



Geological & Geotechnical Consultants

Connell Co-op College

Combined Phase 1 Desk Study & Phase 2 Report on Ground Investigation (November 2020)

Prepared for Darwin Group Ltd



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Darwin Group Ltd

Connell Co-op College

Combined Phase 1 Desk Study & Phase 2 Report on Ground Investigation

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1.0 INTRODUCTION

Key GeoSolutions Ltd (KGS) have been commissioned by Darwin Group to undertake a ground investigation at Connell Coop College, Manchester in order to ascertain the potential ground conditions in relation to the construction of a new school building.

The proposed location of the new school building is within Connell Co-op College grounds. The new building is a single storey modular building approximately 58m x 11 - 20m.

The report comprises a desk study review of both previous site investigation reports (provided by Darwin Group) and publically available information relating to the site and the surrounding area. An intrusive ground investigation for both contamination and geotechnical purposes has been undertaken. KGS has not been provided with the proposed loadings of the building.

KGS believe that a mining stability risk assessment is being undertaken by a third party, and it, therefore, not considered as part of this report.

The comments given in this report and any opinions expressed are based in part on information made available by Darwin Group and other Third Parties. KGS has proceeded in good faith on the assumption that this information is accurate and accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied. There may be, however, conditions pertaining to the site which have not been disclosed by the investigation and which therefore could not be taken into account in this report. In particular, old foundations or underground services may be present that could affect the proposed development.

It should also be noted that the effects of ground and water borne contamination on the environment are constantly under review, and authoritative guidance values are potentially subject to change. The conclusions presented herein are based on the guidance available at the time this report was prepared, and no liability can be accepted for the retrospective effects of any changes or amendments to the legislation or guidance.

2.0 SITE OVERVIEW

2.1 Site Location and Description

The site is located at Connell Co-op College, a free school sixth form centre, within the Beswick hub development, Manchester. The site of the new college building is located at National Grid Reference 387368mE, 397958mN and is shown on Figures 1 and 2.

The site is currently a grassed area with outside seating areas and had previously been the grounds of a colliery, a steel works and a chemical works; the current surrounding landscaping is a mixture of hard and soft landscaping. The proposed new building layout is a single storey extension located along the northern wall of the existing college building. The access is via an access road to the south of the college and through two sets of gates. The boundary to the site consists of a fence which encloses the site and also consists of a grassed slope to the north and a sports court to the east. The southern boundary is a grassed area with numerous shrubs.

2.2 Land Use History

2.2.1 General

The Landmark Information Group (Landmark) was commissioned by WYG Environment (WYG) to provide an Envirocheck® Report for the previous site investigation which took place at this location. This report, including the Historical Ordnance Survey Maps, is presented in its entirety, in Appendix 1. The maps have been re-reviewed to determine historical on-site and off-site land use. Where appropriate these have been supplemented/correlated by other information from web-based sources.

2.2.2 Historical Land uses and features

The review focuses on the land use within the site boundary and the land immediately adjacent to the site. Additional comment on the land use further from the site is added if noteworthy from a geotechnical or land contamination context.

Site –

A review of the historic maps shows that the site was already developed with Clayton Colliery on-site and to the east, and a reservoir to the north were present by 1891, and a chemical works with a range of buildings was established by 1908. The 1948-49 map no longer shows the chemical works building on the site, by 1953-1963 a bowling green is shown to the west of the site. No further changes to the site are shown on the historical mapping, however the site was redeveloped between 2013 and 2016, as part of this development, the existing college was constructed.

Surrounding Land –

Clayton Colliery – was established on-site and on the surrounding land to the east of the site by 1848, but is no longer shown by 1893.

Chemical Works – a chemical works had been established to the north of the site by 1891. It is not clear from the mapping what chemicals were dealt with at the chemical works. The works building expand onto the site by 1908 and remain until the 1953-1963 mapping, after which the buildings and structures of the works reduce in numbers over the years.

Reservoir – a reservoir is shown to the immediate north of the site by 1848. It is not known to which of the various works the reservoir is related, however, there appears to be two streams or ditches running towards Bradford Bleach Works, located to the south of the site on the 1848 mapping. The reservoir remains until the 1894-1895 mapping, and the area is then shown as having buildings of the chemical works over it by 1922.

Wilson Street Works (Steel Works) – a steel works is shown to the south-east of the site by 1948-1949 and remains, as a building marked “works” until at least 1993.

Various Works – above are mentioned works which were directly adjacent to the site, however, a large number and variety of other works and industrial processing area had been present further out from the site but still relatively close to the site.

Houses – extensive housing development had been established by the 1893 map with houses being developed within the boundary of the development site.

2.2.3 Contemporary Surrounding Land Use

A contemporary trade is located 614m south east of the proposed building site. This trade is active and is located 614m south east of the site, 13, Vale Street, Manchester, M11 4NR, Vale Hardware, classified as a commercial Hardware.

2.3 Geo-Environmental Setting

2.3.1 Geology

The site is covered by BGS 1: 50,000 Geological Sheet No. 85 Manchester Bedrock and Superficial Deposits Published 2011. This indicates the site to be underlain by superficial deposits of

Devensian Till; diamicton of the Quaternary period. This is underlain by bedrock of the Pennine Upper Coal Measures Formation; mudstone, siltstone and sandstone of the Carboniferous period.

2.3.2 Hydrogeology and Groundwater Vulnerability

The hydrogeology and groundwater vulnerability at the site has been assessed and is summarised in the following sections.

2.3.3 Classification of Aquifer

The bedrock strata Coal Measures are identified as a Secondary Aquifer - A, defined by the Environment Agency as:-

“permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;”

The superficial strata is identified as Unproductive Strata, defined by the Environment Agency as:-

“These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.”

2.3.4 Soil Vulnerability

The soils beneath the site are taken to be soils from restored mineral workings and urban areas, as such are classed as soils of High Leaching Potential (U) – soils which can possibly transmit a wide range of pollutants a worst case vulnerability classification (H), until proven otherwise.

2.3.5 Groundwater

The site is not in an area where there is potential for groundwater flooding to occur.

2.3.6 Source Protection Zone

The site is not within a Source Protection Zone.

2.3.7 Groundwater Abstraction

Three water abstraction points are located within 1000m of the proposed site. The nearest recorded water abstraction point is located 665m west. This abstraction point is operated by British Waterways Board.

2.4 Other Significant Geo-environmental Information

2.4.1 Hydrology

Water features identified within a 1000m radius of the site include the Ashton Canal situated 575m north east of the site and a river network has been identified 830m south of the site.

The area is not within an area of potential flooding.

No pollution incidents to controlled waters have been recorded within a 250m radius of the proposed site.

2.4.2 Surface Water Abstraction

No water abstraction points are located within 250m of the site boundary.

2.4.3 Radon

With reference to Annex A and B of Radon: Protective Measures for New Dwellings (BR211, 2007), the site is located in a lower probability radon area (less than 1% of homes are estimated to be at or above the action level). The information contained within the Envirocheck® Report (Appendix 1) also states that no radon protective measures are necessary in the construction of new dwellings or extensions.

It should be noted that in areas where protection measures are required, further review will be necessary from time to time as new data becomes available regardless the indicative risk as the risk can vary between neighbouring properties and even from room to room in same building.

Public Health for England (PHE) in 2014 produced a briefing on radon in schools and indicated that in radon affected areas schools should undertake radon measurements in the premises. Consequently, it is possible that the school has additional information on the actual radon risk and it is recommended enquiries are made with the school accordingly.

Given that the new school building is being constructed off-site and therefore includes a suspended floor, simply venting the sub-floor space and sealing the floors would add a further level of protection against the radon risk.

2.4.4 Waste

Based on the Envirocheck report there are three Historical Landfill Site located within 1000m of the site. The closest of which is located c.650m to the south-east of the site, at Clayton, Manchester, Gt Manchester, M11.

Although not indicated as a Historical Landfill Site, the area to the north of the site was previously a reservoir which was subsequently built over, indicating that a significant area of infilled land is located to the north of the site. The area to the east of the site is an old colliery site with a number of old shafts located on the site; there is likely to be infilled/made-up land associated with the colliery and its structures.

2.4.5 Ground Stability, Mineral Workings and Coal Mining

As would be expected based on the published geology the site is noted as being in an area "*which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the coal Authority*".

The Envirocheck report indicates that there is a "rare" risk of hazards associated with non-coal mining activity.

There are eighteen BGS recorded Mineral Sites within 1000m of the site, the closest of such sites was located 0m from the site. The site is no longer active, and was an underground working called Clayton Colliery which worked the Bradford Four Foot Coal (South Lancashire) of the Carboniferous Period.

The Envirocheck® Report indicates the soils found on site are classified as being 'No Hazard' or having 'very low hazard potential' for the following:

- Potential for collapsible ground
- Potential for compressible ground
- Potential for dissolution
- Potential for landslide
- Potential for compressible ground
- Potential for running sand
- Potential for shrinking or swelling clay ground

2.4.6 Environmentally Sensitive Land Uses

Within 1000m of the proposed site two sites of environmentally sensitive land uses areas have been identified these include an area of adopted greenbelt and a local nature reserve located 728m north east and 517m north west of the site.

2.5 Review of Previous Reports / Investigations

2.5.1 BGS Records

A search for any available reports, which may provide relevant information with regards to the site development, has been undertaken. This includes the borehole records kept at the British Geological Survey (BGS).

The BGS has records of numerous boreholes within 1000m of the site however most of the borehole logs are confidential and not available to view. The closest borehole log is located 100m south of the proposed site, the borehole encountered c.0.90m of backfill - ashes, below which firm grey/brown sandy clay with stone inclusions was encountered to between c.0.90m and c.15.25m below ground level (bgl).

2.5.2 WYG Environment - Interpretative Site Investigation Report

Details of the various reports and ground investigations which have previously been undertaken at or adjacent to the site are collated within the WYG Interpretative Site Investigation Report ¹ dated March 2011. There are a large number of previous reports detailed within the WYG report; however most of the information pertains to areas adjacent to the site and relates to the site as it was prior to a wide-scale redevelopment of the site and surrounding areas.

The report identified that the site is underlain by made ground over diamicton (referred to as "Glacial Till"), which is further underlain by Coal Measures, a secondary aquifer. The made ground was encountered to c.1.45-3.70m below ground level (bgl). The report confirms the presence of the reservoir to the north of the site, encountering 0.1->1.10m thickness of soft to firm black silts to c. 3.90-4.60m bgl. The superficial deposits are confirmed to be predominantly firm to stiff clays with occasional gravels and sand lenses. The closest deep borehole to the site was borehole RBH408 which encountered c.2.00m of made ground, superficial deposits to 16.50m bgl which were underlain by bedrock comprising mudstone, sandstone and coal bands.

The report considered that the majority of the site and surrounding area to be impacted by a wide range of inorganic and organic contaminants, including metals, cyanide, asbestos, free phase hydrocarbons, petroleum hydrocarbons, VOCs / SVOCs and PAHs.

¹ WYG Environment – Brookshaw Development Ltd, Openshaw West, Interpretative Site Investigation Report, A064184-SI-V2, March 2011.

Some moderate to high risks to human health were identified which required remediation or mitigation prior to development of the site. Risks to the groundwater aquifers and controlled surface waters were not considered to be significant. Risks associated with ground gas and mine gas were considered to be relatively low, but required further mitigation or data and assessment.

The Mining Risk Assessment undertaken as part of the WYG report concluded that all shafts were located, treated and capped prior to development, and that *“if buildings are constructed in the area of the site to the west of the Bradford Fault the underlying Coal Measures are likely to require grouting”*.

2.5.3 AECOM– Beswick Community Hub Remediation Strategy Report

AECOM produced a Remediation Strategy report² dated July 2013, for site and the surrounding areas. The purpose of the report was to develop a remediation strategy for the site to mitigate or reduce the potential risks to human health and Controlled Waters.

As ground gas monitoring had not been completed at the time of this report being written, the ground gas regime of the site and gas protection measures not considered as part of the report.

The report identified the made ground as a source of contaminants with pathways to receptors, the proposals in the Remediation Strategy break the source/receptor pathways. The strategy allowed for some of the made ground to remain in situ provided that the final landuse / levels provide hardstanding cover or a minimum 600mm cover of “clean” material, as defined in Appendix C of the report. The strategy advised that pathways associated with nearby mine shafts should be broken by grouting and capping of the shafts.

Given that the site has undergone wide-scale redevelopment since the AECOM report was produced it must be assumed that suitable remediation works were undertaken prior to, or as part of, the development of the Beswick Community Hub.

KGS have not been provided with any evidence of the remedial works undertaken, it is recommended that Darwin Group seek to gain a copy of the Verification Report for these works.

² AECOM – Beswick Community Hub Remediation Strategy Report, 60271023-Remedial Strategy Draft1, July 2013.

3.0 CONCEPTUAL MODEL AND PRELIMINARY RISK ASSESSMENT

3.1 Introduction

This section of the report comprises a qualitative assessment of the potential for contaminated land to be present at the site. The statutory definition for “contaminated land” being as follows:

“any land which appears to the local authority in whose area it is situated to be in such a condition by reason of substances in, on, or under the land, that:

- (a) significant harm is being caused or there is significant possibility of such harm being caused; or*
- (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.”*

Consequently, the assessment of contaminated land can be seen as a two phase risk based process, comprising:

- (1) A qualitative assessment of the likelihood of plausible contaminant linkages, i.e. there must not only be a source of contamination, but a pathway and a receptor; and
- (2) A quantitative element which will seek to determine the degree of harm and the significance of such harm on a receptor.

The Statutory definition of contaminated land was introduced through Part 2A of the Environment Protection Act 1990 to specifically address the historical legacy of land contamination. Where a site is being submitted for redevelopment under the planning regime it should on completion be suitable for use and should not be capable of being determined Contaminated Land under Part 2A of the Environment Protection Act 1990.

It is proposed to construct a new single storey building at the school. The construction is assumed to comprise a steel frame with suspended floors. It is anticipated that, in keeping with the other buildings in this area of the school, the new school building will be surrounded by a mixture of hard and existing soft landscaping.

Considering the proposed end use of the site and the findings from the desk study presented in the preceding sections a Conceptual Site Model (CSM) has been derived identifying plausible contaminant linkages and a preliminary risk assessment undertaken as set out below to determine whether plausible significant contaminant linkages are present. This CSM is further reviewed in Chapter 6 as part of the assessment of the results from the preliminary ground investigation undertaken as part of this commission.

3.2 Sources of Contamination

Given that the site has undergone wide-scale redevelopment since the AECOM Remediation Strategy report² was produced it must be assumed that suitable remediation works were undertaken prior to, or as part of, the development of the Beswick Community Hub, which included the development of the existing Connell Co-op College.

The possible on-site sources of contamination include made ground associated with the previous site uses, however, if present, it is likely to be below a hardstanding or 600mm of “clean” soils, as advised by the remediation strategy.

Should made ground be present on-site this might include demolition rubble that could contain asbestos, cyanide, metals, sulphates, free-phase hydrocarbons and Polyaromatic Hydrocarbons (PAHs), there is also the potential for ground gas associated with made ground.

Possible off-site sources of contamination include ground gas, mine gas, and mobile contaminants such as free-phase hydrocarbons.

3.3 Potential Contaminants of Concern

From the specific land uses mentioned above possible contaminants of concern could include: asbestos, metals, cyanide, sulphates, free-phase hydrocarbons, PAHs and ground/mine gas. However, should made ground have been imported to site there is a risk of a broader range of contaminants being present.

3.4 Pathways for Migration

The pathways for migration of potential contaminants include direct contact, ingestion, inhalation and migration along preferential pathways, including permeable made ground and uncapped mine shafts.

As the site is assumed to have been remediated, the pathways are partly limited by the existing hardstanding and at least 600mm cover over soft-landscaped areas, and the presence of hard cover and appropriate soft-landscaping cover when the re-development is completed.

However during construction when hardcover is removed if made ground is present then there is the potential for direct contact, ingestion, inhalation, and for some water ingress to occur allowing leaching and migration along preferential pathways.

There is also the potential for pathways to be created along new infrastructure including utility trenches and pipework as well as foundations. The development will also result in direct contact between contaminants and construction materials.

3.5 Potential receptors

The potential receptors include, site users, maintenance workers, construction workers, surrounding residents, groundwater (secondary aquifer), buildings, and buried structures and services.

3.6 Assessment of Plausible Contaminant linkages

A risk assessment of the identified plausible contaminant linkages has been undertaken for the site in line with current legislation described above. (The assessment takes into consideration the sources of possible contamination risk and the presence of any plausible pathways or receptors as outlined in the Environmental Protection Act 1990 (Part 2A)). The risk assessment has been undertaken on the understanding that the site is to be developed as a single storey school extension. As such, some assumptions have been made with respect to the following assessment as set out immediately below. The geo-environmental risk assessment should be reviewed in the event that the proposed end use is significantly altered from that described in Section 3.1 above.

It has been assumed that appropriate health and safety practices will be adopted during site clearance, preparation, earthworks and construction, and appropriate environmental protection / mitigation measures will be employed. It is also assumed that the proposed development will not introduce contaminative substances into the ground. In keeping with the other buildings in this area of the school it is anticipated that the building will be surrounded by both hard and soft landscaping. Ground conditions based on the geological mapping are expected to be suitable for normal shallow spread foundations.

Table 1 presents a qualitative assessment of the significance of the plausible contaminant linkages identified, those that are likely to only occur during construction are highlighted in *italics*. The classifications of consequence (severity) are taken from R&D Publication 66 (NHBC and Environment Agency, 2008). Whilst this is for housing the classifications have been applied to a broad range of development scenarios. It should be noted that as this PRA is based on desk study information, it has been assumed where there is no definite evidence of whether contamination is present or not or the significance of this contamination, that generally a “medium” consequence category has been selected. As already stated the PRA is reviewed as part of the assessment of results from the preliminary ground investigation in Chapter 6. The scope of the investigation is set out in Chapters 4 and 5.

Table 1 - Plausible Contaminant linkages and Qualitative Preliminary Risk Assessment – Proposed Development (Based on desk study information)

Source	Pathway	Receptor	Consequence	Probability	Risk
Hazards to Human Health					
Soil Contamination – Made Ground if present	Direct Contact / Ingestion / Inhalation	Construction workers ¹	Medium	Low Likelihood	Moderate / Low
Soil Contamination – Asbestos in Made Ground if present	Inhalation	Surrounding Residents / Site Users / Maintenance Workers / Construction workers ¹	Medium	Low Likelihood	Moderate / Low
Soil Contamination – Made Ground if present	Permeation to potable water supplies	Site Users	Medium	Unlikely	Low Risk
Offsite - Potential leachable contaminants from adjacent historic land uses.	Migration through permeable strata	Made Ground On-Site	Moderate	Low Likelihood	Moderate / Low
Ground Gas – From deep made ground ²	Permeation through made ground & inhalation	Site Users/ Maintenance Workers	Medium	Low Likelihood	Moderate / Low
Ground Gas – From deep made ground ²	Permeation through made ground & inhalation	Construction workers ¹	Severe	Low Likelihood	Moderate
Hazards to the Water Environment					
Potential Leachable contamination – Made Ground if present	Water ingress and vertical flow into groundwater during construction	Secondary Aquifer	Mild	Low Likelihood	Moderate / Low
Offsite - Potential leachable contaminants from adjacent historic landfill activities	Migration through permeable strata	Secondary Aquifer	Mild	Low Likelihood	Moderate / Low
Hazards to Building Fabric, Structures and Services					
Soil contamination within the Made Ground (if present)	Direct Contact	Buried structures (concrete)	Medium	Low Likelihood	Moderate / Low
Sulphates within near surface soils	Direct Contact	Buried structures (concrete)	Medium	Low Likelihood	Moderate / Low
Ground Gas – From deep made ground ²	Ingress, accumulation and explosion	Buildings and structures	Medium	Likely	Moderate

Notes:

1. Due to health and safety requirements risks to workers should be removed by use of appropriate work methods and use of PPE. Information on the risks must be provided in advance of works in accordance with CDM 2015. Residual information on risks shall also be retained on-site in the Health and Safety File to ensure future maintenance workers understand the risks and can mitigate accordingly.
2. There is a risk from ground gas associated with deep made ground, the sources are considered to have the potential to affect the end users. The previous site investigation and remediation strategy reports identified the presence of gas from both the made ground and historic coal mining, and these sources may still be capable of generating significant concentrations and volumes of gas. It is assumed that, as part of the development of the site, the mine shafts were grouted and capped effectively removing the pathways for gas associated with historic coal mining.

In summary as can be seen from the PRA above there is generally a perceived Moderate/Low risk of contamination on-site affecting the development.

4.0 GROUND INVESTIGATION

The site work was carried out on the 13th November 2020 and generally in accordance with the guidelines laid down in BS EN 1997-2:2007.

Four windowless sample holes (WS01 to WS04) were sunk in the vicinity the footprint of the proposed new building to investigate the ground conditions and provide samples for chemical analysis. All exploratory holes were located based on the proposed location of the extension building for the geotechnical requirements of foundation design as other than a general risk of contamination being present on site the Desk Study had not identified any specific targets.

The holes were sunk using a windowless sampling rig provided by Geosite Surveys. The approximate locations of the boreholes are shown on Figure 2. The depths of the boreholes and descriptions of the soils encountered are given in the borehole records (Appendix 2).

SPT's (Standard Penetration Tests) were taken at the depths shown on the borehole record. The results are provided on the borehole logs. The results are provided within Appendix 2.

Samples taken for BRE and WAC purposes were recovered in labelled 250g amber jars, 60g amber jars and 500g plastic tubs (marked as "Jars" on the borehole logs). The samples were then stored in cool boxes prior to being delivered to I2 Analytical in Watford. Samples were scheduled using Sample Custody forms provided by I2 Analytical. Samples were also taken for physical testing and were sent to Ground Engineering in Peterborough. Samples were scheduled using a sample custody form.

Gas standpipes were installed in WS01, WS02 and WS04, details of installations are on the borehole logs (see Appendix 2). The remaining borehole was backfilled with arising's on completion.

5.0 LABORATORY TESTING

Samples were selected and scheduled for chemical analysis by KGS: the analysis was carried out by I2 Analytical, a UKAS accredited laboratory with MCERTs accreditation for the majority of test scheduled.

Whilst every effort has been made to schedule tests suitable for the known previous land use, there is no guarantee that other contaminants are not present on site for which analyses have not been carried out or which were not sampled in the programme of exploratory holes.

In addition, two samples of the clay were submitted to Ground Engineering Ltd for Atterberg (Liquid and Plastic limit) tests. The results of the laboratory testing undertaken at Connell Co-op College are presented in Appendix 4.

6.0 DISCUSSIONS ON GROUND CONDITIONS AND RECOMMENDATIONS

6.1 Soil Conditions

The following strata were encountered during the investigation:-

- Made ground
- Sand Clay
- Gravelly Sandy Clay

The boreholes encountered 0.20m – 1.70m of made ground comprising sandy clay with inclusions of gravel with brick and wood fragments. Boreholes WS01, WS02 and WS04 encountered a sandy CLAY below the Made Ground. Boreholes WS01a, WS02a and WS03a all encountered obstructions at c.1.23m bgl.

- WS01 was terminated in gravelly Clay at a depth of 5.45m bgl,
- WS01A refused in made ground at a depth of 1.23m bgl
- WS02 was terminated in gravelly Clay at a depth of 5.45m bgl,
- WS02A refused in made ground at a depth of 1.23m bgl
- WS03 was terminated in gravelly Clay at a depth of 1.38m bgl
- WS03A refused in made ground at a depth of 1.23m bgl,
- WS04 was terminated in gravelly Clay at a depth of 5.45m bgl,

As expected the groundwater was not encountered during the drilling program, however perched water was encountered in WS02 at 0.50mbgl.

6.2 Visual and Olfactory Evidence of Contamination

Visual and olfactory evidence where present is recorded on the exploratory hole logs within the relevant soil descriptions. These include notes regarding the presence of brick and wood inclusions.

6.3 Foundations

The foundations should be taken down to the underlying firm clay. For foundation design purposes it is suggested that pad and strip foundations would be suitable and that an Allowable Bearing Pressure (ABP) of 120N/m² be assumed. The foundations should be formed with a minimum foundation depth of 1.0m below existing ground level and below any made ground.

No loadings have been provided and the provision of a foundation design is beyond the scope of the current report.

If ground conditions are worse than those encountered by the boreholes any foundation design would need to be reviewed by a geotechnical engineer.

Atterberg tests carried out show that the clay of the Devensian Till may be classified as clay of medium to high plasticity and have a medium susceptibility to shrinking and swelling. The foundation designs should account for this and the location of trees on and adjacent to the site whether they are retained or removed.

6.4 Chemical Considerations

The laboratory testing recorded the following contaminants present in the near-surface soils above their relevant laboratory detection limit: heavy metals, chloride, nitrate, sulphate, sulphide, cyanide, water soluble boron, PAH and TPHs. The findings of the chemical analysis are summarised in Table 2. In addition to the chemical testing four samples from near surface were subjected to asbestos identification analysis; asbestos was detected in two samples, however, an asbestos quantification test detected the presence of concentrations of asbestos in the made ground at <0.001%. A complete set of test results is contained in Appendix 4.

Table 6.1: Summary of Test Results

Determinand	Unit	S4UL for RwoHP ¹ , ²	Concentration			
			Min.	Max.	Mean	Standard Deviation
Made Ground (up to 4 Samples)						
pH	pH Units	n/a	7.1	9.4	8.675	0.942
Arsenic (total)	mg/kg	40	36	180	108.67	58.795
Barium (total)	mg/kg	1300	150	240	183.33	40.277
Beryllium (total)	mg/kg	1.7	0.83	1.3	1.08	0.193
Boron (water soluble)	mg/kg	11000	2	3.6	2.9	0.668
Chromium (total)	mg/kg	910	28	58	38	14.142
Copper (total)	mg/kg	7100	44	130	86.67	35.113
Lead (total)	mg/kg	310 ³	93	410	271	132.320
Mercury (total)	mg/kg	1.2	0.4	1.8	1.1	0.572
Nickel (total)	mg/kg	180	22	33	29	4.967
Selenium (total)	mg/kg	430	<1	2.8	1.6	0.849
Vanadium (total)	mg/kg	1200	30	41	36	4.546
Zinc (total)	mg/kg	40000	91	250	153.67	69.139

Determinand	Unit	S4UL for RwoHP ¹ , ²	Concentration			
			Min.	Max.	Mean	Standard Deviation
Chloride (2:1 water soluble)	mg/l	-	7.4	88	41.6	30.255
Sulphate (2:1 water soluble)	mg/l	-	589	1920	1429.75	504.252
Sulphide	mg/kg	-	7.6	29	17.2	8.874
Cyanide (total)	mg/kg	0.04 ⁴	<1	3	2.33	0.943
Organic Matter	%	n/a	2	5.3	3.200	1.490
Polyaromatic Hydrocarbons						
Naphthalene	mg/kg	2.3	<0.05	2.7	1.383	1.082
Acenaphthylene	mg/kg	2900 (86.1) ^{sol}	<0.05	0.5	0.200	0.212
Acenaphthene	mg/kg	3000 (57) ^{sol}	<0.05	2.2	0.907	0.930
Fluorene	mg/kg	2800 (30.9) ^{sol}	<0.05	2.2	0.857	0.956
Phenanthrene	mg/kg	1300 (36) ^{sol}	<0.05	16	6.250	6.979
Anthracene	mg/kg	31000 (1.17) ^{sol}	<0.05	4.6	1.803	1.999
Fluoranthene	mg/kg	1500	<0.05	21	8.183	9.172
Pyrene	mg/kg	3700	<0.05	22	8.483	9.655
Benzo(a)anthracene	mg/kg	11	<0.05	12	4.750	5.201
Chrysene	mg/kg	30	<0.05	8.7	3.383	3.800
Benzo(b)fluoranthene	mg/kg	3.9	<0.05	11	4.317	4.786
Benzo(k)fluoranthene	mg/kg	110	<0.05	3.2	1.310	1.361
Benzo(a)pyrene	mg/kg	3.2	<0.05	10	3.883	4.371
Indeno(123cd)pyrene	mg/kg	45	<0.05	5.2	2.037	2.261
Dibenz(ah)anthracene	mg/kg	0.31	<0.05	1.8	0.700	0.782
Benzo(ghi)perylene	mg/kg	360	<0.05	6.6	2.503	2.916
BTEX & TPH						
EPH Aromatic (>EC10-EC12)	mg/kg	250	3	15	7.133	5.565
EPH Aromatic (>EC12-EC16)	mg/kg	1800	9.4	27	16.800	7.453
EPH Aromatic (>EC16-EC21)	mg/kg	1900	27	100	60.000	30.210
EPH Aromatic (>EC21-EC35)	mg/kg	1900	26	100	59.333	30.652
EPH Aliphatic (>C12-C16)	mg/kg	1100 (24) ^{sol}	<2	2.1	2.033	0.047
EPH Aliphatic (>C16-C35)	mg/kg	65000 (8.48) ^{sol}	<8	57	24.333	23.099

Notes:

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 2. Where S4UL value is affected by changes in soil organic matter concentrations the S4ULs relating to 1% SOM.
 3. Lead values are based on the published C4SL values published by DEFRA for the same land use.
 4. Total Cyanide values are based on the Dutch Intervention Value (DIV) for Free Cyanide as an initial screening value.
 5. Results exceeding threshold values for Residential Properties without Home Grown Produce are shown in orange.
- ^{Sol} S4UL presented exceeds the solubility saturation limit, which is presented in brackets

Darwin Group's Construction Methodology involves a site level reduction of approximately 0.5m followed by the placement of a modular building. The building has a suspended floor with the building supported by columns onto pad foundations.

The results of the contamination testing shown in Table 2 confirm that the made ground on site has the potential to pose a risk to human health. It is assumed that as part of the development, in accordance with the AECOM Remediation Strategy², that any made ground excavated as part of the development will be handled and disposed of in an appropriate manner and that the areas of soft landscaping will be left with a 600mm cover of "clean" materials.

6.4.1 Human Health – End Users / Maintenance Workers

Although the contamination testing identified levels of arsenic, lead, mercury and some PAHs (Naphthalene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenz(ah)anthracene) above that acceptable levels for Residential Properties without Home Grown Produce, and elevated levels of cyanide within near-surface soils, these areas lie beneath the footprint of the proposed extension building.

In terms of long term human health, the only potential pathway that remains on completion of the development is the inhalation pathway for volatile contaminants as the building, hardcover and "clean" soft landscaping remove the direct contact and ingestion pathways.

The risks associated with ground gas as discussed is Section 6.4.3 below.

Regardless of the long term situation there may be short term risks during construction, see Section 6.4.2 below.

6.4.2 Human Health – Construction Workers / Surrounding Residents

Short term risks to construction workers from both identified and potential unidentified contamination can be mitigated by adoption of normal standards of health, safety and hygiene adopted on construction sites.

As the asbestos quantification test detected the presence of concentrations of asbestos in the made ground at less than 0.001%, the made ground, with respect to asbestos, is not considered either a hazardous waste or “difficult” Controlled Waste and should not pose a risk to surrounding residents.

6.4.3 Ground Gas

There remains a risk of ground gas associated with deep made ground on or adjacent to the site, this has the potential to affect the end users, maintenance workers, construction workers and the building's structure.

At present, the ground gas regime of the site has not been fully investigated and the AECOM Remediation Strategy report² did not provide any recommendations for gas protection measures. Unless evidence can be provided in the form of construction details of the existing building or the AECOM Verification report, then it is recommended that basic gas protection measures are installed, in addition the proposed building will have a vented sub-floor space, which would add a further level of protection against the ground gas risk to the end users, maintenance workers and the building's structure.

The risks to construction workers should be mitigated by the adoption of appropriate health and safety practices and risk assessments for entering enclosed spaces or excavations.

6.4.4 Potable Water Supply Pipes

Plastic pipes can be affected by the presence of contamination leading to stress cracking and or permeation. The suitability of near surface soils for plastic potable water supply pipes should be subject to confirmation by the water supply company.

6.4.5 Controlled Waters

The risk to controlled waters is considered unlikely in the long term due to the presence of buildings and hard standing which would prevent water ingress. There may be a very low risk during construction when the underlying made ground is exposed. This very low risk is considered mitigated by:

- The fact the underlying lithology comprises clay or clayey deposits;

6.4.6 Buried Concrete

The presence of sulphate can have a deleterious effect on concrete. Given the results of the pH test (7.1 – 9.4) and sulphate test (0.59 – 1.90 g/l), the soil tested is classified as DS-3 for concrete design.

6.4.7 Summary

It is considered that the development will not cause an increased impact on long term human health as the vented sub-floor void of the building along with sealed floors will mitigate against ground gas and volatile contamination, and the building, hardstanding and 600mm cover over soft-landscaped areas prevents direct contact, ingestion and the inhalation of dust and asbestos.

Near surface soils should be suitable for plastic potable water supply pipes subject to confirmation by the water supply company.

In summary the site is suitable for the proposed development with the following mitigation:

- Design of concrete to take account of the sulphates.
- Construction risk assessments and method statements will need to account of the presence of contamination in the made ground, and vigilance should be maintained in particular to the presence of asbestos or asbestos containing materials.

6.4.8 Classification of Arising's for disposal to landfill

From the waste acceptance criteria (WAC) testing (see Appendix 4 for WAC test results), the made ground tested from WS01a, WS01 and WS03 would classify as stable non-reactive hazardous waste in non-hazardous landfill. The results of the WAC tests should be made available to all interested parties.

Although asbestos was detected in two of the samples tested, an asbestos quantification test detected the presence of concentrations of asbestos in the made ground at less than 0.001%, and is therefore, with respect to asbestos, not considered either a hazardous waste or "difficult" Controlled Waste.

The natural occurring soils should be classified as Listed Inert but care should be taken to ensure it is excavated separately and that it is free from impact from the overlying made ground.

7.0 CONCLUSIONS AND RECOMMENDATIONS

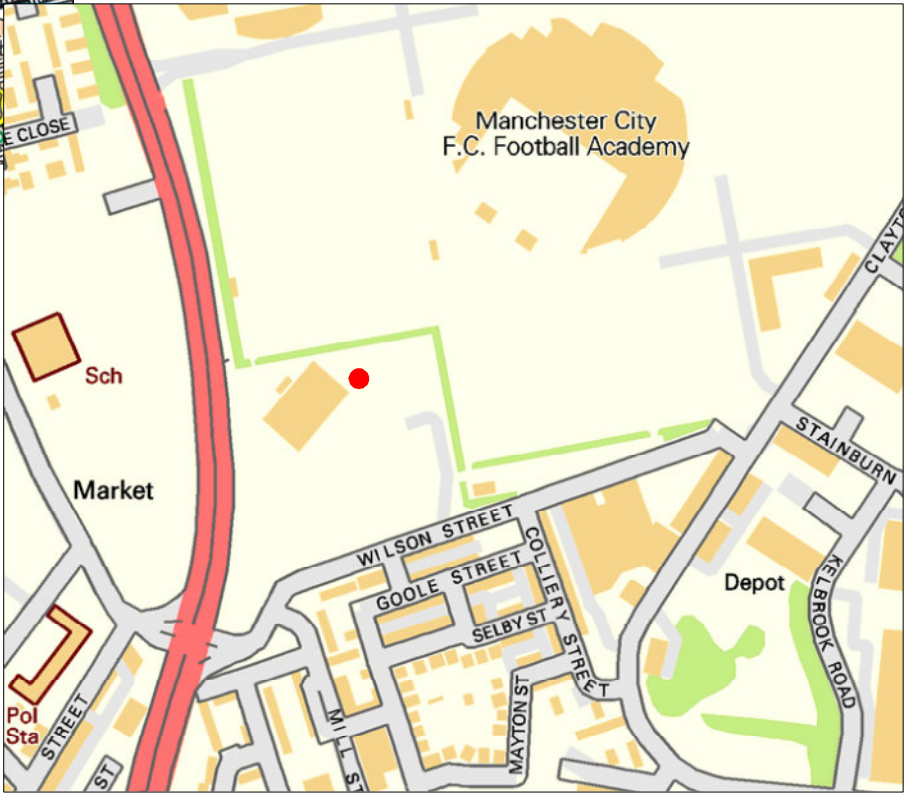
7.1 Conclusions

- It is proposed to construct a new one storey extension at Connell Co-op College.
- A desk study and previous site investigations indicated a range of contaminants associated with made ground and the potential for ground gas.
- The site has been redeveloped since the previous site investigations and it is assumed that the redevelopment was carried out in accordance with the AECOM Remediation Strategy², with made ground removed, or covered by hardstanding or 600mm “clean” soils in soft landscaping areas.
- The recent site investigation identified between 0.2m and 1.70m of made ground beneath which firm grey clay was recorded.
- Groundwater was not encountered during the drilling program, however perched water was encountered in WS02 at 0.50mbgl.
- The made ground was found to contain the following contaminants present above their relevant limit for Inert Waste Landfill: Total Dissolved Solids, PAH, sulphate and antimony.
- The contamination testing of the made ground identified levels of arsenic, lead, mercury and PAHs (Naphthalene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenz(ah)anthracene) above that acceptable levels for Residential Properties without Home Grown Produce, and elevated levels of cyanide within near-surface soils.
- Asbestos was also detected in two of the samples, from boreholes WS01a and WS02. However, an asbestos quantification test detected the presence of concentrations of asbestos in the made ground at <0.001%, and is therefore, with respect to asbestos, not considered either a hazardous waste or “difficult” Controlled Waste.
- The very low risk to Controlled Waters during construction when the when the underlying made ground is exposed is considered mitigated by the fact the underlying lithology comprises clay or clayey deposits.
- It is considered that the development will not cause an increased impact on long term human health as the vented sub-floor void of the building along with sealed floors will mitigate against ground gas and volatile contamination, and the building, hardstanding and 600mm cover over soft-landscaped areas prevents direct contact, ingestion and the inhalation of dust and asbestos.
- Atterberg tests carried out show that the clay of the Devensian Till may be classified as clay of medium to high plasticity and have a medium susceptibility to shrinking and swelling.
- Remnants of old foundations from buildings which previously occupied the site are expected in the development area.
- The WAC results indicate that the made ground tested classifies as stable non-reactive hazardous waste in non-hazardous landfill.

7.2 Recommendations

- Normal standards of health, safety and hygiene adopted on construction sites should offer sufficient mitigation against any potential unidentified contamination.
- The risks to construction workers associated with ground gas should be mitigated by the adoption of appropriate health and safety practices and risk assessments for entering enclosed spaces or excavations.
- Vigilance should be maintained during groundworks in case different ground conditions from those anticipated are encountered.
- Unless evidence can be provided in the form of construction details of the existing building or the AECOM Verification report, then it is recommended that basic gas protection measures are installed, in addition the proposed building will have a vented sub-floor space, which would add a further level of protection against the ground gas risk to the end users, maintenance workers and the building's structure.
- If development is to include water supply pipes the water supply company is contacted to confirm acceptance that plastic pipes are suitable.
- Given the results of the pH tests and sulphate tests, the soils are classified as DS-3 for concrete design.
- The natural soils, where not impacted from the overlying made ground, shall be excavated separately and should classify as Listed Inert for disposal purposes.
- The foundation designs should account for the presence of clays with medium susceptibility to shrinking and swelling, and the location of trees on and adjacent to the site whether they are retained or removed.
- The made ground is not considered to be a suitable load bearing material; therefore, the foundations should be taken down to the underlying firm clay. For foundation design purposes it is suggested that pad and strip foundations would be suitable and that an Allowable Bearing Pressure (ABP) of 120N/m² be assumed. The foundations should be formed with a minimum foundation depth of 1.0m below existing ground level.

FIGURES



NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

01	First Issue	RW	10/12/20
Rev.	Revision Detail	Drawn	Date

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CLIENT:

PROJECT:

CONNELL CO-OP COLLEGE

TITLE:

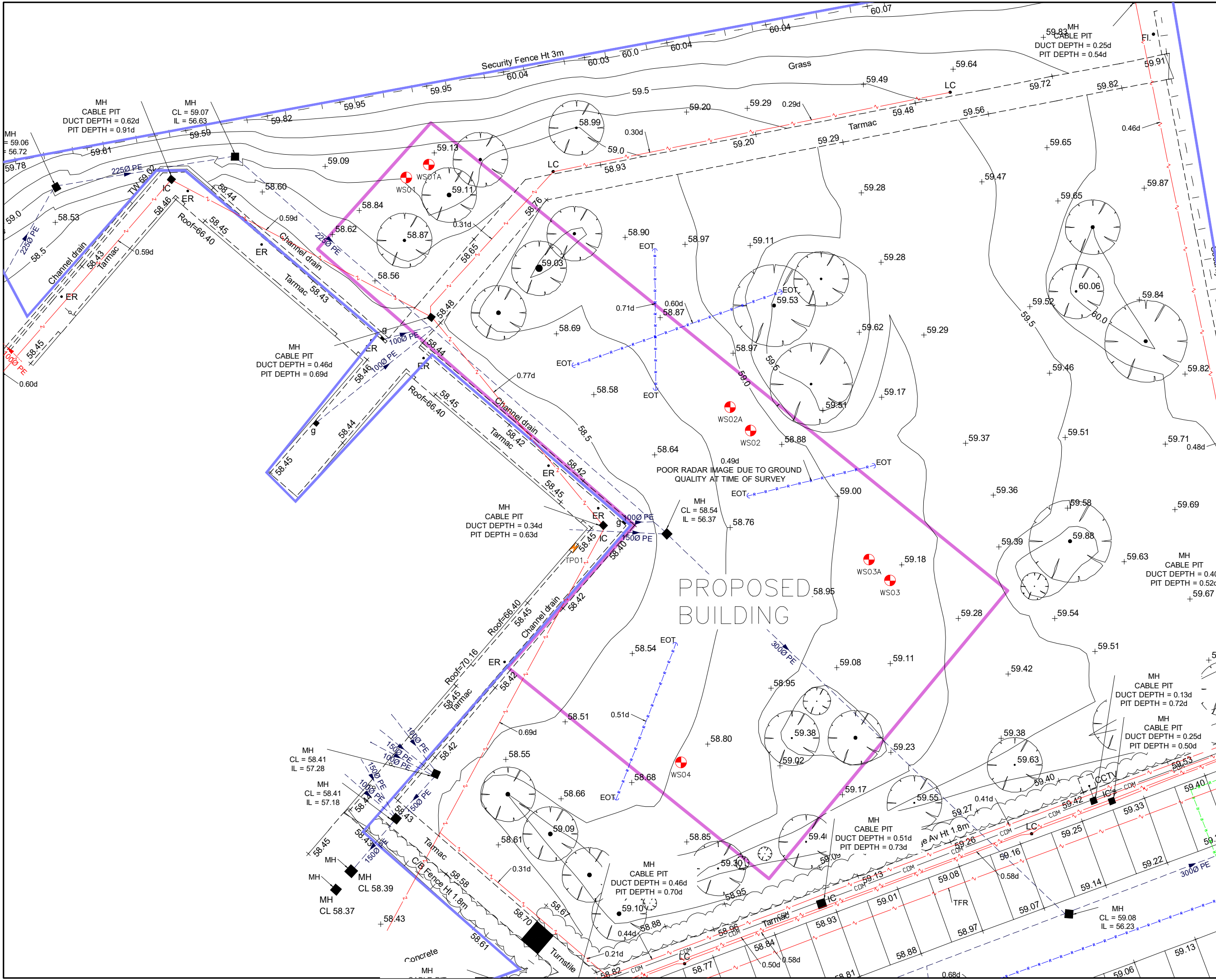
SITE LOCATION PLAN

DRAWN:	CHECKED:	DATE:
RW	BD	DEC '20
SCALE:	ORIGINAL SHEET SIZE:	STATUS:
NTS	A4	DRAFT

DRAWING NO.	REVISION:
FIGURE 1	01

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CLIENT:
DarwinGroup
Construction Has Evolved

PROJECT:
CONNELL CO-OP COLLEGE

TITLE:
BOREHOLE LOCATION PLAN

DRAWN: RW	CHECKED: BD	DATE: NOV '20
SCALE: 1:250	ORIGINAL SHEET SIZE: A3	STATUS: DRAFT

DRAWING NO.	FIGURE 2	REVISION: 01
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APPENDICES

APPENDIX 1
Envirocheck Report

APPENDIX 2

Borehole Logs



KEY GS

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WELL NUMBER WS01

PAGE 1 OF 1

CLIENT Darwin Group PROJECT NAME Connell Co-op College
PROJECT NUMBER 20-315 PROJECT LOCATION Manchester
DATE STARTED 13/11/20 COMPLETED 13/11/20 CO-ORDINATES 387350 mE, 397976 mN
DRILLING CONTRACTOR GSS GROUND ELEVATION 59.1 m HOLE SIZE 101
DRILLING METHOD Windowless Sampler LOGGED BY Ruby Westnedge CHECKED BY BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
1					Grass onto MADE GROUND very silty sandy gravelly CLAY with rootlets, possible brick fragments and wood	
	SPT J	8-7-12-13 (40) ()		1.20	Firm brownish grey CLAY with inclusions of gravel	57.90
2						
	SPT	4-5-7-8 (24)			at 2.00m - 3.00m becomes very stiff mottled brown grey clay	
3						
	SPT	5-8-9-12 (34)				
4					at 3.5m rare gravel inclusions	
	SPT	6-7-7-10 (30)				
5						
	SPT	5-6-7-9 (27)				
				5.45	Bottom of borehole at 5.45 metres.	53.65

NOTES Backfilled with arisings on completion.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

GENERAL BH / TP / WELL CONNELL CO-OP COLLEGE LOGS.GPJ GINT STD A4 ASTM LAB.GDT 9/12/20



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BOREHOLE NUMBER WS01A

PAGE 1 OF 1

CLIENT Darwin Group PROJECT NAME Connell Co-op College
PROJECT NUMBER 20-315 PROJECT LOCATION Manchester
DATE STARTED 13/11/20 COMPLETED 13/11/20 CO-ORDINATES 387352 mE, 397978 mN
DRILLING CONTRACTOR GSS GROUND ELEVATION 59.1 m HOLE SIZE 101
DRILLING METHOD Windowless Sampler LOGGED BY Ruby Westnedge CHECKED BY BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
					Grass onto MADE GROUND very silty sandy gravelly CLAY with rootlets, possible brick fragments and wood
	J	()			
1					
	SPT	50 ()			

1.23

57.88

Refusal at 1.23 metres.
Bottom of borehole at 1.23 metres.

NOTES Backfilled with arisings on completion.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test



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WELL NUMBER WS02

PAGE 1 OF 1

CLIENT Darwin Group **PROJECT NAME** Connell Co-op College
PROJECT NUMBER 20-315 **PROJECT LOCATION** Manchester
DATE STARTED 13/11/20 **COMPLETED** 13/11/20 **CO-ORDINATES** 387375 mE, 397957 mN
DRILLING CONTRACTOR GSS **GROUND ELEVATION** 58.8 m **HOLE SIZE** 101
DRILLING METHOD Windowless Sampler **LOGGED BY** Ruby Westnedge **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
					0.20 Grass onto MADE GROUND grey slightly sandy CLAY with gravel and wood, brick inclusions. 58.60	
					MADE GROUND comprising grey course sub angular GRAVEL	
					0.50 ▽ 58.30 MADE GROUND comprising firm grey sandy gravelly CLAY with rootlets and brick inclusions	
1	J	()				
	SPT J	8-7-12-13 (40)				
		()				
2					1.70 57.10 Firm to stiff brownish grey occasionally sandy gravelly CLAY	
	SPT	4-5-7-8 (24)				
3						
	SPT	5-8-9-12 (34)				
4						
	SPT	6-7-7-10 (30)				
5						
	SPT	5-6-7-9 (27)				
					5.45 53.35 Bottom of borehole at 5.45 metres.	

NOTES Backfilled with arisings on completion. Peached water table noted at 0.50m.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

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BOREHOLE NUMBER WS02A

PAGE 1 OF 1

PROJECT NAME Connell Co-op College

PROJECT LOCATION Manchester

CO-ORDINATES 387377 mE, 397956 mN

GROUND ELEVATION 58.8 m **HOLE SIZE** 101

LOGGED BY Ruby Westnedge **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
1	 SPT	50 ()			0.20 Grass onto MADE GROUND grey slightly sandy CLAY with gravel and wood, brick inclusions. 58.60
					MADE GROUND comprising grey course sub angular GRAVEL
					0.50 MADE GROUND comprising firm grey sandy gravelly CLAY with rootlets and brick inclusions 58.30
					1.23 57.58

Refusal at 1.23 metres.
Bottom of borehole at 1.23 metres.

NOTES Backfilled with arisings on completion.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

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BOREHOLE NUMBER WS03

PAGE 1 OF 1

CLIENT Darwin Group PROJECT NAME Connell Co-op College
PROJECT NUMBER 20-315 PROJECT LOCATION Manchester
DATE STARTED 13/11/20 COMPLETED 13/11/20 CO-ORDINATES 387383 mE, 397946 mN
DRILLING CONTRACTOR GSS GROUND ELEVATION 59.2 m HOLE SIZE 101
DRILLING METHOD Windowless Sampler LOGGED BY Ruby Westnedge CHECKED BY BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
1	J	()			Grass onto MADE GROUND very silty sandy gravelly CLAY with rootlets, possible brick fragments an wood
	SPT	18-20-12 ()			

Refusal at 1.38 metres.
Bottom of borehole at 1.38 metres.

57.83

NOTES Backfilled with arisings on completion.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test



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BOREHOLE NUMBER WS03A

PAGE 1 OF 1

CLIENT	Darwin Group	PROJECT NAME	Connell Co-op College
PROJECT NUMBER	20-315	PROJECT LOCATION	Manchester
DATE STARTED	13/11/20	COMPLETED	13/11/20
DRILLING CONTRACTOR	GSS	CO-ORDINATES	387382 mE, 397948 mN
DRILLING METHOD	Windowless Sampler	GROUND ELEVATION	59.2 m
		HOLE SIZE	101
		LOGGED BY	Ruby Westnedge
		CHECKED BY	BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
1					Grass onto MADE GROUND very silty sandy gravelly CLAY with rootlets, possible brick fragments an wood
	X SPT	50 ()			

Refusal at 1.23 metres.
Bottom of borehole at 1.23 metres.

NOTES Backfilled with arisings on completion.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test



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WELL NUMBER WS04

PAGE 1 OF 1

CLIENT Darwin Group **PROJECT NAME** Connell Co-op College
PROJECT NUMBER 20-315 **PROJECT LOCATION** Manchester
DATE STARTED 13/11/20 **COMPLETED** 13/11/20 **CO-ORDINATES** 387371 mE, 397932 mN
DRILLING CONTRACTOR GSS **GROUND ELEVATION** 58.8 m **HOLE SIZE** 101
DRILLING METHOD Windowless Sampler **LOGGED BY** Ruby Westnedge **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
					Grass onto MADE GROUND grey sandy gravelly CLAY with rootlet, wood and possible brick inclusions	
1	J	()				
	SPT	3-3-3-4 (13)		1.20	Firm to stiff grey CLAY with occasional gravel.	57.60
2	SPT	2-4-4-4 (14)			at 2.00m becomes greyish brown	
					at 2.50m increased gravel inclusions	
3	SPT	4-5-7-7 (23)				
4	SPT	4-6-7-8 (25)				
5	SPT	5-6-6-7 (24)				
				5.45	Bottom of borehole at 5.45 metres.	53.35

NOTES Backfilled with arisings on completion.

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

GENERAL BH / TP / WELL CONNELL CO-OP COLLEGE LOGS.GPJ GINT STD A4 ASTM LAB.GDT 9/12/20

APPENDIX 3

I2 Analytical

(Contamination testing)

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e: ruby@keygs.com

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

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

Analytical Report Number : 20-41776

Project / Site name:	Connell Co-op college	Samples received on:	17/11/2020
Your job number:		Samples instructed on/ Analysis started on:	17/11/2020
Your order number:		Analysis completed by:	23/11/2020
Report Issue Number:	1	Report issued on:	23/11/2020
Samples Analysed:	4 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
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: 20-41776
Project / Site name: Connell Co-op college

Lab Sample Number				1686337	1686338	1686339	1686340
Sample Reference				WS01A	WS01	WS02	WS03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.70	1.00-1.50	1.20-1.50	0.50-1.00
Date Sampled				13/11/2020	13/11/2020	13/11/2020	13/11/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	19	19	17	16
Total mass of sample received	kg	0.001	NONE	1.7	1.7	1.7	1

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile - Loose Fibres	-	Chrysotile - Loose Fibres	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Detected	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.8	7.1	9.4	9.4
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.7	1.5	1.9	0.59
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	1670	1540	1920	589
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	7.4	24	88	47
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	7.2	120	8.2	7.7
Magnesium (leachate equivalent)	mg/l	2.5	NONE	3.6	58	4.1	3.9

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

Analytical Report Number : 20-41776

Project / Site name: Connell Co-op college

* 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 *
1686337	WS01A	None Supplied	0.20-0.70	Brown clay and sand with gravel and brick.
1686338	WS01	None Supplied	1.00-1.50	Light grey clay and sand.
1686339	WS02	None Supplied	1.20-1.50	Brown clay and sand with gravel and brick.

Analytical Report Number : 20-41776
Project / Site name: Connell Co-op college

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
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
Water Soluble Nitrate (2:1) as N 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	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



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Analytical Report Number : 20-41776

Replaces Analytical Report Number: 20-41776, issue no. 1
Additional analysis undertaken.

Project / Site name:	Connell Co-op college	Samples received on:	17/11/2020
Your job number:		Samples instructed on/ Analysis started on:	17/11/2020
Your order number:		Analysis completed by:	18/12/2020
Report Issue Number:	2	Report issued on:	18/12/2020
Samples Analysed:	4 soil samples		

Signed:

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

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

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

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

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

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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: 20-41776
Project / Site name: Connell Co-op college

Lab Sample Number				1686337	1686338	1686339	1686340
Sample Reference				WS01A	WS01	WS02	WS03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.70	1.00-1.50	1.20-1.50	0.50-1.00
Date Sampled				13/11/2020	13/11/2020	13/11/2020	13/11/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	19	19	17	16
Total mass of sample received	kg	0.001	NONE	1.7	1.7	1.7	1

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.8	7.1	9.4	9.4
Total Cyanide	mg/kg	1	MCERTS	3	3	-	< 1
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivale	g/l	0.00125	MCERTS	1.7	1.5	1.9	0.59
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivale	mg/l	1.25	MCERTS	1670	1540	1920	589
Sulphide	mg/kg	1	MCERTS	29	7.6	-	15
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	7.4	24	88	47
Organic Matter	%	0.1	MCERTS	2.3	5.3	-	2
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	2.7	< 0.05	-	1.4
Acenaphthylene	mg/kg	0.05	MCERTS	0.5	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	2.2	< 0.05	-	0.47
Fluorene	mg/kg	0.05	MCERTS	2.2	< 0.05	-	0.32
Phenanthrene	mg/kg	0.05	MCERTS	16	< 0.05	-	2.7
Anthracene	mg/kg	0.05	MCERTS	4.6	< 0.05	-	0.76
Fluoranthene	mg/kg	0.05	MCERTS	21	< 0.05	-	3.5
Pyrene	mg/kg	0.05	MCERTS	22	< 0.05	-	3.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	12	< 0.05	-	2.2
Chrysene	mg/kg	0.05	MCERTS	8.7	< 0.05	-	1.4
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	11	< 0.05	-	1.9
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	3.2	< 0.05	-	0.68
Benzo(a)pyrene	mg/kg	0.05	MCERTS	10	< 0.05	-	1.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	5.2	< 0.05	-	0.86
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.8	< 0.05	-	0.25
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	6.6	< 0.05	-	0.86

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	129	< 0.80	-	22.1
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Analytical Report Number: 20-41776
Project / Site name: Connell Co-op college

Lab Sample Number				1686337	1686338	1686339	1686340
Sample Reference				WS01A	WS01	WS02	WS03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.70	1.00-1.50	1.20-1.50	0.50-1.00
Date Sampled				13/11/2020	13/11/2020	13/11/2020	13/11/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	180	110	-	36
Barium (aqua regia extractable)	mg/kg	1	MCERTS	240	160	-	150
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.3	0.83	-	1.1
Boron (water soluble)	mg/kg	0.2	MCERTS	3.6	3.1	-	2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	58	28	-	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	130	86	-	44
Lead (aqua regia extractable)	mg/kg	1	MCERTS	410	310	-	93
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.8	1.1	-	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	32	22	-	33
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	2.8	< 1.0	-	1
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	37	41	-	30
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	250	120	-	91

Magnesium (water soluble)	mg/kg	5	NONE	7.2	120	8.2	7.7
Magnesium (leachate equivalent)	mg/l	2.5	NONE	3.6	58	4.1	3.9

Monoaromatics & Oxygenates

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

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	2.1	< 2.0	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	11	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	46	< 8.0	-	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	59	< 10	-	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	3.4	3	-	15
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	14	9.4	-	27
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	100	27	-	53
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	100	26	-	52
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	220	65	-	150

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



Analytical Report Number: 20-41776
Project / Site name: Connell Co-op college
Your Order No:

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
1686337	WS01A	0.20-0.70	134	Loose Fibres	Chrysotile	< 0.001	< 0.001
1686339	WS02	1.20-1.50	119	Loose Fibres	Chrysotile	< 0.001	< 0.001

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

Analytical Report Number : 20-41776

Project / Site name: Connell Co-op college

* 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 *
1686337	WS01A	None Supplied	0.20-0.70	Brown clay and sand with gravel and brick.
1686338	WS01	None Supplied	1.00-1.50	Light grey clay and sand.
1686339	WS02	None Supplied	1.20-1.50	Brown clay and sand with gravel and brick.

Analytical Report Number : 20-41776
Project / Site name: Connell Co-op college

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
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
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
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	MCERTS
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 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
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide 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
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
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
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, 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

Analytical Report Number : 20-41776
Project / Site name: Connell Co-op college

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Water Soluble Nitrate (2:1) as N 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	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



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Analytical Report Number : 20-41785

Project / Site name:	Connell Co-op college	Samples received on:	17/11/2020
Your job number:		Samples instructed on/ Analysis started on:	17/11/2020
Your order number:		Analysis completed by:	23/11/2020
Report Issue Number:	1	Report issued on:	23/11/2020
Samples Analysed:	3 leachate samples - 3 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
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.

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Waste Acceptance Criteria Analytical Results								
Report No:	20-41785							
					Client: KEYGSLTD			
Location	Connell Co-op college							
Lab Reference (Sample Number)	1686387 / 1686388				Landfill Waste Acceptance Criteria			
					Limits			
Sampling Date	13/11/2020				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	WS01A							
Depth (m)	0.20-0.70							
Solid Waste Analysis								
TOC (%)**	2.3				3%	5%	6%	
Loss on Ignition (%) **	6.7				--	--	10%	
BTEX (µg/kg) **	< 10				6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007				1	--	--	
Mineral Oil (mg/kg)	98				500	--	--	
Total PAH (WAC-17) (mg/kg)	126				100	--	--	
pH (units)**	9.5				--	>6	--	
Acid Neutralisation Capacity (mol / kg)	100				--	To be evaluated	To be evaluated	
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test			
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	0.0349			0.286	0.5	2	25	
Barium *	0.0493			0.405	20	100	300	
Cadmium *	< 0.0001			< 0.0008	0.04	1	5	
Chromium *	0.0038			0.031	0.5	10	70	
Copper *	0.019			0.16	2	50	100	
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2	
Molybdenum *	< 0.0004			< 0.0040	0.5	10	30	
Nickel *	0.0010			0.0078	0.4	10	40	
Lead *	0.0086			0.071	0.5	10	50	
Antimony *	0.018			0.15	0.06	0.7	5	
Selenium *	< 0.0040			< 0.040	0.1	0.5	7	
Zinc *	0.0050			0.041	4	50	200	
Chloride *	1.9			15	800	15000	25000	
Fluoride	0.085			0.69	10	150	500	
Sulphate *	910			7500	1000	20000	50000	
TDS*	870			7100	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-	
DOC	6.24			51.2	500	800	1000	
Leach Test Information								
Stone Content (%)	< 0.1							
Sample Mass (kg)	1.7							
Dry Matter (%)	81							
Moisture (%)	19							
Results are expressed on a dry weight basis, after correction for moisture content where applicable.					*= UKAS accredited (liquid eluate analysis only)			
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation					** = MCERTS accredited			

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

i2 Analytical

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Waste Acceptance Criteria Analytical Results							
Report No:	20-41785						
					Client: KEYGSLTD		
Location	Connell Co-op college						
Lab Reference (Sample Number)	1686389 / 1686390				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	13/11/2020				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS01						
Depth (m)	1.00-1.50						
Solid Waste Analysis							
TOC (%)**	1.3				3%	5%	6%
Loss on Ignition (%) **	5.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	34.5				100	--	--
pH (units)**	7.4				--	>6	--
Acid Neutralisation Capacity (mol / kg)	3.3				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0146			0.119	0.5	2	25
Barium *	0.0291			0.238	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0007			0.0057	0.5	10	70
Copper *	0.0092			0.075	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	< 0.0004			< 0.0040	0.5	10	30
Nickel *	0.0036			0.030	0.4	10	40
Lead *	0.0073			0.060	0.5	10	50
Antimony *	0.0078			0.064	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0059			0.049	4	50	200
Chloride *	3.2			26	800	15000	25000
Fluoride	0.25			2.0	10	150	500
Sulphate *	460			3800	1000	20000	50000
TDS*	480			3900	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	5.41			44.3	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.7						
Dry Matter (%)	81						
Moisture (%)	19						
Results are expressed on a dry weight basis, after correction for moisture content where applicable.					* = UKAS accredited (liquid eluate analysis only)		
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation					** = MCERTS accredited		

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

i2 Analytical

7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results							
Report No:	20-41785						
				Client: KEYGSLTD			
Location	Connell Co-op college						
Lab Reference (Sample Number)	1686391 / 1686392			Landfill Waste Acceptance Criteria			
Sampling Date	13/11/2020			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	WS03						
Depth (m)	0.50-1.00						
Solid Waste Analysis							
TOC (%)**	1.3			3%	5%	6%	
Loss on Ignition (%) **	4.0			--	--	10%	
BTEX (µg/kg) **	< 10			6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007			1	--	--	
Mineral Oil (mg/kg)	57			500	--	--	
Total PAH (WAC-17) (mg/kg)	20.3			100	--	--	
pH (units)**	11.0			--	>6	--	
Acid Neutralisation Capacity (mol / kg)	100			--	To be evaluated	To be evaluated	
Eluate Analysis							
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1		10:1	Limit values for compliance leaching test			
	mg/l		mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	0.0379		0.310	0.5	2	25	
Barium *	0.0163		0.133	20	100	300	
Cadmium *	< 0.0001		< 0.0008	0.04	1	5	
Chromium *	0.0028		0.023	0.5	10	70	
Copper *	0.0054		0.044	2	50	100	
Mercury *	< 0.0005		< 0.0050	0.01	0.2	2	
Molybdenum *	< 0.0004		< 0.0040	0.5	10	30	
Nickel *	0.0004		0.0034	0.4	10	40	
Lead *	0.0065		0.053	0.5	10	50	
Antimony *	0.015		0.12	0.06	0.7	5	
Selenium *	< 0.0040		< 0.040	0.1	0.5	7	
Zinc *	0.0037		0.030	4	50	200	
Chloride *	2.9		24	800	15000	25000	
Fluoride	0.38		3.1	10	150	500	
Sulphate *	33		270	1000	20000	50000	
TDS*	280		2300	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	< 0.010		< 0.10	1	-	-	
DOC	7.25		59.3	500	800	1000	
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.0						
Dry Matter (%)	84						
Moisture (%)	16						
Results are expressed on a dry weight basis, after correction for moisture content where applicable.							
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation							
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3. This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.							

Analytical Report Number : 20-41785

Project / Site name: Connell Co-op college

* 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 *
1686387	WS01A	None Supplied	0.20-0.70	Brown clay and sand with gravel and brick.
1686389	WS01	None Supplied	1.00-1.50	Light grey clay and sand.
1686391	WS03	None Supplied	0.50-1.00	Brown clay and sand with gravel and brick.

Analytical Report Number : 20-41785

Project / Site name: Connell Co-op college

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance"	L046-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
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 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. MCERTS accredited except Coronene.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (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
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	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
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025

Analytical Report Number : 20-41785

Project / Site name: Connell Co-op college

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Monohydric phenols 10:1 WAC	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	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic 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

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX 4

Ground Engineering
(Atterberg Limits testing)



8180

TEST CERTIFICATE**Determination of Moisture Content**

Tested in Accordance with BS 1377-2: 1990: Clause 3.2

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Client: Key GeoSolutions Ltd
Client Address: Nova House
Audley Ave
Newport
Shropshire TF10 7DW

Contact: Ruby Westnedge

Site Name: Connell Co-op College
Site Address:

Certificate Number: PL7259-1/1/705

Client Reference: L9895

Job Number: PL7259-1

Date Sampled: Unknown

Date Received: 19.11.2020

Date Tested: 26.11.2020

Certificate of Sampling: N/A

Sampling Certificate No.: N/A

Sampled By: Client

TEST RESULTS

Laboratory Reference	Sample Reference	Location	Depth Top	Depth Base	Description	Moisture Content [%]
PL7259-1/1	Not Given	WS01	1.50m	2.00m	Stiff brown orange-brown grey black slightly silty CLAY with rare fine to medium angular calcareous siltstone sandstone carbonaceous debris and selenite.	27
PL7259-1/2	Not Given	WS02	2.50m	3.00m	Very Stiff brown grey slightly silty CLAY with root traces plus rare fine to medium angular calcareous siltstone carbonaceous debris and sandstone.	17
PL7259-1/3	Not Given	WS03	0.50m	1.00m	Firm brown orange-brown grey slightly silty slightly gravelly slightly organic CLAY. Gravel consists of fine to medium angular to sub-rounded flint quartzite and sandstone.	22
PL7259-1/4	Not Given	WS04	1.50m	2.00m	Stiff brown orange-brown grey slightly silty slightly sandy CLAY with rare fine to medium angular chalk carbonaceous debris and sandstone.	18

Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02.12.2020
Form Number: GELab/C/705 Version 18

Page 1 of 1

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Registered in England & Wales
Registration Number: 6929574
Reg Office: Ground Engineering Ltd
Newark Rd, Peterborough PE1 5UA



8180

GROUND ENGINEERING

LIMITED

TEST CERTIFICATE**Determination of Liquid and Plastic Limits**

Tested in Accordance with BS1377-2: 1990: Clause 4.3 & 5: Definitive Method

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Client: Key GeoSolutions Ltd
Client Address: Nova House
Audley Ave
Newport
Shropshire TF10 7DW

Contact: Ruby Westnedge

Site Name: Connell Co-op College
Site Address:

Certificate Number: PL7259-1/1/704-1

Client Reference: L9895

Job Number: PL7259-1

Date Sampled: Unknown

Date Received: 19.11.2020

Date Tested: 26.11.2020

Certificate of Sampling: N/A

Sampling Certificate No.: N/A

Sampled By: Client

TEST RESULTS

Laboratory Reference: PL7259-1/1

Sample Reference: Not Given

Description:

Stiff brown orange-brown grey black slightly silty CLAY with rare fine to medium angular calcareous siltstone sandstone carbonaceous debris and selenite.

Location:

WS01

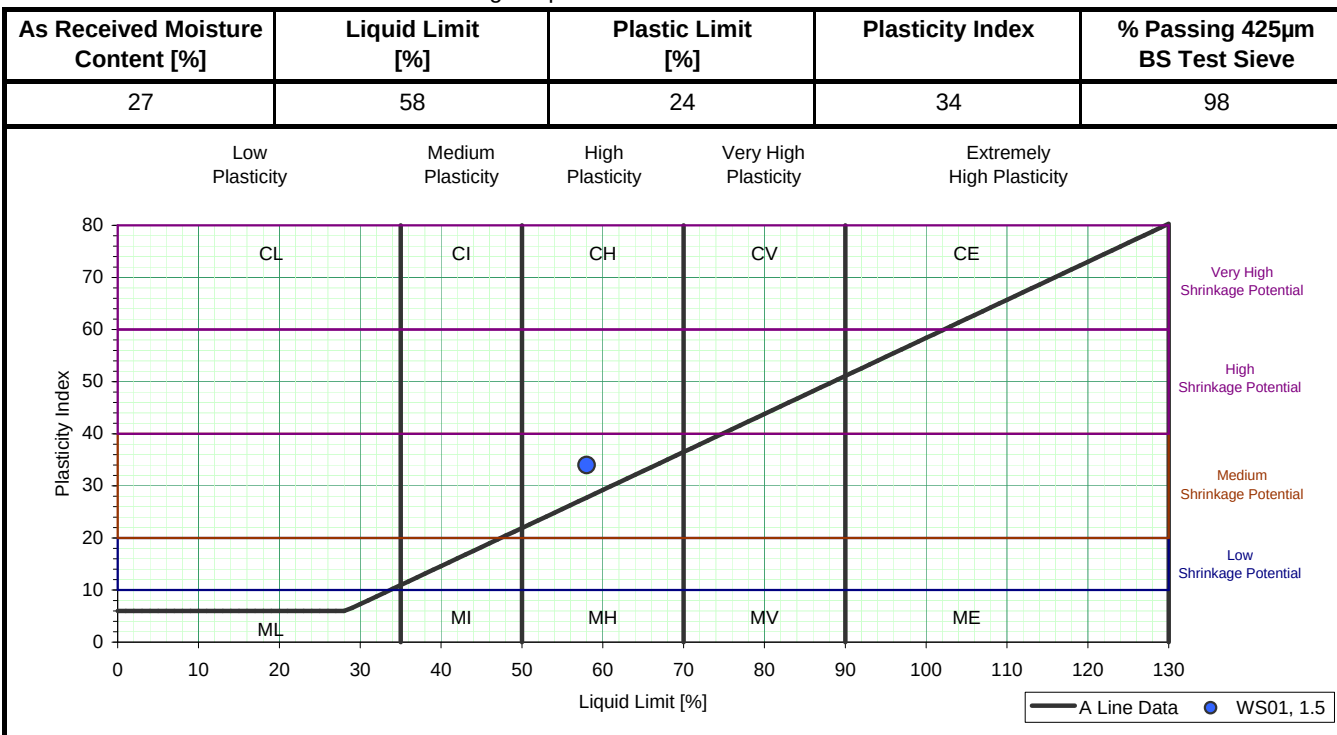
Depth Top: 1.50m

Sample Preparation:

As Received

Depth Base: 2.00m

Estimated % Passing 425µm BS Test Sieve



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02.12.2020

Page 1 of 1

Form Number: GELab/C/704-1 Version 18

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Registered in England & Wales
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Reg Office: Ground Engineering Ltd
Newark Rd, Peterborough PE1 5UA



8180

GROUND ENGINEERING

LIMITED

TEST CERTIFICATE**Determination of Liquid and Plastic Limits**

Tested in Accordance with BS1377-2: 1990: Clause 4.3 & 5: Definitive Method

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Client: Key GeoSolutions Ltd
Client Address: Nova House
Audley Ave
Newport
Shropshire TF10 7DW

Contact: Ruby Westnedge

Site Name: Connell Co-op College
Site Address:

Certificate Number: PL7259-1/2/704-1

Client Reference: L9895

Job Number: PL7259-1

Date Sampled: Unknown

Date Received: 19.11.2020

Date Tested: 30.11.2020

Certificate of Sampling: N/A

Sampling Certificate No.: N/A

Sampled By: Client

TEST RESULTS

Laboratory Reference: PL7259-1/2

Sample Reference: Not Given

Description:

Very Stiff brown grey slightly silty CLAY with root traces plus rare fine to medium angular calcareous siltstone carbonaceous debris and sandstone.

Location:

WS02

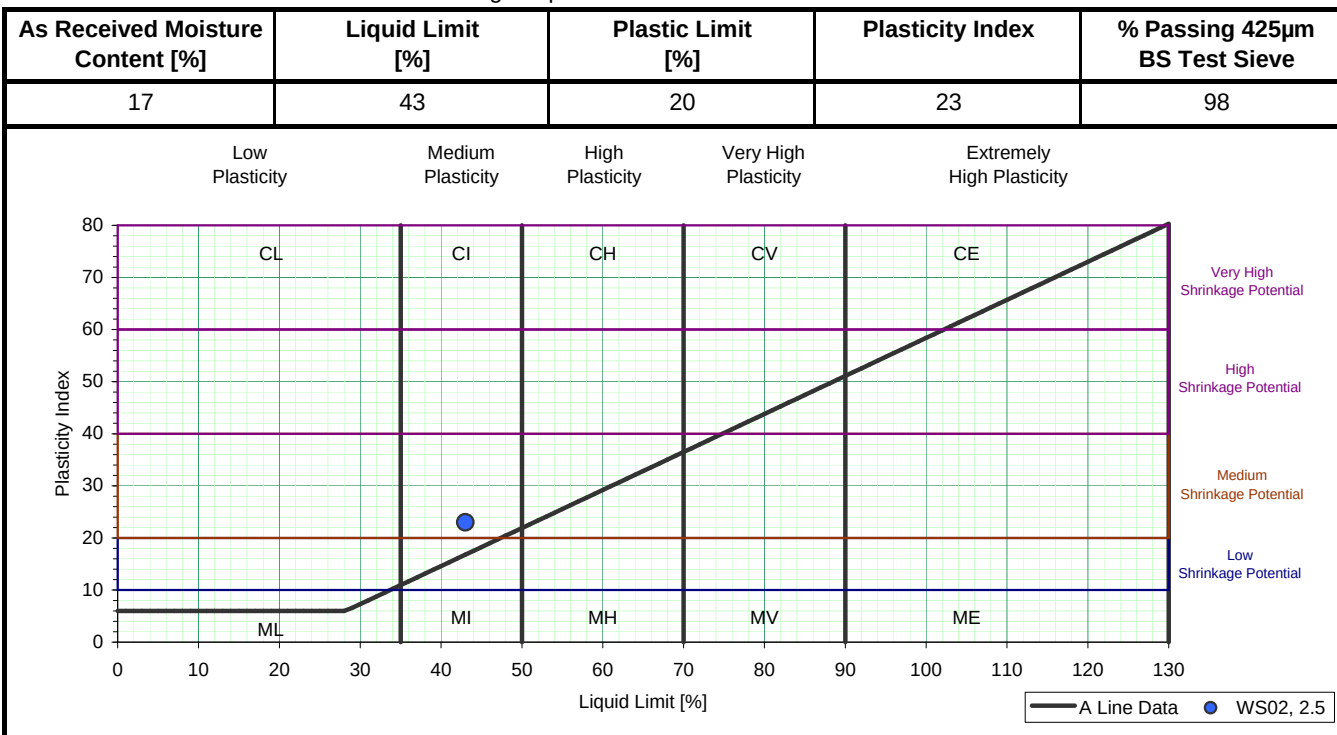
Depth Top: 2.50m

Sample Preparation:

As Received

Depth Base: 3.00m

Estimated % Passing 425µm BS Test Sieve



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02.12.2020

Page 1 of 1

Form Number: GELab/C/704-1 Version 18

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Newark Rd, Peterborough PE1 5UA



8180

GROUND ENGINEERING

LIMITED

TEST CERTIFICATE**Determination of Liquid and Plastic Limits**

Tested in Accordance with BS1377-2: 1990: Clause 4.3 & 5: Definitive Method

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Client: Key GeoSolutions Ltd
Client Address: Nova House
Audley Ave
Newport
Shropshire TF10 7DW

Contact: Ruby Westnedge

Site Name: Connell Co-op College
Site Address:

Certificate Number: PL7259-1/3/704-1

Client Reference: L9895

Job Number: PL7259-1

Date Sampled: Unknown

Date Received: 19.11.2020

Date Tested: 30.11.2020

Certificate of Sampling: N/A

Sampling Certificate No.: N/A

Sampled By: Client

TEST RESULTS

Laboratory Reference: PL7259-1/3

Sample Reference: Not Given

Description:

Firm brown orange-brown grey slightly silty slightly gravelly slightly organic CLAY. Gravel consists of fine to medium angular to sub-rounded flint quartzite and sandstone.

Location:

WS03

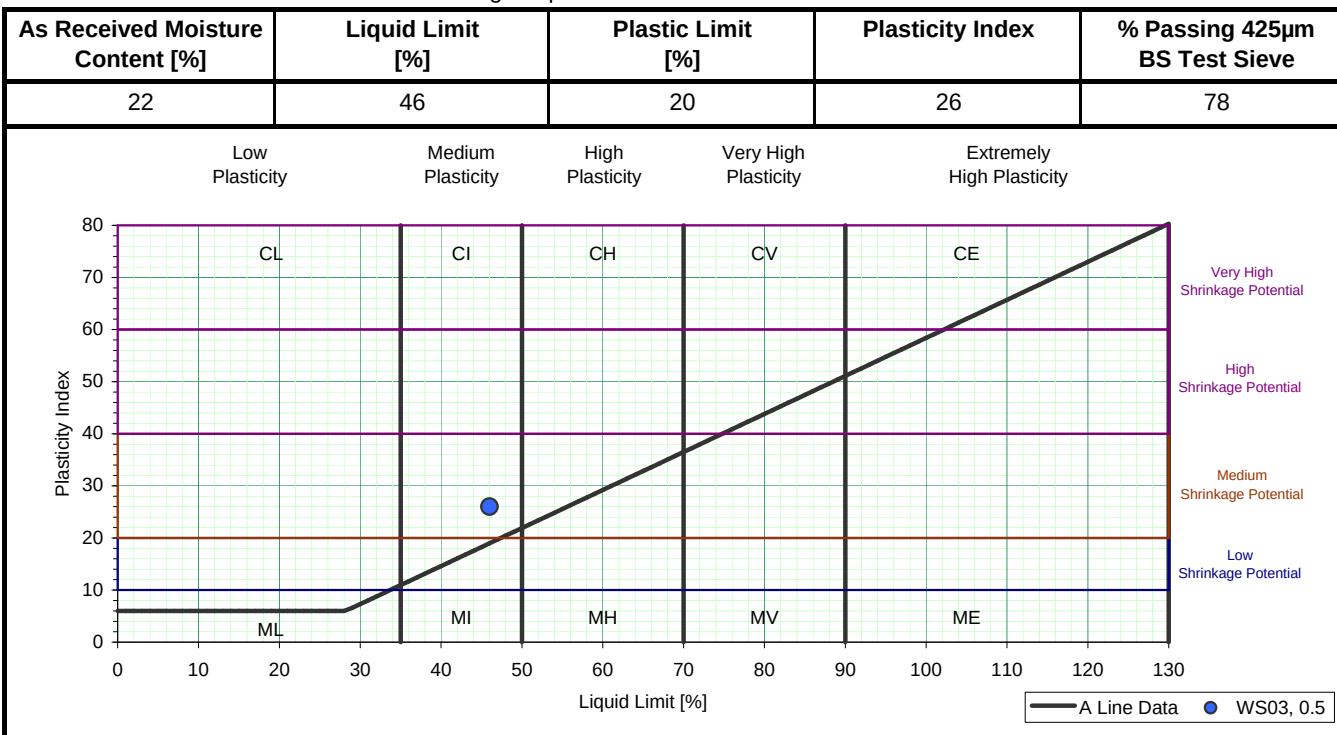
Depth Top: 0.50m

Sample Preparation:

As Received

Depth Base: 1.00m

Estimated % Passing 425µm BS Test Sieve



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02.12.2020 Page 1 of 1

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Newark Rd, Peterborough PE1 5UA



8180

GROUND ENGINEERING

LIMITED

TEST CERTIFICATE**Determination of Liquid and Plastic Limits**

Tested in Accordance with BS1377-2: 1990: Clause 4.3 & 5: Definitive Method

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Client: Key GeoSolutions Ltd
Client Address: Nova House
Audley Ave
Newport
Shropshire TF10 7DW

Contact: Ruby Westnedge

Site Name: Connell Co-op College
Site Address:

Certificate Number: PL7259-1/4/704-1

Client Reference: L9895

Job Number: PL7259-1

Date Sampled: Unknown

Date Received: 19.11.2020

Date Tested: 26.11.2020

Certificate of Sampling: N/A

Sampling Certificate No.: N/A

Sampled By: Client

TEST RESULTS

Laboratory Reference: PL7259-1/4

Sample Reference: Not Given

Description:

Stiff brown orange-brown grey slightly silty slightly sandy CLAY with rare fine to medium angular chalk carbonaceous debris and sandstone.

Location:

WS04

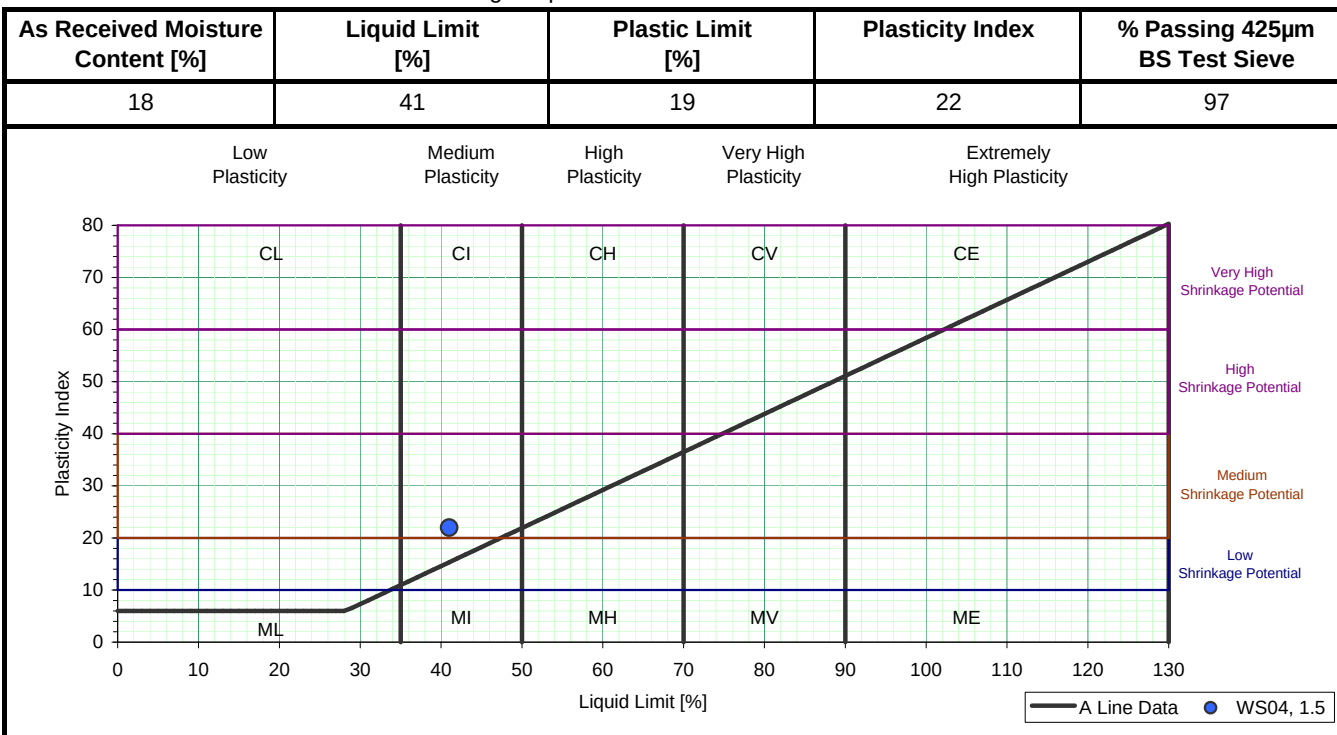
Depth Top: 1.50m

Sample Preparation:

As Received

Depth Base: 2.00m

Estimated % Passing 425µm BS Test Sieve



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02.12.2020

Page 1 of 1

Form Number: GELab/C/704-1 Version 18

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Registration Number: 6929574
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