

North Manchester General Hospital – Acute Works

Phase 2 Ground Investigation

Curtins Ref: 20001-CUR-ZZ-XX-RP-G-00001

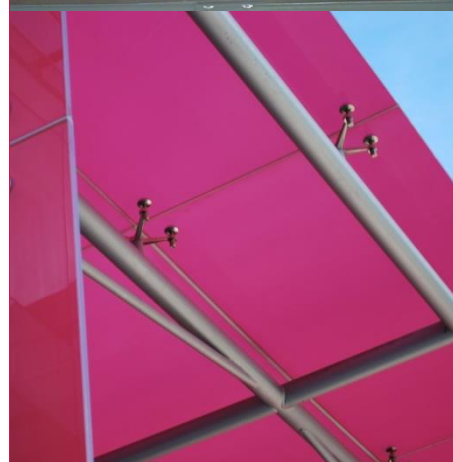
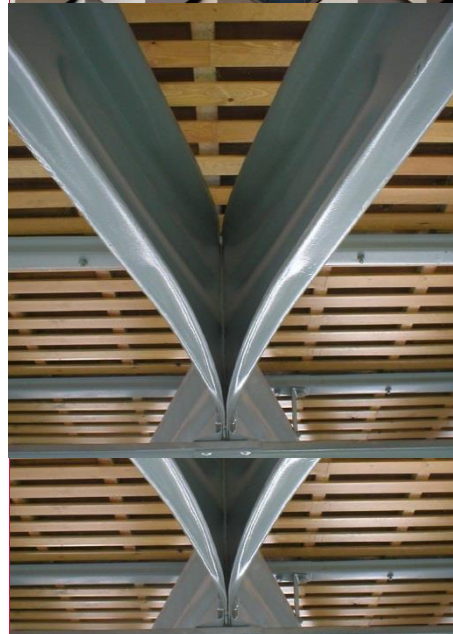
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Site Address: North Manchester General Hospital, Delaunays Road, Crumpsall, M8 5RB



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Executive Summary

Appointment	In February 2021 Curtins were instructed by Hive on behalf of the Manchester University NHS Foundation Trust to undertake a Phase 2 Ground Investigation, referred to as Stage 2, for the proposed Acute Works, North Manchester General Hospital, Crumpsall, M8 5RB. The site is centred on NGR SD 84960 02530 and covers an area of approximately 1.82 Ha. A further Phase 2 Ground Investigation, referred to as Stage 2, was instructed in May 2021. Development plans indicate a four-storey Acute Hospital linked to the retained west wing of the existing hospital.
Current Site Status	The site is currently occupied by a number of hospital car parks with associated roads and areas of vegetation. The site is accessed from Crumpsall Way.
Summary of Preliminary Site Assessment	Earliest historical mapping (1848) shows the site as an area of undeveloped agricultural land, with surrounding areas of similar use. A pond is recorded along the eastern site boundary and it is infilled by 1894. By 1894, the site is occupied by the Prestwich Union Workhouse and an embankment recorded along the northern and western boundary. A hospital is recorded along the southern boundary and Manchester Workhouse approximately 20m south. By 1910, the Prestwich Union Workhouse has undergone significant expansion with additional buildings recorded on site and in 1923, it is renamed Delaunay's Road Institution. By 1933, Delaunay's Road Institution is renamed Crumpsall Institution and connected to the hospital along the southern boundary. Two electrical sub-stations are recorded on site in the north and north east corner. The site remains largely unchanged until 1999 when the site is cleared and replaced by a surface car park. Made ground deposits are not indicated to be present onsite according to BGS records, however, given the historical site uses deposits are anticipated to be present. Superficial soils are identified as glaciofluvial sheet deposits and bedrock deposits identified as Chester Formation. Environment Agency data indicates that the glaciofluvial sheet deposits are associated with a Secondary A Aquifer and the Chester Formation associated with a Principal Aquifer. The site is not located within a Source Protection Zone (SPZ). The nearest surface water feature is the River Irk approximately 320m east of the site.
Fieldworks Undertaken	Site works were undertaken in 2 stages. Stage 1 works were carried out between 24th March and 28th April 2021 comprising two cable percussive boreholes with Geobore S rotary follow on, BH301 and BH302 advanced to 50m and 35m bgl respectively. Stage 2 works were undertaken between 25th May and 22nd June 2021 comprising five cable percussive boreholes, five window samples and three soakaways. Ground gas and groundwater monitoring standpipes were installed in two exploratory holes (BH301-BH302) associated with Stage 1 and ten exploratory holes (BH303 – BH307 and WS301-WS305) associated with Stage 2. Selected soil and rock samples were subject to laboratory analysis. No groundwater samples were obtained. For Stage 1 and Stage 2, six groundwater and ground gas visit were undertaken.
Encountered Ground Conditions	Made ground was encountered in all exploratory holes from ground level to depths between 0.49m bgl and 3.00m bgl. The upper made ground comprised a layer of asphalt/topsoil typically underlain by light grey/brown slightly sandy angular to subangular fine to coarse gravel of limestone and brick. The sub-base was underlain by very sandy gravel or a slightly gravelly sand. Cohesive made ground was encountered in BH301, BH305, WS301-302 and WS304 typically comprising dark brown slightly sandy, gravelly silty clay. Underlying the made ground, glaciofluvial sheet deposits were encountered as interbedded cohesive and granular deposits. The granular deposits generally comprise loose to dense light brown/orange silty, gravelly occasionally clayey sand and cohesive deposits are typically firm to stiff brown slightly silty to silty, slightly to very sandy clay with occasional gravel. Glacial till was encountered underlying the glaciofluvial sheet deposits encountered as stiff to very stiff brown/dark brown slightly silty, sandy, slightly gravelly clay and medium dense to very dense light brown occasionally silty fine to coarse sand or medium dense to dense sand and gravel. Residual soils, considered to be weathered bedrock, were encountered in BH301 at 33.00m bgl (40.43m AOD) as very dense reddish-brown medium to coarse sand. Bedrock was encountered underlying the residual soils in BH301 at 47.30m bgl (26.13m AOD) comprising very weak to weak reddish-brown medium to coarse grained sandstone. Groundwater was encountered during the intrusive works between 9.20m bgl (62.84m AOD) and 27.00m bgl (41.03m AOD). Subsequent groundwater monitoring levels were encountered at depths between 1.05m bgl (72.50m AOD) and 3.71m bgl (67.80m AOD) in the window samples and between 10.14m bgl (61.51m AOD) and 26.82m bgl (46.61m AOD) in the cable percussive boreholes.

Environmental Laboratory Testing	With respect to the proposed '<i>Commercial</i>' end-use of the site, PAH exceedances were recorded in Made Ground in BH302 at 0.40m bgl. Asbestos loose fibres were encountered in BH302 (crocidolite and amosite), BH303 (crocidolite) and BH305 (chrysotile). Asbestos quantification analysis of BH303 and BH305 samples were <0.001% and BH302 was 0.012%.
Ground Contamination and Ground Gas Assessment	A Moderate/Low risk rating is identified to site end-users and construction works, for soils and inhalation and ingestion of soil or dust. Within Made Ground material in BH302, PAH exceedances and loose asbestos fibres were recorded. A Low and Very Low risk rating is identified to controlled waters (Groundwater and Surface Water, respectively) following the ground investigation based on distance from site and the limited pathways due to predominantly low permeability superficial deposits. A Moderate/Low risk rating is identified to site-end users from ground gases arising from site soils migrating into buildings and subsequent inhalation on site. This corresponds to a Characteristic Gas Situation 2 (CS2) requiring ground gas protection measures in accordance with BS8485 are required.
Geotechnical Assessment	Made Ground and likely areas of soft/loose compressible materials will not provide a suitable founding stratum or sub-formation for areas of fill and therefore must be removed prior to any works. Given the proposed four-storey building of the Acute Unit, it is anticipated that a piled foundation solution is adopted to transfer the loads to deeper stiff to very stiff/very dense deposits at depths below 10.50m bgl (61.90m AOD). The carrying capacity of the piles depends not only on their size and the ground conditions but also the method of installation. It is recommended that specialist piling contractors are contracted as to the suitability and carrying capacity of the piles in the ground conditions pertaining to the site. Based on observations on site combined with laboratory tests and that ground bearing floor slabs should not span granular and made ground soils due to potential for differential settlement, suspended floor slabs should be considered Based on the laboratory test results it is considered that a Design Sulphate Class may be taken as DS-1 with an ACEC class of AC-1 within the Made Ground, Glaciofluvial Sheet Deposits, Glacial Till and Chester Formation. Groundwater may be encountered during excavations and any excavations for foundations and services are likely to require close side support in the short term. The inflow of water into excavations will likely be able to be managed by conventional pump sump methods.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1) CS2 gas protection measures will be required to all new buildings. 2) Provision of a suitable thickness of clean and inert cover in all areas of soft landscaping. Details should be described within a Remediation Strategy. 3) Ensure risks to construction workers are suitably managed through PPE and environmental controls/management, to include an asbestos management plan. 4) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer. 5) It is recommended that construction contractors ensure suitable environmental controls are in place during construction and provide staff with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within <i>Appendix C</i>.

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1.0 Introduction

1.1 Project Background

Curtins were instructed by Hive on behalf of the Manchester University NHS Foundation Trust in February 2021 to undertake a Phase 2 Ground Investigation for the proposed Acute Works, North Manchester General Hospital, Crumpsall, M8 5RB.

The Stage 2 Phase 2 Ground Investigation was instructed in May 2021.

It should be noted that a total of four ground investigations have been undertaken at North Manchester General Hospital titled: Multi-Storey Car Park (MSCP), Enabling Works, Acute Works and Temporary Car Parks. This report refers only to the Acute Works, North Manchester General Hospital, Crumpsall, M8 5RB. The site is centred on National Grid Reference (NGR) SD 84960 02530 and covers an area of 1.82 Ha. The site location plan is presented on *Figure 2.1*.

The Acute Works comprises a four-storey Acute Unit linking to the retained west wing of the existing hospital. A current proposed development plan is included in *Appendix A*.

1.2 Scope of Services

The Phase 2 Ground Investigation Report will characterise the environmental and geotechnical conditions of the site development. The ground investigation has also been undertaken to assess the ground and groundwater conditions at the proposed location of new mental health care unit.

The Preliminary Phase 2 Ground Investigation Report is intended to determine:

- a) Preliminary assessment of the geotechnical suitability of the site soils for re-use during earthwork operations.
- b) Preliminary assessment into the likelihood of potential shallow site soils contamination, due to site's current and historic land use, adversely impacting the end-user.
- c) Preliminary assessment into the likelihood of potential of groundwater contamination, due to site's current and historic land use, adversely impacting the end-user.
- d) If there is risk to the end-user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide.
- e) Recommendations for the design of foundations and building floor slabs.

Detailed flood risk assessment, ecology, archaeological studies and waste classification for off-site disposal are outside of the scope of this report.

2.0 Preliminary Site Assessment Summary

This section presents a summary of the current site setting, history, geology and hydrogeology/hydrology, as presented within the Phase 1 report for the wider site (Ref. 1).

This information will feed into the geotechnical assessment (refer to *Section 10.0*) and geo-environmental risk assessment (refer to *Section 7.0*).

2.1 Current Setting

The site is located in the northern section of the existing North Manchester General Hospital, Crumpsall, M8 5RB as shown in *Figure 2.1* below.

The site is currently occupied by a number of hospital car parks with associated road and areas of vegetation. The site is accessed from Crumpsall Way.

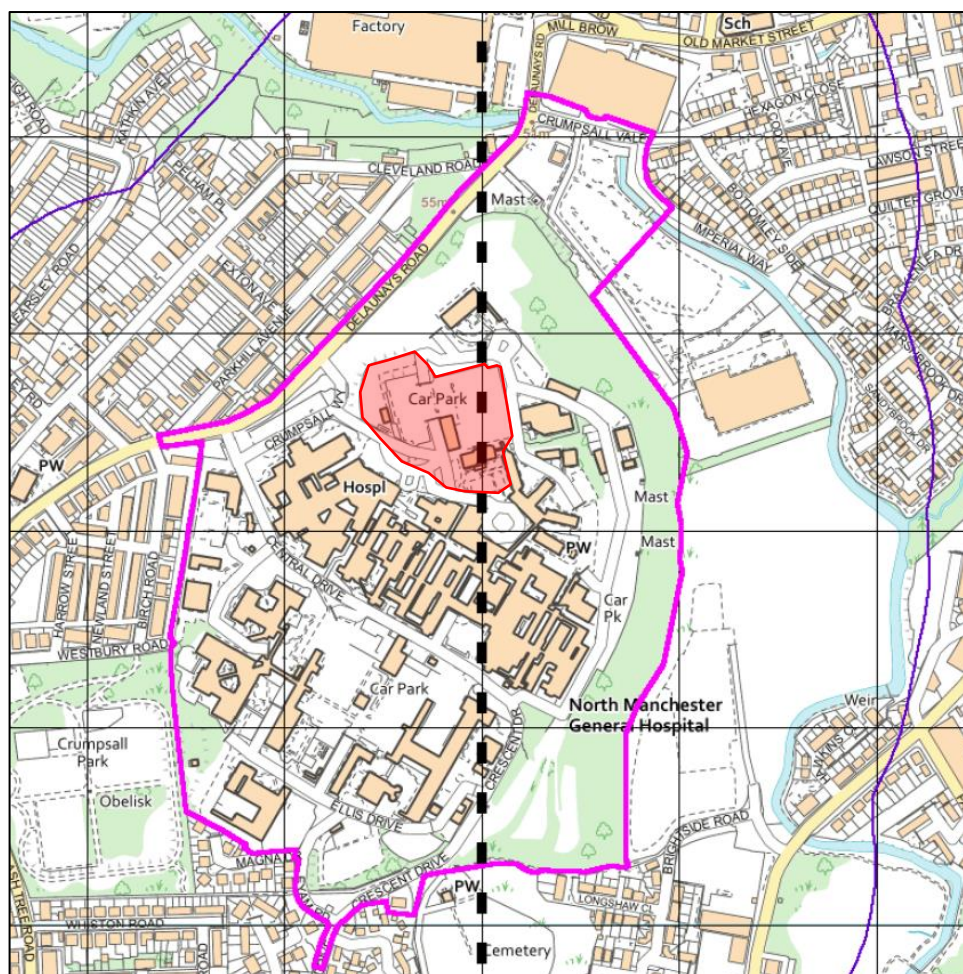


Figure 2.1 – Site Location Plan with Acute Works site shaded in red
(wider site boundary shown in pink, 250m buffer shown in purple).
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2.2 Surrounding Area Details

The following information was also established through undertaking an environmental database search (Ref. 1) included in *Appendix B*.

Table 2.2 – Surrounding Area

Surrounding Area	N	Access road and Crumpsall Vale beyond.
	E	Access road and Diabetes and Endocrinology Unit beyond.
	S	North Manchester General Hospital buildings including; Infectious Diseases and Antenatal Department.
	W	Crumpsall Way, Delaunays Road and residential housing beyond.

2.3 Previous Site Use

A review of the available historical maps (Ref. 1) for the site has been undertaken with specific reference to detailing potential sources of contamination and geotechnical constraints.

Earliest historical mapping (1848) shows the site as an area of undeveloped agricultural land, with surrounding areas of similar use. A pond is recorded along the eastern site boundary and it is infilled by 1894.

By 1894, the site is occupied by the Prestwich Union Workhouse and a raised embankment is detailed along the northern and western boundary. A hospital is recorded along the southern boundary and Manchester Workhouse approximately 20m south.

By 1910, the Prestwich Union Workhouse has undergone expansion with additional buildings recorded on site and in 1923, it is renamed Delaunay's Road Institution.

By 1933, Delaunay's Road Institution is renamed Crumpsall Institution and connected to the main hospital along the southern boundary. Two electrical sub-stations are recorded on site in the north and north eastern corner and a tennis court recorded.

The site remains largely unchanged until 1999, when the site is cleared, with the exception of a building along the southern boundary. By 2000, the site is recorded as a car park and remains unchanged at the time of writing.

2.4 Published Geology

A study of the British Geological Survey (BGS) maps, 1:50,000 (Solid and Drift Edition, Sheet No. 085, 2011) (Ref. 2) indicates the following geological sequence underlying the site:

- Glaciofluvial Sheet Deposits;
- Chester Formation

A fault is recorded through the southern and western boundary of the site orientated northwest southeast. A sequence of faults run parallel to this fault, the closest are approximately 180m north and 280m south.

There are three BGS recorded boreholes located within 150m of the site. The details are given in *Table 2.4*.

Table 2.4 – Historical Borehole Record from Surrounding Area

Borehole Ref.	Location (Easting, Northing)	Details (depth to top of strata/lithology/thickness)	
SD80SW937	60m north west (384910, 402642)	0.00m bgl	MADE GROUND Tarmacadam over concrete (0.30m)
		0.30m bgl	MADE GROUND orange brown silty very clayey sand (2.10m)
		2.40m bgl	Stiff to very stiff dark brown silty sandy CLAY (4.60m)
		7.00m bgl borehole termination	
SD80SW938	65m north west (384860, 402605)	0.00m bgl	MADE GROUND Tarmacadam over concrete (0.50m)
		0.50m bgl	MADE GROUND silty sandy clay with high gravel content (1.00m)
		1.50m bgl	Soft red brown sandy clayey SILT (0.25m)
		1.75m bgl	Medium dense red brown very silty slightly clayey SAND (2.95m)
		4.70m bgl	Stiff dark brown very silty slightly sandy CLAY (2.80m)
		7.50m bgl borehole termination	
SD80SW939	110m west (384820, 402544)	0.00m bgl	MADE GROUND Tarmacadam over concrete (0.30m)
		0.30m bgl	MADE GROUND brown silty sandy clay (0.70m)
		1.00m bgl	Soft dark brown silty organic CLAY (0.50m)
		1.50m bgl	Soft grey brown silty sandy CLAY (1.00m)
		2.50m bgl	Stiff to very stiff dark brown silty sandy CLAY (4.50m)
		7.00m bgl borehole termination	

2.4.1 Made Ground Deposits

Made Ground is not indicated on the geological maps; however, it is anticipated that Made Ground of unknown composition will be present in parts of the site, associated with previous development phases and redevelopment in the surrounding area.

2.4.2 Superficial Deposits

Superficial deposits are recorded as Glaciofluvial Sheet Deposits. The Glaciofluvial Sheet deposits typically comprise layers of sand and gravel of varied colour.

2.4.3 Bedrock Deposits

The site is underlain the Chester Formation, typically comprising conglomerate and sandstone beds with subordinated beds of mudstone.

2.4.4 Mining and Quarrying

The site is located within a Coal Mining Report Area however, it is not within a Development High Risk Area. Coal outcrops and probable workings are mapped 2.20km east of the site. The risk to the development from coal mine workings is **Low** and not considered further.

There are five recorded BGS mineral sites within 1km of the site. All these are now ceased and were for open cast mining of sand and in one case, common clay and marl. The nearest entry was 450m north within a sand quarry identified as Blackley Sand Pit.

2.4.5 Other Ground Stability Issues

The Envirocheck report (Ref. 1) confirms that there is no hazard to very low risk from the following ground stability hazards on and around the site; running sands, collapsible and compressible ground, shrinking or swelling clay, and ground dissolution. For the potential of landslides, the risk is very low to moderate, with moderate risk associated with embankments and quarries in the surrounding area.

2.4.6 Ground Gas

The Envirocheck report (Ref. 1) indicates there is one historical area of infilled land (non-water) within 250m of the site, located approximately 120m north east. There are seven historical areas of infilled land (water), the nearest entry is located along the eastern boundary associated with an infilled pond, recorded on historical mapping in 1894.

There are six historic landfills within 1km of the site. The nearest entry is located 421m east of the site referred to as Land at Factory lane and the input was not identified.

The Envirocheck Report (Ref.1) confirms the site is situated in a lower probability radon area where <1% of homes are above the radon action level. On this basis radon protection measures are not considered necessary in the construction of new dwellings or extensions.

2.4.7 Pollution and Landfill

There are no operational or historic landfills or licensed waste management facilities within 250m of the site boundary.

There have been ten registered radioactive substances are recorded within 250m of the site. The nearest entry is recorded on site registered to Zeneca Specialities for keeping and use of radioactive materials in 1997. The license has now been revoked or cancelled.

2.5 Hydrogeology and Hydrology

Environment Agency and Envirocheck Report (Ref. 1) indicates that the geological sequence underlying the site has the following hydrogeological characteristics:

Geology	Associated Hydrogeological Classification
Made Ground deposits are not indicated to be present	N/A
Glaciofluvial Sheet Deposits	Secondary A Aquifer ¹
Chester Formation	Principal Aquifer ²

Notes:

1. 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 formally classed as minor aquifers.
2. Layers of rock or drift deposits that have high intergranular and/or river base flow on a strategic scale. They provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The site is not located within a Source Protection Zone (SPZ).

There is 1 no groundwater abstraction point within 500m of the site. The entry is located 312m north of the site for general cooling processes associated with industrial, commercial and public serviced operated by the Environment Agency.

The nearest surface water feature is the River Irk, 320m east of the site which flows towards the south and has a river quality of GAQ Grade E with a flow rate of less than 2.5 cumecs.

2.6 Unexploded Ordnance (UXO) Risk Assessment

The likelihood of UXO being encountered on a development site is influenced by several factors including; the proximity to strategic targets, the nature of the development works being undertaken and evidence of local damage in the post-war periods amongst others. To determine the likelihood of UXO being present on a site, a step-wise risk assessment process is followed. This process is outlined within CIRIA C681 Unexploded Ordnance: A Guide for the Construction Industry (Ref. 3).

Risk mapping (Ref. 4) for UXO's has placed the site in a Moderate Risk area. Moderate-risk areas are those with a bombing density of up to 11-50 bombs per 1000 acres and may contain WWII targets.

The Envirocheck report (Ref. 1) indicated no evidence of ruins or significant bomb damage within 1km of the site and no significant targets noted within 1km of the site boundary.

Considering the above and that the site was occupied throughout the war period and developed after the war, Curtins identified a **Low** Risk of encountering UXO during Ground Investigation works.

Contractors undertaking excavations works should carry out their own UXO Risk Assessment in respect to their works.

2.7 Summary of Phase 1 Conceptual Site Model

Table 2.7 records initial Potential Pollutant Linkages (PPL) identified which are to be assessed further through the Phase 2 Investigation.

Table 2.7 – Potential Pollutant Linkages

Source	Pathway	Receptor	Risk Rating
On-site sources of potential contamination: Uncontrolled deposition of made ground during construction of workhouse/hospital buildings. Uncontrolled depositions of made ground during demolition on site Potential contamination associated with vehicle parked on site. Off-site sources of potential contamination: Potential contamination associated with the construction of commercial properties off site. Uncontrolled depositions of Made Ground from backfilled ponds within 250m. Potential contamination associated with various works within 250m of the site.	Direct contact, ingestion, inhalation (dust and vapours)	Site End Users	Moderate/Low
		Construction and Maintenance Workers	
	Vertical migration through superficial deposits (soils)	Controlled Waters (Groundwater Secondary Undifferentiated and Principal Aquifers)	Moderate/Low

Source	Pathway	Receptor	Risk Rating
On and off-site soils with the potential to generate ground gases: Potential ground gas generation from Made Ground containing organic / putrescible content on site. Historic infilled land/pond within 100m of the site with unknown material, particularly along the eastern boundary	Vertical and horizontal migration through underlying superficial deposits into buildings and air spaces	Site End Users	Moderate/Low

Potential contaminants of concern associated with any Made Ground present include, amongst others; broad range aliphatic and aromatic hydrocarbons present within any fuel oils and inorganic compounds including heavy metals and asbestos present in discarded building materials; organic compounds including possible volatile organic compounds and PCBs present associated with nearby/on site Works and Workhouse.

The qualitative risk assessment determined the above risks associated with the proposed development of the site warrant further investigation.

It was recommended that a ground investigation is conducted to both confirm this assessment and provide data in support of the structural and civil engineering design. The scope of the investigation undertaken is detailed in *Section 3.0*.

3.0 Ground Investigation Scope of Works

The site investigations were undertaken by Curtins in two Phases. Phase 1 works were undertaken by Curtins between 24th March and 28th April 2021 and Phase 2 works between 25th May and 22nd June 2021.

The works were split into two stages as specified by Hive Projects Ltd.

The scope of the ground investigation was designed in general accordance with current UK guidance including:

- LCRM (Ref. 5);
- British Standard (BS) 10175:2011+A2:2017 (Ref. 6);
- BS5930:2020 (Ref. 7); and
- and BS EN1997: Part 2:2007 Eurocode 7 (Ref. 8).

The scope and rationale are summarised in *Table 3.0*.

Table 3.0 – Scope and Rationale of Fieldwork Undertaken

Stage	Exploratory Hole Type	Exploratory Hole Ref.	Ground Level (m AOD)	Exploratory Hole Depth (m bgl)	Rationale
Stage 1	Cable Percussion Boreholes with Rotary Geocore S	BH301 BH302	73.43	50.00	• Cable Percussion drilling to 25m to enable Rotary Geocore S to continue the exploratory hole to depths between 35m to 50m bgl. • Confirm ground conditions and groundwater conditions • Collect soil samples for chemical analysis; • Collect samples for geotechnical soil testing; • Collect rock core samples for geotechnical testing; and • Gas and groundwater level monitoring.
			69.33	35.00	
Stage 2	Cable Percussive Boreholes	BH303 BH304 BH305 BH306 BH307	72.17	31.50	• Cable Percussion drilling to 35.00m bgl; • Confirm ground conditions and groundwater conditions; • Collect soils samples for chemical analysis; • Collect soil samples for geotechnical soil testing; and • Gas and groundwater level monitoring.
			68.03	32.50	
	Window Sample Boreholes	WS301 WS302 WS303 WS304 WS305	72.04	35.00	• Confirm ground conditions; • Collect soil samples for chemical and geotechnical analysis; and • Ground gas and groundwater monitoring.
			71.69	35.00	
			71.66	32.50	
			73.55	5.45	
			72.07	5.45	
			71.55	5.45	
			71.79	3.00	
			71.86	5.45	

Stage	Exploratory Hole Type	Exploratory Hole Ref.	Ground Level (m AOD)	Exploratory Hole Depth (m bgl)	Rationale
	Soakaway Testing	SA301 SA302 SA303	71.91 69.74 72.59	- 2.00 2.00	- Confirm shallow ground conditions; - Determine suitability of soils for drainage design.

As part of the investigation, three soakaways (SA301 - SA303) were proposed however, due to the depth of made ground and recorded obstructions in the location of SA301 and SA302, these were not undertaken.

For the location of the exploratory holes refer to Curtins drawing ref. 20001-CUR-ZZ-XX-DR-G-00001 (Stage 1) and 20001-CUR-ZZ-XX-DR-G-00002 (Stage 2). Exploratory hole locations were surveyed upon completion of the works, with the surveyed ground level of the exploratory holes, contained in *Appendix B*.

3.1 Soil Logging and Sampling

Exploratory hole arisings were logged onsite by a qualified Engineer from Curtins and in accordance with the requirements of BS5930 (Ref. 7) including visual and olfactory indications of contamination were recorded. Exploratory hole logs are provided in *Appendix B*.

3.2 Monitoring Well Installations

Groundwater monitoring 50mm diameter slotted pipes were installed within the two exploratory holes (BH301 and BH302) associated with Phase 1 and ten exploratory holes (BH303 – BH307 and WS301 – WS305) associated with the Phase 2 works. A bentonite seal was placed at the top and bottom of each of the exploratory holes, surrounding the screened sections of the pipe. A gravel surround was installed in the annulus between the sides of the borehole and the slotted sections of the pipe.

The monitoring wells were designed to assess the potential for ground gas and monitor groundwater levels in all exploratory holes. The screened sections therefore focused on the more permeable deposits where encountered, where ground gas and groundwater may be encountered.

A summary of the response zone is presented in *Table 3.3*.

Table 3.3 – Monitoring Well Response Zones

Stage	Borehole Ref.	Response Zone(s) (m bgl) (m AOD)	Strata Description(s) (Principal Strata in Capitals)
Stage 1	BH301	34.00 – 50.00 (39.43 – 23.43)	SAND (Residual Soils)
	BH302	26.00 – 35.00 (43.31 – 34.31)	CLAY (Glacial Till)
Stage 2	BH303	20.00 – 30.00 (52.17 – 42.17)	CLAY (Glaciofluvial) and SAND (Glacial Till)

Stage	Borehole Ref.	Response Zone(s) (m bgl) (m AOD)	Strata Description(s) (Principal Strata in Capitals)
	BH304	25.00 – 31.00 (43.08 – 37.03)	CLAY & SAND (Glacial Till)
	BH305	21.00 – 27.00 (51.04 – 45.04)	CLAY & SAND (Glacial Till)
	BH306	9.00 – 19.00 (62.69 – 52.69)	CLAY (Glaciofluvial) and CLAY & SAND (Glacial Till)
	BH307	10.00 – 15.00 (61.66 – 56.66)	CLAY & SAND (Glaciofluvial)
	WS301	1.80 – 3.80 (71.75 – 69.75)	SAND & CLAY (Glaciofluvial)
	WS302	1.00 – 2.50 (71.07 – 69.57)	SAND & CLAY (Glaciofluvial)
	WS303	1.00 – 4.00 (70.55 – 67.55)	SAND (Glaciofluvial)
	WS304	1.20 – 2.00 (70.59 – 69.79)	MADE GROUND
	WS305	2.00 – 3.00 (70.59 – 69.79)	SAND & CLAY (Glaciofluvial)

A copy of the borehole logs can be referred to in *Appendix B* of this report.

3.3 Post-Investigation Monitoring

3.3.1 Groundwater and Ground Gas Monitoring

Stage 1 boreholes were each subject to six groundwater and ground gas visits over six weeks and Stage 2 boreholes were subject to seven groundwater and ground gas visits over 8 weeks to assess the groundwater and the ground gas conditions identified in *Section 2.7*.

The results of the groundwater level monitoring are detailed in *Section 5.9*.

4.0 Laboratory Testing

4.1 Geo-environmental Analysis

Representative soil samples were selected for laboratory chemical analysis to provide information about the encountered ground conditions.

Selected soil samples for chemical testing were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited) and for geotechnical analysis was Ian Farmer Associates (UKAS accredited).

Given the general lack of any obvious point sources of potential contamination the sampling positions were generally located in a non-targeted, systematic array to give adequate and representative coverage of the sites proposed end use and the immediate environmental setting, concentrated in the near surface deposits.

4.1.1 Soil Analysis

The source material of contaminants of concern potentially present on the site was considered to include, amongst others; organic matter, ash and fill, hydrocarbons (e.g. fuel/oils), heavy metals, and asbestos.

The extent of the above is captured by the broad environmental testing suites listed in *Table 4.1.1* below.

Table 4.1.1 – Environmental Chemistry Analysis Suite: Soils

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, asbestos quantification (%), pH, 2;1 Water Soluble Sulphate & Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Nickel	1 mg/kg
	Zinc	5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg
	TPH (Aro/Alk Split)	0.01 to 1.0 mg/kg

A total of ten made ground soils samples were obtained, 2 in Stage 1 and 8 in Stage 2 and tested for Curtins Suite A. Copies of the environmental chemistry testing certificates are presented in *Appendix C*.

4.1.2 Groundwater Analysis

No groundwater samples were obtained following completion of the ground investigation.

4.1.3 Quality Assurance and Quality Control

Soil chemical analysis was conducted by Envirolab Laboratories, a UKAS and MCERTS accredited laboratory. All samples were delivered in appropriate containers for the suites tested and analysed within designated holding times. No soil samples were recorded to have exceeded the maximum holding time.

4.2 Geotechnical Testing

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref. 9). Rock samples were prepared and tested in accordance with ISRM Suggested Methods (Ref. 10).

The undertaken geotechnical testing is summarised in *Table 4.2*.

Table 4.2 – Geotechnical Testing

Test Type	Quantity	Standard
In Situ Testing		
Standard Penetration Testing	154	BS 5930: 2015, Clause 41
Laboratory Testing		
Atterberg Limit	21	BS1377 1990, Part 2 (clause 4.5, 5.3 & 5.4)
Multistage Triaxial Compression Test	12	BS1377 1990, Part 7 (clause 9.0)
Oedometer Consolidation	9	BS1377 1990 Part 5 (Clause 3.3, 3.4, 3.5)
Water Soluble Sulphate	50	ISO 17025 MCERTS
pH Value	50	ISO 17025 MCERTS
Moisture Content	21	BS1377 1990, Part 2
Particle Size Distribution (Wet Sieve)	10	BS1377 1990, Part 2 (clause 9.2)
Point Load Test	Axial Plane: 2	ISRM Suggested Methods: 2007
	Diametral Plan: 2	

The results of the geotechnical testing are summarised in *Section 6.0* of this report.

Copies of the geotechnical testing certificates are presented in *Appendix D*.

5.0 Ground Conditions

The ground conditions across the site, determined during the Curtins ground investigation works, generally comprised made ground with an upper surface covering of asphalt overlying predominantly granular made ground. Underlying the made ground are interbedded cohesive and glaciofluvial sheet deposit. This typically overlies cohesive and granular glacial till deposits. In one exploratory hole location, weathered bedrock was encountered underlain by the Chester Formation bedrock.

5.1 Encountered Ground Conditions

A summary of the ground conditions encountered are presented below, with detailed information presented on the exploratory hole logs included in *Appendix B*.

A summary of the geotechnical test results recorded within the superficial deposits and bedrock are presented in *Section 6.0*. Full details of the geotechnical results can be found in *Appendix D*.

Table 5.1 – Summary of Ground Conditions Encountered

Strata	Depth to Top of Strata		Depth to Bottom of Strata		Thickness	
	Min m bgl (m AOD)	Max m bgl (m AOD)	Min m bgl (m AOD)	Max m bgl (m AOD)	Min (m bgl)	Max (m bgl)
Topsoil/Made Ground	0.00 (69.33)	0.00 (73.43)	0.49 (73.06)	3.00 ¹ (68.79)	0.49	3.00 ¹
Glaciofluvial Sheet Deposits	0.49 (73.06)	2.60 (69.80)	10.50 (61.90)	32.50 ¹ (39.16)	7.90	30.30
Glacial Till	10.50 (61.903)	24.90 (47.26)	31.50 ¹ (40.67)	35.00 ¹ (34.33)	6.60 ¹	23.10
Residual Soils (BH301 only)	33.00 (40.43)		47.30 (26.13)		14.30 ²	
Chester Formation (BH301 only)	47.30 (26.13)		>50.30 ¹ (<23.13)		>3.00 ¹	

¹ Thickness / base not proven

² Data from only one borehole

5.2 Made Ground

Made ground was encountered all exploratory hole locations comprising a surface covering of topsoil/tarmac overlying predominantly granular soil. The made ground was encountered to a maximum depth of 2.60m bgl across the site (69.80m AOD) in BH305.

The base of the made ground was not encountered in WS304 and SA302.

5.2.1 Topsoil/Surface Covering

Topsoil was encountered in BH303, BH304, WS301, SA302 and SA303 from ground level to depths between 0.10m bgl (72.07m AOD) and 0.40m bgl (67.32m AOD). Topsoil typically comprised dark brown slightly gravelly slightly sandy, occasionally silty clay with frequent rootlets.

Asphalt was encountered in the remaining locations. It was encountered from ground level to depths between 0.07m bgl (71.48m AOD) and 0.10m bgl (69.23m AOD).

A surface covering of dark grey slightly sandy gravel was encountered in BH301 from ground level to a depth of 0.10m bgl (73.33m AOD). Gravel is subangular to rounded fine to coarse of mixed lithologies.

5.2.2 Granular Made Ground

Granular made ground was typically encountered underling the asphalt/surface covering.

In BH303, the topsoil was underlain by a black gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of sandstone. In BH304, topsoil was underlain by brown gravelly fine to coarse sand with frequent rebar and cobbles. Gravel is angular to subangular fine to coarse of concrete, brick and sandstone and cobbles are angular of brick and concrete.

In BH301, BH302, BH305 – BH307 and WS302 – WS304, the asphalt was underlain by a light grey/brown slightly sandy angular to subangular fine to coarse gravel including brick and limestone (sub-base). The sand is medium to coarse.

In WS305, the asphalt was underlain by a layer of intact bricks to 0.35m (71.51m AOD). The brick was underlain by brown gravelly medium to coarse sand with high ash content. Gravel is angular to subangular fine to medium including brick, slate and concrete.

In WS302 – WS304, this layer was underlain by a dark brown very sandy gravel with moderate cobble content. Sand is fine to coarse and gravel is angular to sub-angular medium to coarse of tarmac, concrete, glass and brick.

In BH301 and BH305, the sub-base was underlain by a light brown slightly gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse including brick.

In BH302 and WS302, the sub-base was underlain by dark brown sandy to very sandy gravel. The sand is medium to coarse and the gravel angular to subangular fine to coarse including brick, ash, clinker, slate and sandstone.

5.2.3 Cohesive Made Ground

Cohesive made ground was encountered underlying the granular made ground in BH301, BH305, WS301, WS302 and WS304 to a maximum depth of 2.60m bgl (69.44m AOD).

In BH301, it typically comprised dark brown slightly sandy clay with rare gravel. Sand is medium to coarse and gravel is subangular to subrounded fine to medium of brick.

In BH305 and WS301, it comprised dark brown/brown gravelly silty clay. Gravel is angular to subangular fine to coarse including brick.

In WS302, it comprised black sandy gravelly clay. Sand is fine to coarse and gravel is angular sub-angular fine to coarse including sandstone, brick and concrete.

In WS305, cohesive made ground comprised brown slightly sandy clay. Sand is fine to coarse.

5.3 Glaciofluvial Sheet Deposits

Glaciofluvial deposits were encountered in all exploratory locations, except SA302 and WS304, comprised interbedded cohesive and granular deposits directly underlying the made ground.

The deposits were encountered from depths between 0.49m bgl (73.06m AOD) and 2.60m bgl (69.80m bgl) to proven depths of 10.50m bgl (61.90m AOD) to 32.50m bgl (39.16m AOD). The base was not encountered in BH307.

The glaciofluvial sheet deposits have been distinguished from the underlying glacial till deposits by density/stiffness, colour and the composition of the deposit.

5.3.1 Granular Glaciofluvial Sheet Deposits

The granular glaciofluvial sheet deposits were encountered interbedded with cohesive glaciofluvial sheet deposits. In BH303, granular deposits were recorded overlying the cohesive deposits.

The deposits generally comprised loose to dense light brown/orange silty, gravelly, occasionally clayey fine to coarse sand. Gravel is typically angular to subangular fine to coarse of sandstone.

5.3.2 Cohesive Glaciofluvial Deposits

Cohesive glaciofluvial sheet deposits were encountered in all exploratory holes except WS303.

The cohesive layers of glaciofluvial comprised firm to stiff brown slightly silty to silty, slightly to very sandy clay with occasional gravel. Typically, sand is fine to coarse and gravel is subangular to subrounded fine to coarse including sandstone.

In BH307 between 3.00m – 4.00m bgl (68.65m – 67.65m AOD) and WS302 between 1.40m – 1.83m bgl (70.67m – 70.24m AOD) soft brown sandy clay was encountered. Sand is fine to coarse.

In WS305 between 1.00m – 1.80m bgl (70.86m – 70.06m AOD), a soft brown slightly sandy gravelly clay was encountered. Sand is fine to medium and gravel is subangular to rounded fine to coarse including sandstone.

5.4 Glacial Till

Glacial till deposits were encountered underlying the base of the glaciofluvial sheet deposits in BH301 – BH306. The glacial till was cohesive interbedded with granular deposits.

The base of the deposit was encountered in BH301 at 33.00m bgl (40.43m AOD).

In BH302, loss of flush resulting in no recovery was recorded between 26.40m bgl (42.93m AOD) and 35.00m bgl (34.33m AOD) therefore no information is available on the deposit type recorded. It assumed to be glacial till.

5.4.1 Cohesive Glacial Till Deposits

Cohesive glacial till deposits were predominantly encountered as stiff to very stiff brown/dark brown slightly silty, sandy, slightly gravelly clay with occasional cobbles. Sand is fine to coarse and gravel is subrounded to well-rounded fine to coarse including sandstone and mudstone. Cobbles are subrounded of sandstone and mudstone.

5.4.2 Granular Glacial Till Deposits

Granular glacial till deposits were encountered interbedded with the cohesive deposits as medium dense to very dense light brown occasionally silty fine to coarse sand or medium dense to dense sand and gravel. Sand is fine to coarse and gravel is subangular to rounded fine to coarse of sandstone.

5.5 Weathered Bedrock

Weathered bedrock was encountered in BH301 between 47.30m bgl (26.13m AOD) and 48.70m bgl (24.73m AOD). The sandstone was highly weathered recovered as slightly gravelly medium to coarse sand.

5.6 Bedrock Deposits

The Chester Formation bedrock (intact) was encountered in BH301. The bedrock was encountered from 48.70m bgl (24.73m AOD) to a depth of 50.30m bgl (23.13m AOD) where BH301 was terminated.

The bedrock comprised very weak to weak reddish-brown medium to coarse grained sandstone.

Details of the bedrock can be referred to in the exploratory hole logs in *Appendix B*.

5.7 Observed Potential Contamination

A hydrocarbon odour was noted in BH302 between 0.30m and 0.90m bgl in the made ground. No visual evidence of contamination was observed by the engineer.

5.8 Obstructions Encountered

One obstruction was noted across the site. *Table 5.8* outline the details of these.

Table 5.8 – Summary of Obstructions Encountered

Borehole Ref.	Depth Encountered (m bgl)	Elevation (m AOD)	Notes
SA302	1.30	68.45	Intact floor. Hole terminated at 1.30m bgl.

5.9 Groundwater

A summary of the groundwater levels recorded during the siteworks is presented in *Table 5.9a*. Water flush was used during the drilling of BH301 and BH302 from 20.30m bgl and 25.00m bgl respectively and so groundwater strikes could not be recorded beyond these depths

Table 5.9a – Groundwater Noted During Site Investigation

Borehole Ref.	Strike Depth m bgl (m AOD)	Water Depth after 20 mins m bgl (m AOD)	Strata	Notes
BH302	10.50 (58.83)	9.50 (59.83)	Granular Glaciofluvial Sheet Deposits	Rising
BH303	16.40 (55.77)	12.30 (56.87)	Cohesive Glaciofluvial Sheet Deposits	Rising
BH303	26.50 (45.67)	26.40 (45.57)	Granular Glaciofluvial Sheet Deposits	Rising
BH304	27.00 (41.03)	23.00 (45.03)	Granular Glaciofluvial Sheet Deposits	Rising
BH305	9.20 (62.84)	7.20 (60.84)	Granular Glaciofluvial Sheet Deposits	Rising
BH305	14.20 (57.84)	13.00 (56.64)	Granular Glacial Till	Rising
BH306	13.70 (57.99)	11.70 (59.99)	Cohesive Glacial Till	Rising
BH307	13.20 (58.46)	11.30 (60.36)	Cohesive Glaciofluvial Sheet Deposits	Rising

Six rounds, associated with Stage 1, of groundwater monitoring have been undertaken between 5th May and 16th June 2021 and seven rounds, associated with Stage 2, of groundwater monitoring were undertaken between 23rd June and 18th August 2021. The results of which are presented in *Table 5.9b* and *Table 5.9c*.

Table 5.9b – Stage 1 Groundwater Monitoring Results

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth, m bgl (m AOD)					
			05/05/21	13/03/21	26/05/21	02/06/21	07/06/21	16/06/21
BH301	Granular Residual Soils	34.00 – 50.00 (39.43 – 23.43)	26.77 (46.66)	26.71 (46.72)	26.74 (46.69)	26.74 (46.69)	26.87 (46.56)	26.82 (46.61)
BH302	Cohesive Glacial Till Deposits	26.00 – 35.00 (43.33 – 34.33)	20.51 (48.82)	21.56 (47.77)	22.34 (46.99)	22.46 (46.87)	22.40 (46.93)	21.99 (47.34)

Table 5.9c – Stage 2 Groundwater Monitoring Results

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth, m bgl (m AOD)						
			22/06/21	02/07/21	13/07/21	20/07/21	29/07/21	16/06/21	18/08/21
BH303	Cohesive Glaciofluvial and Granular Glacial Till	20.00 – 30.00 (52.17 – 42.17)	25.52 (46.65)	26.71 (46.72)	25.30 (46.87)	24.95 (47.22)	– ¹	24.92 (47.25)	– ¹
BH304	Cohesive and Granular Glacial Till Deposits	25.00 – 31.00 (43.08 – 37.03)	21.35 (46.68)	21.30 (46.73)	21.28 (46.75)	21.29 (46.74)	– ¹	21.25 (46.78)	21.31 (47.25)
BH305	Cohesive and Granular Glacial Till	21.00 – 27.00 (51.04 – 45.04)	– ¹	– ¹	– ¹	– ¹	Dry	– ¹	21.30 (48.74)
BH306	Cohesive Glaciofluvial/ Cohesive and Granular Glacial Till	9.00 – 19.00 (62.69 – 52.69)	– ¹	– ¹	Dry	– ¹	– ¹	Dry	– ¹
BH307	Cohesive and Granular Glaciofluvial	10.00 – 15.00 (61.66 – 56.66)	– ¹	10.26 (61.39)	10.14 (61.51)	10.20 (61.45)	–	10.18 (61.47)	– ¹
WS301	Cohesive and Granular Glaciofluvial	1.80 – 3.80 (71.75 – 69.75)	2.64 (46.68)	2.69 (70.86)	2.62 (70.93)	2.50 (71.05)	1.05 (72.50)	2.50 (71.05)	3.34 (70.21)
WS302	Cohesive and Granular Glaciofluvial	1.00 – 2.50 (71.07 – 69.57)	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WS303	Granular Glaciofluvial	1.00 – 4.00 (70.55 – 67.55)	3.71 (67.80)	Dry	Dry	3.26 (68.25)	3.33 (68.18)	3.22 (68.29)	3.22 (68.29)
WS304	Made Ground	1.20 – 2.00 (70.59 – 69.79)	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WS305	Cohesive and Granular Glaciofluvial	2.00 – 3.00 (70.59 – 69.79)	Dry	– ¹	Dry	Dry	Dry	Dry	Dry

¹ Unable to access

A review of the groundwater monitoring results indicate there is a shallow groundwater level present within the made ground and glaciofluvial deposits and a deeper groundwater level within the deeper glacial till deposits. Given the presence of cohesive strata between the recorded groundwater levels indicate they are not likely to be in hydraulic conductivity.

6.0 Ground Model

6.1 Made Ground

Made ground was encountered in all exploratory holes to depths between 0.49m bgl – 3.00m bgl.

The geotechnical test results recorded within the made ground are summarised in *Table 6.1*.

No laboratory geotechnical testing was undertaken within the made ground due to its unsuitable properties for use as a founding stratum.

Table 6.1 – Summary of geotechnical test results – Made Ground

Parameter	No. of tests	Results	
		Minimum	Maximum
SPT 'N' Value	9	1	38
pH	10	7.70	10.93
Water Soluble Sulphate (mg/l)	10	10	250

6.2 Glaciofluvial Deposits

The made ground is underlain by glaciofluvial deposits, typically recorded as interbedded granular and cohesive strata which are described separately below.

6.2.1 Granular Glaciofluvial

The geotechnical test results recorded within the granular glaciofluvial deposits are summarised in *Table 6.2.1*.

Table 6.2.1 – Summary of geotechnical test results – Granular Glaciofluvial

Parameter	No. of Tests	Results	
		Minimum	Maximum
In-Situ Tests			
SPT 'N' Value ⁽¹⁾ – Granular	47	2	33
Laboratory Tests			
pH	10	6.69	9.96
Water Soluble Sulphate (mg/l)	10	30	960
Particle Size Distribution	2	See <i>Appendix D</i> for results	

Forty seven SPT 'N' were recorded in the granular strata ranging between 2 and 33 indicating very loose to dense stratum with a general increase in density with depth apparent. The results are shown in *Figure 6.2.1a*.

The PSD results are generally consistent with the recorded findings during the site investigation works and are contained within *Appendix D*.

A moderately conservative unit weight of between 16 kN/m³ and 19 kN/m³ is deemed suitable for granular soils above water and a unit weight of between 18 kN/m³ and 21 kN/m³ is deemed suitable for deposits below groundwater, in accordance with BS8002:2015 (Ref. 11)

The Angle of Internal Friction for the granular glaciofluvial deposits has been derived from a review of relationships with SPT N values (Ref. 12) and published values. The values are shown on *Figure 6.2.1b*.

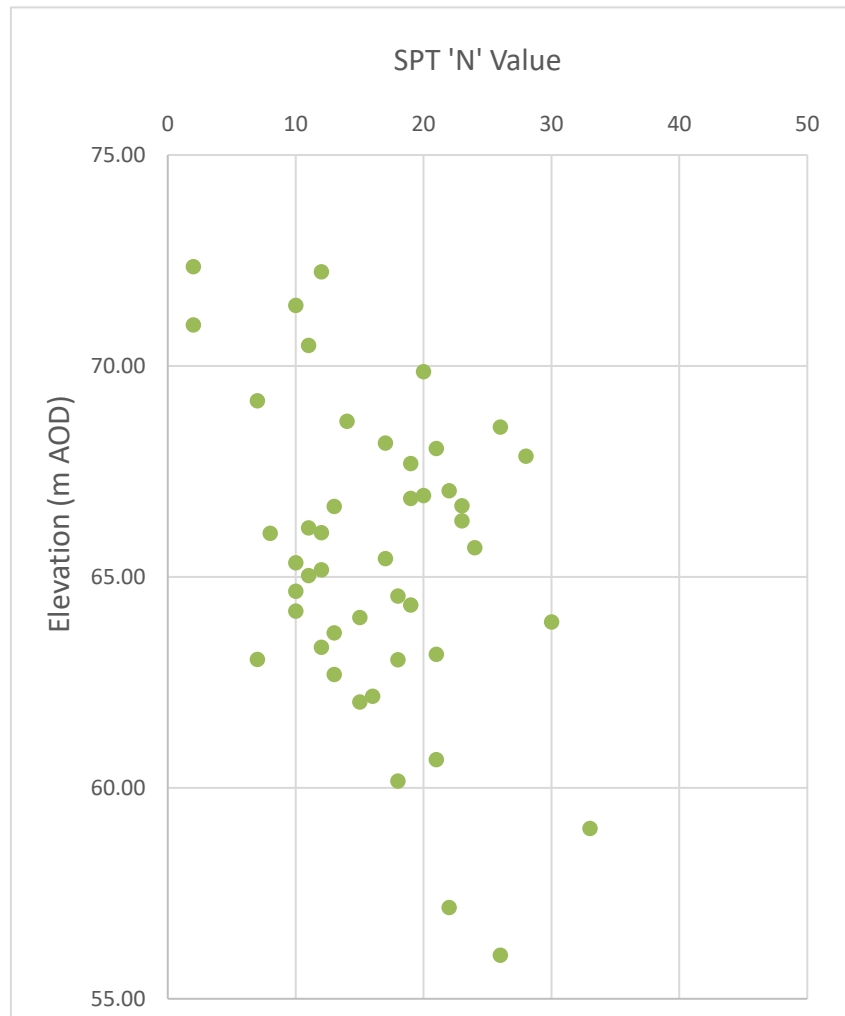


Figure 6.2.1a – Standard Penetration Test vs. Depth - Granular

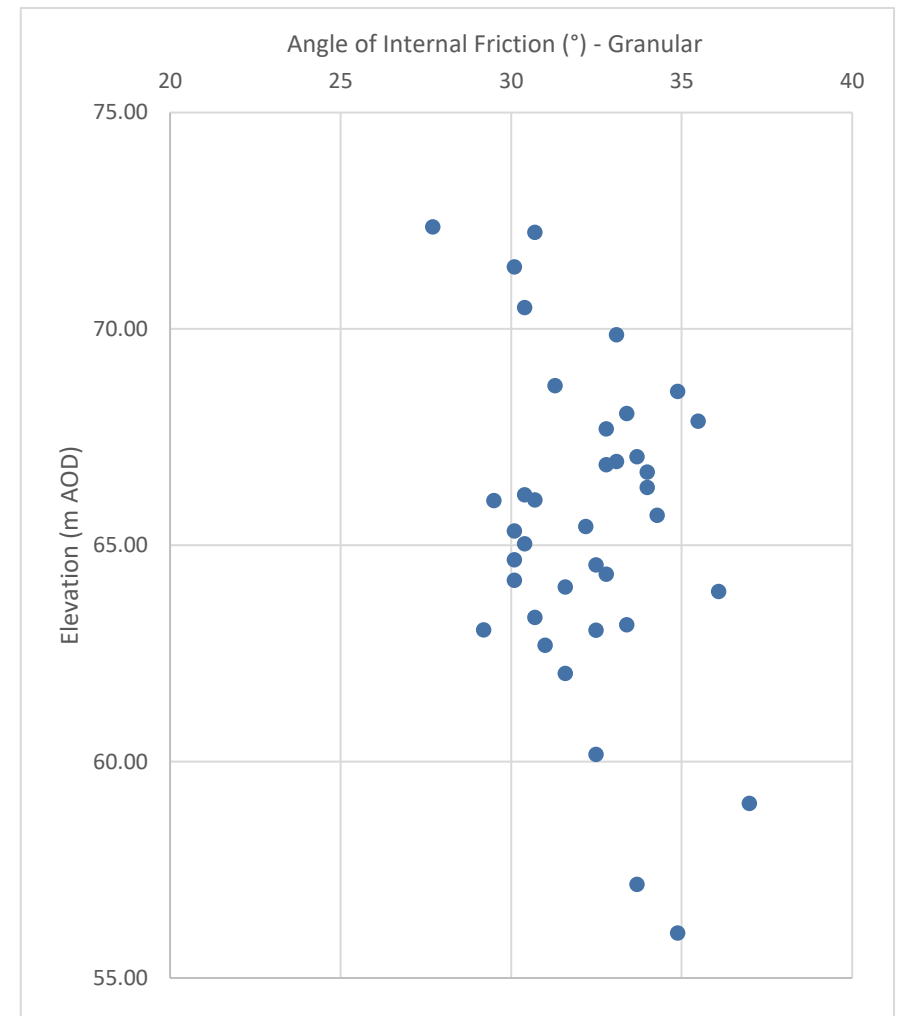


Figure 6.2.1b – Angle of Internal Friction (Granular) vs Depth

6.2.2 Cohesive Glaciofluvial

The geotechnical test results recorded within the cohesive glaciofluvial deposits are summarised in *Table 6.2.2*.

Table 6.2.2 – Summary of geotechnical test results – Cohesive Glaciofluvial

Parameter		No. of Tests	Results	
			Minimum	Maximum
In-Situ Tests				
SPT 'N' Value ⁽²⁾ – Cohesive		38	1	47
Laboratory Tests				
Atterberg Test	Liquid Limit (%) ¹	10	29	50
	Plastic Limit (%) ¹	10	13	29
	Plasticity Index (%) ¹	10	12	25
	Modified Plasticity Index (%) ³	10	12	17.46
Moisture Content (%)		10	18	26
pH		8	5.85	8.41
Water Soluble Sulphate (mg/l)		8	20	60
Multi Stage Quick Undrained Triaxial		4	73	115
One Dimensional Consolidation in Oedometer		3	0.036	0.11

(1) Excludes non-plastic test result

(2) Only includes SPTs tests in which full penetration was achieved.

(3) Modified plasticity index is the plasticity of components <425µm.

A total of 10. Atterberg Tests were undertaken in the cohesive material indicating the soils behave as low to intermediate plasticity clays with a low volume change potential in accordance with guidance from NHBC Standards Chapter 4.2 (2021).

Thirty-eight SPT 'N' values were recorded in the cohesive stratum, ranging between 1 and 47 indicating very soft to very stiff stratum. The results are shown in *Figure 6.2.2a*.

A moderately conservative unit weight of between 18 kN/m³ and 22 kN/m³ is deemed suitable for the cohesive soils, in accordance with BS8002:2015 (Ref. 11).

A moderately conservative Undrained Shear Strength, Cu, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 13) using Equation 1:

$$Cu = f_1 \times \text{SPT N}$$

Equation 1

Where:

C_u is the Undrained Shear Strength

f_1 is the Stroud Factor determined from Figure 1.5 (Ref. 13)

SPT N is Characteristic Standard Penetration Test Result

Using a f_1 factor of 5 for a plasticity index of 15%, estimated C_u values ranged between 30kPa and 235kPa indicating medium strength to very high strength clay. Four Quick Undrained Multi-Stage Triaxial Tests were undertaken. The results in BH301 at 11.00m bgl (62.43m AOD), BH304 at 7.50m bgl (60.52m AOD), BH306 at 10.50m bgl (61.19m AOD) and BH307 at 10.00m bgl (61.66m AOD) recorded values of 115kPa, 73kPa, 82kPa and 88kPa indicating medium to high strength clay. The values are presented in Figure 6.2.2b.

A moderately conservative Coefficient of Consolidation, M_v , of the cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 13) described by Equation 2:

$$M_v = 1 / (f_2 \times \text{SPT } N) \quad \text{Equation 2}$$

Where:

M_v is the coefficient of consolidation

f_2 is the Stroud Factor determined from Figure 1.5

SPT N is Characteristic Standard Penetration Test Result

Using a f_2 factor of 0.66 for a plasticity index of 15%, M_v values typically range between 0.032 and 0.25 m^2/MN . The estimate results indicating very low to medium compressibility clay. Three One Dimensional Consolidation in Oedometer were undertaken. The results in BH301 at 11.00m bgl (62.43m AOD), BH305 at 10.50m bgl (61.54m AOD) and BH307 at 13.00m bgl (58.66m AOD) recorded values of 0.036 m^2/MN , 0.062 m^2/MN and 0.11 m^2/MN indicating very low to medium compressibility. The values are presented in Figure 6.2.2c.

The Angle of Shearing Resistance, ϕ' , for the cohesive glaciofluvial deposits has been derived from the correlation with Plasticity Indices (Ref. 14) shown in Figure 6.2.2d.

Phase 2 Ground Investigation

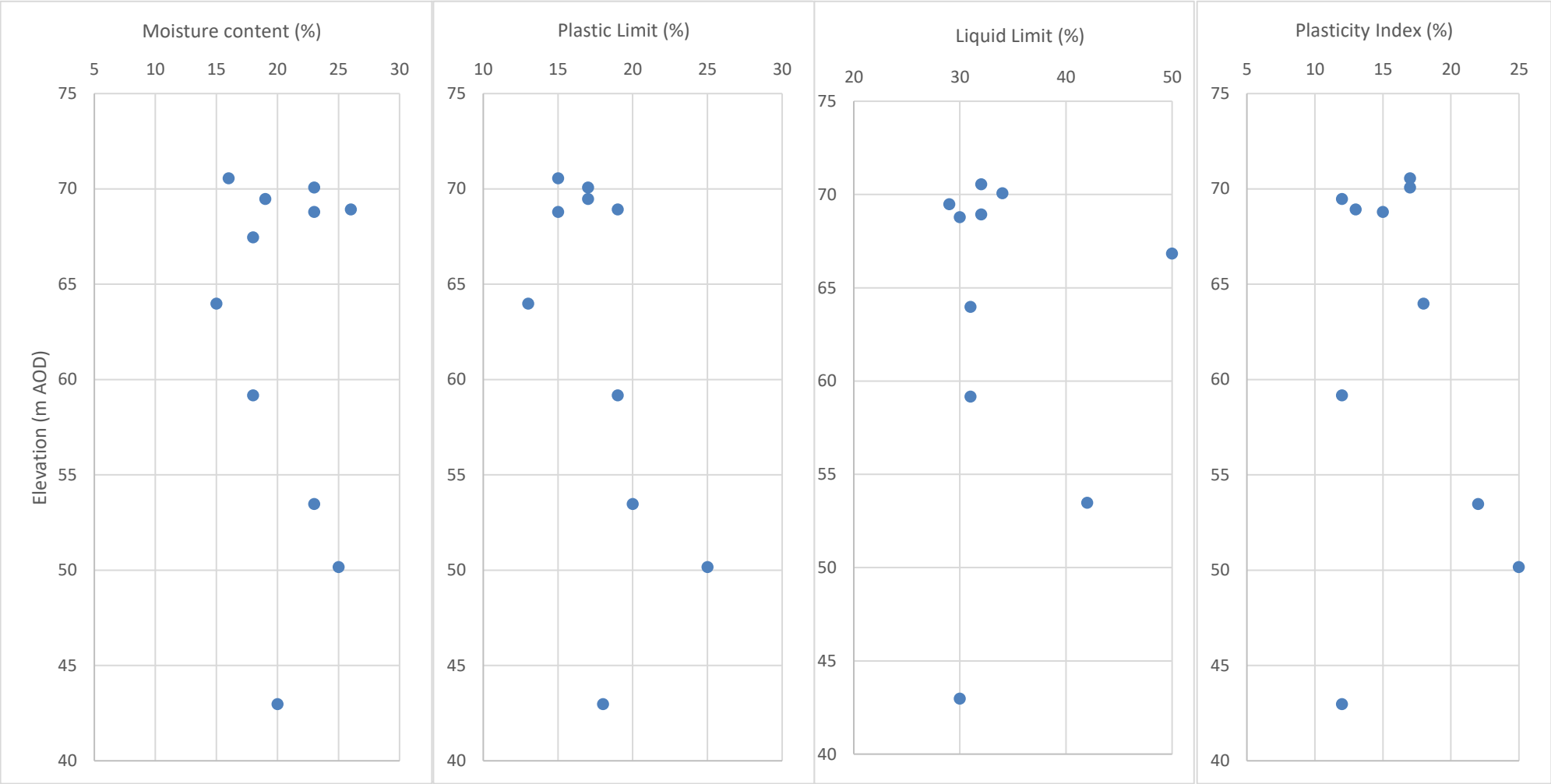


Figure 6.2.2a – Summary of Atterberg Test Results

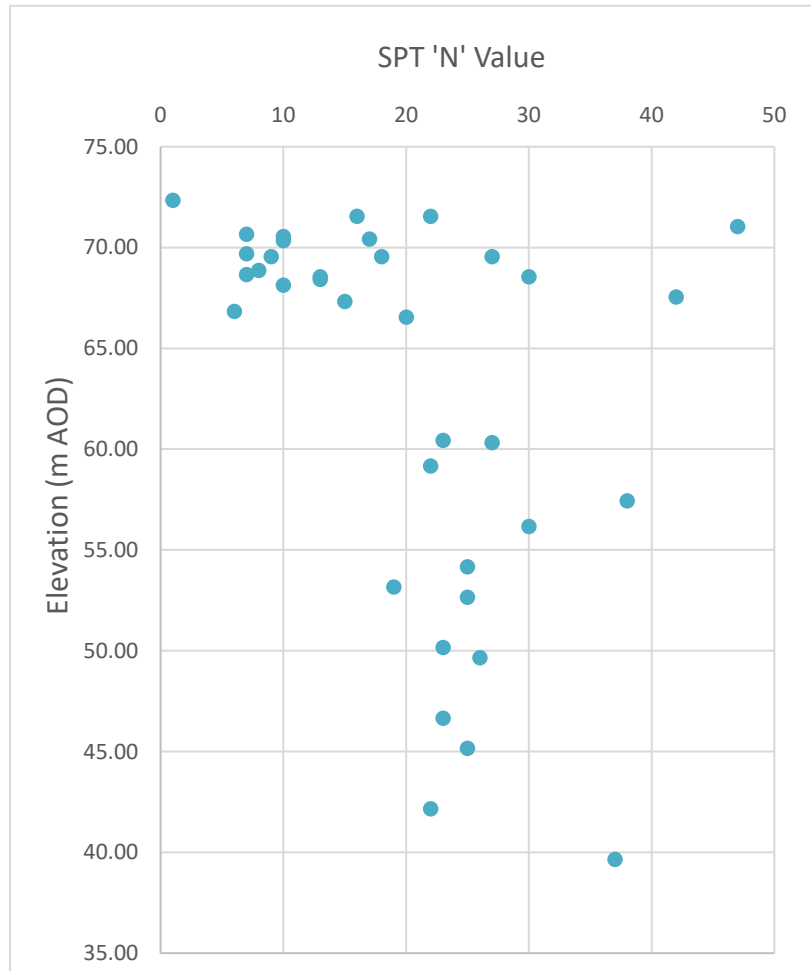


Figure 6.2.2b – Standard Penetration Test vs. Depth - Cohesive

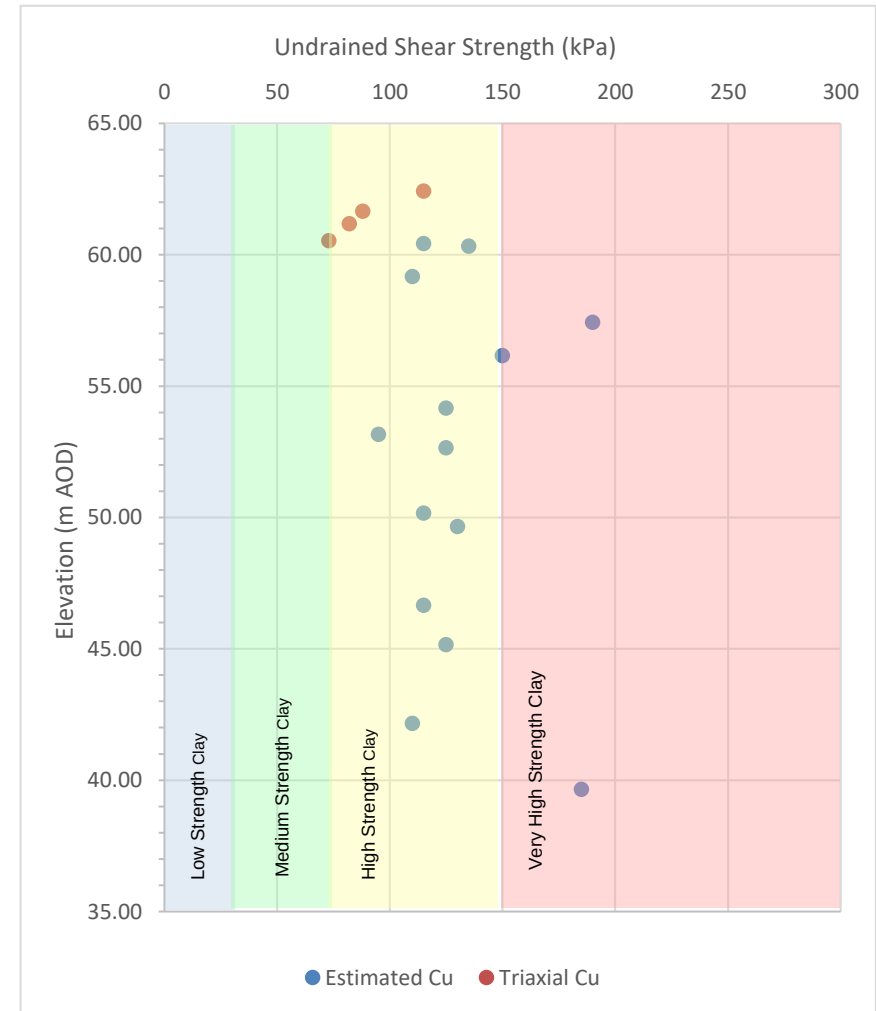


Figure 6.2.2c – Estimated Undrained Shear Strength vs Elevation

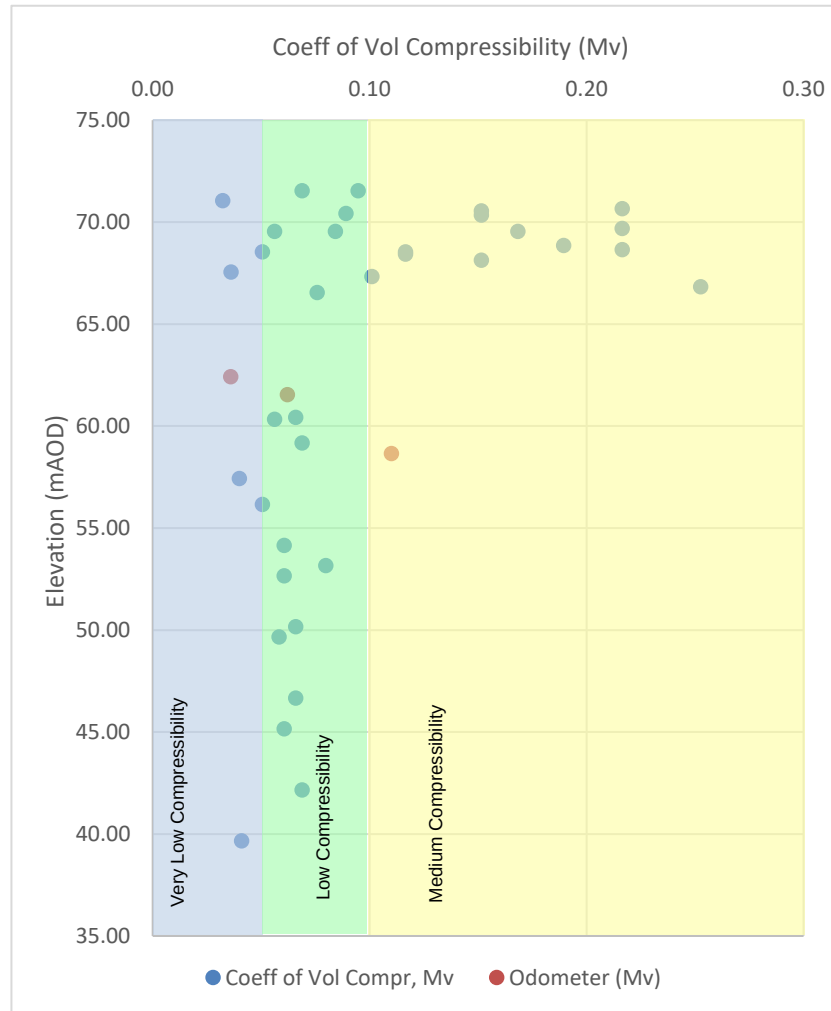


Figure 6.2.2d – Estimated Volume Compressibility Coefficients (Mv) vs Depth

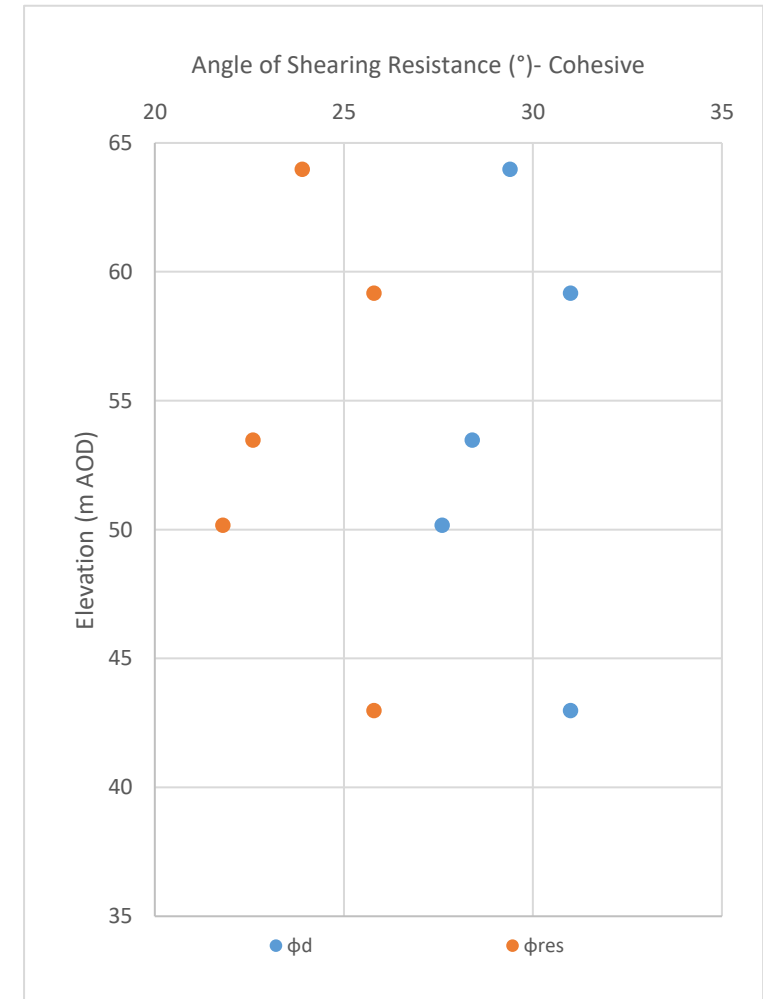


Figure 6.2.2e – Angle Shearing Resistance vs Elevation

6.3 Glacial Till Deposits

Glacial till deposits were encountered underlying the glaciofluvial deposits, recorded as cohesive and granular strata, which are described separately below.

6.3.1 Cohesive Glacial Till

Table 6.3.1 – Summary of geotechnical test results – Cohesive Glacial Till

Parameter		No. of Tests	Results	
			Minimum	Maximum
In-Situ Tests				
SPT 'N' Value ⁽²⁾ – Cohesive		17	19	48
Laboratory Tests				
Atterberg Test	Liquid Limit (%) ¹	9	23	48
	Plastic Limit (%) ¹	9	11	25
	Plasticity Index (%) ¹	9	6	25
	Modified Plasticity Index (%) ³	9	6	23.76
Moisture Content (%)		9	7	26
pH		10	7.99	9.03
Water Soluble Sulphate (mg/l)		10	10	140
One Dimensional Consolidation in Oedometer		6	0.039	0.063
Quick Undrained Multistage Triaxial		8	53	413

(1) Excludes non-plastic test result

(2) Only includes SPTs tests in which full penetration was achieved.

(3) Modified plasticity index is the plasticity of components <425µm.

A total of 9. Atterberg Tests were undertaken in the cohesive material indicating the soils behave as low to intermediate plasticity with a low volume change potential in accordance with guidance from NHBC Standard Chapter 4.2 (2021).

The SPT N results are presented on *Figure 6.3.1b*, showing a general increase in SPT values with depth.

A moderately conservative unit weight of between 19 kN/m³ and 23 kN/m³ is deemed suitable for stiff to very stiff cohesive soils in accordance with BS8002:2015 (Ref. 11).

A moderately conservative Undrained Shear Strength, C_u , of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 13) using Equation 1:

$$C_u = f_1 \times \text{SPT } N$$

Equation 1

Where:

C_u is the Undrained Shear Strength

f₁ is the Stroud Factor determined from Figure 1.5 (Ref. 13)

SPT N is Characteristic Standard Penetration Test Result

Using a *f₁* factor of 5 for an average plasticity of 17%, estimated values ranging between 95kPa and 240kPa indicating high strength to very high strength clay. Eight Quick Undrained Multistage Triaxial Tests recording values between 53kPa in BH305 at 13.50m bgl (58.54m AOD) and 413kPa in BH306 at 19.50m bgl (52.18m AOD) indicating medium strength to extremely high strength clay. The results are presented in *Figure 6.3.1c* however, the 413kPa result in BH306 has been omitted as it is not deemed representative.

A moderately conservative Coefficient of Consolidation, *M_v*, of the cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 13) described by Equation 2:

$$M_v = 1 / (f_2 \times \text{SPT } N)$$

Equation 2

Where:

M_v is the coefficient of consolidation

f₂ is the Stroud Factor determined from Figure 1.5

SPT N is Characteristic Standard Penetration Test Result

Using an *f₂* factor of 0.7 for an average plasticity index of 12%, estimated *M_v* values typically range between 0.029 and 0.075 m²/MN. The results indicate a low to medium compressibility clay. Two One Dimensional Consolidate in Oedometer tests were undertaken. The tests were undertaken in samples obtained in BH301 at 15.00m bgl (54.33m AOD) recording a value of 0.063m²/MN. The result indicates medium compressibility clay. The results are presented in *Figure 6.3.1c*.

The Angle of Shearing Resistance, *φ'*, for the cohesive glacial till deposits has been derived from the correlation with Plasticity Indices (Ref. 14). The results are presented in *Figure 6.3.1d*.

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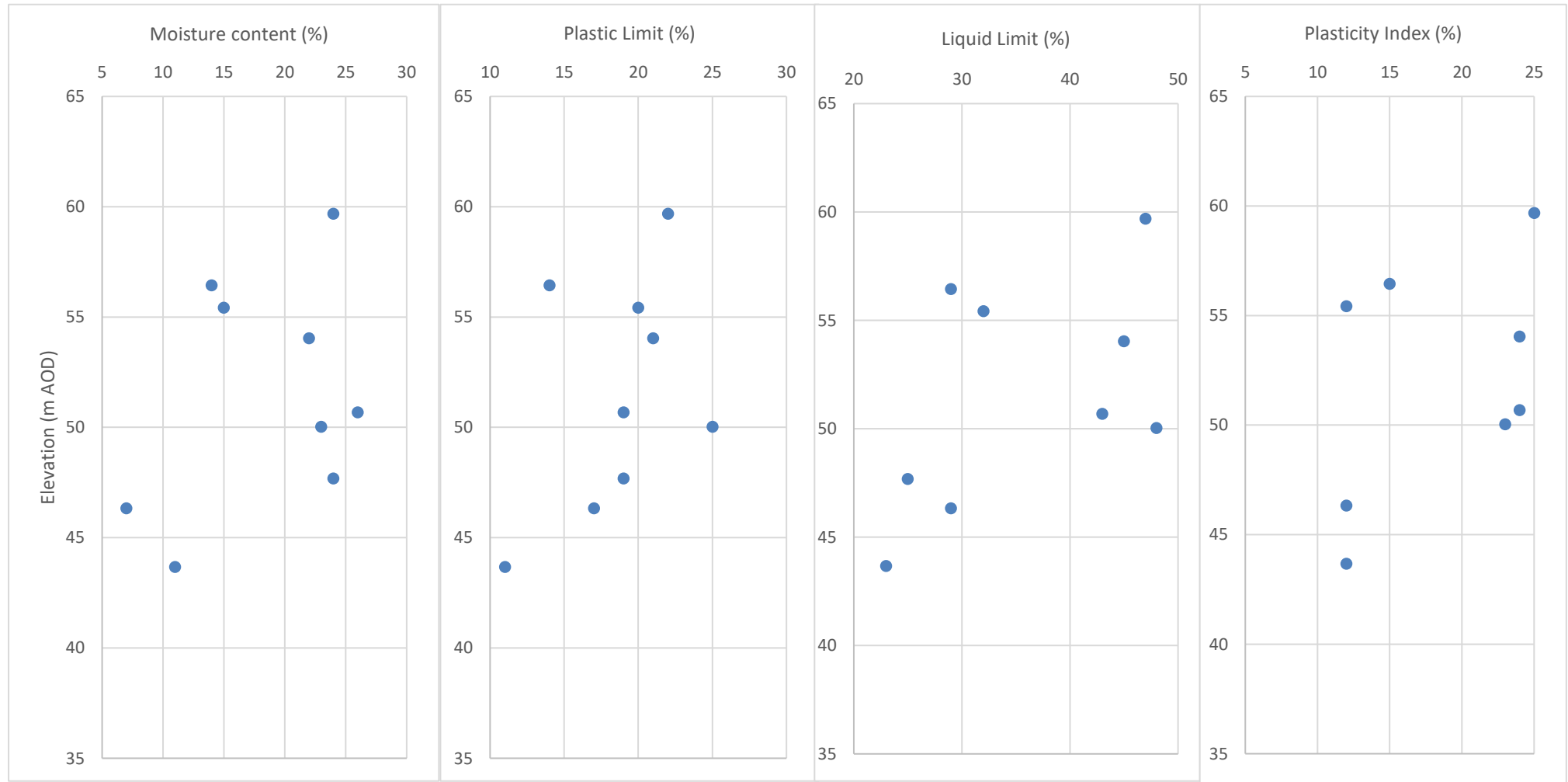


Figure 6.2.2a – Summary of Atterberg Test Results

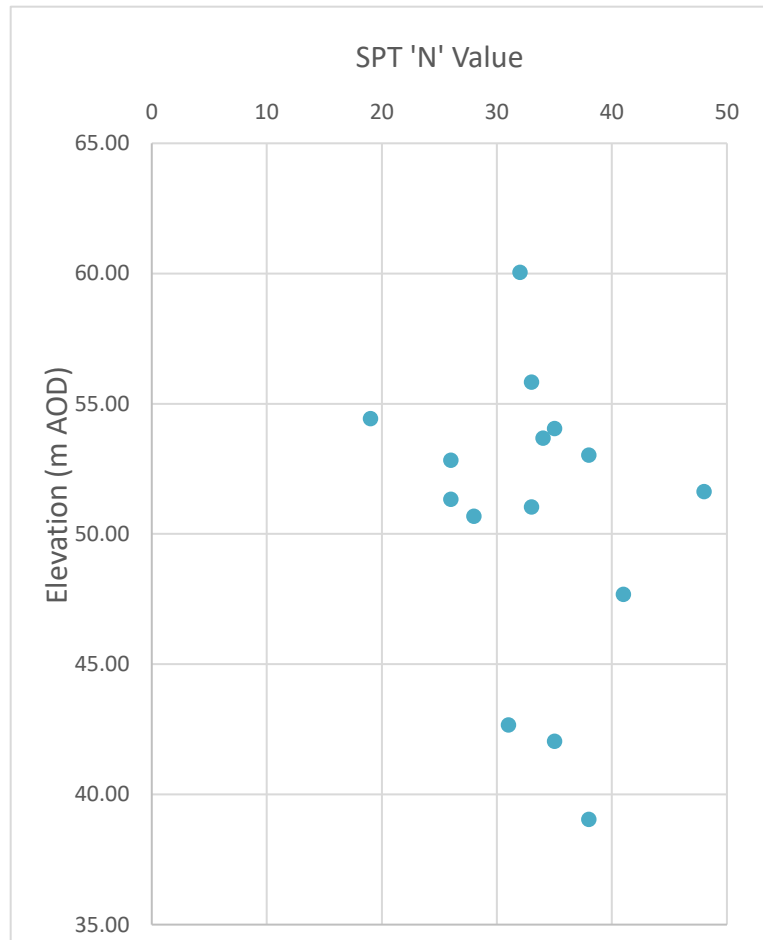


Figure 6.3.1b – Standard Penetration Test vs. Elevation

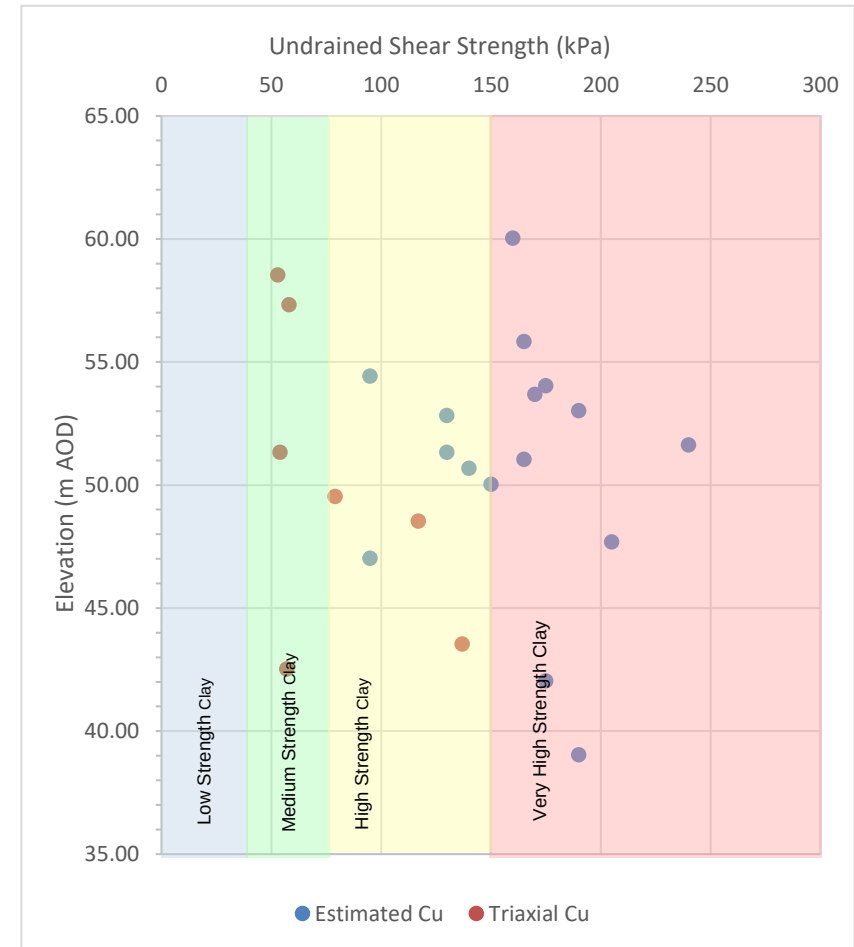


Figure 6.3.1c – Estimated Undrained Shear Strength vs. Elevation

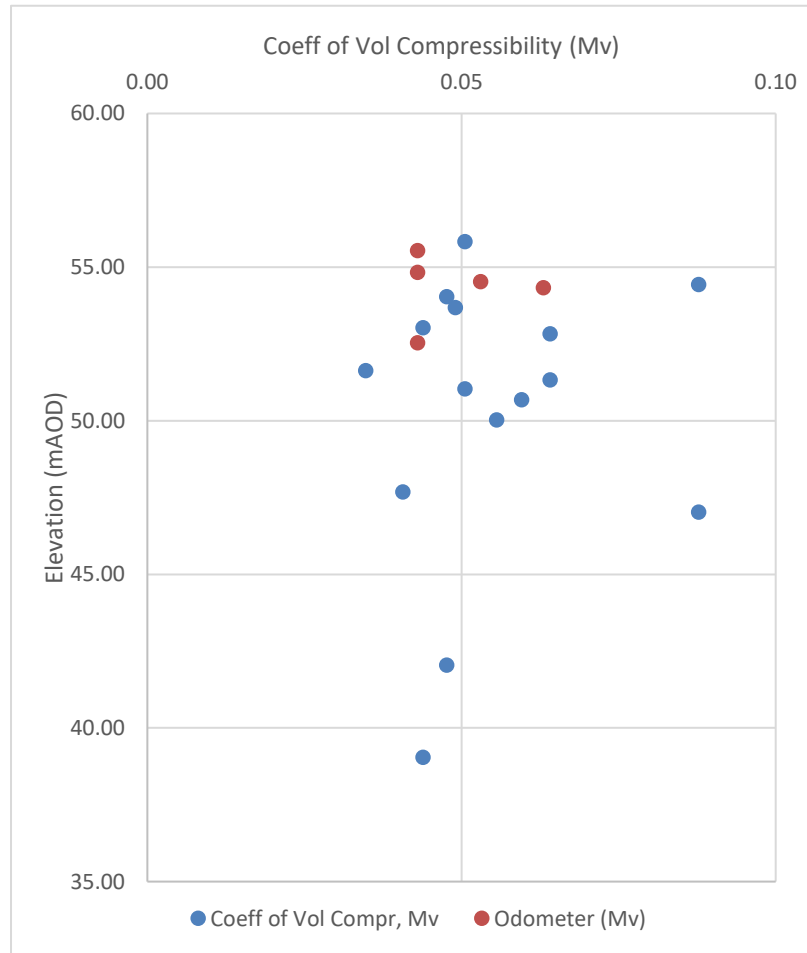


Figure 6.3.1d – Estimated Volume Compressibility Coefficients (Mv) vs Elevation

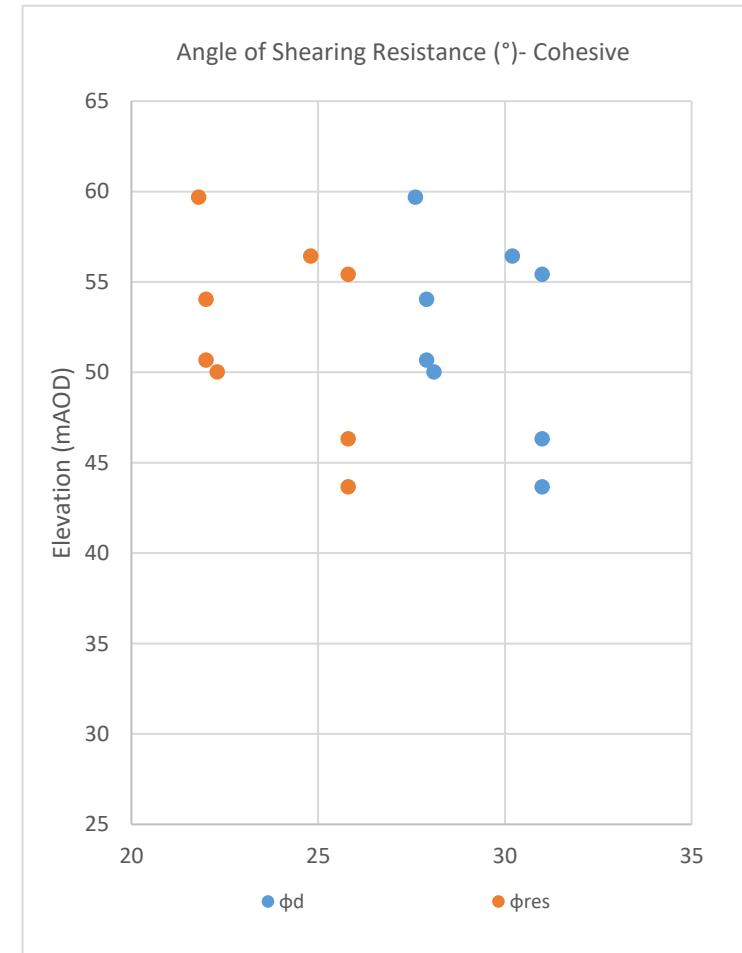


Figure 6.3.1e – Angle Shearing Resistance vs Elevation

6.3.2 Granular Glacial Till

The geotechnical test results recorded within the granular glaciofluvial deposits are summarised in *Table 6.3.2*.

Table 6.3.2 – Summary of geotechnical test results – Granular Glaciofluvial

Parameter	No. of Tests	Results	
		Minimum	Maximum
In-Situ Tests			
SPT 'N' Value ⁽¹⁾ – Granular	7	13	50
Laboratory Tests			
Particle Size Distribution	2	See <i>Appendix D</i> for results	

(1) Only includes SPTs tests in which full penetration was achieved.

Seven SPT 'N' values were recorded in the granular strata ranging between 16 and 50 indicating medium dense to very dense stratum. Twenty-six refusals (>50) were recorded in the granular strata. The values are shown in *Figure 6.3.2a*.

The PSD results are generally consistent with the recorded findings during the site investigation works and are contained within *Appendix D*.

A moderately conservative unit weight of between 16kN/m³ and 20kN/m³ is deemed suitable for granular soils above water and a unit weight of between 18kN/m³ and 22kN/m³ is deemed suitable for deposits below groundwater, in accordance with BS8002:2015 (Ref. 11)

The Angle of Internal Friction for the granular Glacial Till has been derived from a review of relationships with SPT N values (Ref. 12) and published values. The values are shown on *Figure 6.3.2b*.

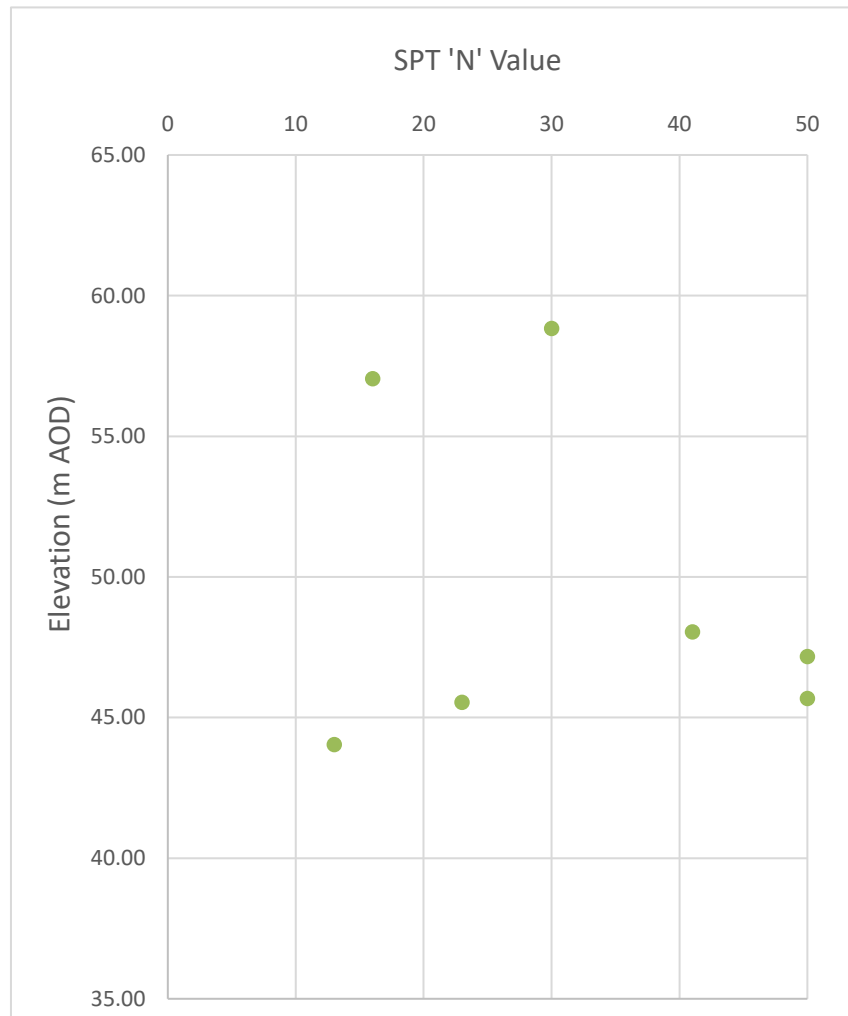


Figure 6.3.2a – Standard Penetration Test vs. Depth - Granular

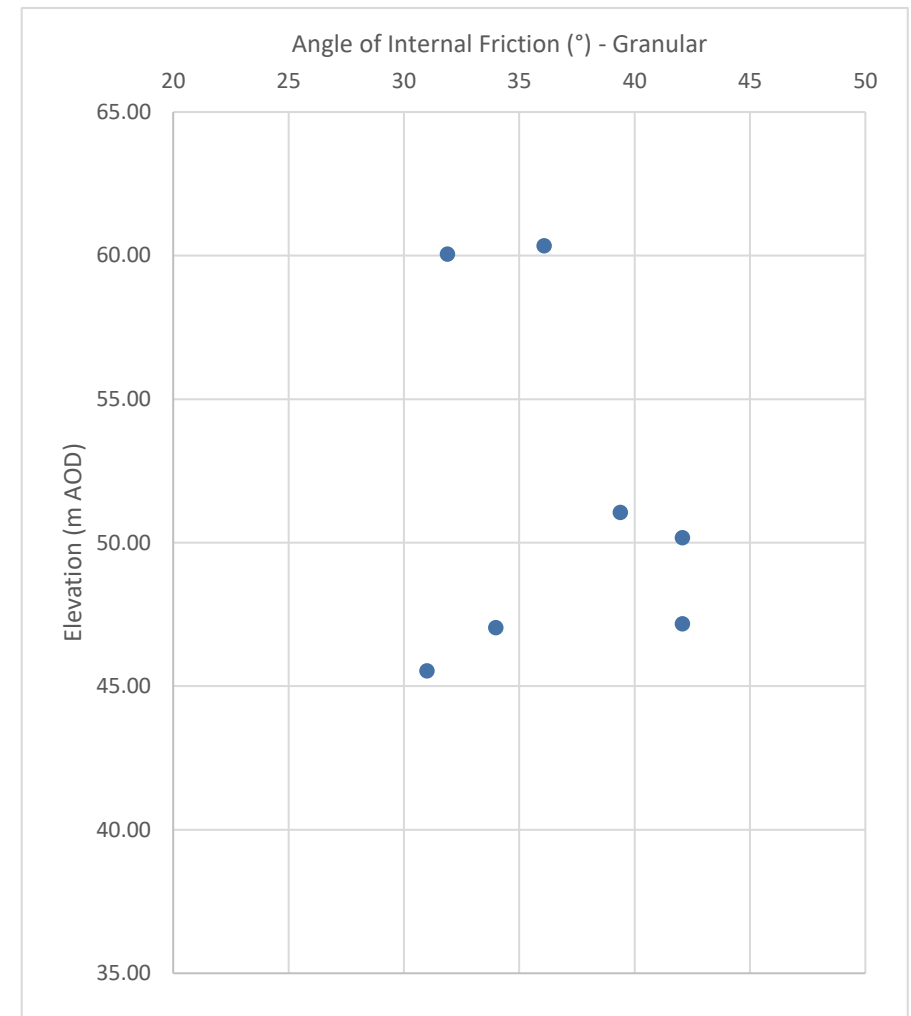


Figure 6.3.2b – Angle of Internal Friction (Granular) vs Depth

6.4 Residual Soils (Weathered Chester Formation)

Residual soils were encountered in BH301 at 47.30m – 48.70m bgl (26.13m – 24.73m AOD) as highly weathered sandstone recovered as medium to coarse slightly gravelly sand.

No SPTs were undertaken in the residual soils or samples were obtained in the strata.

6.5 Chester Formation

The Chester Formation was encountered in BH301 below the residual soils at 48.70m bgl (26.13m AOD).

The borehole logs indicate bedrock comprised very weak to weak reddish-brown medium to coarse grained sandstone. Fracture spacing was variable from extremely closely to closely space.

One assumed zone of non-intact core was recorded and summarised in *Table 6.5a*. Details of this can be referred to in the exploratory hole logs found in *Appendix B*.

Table 6.5a – Summary of non-intact core zone

Exploratory Hole ID	Non-Intact Core Depth (m bgl)	Non-Intact Core Elevation (m AOD)
BH301	49.03 – 49.15	24.40 – 24.28

Rock Quality Designation (RQS) recorded in the sandstone cored samples ranged between 30 and 56, classifying it as poor rock mass quality. Total Core Recovery (TCR) and Solid Core Recovery (SCR) varied between core runs showing an overall increase with depth between 47.30m (26.13m AOD) and 50.30m (23.13m AOD).

A summary of the geotechnical testing results for the sandstone bedrock are presented in *Table 6.5b*. Full details of the geotechnical results are included in *Appendix D*.

Table 6.5b – Summary of Geotechnical Test Results for Sandstone.

Parameter			No of Tests	Summary of Results		
				Min	Max	Avg
Laboratory Test Results	Point Load Indices (Is50) (MPa)	Axial Plane	2	0.24	0.41	0.32
		Diametral Plane	2	0.04	0.31	0.18
	pH Value		1	8.44		
	Water Soluble Sulphate (mg/l)		1	10		
Derived Parameters	Estimated UCS from Point Load Indices	Axial Plane	2	4.32	7.38	5.85
		Diametral Plane	2	0.72	5.58	3.15

Overall, 2No. axial and 2No. diametral Point Load Test (PLT) were undertaken on selected samples from rotary cores. Axial plane PLT (Is(50)) results ranged between 0.24MPa and 0.41MPa and diametral plane PLT (Is(50)) test results ranged between 0.04MPa and 0.31MPa.

An approximation of the unconfined compressive strength (UCS) of the rock may be derived from the following relationship, described in Equation 5:

$$\text{UCS} = \text{PLT Is(50)} \times f_1 \quad \text{Equation 5 (Tomlinson, 1999)}$$

Where f_1 is derived from correlation between PLT Is(50) and UCS results

However, due to lack of UCS results, a published correlation factor of 18 has been used for sandstone (Ref. 13). Based on this relationship, estimated UCS values for bedrock range between 4.32MPa and 7.38MPa for axial tests and 0.72MPa and 5.58MPa for diametral tests, indicating the rock tested has strength index from very weak to moderately weak, which generally correlated with the strengths indicated in field descriptions.

6.6 Aggressive Ground Conditions

The classification of the site in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd edition of 2005 (Ref. 16). A summary of the results obtained as a part of the ground investigation are summarised in Table 6.6a, and Table 6.6b details the classification.

Table 6.6a –Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Test Type	Range
Made Ground	pH	7.70 – 10.93
	Water Soluble Sulphate (mg/l)	10 - 250
Glaciofluvial Deposits	pH	5.85 – 8.50
	Water Soluble Sulphate (mg/l)	10 - 250
Glacial Till	pH	7.88 – 9.03
	Water Soluble Sulphate (mg/l)	10 - 94
Chester Formation	pH	8.44
	Water Soluble Sulphate (mg/l)	10

Table 6.6b –Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class ⁽¹⁾
Made Ground	DS-1	AC-1

Glaciofluvial Deposits	DS-1	AC-1
Glacial Till	DS-1	AC-1
Chester Formation	DS-1	AC-1

(1) ACEC assessment was based on the *mobile* groundwater condition in a *brownfield* scheme area

7.0 Ground and Groundwater Contamination Assessment

This section of the report includes the assessment of the potential contamination, solid, liquid and gas, identified on the subject site which may present a risk to the proposed end-users, associated utilities and the wider environment.

In guidance published by the Environment Agency, the risk to human health or controlled waters is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end-users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (Ref.17).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site by site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the first tier (Tier 1) of this approach otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment presented in the Phase 1 Desk Study in conjunction with observations made during the ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in *Section 10.0* of this report.

The following sections present more detail on the risk assessment methodology rationale for the main receptors.

7.1 Human Health

The soil results will be screened against the relevant Generic Assessment Criteria (GAC) where available, including:

- i) **Soil Guideline Values (SGVs):** These have been published by the Environment Agency and are trigger values for screening out low risk areas of land contamination. SGV's give an indication of representative average concentrations of chemicals in soil, below which long-term health risks are likely to be minimal. SGVs have been published for several contaminants including arsenic, cadmium, mercury, nickel, selenium, BTEX, phenols and dioxins, furans and dioxin-like PCB substances for land uses including residential, allotments and commercial. The SGVs have been developed for a sandy loam soil with 6% soil organic matter (SOM) content;
- ii) **Supplementary Screening Values (SSVs):** In addition to the SGVs developed by the EA, other third party organisations have derived SSVs for a wider range of contaminants and land

uses using the CLEA Model. Curtins have adopted these numbers where applicable, including those developed by Atkins AtriskSoil™, the LQM/CIEH Suitable for Use Levels (S4UL) and EIC/AGS/CL:AIRE published thresholds;

- iii) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium and lead. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 (Ref. 18) in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). C4SLs are not representative of significant possibility of significant harm (SPoSH) and are low risk levels which, and therefore where the C4SLs are not exceeded, land can be demonstrated to be in Category 4 and cannot be determined as contaminated land.

7.1.1 Adopted Soil Human Health GACs Screening Methodology

The proposed site use, an Acute health care unit, is most analogous with a *Commercial* end-use scenario and so assessment has been undertaken against the following GACs, in order of preference:

1. Environment Agency Soil Guideline Values,
2. CL:AIRE, AGS, EIC. Soil Generic Assessment Criteria for Human Health Risk Assessments,
3. LQM/CIEH 2015 S4ULs for Human Health Risk Assessment, and
4. DEFRA Category 4 Screening Levels.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for soils ranged from 1.7% to 13.5%.

With consideration for a calculated geometric average, soils from the Made Ground determine a SOM of 6.5%. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM of 2.5% for the Made Ground for *Commercial* end-use has been adopted for made ground.

The adopted GAC's are listed in *Appendix F*.

7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix C*.

With respect to the proposed *Commercial* end-use of the site, PAH exceedances were recorded in one made ground soil samples tested, detailed in *Table 7.1.2a*.

Table 7.1.2a – Soil GAC Exceedances for Commercial end-use

Determinand	2.5% GAC threshold (mg/kg)	Concentration (mg/kg)
		BH302 (0.40m bgl)
Benzo(a)anthracene	180	273
Benzo(b)fluoranthene	45	105
Dibenzo(ah)anthracene	3.6	11
Benzo(a)pyrene	89.3	35

Selected soil samples were screened for asbestos. No suspected asbestos containing materials (ACMs) were identified in the exploratory hole logs. However, laboratory screening identified loose asbestos fibres detailed in *Table 7.1.2b*.

Table 7.1.2b – Loose Asbestos Fibres

Exploratory Hole ID	Depth (m bgl)	Fibre Type	Quantification Concentration (% w/w)
BH302	0.40	Crocidolite and Amosite	0.012
BH303	0.60	Crocidolite	<0.001
BH305	0.35	Chrysotile	<0.001

8.0 Ground Gas Assessment

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (Ref. 19), BSI Publication code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2015 (Ref. 20) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 21).

The gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within the *Section 2.7* and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

8.1 Ground Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk, standpipe installations were incorporated within the borehole locations as detailed in *Section 3.2*.

For Stage 1, an initial programme of six gas monitoring visits over six weeks was proposed. Six gas monitoring visits have been undertaken between 5th May and 16th June 2021 with barometric pressure recorded between 998 and 1019mb. Rising barometric pressure was recorded on the first (05/05), fourth (03/06) and fifth visit (11/06), steady barometric pressure on the second (13/05) and third (26/05) visits and falling barometric pressure on the sixth (16/06) visit.

For Stage 2, an initial programme of seven gas monitoring over nine weeks was proposed. Six gas monitoring visits have been undertaken between 22nd June and 18th August 2021 with barometric pressure recorded between 997mb and 1015mb. Steady barometric pressure was recorded on the third (13/07) and fourth visit (20/07) and falling pressure on the first (22/06), second (02/07), fifth (29/07) and sixth visit (04/08).

The results log sheets are contained within *Appendix E* and summarised in *Table 8.1*.

Table 8.1 – Summary of Ground Gas Monitoring Results

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Peak Gas Flow (l/hr)	Maximum Steady State Gas Flow (l/hr)
BH301	<0.01	1.7	16.9	-53.5	-1.9
BH302	<0.01	3.4	16.9	-0.5	-0.5
BH303	<0.01	6.6	0.00	8.00	0.7
BH304	<0.01	3.1	16.3	<0.01	<0.01
BH305	<0.01	4.9	7.1	-5.2	-1.8
BH306	<0.01	0.3	20.7	0.1	<0.01

BH307	<0.01	0.7	20.3	-0.8	<0.01
WS301	<0.01	8.9	11.6	<0.01	<0.01
WS302	<0.01	4.9	13.6	-1.2	-1.2
WS303	<0.01	2.0	18.0	-17.1	-17.1
WS304	<0.01	1.1	18.6	<0.01	<0.01
WS305	<0.01	2.2	19.2	0.4	<0.01

Methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells.

Gas flow was recorded at a maximum peak flow rate of -53.5l/hr in BH301 on the third visit in Stage 1. The greatest steady state gas flow of -17.1/hr was recorded in WS303 on the second monitoring visit in Stage 2.

8.2 Ground Gas Assessment

The Conceptual Site Model presented in *Section 2.7* highlighted the Made Ground and infilled land of unknown composition as potential sources of ground gas generation. The Phase 1 report (Ref. 1) suggests no records of organic rich drift deposits (e.g. peat) being present however historically infilled land of unknown material is recorded 9m southwest of the site. Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane and hydrogen sulphide. The Phase 1 identified a **Moderate/Low Risk**.

Made ground soils were encountered to maximum depths of 2.60m bgl. The ground investigation revealed a ground model generally consistent with the preliminary conceptual site model. The natural deposits comprised glaciofluvial sheet deposits overlying glacial till at depth with limit organic content identified.

In accordance with BS8485:2015 (Ref. 20) consideration of the recorded soil gas flow rates, presented below, enables hazardous gas flow rates (Q_{hg}) to be evaluated. Q_{hg} can be derived for both 'representative' and 'worst case check' scenarios and a comparison made in support of an appropriate assessment of ground gas risk. For a 'representative' scenario (highest hazardous gas flow rate recorded in a single borehole on any one occasion) steady state flow rates and maximum gas concentrations are adopted, whilst for a 'worst case' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) peak flows and gas concentrations are adopted, discounting those which have been deemed to be unrepresentative.

As methane was not detected above the instruments limit of detection throughout the monitoring period, the risk to site end users from methane is considered **Low** and is therefore not considered further.

BH301 recorded significantly elevated peak flow rates between -22.3l/hr and -53.5l/hr. From a review of groundwater level monitoring (*Table 5.8b*) and the response zones of the monitoring wells (*Table 3.3*) it can be seen that the response zone was flooded during the monitoring period. It is considered that high flow rates in these boreholes is likely to be linked to rising groundwater in the solid section of the well installation causing an increase in internal pressure within the pipework, which is released and subsequently equalised, when the valve tap is open resulting in the high observed peak flow preceding lower steady flow. The effect is detailed within BS8485:2015 (Ref. 20), CL:AIRE Research Bulletin 17 'A Pragmatic Approach to ground gas risk assessments for the 21st century' (Ref. 22).

Considering the above, and using professional judgement, the elevated peak flow readings from BH301 have been omitted for the calculations used in the assessment of gas risk on site, with remaining flow and carbon dioxide readings considered to give a more representative.

Evaluation of the 'representative' scenario (highest hazardous gas flow rate that is realistically possible i.e. in a single borehole) recorded a maximum Q_{hg} of 0.342l/hr for carbon dioxide with the highest steady state flow rate of -17.1l/hr in BH301.

Evaluation of the 'worst case' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) recorded a maximum Q_{hg} of 1.52l/hr for carbon dioxide with the highest steady state flow rate of -17.1l/hr.

Taking into account the 'representative' and 'worst case' scenario GSV and carbon dioxide concentrations recorded above 5%, it indicates a Characteristic Situation 2 (CS2) gas regime requiring 3.5 points of protection.

9.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented *Section 2.7* and discussed in *Section 2.0* of this report has been revised following the GQRA in *Section 7.0* above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552 (Ref. 23) which is summarised within *Appendix G*.

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Risks presented by Unexploded Ordnance is discussed and assessed in *Section 2.6*.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (Ref. 24) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk. It has been assumed that any future construction works on site will be undertaken in compliance with these requirements and therefore construction workers involved in the building works at the site have been discounted as a human receptor in the conceptual site model. Reference should be given to the environmental testing results discussed within *Section 7.0* and presented within *Appendix C*.

Phase 2 Ground Investigation

Qualitative Risk Assessment

Generic Quantitative Risk Assessment

Detailed Quantitative Risk Assessment or; Remedial Action

- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.
- In the absence of specific site data, a Generic Quantitative Risk Assessment is invariably recommended.

Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating		
Elevated PAH within BH302 at 0.40m bgl above <i>Commercial</i> GACs. Hydrocarbon odour noted between 0.30m and 0.90m bgl in BH302. Amosite and Crocidolite loose fibres of 0.012% identified in BH302 at 0.40m bgl.	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation (indoor & outdoor air)	Commercial end users	Medium Human Health Risk	Low Likelihood	Moderate/Low	Made ground soils in BH302 recorded elevated concentrations above their respective GAC thresholds within respect to PAHs. Laboratory screening identified loose asbestos fibres in a made ground soil sample taken and tested at 0.40m bgl in BH302,	Dependent on the development plans either a suitable thickness of clean and inert capping in all areas of soft landscaping or areas of hardstanding to break the source-pathway-receptor linkage between made ground soils on site containing PAHs and asbestos. Details should be described in a Remediation Strategy. Standard Health & Safety Precautions likely to be used by workers. Contractors to have an Asbestos Management Plan in place during groundworks
		Construction and maintenance workers					
	Vertical and horizontal migration of soluble phase contamination through groundwater.	Controlled Waters (Surface Water) Nearest surface water is the River Irk 320m east.	Mild	Unlikely	Very Low	Significant distance for contamination to migrate to reach the River Irk.	No further action required.
Crocidolite loose fibres in BH303 at 0.60m bgl and Chrysotile loose fibres in BH305 at 0.35m bgl of <0.001%.	Vertical and horizontal migration of soluble phase contamination through superficial deposits and bedrock.	Controlled Waters (Groundwater) Secondary A Aquifer (Superficial) Principal Aquifer (Bedrock) Not within a Source Protection Zone (SPZ).	Medium	Unlikely	Low	No evidence of free product or gross contamination was evident during the ground investigation.	
Potential ground gas generation from Made Ground containing organic/putrescible content on site and off site. Maximum carbon dioxide concentrations of 6.6% in BH303 and of 8.9% in WS301 with maximum steady state flow of - 17.1l/hr.	Ground gas & vapour migration and inhalation. Vertical and horizontal migration through existing service corridors and the underlying superficial deposits.	Commercial end users	Medium Human Health Risk	Low Likelihood	Moderate/Low	Using the 'representative' scenario, due to a full data set within varying pressures, the calculated Q_{hg} for the site was 0.342 l/hr for carbon dioxide. Methane was recorded below the instruments limit of detection. Characteristic Gas Situation is assessed as CS2 requiring 3.5 points of protection in accordance with BS8485.	Characteristic Situation 2 in accordance with BS8485 with 3.5 gas protection score for Type B building.

9.1 Summary of Potential Pollutant Linkages

A **Moderate/Low** risk rating is identified to site end-users and construction workers from contamination in made ground soils through direct contact, dermal uptake, inhalation and ingestion of soil derived dust from the elevated PAHs in BH302 and asbestos fibres noted in BH302, BH303 and BH305. Dependent on the development plans a suitable thickness of clean and inert capping in all areas of soft landscaping, or areas of hardstanding is required.

A **Low** and **Very Low** risk rating is identified to controlled waters (Groundwater and Surface Waters, respectively) following the ground investigation given; reflecting no major sources of contamination were identified in soils, the site is not situated within a source protection zone, and the significant distance to nearest surface water feature.

A **Moderate/Low** risk rating is identified to site end users from ground gases arising from Made Ground and natural soils migrating into buildings and subsequent inhalation by on-site employees. This corresponds to a Characteristic Gas Situation assessed as CS2; therefore, gas protection measures are required.

10.0 Geotechnical Assessment and Recommendations

10.1 Introduction

This section will discuss the ground conditions encountered across the site and provide recommendations for geotechnical engineering design. The proposed development plan comprises a four-storey Acute Unit linking to a retained west wing of the existing hospital.

It is noted at the time of writing this report, the structural details and loadings have not been provided. As such any changes in the development of designs beyond the issue of this Ground Investigation Report to the client should be investigated further by the Construction Designer.

An Earthworks Specification Appendices has been produced to support the Acute Development, report ref. NMGH-CUR-BC-XX-SP-GE-00001.

10.2 Summary of Ground Conditions

The ground conditions at the site generally comprised predominantly granular made ground overlying interbedded cohesive and granular glaciofluvial sheet deposits overlying predominantly cohesive glacial till deposits at depth. In BH301, the glacial till was underlain by residual soils and the Chester Formation.

Glaciofluvial sheet deposits typically comprised medium dense to dense medium to coarse sand and firm to stiff light brown/brown silty, slightly to very sandy clay with occasionally gravel. Glacial till deposits comprised brown/dark brown stiff to very stiff slightly silty, sandy, slightly gravelly clay and very dense light brown fine to coarse sand.

Residual soils comprised very dense reddish-brown medium to coarse sand and Chester Formation comprised very weak to weak reddish-brown medium to coarse grained sandstone.

10.3 Geotechnical Considerations

10.3.1 Presence of Existing Services

The presence of existing services may require detailed geotechnical design, capping and/or diversion associated with the development, which should be managed through the appropriate utility suppliers during the construction phase. The Principal Contractor should ensure the appropriate mitigation measures are put in place during the construction phase (i.e during excavations of foundations) and designers must ensure that suitable geotechnical design is considered to avoid damage during the construction phase and design life of the proposed infrastructures.

10.3.2 Obstructions

One obstruction was encountered during the ground investigation. In SA302, a relic floor was recorded at 1.30m bgl (68.45m AOD). The presence of this obstruction should be taken into account by the piling contractor.

10.4 Foundation Solutions

It is understood the proposed development comprises a four-storey Acute Unit. The loadings for the proposed building have not been provided at the time of writing.

The shallow ground conditions comprised made ground to a maximum depth of 2.60m bgl underlain by medium dense to dense sand and firm to stiff clays. Given the depth of the Made Ground encountered over the site it is considered likely that a piled foundation may be the best foundation solution for the scheme.

Groundwater was encountered during the intrusive works between 9.20m bgl (62.84m AOD) and 27.00m bgl (41.03m AOD). Subsequent groundwater monitoring levels were encountered at shallower depths between 1.05m bgl (72.50m AOD) and 3.71m bgl (67.80m AOD) in the window samples and between 10.14m bgl (61.51m AOD) and 26.82m bgl (46.61m AOD) in the cable percussive boreholes.

The carrying capacity of piles depends not only on their size and the ground conditions but also their method of installation.

Pile design and installation are continually evolving processes, it is recommended that specialist piling contractors are contracted as to the suitability and carrying capacity of the piles in the ground conditions pertaining to the site.

10.5 Excavation and Support

Observations during the intrusive works and subsequent monitoring indicate that perched groundwater is present in the made ground between 72.50m and 67.80m AOD, shallow groundwater in the glaciofluvial sheet deposits between 61.39m and 61.51m AOD and deeper groundwater in the glacial till between 46.56m and 48.82m AOD.

Based on these results, it is possible localised perched groundwater is likely to be encountered during excavations and will likely require temporary shoring and support and the groundwater may require control by conventional pump sump methods.

Any excavations where the water table is encountered, and in accordance with Health and Safety Regulations, side support for safety purposes should be provided to all excavations which appear

unstable, including where groundwater is encountered, and those more than 1.20m deep. Excavations shallower than 1.20m deep, requiring personnel access, will require closed side support.

The chosen contractor should provide details on how they intend to ensure the safety and stability of proposed excavations.

10.6 Ground Floor Slabs

Based on the observations on site together with the results of laboratory tests and that ground bearing floor slabs should not span granular and made ground soils due to potential for differential settlement, it is recommended that consideration is given to a suspended ground floor slab. As piled foundations are anticipated, a suspended slab is recommended to bear on the pile caps by a network of beams which will minimise any differential settlement between the floor and piled structure.

10.7 Soakaways

Three soakaways were proposed however, due to the significant thickness of made ground and recorded obstructions, SA301 and SA302 could not be undertaken.

The Infiltration Test results are typically calculated using

$$\text{Soil Infiltration Rate } f = \frac{V_{p75-25}}{a_{s50} \cdot t_{p75-25}} \quad \text{[Equation 5] (BRE365)}$$

Where:

V_{p75-25} is the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth.

a_{s50} is the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area.

t_{p75-25} is the time for the water level to fall from 75% to 25% effective storage depth.

The results obtained are summarised in Table 10.6. It was not possible to complete more than one test due to the slow infiltration rate.

Table 10.7 – Soakaway Test Results

Location	V_{p75-25} (m ³)	a_{s50} (m ²)	t_{p75-25} (s)	Infiltration Rate
				Test 1
SA303	0.483	3.212	7200	2.09x10 ⁻⁵

Given the presence of significant made ground thickness across the site with obstructions locally and also the high recorded groundwater level observed, infiltration by soakaways is not recommended.

10.8 Chemical Attack on Buried Concrete

The site has been classified in accordance with BRE Special Digest 1 (Ref. 16) and laboratory testing undertaken accordingly in *Section 6.6*. Based on the laboratory test results, the classification is detailed in *Table 10.8*.

Table 10.8 –Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class ⁽¹⁾
Made Ground	DS-1	AC-1
Glaciofluvial Deposits	DS-1	AC-1
Glacial Till	DS-1	AC-1
Chester Formation	DS-1	AC-1

(1) ACEC assessment was based on the *mobile* groundwater condition in a *brownfield* scheme area

11.0 Geo-environmental Conclusions & Recommendations

11.1 Conclusions

11.1.1 Ground Contamination

The environmental chemistry soil results have been compared with the Generic Assessment Criteria (GAC) for soils with respect to human health against “*Commercial*” thresholds.

With respect to the proposed end-use of the site, Tier 1 thresholds for PAHs were exceeded within BH302 and loose asbestos fibres were identified within BH302, BH303 and BH305 during laboratory screening.

A **Moderate/Low** risk rating is identified to site end-users and construction workers from direct contact and dermal uptake and/or inhalation and ingestion of soil derived dust. Dependent on the development plan either a suitable thickness of clean and inert capping or areas of hardstanding to break the source-pathway-receptor linkage between made ground soils on site containing PAHs and asbestos fibres. It is advised contractors have an asbestos management plan in place during groundworks and construction works are provided with suitable PPE and sanitary facilities.

11.1.2 Ground Gas Contamination

During the ground gas monitoring programme methane (CH₄) was recorded below the instrument’s detection limit within all the monitoring wells.

Maximum carbon dioxide (CO₂) concentrations were recorded at 8.9% in WS301 and gas flow recorded a maximum steady state flow rate of -17.1l/hr in WS303.

A Gas Screening Value of 0.342 l/hr for carbon dioxide, while methane was recorded below the detection limit. The site has therefore been classified as Characteristic Situation 2.

A **Moderate/Low** risk rating is identified to site end users from ground gases arising from Made Ground and natural soils migrating into buildings and subsequent inhalation by on-site employees. This corresponds to a Characteristic Gas Situation assessed as CS2, requiring gas protection measures.

11.2 Recommendations

Based on the findings of the ground investigation, the following recommendations are made:

- 1) CS2 ground gas protection measures required to new buildings.

- 1) Provision of a suitable thickness of clean and inert cover in all areas of soft landscaping. Details should be described in a Remediation Strategy.
- 2) Ensure risks to construction workers are suitably managed through PPE and environmental controls/management, to include an asbestos management plan.
- 3) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer.
- 4) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results.

12.0 References

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20001-CUR-ZZ-XX-RP-G-00001

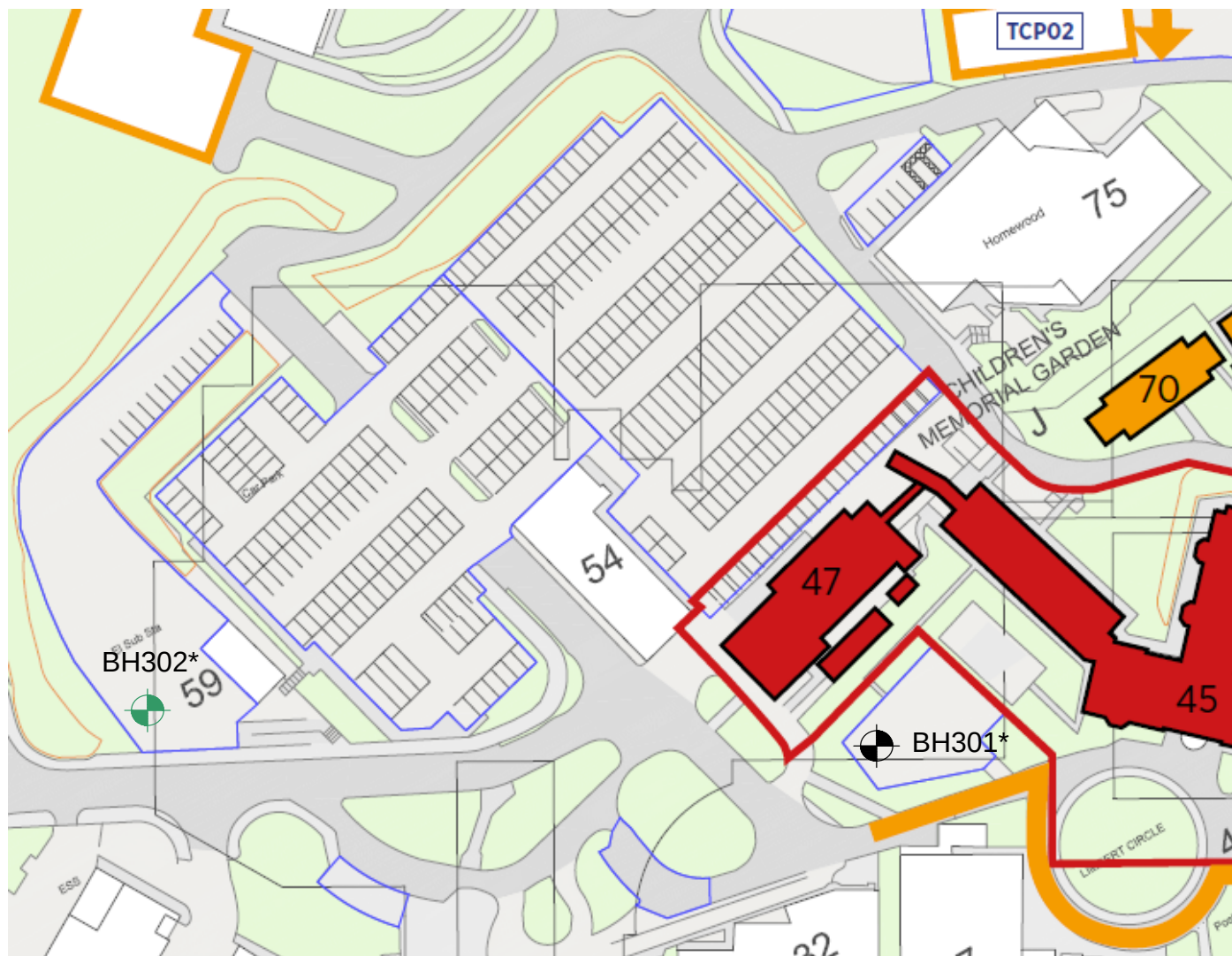
North Manchester General Hospital

Phase 2 Ground Investigation



Appendix A – Drawings

- *Acute Exploratory Hole Location Plan Stage 1*(September 2021), Curtins Drawing Ref. 20001-CUR-ZZ-XX-DR-G-00001
- *Acute Exploratory Hole Location Plan Stage 2 (September 2021)*, Curtins Drawing Ref. 20001-CUR-ZZ-XX-DR-G-00002



 CABLE PERCUSSIVE BOREHOLE TO 25M
FOLLOWED ON WITH OPEN HOLE ROTARY TO
35M

 CABLE PERCUSSIVE BOREHOLE TO 25M
FOLLOWED ON WITH OPEN HOLE ROTARY TO
50M

* MONITORING INSTALLATION

Rev:	Description:	Date:	By:	Chkd:
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Status:

INFORMATION

Project:

**NORTH MANCHESTER GENERAL HOSPITAL
ACUTE STAGE 1**

Drg Title:

EXPLORATORY HOLE LOCATION PLAN

Scale: NTS	Size: A3	First Issue: 13/09/21	Drawn: PN	Checked: RA
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Drg No: 20001-CUR-ZZ-XX-DR-G-00001	Rev:
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Appendix B – Exploratory Hole Logs

- Geobore S Borehole Logs – BH301 to BH302
- Geobore S Borehole Log with rotary core details – BH302
- BH301 Rock Core Photolog
- Cable Percussive Borehole Log – BH303 to BH307
- Window Sample Borehole Log – WS301 to WS305
- Soakaway Trial Pit Logs – SA302 to SA303



Rotary Core Log

Borehole No.

BH301

Sheet 1 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.05	ES				0.10	73.33		MADE GROUND: Dark grey slightly sandy subangular to rounded fine to coarse gravel of mixed lithologies including brick. Sand is medium to coarse. MADE GROUND: Light grey slightly sandy angular to subangular medium to coarse gravel of limestone/aggregate with low cobble content. Cobbles are angular of limestone. MADE GROUND: Light brown slightly gravelly medium to coarse sand. Gravel is subangular to subrounded fine to medium of mixed lithologies including brick. REWORKED GROUND?: Dark brown slightly sandy CLAY with rare gravel. Sand is medium to coarse. Gravel is subangular fine to medium of brick. Medium dense light brown slightly gravelly slightly gravelly medium to coarse SAND. Gravel is subrounded fine to medium of coal.	
							0.33	73.10			
							0.70	72.73			
							1.10	72.33			1
		2.00 - 2.45	B								
							3.00	70.43			2
		4.00 4.00 - 4.45	D U								
											3
											4
											5
											6
							6.00	67.43			7
		6.50 - 6.95	B								8
											9
											10

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 2 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		11.00 - 11.45	U				10.50	62.93		Stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to rounded, fine to coarse of mixed lithologies including sandstone.	11
		14.50 - 14.95	U								12
		17.00 - 17.45	D				17.00	56.43		Very stiff brown sandy CLAY. Sand is medium to coarse.	17
		18.00	D								18
											19
											20

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 3 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		21.00 - 21.45	D								21
							23.00	50.43			22
							23.30	50.13			23
		23.50 - 23.95	D							Very dense reddish brown medium to coarse SAND.	24
										Very stiff brown sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.	25
											26
											27
							27.30	46.13			28
										Very stiff dark brown slightly silty slightly gravelly CLAY with moderate cobble content. Gravel is subrounded to well rounded medium to coarse including sandstone and mudstone. Cobbles are subangular of sandstone.	29
											30

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 4 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
							33.00	40.43		Very dense reddish brown medium to coarse SAND.	31
											32
											33
											34
											35
											36
											37
											38
											39
											40

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





BH301

Sheet 5 of 6

Project Name: NMGH Masterplanning

Project No.	076686.300
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Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
Well 1							47.30	26.13			41
											42
											43
		47.30 - 48.80			100	18	30			Highly weathered weak reddish brown medium to coarse grained SANDSTONE recovered as a medium to coarse slightly gravelly sand.	48
49.19 - 49.34 48.80 - 50.30	C S NI	100	84	56	49.30	24.13		Very weak reddish brown medium to coarse grained SANDSTONE. 48.70m to 49.03m 0 - 10 degrees very closely to closely spaced, planar rough From 49.03m to 49.18m recovered as non-intact core of medium to coarse slightly gravelly sand. 49.18m to 49.36m 1 no. discon 0 - 10 degrees planar rough Weak light reddish brown medium to coarse grained SANDSTONE.	49		
										Continued on next sheet	50

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 6 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		50.10 - 50.26	C				50.30	23.13		From 49.36m to 49.45m highly fractured 49.45m to 50.30m 0 - 10 degrees very closely to closely spaced, locally extremely planar rough End of borehole at 50.00 m	
											51
											52
											53
											54
											55
											56
											57
											58
											59
											60

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.



Client Name: Manchester University Foundation Trust		Project Name: North Manchester General Hospital Stage 1 Acute	Project No: B076686
No. 1	Date: 27/04/21	Description: BH301 Rock Logging Photographs 47.30m to 50.30m	





Borehole Log

Borehole No.

BH301

Sheet 1 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
CP

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.05	ES		0.10	73.33		MADE GROUND: Dark grey slightly sandy subangular to rounded fine to coarse gravel of mixed lithologies including brick. Sand is medium to coarse.	1
					0.33	73.10			
					0.70	72.73		MADE GROUND: Light grey slightly sandy angular to subangular medium to coarse gravel of limestone/aggregate with low cobble content. Cobbles are angular of limestone.	
		1.20		N=12 (1,2/2,3,3,4)	1.10	72.33		MADE GROUND: Light brown slightly gravelly medium to coarse sand. Gravel is subangular to subrounded fine to medium of mixed lithologies including brick.	2
		2.00 2.00 - 2.45	B	N=10 (2,4/3,2,2,3)				REWOKED GROUND?: Dark brown slightly sandy CLAY with rare gravel. Sand is medium to coarse. Gravel is subangular fine to medium of brick.	
		3.00		N=17 (4,3/3,4,5,5)	3.00	70.43		Medium dense light brown slightly gravelly slightly gravelly medium to coarse SAND. Gravel is subrounded fine to medium of coal.	3
		4.00 4.00 - 4.45	D U	Ublow=115				Firm light brown slightly sandy CLAY. Sand is fine to medium.	4
		5.00		N=13 (2,3/3,3,4,3)					5
		6.00			6.00	67.43			6
		6.50 6.50 - 6.95	B	N=20 (3,4/4,6,5,5)				Medium dense light brown fine SAND.	7
		8.00		N=17 (2,3/3,4,5,5)					8
		9.50		N=30 (4,5/6,7,8,9)					9
									10

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Borehole Log

Borehole No.

BH301

Sheet 2 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
CP

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		11.00 - 11.45	U	Ublow=130	10.50	62.93		Stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to rounded, fine to coarse of mixed lithologies including sandstone.	11
		13.00		N=23 (3,5/5,5,6,7)					12
		14.50 - 14.95	U	Ublow=125					13
		16.00		N=38 (4,7/8,9,10,11)					14
		17.00 - 17.45	D	Ublow=130	17.00	56.43		Very stiff brown sandy CLAY. Sand is medium to coarse.	15
		18.00	D						16
		19.00		N=19 (2,2/3,4,5,7)					17
									18
									19
									20

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Borehole Log

Borehole No.

BH301

Sheet 3 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
CP

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		20.30		N=50 (8,9/50 for 255mm)					
		21.00 - 21.45	D						21
		21.80		N=48 (10,12/13,12,11,12)					22
		23.30		50 (19,6/50 for 140mm)	23.00	50.43			23
		23.50 - 23.95	D		23.30	50.13		Very dense reddish brown medium to coarse SAND.	
								Very stiff brown sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.	24
		24.80		50 (25 for 110mm/50 for 165mm)					25
		26.30		50 (25 for 50mm/50 for 55mm)					26
		27.80		N=50 (9,11/50 for 255mm)	27.30	46.13			27
								Very stiff dark brown slightly silty slightly gravelly CLAY with moderate cobble content. Gravel is subrounded to well rounded medium to coarse including sandstone and mudstone. Cobbles are subangular of sandstone.	28
		29.30		50 (25 for 140mm/50 for 210mm)					29
									30

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.



Borehole Log

Borehole No.

BH301

Sheet 4 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
CP

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		30.80		N=50 (10,13/50 for 285mm)	33.00	40.43			31
		32.30		50 (25 for 125mm/50 for 195mm)				32	
		33.80		50 (10,13/50 for 180mm)				33	
		35.30		50 (25 for 130mm/50 for 175mm)				34	
		36.80		50 (25 for 75mm/50 for 185mm)				35	
		38.30		50 (25 for 75mm/50 for 130mm)				36	
		39.80		50 (25 for 45mm/50 for 65mm)				37	
								38	
Continued on next sheet									39
									40

Remarks

Remarks	Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.
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Borehole Log

Borehole No.

BH301

Sheet 5 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
CP

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		41.30		50 (25 for 65mm/50 for 75mm)					41
		42.80		50 (25 for 75mm/50 for 95mm)					42
		44.30		50 (25 for 100mm/50 for 105mm)					43
									44
									45
									46
					47.30	26.13			47
								Highly weathered weak reddish brown medium to coarse grained SANDSTONE recovered as a medium to coarse slightly gravelly sand.	48
								From 48.30m to 48.70m no recovery	
					48.70	24.73		Very weak reddish brown medium to coarse grained SANDSTONE.	49
								48.70m to 49.03m 0 - 10 degrees very closely to closely spaced, planar rough	
								From 49.03m to 49.18m recovered as non-intact core of medium to coarse slightly gravelly sand.	
								49.18m to 49.36m 1 no. discon 0 - 10 degrees planar rough	
					49.30	24.13		Weak light reddish brown medium to coarse grained SANDSTONE.	50
								Continued on next sheet	

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Borehole Log

Borehole No.

BH301

Sheet 6 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
CP

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		50.10 - 50.26	C		50.30	23.13		From 49.36m to 49.45m highly fractured 49.45m to 50.30m 0 - 10 degrees very closely to closely spaced, locally extremely, planar rough End of borehole at 50.00 m	
									51
									52
									53
									54
									55
									56
									57
									58
									59
									60

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Borehole Log

Borehole No.

BH302

Sheet 1 of 4

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384880.80 - 402524.96

Hole Type
CP

Location: North Manchester General Hospital

Level: 69.33

Scale
1:50

Client: Bruntwood

Dates: 22/04/2021 - 27/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	69.23	ASPHALT		
		0.30			0.30	69.03	MADE GROUND: Light grey slightly sandy angular to subangular medium to coarse gravel of limestone/aggregate with low cobble content. Cobbles are angular of limestone.		
		0.90			0.90	68.43	MADE GROUND: Dark brown sandy angular to subangular fine to coarse gravel of brick, ash, clinker, slate and sandstone. Hydrocarbon odour.		1
		1.20		N=10 (2,2/3,2,2,3)			Firm brown with green/grey bands slightly silty CLAY with frequent sand bands. Sand is fine to medium.		
		2.00		N=15 (2,4/4,4,3,4)					2
		2.20 - 2.65	B		2.20	67.13	Medium dense brown medium to coarse SAND with rare gravel. Gravel is subangular to subrounded fine to coarse including sandstone.		
		3.00		N=23 (3,4/5,5,6,7)					3
		4.00		N=10 (2,2/3,2,3,2)					4
		4.00 - 4.45	B						
		5.00		N=19 (3,4/5,5,5,4)					5
		5.00 - 5.45	D						
		6.00		N=12 (3,3/2,3,3,4)					6
		6.00 - 6.45	B						
		6.70			6.70	62.63	Stiff brown very sandy CLAY with frequent gravel. Gravel is subangular to rounded fine to coarse of sandstone.		7
		7.50 - 7.95	U	Ublow=130	7.50	61.83	Stiff brown silty slightly sandy laminated CLAY. Sand is fine.		8
		9.00		N=27 (3,4/5,6,7,9)					9
									10

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater encountered at 10.50m bgl, rising to 9.50m bgl after 20 minutes.





Borehole Log

Borehole No.

BH302

Sheet 2 of 4

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384880.80 - 402524.96

Hole Type
CP

Location: North Manchester General Hospital

Level: 69.33

Scale
1:50

Client: Bruntwood

Dates: 22/04/2021 - 27/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50	B	N=30 (4,5/6,7,8,9)	10.50	58.83		Dense brown fine to coarse SAND.	11
		10.50 - 10.95							
		12.00 - 12.45	U	Ublow=125	11.90	57.43		Very stiff brown slightly silty laminated CLAY.	12
									13
		13.50		N=33 (4,6/8,8,9,8)	13.50	55.83		Very stiff brown silty CLAY with frequent sand bands. Sand is fine to medium.	14
									15
		15.00 - 15.45	U	Ublow=120					16
									17
		16.50		N=26 (3,4/5,6,7,8)					18
									19
		18.00 - 18.45	U	Ublow=120					20
		19.50		N=26 (4,5/6,6,7,7)					

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater encountered at 10.50m bgl, rising to 9.50m bgl after 20 minutes.





Borehole Log

Borehole No.

BH302

Sheet 3 of 4

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384880.80 - 402524.96

Hole Type
CP

Location: North Manchester General Hospital

Level: 69.33

Scale
1:50

Client: Bruntwood

Dates: 22/04/2021 - 27/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		21.00	B	N=50 (7,8/50 for 240mm)	21.00	48.33		Very dense brown fine SAND.	21	
		21.00 - 21.45							22	
		22.50 - 22.95	U	Ublow=130	22.50	46.83		Very stiff brown sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.	23	
		24.00		N=50 (7,9/50 for 265mm)		24				
		25								
		26.00		50 (25 for 75mm/50 for 145mm)	26.40	42.93				NO RECOVERY: LOSS OF FLUSH
		27								
		27.50		30 (25 for 75mm/30 for 75mm)						27
		28								
		29.00		50 (11,13/50 for 200mm)						29
30										
									Continued on next sheet	30

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater encountered at 10.50m bgl, rising to 9.50m bgl after 20 minutes.





Borehole Log

Borehole No.

BH302

Sheet 4 of 4

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384880.80 - 402524.96

Hole Type
CP

Location: North Manchester General Hospital

Level: 69.33

Scale
1:50

Client: Bruntwood

Dates: 22/04/2021 - 27/04/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		30.50		50 (25 for 75mm/50 for 135mm)					31
		32.00		50 (21,4/50 for 85mm)					
		33.50		50 (25 for 75mm/50 for 30mm)					
					35.00	34.33		End of borehole at 35.00 m	35
									36
									37
									38
									39
									40

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater encountered at 10.50m bgl, rising to 9.50m bgl after 20 minutes.





Borehole Log

Borehole No.

BH303

Sheet 1 of 4

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384960.44 - 402450.35

Hole Type
CP

Location: Manchester

Level: 72.17

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 1.00	B		0.10	72.07		TOPSOIL: Grass over slightly gravelly sandy clay with frequent rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone and brick.	
		0.60	ES					MADE GROUND: Black gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of brick.	
		1.20		N=2 (1,0/1,0,1,0)	1.10	71.07		Loose brown slightly gravelly fine to coarse SAND with thin bands of clay. Gravel is angular to subangular fine to coarse of sandstone.	1
		1.20 - 1.65 1.20 - 1.65	B D						
		2.00 - 2.45 2.00 - 2.45	B D						2
		3.00		N=7 (1,1/1,2,2,2)					3
		3.00 - 3.45 3.00 - 3.45	B D						
		4.00		N=17 (1,2/3,4,5,5)					4
		4.00 - 4.45 4.00 - 4.45	B D					From 4.00 to 5.70m medium dense.	
		5.50		N=13 (1,2/2,3,4,4)					5
		5.50 - 5.95 5.50 - 5.95	B D		5.70	66.47			
		7.00		N=12 (1,2/2,3,3,4)				Medium dense brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of sandstone.	6
		7.00 - 7.45 7.00 - 7.45	B D						7
									8

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater seepage at 16.40m bgl and strike at 26.40m bgl. Terminated at 31.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH303

Sheet 2 of 4

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384960.44 - 402450.35

Hole Type
CP

Location: Manchester

Level: 72.17

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		8.50 8.50 - 8.95 8.50 - 8.95	B D	N=13 (1,2/3,3,3,4)	8.80	63.37			
		10.00 10.00 - 10.45 10.00 - 10.45	B D	N=16 (2,3/4,4,4,5)				Medium dense brown silty fine to coarse SAND.	9
		11.50 11.50 - 11.95 11.50 - 11.95	B D	N=21 (2,3/4,5,6,6)					10
		12.00	D		12.00	60.17			11
		13.00 13.00 - 13.45 13.00 - 13.45	B D	N=22 (2,4/4,5,6,7)				Stiff sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of sandstone.	12
		14.50 - 14.95	U	Ublow=80	14.60	57.57			13
		15.00	D					Stiff brown sandy silty CLAY. Sand is fine to coarse.	14
		16.00		N=30 (2,3/6,7,8,9)					15
								Continued on next sheet	16

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater seepage at 16.40m bgl and strike at 26.40m bgl. Terminated at 31.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH303

Sheet 3 of 4

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384960.44 - 402450.35

Hole Type
CP

Location: Manchester

Level: 72.17

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		16.00 - 16.45	B						
		16.00 - 16.45	D						
		16.70	D		16.70	55.47		From 16.40 to 16.70m occasional sand lenses.	
		17.50 - 17.95	U	Ublow=75				Stiff brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	17
		18.00	D						18
		19.00							
		19.00 - 19.95	B	N=19 (2,3/3,4,5,7)	19.00	53.17		Stiff sandy silty CLAY. Sand is fine to coarse.	19
		19.00 - 19.95	D						
		20.50 - 20.95	U	Ublow=75					20
		21.00	D						21
		22.00							
		22.00 - 22.45	B	N=23 (2,3/4,5,7,7)					22
		22.00 - 22.45	D						
		23.50 - 23.95	U	Ublow=80					23
		23.50 - 24.00	B						24

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater seepage at 16.40m bgl and strike at 26.40m bgl. Terminated at 31.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH303

Sheet 4 of 4

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384960.44 - 402450.35

Hole Type
CP

Location: Manchester

Level: 72.17

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		25.00		N=50 (5,7/50 for 295mm)	24.90	47.27		Very dense brown fine to coarse SAND.	25
		25.00 - 25.45	B						
		25.00 - 25.45	D						
		26.50		50 (7,10/50 for 225mm)	26.40	45.77		Very dense brown SAND and GRAVEL. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	26
		26.50 - 26.95	B						
		26.50 - 26.95	D						
		27.20	D		27.20	44.97		Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	27
		28.00 - 28.45	U	Ublow=90					
		28.50	D						
		29.50		N=31 (4,6/7,7,8,9)	29.40	42.77		Very stiff brown slightly sandy silty CLAY. Sand is fine to coarse.	28
		29.50 - 29.95	B						
		29.50 - 29.95	D						
		31.00 - 31.45	U	Ublow=80					29
		31.00 - 31.45							
		31.50	D		31.30	40.87		Very dense brown clayey fine to coarse SAND.	30
		31.50			31.50	40.67		Very dense brown clayey fine to coarse SAND.	31
								End of borehole at 31.50 m	32

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater seepage at 16.40m bgl and strike at 26.40m bgl. Terminated at 31.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH304

Sheet 1 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384891.53 - 402486.22

Hole Type
CP

Location: Manchester

Level: 68.03

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES		0.40	67.63		TOPSOIL: Grass over brown slightly gravelly sandy clay with frequent rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to medium of sandstone and concrete.	
		0.50	D					MADE GROUND: Brown gravelly fine to coarse sand with frequent rebar and low cobble content. Gravel is angular to subangular fine to coarse of concrete, brick and sandstone. Cobbles are angular to subangular of brick and concrete.	
		1.10	D		1.00	67.03		Soft brown very sandy CLAY. Sand is fine to coarse.	1
		1.20	D					From 1.00 to 1.20m sandy.	
		2.00	D		2.00	66.03		Loose to medium dense brown silty fine to coarse SAND.	2
		3.00	B		3.00	65.03		Medium dense gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of sandstone.	3
		3.00 - 3.45		N=11 (2,2/2,3,3,3)					
		4.00		N=15 (2,3/3,4,4,4)					4
		5.00		N=18 (2,3/4,4,5,5)					5
		6.00		N=15 (2,3/3,4,4,4)					6
		6.70	D		6.70	61.33		Stiff brown gravelly silty CLAY. Gravel is angular to subangular fine to medium of sandstone.	7
		7.50 - 7.95	U						
				Ublow=130					
		8.00	D						8

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 27m bgl. Terminated at 32.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH304

Sheet 2 of 5

Project Name: North Manchester General
Hospital Stage 2Project No.
076686.301

Co-ords: 384891.53 - 402486.22

Hole Type
CP

Location: Manchester

Level: 68.03

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		9.00 9.00 - 9.45	B	N=33 (6,6/9,9,7,8)	9.00	59.03			9
		10.00 - 10.50	B						10
		10.50 - 10.95 10.50 - 10.95	B U	Ublow=125					11
		12.00 12.00 - 12.45	B	N=26 (2,3/6,5,8,7)	12.20	55.83			12
		13.20	D						13
		13.50 - 13.95	U	Ublow=130					14
		14.00	D						15
		15.00		N=38 (5,7/9,9,10,10)					16

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 27m bgl. Terminated at 32.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH304

Sheet 3 of 5

Project Name: North Manchester General
Hospital Stage 2Project No.
076686.301

Co-ords: 384891.53 - 402486.22

Hole Type
CP

Location: Manchester

Level: 68.03

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		16.50 - 16.95	U	Ublow=135	18.00	50.03		Stiff brown silty CLAY with frequent sand lenses. Sand is fine to coarse.	17
		17.00	D						
		18.00	D	N=30 (4,5/7,7,8,8)					18
		18.00							
		19.50 - 19.95	U	Ublow=130					19
		20.00	D						20
		21.00							
		21.00 - 21.45	B	N=19 (5,5/5,5,4,5)	21.00	47.03		Medium dense brown silty fine to medium SAND.	21
									22
		22.50		N=23 (5,6/5,6,6,6)					23
		24.00		N=13 (2,3/3,3,4,3)	24.00	44.03			24

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 27m bgl. Terminated at 32.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH304

Sheet 4 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384891.53 - 402486.22

Hole Type
CP

Location: Manchester

Level: 68.03

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		24.00 - 24.45	B					Stiff brown sandy CLAY. Sand is fine to coarse. From 24.00 to 25.00m soft to firm	25
		25.50 - 25.95	U	Ublow=120					26
		26.00	D						27
		27.00		N=50 (9,10/50 for 295mm)	27.00	41.03			28
		27.00 - 27.45	B					Very dense brown SAND and GRAVEL with low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone. Cobbles are subangular to subrounded of sandstone.	29
		28.50		N=50 (11,12/50 for 275mm)					30
		28.50 - 28.95	D						31
		30.00		50 (15,10/50 for 195mm)					32
		30.00 - 30.45	B						
		31.00		50 (15,10/50 for 165mm)	31.00	37.03			
		31.00 - 31.45	B					Very dense brown fine to coarse SAND.	
								Continued on next sheet	

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 27m bgl. Terminated at 32.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH304

Sheet 5 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384891.53 - 402486.22

Hole Type
CP

Location: Manchester

Level: 68.03

Scale
1:40

Client: MFT

Dates: 07/06/2021 - 10/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		32.50		50 (18,7/50 for 150mm)	32.50	35.53		End of borehole at 32.50 m	33
									34
									35
									36
									37
									38
									39
									40

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 27m bgl. Terminated at 32.50m bgl due to surging of silt/sand material up the casing - unable to advance deeper.





Borehole Log

Borehole No.

BH305

Sheet 1 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385026.94 - 402507.59

Hole Type
CP

Location: Manchester

Level: 72.04

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	71.94		MADE GROUND: Tarmacadam.	
		0.30 0.35	D ES					MADE GROUND: Brick and concrete layer with ash and scrap metal.	
		1.20 1.20 - 1.65	D	N=18 (7,6/5,6,4,3)					1
		1.70	D		1.70	70.34		MADE GROUND: Brown gravelly silty CLAY. Gravel is angular to subangular fine to coarse of brick.	2
		2.00 2.00 - 2.45	B	N=15 (2,2/3,3,4,5)					
		2.60	D		2.60	69.44		Firm brown silty CLAY.	
		3.00 - 3.45	U	Ublow=110					3
		3.50 3.50 - 4.00	D B		3.50	68.54		Medium dense brown silty fine to coarse SAND.	
		4.00		N=21 (3,4/5,5,5,6)					4
		5.00		N=22 (3,4/5,6,5,6)					5
		6.00		N=12 (2,2/2,3,3,4)					6
		6.50 - 7.00	B					From 6.00 to 7.50m loose.	
		7.50		N=18 (2,3/4,4,5,5)					7
									8

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 9.20m, 14.20m and 24.00m bgl.





Borehole Log

Borehole No.

BH305

Sheet 2 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385026.94 - 402507.59

Hole Type
CP

Location: Manchester

Level: 72.04

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		9.00		N=7 (2,1/1,1,2,3)				<i>From 9.00 to 10.50m loose.</i>	9
		10.50 - 10.95	U	Ublow=120	10.50	61.54		Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	10
		11.00	D						11
		12.00		N=32 (4,5/5,7,10,10)				<i>From 12.00 to 14.20m silty sand bands present.</i>	12
		13.50 - 13.95	U	Ublow=120					13
		14.00	D						14
		14.20 - 14.65	B		14.20	57.84		Medium dense brown silty fine to coarse SAND.	
		15.00		N=16 (2,3/3,4,4,5)					15
		15.60	D		15.60	56.44		Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to medium of sandstone.	16
								Continued on next sheet	

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 9.20m, 14.20m and 24.00m bgl.





Borehole Log

Borehole No.

BH305

Sheet 3 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385026.94 - 402507.59

Hole Type
CP

Location: Manchester

Level: 72.04

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		16.50 - 16.95	U	Ublow=125	18.00	54.04		Very stiff brown silty CLAY with occasional sand lenses. Sand is fine to coarse. Slightly laminated.	17
		17.00	D						
		18.00	D						18
		18.00		N=35 (6,7/8,8,9,10)					
		19.50 - 19.95	U	Ublow=130					19
		20.00	D						20
		21.00	D						21
		21.00		N=33 (5,6/33 for 275mm)					22
		22.50 - 22.95	U	Ublow=120					23
		23.00	D						24
					24.00	48.04		Continued on next sheet	

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 9.20m, 14.20m and 24.00m bgl.





Borehole Log

Borehole No.

BH305

Sheet 4 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385026.94 - 402507.59

Hole Type
CP

Location: Manchester

Level: 72.04

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		24.00		41 (12,13/41 for 235mm)				Very dense brown silty fine to medium SAND.	
		24.00 - 24.45	B						25
		25.50		N=50 (10,15/50 for 200mm)	26.00	46.04			
		26.60 - 27.00	B					Very dense brown SAND and GRAVEL with low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone. Cobbles are subangular to subrounded of sandstone.	26
		27.00		N=50 (10,11/13,13,15,9)					27
		27.00 - 27.45	D						
		27.70 - 28.00	B		27.70	44.34		Very stiff brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	28
		28.50 - 28.95	U	Ublow=130					
		29.00	D						29
		30.00	D		30.00	42.04		Very stiff brown slightly sandy silty CLAY with occasional sand lenese. Sand is fine to coarse.	30
		30.00		N=35 (6,7/8,9,9,9)					
		31.50 - 31.95	U	Ublow=130					31
		32.00	D						32

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 9.20m, 14.20m and 24.00m bgl.





Borehole Log

Borehole No.

BH305

Sheet 5 of 5

Project Name: North Manchester General
Hospital Stage 2Project No.
076686.301

Co-ords: 385026.94 - 402507.59

Hole Type
CP

Location: Manchester

Level: 72.04

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		33.00		N=38 (5,7/9,10,9,10)					33
									34
					35.00	37.04			35
									36
									37
									38
									39
									40

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 9.20m, 14.20m and 24.00m bgl.





Borehole Log

Borehole No.

BH306

Sheet 2 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385004.08 - 402518.91

Hole Type
CP

Location: Manchester

Level: 71.69

Scale
1:40

Client: MFT

Dates: 17/06/2021 - 22/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		9.00		N=13 (1,2/3,4,3,3)	9.40	62.29			9
		10.50 - 10.95	U	Ublow=120				Firm brown slightly gravelly silty CLAY. Gravel is angular to subangular fine to medium of sandstone.	10
		11.00 11.00 - 11.50	D B		11.00	60.69		Stiff brown slightly gravelly silty CLAY. Gravel is angular to subangular fine to medium of sandstone.	11
		12.00 12.00 - 12.45	B	N=50 (7,8/50 for 280mm)	12.00	59.69		Very stiff brown sandy CLAY with occasional sand lenses. Sand is fine to coarse.	12
		13.50 - 13.95 13.50 - 13.95	B U	Ublow=110					13
		15.00 15.00 - 15.45	B	50 (6,8/50 for 225mm)	15.00	56.69		Very dense brown silty fine to coarse SAND.	15
								Continued on next sheet	16

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 13.70m, 29.00m and 30.00m bgl.





Borehole Log

Borehole No.

BH306

Sheet 3 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385004.08 - 402518.91

Hole Type
CP

Location: Manchester

Level: 71.69

Scale
1:40

Client: MFT

Dates: 17/06/2021 - 22/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		16.50 - 16.95	U	Ublow=130	16.50	55.19		Very stiff brown slightly gravelly silty CLAY with occasional sand lenses. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	17
		17.00	D						
		18.00							
		18.00 - 18.45	B	N=34 (8,10/8,7,9,10)	18.00	53.69		Very stiff brown sandy silty CLAY with frequent sand lenses. Sand is fine to coarse.	18
		19.50 - 19.95	U	Ublow=130					19
		20.00	D						20
		21.00	D	N=28 (5,6/6,7,7,8)					21
		21.00							
		22.50 - 22.95	U	Ublow=130					22
		23.00	D		23.00	48.69			23
								Very stiff brown laminated sandy silty CLAY. Sand is fine to coarse.	24

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 13.70m, 29.00m and 30.00m bgl.





Borehole Log

Borehole No.

BH306

Sheet 5 of 5

Project Name: North Manchester General
Hospital Stage 2Project No.
076686.301

Co-ords: 385004.08 - 402518.91

Hole Type
CP

Location: Manchester

Level: 71.69

Scale
1:40

Client: MFT

Dates: 17/06/2021 - 22/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		32.50 - 32.95	B	N=50 (8,9/50 for 275mm)	32.50	39.19		Very dense brown fine to coarse SAND.	33
		33.00					34		
		34.50		50 (10,12/50 for 215mm)	35.00	36.69			35
		34.50 - 34.95	B						
									37
									38
									39
									40

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strike at 13.70m, 29.00m and 30.00m bgl.





Borehole Log

Borehole No.

BH307

Sheet 1 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384991.62 - 402548.02

Hole Type
CP

Location: Manchester

Level: 71.66

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 1.20	B		0.10	71.56		MADE GROUND: Tarmacadam. MADE GROUND: Stone, brick and concrete layer.	
		1.20 1.20 - 1.65 1.20 - 1.65	B D	N=38 (5,7/14,7,5,12)					1
		2.00 2.00 - 2.45 2.00 - 2.45	B D	N=7 (3,4/3,2,1,1)	2.20	69.46		Loose brown clayey fine to coarse SAND.	2
		2.50	D						
		3.00 3.00 - 3.45 3.00 - 3.45	B D	N=7 (1,1/2,2,1,2)	3.00	68.66		Soft brown sandy CLAY. Sand is fine to coarse.	3
		4.00 - 4.45	U	Ublow=55	4.00	67.66		Medium dense brown silty fine to coarse SAND.	4
		4.50	D						5
		5.50 5.50 - 5.95 5.50 - 5.95	B D	N=11 (1,2/2,3,3,3)					6
		7.00 7.00 - 7.45 7.00 - 7.45	B D	N=10 (1,1/2,2,3,3)					7
								Continued on next sheet	8

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 13.20m, 24.90m and 31.30m bgl. Terminated at 32.50m bgl due to sand, gravel and cobble layer - unable to advance deeper.





Borehole Log

Borehole No.

BH307

Sheet 2 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384991.62 - 402548.02

Hole Type
CP

Location: Manchester

Level: 71.66

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		8.50 8.50 - 8.95 8.50 - 8.95	B D	N=21 (2,3/4,5,6,6)	8.60	63.06		Firm brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	9
		9.00	D						
		10.00 - 10.45	U	Ublow=60	10.20	61.46		Firm brown sandy silty CLAY. Sand is fine to coarse.	10
		10.50	D						11
		11.50 11.50 - 11.95 11.50 - 11.95	B D	N=18 (1,2/3,4,5,6)	11.20	60.46		Medium dense brown clayey fine to coarse SAND.	
		12.00	D		12.00	59.66			12
		13.00 - 13.45	U	Ublow=55	13.20	58.46		Stiff brown sandy silty CLAY. Sand is fine to coarse.	13
		13.50	D						14
		14.50 14.50 - 14.95 14.50 - 14.95	B D	N=22 (2,3/4,5,6,7)					15
		15.20	D		15.20	56.46		Stiff brown sandy silty CLAY. Sand is fine to coarse.	
		16.00 - 16.45	U	Ublow=80					16

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 13.20m, 24.90m and 31.30m bgl. Terminated at 32.50m bgl due to sand, gravel and cobble layer - unable to advance deeper.





Borehole Log

Borehole No.

BH307

Sheet 3 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384991.62 - 402548.02

Hole Type
CP

Location: Manchester

Level: 71.66

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		16.50	D						
		17.50 17.50 - 17.95 17.50 - 17.95	B D	N=25 (2,4/5,6,7,7)					17
		19.00 19.00 - 19.45 19.00 - 19.45	B D	N=25 (3,4/4,6,7,8)					18
		20.50 - 20.95	U	Ublow=75					19
		21.00	D						20
		22.00 22.00 - 22.45 22.00 - 22.45	B D	N=26 (2,4/5,6,7,8)					21
		23.50 - 23.95	U	Ublow=80					22
		24.00	D						23
									24

From 23.60 to 24.90m no silt.

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 13.20m, 24.90m and 31.30m bgl. Terminated at 32.50m bgl due to sand, gravel and cobble layer - unable to advance deeper.





Borehole Log

Borehole No.

BH307

Sheet 4 of 5

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384991.62 - 402548.02

Hole Type
CP

Location: Manchester

Level: 71.66

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		25.00 25.00 - 25.45 25.00 - 25.45	B D	N=23 (3,4/5,5,6,7)	24.90	46.76		Medium dense brown clayey silty fine to coarse SAND with occasional sand bands.	25	
		26.50 26.50 - 26.95 26.50 - 26.95	B D	N=25 (2,4/5,6,7,7)	26.90	44.76			27	
		27.00	D	Ublow=70				28.20	43.46	
		28.00 - 28.45	U		N=22 (2,3/4,5,6,7)	29.30	42.36			
		28.50	D	Ublow=90				31.30	40.36	
		29.50 29.50 - 29.95 29.50 - 29.95	B D		N=37 (4,5/7,9,10,11)					
		31.00 - 31.45 31.00 - 31.50	U B							
				32.00						
		Continued on next sheet								

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 13.20m, 24.90m and 31.30m bgl. Terminated at 32.50m bgl due to sand, gravel and cobble layer - unable to advance deeper.





Borehole Log

Borehole No.

BH307

Sheet 5 of 5

Project Name: North Manchester General
Hospital Stage 2Project No.
076686.301

Co-ords: 384991.62 - 402548.02

Hole Type
CP

Location: Manchester

Level: 71.66

Scale
1:40

Client: MFT

Dates: 11/06/2021 - 16/06/2021

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		32.00 - 32.45	D						
					32.50	39.16		End of borehole at 32.50 m	
									33
									34
									35
									36
									37
									38
									39
									40

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater strikes at 13.20m, 24.90m and 31.30m bgl.
Terminated at 32.50m bgl due to sand, gravel and cobble layer - unable to advance deeper.





Borehole Log

Borehole No.

WS301

Sheet 1 of 1

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384994.81 - 402586.00

Hole Type
WS

Location: Manchester

Level: 73.55

Scale
1:50

Client: MFT

Dates: 25/05/2021 - 25/05/2021

Logged By
RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	73.40		TOPSOIL: Grass over dark brown very silty clay with frequent rootlets.	
		0.49	ES		0.49	73.06		Dark brown slightly gravely silty clay with occasional rootlets. Gravel is coarse and angular of brick.	
		1.00			1.00	72.55		Medium dense brown slightly clayey fine to medium SAND.	1
		1.20		N=1 (1,0/0,1,0,0)				Very soft brown very sandy CLAY.	
		2.00		N=16 (1,3/3,4,4,5)	2.00	71.55		Firm brown slightly sandy CLAY.	2
		3.00		N=10 (2,3/3,2,2,3)					3
		3.00 - 3.45	D						
		4.00		N=9 (1,2/2,2,3,2)					4
		5.00		N=13 (2,2/3,3,3,4)					5
		5.45			5.45	68.10		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

Service clearance handpit to 1.20m bgl. Groundwater seepage noted at 3.00m bgl.





Borehole Log

Borehole No.

WS302

Sheet 1 of 1

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385001.00 - 402500.00

Hole Type
WS

Location: Manchester

Level: 72.07

Scale
1:50

Client: MFT

Dates: 26/05/2021 - 26/05/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.35	ES		0.10 0.20 0.30	71.97 71.87 71.77		ASPHALT	
					0.70 0.85	71.37 71.22		MADE GROUND: Light brown/grey slightly sandy angular to subangular medium to coarse gravel of limestone. Sand is medium to coarse.	
		1.20		N=2 (1,2/1,0,0,1)	1.40	70.67		MADE GROUND: Light grey/brown sandy angular to subrounded fine to coarse gravel including brick and limestone with moderate cobble content. Cobbles are angular of brick.	1
					1.83	70.24		MADE GROUND: Reddish brown medium to coarse gravelly sand. Gravel is angular to subrounded medium to coarse of brick.	
		2.00		N=22 (3,3/5,5,6,6)	2.00	70.07		MADE GROUND: Black sandy gravelly clay. Sand is medium to coarse. Gravel is angular to subrounded fine to coarse including brick, concrete and sandstone.	2
		2.00 - 2.35	D		2.40	69.67		Loose orange/brown fine to medium SAND with rare gravel including brick and coal.	
		2.50		N=47 (11,8/10,10,11,16)	2.60	69.47		Soft brown grey CLAY with bands of light brown medium to coarse sand.	
								Firm brown slightly sandy CLAY. Sand is fine to medium.	3
								Stiff brown grey CLAY with bands of light brown medium to coarse sand.	
								Firm brown slightly sandy CLAY. Sand is fine to medium.	
		4.00		N=27 (4,4/3,4,9,11)	4.00	68.07		Dense light brown slightly clayey fine to medium SAND.	4
					4.60	67.47		Stiff brown very sandy CLAY. Sand is fine to medium.	
		5.00		N=26 (7,5/5,7,7,7)				Dense light brown medium to coarse SAND.	5
					5.45	66.62		End of borehole at 5.45 m	6

Remarks

Service clearance handpit to 1.20m bgl. No groundwater encountered.





Borehole Log

Borehole No.

WS303

Sheet 1 of 1

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384940.00 - 402508.00

Hole Type
WS

Location: Manchester

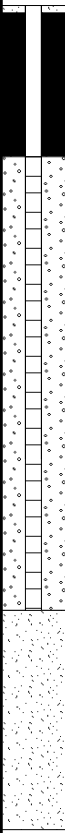
Level: 71.55

Scale
1:50

Client: MFT

Dates: 25/05/2021 - 25/05/2021

Logged By
RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.07			0.07	71.48		ASPHALT	
		0.35	ES		0.35	71.20		MADE GROUND: Brown/grey gravel. Gravel is medium to coarse and angular to sub-angular of concrete.	
		1.20		N=10 (1,2/2,2,3,3)	0.95	70.60		MADE GROUND: Dark brown very sandy gravel with frequent cobbles. Gravel is medium to coarse and angular to sub-angular of tarmac, concrete, glass and brick. Cobbles are angular of brick.	1
		2.00 2.00 - 3.00	B	N=18 (3,4/3,4,5,6)				Medium dense brown slightly clayey fine to medium SAND.	2
		3.00		N=30 (3,5/6,7,7,10)					3
		4.00		N=42 (6,8/7,10,11,14)					4
		5.00		N=20 (3,2/3,3,6,8)					5
					5.45	66.10		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

Service clearance handpit to 1.20m bgl. Damp material noted at 4.00m bgl.





Borehole Log

Borehole No.

WS304

Sheet 1 of 1

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384930.00 - 402536.00

Hole Type
WS

Location: Manchester

Level: 71.79

Scale
1:50

Client: MFT

Dates: 25/05/2021 - 25/05/2021

Logged By
RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.07	ES	N=1 (1,0/0,1,0,0) N=6 (1,2/2,1,1,2)	0.07	71.72		ASPHALT	1
		0.35			0.35	71.44		MADE GROUND: Brown/grey gravel. Gravel is medium to coarse and angular to sub-angular of concrete.	
		1.20						MADE GROUND: Dark brown very sandy gravel with frequent cobbles. Gravel is medium to coarse and angular to sub-angular of tarmac, concrete, glass and brick. Cobbles are angular of brick.	
		2.00							
					3.00	68.79		End of borehole at 3.00 m	3
									4
									5
									6
									7
									8
									9
									10

Remarks

Service clearance handpit to 1.20m bgl. No groundwater strikes recorded. Borehole terminated at 3.00m bgl due to borehole collapsed to 2.20m bgl.





Borehole Log

Borehole No.

WS305

Sheet 1 of 1

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 385007.00 - 402536.00

Hole Type
WS

Location: Manchester

Level: 71.86

Scale
1:50

Client: MFT

Dates: 26/05/2021 - 26/05/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	71.76		ASPHALT	
		0.35			0.35	71.51		MADE GROUND: INTACT BRICKS	
		0.70			0.70	71.16		MADE GROUND: Black gravelly medium to coarse sand with high ash content. Gravel is angular to subangular medium to coarse including brick, slate and concrete.	
		0.85			0.85	71.01		MADE GROUND: Brown slightly sandy clay with frequent rootlets. (Relic topsoil)	1
		1.00			1.00	70.86		Loose orange/brown fine to medium SAND with rare gravel including brick and coal.	
		1.20		N=7 (1,2/2,1,2,2)				Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to rounded fine to medium including sandstone.	
		2.00			1.80	70.06		Medium dense light brown/orange slightly clayey medium to coarse SAND.	2
		2.00 - 2.45	B	N=20 (1,2/4,6,5,5)					
		2.55			2.55	69.31		Firm grey mottled brown sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse including mudstone and sandstone.	3
		3.00		N=8 (1,1/2,1,3,2)					
		3.00 - 3.45	D		3.25	68.61		Dense orange medium slightly gravelly medium to coarse SAND. Gravel is subangular to rounded fine to coarse including sandstone.	4
		4.00		N=28 (5,5/5,7,8,8)					5
		5.00		N=19 (4,4/4,5,5,5)					6
		5.45			5.45	66.41		End of borehole at 5.45 m	7
									8
									9
									10

Remarks

Service clearance handpit to 1.20m bgl. Groundwater seepage noted at 3.50m bgl.



Appendix C – Chemical Laboratory Testing Results

- Envirolab, Environmental Chemistry Analysis Results, Soils
 - Final Analytical Test Report Ref. 21-03330-1
 - Final Analytical Test Report Ref. 21-04469-1
 - Final Analytical Test Report Ref. 21-05861-2
 - Final Analytical Test Report Ref. 21-06361-1
 - Final Analytical Test Report Ref. 21-06795-1
 - Final Analytical Test Report Ref. 21-06845-1

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/03330
Issue Number: 1
Date: 13 April, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Philippa Neesham/Rob Allen
Project Name: NMGH - Acute + Enabling
Project Ref: 076686
Order No: EBMA2778
Date Samples Received: 29/03/21
Date Instructions Received: 30/03/21
Date Analysis Completed: 13/04/21

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Danielle Brierley
Client Manager

Envirolab Job Number: 21/03330

Client Project Name: NMGH - Acute + Enabling

Client Project Ref: 076686

Lab Sample ID	21/03330/1	21/03330/2	21/03330/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP202	CP202	CP301							
Depth to Top	0.60	3.00	0.05							
Depth To Bottom										
Date Sampled	22-Mar-21	22-Mar-21	25-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	2ABE	2ABE	4AE							
% Stones >10mm _A	6.6	6.9	19.2					% w/w	0.1	A-T-044
pH _D ^{M#}	8.51	8.35	8.38					pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.16	0.41	<0.01					g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2					mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	6.2	4.4	3.2					% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	7	10	3					mg/kg	1	A-T-024s
Boron (water soluble) _D	3.1	3.4	<1.0					mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.7	1.1	0.6					mg/kg	0.5	A-T-024s
Copper _D ^{M#}	41	117	19					mg/kg	1	A-T-024s
Chromium _D ^{M#}	19	39	27					mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1					mg/kg	1	A-T-040s
Lead _D ^{M#}	106	166	31					mg/kg	1	A-T-024s
Mercury _D	0.50	0.64	1.77					mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	25	20	24					mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1					mg/kg	1	A-T-024s
Zinc _D ^{M#}	148	275	45					mg/kg	5	A-T-024s

Envirolab Job Number: 21/03330

Client Project Name: NMGH - Acute + Enabling

Client Project Ref: 076686

Lab Sample ID	21/03330/1	21/03330/2	21/03330/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP202	CP202	CP301							
Depth to Top	0.60	3.00	0.05							
Depth To Bottom										
Date Sampled	22-Mar-21	22-Mar-21	25-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	2ABE	2ABE	4AE							
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD							A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A							A-T-045

Envirolab Job Number: 21/03330

Client Project Name: NMGH - Acute + Enabling

Client Project Ref: 076686

Lab Sample ID	21/03330/1	21/03330/2	21/03330/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP202	CP202	CP301							
Depth to Top	0.60	3.00	0.05							
Depth To Bottom										
Date Sampled	22-Mar-21	22-Mar-21	25-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	2ABE	2ABE	4AE							
PAH-16MS										
Acenaphthene _A ^{M#}	0.33	0.47	0.09					mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.13	0.04	0.04					mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	1.00	1.01	0.24					mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	3.07	1.63	0.93					mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	3.24	2.40	1.21					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	3.59	2.90	1.36					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	1.66	1.14	0.67					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	1.39	<0.07	<0.07					mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	2.90	2.52	0.99					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.41	0.33	0.17					mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	6.42	6.22	1.63					mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.34	0.40	0.06					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	1.91	1.22	0.74					mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.09	0.09	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	3.99	4.45	0.68					mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	5.99	5.12	1.51					mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	36.5	29.9	10.3					mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03330

Client Project Name: NMGH - Acute + Enabling

Client Project Ref: 076686

Lab Sample ID	21/03330/1	21/03330/2	21/03330/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP202	CP202	CP301							
Depth to Top	0.60	3.00	0.05							
Depth To Bottom										
Date Sampled	22-Mar-21	22-Mar-21	25-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	2ABE	2ABE	4AE							
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<5					mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<5					mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	1	2	<5					mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	3	6	5					mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	27	67	372					mg/kg	1	A-T-055s
Total Aliphatics _A	31	76	377					mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	<1	<5					mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	1	<5					mg/kg	1	A-T-055s
Aro >C12-C16 _A	5	9	<5					mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	31	53	16					mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	154	208	247					mg/kg	1	A-T-055s
Total Aromatics _A	191	271	263					mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	222	347	640					mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s

REPORT NOTES

General

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

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG
Project: NMGH - Acute + Enabling
Clients Project No: 076686

Project No: 21/03330
Date Received: 30/03/2021 (am)
Cool Box Temperatures (°C): 10.5

Lab Sample ID	21/03330/1	21/03330/2
Client Sample No		
Client Sample ID/Depth	CP202 0.60m	CP202 3.00m
Date Sampled	22/03/21	22/03/21
Deviation Code		
F	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/03330/1	21/03330/2
Client Sample No		
Client Sample ID/Depth	CP202 0.60m	CP202 3.00m
Date Sampled	22/03/21	22/03/21
Cyanide (total)	✓	✓
PAH-16MS	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/04469
Issue Number: 1
Date: 05 May, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham
Project Name: Not specified
Project Ref: 76686
Order No: TBC
Date Samples Received: 26/04/21
Date Instructions Received: 27/04/21
Date Analysis Completed: 05/05/21

Prepared by:



Sophie France
Client Service Manager

Approved by:



Danielle Brierley
Client Manager

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	22-Apr-21									
Sample Type	Solid									
Sample Matrix Code	7									
% Stones >10mm _A	<0.1							% w/w	0.1	A-T-044
pH _D ^{M#}	8.22							pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01							g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1							mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2							mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	13.5							% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	5							mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0							mg/kg	1	A-T-027s
Cadmium _D ^{M#}	2.7							mg/kg	0.5	A-T-024s
Copper _D ^{M#}	61							mg/kg	1	A-T-024s
Chromium _D ^{M#}	13							mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1							mg/kg	1	A-T-040s
Lead _D ^{M#}	66							mg/kg	1	A-T-024s
Mercury _D	0.64							mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	26							mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1							mg/kg	1	A-T-024s
Zinc _D ^{M#}	71							mg/kg	5	A-T-024s

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	22-Apr-21									
Sample Type	Solid									
Sample Matrix Code	7									
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	Crocidolite & Amosite									A-T-045
Asbestos Matrix (microscope) _o	Loose Fibres									A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _o	N/A									A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _o	0.012							% w/w	0.001	A-T-054

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	22-Apr-21									
Sample Type	Solid									
Sample Matrix Code	7									
PAH-16MS										
Acenaphthene _A ^{M#}	71							mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.53							mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	101							mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	273							mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	89.8							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	105							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	29.5							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	47.8							mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	205							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	11							mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	287							mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	71.4							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	40.9							mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	47.3							mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	376							mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	249							mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	2010							mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	22-Apr-21									
Sample Type	Solid									
Sample Matrix Code	7									
TPH CWG										
Ali >C5-C6 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<50							mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<50							mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<50							mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<50							mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	184							mg/kg	1	A-T-055s
Total Aliphatics _A	184							mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<50							mg/kg	1	A-T-055s
Aro >C10-C12 _A	274							mg/kg	1	A-T-055s
Aro >C12-C16 _A	1340							mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	5050							mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	9830							mg/kg	1	A-T-055s
Total Aromatics _A	16500							mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	16600							mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01							mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01							mg/kg	0.01	A-T-022s

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/04469
Project:		Date Received:	27/04/2021 (am)
Clients Project No:	76686	Cool Box Temperatures (°C):	10.2

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT SUPPLEMENT TO TEST REPORT 21/05861/1

Amendments: Request for Additional Analysis

Envirolab Job Number: 21/05861
Issue Number: 2

Date: 22 June, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA
Project Name: North Manchester General Hospital - Enabling Works
Project Ref: BO76686
Order No: EBMA2924
Date Samples Received: 26/05/21
Date Instructions Received: 27/05/21
Date Analysis Completed: 16/06/21

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 21/05861

Client Project Name: North Manchester General Hospital -
Enabling Works

Client Project Ref: BO76686

Lab Sample ID	21/05861/1	21/05861/2	21/05861/3	21/05861/4	21/05861/5	21/05861/6	21/05861/7	Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1								
Client Sample ID	BH208	BH209	WS204	WS206	WS303	WS301	WS304			
Depth to Top	0.50	0.60	0.80	1.10	0.35	0.50	0.50			
Depth To Bottom										
Date Sampled	24-May-21	24-May-21	24-May-21	24-May-21	25-May-21	25-May-21	25-May-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4A	4A	4A	6A	4AB	4A	4ABE			
% Stones >10mm _A	8.9	<0.1	7.2	8.2	16.3	<0.1	16.3	% w/w	0.1	A-T-044
pH _D ^{M#}	7.50	7.84	7.76	7.86	8.45	7.27	8.06	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.03	0.07	0.31	0.03	<0.01	0.02	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1	2	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	2.3	7.7	1.6	2.5	2.5	1.3	8.4	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	10	5	2	6	7	4	7	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.7	2.9	0.6	1.2	1.8	0.7	1.0	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	29	108	19	43	22	23	57	mg/kg	1	A-T-024s
Chromium _D ^{M#}	10	272	18	37	13	10	15	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	95	123	30	104	102	20	259	mg/kg	1	A-T-024s
Mercury _D	<0.17	0.61	<0.17	0.46	0.99	<0.17	0.68	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	12	26	16	34	13	14	19	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	3	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	48	229	48	66	96	37	178	mg/kg	5	A-T-024s

Envirolab Job Number: 21/05861

Client Project Name: North Manchester General Hospital -
Enabling Works

Client Project Ref: BO76686

Lab Sample ID	21/05861/1	21/05861/2	21/05861/3	21/05861/4	21/05861/5	21/05861/6	21/05861/7	Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1								
Client Sample ID	BH208	BH209	WS204	WS206	WS303	WS301	WS304			
Depth to Top	0.50	0.60	0.80	1.10	0.35	0.50	0.50			
Depth To Bottom										
Date Sampled	24-May-21	24-May-21	24-May-21	24-May-21	25-May-21	25-May-21	25-May-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4A	4A	4A	6A	4AB	4A	4ABE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	Chrysotile	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos Matrix (microscope) _o	-	Loose Fibres	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _o	N/A	N/A	N/A	N/A	N/A	N/A	N/A			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _o	-	<0.001	-	-	-	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 21/05861

Client Project Name: North Manchester General Hospital -
Enabling Works

Client Project Ref: BO76686

Lab Sample ID	21/05861/1	21/05861/2	21/05861/3	21/05861/4	21/05861/5	21/05861/6	21/05861/7	Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1								
Client Sample ID	BH208	BH209	WS204	WS206	WS303	WS301	WS304			
Depth to Top	0.50	0.60	0.80	1.10	0.35	0.50	0.50			
Depth To Bottom										
Date Sampled	24-May-21	24-May-21	24-May-21	24-May-21	25-May-21	25-May-21	25-May-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4A	4A	4A	6A	4AB	4A	4ABE			
PAH-16MS										
Acenaphthene _A ^{M#}	0.05	0.65	0.03	0.03	2.16	0.06	0.16	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.04	0.12	<0.01	0.01	0.26	<0.01	0.04	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.12	2.18	0.05	0.09	4.04	0.14	0.33	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.67	16.9	0.22	0.39	14.4	0.21	2.11	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.65	17	0.18	0.44	9.97	0.11	2.24	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.68	17.1	0.20	0.42	11.2	0.12	2.40	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.39	10.7	0.10	0.28	4.60	<0.05	1.19	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.25	5.87	<0.07	0.14	3.74	<0.07	0.73	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.65	14.1	0.20	0.48	13.1	0.19	1.92	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.07	2.16	<0.04	0.04	1.30	<0.04	0.28	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.21	29	0.46	0.63	30.1	0.62	3.66	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.04	0.37	0.02	0.03	1.00	0.04	0.10	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.41	11.6	0.11	0.27	5.00	0.05	1.39	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	0.15	<0.03	<0.03	0.11	<0.03	0.05	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.59	6.13	0.20	0.35	19.9	0.56	1.22	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.18	29.6	0.43	0.66	29.6	0.56	3.44	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	7.00	164	2.20	4.26	150	2.66	21.3	mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/05861

Client Project Name: North Manchester General Hospital -
Enabling Works

Client Project Ref: BO76686

Lab Sample ID	21/05861/1	21/05861/2	21/05861/3	21/05861/4	21/05861/5	21/05861/6	21/05861/7	Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1								
Client Sample ID	BH208	BH209	WS204	WS206	WS303	WS301	WS304			
Depth to Top	0.50	0.60	0.80	1.10	0.35	0.50	0.50			
Depth To Bottom										
Date Sampled	24-May-21	24-May-21	24-May-21	24-May-21	25-May-21	25-May-21	25-May-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4A	4A	4A	6A	4AB	4A	4ABE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	3	<1	<1	2	<1	3	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	10	1	<1	4	<1	4	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	8	117	11	4	20	1	26	mg/kg	1	A-T-055s
Total Aliphatics _A	8	131	12	4	26	1	33	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	1	1	1	1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	3	10	2	1	14	<1	7	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	13	77	4	3	112	<1	48	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	54	462	17	12	362	5	187	mg/kg	1	A-T-055s
Total Aromatics _A	72	553	25	17	490	5	242	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	80	683	37	21	516	6	275	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

REPORT NOTES

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Analytical results reflect the quality of the sample at the time of analysis only.

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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/05861
Project:	North Manchester General Hospital - Enabling Works	Date Received:	27/05/2021 (am)
Clients Project No:	BO76686	Cool Box Temperatures (°C):	11.4

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/06361
Issue Number: 1
Date: 21 June, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA
Project Name: North Manchester General Hospital - Acute Works
Project Ref: B076686
Order No: EBMA2932
Date Samples Received: 09/06/21
Date Instructions Received: 10/06/21
Date Analysis Completed: 21/06/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/06361

Client Project Name: North Manchester General Hospital -
Acute Works

Client Project Ref: B076686

Lab Sample ID	21/06361/1	21/06361/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1								
Client Sample ID	BH304	BH303								
Depth to Top	0.40	0.60								
Depth To Bottom										
Date Sampled	07-Jun-21	07-Jun-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	6AE								
% Stones >10mm _A	28.4	<0.1						% w/w	0.1	A-T-044
pH _D ^{M#}	8.76	7.70						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.09	<0.01						g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	1.7	5.3						% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	3	8						mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.6	0.6						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	21	32						mg/kg	1	A-T-024s
Chromium _D ^{M#}	13	12						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	57	135						mg/kg	1	A-T-024s
Mercury _D	1.50	<0.17						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	12	14						mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Zinc _D ^{M#}	67	78						mg/kg	5	A-T-024s

Envirolab Job Number: 21/06361

Client Project Name: North Manchester General Hospital -
Acute Works

Client Project Ref: B076686

Lab Sample ID	21/06361/1	21/06361/2								
Client Sample No	ES1	ES1								
Client Sample ID	BH304	BH303								
Depth to Top	0.40	0.60								
Depth To Bottom										
Date Sampled	07-Jun-21	07-Jun-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	6AE								
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	Crocidolite								A-T-045
Asbestos Matrix (microscope) _o	-	Loose Fibres								A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _o	N/A	N/A								A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _o	-	<0.001						% w/w	0.001	A-T-054

Envirolab Job Number: 21/06361

Client Project Name: North Manchester General Hospital -
Acute Works

Client Project Ref: B076686

Lab Sample ID	21/06361/1	21/06361/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1								
Client Sample ID	BH304	BH303								
Depth to Top	0.40	0.60								
Depth To Bottom										
Date Sampled	07-Jun-21	07-Jun-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	6AE								
PAH-16MS										
Acenaphthene _A ^{M#}	0.06	0.05						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.02	0.25						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.15	0.81						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.49	4.82						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.51	4.87						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.53	5.02						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.28	2.03						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.21	1.86						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.47	3.99						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.07	0.45						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.89	9.66						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.06	0.13						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.31	2.43						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.03	0.04						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.56	2.89						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.78	8.77						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	5.42	48.1						mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/06361

Client Project Name: North Manchester General Hospital -
Acute Works

Client Project Ref: B076686

Lab Sample ID	21/06361/1	21/06361/2							
Client Sample No	ES1	ES1							
Client Sample ID	BH304	BH303							
Depth to Top	0.40	0.60							
Depth To Bottom									
Date Sampled	07-Jun-21	07-Jun-21							
Sample Type	Soil - ES	Soil - ES							
Sample Matrix Code	4A	6AE							
TPH CWG									
Ali >C5-C6 _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
Ali >C8-C10 _A	<1	<1						mg/kg	1 A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1						mg/kg	1 A-T-055s
Ali >C12-C16 _A ^{M#}	2	1						mg/kg	1 A-T-055s
Ali >C16-C21 _A ^{M#}	3	2						mg/kg	1 A-T-055s
Ali >C21-C35 _A ^{M#}	33	18						mg/kg	1 A-T-055s
Total Aliphatics _A	38	21						mg/kg	1 A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
Aro >C8-C10 _A	<1	1						mg/kg	1 A-T-055s
Aro >C10-C12 _A	<1	<1						mg/kg	1 A-T-055s
Aro >C12-C16 _A	2	6						mg/kg	1 A-T-055s
Aro >C16-C21 _A ^{M#}	9	65						mg/kg	1 A-T-055s
Aro >C21-C35 _A ^{M#}	37	249						mg/kg	1 A-T-055s
Total Aromatics _A	49	321						mg/kg	1 A-T-055s
TPH (Ali & Aro >C5-C35) _A	86	342						mg/kg	1 A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s
MTBE _A [#]	<0.01	<0.01						mg/kg	0.01 A-T-022s

REPORT NOTES

General

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

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/06361
Project:	North Manchester General Hospital - Acute Works	Date Received:	10/06/2021 (am)
Clients Project No:	B076686	Cool Box Temperatures (°C):	12.0

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/06795
Issue Number: 1
Date: 28 June, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

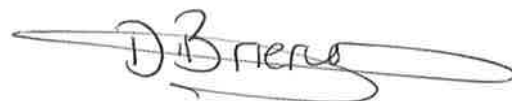
Project Manager: EBMA
Project Name: NMGH Accute Works
Project Ref: 076686
Order No: EBMA2938
Date Samples Received: 18/06/21
Date Instructions Received: 21/06/21
Date Analysis Completed: 25/06/21

Prepared by:



Holly Neary-King
Client Services Supervisor

Approved by:



Danielle Brierley
Client Manager

Envirolab Job Number: 21/06795

Client Project Name: NMGH Accute Works

Client Project Ref: 076686

Lab Sample ID	21/06795/1							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	BH306									
Depth to Top	0.45									
Depth To Bottom										
Date Sampled	17-Jun-21									
Sample Type	Soil - ES									
Sample Matrix Code	6AB									
% Stones >10mm _A	<0.1							% w/w	0.1	A-T-044
pH _D ^{M#}	7.91							pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.08							g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1							mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2							mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	7.1							% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	15							mg/kg	1	A-T-024s
Boron (water soluble) _D	1.3							mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.0							mg/kg	0.5	A-T-024s
Copper _D ^{M#}	47							mg/kg	1	A-T-024s
Chromium _D ^{M#}	17							mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1							mg/kg	1	A-T-040s
Lead _D ^{M#}	438							mg/kg	1	A-T-024s
Mercury _D	0.31							mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	21							mg/kg	1	A-T-024s
Selenium _D ^{M#}	1							mg/kg	1	A-T-024s
Zinc _D ^{M#}	139							mg/kg	5	A-T-024s

Envirolab Job Number: 21/06795

Client Project Name: NMGH Accute Works

Client Project Ref: 076686

Lab Sample ID	21/06795/1							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	BH306									
Depth to Top	0.45									
Depth To Bottom										
Date Sampled	17-Jun-21									
Sample Type	Soil - ES									
Sample Matrix Code	6AB									
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD									A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A									A-T-045

Envirolab Job Number: 21/06795

Client Project Name: NMGH Accute Works

Client Project Ref: 076686

Lab Sample ID	21/06795/1							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	BH306									
Depth to Top	0.45									
Depth To Bottom										
Date Sampled	17-Jun-21									
Sample Type	Soil - ES									
Sample Matrix Code	6AB									
PAH-16MS										
Acenaphthene _A ^{M#}	0.25							mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.18							mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.82							mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	4.49							mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	3.79							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	3.39							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	1.92							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	1.14							mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	3.95							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.47							mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	8.26							mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.24							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	2.44							mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.13							mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	3.65							mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	8.41							mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	43.5							mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/06795

Client Project Name: NMGH Accute Works

Client Project Ref: 076686

Lab Sample ID	21/06795/1							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	BH306									
Depth to Top	0.45									
Depth To Bottom										
Date Sampled	17-Jun-21									
Sample Type	Soil - ES									
Sample Matrix Code	6AB									
TPH CWG										
Ali >C5-C6 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1							mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1							mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	2							mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	6							mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	209							mg/kg	1	A-T-055s
Total Aliphatics _A	218							mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01							mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2							mg/kg	1	A-T-055s
Aro >C10-C12 _A	2							mg/kg	1	A-T-055s
Aro >C12-C16 _A	8							mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	71							mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	305							mg/kg	1	A-T-055s
Total Aromatics _A	388							mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	606							mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01							mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01							mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01							mg/kg	0.01	A-T-022s

REPORT NOTES

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Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/06795
Project:	NMGH Accute Works	Date Received:	21/06/2021 (am)
Clients Project No:	076686	Cool Box Temperatures (°C):	11.6

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/06845
Issue Number: 1 **Date:** 30 June, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA
Project Name: NMGH Acute
Project Ref: B076686
Order No: EBMA2952
Date Samples Received: 21/06/21
Date Instructions Received: 22/06/21
Date Analysis Completed: 30/06/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/06845

Client Project Name: NMGH Acute

Client Project Ref: B076686

Lab Sample ID	21/06845/1	21/06845/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH305	BH307								
Depth to Top	0.35	0.20								
Depth To Bottom										
Date Sampled	11-Jun-21	11-Jun-21								
Sample Type	Soil	Soil								
Sample Matrix Code	4AB	4AB								
% Stones >10mm _A	<0.1	28.4						% w/w	0.1	A-T-044
pH _D ^{M#}	10.91	10.93						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.09	0.25						g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	5.8	2.8						% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	7	4						mg/kg	1	A-T-024s
Boron (water soluble) _D	2.3	1.1						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.6	<0.5						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	85	20						mg/kg	1	A-T-024s
Chromium _D ^{M#}	19	14						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	168	151						mg/kg	1	A-T-024s
Mercury _D	<0.17	0.28						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	28	11						mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	<1						mg/kg	1	A-T-024s
Zinc _D ^{M#}	488	63						mg/kg	5	A-T-024s

Envirolab Job Number: 21/06845

Client Project Name: NMGH Acute

Client Project Ref: B076686

Lab Sample ID	21/06845/1	21/06845/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH305	BH307								
Depth to Top	0.35	0.20								
Depth To Bottom										
Date Sampled	11-Jun-21	11-Jun-21								
Sample Type	Soil	Soil								
Sample Matrix Code	4AB	4AB								
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	Chrysotile	NAD								A-T-045
Asbestos Matrix (microscope) _D	Loose Fibres	-								A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A								A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _D	<0.001	-						% w/w	0.001	A-T-054

Envirolab Job Number: 21/06845

Client Project Name: NMGH Acute

Client Project Ref: B076686

Lab Sample ID	21/06845/1	21/06845/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH305	BH307								
Depth to Top	0.35	0.20								
Depth To Bottom										
Date Sampled	11-Jun-21	11-Jun-21								
Sample Type	Soil	Soil								
Sample Matrix Code	4AB	4AB								
PAH-16MS										
Acenaphthene _A ^{M#}	0.10	1.53						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.05	<0.10						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.26	2.21						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	1.39	6.26						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	1.44	4.66						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	1.49	4.80						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.93	2.39						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.52	1.83						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	1.45	5.46						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.18	0.49						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	2.40	12						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.07	1.12						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.96	2.98						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.06	1.10						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.97	8.51						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	2.72	12.7						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	15	68						mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/06845

Client Project Name: NMGH Acute

Client Project Ref: B076686

Lab Sample ID	21/06845/1	21/06845/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH305	BH307								
Depth to Top	0.35	0.20								
Depth To Bottom										
Date Sampled	11-Jun-21	11-Jun-21								
Sample Type	Soil	Soil								
Sample Matrix Code	4AB	4AB								
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1						mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	5	6						mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	14	13						mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	227	248						mg/kg	1	A-T-055s
Total Aliphatics _A	245	269						mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	3						mg/kg	1	A-T-055s
Aro >C10-C12 _A	1	2						mg/kg	1	A-T-055s
Aro >C12-C16 _A	9	13						mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	36	68						mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	165	280						mg/kg	1	A-T-055s
Total Aromatics _A	214	367						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	459	635						mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s

REPORT NOTES

General

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

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/06845
Project:	NMGH Acute	Date Received:	22/06/2021 (am)
Clients Project No:	B076686	Cool Box Temperatures (°C):	16.1

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Appendix D – Geotechnical Laboratory Testing Results

- Envirolab, Geotechnical Analysis Results
 - Final Analytical Test Report Ref. 21-04469-2
 - Final Analytical Test Report Ref. 21-04505-1
 - Final Analytical Test Report Ref. 21-04812-1
 - Final Analytical Test Report Ref. 21-05168-1
 - Final Analytical Test Report Ref. 21-06888-1
 - Final Analytical Test Report Ref. 21-07503-1
- Ian Farmers Associates, Geotechnical Analysis Results
 - Final Test Report Ref. 2280580/1
 - Final Test Report Ref. 2280522/1
 - Final Test Report Ref. 2280528/1
 - Final Test Report Ref. 2280543/1
 - Final Test Report Ref. 2280610/1
 - Final Test Report Ref. 2280638/1

FINAL ANALYTICAL TEST REPORT SUPPLEMENT TO TEST REPORT 21/04469/1

Amendments: Request for Additional Analysis

Envirolab Job Number: 21/04469
Issue Number: 2

Date: 25 June, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham
Project Name: Not specified
Project Ref: 76686
Order No: EBMA2870
Date Samples Received: 26/04/21
Date Instructions Received: 27/04/21
Date Analysis Completed: 25/06/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Sophie France
Client Service Manager

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1	21/04469/9	21/04469/15	21/04469/18	21/04469/21	21/04469/24	21/04469/26	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302	BH302	BH302	BH302	BH302	BH302	BH302			
Depth to Top	0.40	6.70	12.00	15.00	18.00	21.00	23.00			
Depth To Bottom			12.45	15.45	18.45	21.45				
Date Sampled	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	23-Apr-21	23-Apr-21			
Sample Type	Solid	Solid	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	7	7			3A		6A			
% Stones >10mm _A	<0.1	<0.1	-	-	<0.1	-	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	8.22	8.50	-	-	9.03	-	8.98	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.06	-	-	0.04	-	0.04	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	-	-	-	-	-	-	mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	13.5	-	-	-	-	-	-	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	5	-	-	-	-	-	-	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	-	-	-	-	-	-	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	2.7	-	-	-	-	-	-	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	61	-	-	-	-	-	-	mg/kg	1	A-T-024s
Chromium _D ^{M#}	13	-	-	-	-	-	-	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	-	-	-	-	-	-	mg/kg	1	A-T-040s
Lead _D ^{M#}	66	-	-	-	-	-	-	mg/kg	1	A-T-024s
Mercury _D	0.64	-	-	-	-	-	-	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	26	-	-	-	-	-	-	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-024s
Zinc _D ^{M#}	71	-	-	-	-	-	-	mg/kg	5	A-T-024s
Moisture Content of Soil (Oven Dried Method) _A [#]	-	Appended	-	-	-	-	Appended			Subcon IFA
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	Appended	-	-	-	-	Appended			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A	-	-	Appended	-	Appended	-	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	-	-	-	Appended	-			Subcon IFA
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3 _A	-	-	-	Appended	-	-	-			Subcon IFA

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1	21/04469/9	21/04469/15	21/04469/18	21/04469/21	21/04469/24	21/04469/26	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302	BH302	BH302	BH302	BH302	BH302	BH302			
Depth to Top	0.40	6.70	12.00	15.00	18.00	21.00	23.00			
Depth To Bottom			12.45	15.45	18.45	21.45				
Date Sampled	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	23-Apr-21	23-Apr-21			
Sample Type	Solid	Solid	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	7	7			3A		6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	Crocidolite & Amosite	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope) ₀	Loose Fibres	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? ₀	N/A	-	-	-	-	-	-			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) ₀	0.012	-	-	-	-	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1	21/04469/9	21/04469/15	21/04469/18	21/04469/21	21/04469/24	21/04469/26	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302	BH302	BH302	BH302	BH302	BH302	BH302			
Depth to Top	0.40	6.70	12.00	15.00	18.00	21.00	23.00			
Depth To Bottom			12.45	15.45	18.45	21.45				
Date Sampled	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	23-Apr-21	23-Apr-21			
Sample Type	Solid	Solid	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	7	7			3A		6A			
PAH-16MS										
Acenaphthene _A ^{M#}	71	-	-	-	-	-	-	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.53	-	-	-	-	-	-	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	101	-	-	-	-	-	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	273	-	-	-	-	-	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	89.8	-	-	-	-	-	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	105	-	-	-	-	-	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	29.5	-	-	-	-	-	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	47.8	-	-	-	-	-	-	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	205	-	-	-	-	-	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	11	-	-	-	-	-	-	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	287	-	-	-	-	-	-	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	71.4	-	-	-	-	-	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	40.9	-	-	-	-	-	-	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	47.3	-	-	-	-	-	-	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	376	-	-	-	-	-	-	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	249	-	-	-	-	-	-	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	2010	-	-	-	-	-	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/04469

Client Project Name: Not specified

Client Project Ref: 76686

Lab Sample ID	21/04469/1	21/04469/9	21/04469/15	21/04469/18	21/04469/21	21/04469/24	21/04469/26	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH302	BH302	BH302	BH302	BH302	BH302	BH302			
Depth to Top	0.40	6.70	12.00	15.00	18.00	21.00	23.00			
Depth To Bottom			12.45	15.45	18.45	21.45				
Date Sampled	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	22-Apr-21	23-Apr-21	23-Apr-21			
Sample Type	Solid	Solid	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	7	7			3A		6A			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<50	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<50	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<50	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<50	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	184	-	-	-	-	-	-	mg/kg	1	A-T-055s
Total Aliphatics _A	184	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<50	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C10-C12 _A	274	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C12-C16 _A	1340	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	5050	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	9830	-	-	-	-	-	-	mg/kg	1	A-T-055s
Total Aromatics _A	16500	-	-	-	-	-	-	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	16600	-	-	-	-	-	-	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s

REPORT NOTES

General

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The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street ,
Manchester, UK, M1 5WG

Project No: 21/04469

Date Received: 27/04/2021 (am)

Project: **Cool Box Temperatures (°C):** 10.2

Clients Project No: 76686

Lab Sample ID	21/04469/9	21/04469/21	21/04469/26
Client Sample No			
Client Sample ID/Depth	BH302 6.70m	BH302 18.00- 18.45m	BH302 23.00m
Date Sampled	22/04/21	22/04/21	23/04/21
Deviation Code			
F	✓	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/04469/9	21/04469/21	21/04469/26
Client Sample No			
Client Sample ID/Depth	BH302 6.70m	BH302 18.00- 18.45m	BH302 23.00m
Date Sampled	22/04/21	22/04/21	23/04/21
Sulphate (water sol 2:1)	✓	✓	✓

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/04505
Issue Number: 1
Date: 21 May, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham/Rob Allen
Project Name: North Manchester General Hospital - Acute
Project Ref: B076686
Order No: EBMA2816
Date Samples Received: 07/04/21
Date Instructions Received: 28/04/21
Date Analysis Completed: 21/05/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/04505

Client Project Name: North Manchester General Hospital -
Acute

Client Project Ref: B076686

Lab Sample ID	21/04505/1	21/04505/2	21/04505/3	21/04505/4				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP301	CP301	BH301	BH301						
Depth to Top	11.00	14.50	21.0	23.50						
Depth To Bottom	11.45	14.95								
Date Sampled	25-Mar-21	25-Mar-21	25-Mar-21	25-Mar-21						
Sample Type	Soil - U	Soil - U	Soil - D	Soil - D						
Sample Matrix Code			3	3						
% Stones >10mm _A	-	-	<0.1	<0.1				% w/w	0.1	A-T-044
pH _D ^{M#}	-	-	8.02	8.06				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	-	0.09	0.14				g/l	0.01	A-T-026s
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3 _A	Appended	Appended	-	-						Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	Appended	-	-	-						Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A	Appended	Appended	-	-						Subcon IFA

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG
Project: North Manchester General Hospital - Acute
Clients Project No: B076686
Project No: 21/04505
Date Received: 28/04/2021 (am)
Cool Box Temperatures (°C): 6.7, 7.4

Lab Sample ID	21/04505/3	21/04505/4
Client Sample No		
Client Sample ID/Depth	BH301 21.0m	BH301 23.50m
Date Sampled	25/03/21	25/03/21
Deviation Code		
F	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/04505/3	21/04505/4
Client Sample No		
Client Sample ID/Depth	BH301 21.0m	BH301 23.50m
Date Sampled	25/03/21	25/03/21
Sulphate (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/04812
Issue Number: 1
Date: 25 May, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham
Project Name: North Manchester General Hospital - Acute
Project Ref: 76686
Order No: EBMA2852
Date Samples Received: 26/04/21
Date Instructions Received: 05/05/21
Date Analysis Completed: 24/05/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Richard Wong
Client Manager

Envirolab Job Number: 21/04812

Client Project Name: North Manchester General Hospital -
Acute

Client Project Ref: 76686

Lab Sample ID	21/04812/1	21/04812/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH301	BH301								
Depth to Top	49.19	50.1								
Depth To Bottom	49.34	50.26								
Date Sampled	21-Apr-21	21-Apr-21								
Sample Type	Soil - C	Soil - C								
Sample Matrix Code	5									
% Stones >10mm _A	<0.1	-						% w/w	0.1	A-T-044
pH _D ^{M#}	8.44	-						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	-						g/l	0.01	A-T-026s
Point Load (Single) ISRM 2007 _A	Appended	Appended								Subcon IFA

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG
Project: North Manchester General Hospital - Acute
Clients Project No: 76686
Project No: 21/04812
Date Received: 05/05/2021 (am)
Cool Box Temperatures (°C): 7.4

Lab Sample ID	21/04812/1
Client Sample No	
Client Sample ID/Depth	BH301 49.19-49.34m
Date Sampled	21/04/21
Deviation Code	
F	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/04812/1
Client Sample No	
Client Sample ID/Depth	BH301 49.19-49.34m
Date Sampled	21/04/21
Sulphate (water sol 2:1)	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/05168
Issue Number: 1
Date: 27 May, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Philippa Neesham/Rob Allen
Project Name: North Manchester General Hospital - Acute
Project Ref: B076686
Order No: EBMA2876
Date Samples Received: 07/04/21
Date Instructions Received: 12/05/21
Date Analysis Completed: 27/05/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Sophie France
Client Service Manager

Envirolab Job Number: 21/05168

Client Project Name: North Manchester General Hospital -
Acute

Client Project Ref: B076686

Lab Sample ID	21/05168/1	21/05168/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP301	CP301								
Depth to Top	4.50	18.00								
Depth To Bottom										
Date Sampled	25-Mar-21	25-Mar-21								
Sample Type	Soil - D	Soil - D								
Sample Matrix Code	6	3								
% Stones >10mm _A	<0.1	10.4						% w/w	0.1	A-T-044
pH _D ^{M#}	6.64	7.99						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	0.05						g/l	0.01	A-T-026s
Moisture Content of Soil (Oven Dried Method) _A [#]	Appended	Appended								Subcon IFA
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	Appended	Appended								Subcon IFA

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Opinions and interpretations expressed are outside the scope of our accreditation.

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street ,
Manchester, UK, M1 5WG

Project No: 21/05168

Date Received: 12/05/2021 (am)

Project: North Manchester General Hospital - Acute

Cool Box Temperatures (°C): 7.2

Clients Project No: B076686

Lab Sample ID	21/05168/1	21/05168/2
Client Sample No		
Client Sample ID/Depth	CP301 4.50m	CP301 18.00m
Date Sampled	25/03/21	25/03/21
Deviation Code		
F	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/05168/1	21/05168/2
Client Sample No		
Client Sample ID/Depth	CP301 4.50m	CP301 18.00m
Date Sampled	25/03/21	25/03/21
Sulphate (water sol 2:1)	✓	✓

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/06888
Issue Number: 1
Date: 15 July, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham/Rob Allen/Zoe Henderson
Project Name: North Manchester General Hospital - Acute Stage 2
Project Ref: B076686
Order No: EBMA2940
Date Samples Received: 01/06/21
Date Instructions Received: 23/06/21
Date Analysis Completed: 14/07/21

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Richard Wong
Client Manager

Envirolab Job Number: 21/06888

Client Project Name: North Manchester General Hospital -
Acute Stage 2

Client Project Ref: B076686

Lab Sample ID	21/06888/1	21/06888/2	21/06888/3	21/06888/4				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS301	WS302	WS303	WS305						
Depth to Top	3.00	2.00	2.00	3.00						
Depth To Bottom	3.45	2.35	3.00	3.45						
Date Sampled	25-May-21	26-May-21	25-May-21	26-May-21						
Sample Type	Soil - D	Soil - D	Soil - B	Soil - D						
Sample Matrix Code	3A	3	4A	3A						
% Stones >10mm _A	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH _D ^{M#}	5.99	7.06	7.58	5.85				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.04	0.05	0.01	0.06				g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	Appended	Appended	-	Appended						Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	Appended	Appended	-	Appended						Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	Appended	-						Subcon IFA

REPORT NOTES

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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG
Project: North Manchester General Hospital - Acute Stage 2
Clients Project No: B076686
Project No: 21/06888
Date Received: 23/06/2021 (am)
Cool Box Temperatures (°C): 15.0

Lab Sample ID	21/06888/1	21/06888/3
Client Sample No		
Client Sample ID/Depth	WS301 3.00-3.45m	WS303 2.00-3.00m
Date Sampled	25/05/21	25/05/21
Deviation Code		
F	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/06888/1	21/06888/3
Client Sample No		
Client Sample ID/Depth	WS301 3.00-3.45m	WS303 2.00-3.00m
Date Sampled	25/05/21	25/05/21
Sulphate (water sol 2:1)	✓	✓

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/06888/1	21/06888/2	21/06888/3	21/06888/4
Client Sample No				
Client Sample ID/Depth	WS301 3.00-3.45m	WS302 2.00-2.35m	WS303 2.00-3.00m	WS305 3.00-3.45m
Date Sampled	25/05/21	26/05/21	25/05/21	26/05/21
A-T-026s	25/06/2021	25/06/2021	25/06/2021	25/06/2021
A-T-031s	25/06/2021	25/06/2021	25/06/2021	25/06/2021
A-T-044	24/06/2021	24/06/2021	24/06/2021	24/06/2021

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/07503
Issue Number: 1
Date: 06 August, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham/Rebecca Tidsey/Rob Allen
Project Name: North Manchester General Hospital - Acute
Project Ref: B076686.301
Order No: EBMA2953
Date Samples Received: 10/06/21
Date Instructions Received: 12/07/21
Date Analysis Completed: 06/08/21

Prepared by:



Sophie France
Client Service Manager

Approved by:



Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/3	21/07503/5	21/07503/7	21/07503/10	21/07503/14	21/07503/15	21/07503/18	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH304	BH304	BH304	BH304	BH304	BH304	BH304			
Depth to Top	1.2	3	7.5	10	13.5	14	18			
Depth To Bottom		3.45	7.95	10.5	13.95					
Date Sampled	07-Jun-21	07-Jun-21	07-Jun-21	07-Jun-21	08-Jun-21	08-Jun-21	08-Jun-21			
Sample Type	Soil - D	Soil - B	Soil - U	Soil - B	Soil - U	Soil - D	Soil - D			
Sample Matrix Code						5A				
% Stones >10mm _A	-	-	-	-	-	<0.1	-	% w/w	0.1	A-T-044
pH _D ^{M#}	-	-	-	-	-	8.21	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	-	-	-	-	0.09	-	g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	Appended	-	-	-	-	-	Appended			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	Appended	-	-	-	-	-	Appended			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A	-	-	Appended	-	-	-	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	Appended	-	Appended	-	-	-			Subcon IFA
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3 _A	-	-	-	-	Appended	-	-			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/19	21/07503/22	21/07503/23	21/07503/24	21/07503/28	21/07503/34	21/07503/35	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH304	BH304	BH304	BH304	BH304	BH305	BH305			
Depth to Top	19.5	24	25.5	26	31	3	3.5			
Depth To Bottom	19.95	24.45	25.95		31.45	3.45				
Date Sampled	08-Jun-21	08-Jun-21	09-Jun-21	09-Jun-21	09-Jun-21	11-Jun-21	11-Jun-21			
Sample Type	Soil - U	Soil - B	Soil - U	Soil - D	Soil - B	Soil - U	Soil - D			
Sample Matrix Code		4A	3	3	3		1			
% Stones >10mm _A	-	-	-	<0.1	-	-	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	-	-	-	8.33	-	-	8.31	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	-	-	0.09	-	-	<0.01	g/l	0.01	A-T-026s
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A)	Appended	-	Appended	-	-	Appended	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	Appended	-	-	Appended	-	-			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital -
Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/38	21/07503/40	21/07503/42	21/07503/43	21/07503/46	21/07503/47	21/07503/50	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH305	BH305	BH305	BH305	BH305	BH305	BH305			
Depth to Top	10.5	13.5	14.2	15.6	18	19.5	22.5			
Depth To Bottom	10.95	13.95	14.65			19.95	22.95			
Date Sampled	11-Jun-21	14-Jun-21	14-Jun-21	14-Jun-21	14-Jun-21	14-Jun-21	14-Jun-21			
Sample Type	Soil - U	Soil - U	Soil - B	Soil - D	Soil - D	Soil - U	Soil - U			
Sample Matrix Code										
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	-	-	Appended	Appended	-	-			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	-	-	-	Appended	Appended	-	-			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A)	-	Appended	-	-	-	-	Appended			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	Appended	-	-	-	-			Subcon IFA
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3 _A	Appended	-	-	-	-	Appended	-			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/51	21/07503/56	21/07503/63	21/07503/64	21/07503/65	21/07503/67	21/07503/69	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH305	BH305	BH306	BH306	BH306	BH306	BH306			
Depth to Top	23	28.5	1.2	2	3	10.5	12			
Depth To Bottom		28.95	1.65		3.45	10.95	12.45			
Date Sampled	14-Jun-21	15-Jun-21	17-Jun-21	17-Jun-21	17-Jun-21	17-Jun-21	17-Jun-21			
Sample Type	Soil - D	Soil - U	Soil - B	Soil - D	Soil - B	Soil - U	Soil - B			
Sample Matrix Code	3				4A					
% Stones >10mm _A	<0.1	-	-	-	<0.1	-	-	% w/w	0.1	A-T-044
pH _D ^{M#}	7.88	-	-	-	6.69	-	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.04	-	-	-	0.01	-	-	g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	-	-	Appended	-	-	Appended			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	-	-	-	Appended	-	-	Appended			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A	-	Appended	-	-	-	Appended	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	Appended	-	-	-	-			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/72	21/07503/74	21/07503/75	21/07503/77	21/07503/79	21/07503/80	21/07503/82	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH306	BH306	BH306	BH306	BH306	BH306	BH306			
Depth to Top	16.5	18	19.5	21	23	24	27			
Depth To Bottom	16.95	18.45	19.95			24.45	27.45			
Date Sampled	18-Jun-21	18-Jun-21	18-Jun-21	18-Jun-21	18-Jun-21	22-Jun-21	22-Jun-21			
Sample Type	Soil - U	Soil - B	Soil - U	Soil - D	Soil - D	Soil - B	Soil - B			
Sample Matrix Code		5			3					
% Stones >10mm _A	-	<0.1	-	-	<0.1	-	-	% w/w	0.1	A-T-044
pH _D ^{M#}	-	8.09	-	-	8.12	-	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	0.06	-	-	0.01	-	-	g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	-	-	Appended	-	Appended	-			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	-	-	-	Appended	-	Appended	-			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A	-	-	Appended	-	-	-	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	-	-	-	-	Appended			Subcon IFA
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3 _A	Appended	-	-	-	-	-	-			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/89	21/07503/92	21/07503/99	21/07503/107	21/07503/112	21/07503/119	21/07503/125	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH303	BH303	BH303	BH303	BH303	BH303	BH303			
Depth to Top	1.2	2	7	13	16.7	22	26.5			
Depth To Bottom	1.65	2.45	7.45	13.45		22.45	26.95			
Date Sampled	07-Jun-21	07-Jun-21	07-Jun-21	08-Jun-21	08-Jun-21	09-Jun-21	09-Jun-21			
Sample Type	Soil - D	Soil - B	Soil - B	Soil - D	Soil - D	Soil - D	Soil - B			
Sample Matrix Code	4A				3					
% Stones >10mm _A	0.7	-	-	-	<0.1	-	-	% w/w	0.1	A-T-044
pH _D ^{M#}	7.66	-	-	-	8.36	-	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	-	-	-	0.05	-	-	g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	-	-	Appended	-	Appended	-			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	-	-	-	Appended	-	Appended	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	Appended	Appended	-	-	-	Appended			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/128	21/07503/136	21/07503/139	21/07503/146	21/07503/147	21/07503/150	21/07503/155	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH303	BH307	BH307	BH307	BH307	BH307	BH307			
Depth to Top	28.5	2	3	7	8.5	10	13			
Depth To Bottom		2.45	3.45	7.45	8.95	10.45	13.45			
Date Sampled	09-Jun-21	11-Jun-21	11-Jun-21	14-Jun-21	14-Jun-21	14-Jun-21	14-Jun-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - B	Soil - D	Soil - U	Soil - U			
Sample Matrix Code	5A	4AB		5A						
% Stones >10mm _A	<0.1	36.5	-	<0.1	-	-	-	% w/w	0.1	A-T-044
pH _D ^{M#}	8.28	8.71	-	7.65	-	-	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.25	-	<0.01	-	-	-	g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	Appended	-	Appended	-	Appended	-	-			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	Appended	-	Appended	-	Appended	-	-			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s _A	-	-	-	-	-	Appended	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	-	Appended	-	-	-			Subcon IFA
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3 _A	-	-	-	-	-	-	Appended			Subcon IFA

Envirolab Job Number: 21/07503

Client Project Name: North Manchester General Hospital - Acute

Client Project Ref: B076686.301

Lab Sample ID	21/07503/157	21/07503/164	21/07503/168	21/07503/173	21/07503/176	21/07503/179	21/07503/182	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH307	BH307	BH307	BH307	BH307	BH307	BH307			
Depth to Top	14.5	19	22	25	27	29.5	32			
Depth To Bottom	14.95	19.45	22.45	25.45		29.95	32.45			
Date Sampled	14-Jun-21	14-Jun-21	15-Jun-21	15-Jun-21	15-Jun-21	15-Jun-21	16-Jun-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - B	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	4A		3	5	6		4A			
% Stones >10mm _A	<0.1	-	<0.1	<0.1	<0.1	-	51.7	% w/w	0.1	A-T-044
pH _D ^{M#}	8.34	-	8.33	8.36	8.41	-	8.59	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.01	-	0.05	0.02	0.03	-	<0.01	g/l	0.01	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	Appended	-	-	-	Appended	-			Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A [#]	-	Appended	-	-	-	Appended	-			Subcon IFA
Particle Size Distribution (Wet Sieving Method) _A [#]	-	-	-	Appended	-	-	-			Subcon IFA

REPORT NOTES

General

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

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG **Project No:** 21/07503
Project: North Manchester General Hospital - Acute **Date Received:** 12/07/2021 (am)
Clients Project No: B076686.301 **Cool Box Temperatures (°C):** 15.0

Lab Sample ID	21/07503/15	21/07503/24	21/07503/35	21/07503/51	21/07503/89	21/07503/112	21/07503/128	21/07503/136	21/07503/146	21/07503/157
Client Sample No										
Client Sample ID/Depth	BH304 14m	BH304 26m	BH305 3.5m	BH305 23m	BH303 1.2-1.65m	BH303 16.7m	BH303 28.5m	BH307 2-2.45m	BH307 7-7.45m	BH307 14.5-14.95m
Date Sampled	08/06/21	09/06/21	11/06/21	14/06/21	07/06/21	08/06/21	09/06/21	11/06/21	14/06/21	14/06/21
Deviation Code										
F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Key

F

Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/07503/15	21/07503/24	21/07503/35	21/07503/51	21/07503/89	21/07503/112	21/07503/128	21/07503/136	21/07503/146	21/07503/157
Client Sample No										
Client Sample ID/Depth	BH304 14m	BH304 26m	BH305 3.5m	BH305 23m	BH303 1.2-1.65m	BH303 16.7m	BH303 28.5m	BH307 2-2.45m	BH307 7-7.45m	BH307 14.5-14.95m
Date Sampled	08/06/21	09/06/21	11/06/21	14/06/21	07/06/21	08/06/21	09/06/21	11/06/21	14/06/21	14/06/21
Sulphate (water sol 2:1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/07503/3	21/07503/5	21/07503/7	21/07503/10	21/07503/14	21/07503/15	21/07503/18	21/07503/19	21/07503/22	21/07503/23	21/07503/24	21/07503/28
Client Sample No												
Client Sample ID/Depth	BH304 1.2m	BH304 3-3.45m	BH304 7.5-7.95m	BH304 10-10.5m	BH304 13.5-13.95m	BH304 14m	BH304 18m	BH304 19.5-19.95m	BH304 24-24.45m	BH304 25.5-25.95m	BH304 26m	BH304 31-31.45m
Date Sampled	07/06/21	07/06/21	07/06/21	07/06/21	08/06/21	08/06/21	08/06/21	08/06/21	08/06/21	09/06/21	09/06/21	09/06/21
A-T-026s						15/07/2021					15/07/2021	
A-T-031s						15/07/2021					15/07/2021	
A-T-044						14/07/2021					14/07/2021	

Lab Sample ID	21/07503/34	21/07503/35	21/07503/38	21/07503/40	21/07503/42	21/07503/43	21/07503/46	21/07503/47	21/07503/50	21/07503/51	21/07503/56	21/07503/63
Client Sample No												
Client Sample ID/Depth	BH305 3-3.45m	BH305 3.5m	BH305 10.5-10.95m	BH305 13.5-13.95m	BH305 14.2-14.65m	BH305 15.6m	BH305 18m	BH305 19.5-19.95m	BH305 22.5-22.95m	BH305 23m	BH305 28.5-28.95m	BH306 1.2-1.65m
Date Sampled	11/06/21	11/06/21	11/06/21	14/06/21	14/06/21	14/06/21	14/06/21	14/06/21	14/06/21	14/06/21	15/06/21	17/06/21
A-T-026s		15/07/2021								15/07/2021		
A-T-031s		15/07/2021								15/07/2021		
A-T-044		14/07/2021								14/07/2021		

Lab Sample ID	21/07503/64	21/07503/65	21/07503/67	21/07503/69	21/07503/72	21/07503/74	21/07503/75	21/07503/77	21/07503/79	21/07503/80	21/07503/82	21/07503/89
Client Sample No												
Client Sample ID/Depth	BH306 2m	BH306 3-3.45m	BH306 10.5-10.95m	BH306 12-12.45m	BH306 16.5-16.95m	BH306 18-18.45m	BH306 19.5-19.95m	BH306 21m	BH306 23m	BH306 24-24.45m	BH306 27-27.45m	BH303 1.2-1.65m
Date Sampled	17/06/21	17/06/21	17/06/21	17/06/21	18/06/21	18/06/21	18/06/21	18/06/21	18/06/21	22/06/21	22/06/21	07/06/21
A-T-026s		15/07/2021				15/07/2021			15/07/2021			15/07/2021
A-T-031s		15/07/2021				15/07/2021			15/07/2021			15/07/2021
A-T-044		14/07/2021				14/07/2021			14/07/2021			14/07/2021

Lab Sample ID	21/07503/92	21/07503/99	21/07503/10 7	21/07503/11 2	21/07503/11 9	21/07503/125	21/07503/12 8	21/07503/13 6	21/07503/13 9	21/07503/14 6	21/07503/14 7	21/07503/15 0
Client Sample No												
Client Sample ID/Depth	BH303 2- 2.45m	BH303 7- 7.45m	BH303 13- 13.45m	BH303 16.7m	BH303 22- 22.45m	BH303 26.5- 26.95m	BH303 28.5m	BH307 2- 2.45m	BH307 3- 3.45m	BH307 7- 7.45m	BH307 8.5- 8.95m	BH307 10- 10.45m
Date Sampled	07/06/21	07/06/21	08/06/21	08/06/21	09/06/21	09/06/21	09/06/21	11/06/21	11/06/21	14/06/21	14/06/21	14/06/21
A-T-026s				15/07/2021			15/07/2021	15/07/2021		15/07/2021		
A-T-031s				15/07/2021			15/07/2021	15/07/2021		15/07/2021		
A-T-044				14/07/2021			14/07/2021	14/07/2021		14/07/2021		

Lab Sample ID	21/07503/155	21/07503/157	21/07503/164	21/07503/168	21/07503/173	21/07503/176	21/07503/179	21/07503/182
Client Sample No								
Client Sample ID/Depth	BH307 13-13.45m	BH307 14.5-14.95m	BH307 19-19.45m	BH307 22-22.45m	BH307 25-25.45m	BH307 27m	BH307 29.5-29.95m	BH307 32-32.45m
Date Sampled	14/06/21	14/06/21	14/06/21	15/06/21	15/06/21	15/06/21	15/06/21	16/06/21
A-T-026s		15/07/2021		15/07/2021	15/07/2021	15/07/2021		15/07/2021
A-T-031s		15/07/2021		15/07/2021	15/07/2021	15/07/2021		15/07/2021
A-T-044		14/07/2021		14/07/2021	14/07/2021	14/07/2021		14/07/2021

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

F.A.O.

Final Test Report - 2280528 / 1

Site: North Manchester General Hospital

Job Number: 2280528

Originating Client: Envirolab

Originating Reference: 21/04812

Date Sampled: Not Given

Date Scheduled: 06/05/2021

Date Testing Started: 13/05/2021

Date Testing Finished: 17/05/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Tim Robinson
Quality Supervisor

Report Issue Date: 17/05/2021



Site: North Manchester General Hospital

Job Number: 2280528

Client: Envirolab

Page: 2

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P kN	Equivalent diameter, De mm	Point Load Strength Index		Remarks (including water content if measured)
				Type (D, A, I, B)	Direction (PL, PD or U)		Lne mm	W mm	Dps mm	Dps' mm			Is MPa	Is (50) MPa	
BH301	49.19	C1	Brown SANDSTONE As received	D	U	YES	81.2	101.4	101.4	94.4	0.3	101.4	0.03	0.04	
BH301	49.19	C1	Brown SANDSTONE As received	A	U	YES		100.4	98.2	84.2	2.1	112.1	0.17	0.24	
BH301	50.1	C2	Brown SANDSTONE As received	D	U	YES	80.9	100.9	100.9	87.9	2.3	100.9	0.23	0.31	
BH301	50.1	C2	Brown SANDSTONE As received	A	U	YES		100.7	85.2	68.2	4.5	104.5	0.41	0.58	

Test Type

D - Diametral, A - Axial, I - Irregular Lump, B - Block

Direction

PL - Parallel to planes of weakness

PD - Perpendicular to planes of weakness

U - Unknown or random

Dimensions

Dps - Distance between platens (platen separation)

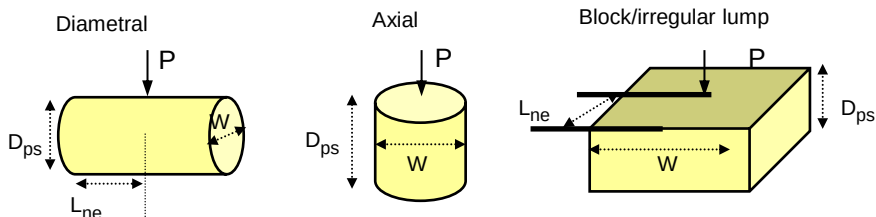
Dps' - at failure (see ISRM note 6)

Lne - Length from platens to nearest free end

W - Width of shortest dimension perpendicular to load, P

Size factor, F = (De/50)^{0.45} for all tests.

Detailed legend for test and dimensions, based on ISRM

**Method of Preparation:** ISRM 2007 Suggested method for point load strength index (pages 125 - 132)**Method of Test:** ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.



Final Test Report - 2280528 / 1

Site: North Manchester General Hospital

Job Number: 2280528

Originating Client: Envirolab

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 17/05/2021

F.A.O.

Final Test Report - 2280522 / 1

Site: NW GH
Job Number: 2280522
Originating Client: Envirolab
Originating Reference: 21/04505
Date Sampled: Not Given
Date Scheduled: 04/05/2021
Date Testing Started: 13/05/2021
Date Testing Finished: 21/05/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Tim Robinson
Quality Supervisor

Report Issue Date: 21/05/2021



Site: NW GH

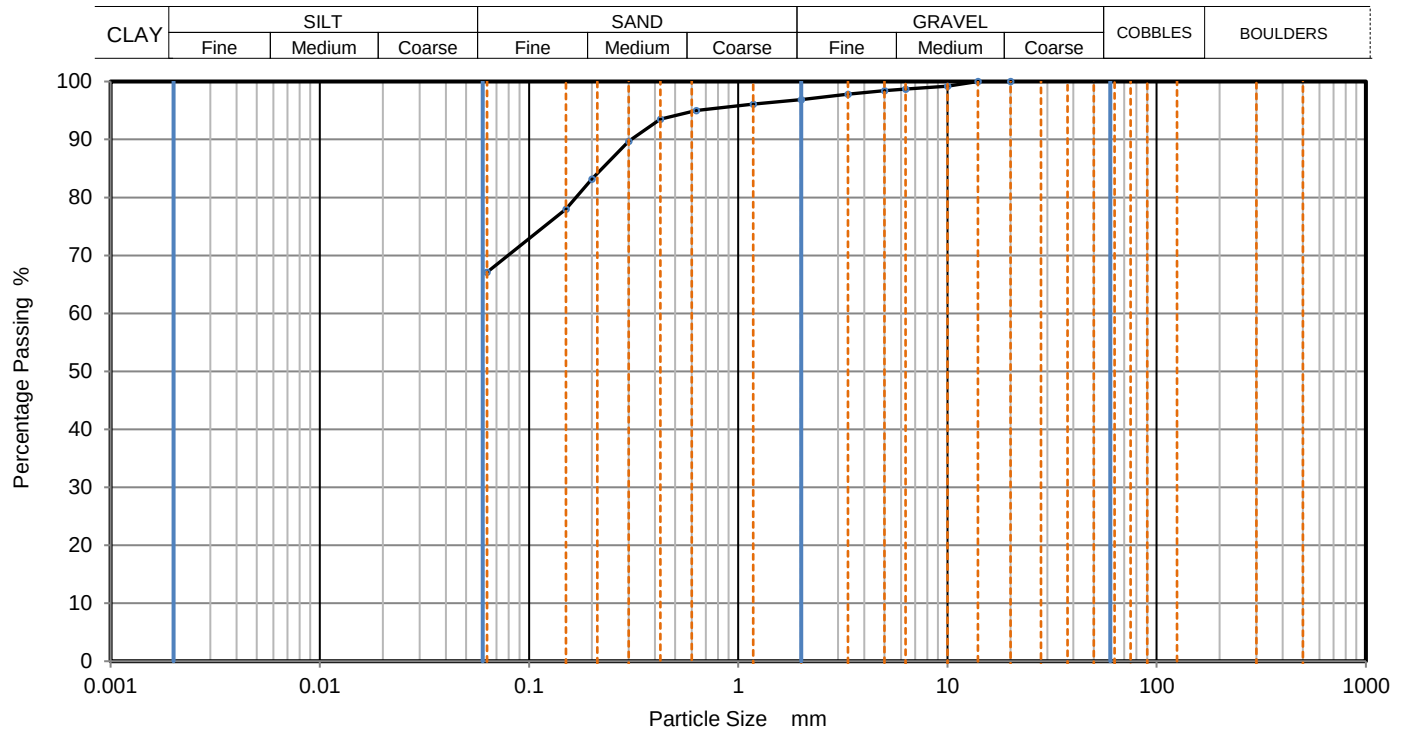
Job Number: 2280522

Client: Envirolab

Page: 2

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP301	11.00	U1	Wet Sieve	Brown sandy, silty CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	99		
6.3	99		
5	98		
3.35	98		
2	97		
1.18	96		
0.63	95		
0.425	94		
0.3	90		
0.2	83		
0.15	78		
0.063	67		

Dry Mass of sample, g

590

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	30
Fines <0.063mm	67

Grading Analysis		
D100	mm	14
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: NW GH

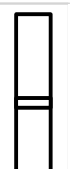
Job Number: 2280522

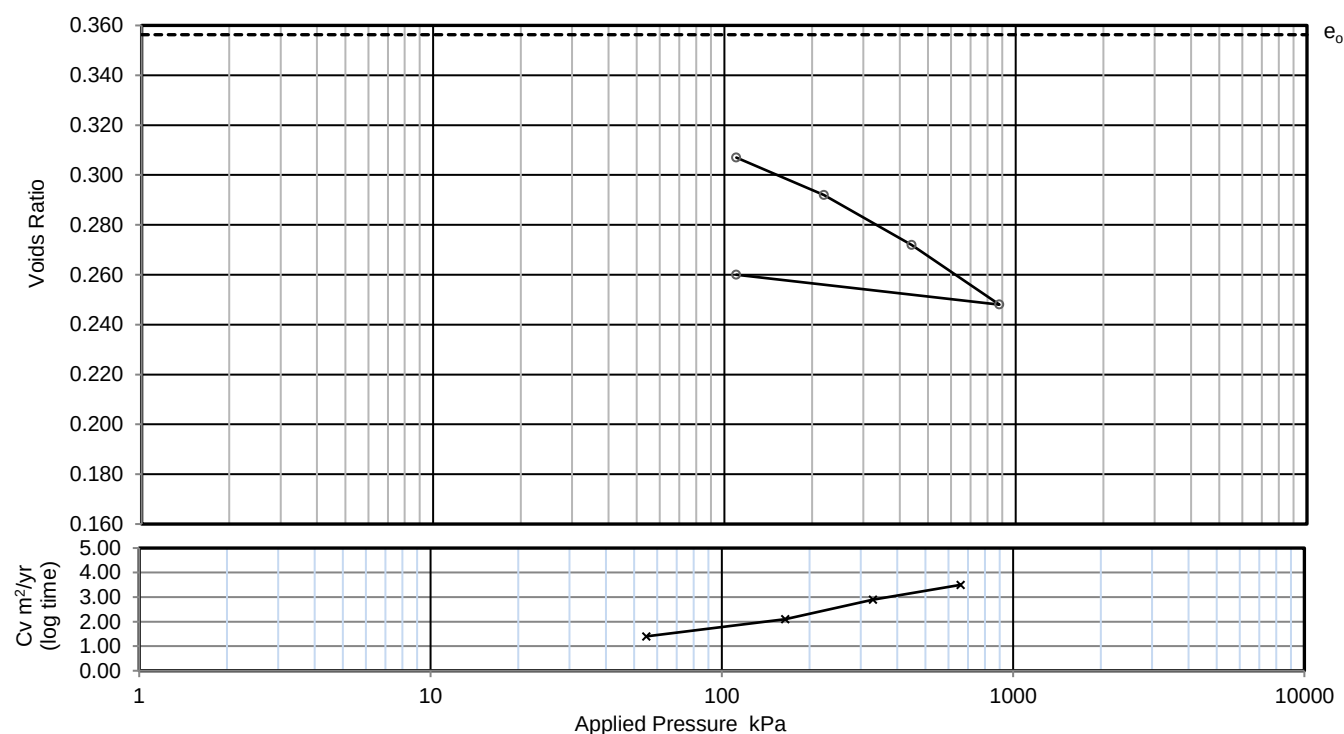
Client: Envirolab

Page: 3

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
CP301	11.00	U1	Brown sandy, silty CLAY

Initial Specimen		Length of Sample (mm)	410.00	Diameter (mm)	75.01
		Depth from top of specimen (mm)	230.00	Particle density (Mg/m ³)	2.65 assumed
		Condition of Sample:	Undisturbed	Swelling Pressure (kPa)	
		Orientation:	Vertical	Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.356
110	0.33	1.4	2	0.00048	0.307
220	0.11	2.1	4.2	0.00081	0.292
440	0.069	2.9	4.5	0.0013	0.272
880	0.042	3.5	4.7	0.0013	0.248
110	0.012				0.260

	Initial	Final
Height (mm)	19.98	18.56
Moisture Content (%)	16	13
Bulk density (Mg/m ³)	2.26	2.38
Dry density (Mg/m ³)	1.95	2.10
Voids Ratio	0.356	0.260
Degree of Saturation (%)	117	136

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen

BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties



Site: NW GH

Job Number: 2280522

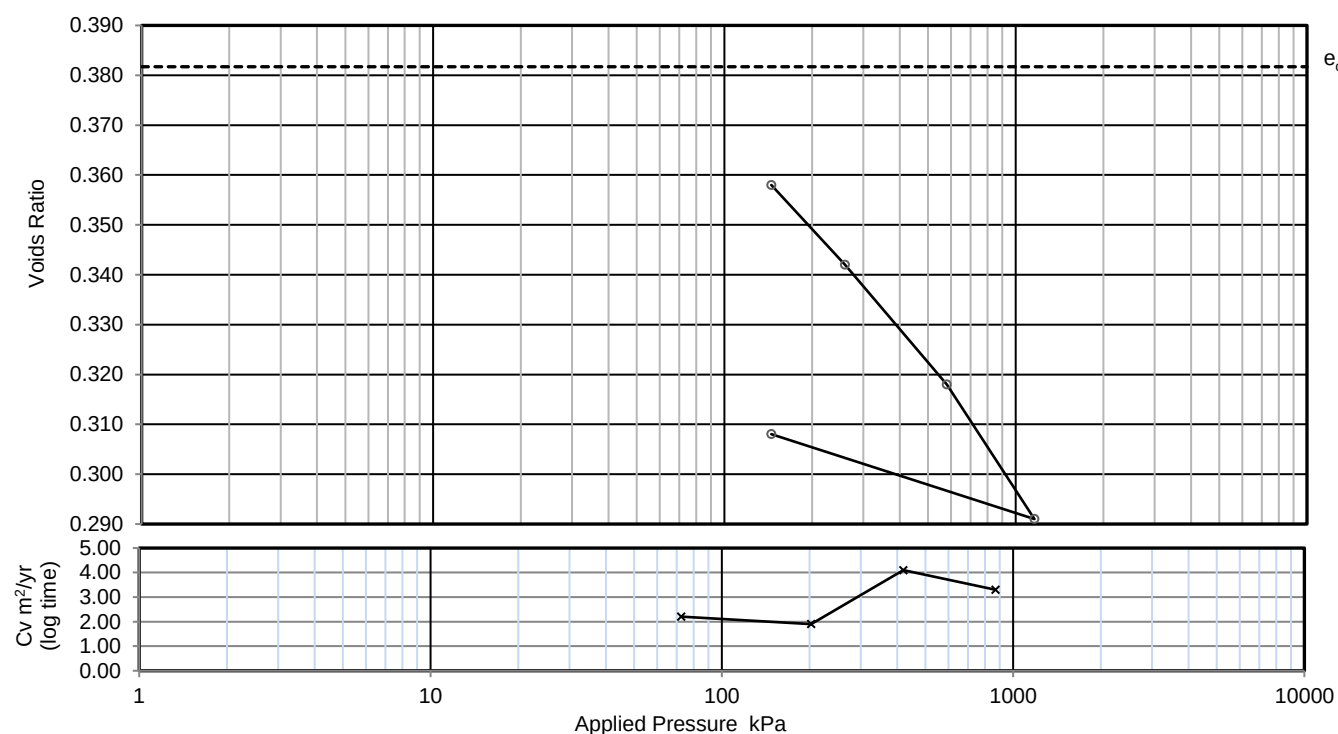
Client: Envirolab

Page: 4

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
CP301	14.50	U2	Brown silty CLAY

Initial Specimen		Length of Sample (mm)	419.00
		Depth from top of specimen (mm)	223.00
		Condition of Sample:	Undisturbed
		Orientation:	Vertical
		Diameter (mm)	75.02
		Particle density (Mg/m ³)	2.65 assumed
		Swelling Pressure (kPa)	
		Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.382
145	0.12	2.2	2.9	0.0013	0.358
260	0.098	1.9	2.5	0.001	0.342
580	0.057	4.1	4.9	0.0018	0.318
1,160	0.035	3.3	4	0.0021	0.291
145	0.013				0.308

	Initial	Final
Height (mm)	20.00	18.94
Moisture Content (%)	17	15
Bulk density (Mg/m ³)	2.24	2.32
Dry density (Mg/m ³)	1.92	2.03
Voids Ratio	0.382	0.308
Degree of Saturation (%)	118	125

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties



Site: NW GH

Job Number: 2280522

Client: Envirolab

Page: 5

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
CP301	11.00	U1	Brown sandy, silty CLAY

Initial Sample	Original Length (mm)	410.1		
	Depth from Top (mm)	10		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		210.46		
Diameter (mm)		101.67		
Moisture Content (%)		13.6		
Bulk Density (Mg/m ³)		2.20		
Dry Density (Mg/m ³)		1.94		
Membrane Thickness (mm)		0.33		
Membrane Type		Latex		
Rate of Strain (%/min)		1.90		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	110	220	440
	Axial Strain (%)	15	17	20
	Membrane Corr. (kPa)	1.0	1.1	1.3
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	217	230	249
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	109	115	124
	Mode of Failure	Plastic		

$\phi_u = 0$

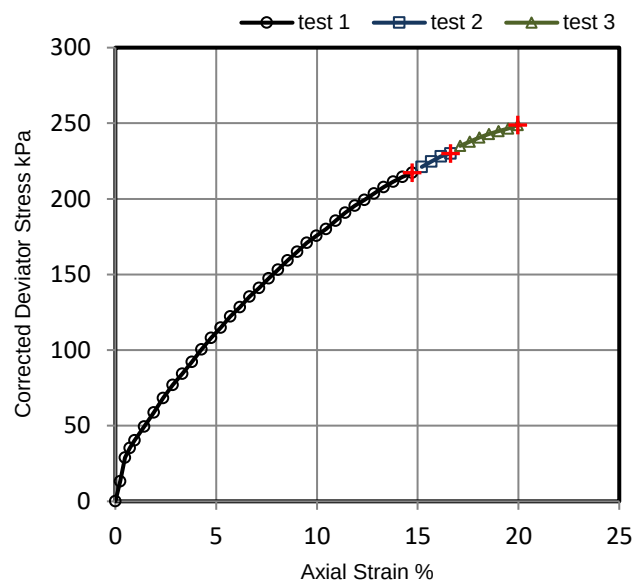
Average c_u 116 kPa

Linear Regression

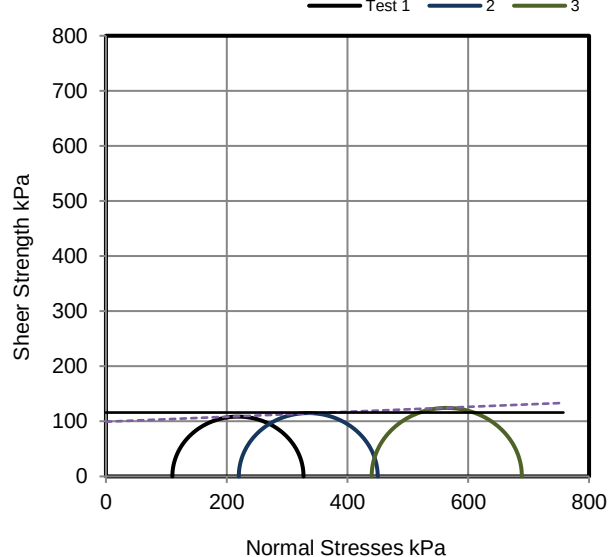
ϕ_u 2.6 °

c_u 99 kPa

Deviator Stress v Axial Strain



Mohr Circles



Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: NW GH

Job Number: 2280522

Client: Envirolab

Page: 6

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
CP301	14.50	U2	Brown silty CLAY

Initial Sample	Original Length (mm)	419.2		
	Depth from Top (mm)	8		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		209.78		
Diameter (mm)		101.02		
Moisture Content (%)		14.5		
Bulk Density (Mg/m3)		2.27		
Dry Density (Mg/m3)		1.98		
Membrane Thickness (mm)		0.32		
Membrane Type		Latex		
Rate of Strain (%/min)		1.91		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	145	290	580
	Axial Strain (%)	11	12	20
	Membrane Corr. (kPa)	0.8	0.8	1.2
	Deviator Stress ($\sigma_1 - \sigma_3$)f (kPa)	207	221	263
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)$ f (kPa)	104	111	131
	Mode of Failure	Compound		

$\phi_u = 0$

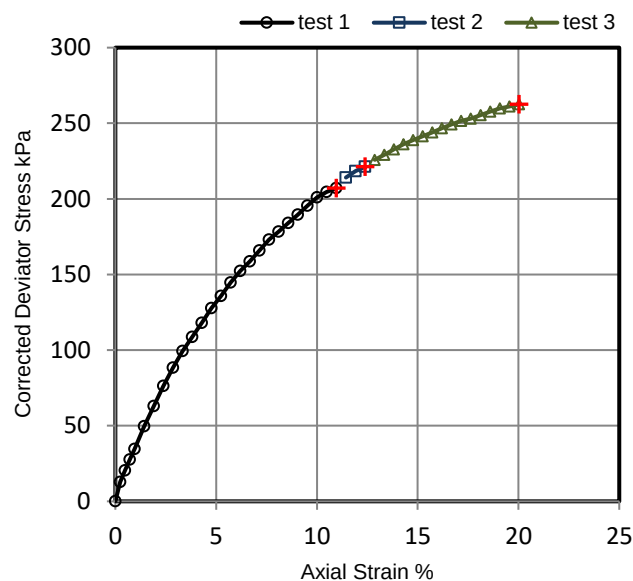
Average c_u 115 kPa

Linear Regression

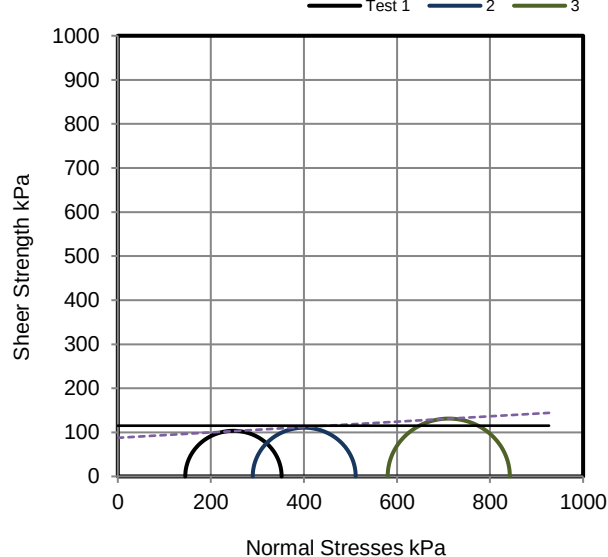
ϕ_u 3.5 °

c_u 88 kPa

Deviator Stress v Axial Strain



Mohr Circles



Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with
multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Final Test Report - 2280522 / 1

Site: NW GH
Job Number: 2280522
Originating Client: Envirolab

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 21/05/2021

F.A.O.

Final Test Report - 2280610 / 1

Site: NW GH
Job Number: 2280610
Originating Client: Envirolab
Originating Reference: 21/06888
Date Sampled: Not Given
Date Scheduled: 24/06/2021
Date Testing Started: 29/06/2021
Date Testing Finished: 13/07/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Tim Robinson
Quality Supervisor

Report Issue Date: 14/07/2021

Page: 2



Site: NW GH

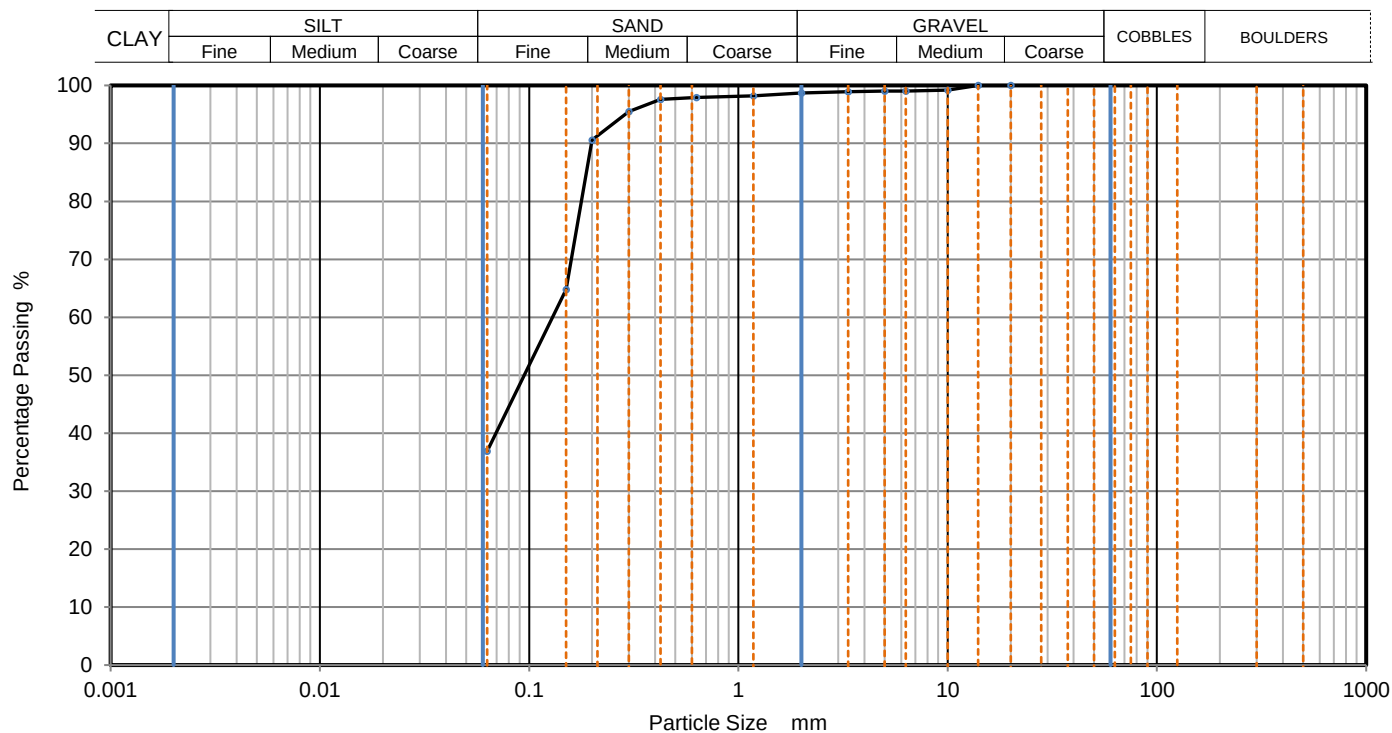
Job Number: 2280610

Client: Envirolab

Page: 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS303	2.00	B	Wet Sieve	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.63	98		
0.425	98		
0.3	96		
0.2	91		
0.15	65		
0.063	37		

Dry Mass of sample, g

556

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	62
Fines <0.063mm	37

Grading Analysis		
D100	mm	14
D60	mm	0.129
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method



1464

Result reported relates only to the sample tested.



Final Test Report - 2280610 / 1

Site: NW GH
Job Number: 2280610
Originating Client: Envirolab

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 14/07/2021

F.A.O.

Final Test Report - 2280638 / 1

Site: North Manchester Hospital

Job Number: 2280638

Originating Client: Envirolab

Originating Reference: 21/07503

Date Sampled: Not Given

Date Scheduled: 14/07/2021

Date Testing Started: 23/07/2021

Date Testing Finished: 05/08/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Tim Robinson
Quality Supervisor

Report Issue Date: 06/08/2021



Site: North Manchester Hospital

Job Number: 2280638

Client: Envirolab

Page: 2

**Determination of Moisture Content, Liquid Limit and Plastic Limit
and Derivation of Plasticity and Liquidity Index**

Borehole / Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Natural - Stones removed by hand Sieved - Washed on 425 µm sieve			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
				Natural / Sieved	Percentage Passing %	Moisture Content %						
BH303	13.00	D	18	Natural	100	18	31	19	12	-0.08	CL	Brown slightly sandy, silty CLAY
BH303	22.00	D	25	Natural	100	25	50	25	25	0.00	CI/CH	Brown slightly silty CLAY
BH303	28.50	D	8.6	Sieved	57	11	23	11	12	0.02	CL	Brown gravelly, sandy, silty CLAY
BH304	1.20	D	28	Sieved	23	105	31	29	2	37.88	ML	Brown slightly clayey, sandy SILT
BH304	18.00	D	23	Natural	100	23	48	25	23	-0.09	CI	Brown silty CLAY
BH305	15.60	D	14	Natural	100	14	29	14	15	0.00	CL	Brown silty CLAY
BH305	18.00	D	22	Natural	100	22	45	21	24	0.04	CI	Brown slightly silty CLAY
BH306	2.00	D	20	Sieved	86	22		NP				Brown CLAY/SAND
BH306	12.00	B	24	Natural	100	24	47	22	25	0.08	CI	Brown silty CLAY
BH306	21.00	D	26	Natural	99	26	43	19	24	0.30	CI	Brown silty CLAY
BH306	24.00	B	24	Natural	100	24	25	19	6	0.83	CL	Brown silty CLAY
BH307	3.00	D	17	Natural	95	18	29	17	12	0.06	CL	Brown sandy, silty SAND
BH307	8.50	D	15	Natural	97	15	31	13	18	0.13	CLO	Brown slightly sandy, slightly silty CLAY
BH307	19.00	D	23	Natural	100	23	42	20	22	0.14	CI	Brown silty CLAY
BH307	29.50	D	20	Natural	100	20	30	18	12	0.17	CL	Brown silty CLAY

Method of Preparation: BS 1377 : Part 1 : 1990 : Clause 7 Preparation of disturbed samples for testing
BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 3.2 Determination of moisture content
BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index



Results reported relate only to the samples tested.



Site: North Manchester Hospital

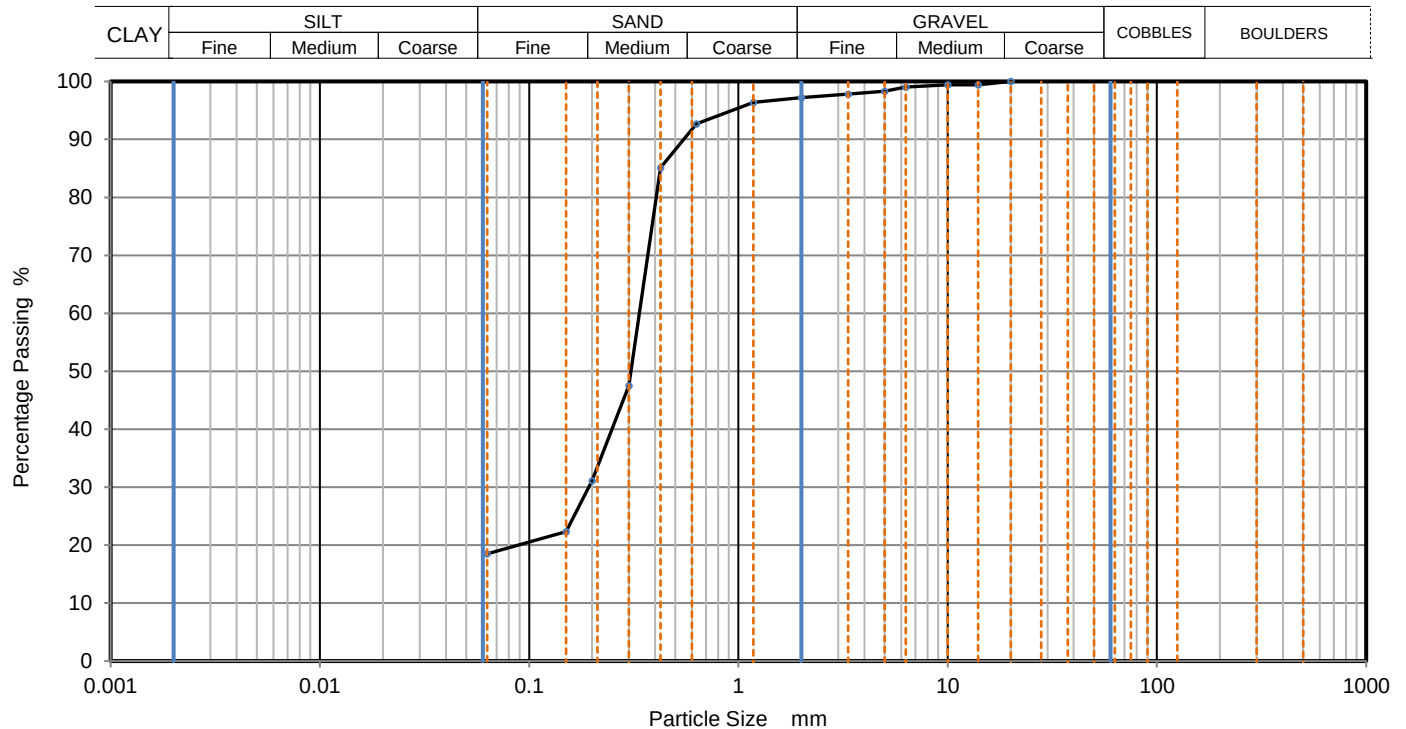
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	2.00	B	Wet Sieve	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	99		
10	99		
6.3	99		
5	98		
3.35	98		
2	97		
1.18	96		
0.63	93		
0.425	85		
0.3	48		
0.2	31		
0.15	22		
0.063	19		

Dry Mass of sample, g

1264

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	79
Fines <0.063mm	18

Grading Analysis		
D100	mm	20
D60	mm	0.337
D30	mm	0.193
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

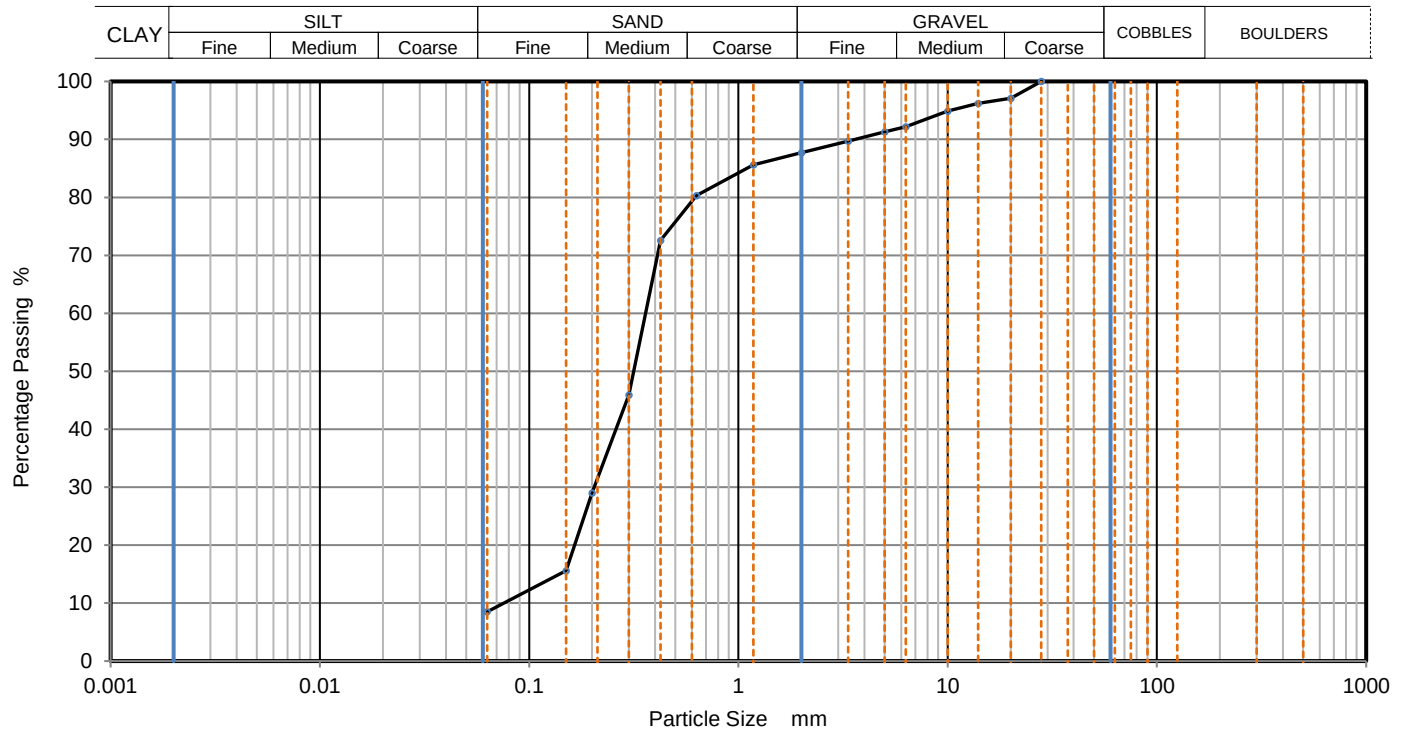
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Client: Envirolab

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	7.00	B	Wet Sieve	Brown slightly silty, gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
28	100		
20	97		
14	96		
10	95		
6.3	92		
5	91		
3.35	90		
2	88		
1.18	86		
0.63	80		
0.425	73		
0.3	46		
0.2	29		
0.15	16		
0.063	9		

Dry Mass of sample, g

1625

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	79
Fines <0.063mm	9

Grading Analysis		
D100	mm	28
D60	mm	0.361
D30	mm	0.205
D10	mm	0.0754
Uniformity Coefficient		4.8
Curvature Coefficient		1.5

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

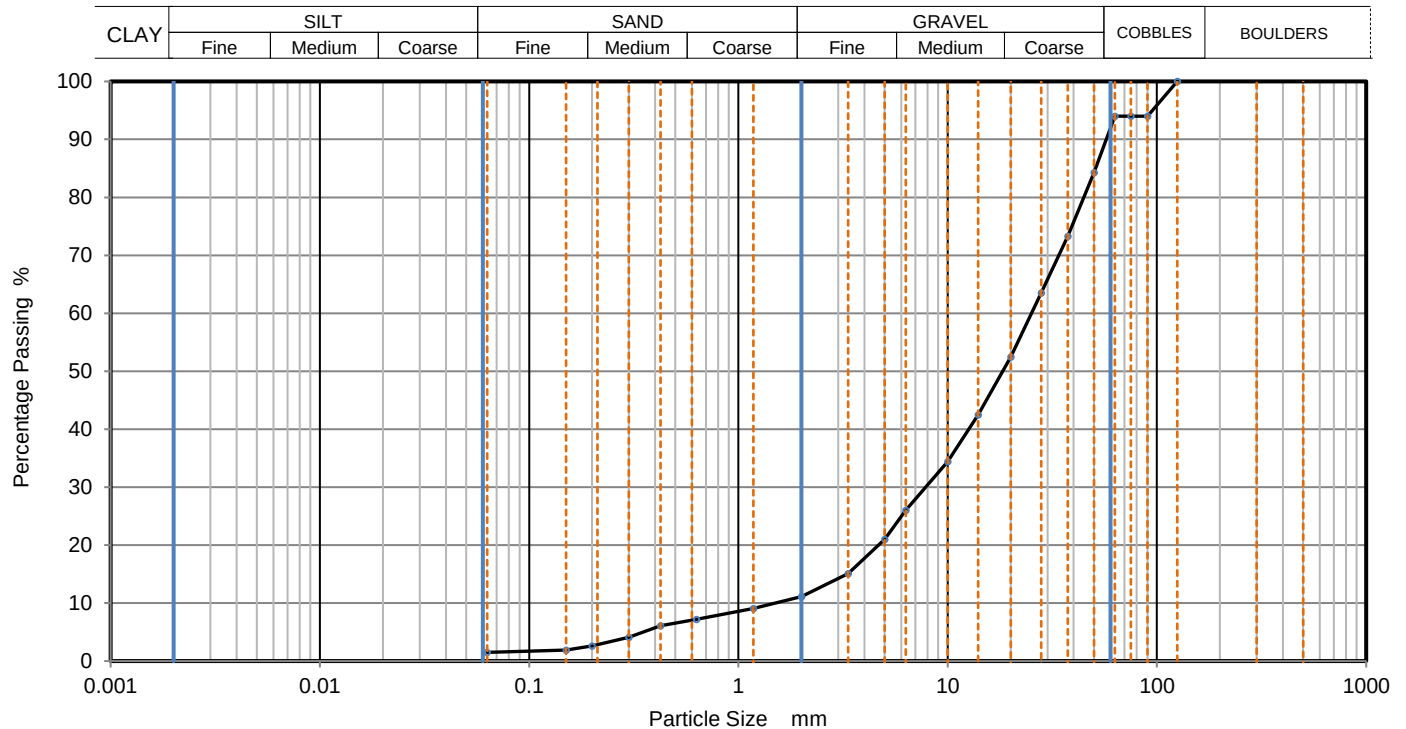
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Client: Envirolab

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	26.50	B	Wet Sieve	Brown slightly sandy GRAVEL



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	94		
75	94		
63	94		
50	84		
37.5	73		
28	64		
20	53		
14	43		
10	34		
6.3	26		
5	21		
3.35	15		
2	11		
1.18	9		
0.63	7		
0.425	6		
0.3	4		
0.2	3		
0.15	2		
0.063	2		

Dry Mass of sample, g

9863

Sample Proportions	% dry mass
Very coarse	6
Gravel	83
Sand	10
Fines <0.063mm	1

Grading Analysis		
D100	mm	125
D60	mm	25.2
D30	mm	7.84
D10	mm	1.49
Uniformity Coefficient		17
Curvature Coefficient		1.6

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

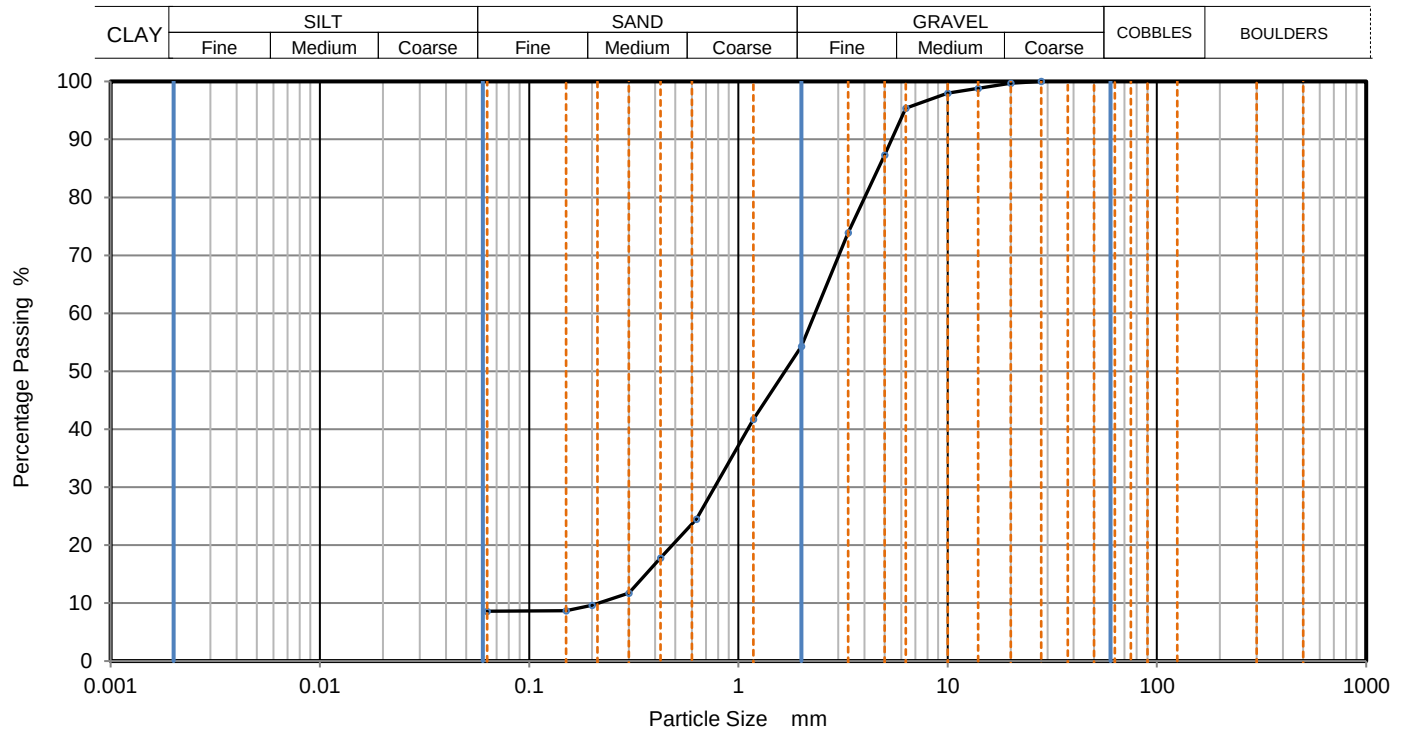
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH304	3.00	B	Wet Sieve	Brown slightly silty, SAND/GRAVEL



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
28	100		
20	100		
14	99		
10	98		
6.3	95		
5	87		
3.35	74		
2	54		
1.18	42		
0.63	25		
0.425	18		
0.3	12		
0.2	10		
0.15	9		
0.063	9		

Dry Mass of sample, g

1449

Sample Proportions	% dry mass
Very coarse	0
Gravel	46
Sand	46
Fines <0.063mm	9

Grading Analysis		
D100	mm	28
D60	mm	2.32
D30	mm	0.77
D10	mm	0.216
Uniformity Coefficient		11
Curvature Coefficient		1.2

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

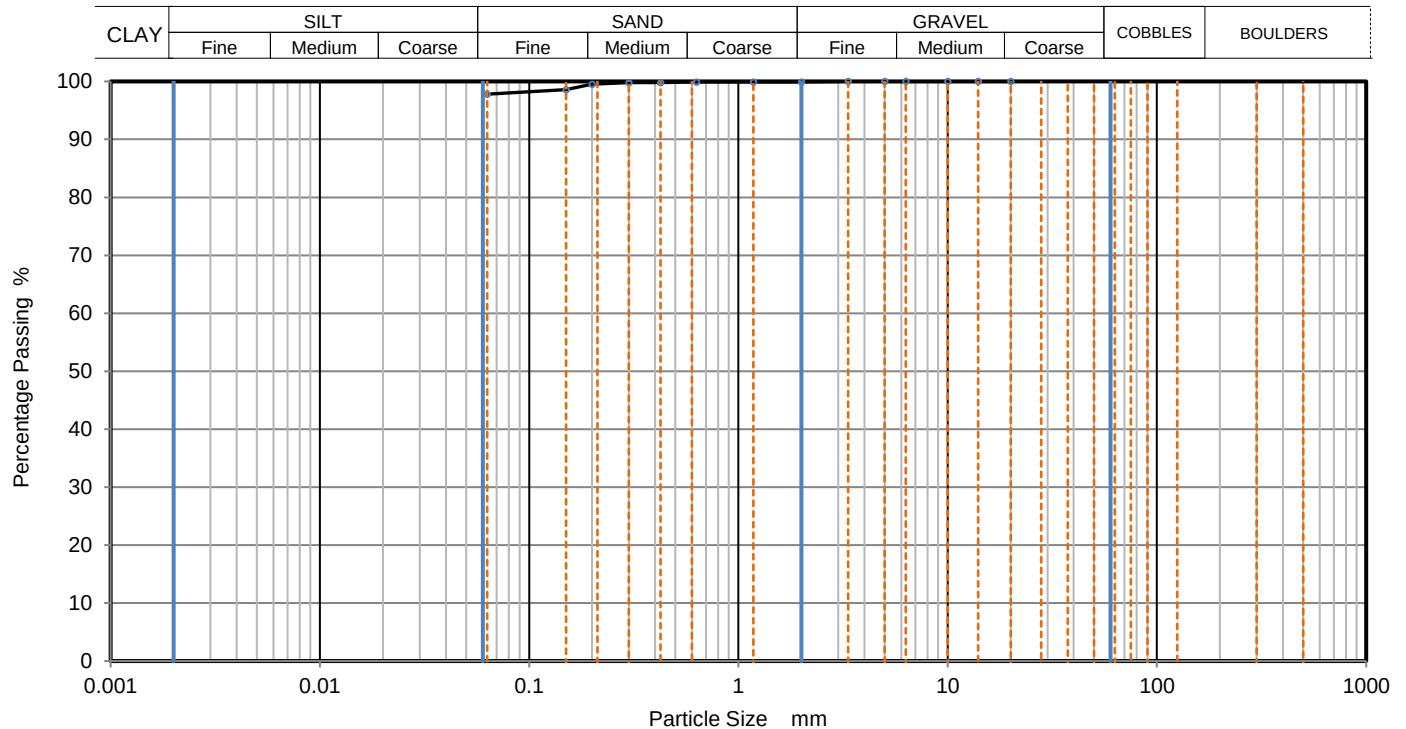
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH304	10.00	B	Wet Sieve	Brown silty CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	100		
0.3	100		
0.2	100		
0.15	99		
0.063	98		

Dry Mass of sample, g

816

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	2
Fines <0.063mm	98

Grading Analysis		
D100	mm	5
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

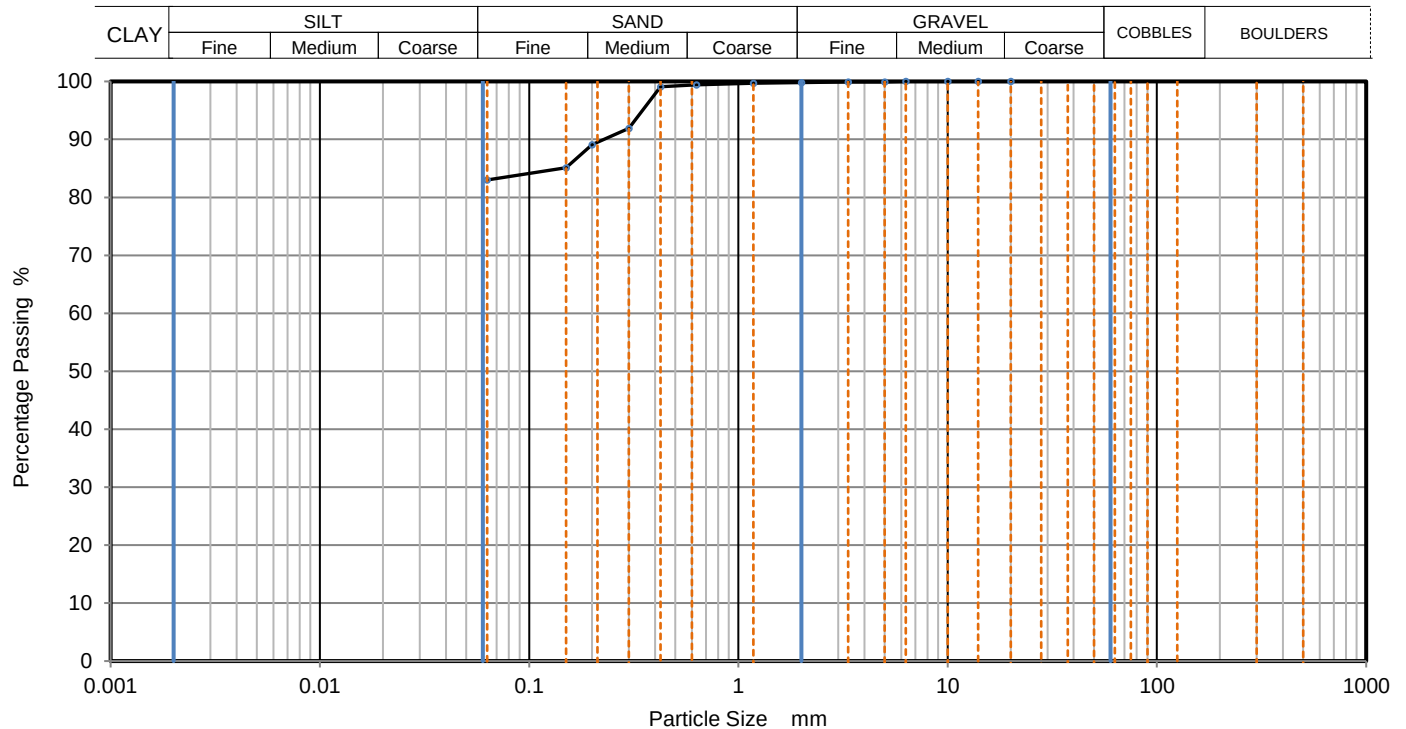
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH304	24.00	B	Wet Sieve	Brown sandy, silty CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	99		
0.3	92		
0.2	89		
0.15	85		
0.063	83		

Dry Mass of sample, g

738

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	17
Fines <0.063mm	83

Grading Analysis		
D100	mm	6.3
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

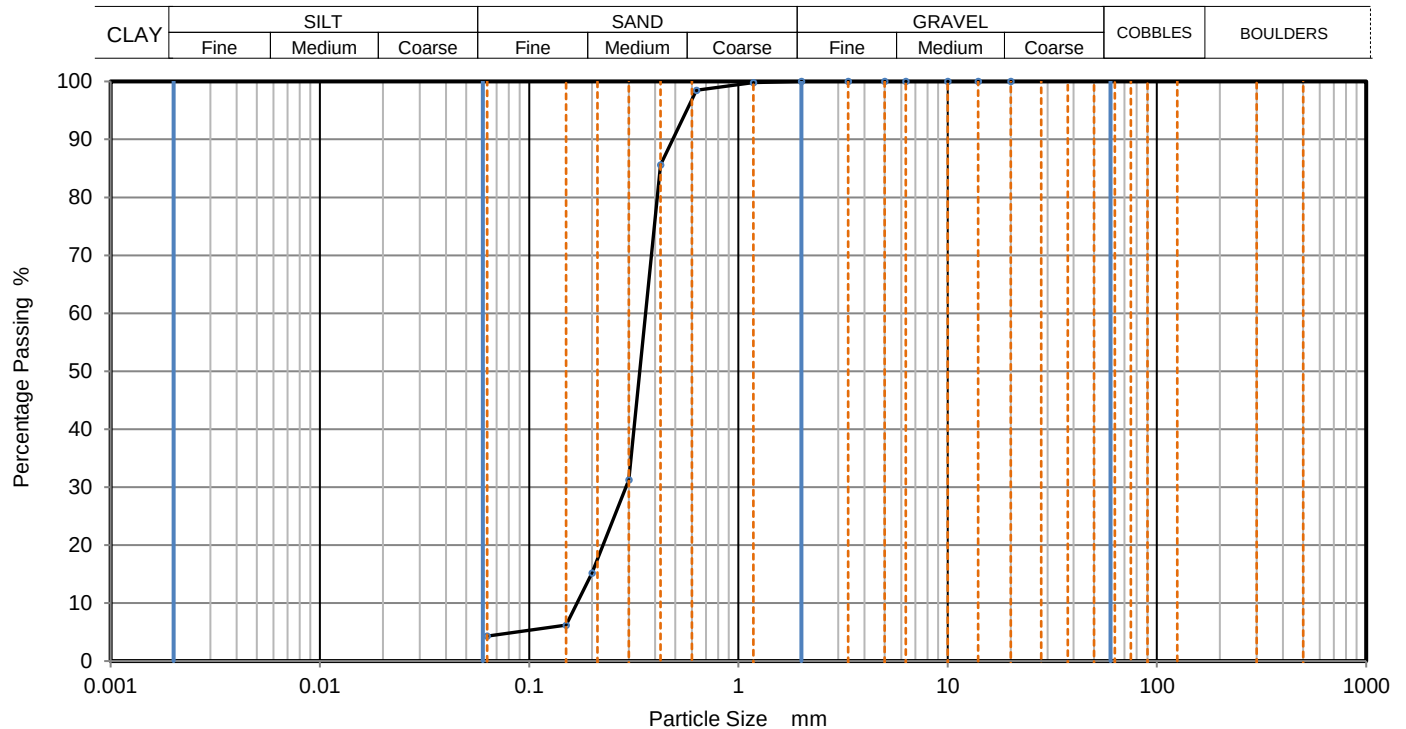
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH304	31.00	B	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	86		
0.3	31		
0.2	15		
0.15	6		
0.063	4		

Dry Mass of sample, g

1562

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	96
Fines <0.063mm	4

Grading Analysis		
D100	mm	2
D60	mm	0.361
D30	mm	0.29
D10	mm	0.169
Uniformity Coefficient		2.1
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

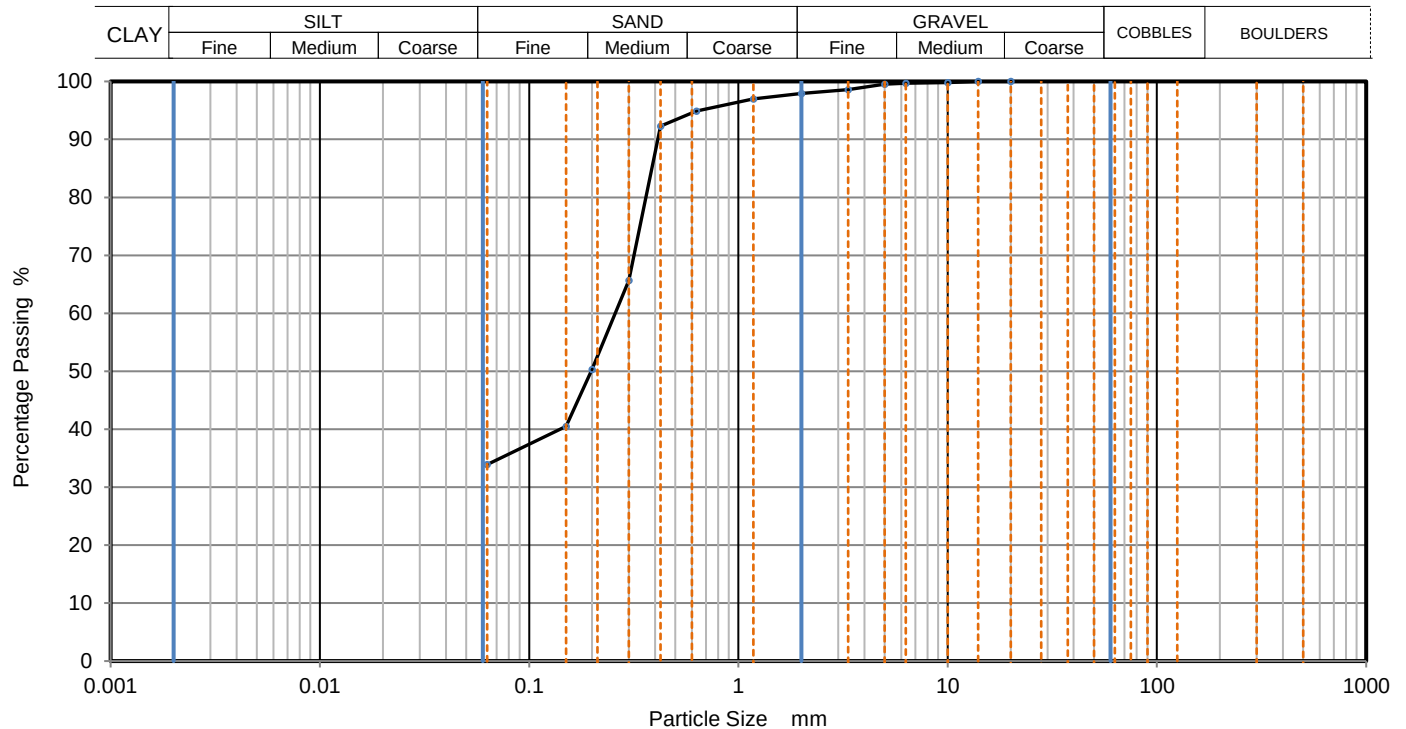
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH305	14.20	B	Wet Sieve	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	97		
0.63	95		
0.425	92		
0.3	66		
0.2	50		
0.15	41		
0.063	34		

Dry Mass of sample, g

1149

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	64
Fines <0.063mm	34

Grading Analysis		
D100	mm	14
D60	mm	0.258
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

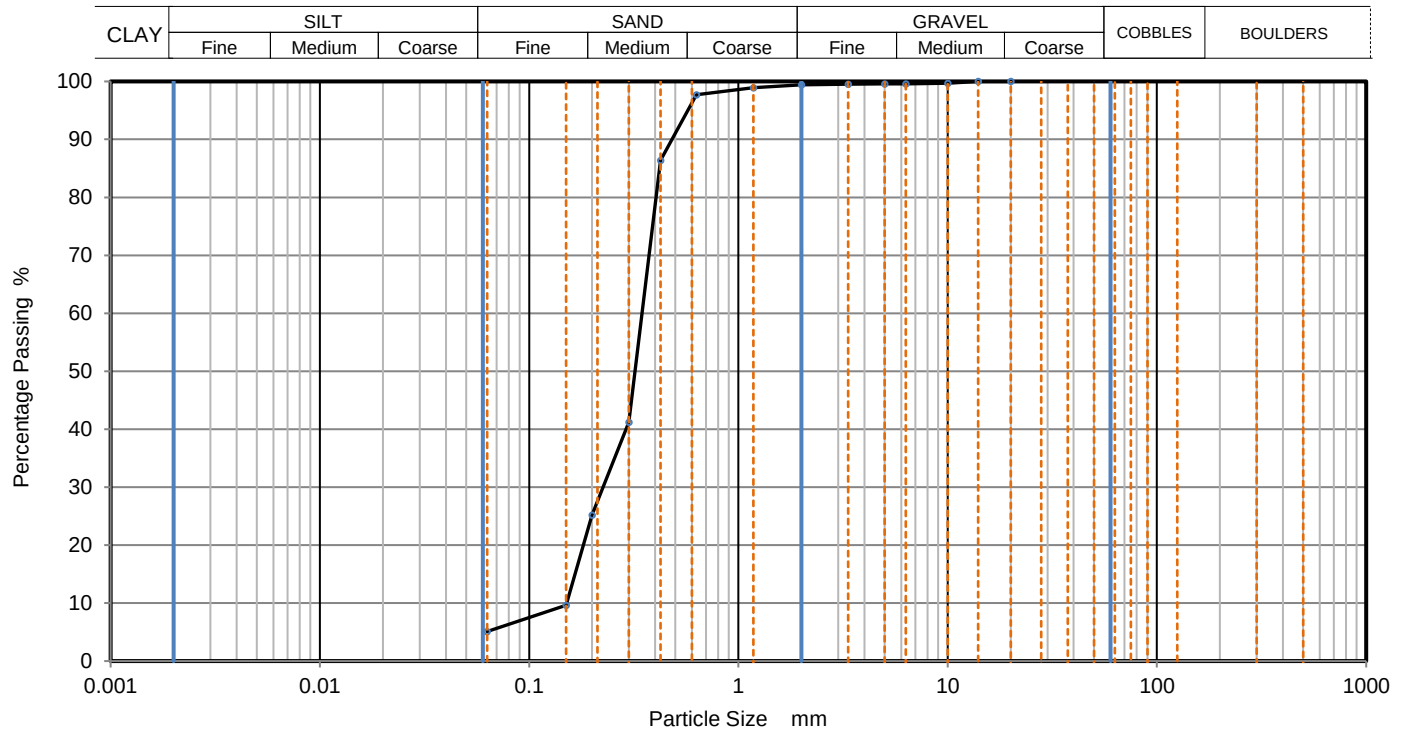
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH306	1.20	B	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.63	98		
0.425	86		
0.3	41		
0.2	25		
0.15	10		
0.063	5		

Dry Mass of sample, g

887

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	94
Fines <0.063mm	5

Grading Analysis		
D100	mm	14
D60	mm	0.347
D30	mm	0.226
D10	mm	0.151
Uniformity Coefficient		2.3
Curvature Coefficient		0.97

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

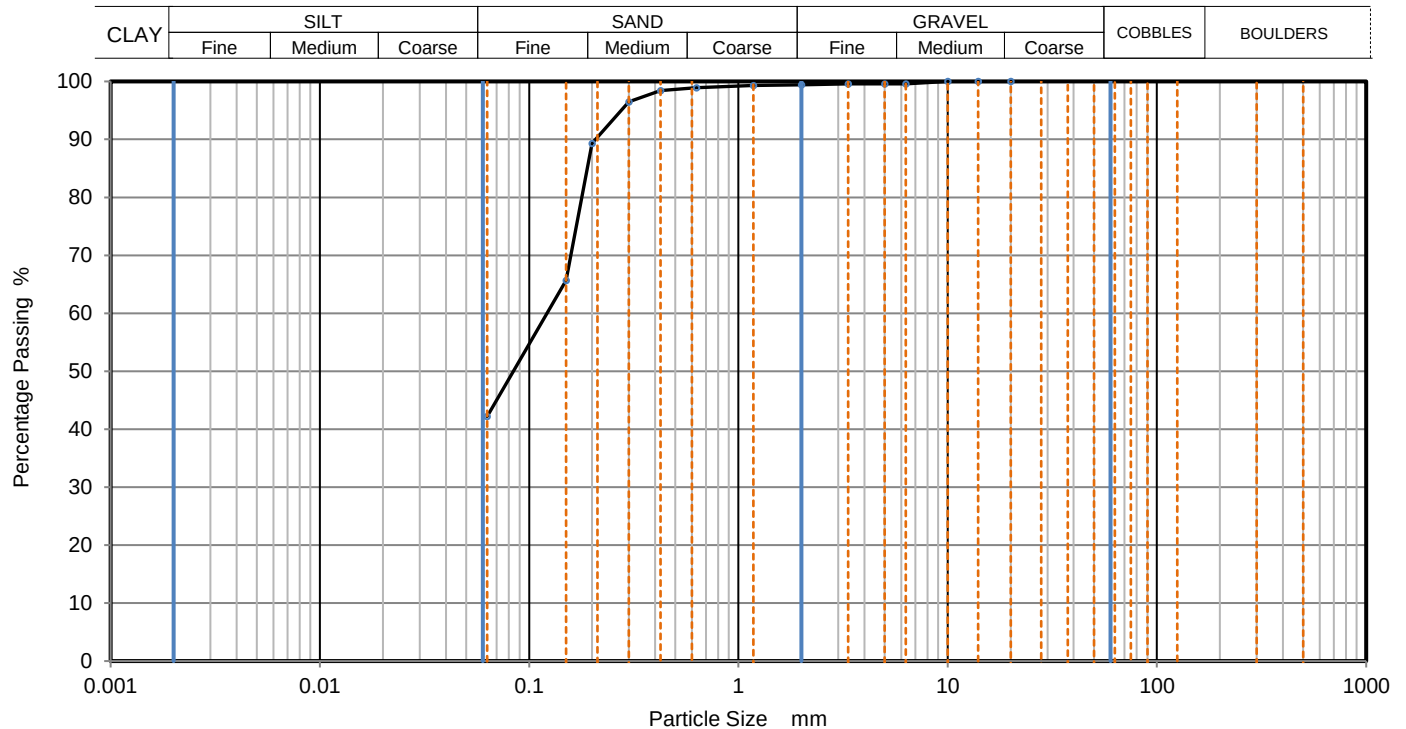
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH307	7.00	B	Wet Sieve	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.63	99		
0.425	98		
0.3	97		
0.2	89		
0.15	66		
0.063	42		

Dry Mass of sample, g

910

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	57
Fines <0.063mm	42

Grading Analysis		
D100	mm	10
D60	mm	0.122
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

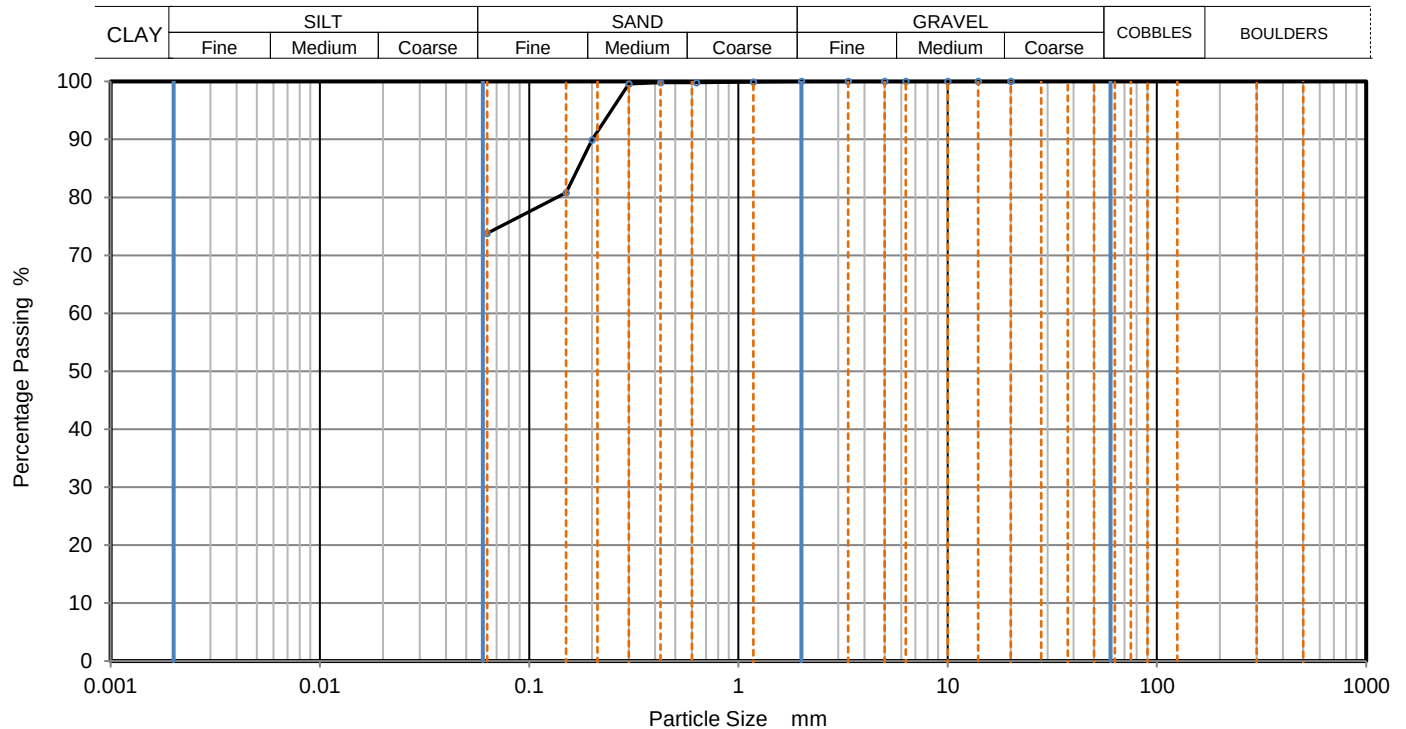
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH307	25.00	B	Wet Sieve	Brown slightly clayey, sandy SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	100		
0.3	100		
0.2	90		
0.15	81		
0.063	74		

Dry Mass of sample, g

916

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	26
Fines <0.063mm	74

Grading Analysis		
D100	mm	3.35
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: North Manchester Hospital

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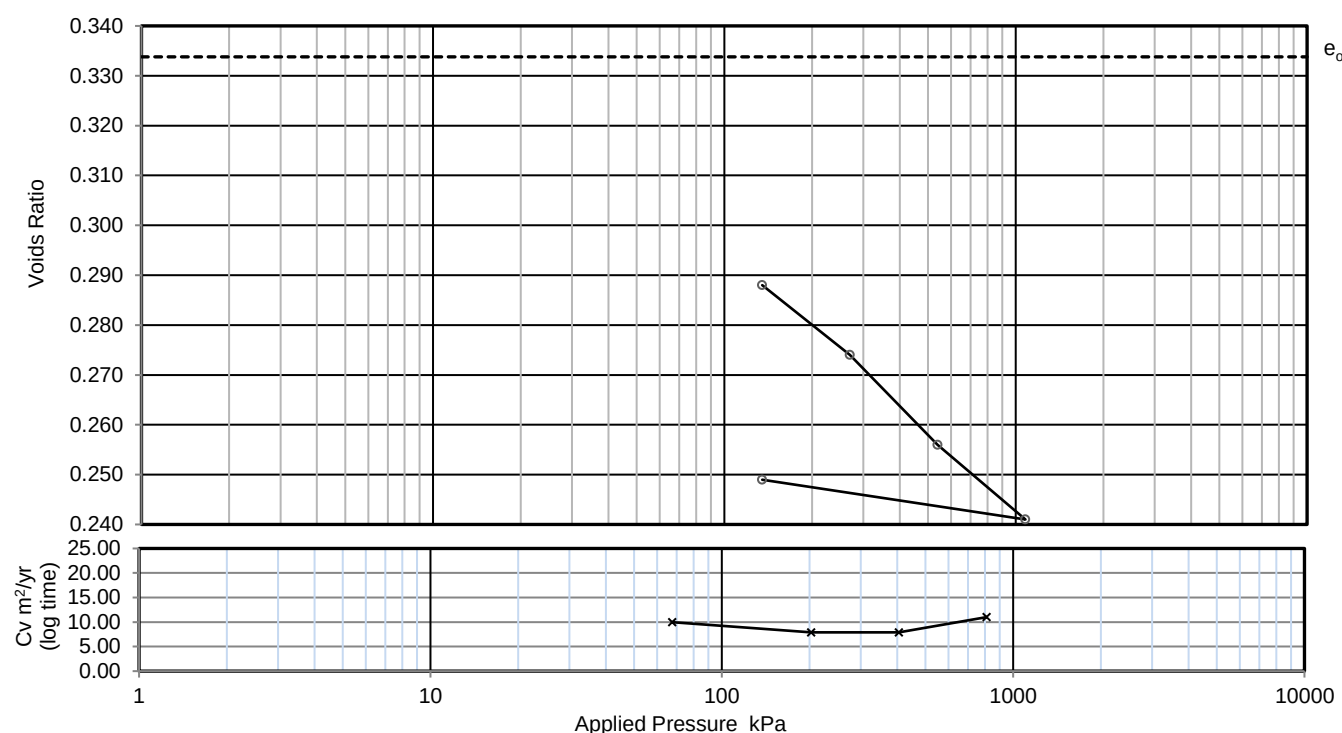
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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH304	13.50	U	Brown silty CLAY

Initial Specimen		Length of Sample (mm)	360.00	Diameter (mm)	75.01
		Depth from top of specimen (mm)	20.00	Particle density (Mg/m ³)	2.65 assumed
		Condition of Sample:	Undisturbed	Swelling Pressure (kPa)	
		Orientation:	Vertical	Lab Temp. (°C)	21



Applied Pressure kPa	Mv m ² /MN	Cv (t ₅₀ , log) m ² /yr	Cv (t ₉₀ , root) m ² /yr	Csec	Voids ratio
0.0	-	-	-	-	0.334
135	0.26	10	25	0.00029	0.288
270	0.077	7.9	14	0.00079	0.274
540	0.053	7.9	18	0.00079	0.256
1,080	0.022	11	13	0.0011	0.241
135	0.0069				0.249

	Initial	Final
Height (mm)	19.08	17.86
Moisture Content (%)	12	12
Bulk density (Mg/m ³)	2.23	2.37
Dry density (Mg/m ³)	1.99	2.12
Voids Ratio	0.334	0.249
Degree of Saturation (%)	99	127

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties



Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

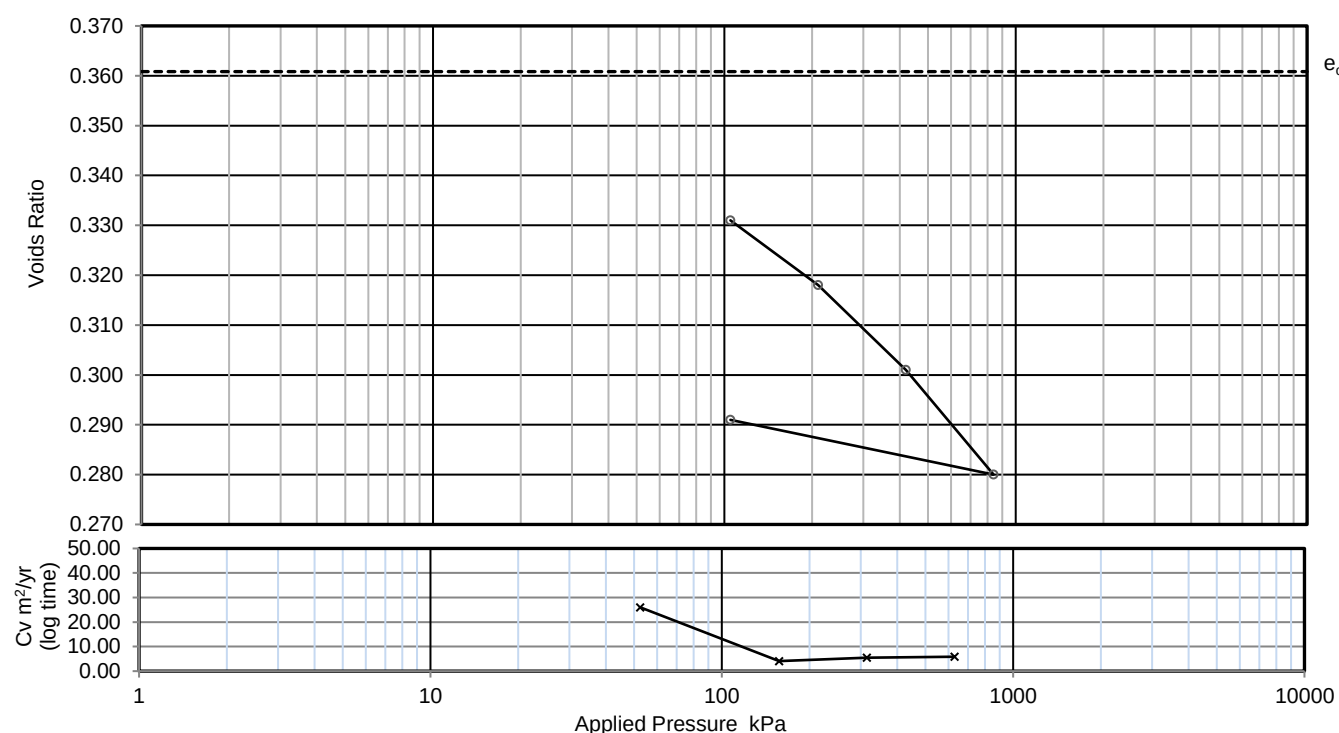
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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH305	10.50	U	Brown slightly gravelly, slightly silty, sandy CLAY

Initial Specimen		Length of Sample (mm)	420.00	Diameter (mm)	75.00
		Depth from top of specimen (mm)	10.00	Particle density (Mg/m ³)	2.65 assumed
		Condition of Sample:	Undisturbed	Swelling Pressure (kPa)	
		Orientation:	Vertical	Lab Temp. (°C)	21



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.361
105	0.21	26	31	0.00029	0.331
210	0.089	4.1	8.1	0.0008	0.318
420	0.062	5.5	9.2	0.0011	0.301
840	0.038	5.9	11	0.0011	0.280
105	0.011				0.291

	Initial	Final
Height (mm)	19.05	18.07
Moisture Content (%)	14	13
Bulk density (Mg/m ³)	2.22	2.32
Dry density (Mg/m ³)	1.95	2.05
Voids Ratio	0.361	0.291
Degree of Saturation (%)	101	117

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties





Site: North Manchester Hospital

Job Number: 2280638

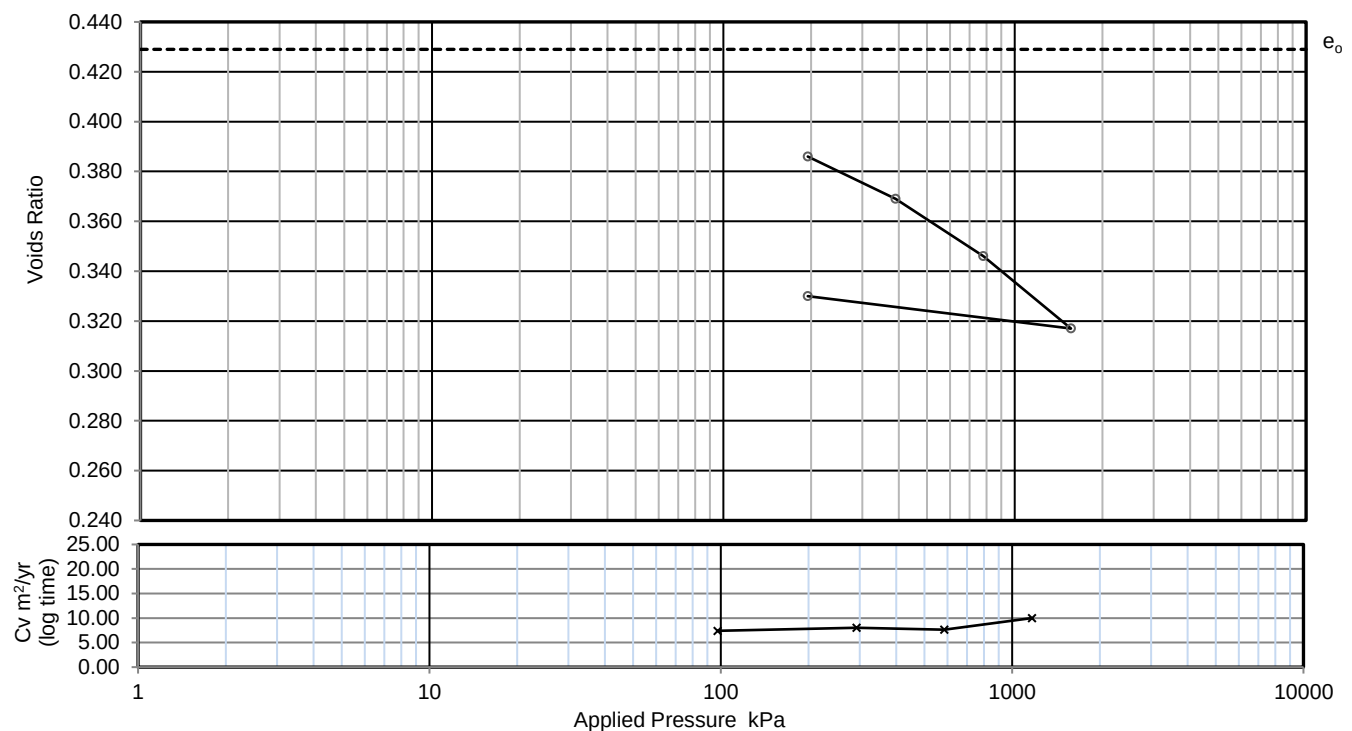
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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH305	19.50	U	Brown silty CLAY

Initial Specimen		Length of Sample (mm)	400.00	Diameter (mm)	74.99
		Depth from top of specimen (mm)	30.00	Particle density (Mg/m ³)	2.65 assumed
		Condition of Sample:	Undisturbed	Swelling Pressure (kPa)	
		Orientation:	Vertical	Lab Temp. (°C)	21



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.429
195	0.15	7.4	15	0.00059	0.386
390	0.062	8	13	0.0011	0.369
780	0.043	7.6	12	0.0012	0.346
1,560	0.028	10	14	0.0017	0.317
195	0.007				0.330

	Initial	Final
Height (mm)	19.03	17.70
Moisture Content (%)	17	15
Bulk density (Mg/m ³)	2.16	2.28
Dry density (Mg/m ³)	1.85	1.99
Voids Ratio	0.429	0.330
Degree of Saturation (%)	103	117

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties



Result reported relates only to the sample tested.

Site: North Manchester Hospital

Job Number: 2280638

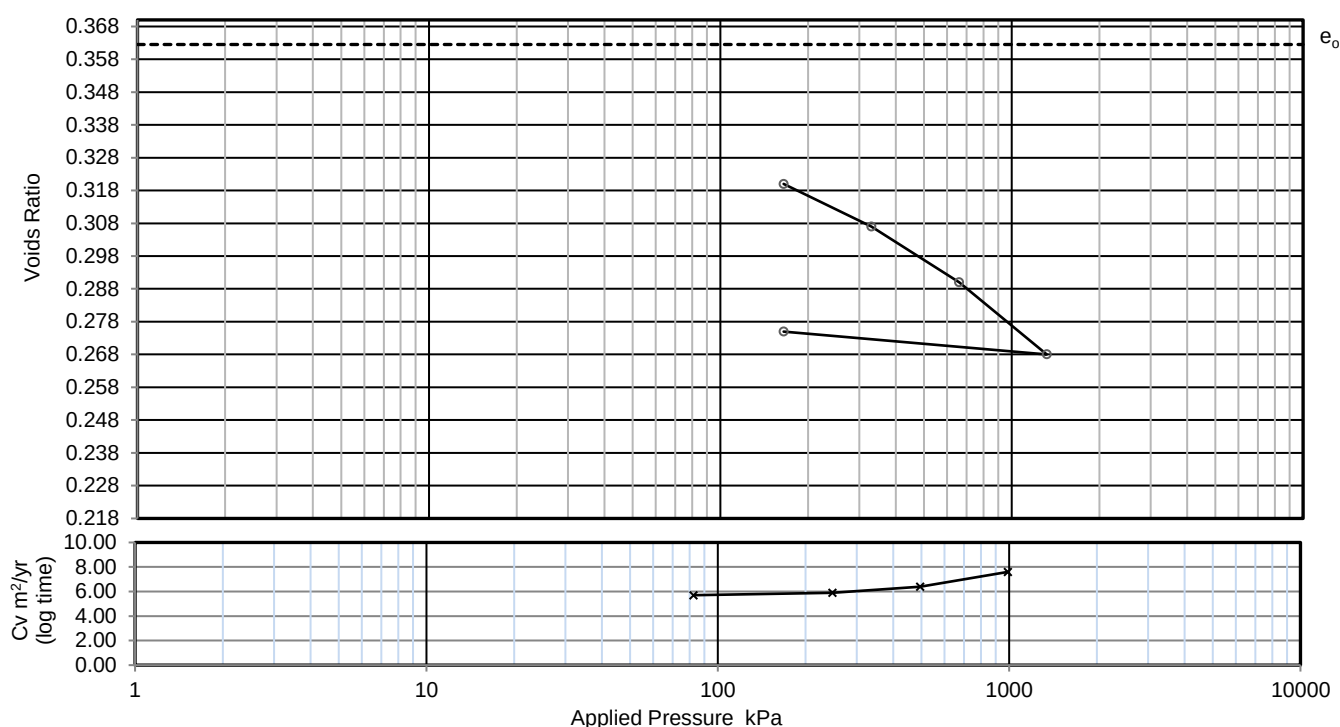
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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH306	16.50	U	Brown silty CLAY

Initial Specimen		Length of Sample (mm)	330.00	Diameter (mm)	75.02
		Depth from top of specimen (mm)	10.00	Particle density (Mg/m³)	2.65 assumed
		Condition of Sample: Undisturbed		Swelling Pressure (kPa)	
		Orientation: Vertical		Lab Temp. (°C)	



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.363
165	0.19	5.7	12	0.00059	0.320
330	0.06	5.9	8.8	0.00089	0.307
660	0.039	6.4	8.6	0.0011	0.290
1,320	0.025	7.6	10	0.0014	0.268
165	0.0044				0.275

	Initial	Final
Height (mm)	19.01	17.78
Moisture Content (%)	14	12
Bulk density (Mg/m ³)	2.21	2.33
Dry density (Mg/m ³)	1.94	2.08
Voids Ratio	0.363	0.275
Degree of Saturation (%)	101	119

Remarks:

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties



Site: North Manchester Hospital

Job Number: 2280638

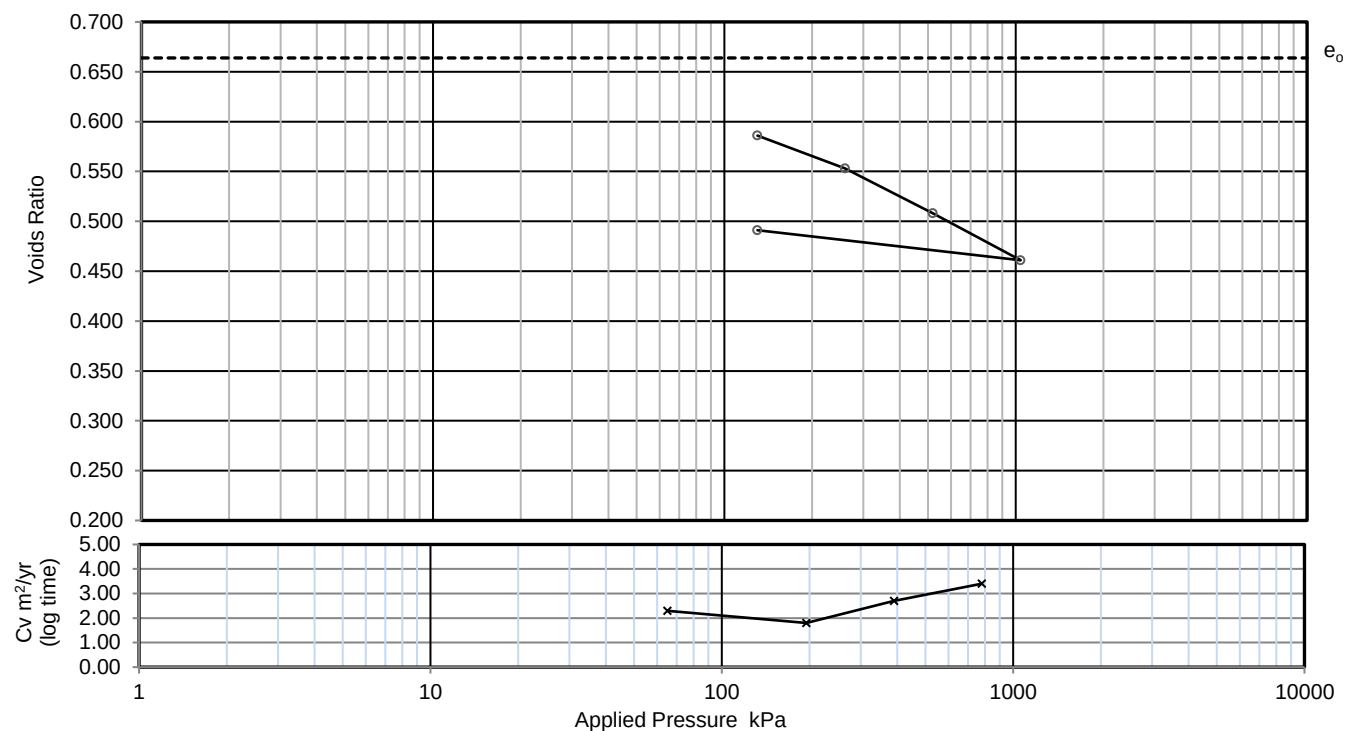
Client: Envirolab

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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH307	13.00	U	Brown silty CLAY

Initial Specimen		Length of Sample (mm)	420.00	Diameter (mm)	75.03
		Depth from top of specimen (mm)	10.00	Particle density (Mg/m ³)	2.65 assumed
		Condition of Sample:	Undisturbed	Swelling Pressure (kPa)	
		Orientation:	Vertical	Lab Temp. (°C)	21



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.664
130	0.36	2.3	7.5	0.0017	0.586
260	0.16	1.8	2.6	0.0019	0.553
520	0.11	2.7	3.1	0.002	0.508
1,040	0.06	3.4	4.6	0.0025	0.461
130	0.023				0.491

	Initial	Final
Height (mm)	19.02	17.04
Moisture Content (%)	27	22
Bulk density (Mg/m ³)	2.02	2.17
Dry density (Mg/m ³)	1.59	1.78
Voids Ratio	0.664	0.491
Degree of Saturation (%)	108	118

Remarks:

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties





Site: North Manchester Hospital

Job Number: 2280638

Client: Envirolab

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH304	7.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	432.1		
	Depth from Top (mm)	98.96		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		205.89		
Diameter (mm)		101.87		
Moisture Content (%)		14.3		
Bulk Density (Mg/m ³)		2.21		
Dry Density (Mg/m ³)		1.93		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.46		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	75	150	300
	Axial Strain (%)	6	8	20
	Membrane Corr. (kPa)	0.3	0.4	0.8
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	116	145	256
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	58	73	128
	Mode of Failure	Plastic		

$\phi_u = 0$

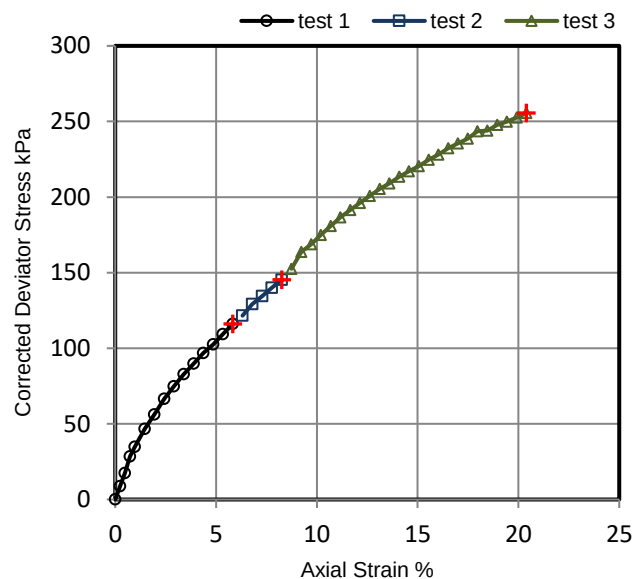
Average c_u 86 kPa

Linear Regression

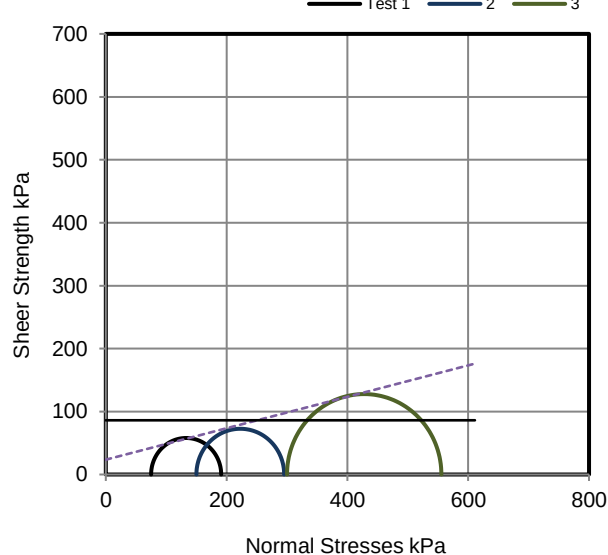
ϕ_u 14.0 °

c_u 24 kPa

Deviator Stress v Axial Strain



Mohr Circles



Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

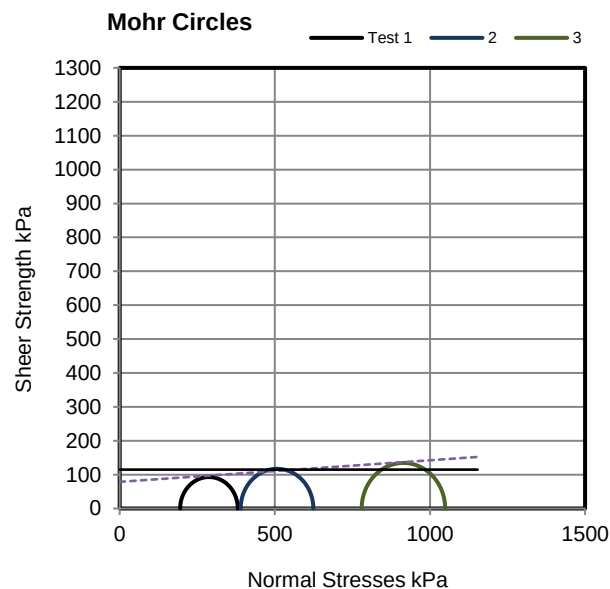
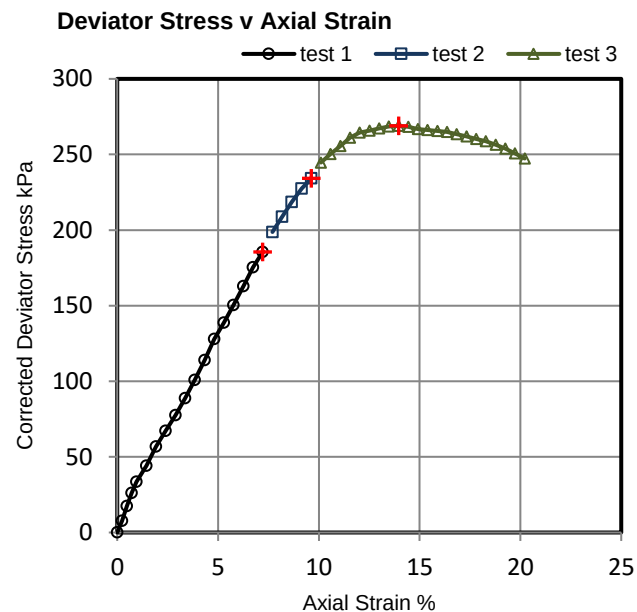
Client: Envirolab

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH304	19.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	334.54		
	Depth from Top (mm)	105.57		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		207.81		
Diameter (mm)		102.23		
Moisture Content (%)		27.2		
Bulk Density (Mg/m ³)		2.05		
Dry Density (Mg/m ³)		1.61		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.44		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	195	390	780
	Axial Strain (%)	7	10	14
	Membrane Corr. (kPa)	0.4	0.4	0.6
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	186	234	269
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	93	117	134
	Mode of Failure	Brittle		



$\phi_u = 0$

Average c_u 115 kPa

Linear Regression

ϕ_u 3.6 °

c_u 79 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

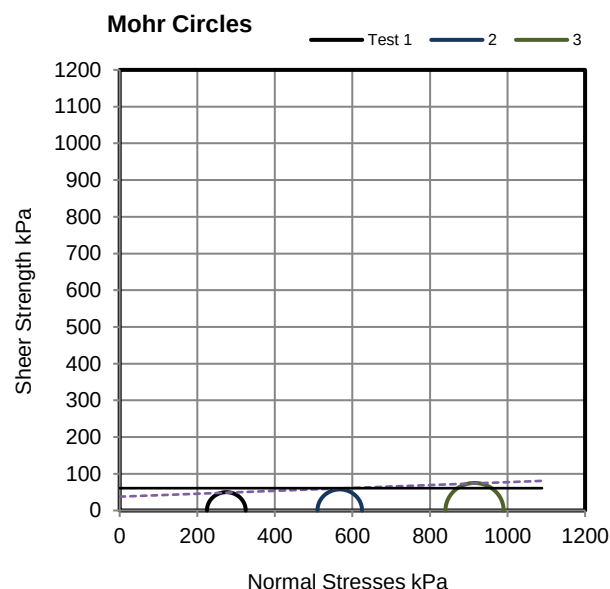
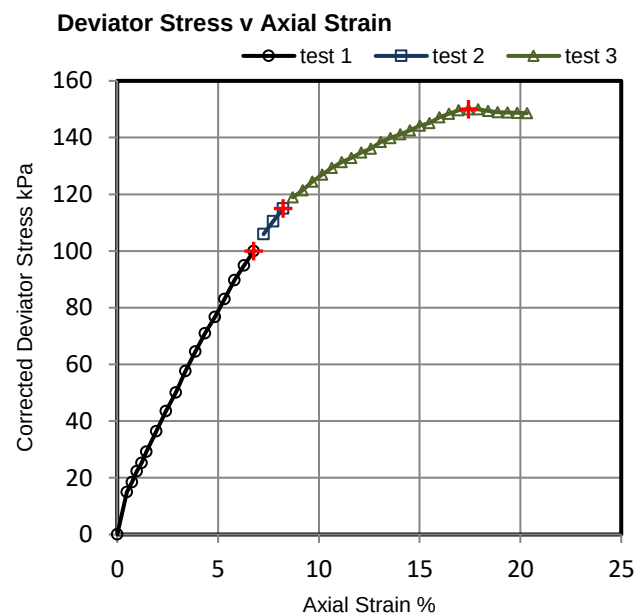
Client: Envirolab

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH304	25.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	317.6		
	Depth from Top (mm)	112.64		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		206.63		
Diameter (mm)		102.25		
Moisture Content (%)		18.4		
Bulk Density (Mg/m ³)		2.18		
Dry Density (Mg/m ³)		1.84		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.45		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	225	510	840
	Axial Strain (%)	7	8	17
	Membrane Corr. (kPa)	0.3	0.4	0.7
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	100	115	150
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	50	57	75
	Mode of Failure	Plastic		



$\phi_u = 0$

Average c_u 61 kPa

Linear Regression

ϕ_u 2.3 °

c_u 38 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

Client: Envirolab

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH305	13.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	431.86		
	Depth from Top (mm)	197.08		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		205.04		
Diameter (mm)		102.42		
Moisture Content (%)		18.8		
Bulk Density (Mg/m ³)		2.17		
Dry Density (Mg/m ³)		1.83		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.46		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	135	270	540
	Axial Strain (%)	5	10	17
	Membrane Corr. (kPa)	0.3	0.4	0.6
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	50	106	165
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	25	53	83
	Mode of Failure	Plastic		

$\phi_u = 0$

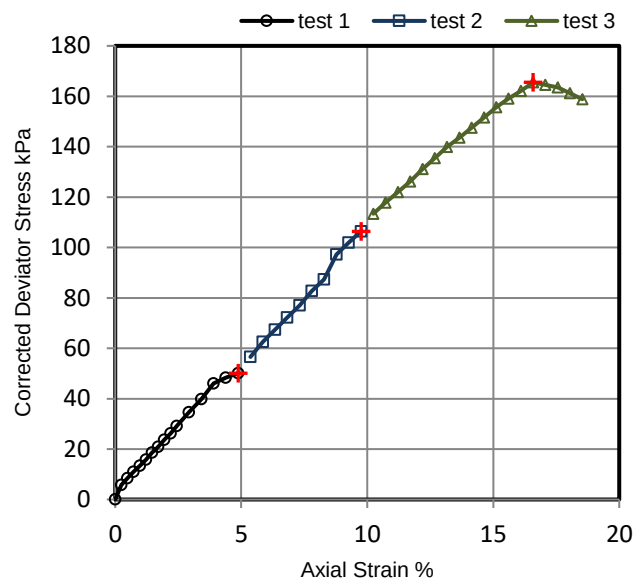
Average c_u 54 kPa

Linear Regression

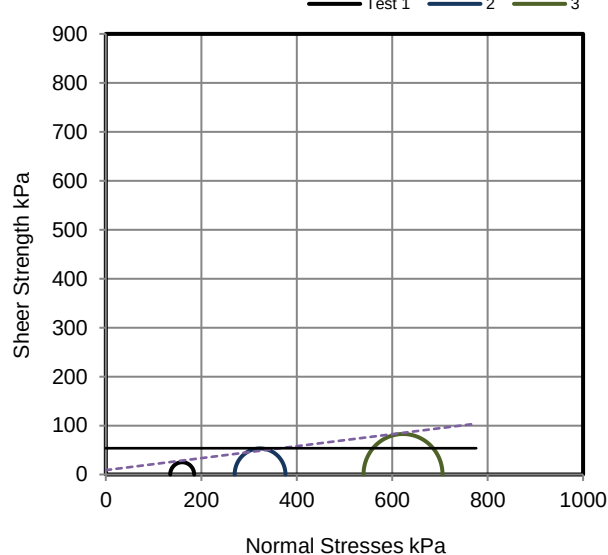
ϕ_u 7.0 °

c_u 9 kPa

Deviator Stress v Axial Strain



Mohr Circles



Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

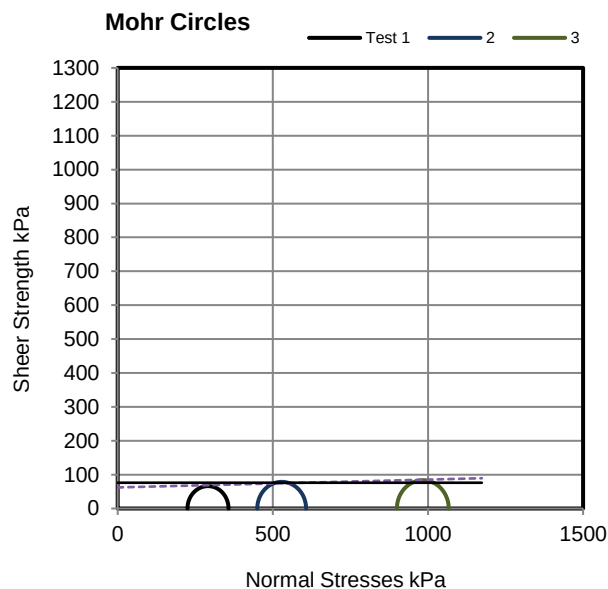
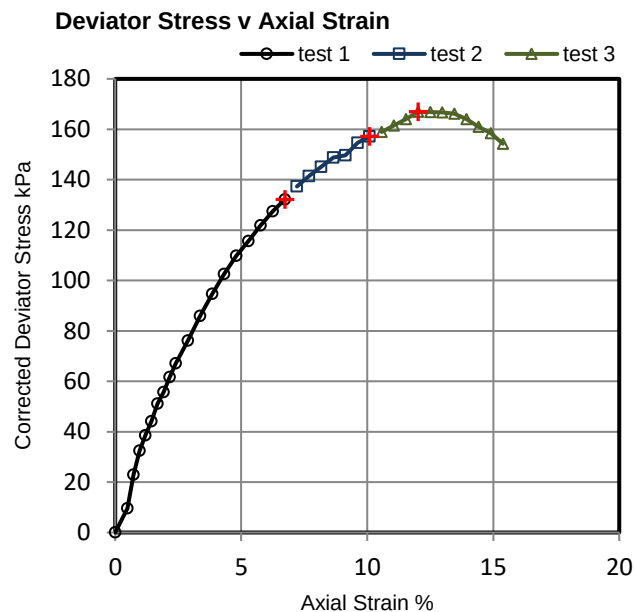
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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH305	22.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	427.95		
	Depth from Top (mm)	202.51		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		208.03		
Diameter (mm)		104.45		
Moisture Content (%)		25.6		
Bulk Density (Mg/m ³)		1.93		
Dry Density (Mg/m ³)		1.53		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.44		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	225	450	900
	Axial Strain (%)	7	10	12
	Membrane Corr. (kPa)	0.3	0.4	0.5
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	132	157	167
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	66	79	83
	Mode of Failure	Plastic		



$\phi_u = 0$

Average c_u 76 kPa

Linear Regression

ϕ_u 1.3 °

c_u 62 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

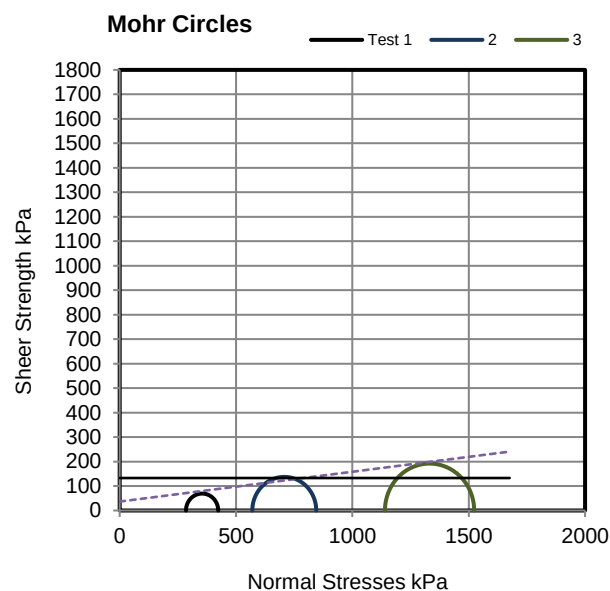
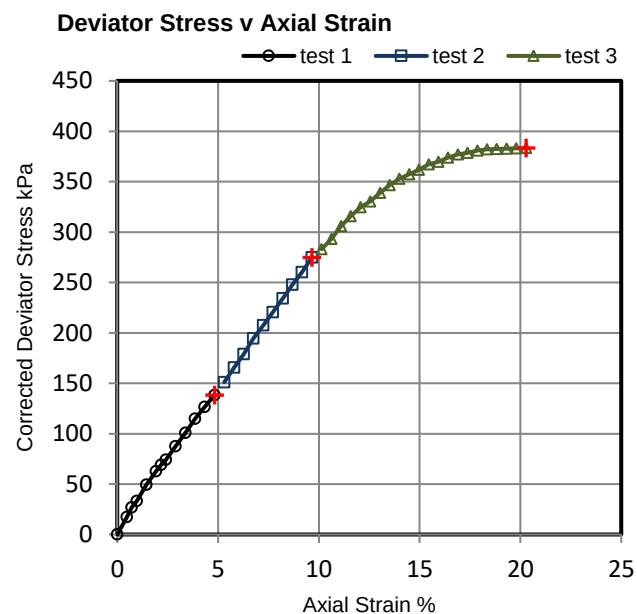
Client: Envirolab

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**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure -
Multistage test**

Borehole / Trial Pit	Depth (m)	Sample	Description
BH305	28.50	U	Brown silty , gravelly CLAY

Initial Sample	Original Length (mm)	412.05		
	Depth from Top (mm)	66.71		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		207.15		
Diameter (mm)		102.58		
Moisture Content (%)		13.8		
Bulk Density (Mg/m ³)		2.24		
Dry Density (Mg/m ³)		1.97		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.45		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	285	570	1140
	Axial Strain (%)	5	10	20
	Membrane Corr. (kPa)	0.3	0.4	0.8
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	138	275	383
	Undrained Shear Strength, $CU = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	69	137	192
	Mode of Failure	Plastic		



$\phi_u = 0$

Linear Regression

Average c_u 133 kPa

ϕ_u 6.9 °

c_u 37 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or

BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.

BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

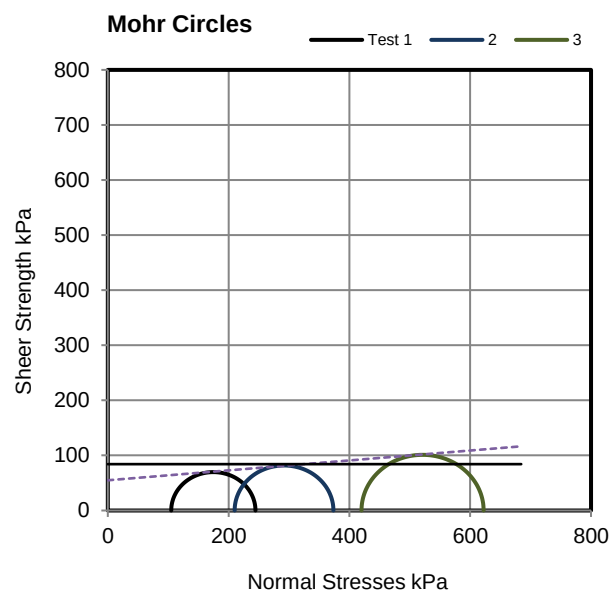
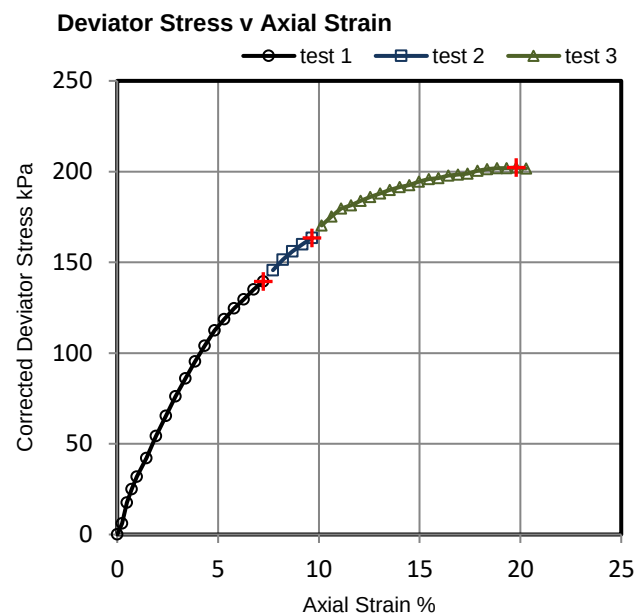
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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH306	10.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	456.43		
	Depth from Top (mm)	140.47		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		207.11		
Diameter (mm)		102.11		
Moisture Content (%)		15.6		
Bulk Density (Mg/m ³)		2.25		
Dry Density (Mg/m ³)		1.95		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.45		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	105	210	420
	Axial Strain (%)	7	10	20
	Membrane Corr. (kPa)	0.4	0.4	0.8
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	139	164	202
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)_f$ (kPa)	70	82	101
	Mode of Failure	Plastic		



$\phi_u = 0$

Average c_u 84 kPa

Linear Regression

ϕ_u 5.1 °

c_u 55 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

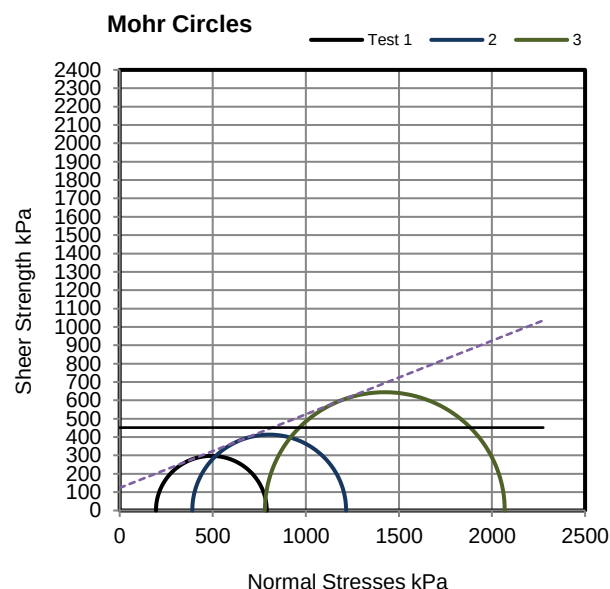
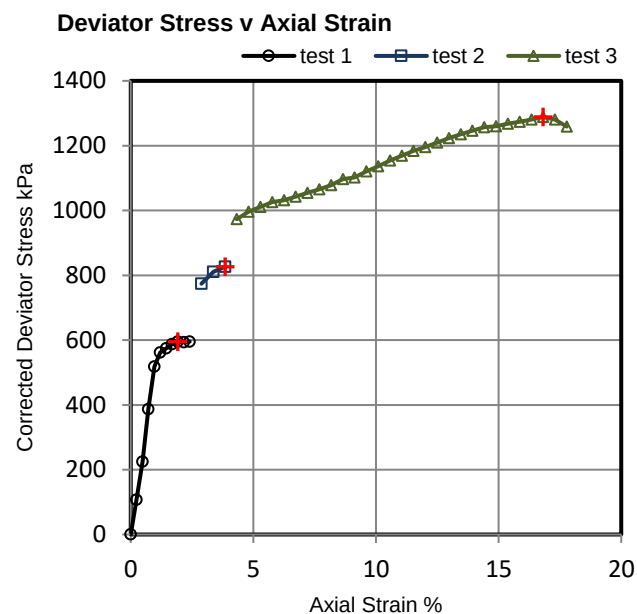
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**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure -
Multistage test**

Borehole / Trial Pit	Depth (m)	Sample	Description
BH306	19.50	U	Brown silty CLAY

Initial Sample	Original Length (mm)	390.08		
	Depth from Top (mm)	144.47		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		208.12		
Diameter (mm)		102.55		
Moisture Content (%)		16.7		
Bulk Density (Mg/m ³)		2.22		
Dry Density (Mg/m ³)		1.90		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.44		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	195	390	780
	Axial Strain (%)	2	4	17
	Membrane Corr. (kPa)	0.1	0.2	0.7
	Deviator Stress ($\sigma_1 - \sigma_3$) _f (kPa)	595	826	1288
	Undrained Shear Strength, CU = $\frac{1}{2}(\sigma_1 - \sigma_3)$ _f (kPa)	298	413	644
	Mode of Failure	Compound		



$\phi_u = 0$

Linear Regression

Average cu 452 kPa

ϕ_u 21.8 °

cu 123 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with
multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Site: North Manchester Hospital

Job Number: 2280638

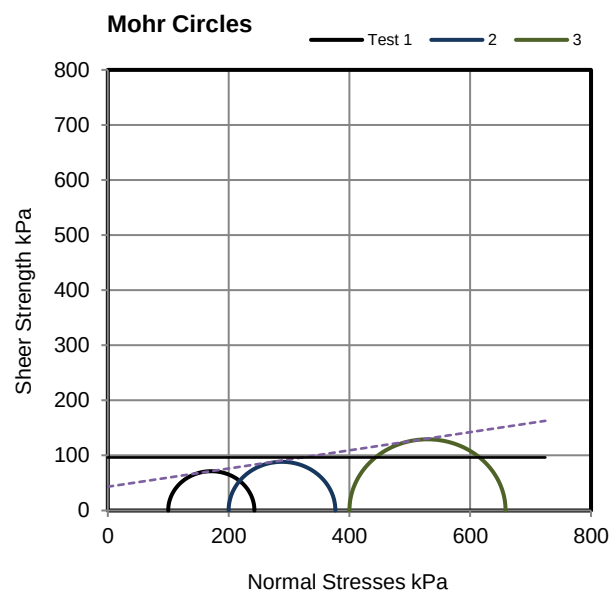
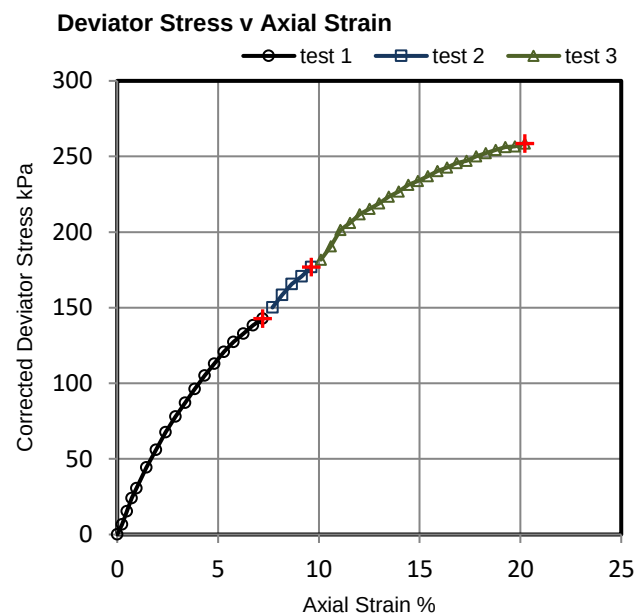
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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Borehole / Trial Pit	Depth (m)	Sample	Description
BH307	10.00	U	Brown silty, gravelly CLAY

Initial Sample	Original Length (mm)	447.28		
	Depth from Top (mm)	210.77		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		207.80		
Diameter (mm)		101.93		
Moisture Content (%)		14.1		
Bulk Density (Mg/m ³)		2.19		
Dry Density (Mg/m ³)		1.92		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		1.44		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	100	200	400
	Axial Strain (%)	7	10	20
	Membrane Corr. (kPa)	0.4	0.4	0.8
	Deviator Stress ($\sigma_1 - \sigma_3$)f (kPa)	143	177	259
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3)f$ (kPa)	71	88	129
	Mode of Failure	Plastic		



$\phi_u = 0$

Average c_u 96 kPa

Linear Regression

ϕ_u 9.4 °

c_u 43 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or

BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.

BS 1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.



Final Test Report - 2280638 / 1

Site: North Manchester Hospital

Job Number: 2280638

Originating Client: Envirolab

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 06/08/2021

F.A.O.

Final Test Report - 2280543 / 1

Site: NM GH

Job Number: 2280543

Originating Client: Envirolab

Originating Reference: 21/05168

Date Sampled: Not Given

Date Scheduled: 17/05/2021

Date Testing Started: 24/05/2021

Date Testing Finished: 27/05/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Tim Robinson
Quality Supervisor

Report Issue Date: 27/05/2021

Site: NM GH

Job Number: 2280543

Client: Envirolab

Page: 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Natural - Stones removed by hand Sieved - Washed on 425 µm sieve			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
				Natural / Sieved	Percentage Passing %	Moisture Content %						
CP301	4.50	D	26	Natural	100	26	32	19	13	0.54	CL	Brown silty CLAY
CP301	18.00	D	15	Natural	96	15	32	20	12	-0.39	CL	Brown silty CLAY

Method of Preparation: BS 1377 : Part 1 : 1990 : Clause 7 Preparation of disturbed samples for testing
BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 3.2 Determination of moisture content
BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index



Results reported relate only to the samples tested.



Final Test Report - 2280543 / 1

Site: NM GH
Job Number: 2280543
Originating Client: Envirolab

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 27/05/2021

Appendix E – Monitoring Results

- Stage 1 Ground Gas Monitoring and Groundwater Level Visits 1 – 6
- Stage 2 Ground Gas Monitoring and Groundwater Level Visits 1 - 7

GAS MONITORING LOG SHEET

Project: NMGH - Stage 1

Date: 05/05/2021

Job Number: B076686.301

Visit: 1

Client: MFT

Weather: Sunny

Barometric State: Rising

Ground Conditions: Damp

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH301	73.43	998	-22.3	0.0	0.0	0.0	1.7	1.7	16.9	0	105	26.77 46.66	48.75 24.68	1
BH302	69.33	998	0.0	0.0	0.0	0.0	2.1	1.5	19.6	0	45	20.51 48.82	35.78 33.55	

Notes

Logged by

1 Flow monitored for 3mins

SH

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902

**GAS MONITORING LOG SHEET****Project:** NMGH - Stage 1**Date:** 13/05/2021**Job Number:** B076686.301**Visit:** 2**Client:** MFT**Weather:** Raining**Barometric State:** Steady**Ground Conditions:** Wet

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD
			Max	SS	Max	SS	Max	SS					
BH301	73.43	999	-	-	0.0	0.0	1.3	1.3	17.3	0	0	26.71 46.72	48.75 24.68
BH302	69.33	999	-0.1	0.0	0.0	0.0	2.2	0.9	19.4	0	0	21.56 47.77	25.48 43.85

Notes

1 Borehole flooded - no flow recorded

Logged by

PN

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 26/05/2021**Job Number:** B076686.301**Visit:** 3**Client:** MFT**Weather:** Drizzling**Barometric State:** Steady**Ground Conditions:** Damp

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD
			Max	SS	Max	SS	Max	SS					
BH301	73.43	1009	-53.5	-1.9	0.0	0.0	0.8	0.8	18.2	6	29	26.74 46.69	48.75 24.68
BH302	69.33	1009	-0.5	-0.5	0.0	0.0	3.4	2.7	17.1	0	0	22.34 46.99	35.09 34.24

Notes**Logged by**

1 Monitored for 5 minutes

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 03/06/2021**Job Number:** B076686.301**Visit:** 4**Client:** MFT**Weather:** Cloudy**Barometric State:** Rising**Ground Conditions:** Dry

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD
			Max	SS	Max	SS	Max	SS					
BH301	73.43	1019	4.8	0.0	0.0	0.0	1.2	1.2	18.6	0	0	26.74 46.69	48.72 24.71
BH302	69.33	1009	-0.1	0.0	0.0	0.0	2.2	0.7	18.8	2	4	22.46 46.87	35.05 34.28

Notes**Logged by**

GAS MONITORING LOG SHEET

Date:

Visit: 5

Weather:

Ground Conditions:

[illegible]

Logged by

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 16/06/2021**Job Number:** B076686.301**Visit:** 6**Client:** MFT**Weather:** Drizzling**Barometric State:** Falling**Ground Conditions:** Damp

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD
			Max	SS	Max	SS	Max	SS					
BH301	73.43	1001	37.8	0.0	0.0	0.0	0.9	0.9	17.8	0	75	26.82 46.61	48.65 24.78
BH302	69.33	1001	0.0	0.0	0.0	0.0	1.2	0.5	16.9	0	0	21.99 47.34	34.99 34.34

Notes**Logged by**

1 Flow dropped to 0 after 5 minutes

Curtins

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GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 22/06/2021**Job Number:** B076686.301**Visit:** 1**Client:** MFT**Weather:** Party cloudy**Barometric State:** Falling**Ground Conditions:** Dry

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD		Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS							
BH303	72.17	1015	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0	9	25.52 46.65	30.55 41.62		
BH304	68.03	1015	0.0	0.0	0.0	0.0	2.1	2.0	16.5	0	0	21.35 46.68	21.90 46.13		
BH305	72.04	1015	-5.2	-5.0	0.0	0.0	0.0	0.0	21.2	0	0	- -	25.65 46.39		
BH306	71.68	1015	-	-	-	-	-	-	-	-	-	- -	- -		1
BH307	71.65	1015	0.0	0.0	0.0	0.0	0.4	0.1	20.3	0	0	- -	- -		
WS301	73.55	1015	0.0	0.0	0.0	0.0	8.3	8.1	12.5	0	10	2.64 70.91	3.84 69.71		
WS302	72.07	1015	0.0	0.0	0.0	0.0	0.8	0.8	18.8	0	0	DRY -	1.48 70.59		
WS303	71.51	1015	0.0	0.0	0.0	0.0	1.6	1.5	19.0	0	0	3.71 67.80	3.73 67.78		
WS304	71.78	1015	0.0	0.0	0.0	0.0	0.8	0.8	20.0	0	0	DRY -	2.22 69.56		
WS305	71.85	1015	0.0	0.0	0.0	0.0	2.2	2.2	19.2	0	0	DRY -	2.88 68.97		

Notes

1 Borehole install not complete

Logged by

PN

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
 Tel: 0161 236 2394
 Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1	Date:	02/07/2021
Job Number:	B076686.301	Visit:	2
Client:	MFT	Weather:	Cloudy
Barometric State:	Falling	Ground Conditions:	Dry

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH303	72.17	1008	0.0	0.0	0.0	0.0	5.5	3.3	10.8	0	0	25.43	30.40	
BH304	68.03	1008	0.0	0.0	0.0	0.0	3.1	2.0	18.0	9	47	21.30	21.30	
BH305	72.04	-	-	-	-	-	-	-	-	-	-	-	-	1
BH306	71.68	-	-	-	-	-	-	-	-	-	-	-	-	2
BH307	71.65	1009	0.0	0.0	0.0	0.0	0.7	0.0	21.5	0	0	10.26	13.95	
WS301	73.55	1009	0.0	0.0	0.0	0.0	8.9	8.9	12.6	0	0	2.69	3.83	
WS302	72.07	1009	0.0	0.0	0.0	0.0	0.0	0.0	21.6	0	0	DRY	2.44	
WS303	71.51	1009	###	-17.1	0.0	0.0	0.7	0.6	20.6	0	0	DRY	3.64	
WS304	71.78	1009	0.0	0.0	0.0	0.0	0.8	0.8	20.6	0	0	DRY	2.25	
WS305	71.85	-	-	-	-	-	-	-	-	-	-	-	-	3

Notes**Logged by**

- 1 Borehole unable to be accessed - under car tyre
- 2 Unable to open flush cover
- 3 Accidentally missed

ZH

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
 All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
 Tel: 0161 236 2394
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GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1	Date:	13/07/2021
Job Number:	B076686.301	Visit:	3
Client:	MFT	Weather:	Cloudy
Barometric State:	Steady	Ground Conditions:	Dry

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH303	72.17	1009	0.0	0.0	0.0	0.0	3.5	3.5	7.4	0	2	25.30	30.10	
BH304	68.03	1008	0.0	0.0	0.0	0.0	2.1	2.1	16.6	1	14	21.28	21.50	
BH305	72.04	-	-	-	-	-	-	-	-	-	-	-	-	1
BH306	71.68	1005	0.0	0.0	0.0	0.0	0.4	0.3	20.7	0	1	DRY	18.40	2
BH307	71.65	1007	0.0	0.0	0.0	0.0	0.2	0.1	21.3	0	1	10.14	13.80	
WS301	73.55	1007	0.0	0.0	0.0	0.0	4.1	4.1	16.0	0	1	2.62	3.84	
WS302	72.07	1007	-0.1	-0.1	0.0	0.0	0.3	0.3	20.8	0	1	DRY	2.20	
WS303	71.51	1009	0.0	0.0	0.0	0.0	0.7	0.2	20.2	0	1	DRY	3.68	
WS304	71.78	1009	0.0	0.0	0.0	0.0	0.7	0.3	20.0	0	0	DRY	2.20	
WS305	71.85	1009	0.0	0.0	0.0	0.0	0.2	0.1	21.1	0	2	DRY	2.74	

Notes**Logged by**

- 1 Unable to open
 2 Dip monitor playing up, unsure if dry

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 20/07/2021**Job Number:** B076686.301**Visit:** 4**Client:** MFT**Weather:** Sunny**Barometric State:** Steady**Ground Conditions:** Dry

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH303	72.17	1010	8.0	0.7	0.0	0.0	5.2	5.2	9.7	1	1	24.95	30.16	
BH304	68.03	1013	0.0	0.0	0.0	0.0	2.2	2.2	17.2	1	5	21.29	21.77	
BH305	72.04	-	-	-	-	-	-	-	-	-	-	-	-	1
BH306	71.68	-	-	-	-	-	-	-	-	-	-	-	-	1
BH307	71.65	1011	-0.8	-0.7	0.0	0.0	0.2	0.1	21.5	0	0	10.20	13.77	
WS301	73.55	1011	0.0	0.0	0.0	0.0	8.2	8.2	11.6	1	1	2.50	3.82	
WS302	72.07	1012	0.0	0.0	0.0	0.0	0.5	0.5	21.0	0	0	DRY	2.46	
WS303	71.51	1012	0.0	0.0	0.0	0.0	1.3	0.9	19.7	0	1	3.26	3.72	
WS304	71.78	1012	0.0	0.0	0.0	0.0	0.5	0.5	21.0	0	0	DRY	2.19	
WS305	71.85	1011	0.4	0.0	0.0	0.0	0.7	0.6	20.6	0	0	DRY	2.94	

Notes**Logged by**

1 Could not access

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

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GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1	Date:	29/07/2021
Job Number:	B076686.301	Visit:	5
Client:	MFT	Weather:	Rain
Barometric State:	Falling	Ground Conditions:	Damp

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH303	72.17	999	-0.4	-0.3	0.0	0.0	2.7	2.6	0.0	0	0	-	30.10	1
BH304	68.03	-	-	-	-	-	-	-	-	-	-	-	-	2
BH305	72.04	999	0.1	0.1	0.0	0.0	0.1	0.1	21.4	0	0	Dry	12.30	
BH306	71.68	998	0.1	0.0	0.0	0.0	0.2	0.1	20.8	0	0	-	11.60	1
BH307	71.65	999	0.0	0.0	0.0	0.0	0.0	0.0	21.4	0	0		13.65	1
WS301	73.55	997	0.0	0.0	0.0	0.0	0.0	0.0	21.4	0	0	1.05	3.81	
WS302	72.07	998	-1.2	-1.2	0.0	0.0	0.1	0.1	21.1	0	0	Dry	2.48	
WS303	71.51	998	0.0	0.0	0.0	0.0	1.8	1.5	18.6	0	2	3.33	3.63	
WS304	71.78	998	0.0	0.0	0.0	0.0	0.8	0.8	19.9	0	0	Dry	2.21	
WS305	71.85	-	-	-	-	-	-	-	-	-	-	-	-	2

Notes

- 1 Dip Meter Faulty-Water level not taken.
2 Borehole not located.

Logged by

NF

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 04/08/2021**Job Number:** B076686.301**Visit:** 6**Client:** MFT**Weather:** Sunny**Barometric State:** Falling**Ground Conditions:** Dry

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH303	72.17	1005	-0.3	-0.3	0.0	0.0	6.6	6.6	9.9	0	0	24.92	30.15	
BH304	68.03	1006	0.0	0.0	0.0	0.0	2.2	2.2	17.7	0	0	21.25	21.70	
BH305	72.04	-	-	-	-	-	-	-	-	-	-	-	-	1
BH306	71.68	1005	0.0	0.0	0.0	0.0	0.3	0.1	21.3	0	0	DRY	18.84	
BH307	71.65	1005	0.0	0.0	0.0	0.0	0.1	0.0	21.9	0	0	10.18	13.75	
WS301	73.55	1009	0.0	0.0	0.0	0.0	2.4	1.9	16.8	0	0	2.50	3.80	
WS302	72.07	1007	0.0	0.0	0.0	0.0	0.3	0.3	21.0	0	0	DRY	2.40	
WS303	71.51	1006	0.0	0.0	0.0	0.0	2.0	2.0	18.5	0	0	3.22	3.70	
WS304	71.78	1005	0.0	0.0	0.0	0.0	1.0	1.0	19.6	0	0	DRY	2.15	
WS305	71.85	1005	0.0	0.0	0.0	0.0	1.5	0.9	19.8	0	0	DRY	2.95	

Notes**Logged by**

1 Cannot open

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: NMGH - Stage 1**Date:** 18/08/2021**Job Number:** B076686.301**Visit:** 7**Client:** MFT**Weather:** Rain**Barometric State:** Falling**Ground Conditions:** Wet

Borehole Reference	Surveyed Ground Level m AOD	Barometric Pressure mb	Flow		Methane		Carbon Dioxide		Oxygen	Hydrogen Sulphide	Carbon Monoxide	Water Level m bgl m AOD	Borehole Base m bgl m AOD	Note
			Max	SS	Max	SS	Max	SS						
BH303	72.17	-	-	-	-	-	-	-	-	-	-	-	-	2
BH304	68.03	1009	0.0	0.0	0.0	0.0	2.6	2.6	16.3	2	0	21.31	29.99	
BH305	72.04	1010	-1.8	-2	0	0	4.9	4.9	7.1	1	0	23.3	25.52	
BH306	71.68	-	-	-	-	-	-	-	-	-	-	-	-	1
BH307	71.65	-	-	-	-	-	-	-	-	-	-	-	-	1
WS301	73.55	1009	0.0	0.0	0.0	0.0	0.9	0.9	19.6	0	1	3.34	3.88	
WS302	72.07	1010	0.0	0.0	0.0	0.0	4.9	4.9	13.6	2	0	DRY	2.45	
WS303	71.51	1009	0.0	0.0	0.0	0.0	1.7	1.2	18.0	1	0	3.22	3.62	
WS304	71.78	1010	0.0	0.0	0.0	0.0	1.1	1.1	18.8	0	0	DRY	2.20	
WS305	71.85	1011	0.0	0.0	0.0	0.0	0.1	0.0	20.6	0	0	DRY	2.95	

Notes**Logged by**

1 Parked car over install

RT

2 Borehole flooded

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

20001-CUR-ZZ-XX-RP-G-00001

North Manchester General Hospital

Phase 2 Ground Investigation



Appendix F – GAC Screening Thresholds

- Curtins GAC Commercial Thresholds for 2.5% SOM.

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 <u>21</u>	6 <u>21</u>	1.8 <u>170</u>	33 <u>49</u>	7.7 <u>21</u>	220 <u>250</u>
Lead	<u>200</u>	<u>310</u>	<u>80</u>	<u>2,300</u>	<u>630</u>	<u>1,300</u>
Mercury (elemental)	1	1	26	26	16	26 ⁽⁸⁾ [30]
Mercury (inorganic)	170	240	80	3600	120	240
Nickel	130 ⁽¹⁰⁾	180 ⁽¹⁰⁾	53 ⁽¹¹⁾	980 ⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 <u>79</u>	170 <u>170</u>
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₆	78	78	1700	5900	590000	130000
EC ₆ - EC ₈	230	230	5600	17000	610000	220000
EC ₈ - EC ₁₀	65	65	770	4800	13000	18000
EC ₁₀ - EC ₁₂	330	330	4400	23000	13000	23000
EC ₁₂ - EC ₁₆	2400	2400	13000	82000	13000	25000
EC ₁₆ - EC ₃₅	92000	92000	270000	1700000	250000	480000
EC ₃₅ - EC ₄₄	92000	92000	270000	1700000	250000	480000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₇	140	690	27	46000	56000	84000
EC ₇ - EC ₈	290	1800	51	110000	56000	95000
EC ₈ - EC ₁₀	83	110	21	8100	5000	8500
EC ₁₀ - EC ₁₂	180	590	31	28000	5000	9700
EC ₁₂ - EC ₁₆	330	2300	57	37000	5100	10000
EC ₁₆ - EC ₂₁	540	1900	110	28000	3800	7700
EC ₂₁ - EC ₃₅	1500	1900	820	28000	3800	7800
EC ₃₅ - EC ₄₄	1500	1900	820	28000	3800	7800
Aliph + Arom EC >44-70	1800	1900	2100	28000	3800	7800
<i>Aromatic</i>						
Benzene	0.16	0.49	0.035	50	72	100
Ethyl benzene	150	380	39	1200⁽⁸⁾ [35000]	1200⁽⁸⁾ [24000]	1200⁽⁸⁾ [22000]
Toluene	270	1300	51	1900⁽⁸⁾ [110000]	1900⁽⁸⁾ [56000]	1900⁽⁸⁾ [95000]
Xylene ⁽⁹⁾	98	120	70	1200⁽⁸⁾ [14000]	1200⁽⁸⁾ [42000]	1200⁽⁸⁾ [23000]
Phenol	290	420	140	1500⁽¹⁴⁾ (35000)	1500⁽¹⁴⁾ (10000)	1500⁽¹⁴⁾ (8300)
<i>Polycyclic Aromatic Hydrocarbons (PAH)</i>						
Naphthalene	5.6	5.6	10	460	4900	1900
Acenaphthylene	420	4600	69	97000	15000	30000
Acenaphthene	510	4700	85	97000	15000	30000
Fluorene	400	3800	67	68000	9900	20000
Phenanthrene	220	1500	38	22000	3100	6200
Anthracene	5400	35000	950	540000	74000	150000
Fluoranthene	560	1600	130	23000	3100	6300
Pyrene	1200	3800	270	54000	7400	15000
Benz(a)anthracene	11	14	6.5	170	29	56
Chrysene	22	31	9.4	350	57	110
Benzo(b)fluoranthene	3.3	4.0	2.1	44	7.2	15
Benzo(k)fluoranthene	93	110	75	1200	190	410
Benzo(a)pyrene	2.7	3.2	2	35	5.7	12
Indeno(123cd)pyrene	36	46	21	510	82	170
Dibenzo(ah)anthracene	0.28	0.32	0.27	3.6	0.57	1.3
Benzo(ghi)perylene	340	360	470	4000	640	1500
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00087	0.001	0.001	0.077	3.5	5
Trichloroethene (TCE)	0.034	0.036	0.091	2.6	120	91
1,1,1,2 Tetrachlorethane	2.8	3.5	1.9	250	1400	1800
Tetrachlorethane (PCE)	0.39	0.4	1.5	42	1400	1100
1,1,1 Trichlorethane	18	18	110	1300	140000	76000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs
- Soil organic matter (SOM) is assumed to be 2.5% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Appendix G – Risk Assessment Methodology

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of an event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment, the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	Medium	Mild	Minor
Probability (Likelihood)	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in “significant harm” as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	<i>Harm is likely to arise</i> to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	<i>It is possible</i> that without appropriate further action <i>harm could arise</i> to a designated receptor. It is relatively <i>unlikely</i> that any such harm would be <i>severe</i> , and if any harm were to occur it is <i>more likely</i> that such harm would be <i>relatively mild</i> .
Low Risk	<i>It is possible</i> that <i>harm could arise</i> to a designated receptor from an identified hazard. It is <i>likely</i> that, at worst, if any harm was realised any effects would be <i>mild</i> .
Very Low Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term 'risk' in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

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