sample to carry out test         |
| N/S | Sample not suitable for testing               |

**Approved by:**

Rachael Burton

Reporting Team Lead

# Chemtech Environmental Limited

## SOILS

|                               |                    |                       |          |          |          |          |          |
|-------------------------------|--------------------|-----------------------|----------|----------|----------|----------|----------|
| <b>Lab number</b>             |                    |                       | 105613-1 | 105613-2 | 105613-3 | 105613-4 | 105613-5 |
| <b>Sample id</b>              |                    |                       | CP2      | CP3      | DCS1     | DCS3     | DCS5     |
| <b>Depth (m)</b>              |                    |                       | 1.20     | 3.00     | 1.80     | 1.20     | 1.20     |
| <b>Sample Type</b>            |                    |                       | D        | D        | D        | D        | D        |
| <b>Date sampled</b>           |                    |                       | -        | -        | -        | -        | -        |
| <b>Test</b>                   | <b>Method</b>      | <b>Units</b>          |          |          |          |          |          |
| pH                            | CE004 <sup>U</sup> | units                 | 5.6      | 6.9      | 7.1      | 6.3      | 6.9      |
| Magnesium (2:1 water soluble) | CE061              | mg/l Mg               | 13       | 3.1      | 2.1      | 1.7      | 2.2      |
| Chloride (2:1 water soluble)  | CE049 <sup>U</sup> | mg/l Cl               | 4.7      | 5.5      | 6.6      | 3.4      | 7.0      |
| Nitrate (2:1 water soluble)   | CE049 <sup>U</sup> | mg/l NO <sub>3</sub>  | 1.1      | <1       | 2.8      | <1       | 6.0      |
| Sulphate (2:1 water soluble)  | CE061 <sup>U</sup> | mg/l SO <sub>4</sub>  | 16       | <10      | 23       | <10      | 14       |
| Sulphate (total)              | CE062 <sup>U</sup> | mg/kg SO <sub>4</sub> | 116      | <100     | <100     | 135      | 205      |
| Sulphur (total)               | CE119              | mg/kg S               | 100      | <100     | <100     | 168      | 259      |
| Sulphur (total)               | CE119              | % w/w S               | 0.01     | <0.01    | <0.01    | 0.02     | 0.03     |

# Chemtech Environmental Limited

## METHOD DETAILS

| METHOD | SOILS                         | METHOD SUMMARY              | SAMPLE      | STATUS | LOD  | UNITS                 |
|--------|-------------------------------|-----------------------------|-------------|--------|------|-----------------------|
| CE004  | pH                            | Based on BS 1377, pH Meter  | As received | U      | -    | units                 |
| CE061  | Magnesium (2:1 water soluble) | Aqueous extraction, ICP-OES | Dry         |        | 1    | mg/l Mg               |
| CE049  | Chloride (2:1 water soluble)  | Aqueous extraction, IC-COND | Dry         | U      | 1    | mg/l Cl               |
| CE049  | Nitrate (2:1 water soluble)   | Aqueous extraction, IC-COND | Dry         | U      | 1    | mg/l NO <sub>3</sub>  |
| CE061  | Sulphate (2:1 water soluble)  | Aqueous extraction, ICP-OES | Dry         | U      | 10   | mg/l SO <sub>4</sub>  |
| CE062  | Sulphate (total)              | Acid extraction, ICP-OES    | Dry         | U      | 100  | mg/kg SO <sub>4</sub> |
| CE119  | Sulphur (total)               | Acid extraction, ICP-OES    | Dry         |        | 100  | mg/kg S               |
| CE119  | Sulphur (total)               | Acid extraction, ICP-OES    | Dry         |        | 0.01 | % w/w S               |

# Chemtech Environmental Limited

## DEVIATING SAMPLE INFORMATION

### Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

### Key

|     |                                                 |
|-----|-------------------------------------------------|
| N   | No (not deviating sample)                       |
| Y   | Yes (deviating sample)                          |
| NSD | Sampling date not provided                      |
| NST | Sampling time not provided (waters only)        |
| EHT | Sample exceeded holding time(s)                 |
| IC  | Sample not received in appropriate containers   |
| HP  | Headspace present in sample container           |
| NCF | Sample not chemically fixed (where appropriate) |
| OR  | Other (specify)                                 |

| Lab ref  | Sample id | Depth (m) | Deviating | Tests (Reason for deviation) |
|----------|-----------|-----------|-----------|------------------------------|
| 105613-1 | CP2       | 1.20      | Y         | All (NSD)                    |
| 105613-2 | CP3       | 3.00      | Y         | All (NSD)                    |
| 105613-3 | DCS1      | 1.80      | Y         | All (NSD)                    |
| 105613-4 | DCS3      | 1.20      | Y         | All (NSD)                    |
| 105613-5 | DCS5      | 1.20      | Y         | All (NSD)                    |

# Chemtech Environmental Limited

## ADDITIONAL INFORMATION

### Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones, where applicable.

# **APPENDIX E**

## APPENDIX E

### STANDARD FIELDWORK AND ASSESSMENT PROCEDURES

#### Scope of Work

The scope of work undertaken is defined in Section 1 of the Report. It should be noted that Applied Geology Limited does not provide arboricultural surveys, specialist surveys for the detection of invasive plant species (such as Japanese Knotweed) or protected species of wildlife. Information from environmental and ecological datasets is included from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website, however, if a full assessment of Environmental or Ecological aspects is required, it is recommended that other specialists are consulted. Similarly, information on flood risk is included; obtained from the Environment Agency Web site and the GroundSure report; but this is not intended to be a full hydrological study and, if a flood risk assessment is needed, additional analysis by others is recommended to confirm this aspect of the development. Also, whilst our field staff have undergone asbestos awareness training, Applied Geology does not undertake asbestos surveys or provide specific advice relating to asbestos-containing materials. Any suspected asbestos-containing materials observed by our field staff will be mentioned in the report but further assessment by others may be required.

#### Fieldwork

Fieldwork is generally carried out in accordance with BS5930 (2015) "Code of Practice for Site Investigations" and BS10175 (2011) Investigation of Potentially Contaminated Sites, unless otherwise stated.

Prior to commencement on site, statutory services plans are generally obtained and verbal enquiries are also made regarding the positions of private or statutory services on site. Prior to excavation or drilling, locations are scanned with a cable avoidance tool (CAT) and service pits are generally excavated at borehole positions, where possible.

Descriptions and depths of the various strata recovered are presented on the exploratory hole records, reproduced in the report appendices, together with sample depths, the results of in-situ testing, comments on groundwater inflows, and any other pertinent information. The strata descriptions are in general accordance with BS5930:2015. Disturbed plastic pot and glass amber jar samples are recovered from the various strata and stored and transported in cool boxes, where relevant, for possible future laboratory testing.

Light cable percussion boreholes are generally drilled using a Pilcon Wayfarer or Dando rig and are advanced using equipment to bore 200/150mm diameter boreholes. Disturbed plastic pot samples are recovered from all deposits encountered to allow examination and laboratory testing. Certain strata are cased off due to their tendency to collapse, particularly in the presence of groundwater inflows and/or to reduce the risk of cross contamination. In situ Standard Penetration Tests, using Split Spoon (SPT) and Cone (CPT) are undertaken in the boreholes to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT "N" value results. Within the fine grained (cohesive) deposits, "undisturbed" 100mm driven open tube samples were recovered from the various deposits to provide samples for examination and laboratory testing. On encountering groundwater, boring is usually suspended for 20 minutes while any rise in water level is recorded. Full details of the groundwater observations and monitoring results during boring operations are included on the borehole records. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion, unless otherwise stated on the individual logs.

Unless otherwise stated on the relevant logs, trial pits are excavated using a wheeled backhoe excavator, usually with a 0.6m wide bucket. The excavations are logged from the ground surface by an Engineering Geologist / Geo-environmental Engineer and relevant field testing, appropriate to the soils encountered, is carried out on samples brought to the surface. Representative disturbed soil samples are collected from selected horizons for subsequent laboratory testing. The trial pits are

usually unshored and where reasonable, left open for a period of time to allow observations of pit stability and depth and inflow rate of any groundwater ingress. The excavations are backfilled with arisings prior to moving on to the next position. Any trial pits carried out as part of this or previous investigations may represent soft spots and conduits/sumps for groundwater or surface water. In excavations, such materials may also be loose and unstable.

Driven Continuous Sampling (DCS) boreholes are drilled using a track mounted Global mini-rig or similar using sampling tubes of varying diameter (decreasing with depth). Samples of the deposits encountered are recovered in 1m long clear plastic liners, which are logged and sub-sampled on site by an Engineering Geologist. Generally for geotechnical investigations, during the drilling process in-situ Standard Penetration Tests (SPTs) are undertaken at selected depths to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT "N" value results. Groundwater seepages are noted during drilling if encountered. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion.

Unless specifically stated in the report, exploratory hole locations should be regarded as approximate. Consideration should be given to accurate location of the exploratory holes where it is considered they may impact on proposed development.

It should be noted that groundwater levels at any particular site may fluctuate due to rainfall, seasonal variations etc and, therefore, levels may be different to those measured during the course of the fieldwork and monitoring period.

#### Laboratory Testing

The geotechnical testing was carried out in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes and was undertaken by a UKAS accredited specialist laboratory. Chemical testing was undertaken by a UKAS accredited specialist chemical testing laboratory and MCERTS accredited methods, in accordance with Environment Agency recommendations, were specified where available.

#### Contamination Assessment – Human Health

Applied Geology Limited has followed the guidance given in the CLR 11 publication and other available guidance to assess the contaminant concentrations. Details of the methodology followed are briefly outlined below.

The available chemical data is sorted into appropriate datasets depending on sampling regime and ground conditions. An initial generic quantitative risk assessment is undertaken on this data using statistical tests, where appropriate, and relevant screening values. Risk to human health has been initially assessed by comparing soil results against various published screening criteria. These have been sourced from the following, in order of preference:

- DEFRA. Category 4 Screening Levels (C4SL), March 2014;
- LQM/CIEH S4UL for Human Health Risk Assessment (S4UL), 2015\*;
- Environment Agency/DEFRA, Soil Guideline Values (SGV) published in 2009;
- EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (GAC), 2010.

\*- © Land Quality Management Limited reproduced with permission; Publication Number S4UL3159. All rights reserved

Except for lead and benzo(a)pyrene, the assessments will be carried out by comparing results against the LQM/CIEH S4UL in the first instance, where these values are exceeded, then reference will be made to the C4SLs where such exist. Lead will only be compared to the C4SL because no S4UL exists for lead. For Benzo(a)pyrene, Applied Geology has chosen to adopt the approach presented by the C4SL committee rather than the approach proposed by LQM/CIEH. Further discussion on this is presented below.

It is our view, and the view of others in the industry, that the C4SL were derived for use in both the Part IIA system and through the planning system, as they allow identification of those sites that fall within Category 4 (not contaminated) and are therefore able to be developed with no further remedial action. The C4SLs are considered to represent a contamination level that is 'low' from a toxicological view point, which we therefore consider to be 'acceptable' under planning.

Historically, the level of contamination has been assessed with reference to SGV values which were derived to represent a 'minimal' level of contamination. The SGVs are still valid and can be used alongside C4SL, however both screening values are only intended to provide guidance as to the level of contamination and, where concentrations fall below these screening values, the site is not contaminated (and is within Category 4). Exceedance of a SGV/S4UL/C4SL does not automatically indicate that an 'unacceptable' risk exists at a site; simply that further consideration of that particular contaminant is required.

At this time, there are two toxicological methodologies that can be used in the derivation of screening criteria for PAHs; Relative Potency Factor (RPFs) or the Surrogate Marker approach. Applied Geology has chosen (based on the latest guidance from the Health Protection Agency (HPA) to use the surrogate marker approach proposed in the C4SL methodology, whereby benzo(a)pyrene can be used as a surrogate marker for all 'genotoxic' (gene damaging) PAHs. The surrogate marker approach estimates the toxicity of a mixture of PAHs in an environmental matrix by using data from toxicity studies in which a PAH mixture of known composition was tested. Exposure to the surrogate marker benzo(a)pyrene is assumed to represent exposure to all the PAHs in the environmental matrix. Thus, the level of toxicity ascribed to the surrogate represents the toxicity of the PAH mixture. This allows an assessment of the combined carcinogenic risk associated with genotoxic PAHs using only benzo(a)pyrene. In order to confirm that the mixture of genotoxic PAH in the soil is similar to the coal tar mixture used in the toxicological study, various PAH ratios are plotted and checked to see that they fall within the limits set in HPA, 2010.

#### Contamination Assessment – Water Quality

Risks to water quality has been assessed by following the Environment Agency guidance on groundwater protection (previously known as GP3), updated on their website in March 2017, see <https://www.gov.uk/government/policies/water-quality> and 'The Environment Agency's approach to groundwater protection' (March 2017 Version 1.0).

For hazardous substances, which should be prevented from entering groundwater, the screening criteria are initially set as the limit of detection, however, if groundwater has already been impacted, an appropriate environmental standard will then be used. For hazardous substances, background quality may also be taken into account.

For non-hazardous compounds, their release should not result in any pollution or significant risk of pollution in the future, as such comparison with UK DWS or EQS standards will allow determination of whether pollution could occur. Typically screening criteria will be sourced from the following:

- Environmental Standards (ES), which are defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC) and the Priority Substances Directive (PSD) (2008/105/EC) a daughter directive of the WFD.
- The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Direction, 2010.
- UK Water Supply (Water Quality) Regulations, 2010.
- UK quality standards for water to be used for direct abstraction to potable supply e.g. Surface Water (Abstraction for Drinking Water) (Classification) Regulations, 1996.
- World Health Organisation (WHO) Guidelines for Drinking Water Quality.

### Re-use of Soils and Waste Soil Disposal

It is noted that if any excavated material is to be reused on site, a Waste Management Plan (WMP) and / or a Materials Management Plan (MMP) will probably be required. Any such materials must be suitable for re-use without further treatment, and only the quantity necessary for the specified works should be used. Any materials not within these definitions may need to be considered as waste whereby a Waste Management Licence Exemption may also be required.

A specific categorisation and assessment of potential waste soils arising from the proposed development has not been undertaken as part of the investigation, unless otherwise detailed in the report text. However, generic comments and advice are made below for the reader.

All waste soils should be sorted to prevent mixtures of waste types. Where possible, any waste soil should be recycled and the volume of soil to be disposed of should be minimised. Any excavated soil material and excess spoil disposed of off-site should be treated as Waste and classified as Inert, Non-hazardous or Hazardous, prior to removal from site, as required by the "Duty of Care" (Environmental Protection Act, 1990) legislation together with Annex II of Directive 1999/31/EC ("Landfill Directive"). Initially, Basic Characterisation of the waste is required whereby the material should be described and its source of origin recorded (a site plan, exploratory hole records and the certificates of chemical analysis in this report should be included). This should also include data on its composition and leaching behaviour, its European Waste Catalogue (EWC) code, and where relevant any hazardous properties according to Annex III of Directive 91/689/EEC. This information should be provided to the licensed waste contractor.

Soils excavated on many sites would generally fall under the EWC description "Soil and Stones", EWC code 17 05 04. Waste Acceptance Criteria (WAC) testing is required for many Inert wastes and generally for all Hazardous Waste but not for non-hazardous waste. There are certain restrictions for inert wastes regarding topsoil and peat. Any asbestos must be disposed of by suitably licensed contractors to a suitably licensed facility.

### Health & Safety Aspects

As outlined within the HSE publication 'Successful Health and Safety Management - HSG65', this report should inform your development of safe systems of work and information as an input into the safety management system.

When developing risk control systems we suggest making reference to the CIRIA report 132 "A guide for safe working on contaminated sites" and the HSE document "Protection of workers and the general public during the development of contaminated land – HSG66". All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.

The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations.

Where excavations are undertaken on site, trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions. Care should be taken when digging excavations to prevent undermining or causing loss of support to the foundations of the nearby adjoining structures. Surcharging such as from spoil or vehicle movements close to excavation sides should be avoided. Practical guidance on trench excavation is given in CIRIA Report 97 Trenching Practice. Guidance on groundwater control is given in CIRIA Report 113 Control of groundwater for temporary works. Temporary works should be designed by a suitably qualified engineer or a competent person particularly where personnel access is necessary, in accordance with the requirements of the Construction (Design and Management) (CDM) Regulations.