





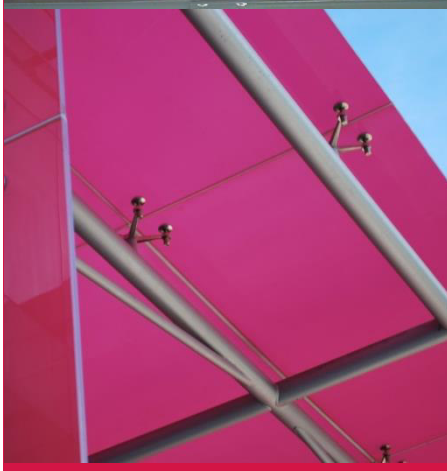

North Manchester General Hospital – Multi Storey Car Park

Phase 2 Ground Investigation

Curtins Ref: 20200-CUR-MSCP-XX-RP-G-2001

Revision: P01

Issue Date: 30 June 2021

Client Name: Manchester University NHS Foundation Trust

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

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

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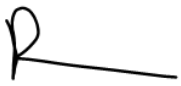
P Neesham MSci (Hons) Geo-Environmental Engineer		30 June 2021

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Executive Summary

Appointment	**In February 2021 Curtins were instructed by Hive Project Ltd and Morgan Sindall for and on behalf of Manchester University NHS Foundation Trust to undertake a Phase 2 Ground Investigation for the proposed Multi-Storey Car Park located north of Limbert Circle, North Manchester General Hospital, Crumpsall, M8 5RB. The site is centred on NGR SD 85081 02423 and covers an area of approximately 1.004Ha.** **Development plans comprise demolition of existing buildings and the construction of a 1,025 space multi-storey car park.**
Current Site Status	The site is currently occupied by a four-storey hospital building at North Manchester General Hospital with associated road, car parks and areas of vegetation. The western two-thirds of the site is occupied by the building and the eastern third occupied by a car park and vegetation. The site is accessed from an access road around the perimeter of the wider North Manchester General Hospital site or via Limbert Circle.
Summary of Preliminary Site Assessment	Earliest historical mapping shows the site as undeveloped agricultural land surrounded by agricultural fields with a pond in the northwest corner of the site. By 1894, the centre of the site has been developed, occupied by a hospital associated with the Manchester Workhouse. The east of the site remained undeveloped. By 1932, the hospital is no longer recorded and a Nurse's House present. The site remained unchanged until 1982 when a chapel was recorded in the southeast corner. By 2000, a car park was present in the east and by 2006, a building was recorded in the northeast corner and an access road along the eastern boundary. Made Ground deposits are not indicated to be present onsite according to BGS, however given the previous uses deposits are anticipated to be present. Superficial soils are indicated as Glaciofluvial Sheet deposits (majority of the site) and Glacial Till (south east corner) overlying the Chester Formation (bedrock). Environment Agency data indicates the superficial Glaciofluvial Sheet Deposit is associated with a Secondary A Aquifer and the Glacial Till is associated with a Secondary Undifferentiated Aquifer. The Chester Formation is recorded as Principal Aquifer. There are no groundwater abstraction points within 500m of the site. The nearest surface water feature is the River Irk 229m east of the site, flowing south.
Fieldworks Undertaken	Field works were carried out between 4th March and 21st April 2021, comprising five cable percussive boreholes with rotary Geobore S follow on, two window samples boreholes, three machine excavated trial pits and one CBR. Ground gas and groundwater monitoring standpipes were installed within five of the cable percussive boreholes (BH101-BH105). Selected soil and rock samples were subjected to laboratory analysis. No groundwater samples were taken. Six ground gas monitoring visits have been undertaken between 23rd April and 11th June.
Encountered Ground Conditions	Topsoil/Made Ground was encountered in all exploratory holes from ground level to depths between 0.50m and 3.00m bgl. Topsoil typically comprised brown slightly sandy clay with frequent rootlets. In the upper Made Ground, a layer of tarmacadam was encountered underlain by light brown/grey sandy gravel. Made Ground was typically granular comprising light to dark brown/grey gravelly medium to coarse sand or brown slightly clayey slightly sandy angular to subrounded fine to coarse gravel. Cohesive Made Ground was encountered in BH105 and comprised red/brown slightly sandy gravelly clay. Underlying the Made Ground, glaciofluvial sheet deposits were encountered as interbedded cohesive and granular deposits. Cohesive material is typically firm to stiff light brown/brown slightly sandy, slightly gravelly to gravelly, occasionally silty clay. Granular material typically comprised medium dense occasionally slightly silty fine to medium sand. Glacial Till was encountered underling the glaciofluvial sheet deposits in BH101-BH105. The glacial till deposits encountered were predominantly cohesive deposits with interbedded granular deposits. The cohesive deposits were typically very stiff brown slightly sandy to sandy, slightly gravelly clay and the granular deposits were very dense light brown fine to medium sand. The base of the deposit was encountered in BH105 at 42.50m bgl. Bedrock was encountered in BH105 at 42.50m bgl (31.59m AOD) comprising weak to medium strong fine to coarse grained Sandstone. During return monitoring visits, groundwater levels were recorded between 52.01m AOD and 46.64m AOD within the Glacial Till and between 65.89m AOD and 65.76m AOD within the Glaciofluvial Deposits.
Environmental Laboratory Testing	With respect to the proposed *'Commercial'* end-use of the site, no exceedances were noted within the soil samples collected. Soil samples were also screened for asbestos, no suspected asbestos containing materials were identified in any of the laboratory testing.

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Ground Contamination and Ground Gas Assessment	A **Low** risk rating is identified to site end-users and construction workers, from soils during inhalation and ingestion of soil or dust. No exceedances were noted on site and no suspected containing materials identified in exploratory hole logs or during laboratory screening. A **Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) following the ground investigation, where no major sources of contamination were identified and limited pathways due to low permeability superficial deposits. A **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. This corresponds to a Characteristic Gas Situation assessed as CS1 classification, therefore no gas protection measures in accordance with BS8485 are required.
Geotechnical Assessment	Topsoil, 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 1,025 space multi-storey car park, it is anticipated that a piled foundation solution is adopted to transfer the loads to deeper stiffer/very dense deposits at depths below 15.00m bgl. The carrying capacity of the piles depends not only on their size and the ground conditions but also the method of installation. The preliminary testing results for re-use of natural Glaciofluvial Sheet Deposit soils indicate that the site won deposits could be suitable for re-use as general fill on site, subject to further classification and the criteria set by the earthworks designer. Risk of working with cohesive fill, particularly in wet seasons must be considered. Based on observations on site combined with laboratory tests, it is recommended that consideration be given to a suspended ground floor slab. 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.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within *Appendix C.* 2) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer. 3) An earthworks specification must be designed, supervised and undertaken prior to construction.

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1.0 Introduction

1.1 Project Background

Curtins were instructed by Hive Projects Ltd & Morgan Sindall on behalf of Manchester University NHS Foundation Trust in February 2021 to undertake a Phase 2 Ground Investigation for the proposed Multi-Storey Car Park, located north of Limbert Circle, North Manchester General Hospital, Crumpsall, M8 5RB. The site location plan is presented in *Figure 2.1*.

It should be noted that a total of four ground investigations have been undertaken at North Manchester General Hospital titled; Multi-Storey Car Park, Enabling Works, Acute Works and Temporary Car Parks. This report refers only to the Multi-Storey Car Park located north of Limbert Circle, North Manchester General Hospital, Crumpsall, M8 5RB (approximately centred on NGR SD 85081 02423) that covers an area of approximately 1.004Ha. The drawing plan relating to the development is included in *Appendix A*.

The proposed development comprises demolition of existing buildings and the construction of a 1,025 space Multi-Storey Car Park.

1.2 Scope of Services

The Phase 2 Ground Investigation Report will characterise the environmental and geotechnical conditions of the site. The ground investigation has been undertaken to assess the ground and groundwater conditions across the site.

The Phase 2 Ground Investigation Report is intended to:

a) Determine the risk of the proposed end-user being adversely impacted by potential contamination in shallow site soils that may be present on the site due to its known current, recent and historical use;
b) Determine if there is a risk to the end-user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide;
c) Characterise site wide natural soils and provide classification of soils for re-use;
d) Recommendations for the design of foundations and building ground floor slabs; and
e) Recommendations for the specification of sub-structure concrete.

Detailed flood risk assessment, ecology and archaeological studies are outside of the scope of this report.

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2.0 Preliminary Site Assessment Summary

This section presents a summary of the current site setting, history, geology, and hydrogeology/hydrology previously detailed in Curtins Phase 1 report (Ref. 1). As such it is advised that this report is read in conjunction with the Phase 1 report (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 north of Limbert Circle, North Manchester General Hospital, Crumpsall, M8 5RB as shown in *Figure 2.1* below.

The site is currently occupied by a four-storey hospital building at North Manchester General hospital with associated road, car parks and areas of vegetation. The western two thirds of the site is occupied by the four-storey building and the eastern third occupied by a car park and vegetation.

The site is accessed from an access road around the perimeter of the wider North Manchester General Hospital site or via Limbert Circle.

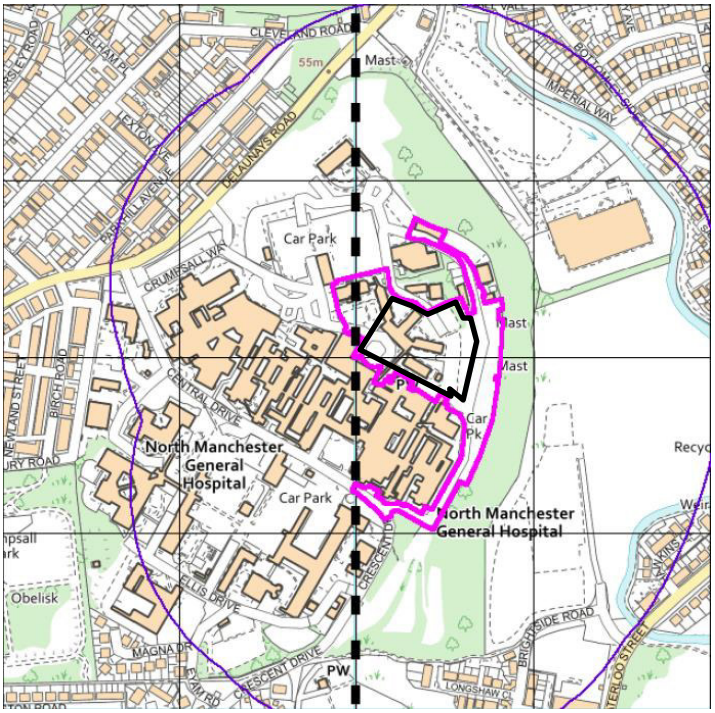

Figure 2.1 *– Site Location Plan (Enabling site boundary shown in pink, 250m buffer shown in purple) and Multi Storey Car Park boundary shown in black. Crown Copyright. License number 100020245*

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**	North Manchester General Hospital buildings and associated roads with buildings including; the Diabetes & Endocrinology Centre.
	E	An unnamed road followed by car parking and vegetation.
	S	Limbert Circular and the North Manchester General Hospital buildings including; the Pennine Acute Hospitals NHS Trust.
	W	North Manchester General Hospital buildings and associated car parking with buildings including; the Dermatology Department.

2.3 Previous Site Use

A review of the available historical mapping information for the site, as presented within Curtins Phase 1 report (ref. 1) has been undertaken with specific reference to potential sources of contamination.

Earliest historical mapping (1848) shows the site is undeveloped agricultural land surrounded by agricultural fields. A pond is recorded in the northwest corner of the site.

By 1894, the centre of the site has been developed, occupied by a hospital associated with the Manchester Workhouse. The east of the site remains undeveloped.

By 1932, the hospital is no longer recorded, and a Nurse's House is present in its place. The site remains unchanged until 1982, when a chapel is recorded in the southeast corner of the site.

In 2000, a car park is recorded in the east of the site. By 2006, a building is recorded in the northeast of the site and an access road is present on the eastern boundary of the site.

2.4 Published Geology

A review of the Curtins Phase 1 Report (Ref. 1), BGS borehole records and the British Geological Survey (BGS) maps,1:50,000 (Solid and Drift Edition) (2011) for Manchester (Sheet 85) (Ref. 2) indicates the following geological sequence underlying the site:

- Glaciofluvial Sheet Deposits (majority of the site);
- Glacial Till Deposits (southeast corner);
- Chester Formation.

A fault is recorded through the centre of the site, orientated northwest southeast. A sequence of faults run parallel to this fault, the closest are approximately 180m south and 120m north of the site.

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There are three BGS recorded boreholes located within 250m of the site boundary. 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)
SD80SW938	235m 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***
SD80SW938	245m 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***
SD80SW937	250m 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***

2.4.1 Made Ground Deposits

Made Ground deposits are not indicated on the geological maps; however, it is anticipated that Made Ground of unknown composition will be present given the history of development on site.

2.4.2 Superficial Deposits

Glaciofluvial Sheet Deposits are recorded across most of the site. Glaciofluvial Sheet Deposits typically comprised sand and gravel layers of varied colour. Glacial Till Deposits are recorded

in the southeast, expected to consist of a heterogenous mixture of clay, sand, gravel and boulders that vary widely in size and shape.

2.4.3 Bedrock Deposits

Bedrock deposits are indicated to comprise the Chester Formation. The Chester Formation comprises conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown sandstone.

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 2.00km east of the site. The risk of 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 629m north within a sand quarry identified as Blackley Sand Pit.

2.4.5 Other Ground Stability Issues

The Curtins Phase 1 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 Curtins Phase 1 Report (Ref.1) indicates no historical areas of infilled land (non-water) within 250m of the site. There is potential for ground gas form three historical area of infilled land (water0 within 250m of the site. The nearest entry is located in the north west corner of the site. Another located, 35m north of the site.

There are no BGS recorded or registered landfill site recorded within 1km of the site.

There are six historic landfills within 1km of the site. The nearest entry is located 431m east of the site referred to as Land at Factory Lane and the input was not identified.

The Curtins Phase 1 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.

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2.4.7 Pollution and Landfill

There are no currently operational or historic landfills within 250m of the site. The closest is located 431m east of the site with no records of the types of waste disposed.

There are no records of licensed waste management facilities within 250m of the site boundary. The closest is located 847m south of the site.

Nine registered radioactive substances are recorded within 500m of the site. The nearest entry is recorded 89m north registered to Zenecca Specialities for keeping and use of radioactive materials in 1997. The license has now been revoked/cancelled.

2.5 Hydrogeology and Hydrology

The Curtins Phase 1 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 (majority of the site)	Secondary A Aquifer[1]
Glacial Till Deposits (south east corner)	Secondary Undifferentiated Aquifer[2]
Chester Formation	Principal Aquifer[3]

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 classified as minor aquifers.*
2. *This is assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*
3. *Layers of rock or drift deposits that have high intergranular and/or fracture permeability. They provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.*

There is a fault recorded through the middle of the site, orientated northwest southeast. A sequence of faults runs parallel to this fault, the closest are approximately 180m south and 120m north of the site.

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

There are no groundwater abstraction points within 500m of the site. The nearest entry is located 526m 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 229m east, flowing south.

2.6 Unexploded Ordnance (UXO) Risk Assessment

Risk Mapping for UXO's (Ref. 3) has placed the site in a Moderate Risk area. Moderate risk areas are those that show a bomb density of 11-50 bombs per 1000 acres and may contain WWII targets.

A review of historical maps from the Envirocheck report (Ref. 1), show no evidence of ruins within 1km of the site and no evidence of bomb damage on site and no significant bombing targets noted within 1km of the site boundary.

Considering the above and that the site was occupied throughout the war period and redeveloped after the war, the risk of encountering potential UXO as part of future intrusive works is considered Low. As such no Detailed UXO Risk Assessment report is required.

If unexploded ordnance is discovered during any works, stop immediately, prevent access to the area, and inform the police. If the site boundary or location changes then the UXO risk should be reassessed.

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*

<table>
<tr><th>Source</th><th>Pathway</th><th>Receptor</th><th>Risk Rating</th></tr>
<tr><td rowspan="3">On-site sources of potential contamination:

Potential contamination associated with Made Ground of unknown composition from uncontrolled deposition of construction hospital buildings.

Uncontrolled deposition of made ground during demolition of building on site.

Potential contamination associated with vehicle parked in the east of the 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.</td><td rowspan="2">Direct contact, ingestion, inhalation (dust and vapours)</td><td>Site End Users
(Commercial)</td><td rowspan="3">Moderate / Low

Moderate / Low</td></tr>
<tr><td>Construction and Maintenance Workers</td></tr>
<tr><td>Vertical migration through the superficial deposits (soils)</td><td>Controlled Waters
(Groundwater – Superficial: Secondary A and Secondary Undifferentiated aquifers. Bedrock: Principal aquifer)</td></tr>
</table>

Source	Pathway	Receptor	Risk Rating
Potential contamination associated with various works within 250m of the site.			
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 within 100m of the site with unknown material, particularly in the north west corner.	Vertical and horizontal migration through underlying superficial deposits into buildings and air spaces	**Site End Users** (Commercial)	**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; inorganic compounds including heavy metals; and asbestos present in discarded building materials.

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 in detailed in *Section 3.0*.

3.0 Ground Investigation Scope of Works

Site investigation works were undertaken by Curtins between 4th March and 21st April 2021.

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

- LCRM (Ref. 4);
- British Standard (BS) 10175:2011+A2:2017 (Ref. 5);
- BS5930:2015+2020 (Ref. 6);
- and BS EN1997: Part 2:2007 Eurocode 7 (Ref. 7).

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

Table 3.0 – *Scope and Rationale of Fieldwork Undertaken*

Exploratory Hole Type	Exploratory Hole Ref.	Ground level (m AOD)	Exploratory Hole Depth (m bgl)	Rationale
Cable Percussive Boreholes with Rotary Geocore S	BH101 BH102 BH103 BH104 BH105	74.16 73.84 73.90 74.09 74.09	35.00 35.00 35.00 35.00 50.00	Advance drilling to between 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.
Window Sample Boreholes	WS101 WS102	71.65 71.57	3.00 2.00	Confirm ground conditions Collect soils samples for chemical analysis.
Machine Excavated Trial Pits	SA101 SA102 SA103	72.47 74.09 74.01	2.10 2.00 2.20	Confirm shallow ground conditions; Determine suitability of soils for drainage design Collect samples to determine suitability of shallow soils for re-use in earthworks.
CBRs	CBR101	74.03	0.70	Confirm shallow ground conditions

For the location of the exploratory holes refer to Curtins drawing ref. 20200-CUR-MSCP-00-DR-G-2001. Exploratory hole locations were surveyed upon completion of the works, with surveyed ground levels and co-ordinates have been added to the logs, and can be referred to 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. 6) including visual and olfactory indications of contamination were recorded. Exploratory hole logs can be referred to *Appendix B*.

3.2 Rock Logging and Sampling

Collected rock cores were logged by Curtins, in accordance with BS5930 (Ref. 6) including recording rock quality parameters, fracture indices and other detailed descriptions. A photographic record of the cores is provided in *Appendix B*. Selected rock samples were scheduled for geotechnical testing, undertaken by Ian Farmer Associates, a UKAS accredited laboratory.

3.3 Monitoring Well Installations

Groundwater monitoring 50mm diameter slotted pipes were installed within five exploratory boreholes (BH101, BH102, BH103, BH104 and BH105). 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 section of the pipe.

The monitoring wells were designed to assess the potential for ground gas and monitor groundwater levels in all exploratory holes. No groundwater samples were collected. The screened sections therefore focused on the more permeable deposits where encountered, when possible, 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*

Borehole Ref.	Response Zone m bgl (m AOD)	Strata Description(s)
BH101	24.00 – 35.00 (50.16 – 39.16)	CLAY (Glacial Till)
BH102	25.00 – 35.00 (48.84 – 33.84)	CLAY (Glacial Till)
BH103	30.00 – 35.00 (43.93 – 38.93)	SAND (Glacial Till)
BH104	6.00 – 13.00 (68.09 – 61.09)	SAND and CLAY (Glaciofluvial)
BH105	44.00 – 50.00 (30.09 – 24.09)	SANDSTONE (Chester Formation)

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

3.4 Post-Investigation Monitoring

3.4.1 Groundwater and Ground Gas Monitoring

Six groundwater level and ground gas monitoring visits over six weeks have been undertaken, to assess the groundwater levels and the ground gas conditions identified in *Section 2.0*.

The results of the groundwater level monitoring are detailed in *Section 5.8*.

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4.0 Laboratory Testing

4.1 Geo-environmental Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and 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 Farmers Associates (UKAS accredited) and i2 Analytical.

Given the lack of any obvious sources of potential contamination the sampling positions were generally located in a non-targeted, systematic array, beneath the proposed residential and commercial buildings, 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), polyaromatic hydrocarbons (PAHs), heavy metals, and asbestos.

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

Table 4.1.1 – *Environmental Chemistry Analysis Suite: Soils*

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen,	-
	pH Value,	0.01 pH
	2;1 Water Soluble Sulphate	0.01 g/l
	Soil Organic Matter (SOM)	0.1% w/w
	Arsenic, Chromium, Chromium VI, Copper, Lead, Nickel, Selenium	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

Suite Ref.	Analyte	LOD
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg
	TPH (Aro/Ali Split)	0.01 to 1 mg/kg

A total of eight made ground soil samples were obtained and tested for Suite A. Copies of the environmental chemistry testing certificates are presented in *Appendix C*.

4.1.2 Groundwater Analysis

No groundwater samples were obtained as part of this investigation.

4.2 Geotechnical Testing

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref. 8). Rock samples were prepared and tested in accordance with ISRM Suggested Methods (Ref. 9).

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	87	BS 5930: 2015, Clause 41
Laboratory Testing (General Testing - Foundation Design)		
Atterberg Limit	18	BS1377 1990, Part 2 (clause 4.5, 5.3 & 5.4)
Particle Size Distribution (Wet Sieve)	5	BS1377 1990, Part 2 (clause 9.2 and 9.5)
Moisture Content	23	BS1377 1990, Part 2
Multistage Quick Undrained Triaxial Test	10	BS1377 1990 Part 2 (Clause 9.2)
Odometer Consolidation	10	BS1377 1990 Part 5 (Clause 3.3, 3.4, 3.5)
Water Soluble Sulphate	25	IS0 17025 MCERTS
pH Value	25	IS0 17025 MCERTS
Point Load Test	Axial Plane: 5 Diametral Plane: 5	ISRM Suggested Methods: 2007

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Test Type	Quantity	Standard
Uniaxial Compressive Strength Test	3	ISRM: 1989 Non UKAS Accredited
Laboratory Testing (Re-use of Soils)		
Moisture Content	3	BS1377 1990
Atterberg Limit	2	BS1377 1990, Part 2 (clause 3.2)
PSD (Sedimentation by Hydrometer)	3	BS1377 1990, Part 2 (clauses 9.2 and 9.5)
Particle Density (Gas Jar)	2	BS1377 1990
Moisture condition Value / Optimum Moisture Content (MCV/OMC) Relationship	3	BS1377 1990, Part 2 (clause 3.7)
OMC/MDD Relationship (4.5kg litre mould)	2	BS1377- 4 1990, (clause 3.6)
OMC/MDD Relationship (2.5kg litre mould)	2	BS137- 4 1990 (clause 3.4)
OMC/MDD Relationship (Vibrating Hammer)	1	BS137- 4 1990
CBR on remoulded specimen	3	BS1377 1990
Odometer Consolidation	2	BS1377 1990
Quick Undrained Triaxial (3x38mm)	2	BS1377 1990
Shear Box (3x60mm) Immediate Shear	1	BS1377 1990

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

Copies of the geotechnical testing certificates can be referred to in *Appendix D*.

5.0 Ground Conditions

The ground conditions across the site, determined during the Curtins ground investigation works, generally comprised topsoil/asphalt granular Made Ground overlying interbedded cohesive and granular Glaciofluvial Sheet Deposits. This typically overlays cohesive and granular Glacial Till deposits. Below which competent bedrock comprising medium to coarse grained sandstone.

5.1 Encountered Ground Conditions

A summary of the ground conditions encountered during the site investigation works is 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 (73.84 – 74.09)	0.00 (73.84 – 74.09)	0.50 (71.98)	3.00 (71.16)	0.50	3.00
Glaciofluvial Sheet Deposits	0.50 (71.93)	3.00 (71.16)	9.50 (64.66)	15.50 (58.59)	6.00	14.30
Glacial Till	9.50 (64.66)	15.50 (58.59)	35.50[1] (38.94 – 39.09)	42.50 (31.59)	22.60[1]	29.50
Chester Formation	42.50 (31.59)	-[2]	50.00[1] (24.09)	-[2]	7.50[1]	-[1]

1 Thickness not proven
2 Base not proven

5.2 Made Ground

The Made Ground typically comprised a surface covering of topsoil/asphalt overlying predominantly granular made ground. Made Ground was encountered to a maximum depth of 3.00m bgl (71.16m AOD) in BH101.

The base of the deposit was not encountered in WS102 due to borehole termination. Termination was due to obstruction.

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5.2.1 Topsoil/Surface Covering

Topsoil was encountered in all exploratory holes, excluding BH101, WS101 and WS102 from ground level to depths between 0.05m (74.04m AOD) and 0.45m bgl (73.14m AOD). Topsoil typically comprised brown slightly sandy clay with frequent rootlets.

Asphalt was encountered from ground level to depths between 0.10m and 0.12m bgl (74.06m AOD – 71.53m AOD) and in BH101, WS101 and WS102.

5.2.2 Granular Made Ground

Granular Made Ground was encountered underlying the topsoil/surface covering in all exploratory holes, excluding BH105.

Within BH101, WS101 and WS102 underlying the asphalt, it typically comprised light brown/grey sandy gravel. The sand is medium to coarse and the gravel is angular to subrounded fine to coarse including aggregate, limestone and brick.

Within BH101, BH103, SA101, SA102, SA103 underlying the topsoil, it typically comprised light to dark brown grey gravelly medium to coarse sand. The gravel is angular to subrounded fine to coarse including brick, glass, slate, concrete and ceramic.

Within BH102 and BH104, it typically comprised brown slightly clayey slightly sandy angular to subrounded fine to coarse gravel including brick, glass, slate and ceramic.

5.2.3 Cohesive Made Ground

Cohesive Made Ground was encountered underlying the topsoil in BH105. It typically comprised red/brown slightly sandy gravelly clay. Sand is fine to coarse and gravel is subangular to subrounded fine to coarse including brick and ceramic.

5.3 Glaciofluvial Sheet Deposits

Glaciofluvial Sheet Deposits were encountered in all exploratory hole, excluding WS102, comprising interbedded cohesive and granular deposits directly underlying the made ground.

The deposits were encountered from depths between 0.50m and 3.00m bgl across the site, to proven depths of 9.50m bgl (64.66 AOD) and 15.50m bgl (58.59m AOD).

5.3.1 Granular Glaciofluvial Sheet Deposits

The granular Glaciofluvial Sheet Deposits were encountered in all exploratory holes, excluding WS102. It appears to be interbedded with cohesive Glaciofluvial Sheet Deposits.

The deposits generally comprised medium dense occasionally slightly silty fine to medium sand.

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In BH102, BH103, BH105 and WS101, the granular deposits were recorded underlying the made ground at 0.70-4.80m, 0.70m-3.60m, 0.70m-0.90m and 1.40-1.70m respectively. A cohesive band was found to be interbedded between the initial and second granular layer which extended to 8.00-12.00m, 10.10-12.40m, 11.00-13.00m and 2.80-3.00m (base of the borehole) respectively.

5.3.2 Cohesive Glaciofluvial Sheet Deposits

The cohesive Glaciofluvial Sheet Deposits were encountered in all exploratory holes, except SA101 and WS102.

The cohesive layers of glaciofluvial deposits comprised firm to stiff light brown/brown slightly sandy, slightly gravelly to gravelly, occasionally silty clay. Typically, sand is fine to coarse and gravel is subangular to rounded fine to carse including mudstone and sandstone.

In BH101 and BH103, cohesive deposits were recorded underlying the made ground at 3.00-4.00m and 1.20-2.50m bgl respectively. A granular band was found to be interbedded between the initial and second cohesive layer which extended to 7.80-9.50m and 3.00-6.50m respectively.

5.4 Glacial Till

Glacial Till deposits were encountered underling the base of glaciofluvial sheet deposits in BH101-BH105. The Glacial Till encountered was predominantly cohesive with interbedded granular deposits.

Glacial Till deposits were encountered to depths of between 35.00m (38.94m AOD – 39.09m AOD) and 42.50m bgl (31.59m AOD). The base of the deposit was encountered in BH105 at 42.50m bgl (31.59 AOD).

5.4.1 Cohesive Glacial Till Deposits

Cohesive Glacial Till deposits were predominantly encountered as very stiff brown slightly sandy to sandy, slightly gravelly clay and very stiff brown sandy clay. Sand is fine to medium. Gravel is subrounded to rounded, fine to coarse including sandstone and mudstone.

The cohesive layers of Glacial Till were recorded to be interbedded with bands of sand.

5.4.2 Granular Glacial Till Deposits

Granular Glacial Till deposits were encountered interbedded with the cohesive deposits as very dense light brown fine to medium sand.

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The granular deposits were encountered in BH101 (12.50m – 13.70m and 22.10m - 23.50m), BH102 (21.00m - 22.00m), BH103 (20.00m - 23.50m) BH104 (20.60m – 22.50m) and BH105 (22.50m – 22.90m).

In BH103, very dense reddish brown fine to medium sand was encountered from 29.00m to 35.00m bgl.

5.5 Bedrock Deposits

The Chester Formation bedrock was encountered in BH105. The bedrock was encountered from 42.50m bgl (31.59 AOD) to a depth of 50.00m bgl (24.09m AOD) where BH105 was terminated.

The bedrock comprised weak to medium strong fine to coarse grained Sandstone.

Fracture spacing ranged from very closely spaced to closely spaced, becoming medium spaced with increasing depth and strength on the rock.

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

5.6 Observed Potential Contamination

No potential visual or olfactory contamination was observed during the intrusive investigation works.

5.7 Obstructions Encountered

W102 was terminated at 2.00m bgl (69.57m AOD) due to intact bricks within the made ground.

5.8 Groundwater

A summary of the groundwater levels recorded during the siteworks is presented in *Table 5.8a*.

Table 5.8a – *Groundwater Noted During Site Investigation*

Borehole Ref.	Water Strikes			
	Strike Depth m bgl (m AOD)	Water Depth after 20 mins m bgl (m AOD)	Strata	Notes
BH101	11.60 (62.56)	9.00 (59.96)	Cohesive Glaciofluvial	Rising
BH104	16.50 (57.59)	14.00 (55.09)	Cohesive Glacial Till	Rising
BH105	11.00 (63.09)	10.50 (62.59)	Granular Glaciofluvial	Rising

Six rounds of groundwater monitoring have been undertaken between 23rd April and 11th June 2021, the results of which are presented in *Table 5.8b*.

Table 5.8b – *Groundwater Monitoring Results*

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth, m bgl (mAOD)					
			24/04/21	05/05/21	13/05/21	26/05/21	03/06/21	11/06/21
BH101	Cohesive Glacial Till	24.00 – 35.00 (50.16 - 39.16)	26.34 (47.82)	-[1]	27.52 (46.64)	26.95 (47.21)	26.80 (47.36)	26.61 (47.55)
BH102	Cohesive Glacial Till	25.00 – 35.00 (48.84 – 33.84)	24.93 (48.91)	24.16 (49.68)	24.80 (49.04)	-[1]	21.83 (52.01)	24.90 (48.94)
BH103	Granular Glacial Till	30.00 – 35.00 (43.93 – 38.93)	24.50 (49.43)	27.47 (46.46)	23.95 (49.98)	-[1]	25.50 (48.43)	25.09 (48.84)
BH104	Granular and Cohesive Glaciofluvial	6.00 – 13.00 (68.09 – 61.09)	8.23 (65.81)	8.33 (65.76)	8.25 (65.84)	8.20 (65.89)	-[2]	-[2]
BH105	Sandstone Bedrock	44.00 – 50.00 (30.09 – 24.09)	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]

(1) Unable to access
(2) Borehole destroyed

6.0 Ground Model

6.1 Made Ground

Made Ground and/or topsoil was encountered in all exploratory holes.

The geotechnical test results recorded within the Made Ground are summarised in *Table 6.1.*

No laboratory geotechnical testing has been undertaken on this stratum due its unsuitable engineering properties.

Two in-situ SPT 'N' values were undertaken within the Made Gground.

Table 6.1 – *Summary of geotechnical test results – Made Ground*

Parameter	No. of tests	Results	
		Minimum	Maximum
SPT 'N' Value	2	8 & 8	
pH	6	6.14	9.88
Water Soluble Sulphate (mg/l)	6	10	280

6.2 Glaciofluvial Sheet Deposits

The Made Ground is underlain by glaciofluvial sheet deposits, typically recorded as cohesive and granular 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	21	7	42
Laboratory Tests			
pH	2	7.18	7.37
Water Soluble Sulphate (mg/l)	2	10	30
Particle Size Distribution	4	See *Appendix D* for results	

Twenty-one SPT 'N' values were recorded in the granular strata ranging between 7 and 42. The SPT 'N' results indicate a highly variable stratum, typically from loose to dense. The results are shown on *Figure 6.2.1a.*

The PSD results are generally consistent with the recorded descriptions during the site investigation works.

A moderately conservative unit weight of 17 kN/m^3 is deemed suitable for granular soils above groundwater and of 20 kN/m^3 in accordance with BS8002:2015 (Ref. 10).

The Angle of Internal Friction, estimated based on relationships with SPT N values (Ref. 11) are determined to typically increase with depth. The values are shown on *Figure 6.2.1b.*

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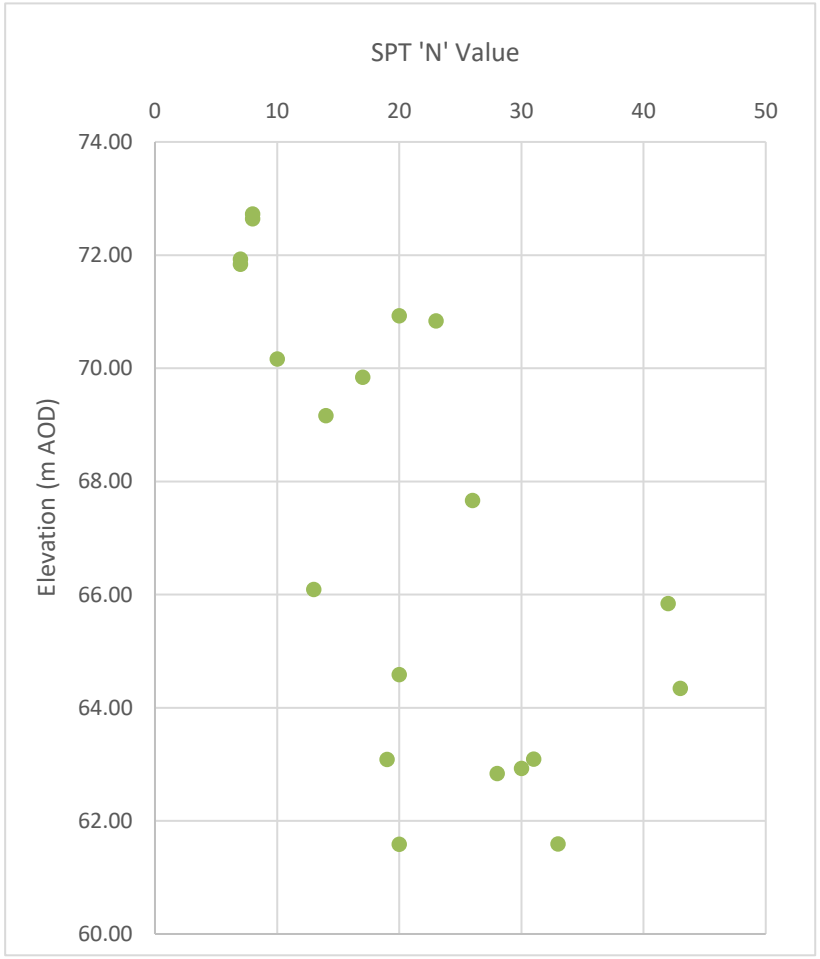

Figure 6.2.1a – *Standard Penetration Test vs. Depth - Granular*

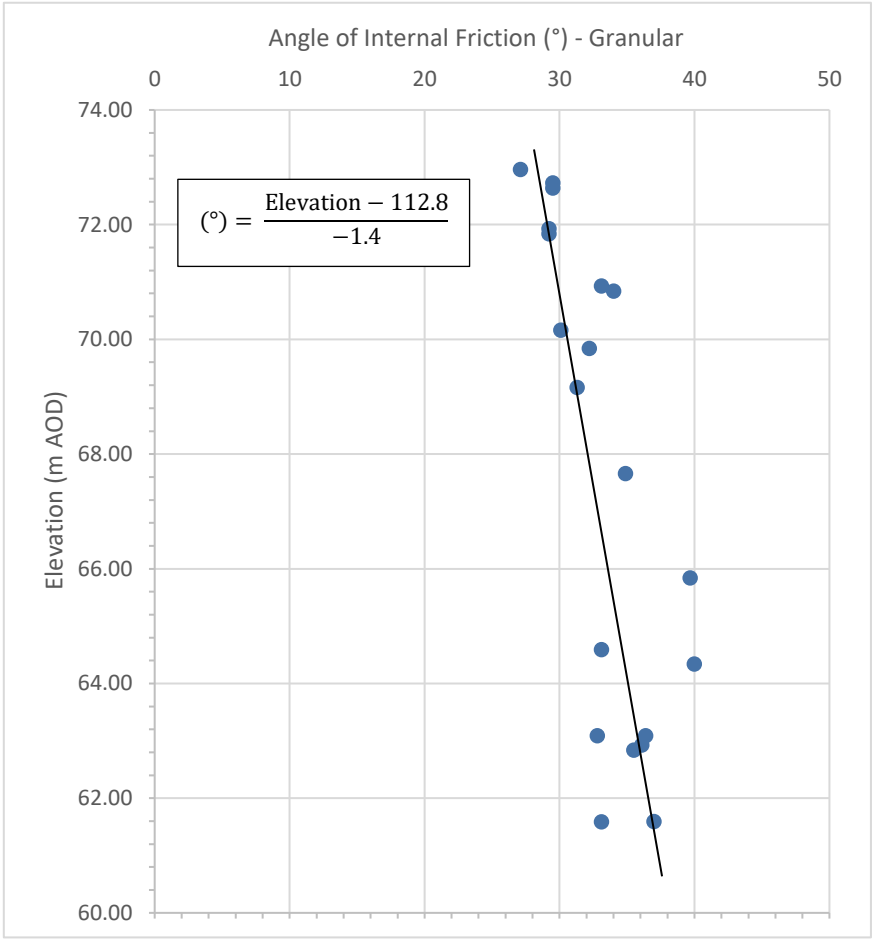

Figure 6.2.1b – *Angle of Internal Friction (Granular) vs Depth*

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		16	4	32
Laboratory Tests				
Atterberg Test	Liquid Limit (%)[1]	3	30	40
	Plastic Limit (%)[1]	3	14	18
	Plasticity Index (%)[1]	3	12	21
	Modified Plasticity Index (%)[3]	3	10.8	21
Moisture Content (%)		3	15	26
pH		3	5.52	7.63
Water Soluble Sulphate (mg/l)		3	10	-
One Dimensional Consolidation in Oedometer		1	0.085	-

(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.

Three Atterberg Tests were completed. The results typically indicate Low and Intermediate plasticity clays from the samples taken. The results of the Atterberg Limits are presented on *Figure 6.2.2a*.

The SPT N results are presented on *Figure 6.2.2b*, showing a general increase in SPT values with depth.

A moderately conservative unit weight of 17 kN/m^3 is deemed suitable for firm cohesive soils above and below the groundwater table in accordance with BS8002:2015 (Ref. 10)

The Undrained Shear Strength, Cu, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 12) using Equation 1:

$$Cu = f_1 \times SPT\ N \qquad \textbf{Equation 1}$$

Where:

Cu is the Undrained Shear Strength

f_1 is the Stroud Factor determined from Figure 1.5 (Ref. 12)
SPT N is Characteristic Standard Penetration Test Result

Using an f1 factor of 6 for an average plasticity index of 17%, Cu values ranging between 24kPa and 180kPa were determined. The results indicate medium to high strength clay, generally increasing with depth. One Quick Undrained Multi Stage Triaxial Tests were undertaken. The results in BH103 at 9.50m bgl recorded a Cu of 48kPa indicating medium strength clay.

Figure 6.2.2c indicates the estimated Undrained Shear Strength of cohesive glaciofluvial sheet derived through the correlation between SPTs and plasticity indices is greater than the strength of the soils determined through laboratory analysis, where shear strength values were 48 kPa at 9.50m bgl. It is considered given the variability in plasticity index identified in samples, the triaxial compression tests may have been undertaken on samples of higher plasticity, results in lower undrained shear strength values.

The Coefficient of Consolidation, Mv, of the cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 12) described by Equation 2:

$$Mv=1/(f_2 \times SPT\ N) \qquad \textbf{Equation 2}$$

Where:
Mv 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 an f2 factor of 0.6 for an average plasticity index of 17%, Mv values typically range between 0.052 and 0.41 m^2/MN. The majority of results indicate a low to medium compressibility clay. A One Dimensional Consolidation in Odometer was undertaken on a sample at 9.50m bgl in BH103, recording a value of 0.085m^2/MN. This indicates low compressibility. The values are presented in *Figure 6.2.2d.*

The Angle of Shearing Resistance, ϕ', for the cohesive glaciofluvial deposits has been derived from the correlation with Plasticity Indices (Ref. 13) shown in *Figure 6.2.2e*.

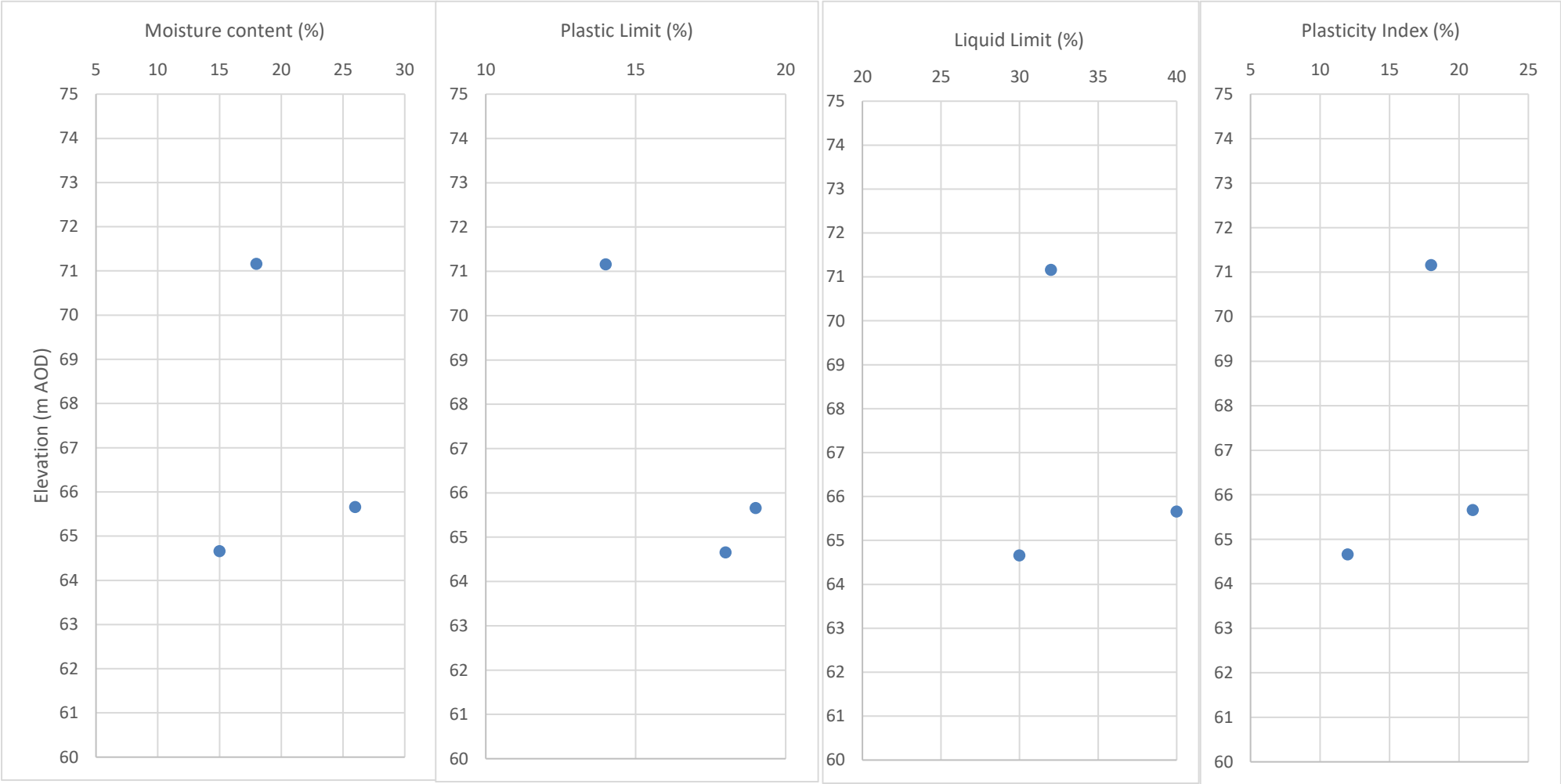

Figure 6.2.2a – *Summary of Atterberg Test Results*

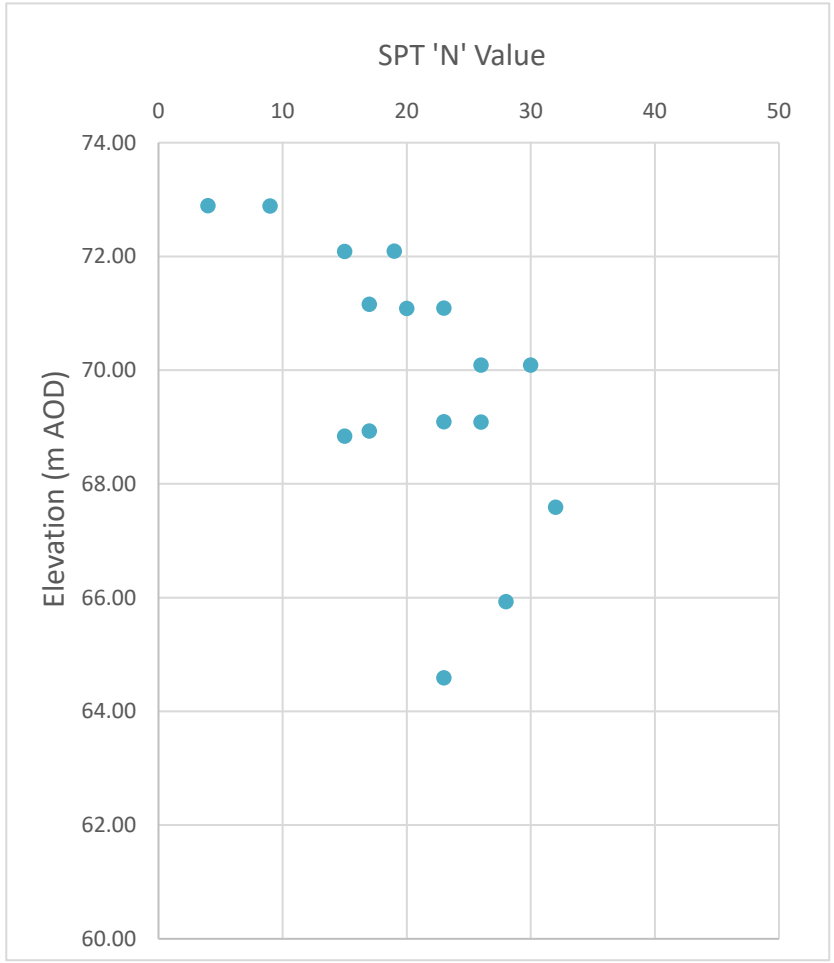

Figure 6.2.2b – *Standard Penetration Test vs. Depth - Cohesive*

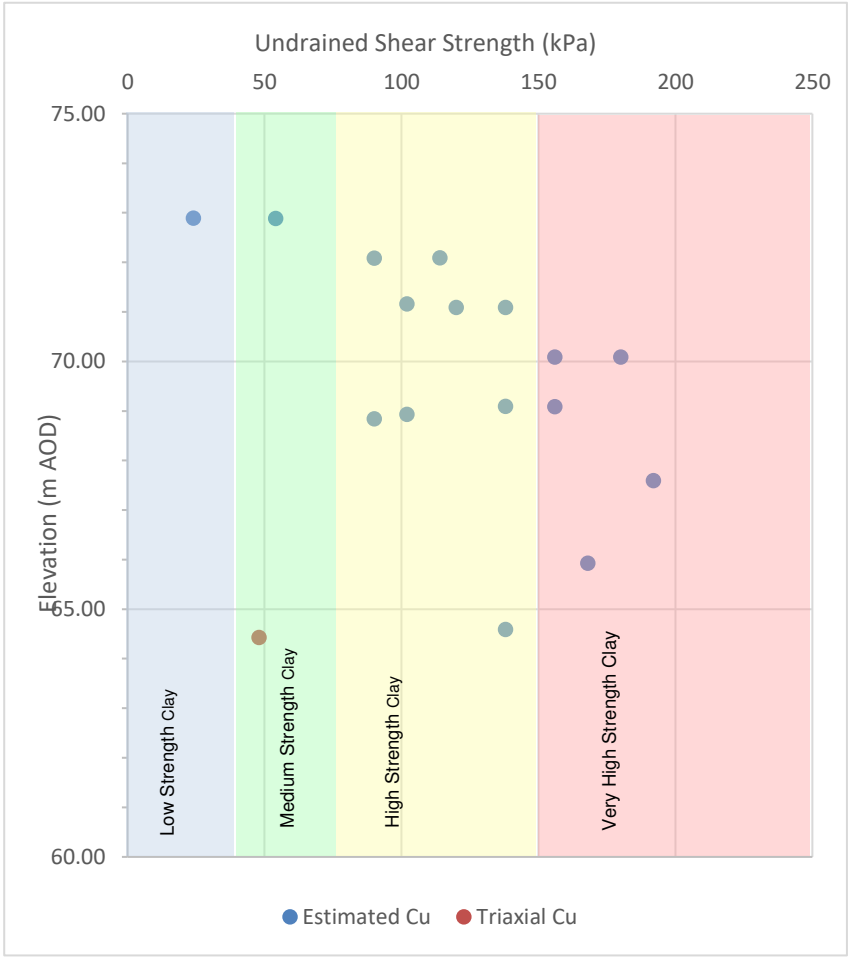

Figure 6.2.2c – *Estimated Undrained Shear Strength vs Depth*

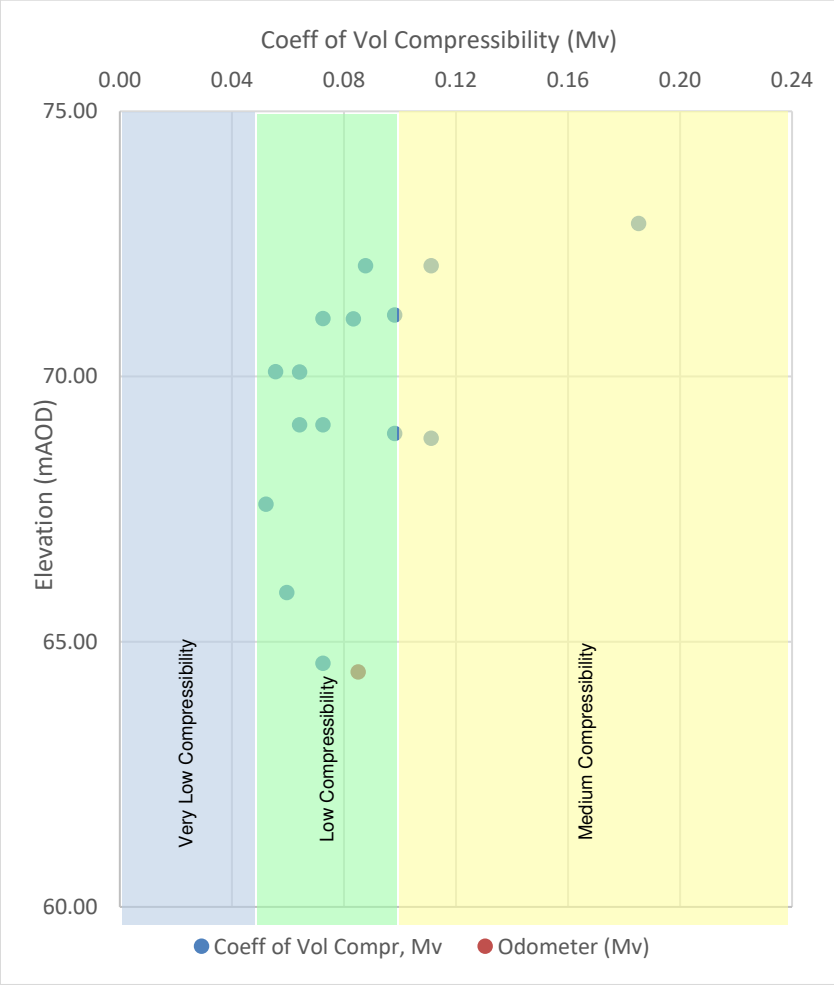

Figure 6.2.2d – *Estimated Volume Compressibility Coefficients (Mv) vs Depth*

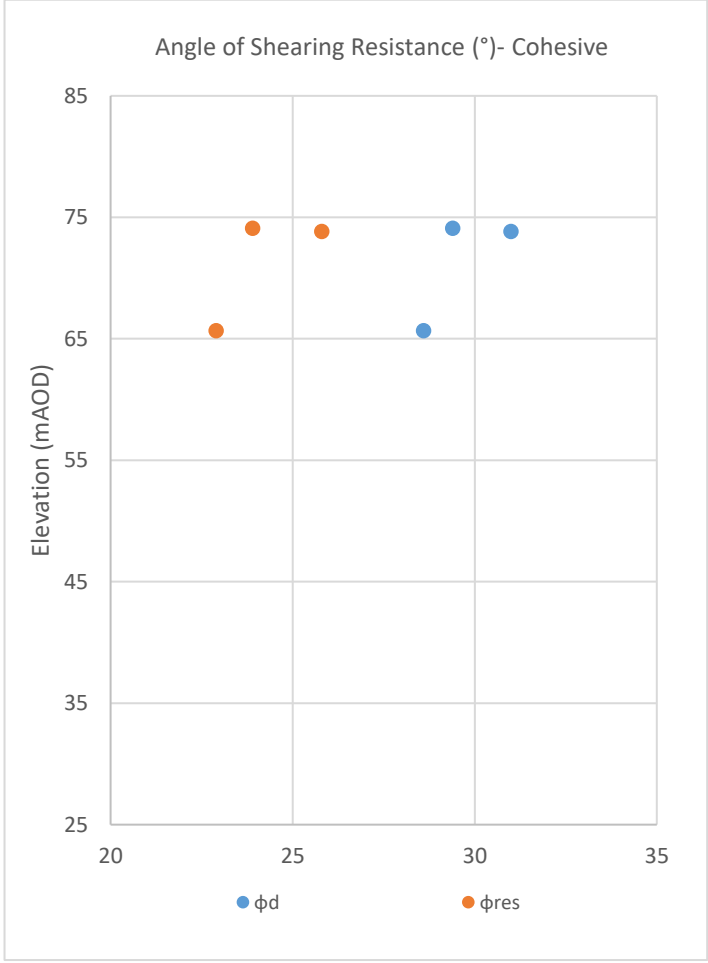

Figure 6.2.2e – *Angle Shearing Resistance (Cohesive) vs Depth*

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6.3 Glacial Till Deposits

The made ground is underlain by glaciofluvial sheet deposits, typically recorded as cohesive and granular strata which are summarised 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		18	33	50
Laboratory Tests				
Atterberg Test	Liquid Limit (%)[1]	9	19	40
	Plastic Limit (%)[1]	9	11	22
	Plasticity Index (%)[1]	9	4	22
	Modified Plasticity Index (%)[3]	9	3.44	21.34
Moisture Content (%)		9	10	24
pH		6	8.08	8.27
Water Soluble Sulphate (mg/l)		6	60	140
One Dimensional Consolidation in Oedometer		9	0.027	0.066
Quick Undrained Multistage Triaxial		2	56	110

(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.

The Atterberg Test results typically indicate Low and Intermediate plasticity clays from the samples taken. The results of the Atterberg Limits are presented in *Figure 6.3.1a*.

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 22 kN/m^3 is deemed suitable for very stiff cohesive above and below the groundwater table in accordance with BS8002:2015. (Ref. 10).

The Undrained Shear Strength, Cu, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 12) using Equation 1:

$$Cu=f_1 \times SPT\ N \qquad \textbf{Equation 1}$$

Where:

Cu is the Undrained Shear Strength

f_1 is the Stroud Factor determined from Figure 1.5 (Ref. 12)

SPT N is Characteristic Standard Penetration Test Result

Using an f1 factor of 6.8 for an average plasticity index of 14%, Cu values ranging between 156 and 300kPa were determined. The estimated results indicate a very high strength clay, generally increasing with depth.

Two Quick Undrained Multi Stage Triaxial Tests were undertaken. The tests were undertaken in BH101 at 14.00m bgl and 20.00m bgl recording values of 110kPa and 56kPa respectively indicating medium to high strength clay.

Figure 6.3.1c indicates the estimated Undrained Shear Strength of cohesive glacial till derived through correlation between SPTs and plasticity indices is greater than the strength of the soils determined through laboratory analysis, where shear strength values were 56kPa and 110kPa. It is considered given the range of plasticity index identified in the samples, the triaxial may have been undertaken on samples of higher plasticity, resulting in lower undrained shear strength values.

The Coefficient of Consolidation, Mv, of the cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 11) described by Equation 2:

$$Mv=1/(f_2 \times SPT\ N) \qquad \textbf{Equation 2}$$

Where:

Mv 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 an f2 factor of 0.7 for an average plasticity index of 14%, Mv values typically range between 0.028 and 0.054 m2/MN. The majority of results indicate a very low to low compressibility clay. Nine One Dimensional Consolidate in Odometer test were undertaken recording values between 0.027 m2/MN. And 0.066 m2/MN. The results predominantly indicated very low compressibility. The values are shown in *Figure 6.3.1d*.

The Angle of Shearing Resistance, ϕ', for the cohesive glaciofluvial deposits has been derived from the correlation with Plasticity Indices (Ref. 13) show in *Figure 6.3.1e*.

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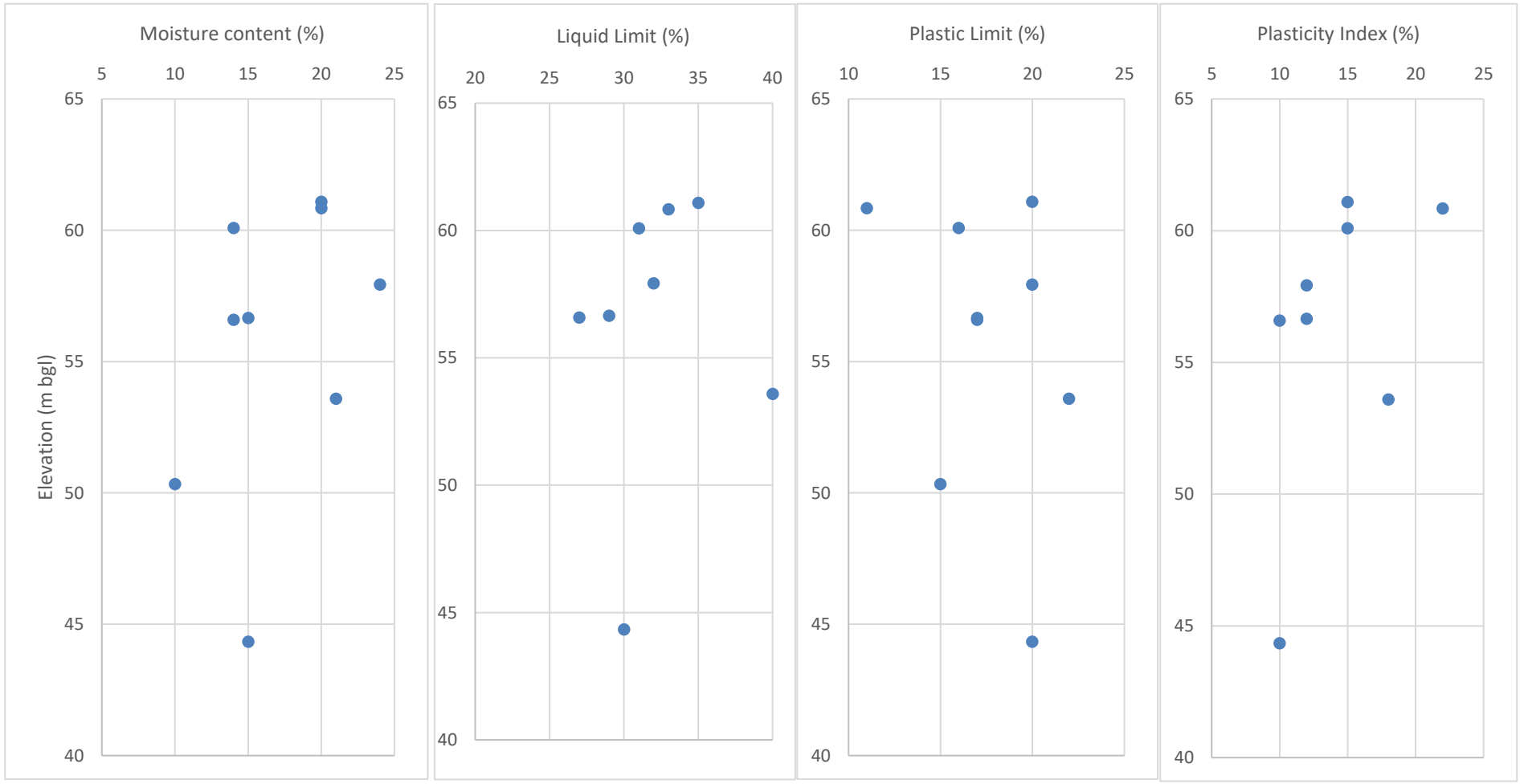

Figure 6.3.1a – *Summary of Atterberg Test Results*

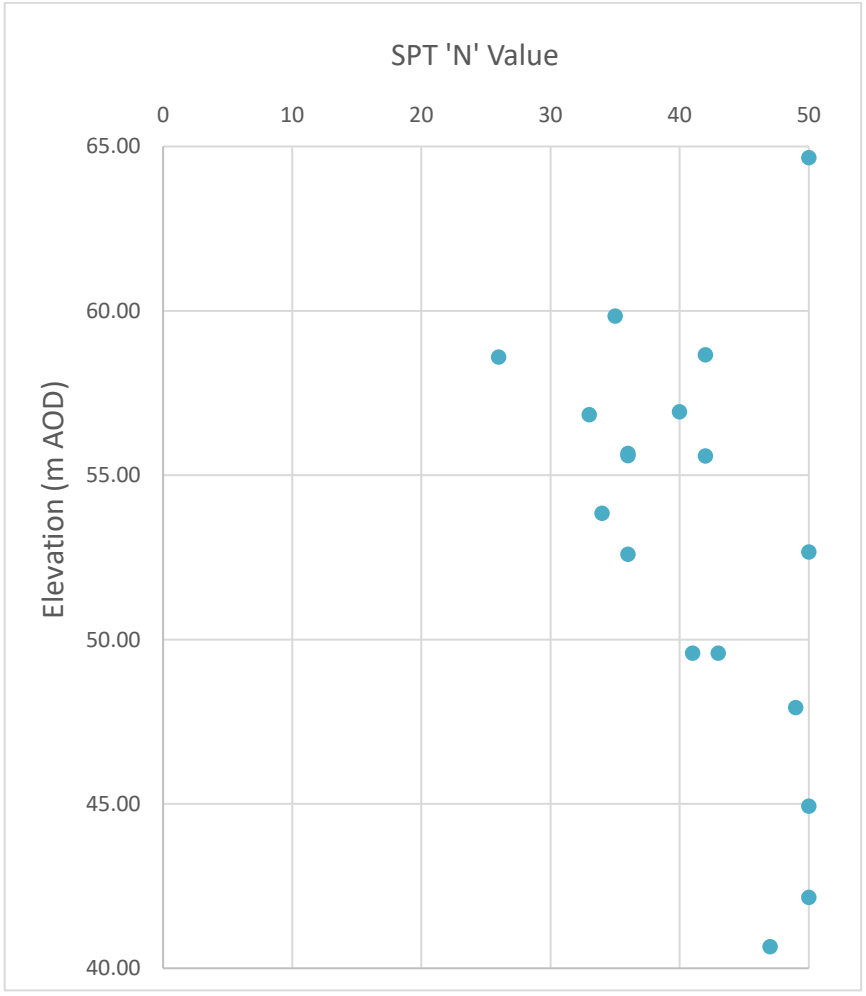

Figure 6.3.1b – *Standard Penetration Test vs. Depth - Cohesive*

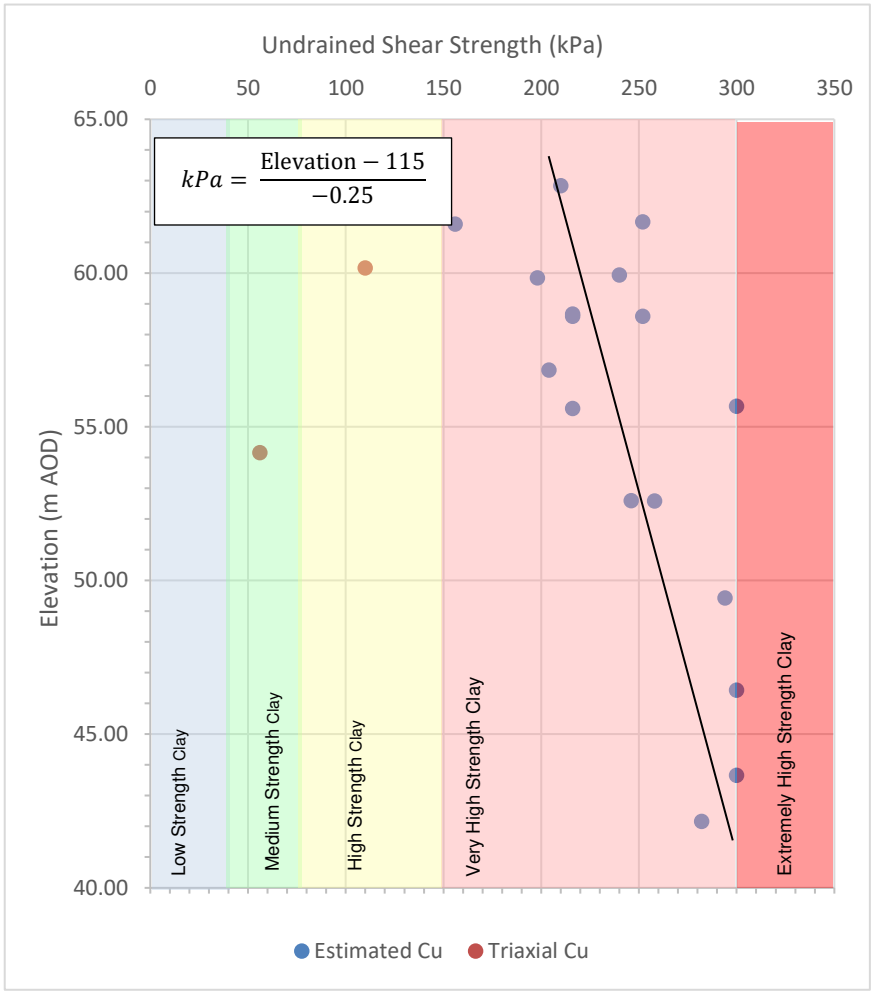

Figure 6.3.1c – *Estimated Undrained Shear Strength vs Depth*

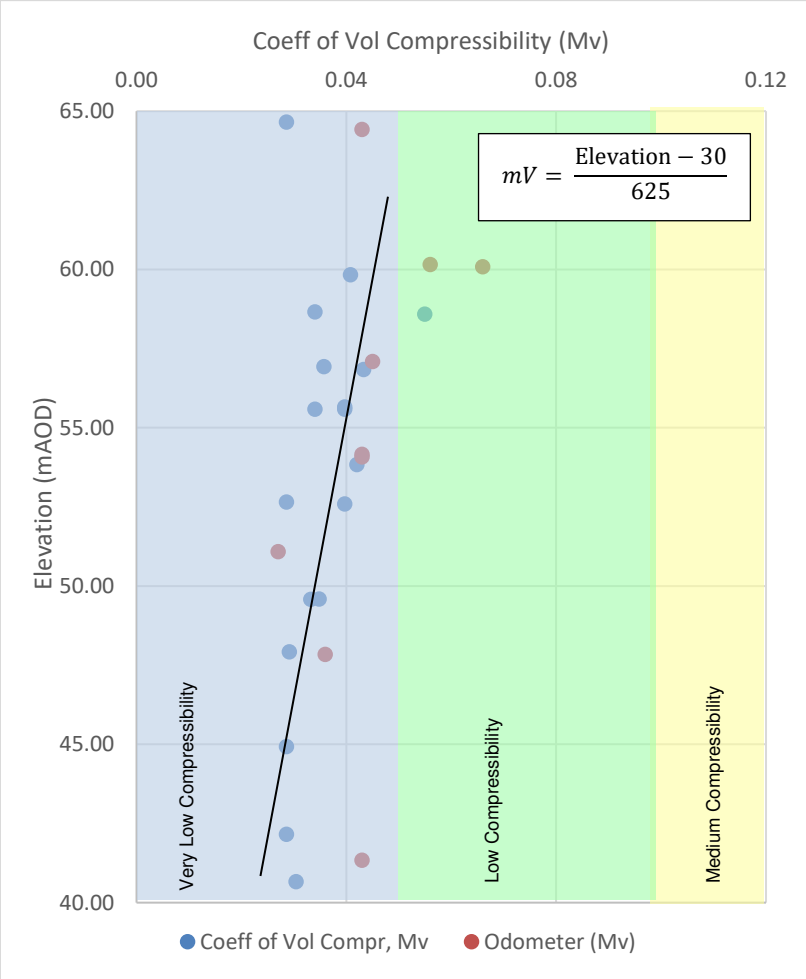

Figure 6.3.1d – *Estimated Volume Compressibility Coefficients (Mv) vs Depth*

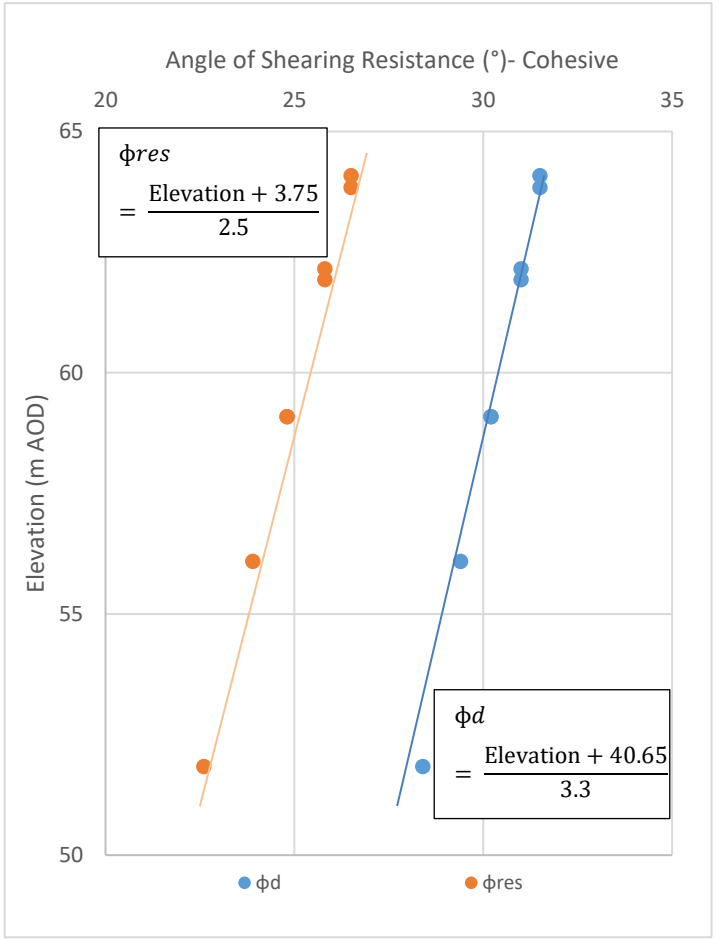

Figure 6.3.1e – *Angle Shearing Resistance (Cohesive) vs Depth*

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 Glacial Till*

Parameter	No. of Tests	Results	
		Minimum	Maximum
In-Situ Tests			
SPT 'N' Value (1) – Granular	2	38	45
Laboratory Tests			
pH	-	-	-
Water Soluble Sulphate (mg/l)	-	-	-
Particle Size Distribution	1	See *Appendix D* for results	

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

Two SPT 'N' values were recorded in the granular strata ranging between 38 and 45. The remaining eight SPT 'N' values were refusals. The SPT 'N' values indicate dense to very dense stratum.

The PSD result is generally consistent with the recorded findings during the site investigation works.

A moderately conservative unit weight of 19 kN/m^3 is deemed suitable for granular soils above groundwater and of 22 kN/m^3 below the water table in accordance with BS8002:2015 (Ref. 10).

The Angle of Internal Friction of ranged between 38.48° and 42.07° for the granular Glacial Till has been derived from a review of relationships with SPT N values (Ref. 11) and published values. However, eight of the SPT results did not reach full penetration. Full penetration was achieved in BH101 at 12.50m bgl (38.48°) and BH102 at 21.50m bgl (40.58°).

6.4 Chester Formation

The Chester Formation was encountered in BH105 noted in *Section 5.5* below the Glacial Till at 31.59m AOD (42.50m bgl).

The borehole logs indicate bedrock comprised weak to medium strong reddish brown medium to coarse sandstone. Fracture spacing was variable from very closely spaced to medium spaced.

Some assumed zones of core loss and non-intact core were recorded and summarised in *Table 6.4a*. Details of this can be referred to in the exploratory logs found in *Appendix B.*

Table 6.4a – *Summary of zones of core loss*

Exploratory Hole ID	Core Loss Depth (m bgl)	Core Loss Depth (m AOD)
BH105	43.70 – 44.00	30.39 – 30.09
BH105	46.90 – 47.00	27.19 – 27.09

Rock Quality Designation (RQD) recorded in the sandstone cored samples ranged from 30 to 74 which classifies it as poor to fair rock mass quality, generally increasing with depth. Total Core Recovery (TCR) and Solid Core Recovery (SCR) varied between core runs showing an overall increase with depth. The Rock Quality Parameters are presented in *Figure 6.4a*.

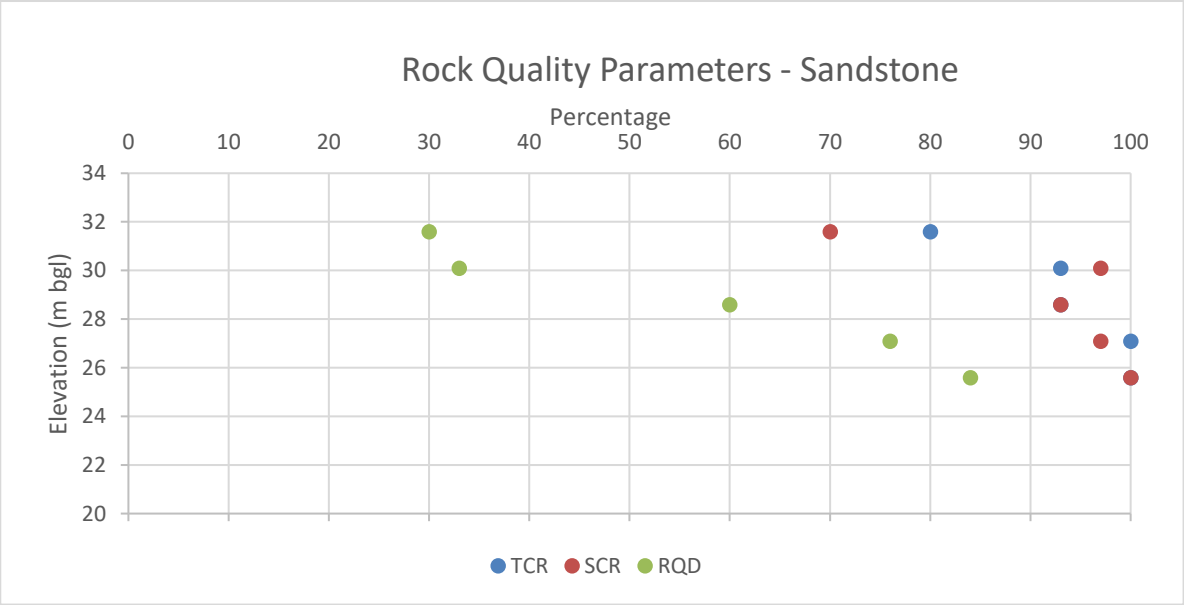

Figure 6.4a *– Summary of Rock Quality Parameters vs Elevation for Sandstone*

A summary of the geotechnical testing results for the sandstone bedrock are presented in *Table 6.4b.* Full details of the geotechnical results are included in *Appendix D.*

Table 6.4b *– Summary of Geotechnical Test Results for Sandstone.*

Parameter			No. of Tests	Summary of Results		
				Min	Max	Average
Laboratory Test Results	Point Load Indices (Is50) (MPa)	Axial Plane	5	0.06	0.35	0.22
		Diametral Plane	5	0.03	0.38	0.16
	Unconfined Compressive Strength, UCS (MPa)		3	6.9	9.3	7.8
	pH Value		3	6.87	8.03	7.43
	Water Soluble Sulphate (mg/l)		3	10	-	-
Derived Parameters	Estimated UCS from Point Load Indices	Axial Plane	5	1.8	6.3	3.96
		Diametral Plane	5	0.54	6.84	2.84

Overall, 5No. axial and 5No. diametral Point Load Tests (PLT) were undertaken on selected samples of sandstone from rotary cores. Axial plan PLT (Is(50)) results ranged between 0.06MPa and 0.35MPa and diametral plan PLT (Is(50)) test results ranged between 0.03MPa and 0.38MPa.

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

$$UCS = PLT\ Is(50) \times f1 \qquad \textbf{Equation 5}\ \text{(Tomlinson, 1999)}$$

Where f1 is derived from correlation between PLT Is(50) and UCS results

However, due to the limited set of UCS results, a published correlation factor of 18 has been used for sandstone (Ref. 12). Based on this relationship, estimated UCS values for bedrock range between 1.80MPa and 6.30MPa for axial tests and 0.54MPa and 6.84MPa for diametral tests, indicating the rock tested has strength index from very weak to moderately weak, which are lower strengths than indicated during field descriptions.

The estimated UCS are generally lower than the UCS testing results which ranged between 6.90MPa and 9.30MPa. Test termination reasons varied between axial cleavage and fragmentation. The UCS testing results indicate that the intact rock is generally moderately weak, This shows a lower strength than indicated during field descriptions. The results are shown in *Figure 6.4b*

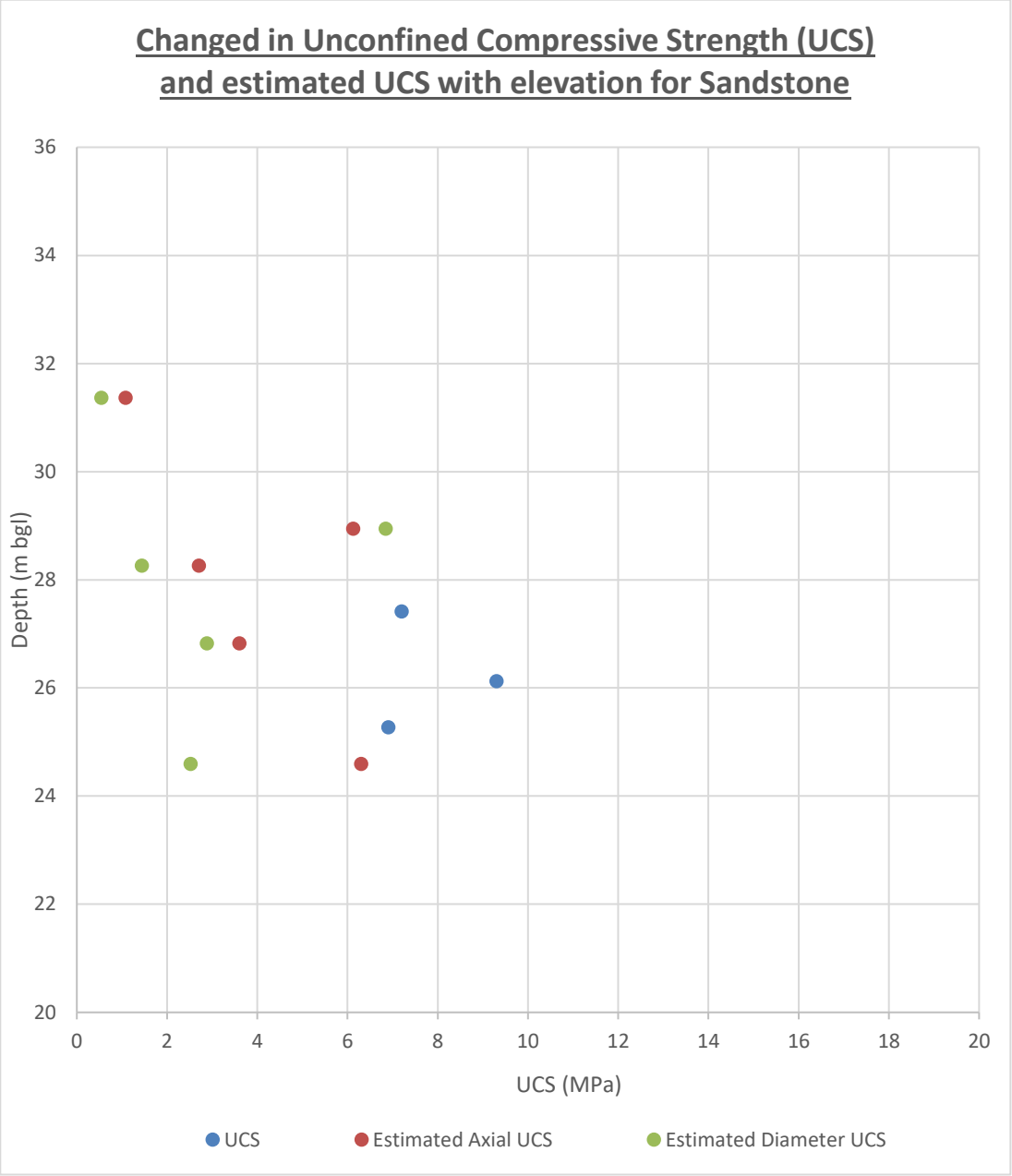

Figure 6.4b – *Summary of Rock Quality Parameters vs Elevation for Sandstone*

6.5 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. 14). A summary of the results obtained as a part of the ground investigation are summarised in *Table 6.5a* and *Table 6.5b* below.

Table 6.5a –*Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Test Type	Range
Made Ground	pH	6.14 – 9.88
	Water Soluble Sulphate (mg/l)	10 - 280
Glaciofluvial Sheet Deposits	pH	5.52 – 7.63
	Water Soluble Sulphate (mg/l)	10 - 30
Glacial Till	pH	8.08 – 8.27
	Water Soluble Sulphate (mg/l)	60 – 140
Chester Formation	pH	6.87 – 8.03
	Water Soluble Sulphate (mg/l)	10

Table 6.5b – *Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

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

In these conditions, and as a preliminary assessment and subject to further testing, it is considered that deterioration of buried concrete due to sulphate or acid attack is unlikely to occur. The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 (AC-1) conditions assuming mobile groundwater.

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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.15).

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

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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. 16) 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

Current development proposals indicate the construction of a 1025 space multi storey car park with associated infrastructure. The screening of soil results against GACs has been compared against the *Commercial* end-use scenario. Assessment has therefore 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 0.3% to 10.7%. The greatest organic matter concentrations were recorded in the shallower samples of Topsoil compared to deeper subsoil samples.

With consideration for a calculated geometric average, soils from made ground determine an SOM of 3.15%. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM of 2.5% for the identified end use thresholds have been adopted for made ground.

The adopted GAC can be referred to 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 *Commercial* end-use thresholds, there are no exceedances noted within samples collected.

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All soil samples were screened for asbestos. No suspected asbestos containing materials (ACMs) were identified within any of the exploratory hole logs or during laboratory screening.

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8.0 Re-Use of Site Soils and Waste Classification

8.1 Re-Use of Site Soils

Based on geochemical testing results presented, it is considered that there is currently no requirement to remove soils on site.

The re-use of site won soils may there be undertaken if the following principles are met:

i) the geotechnical suitability of the material needs to be confirmed;
ii) the re-use of the material needs to be covered as part of the planning approval, e.g. site levels maintained within agreed limits;
iii) the volume of the material being re-used needs to be confirmed and traceable; and
iv) regulatory approval from the relevant authorities has been sought.

These principles are outlined within the CL;AIRE Definition of Waste Code of Practice (v2) and if and where the re-use of site-won soils is proposed as part of the development works it is recommended that a Materials Management Plan is produced in line with the Definition of Waste Code of Practice to detail and document the process.

The Made Ground soils recorded do not indicate any clear signs that would result in being deemed unacceptable for re-use and re-engineering on site.

Bulk samples were obtained of natural soils to allow classification in accordance with The Specification for Highways Works Series 600. The geotechnical suitability of the material is discussed in Section 10.

8.2 Materials Classification

Where any sites soils are to be moved, disposed of or recovered, guidance on the movement of contaminated soils is provided within the following document published by the Environment Agency, the Guidance on the classification and Assessment of Waste Technical Guidance WM3 (1st Edition 2015) (Environment Agency, 2015) (Ref. 17).

Guidance states that the principal contractor (or any other sub-contractor undertaking excavations) should, in conjunction with the proposed disposal facility, use where possible the relevant environmental chemistry analyses results to classify any surplus material identified for off-site disposal. However, it should be noted that this information is for guidance only and material identified for disposal should be tested and assessed in accordance with WM3 to enable classification during the works.

An initial assessment for waste classification of the Made Ground soils encountered on site has been carried out through a comparison of the soil testing results against the Tier 1 Thresholds and using the Waste Soil Characterisation Assessment Tool, Cat-WasteSoil developed by McArdle and Atkins. This online tool gives a rapid assessment of contaminated soils and their classification as either hazardous

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and non-hazardous (stable non-reactive hazardous waste) waste, it should be noted that this tool does not classify inert waste. Persistent Organic Pollutants (POPs) were not tested as part of the investigation however, based on the Conceptual Site Model the risk is these being present on the site is considered Low.

At the request of Morgan Sindall, five made ground samples were also subjected to full solid and leachate Waste Acceptance Criteria analysis.

The initial classification of the five Made Ground samples collected and analysed during the investigation indicates that four of the samples may be classed as non-hazardous waste with respect to Environment Agency waste classes, using the guidance given within WM3. One sample, obtained from BH102, was classed as hazardous due to recorded concentrations of hydrocarbons/oils.

A 2 stage solid and leachate hazardous WAC suite was undertaken to assess acceptability of material for acceptance in a Hazardous or Stable Non-Reactive Hazardous Waste in Non-Hazardous Waste Landfill. The results are summarised in *Table 8.2* below.

Table 8.2 – *Summary of WAC Testing Results*

Exploratory Hole ID	Elevation (mAOD)	Sample Depth (m bgl)	Preliminary Waste Classification	WAC Testing Classification	Final Classification
WS101	71.65	0.2	Non-Hazardous	Inert Waste Landfill	Inert Waste Landfill
WS101	71.65	1.45	Non-Hazardous	Inert Waste Landfill	Inert Waste Landfill
WS102	71.57	0.35	Non-Hazardous	Inert Waste Landfill	Inert Waste Landfill
BH102	73.84	0.5	Hazardous	Hazardous Waste Landfill	Hazardous for off-site disposal
BH104	74.08	0.45	Non-Hazardous	Hazardous Waste Landfill	Non-Hazardous for off-disposal

Landfill operators are not obliged to accept waste and, if they were to do so, may have specific requirements beyond those outlined above prior to acceptance. Landfill operators should be contacted to confirm the above classifications or otherwise.

Additional analysis of soils being removed from site may be required to confirm waste materials are complaint with the descriptions above.

9.0 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. 18), BSI Publication code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2019 (Ref. 19) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 20).

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 Phase 1 Preliminary Risk Assessment (desk study) (Ref. 1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

9.1 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 five of the boreholes (BH101, BH102, BH103, BH104 and BH105) as detailed in *Section 3.2*.

An initial programme of six gas monitoring visits over six weeks was proposed. The six visits have been undertaken between 23rd April and 11th June 2021, with barometric pressure recorded between 998 and 1019mb. Rising barometric pressure was recorded on the second visit (05/05), steady barometric pressure was recorded on third (13/05), fourth (27/05) and fifth (03/06) visit and falling barometric pressure was recorded on the first (23/04) and sixth (11/06) visit.

The log results sheets are contained within *Appendix E* and summarised in *Table 9.1*

Table 9.1– *Summary of Ground Gas Monitoring Results*

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Gas Flow (l/hr)	Steady State Gas Flow (l/hr)
BH101	<0.1	1.3	18.5	-29.0	-3.0
BH102	<0.1	4.1	2.7	-0.5	-0.1
BH103	<0.1	0.1	19.4	<0.1	<0.1
BH104	<0.1	0.4	18.0	0.8	<0.1
BH105	<0.1	0.5	17.4	-0.3	-0.1

Methane concentrations were recorded at or below the limit of detection limit within all the monitoring wells.

Carbon monoxide was generally recorded at or below the limit of detection however, BH101, BH104 and BH105 recorded concentrations of between 65ppm and 872ppm.

Hydrogen sulphide was generally recorded at or below the limit of detection however, BH101 and BH104 recorded concentrations between 29ppm and 125ppm.

Gas flow was recorded at a maximum peak flow rate of -29.0l/hr in BH101 on the first visit (23rd April). The maximum steady state flow rate of -3.0l/hr was recorded in BH101 on the first visit.

9.2 Ground Gas Assessment

The Conceptual Site Model presented in *Section 2.7* highlighted Made Ground as a potential source of ground gas generation. The report suggests no records of historic or active landfills within close proximity to the site, however there is filled land within 100m 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 consisted of predominantly granular deposits comprising light/dark brown grey gravelly medium to coarse sand/brown slightly clayey slightly sandy gravel to a maximum depth of 3.00mbgl. Made ground included anthropogenic constituents including brick and concrete. Natural deposits comprised glaciofluvial sheet deposits overlying glacial till. Within BH101, bedrock of the Chester Formation was encountered.

Current development plans indicate a multi-storey car park with 1,025 spaces so this assessment has been undertaken in accordance with guidance within BS8485:2019 (Ref. 19).

In accordance with BS8485:2015 (Ref.19), consideration of the recorded soil gas flow rates, presented above, enables hazardous gas flow rates (Q_{hg}) to be evaluated. Q_{hg} can be derived for both 'representative' and 'worst case' scenarios and a comparison made in support of an appropriate assessment of ground gas risk.

As methane was not detected above the gas monitor's limit of detection through the monitoring period, the risk to the site end-users from methane is Low and is therefore not considered further.

As a total of six monitoring visits have been undertaken with varying barometric states, including two visits below 1000mb, it is considered that the gas monitoring results recorded do represent the site's ground gas regime and so the 'worst case' scenario has not been assessed further.

For a 'representative' scenario (highest hazardous gas flow rate that is realistically possible i.e. in a single bore) steady state flow rates and peak gas concentrations are adopted.

Evaluation of the 'representative' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) records a maximum Q_{hg} of 0.0041 l/hr for carbon dioxide with the highest carbon dioxide concentration of 4.1% in BH102.

In accordance with BS8485:2015, the 'representative' GSV indicates a Characteristic Situation 1 (CS1) gas regime requiring no ground gas protection measures for the multi-storey car park.

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10.0 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. 21) 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 2.5*.

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. 22) 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*.

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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**		
No potential sources of contamination identified.	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation (indoor & outdoor air)	**Site end users** (Commercial)	**Medium** Human Health Risk	**Unlikely**	**Low**	No exceedances when compared to commercial end-use thresholds. No suspected asbestos containing materials (ACMs) were identified within any of the exploratory hole logs or laboratory screening.	No further action required.
		Construction and maintenance workers					
	Soil dust ingestion/inhalation produced during construction	**Adjacent residents**					
	Vertical and horizontal migration of soluble phase contamination through groundwater.	**Controlled Waters** (Surface Water) Nearest surface water feature is the River Irk 229m west of the site.	**Medium**	**Unlikely**	**Low**	No evidence of free product or gross contamination was evident during the ground investigation. The nearest surface water feature is the River Irk which is located 229m to the east of the site, flowing south	No further action required.
	Vertical and horizontal migration of soluble phase contamination through superficial deposits and bedrock.	**Controlled Waters** (Groundwater) Secondary Undifferentiated Aquifer/Secondary A Aquifer (Superficial) Principal Aquifer (Bedrock)	**Medium**	**Unlikely**	**Low**	No evidence of free product or gross contamination was evident during the ground investigation. Not within a Source Protection Zone (SPZ). Considering the low permeability of the underlying ground conditions (Glacial Till) this SPR linkage likelihood is considered unlikely.	
A maximum carbon dioxide concentration of 4.1% was recorded in BH102. A maximum steady state flow of -3.0l/hr was recorded in BH101.	Ground gas & vapour migration and inhalation.	**Site End Users** (Commercial)	**Medium** Human Health Risk	**Low Likelihood**	**Low**	For the multi storey car park, the carbon dioxide ground gas assessment recorded a maximum concentration of 4.1% v/v with BH102. The representative GSV is 0.0041l/.hr for carbon dioxide indicative of Characteristic Situation 1 requiring no gas protection measures. Methane was recorded at or below the instrument's limit of detection within all the monitoring wells.	No further action required.

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10.1 Summary of Significant Pollutant Linkages

A **Low** risk rating is identified to site end-users and construction workers, from soils and dust from inhalation and ingestion. No further action is required.

A **Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) following the ground investigation, where no major sources of contamination were identified and limited pathways due to low permeability superficial deposits.

A **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 CS1, therefore no gas protection measures in accordance with BS8485 are required.

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11.0 Geotechnical Assessment and Recommendations

11.1 Introduction

This section will discuss the ground and groundwater conditions encountered across the site and assess their associated risks for the proposed scope of the works. The proposed development comprises demolition of existing buildings and the construction of a 1,025 Multi-Storey Car Park. ,

It must be noted that 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 further investigated by the Construction Designer.

11.2 Summary of Ground Conditions

The ground conditions on site generally comprised topsoil/asphalt overlying predominantly granular Made Ground. The Made Ground was underlain by interbedded cohesive and granular Glaciofluvial Sheet Deposits. Granular materials comprise medium dense occasionally slightly silty fine to medium sand and cohesive materials comprised firm to stiff light brown slightly sandy, slightly gravelly, silty clay.

Glacial Till was encountered underlying the Glaciofluvial Deposits in BH101 toBH105. The deposits were predominantly cohesive with interbedded granular deposits. Cohesive deposits were typically very stiff brown/dark brown clay and granular deposits very dense light brown fine to medium sand. Bedrock of the Chester Formation was encountered in BH105 at 42.50m bgl (31.59m AOD) as weak to medium strong fine to coarse grained Sandstone.

11.3 Foundation Design

It is understood that the proposed development is to consist of a multi-storey car park with 1,025 spaces. The loading has not been provided at the time of writing.

The shallow ground conditions comprised 0.50m to 3.00m Made Ground underlain by loose to medium dense sands and firm to stiff clays. In BH102 and BH103, loose sand was encountered underlying the made ground to depths between 3.00m (70.84m AOD) and 3.60m (70.33m AOD) respectively. Given the loose deposits encountered and proposed structure, it is likely that a piled foundation may be used to transfer the loads to the very stiff/ very dense deposits at depths below 12.50m bgl (61.66m AOD) – 15.00m bgl (58.59m AOD).

Groundwater was encountered in BH101 at 11.60m bgl (62.56m AOD), BH104 at 16.50m bgl (57.59m AOD) and BH105 at 11.00m bgl (63.09m AOD). Subsequent groundwater level monitoring was encountered at depths of 8.20m bgl (65.89m AOD) and 8.33m bgl (65.76m AOD) in the Glaciofluvial Ddeposits between 21.83m bgl (52.01m AOD) and 27.52m bgl (46.64m AOD) within the Glacial Till.

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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.

11.4 Ground Floor Slabs

Based on the observations on site together with the results of laboratory tests, 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.

11.5 Re-use of Soils

11.5.1 Geotechnical Characteristics of Shallow Site Soils

Samples were obtained from SA101 – SA103. Samples from SA102 and SA103 were described as cohesive and SA101 described as granular. Review of the geotechnical testing results indicates SA103 is a granular deposit, described as slightly clayey very silty sand.

Particle Size Distribution (PSD) tests have been undertaken to classify the materials in accordance with Table 6/2 of Series 600 SHW.

All tests, have been undertaken in accordance to the requirement of Series 600 SHW and remoulded and compacted, where required.

The classification of natural strata, in terms of concrete in aggressive ground has been undertaken in accordance with guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd edition of 2005 (Ref. 17).

Shallow site soils across the site have proven to be variable. Detailed descriptions of the soils encountered is presented in *Section 5.0*. At this preliminary stage, testing has been undertaken on selected samples to provide an overview of the characteristics of all shallow site soils encountered. Further variation beyond the findings of this report is likely possible. Upon receipt of proposed earthworks to be undertaken, additional testing should be undertaken to confirm the geotechnical suitability of the shallow site soils for re-use.

11.5.2 Particle Size Distribution

Cohesive Glaciofluvial Sheet Deposits

One Particle Size Distributions tests were undertaken within the cohesive Glaciofluvial Deposits, *Table 11.5.2a*.

Table 11.5.2a – *Cohesive Glaciofluvial Deposits Particle Size Distribution*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Percent Passing (%)					Uniformity Coefficient
			125	75	10	2	0.063	
SA102	72.84	1.25	100	100	97	94	69	>23

Granular Glaciofluvial Deposits

Two Particle Size Distribution tests were undertaken within the granular Glacial Till, *Table 11.5.2b.*

Table 11.5.2b – *Granular Glaciofluvial Deposits Particle Size Distribution*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Percent Passing (%)					Uniformity Coefficient
			125	75	10	2	0.063	
SA101	71.12	1.35	100	100	99	97	21	14
SA103	73.07	1.00	100	100	99	97	45	20

11.5.3 Moisture Content and Optimum Moisture Content

Natural moisture content (MC) and Optimum Moisture Content (OMC) tests have been undertaken on samples obtained on site.

Cohesive Glaciofluvial Deposits

One moisture content test was undertaken within the Cohesive Glaciofluvial Deposits, *Table 11.5.3a* and *Figure 11.5.3a*.

Table 11.5.3a – *Cohesive Glaciofluvial Deposits Moisture Content*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Moisture Content %
SA102	72.84	1.25	17

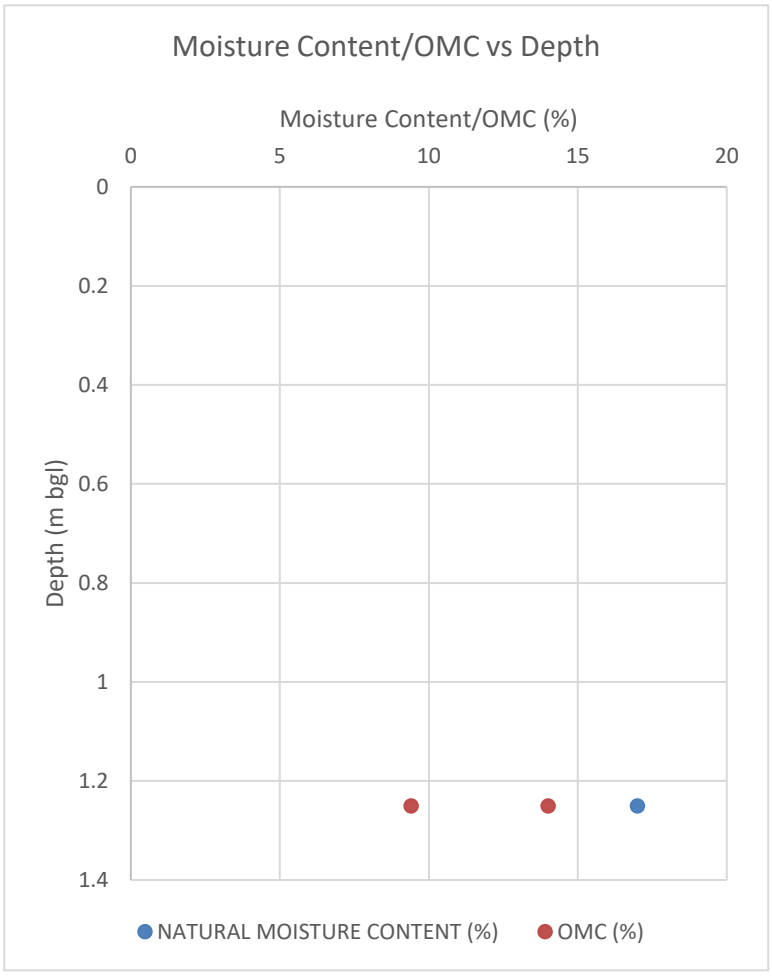

Figure 11.5.3a – *Moisture Content and OMC vs. Depth*

In summary:

- The OMC utilising a 4.5kg hammer for SA102 is 9.9%.
- The OMC utilising a 2.5kg hammer for SA102 is 14%.
- The Maximum Dry Density (DD) utilising a 4.5kg hammer for SA102 is 2.02g/m^3.
- The Maximum Dry Density (DD) utilising a 2.5kg hammer for SA102 is 1.87g/m^3.
- OMC has been achieved between 5% and 10% air voids.

For detailed graphs refer to *Appendix D*.

Granular Glaciofluvial Deposits

Two moisture content test was undertaken within the granular Glaciofluvial Deposits, *Table 11.5.3b* and *Figure 11.5.3b*.

Table 11.5.3b *– Granular Glaciofluvial Deposits Moisture Content*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Moisture Content %
SA101	71.12	1.35	13
SA103	73.07	1.00	19

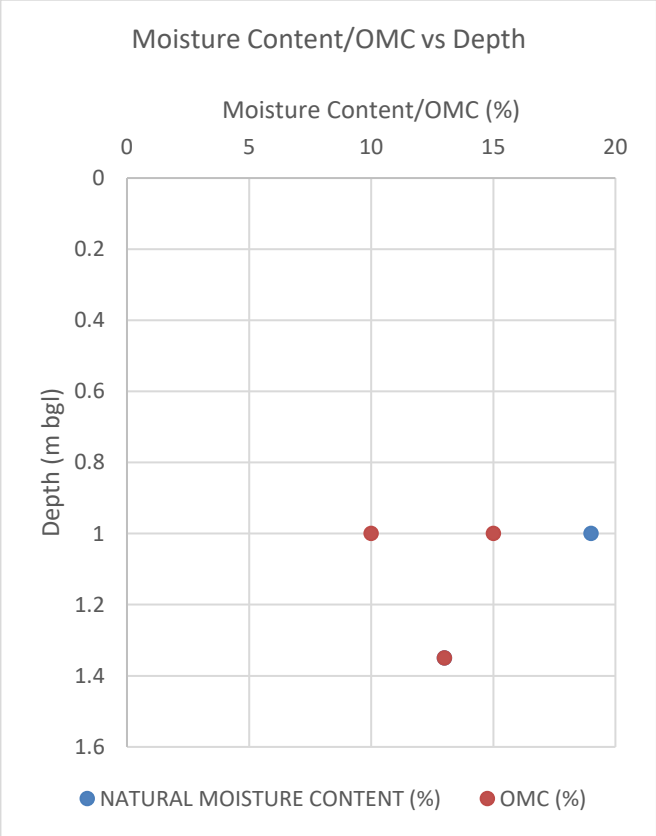

Figure 11.5.3b – *Moisture Content and OMC vs. Depth*

In summary:

- The OMC utilising a 4.5kg hammer for SA103 is 10%.
- The OMC utilising a 2.5kg hammer for SA103 is 9.9%.
- The Maximum Dry Density (DD) utilising a 4.5kg hammer for SA103 is 1.98g/m^3.
- The Maximum Dry Density (DD) utilising a 2.5kg hammer for SA103 is 2.03g/m^3.
- OMC has been achieved between 5% and 10% air voids.

For detailed graphs refer to *Appendix D*.

11.5.4 Moisture Condition Value

The Moisture Conditions Value (MCV) of the samples has been determined from the MCV Relationships testing.

Cohesive Glaciofluvial Deposits

One Moisture Condition Value test was undertaken within the cohesive deposits, *Table 11.5.4a*.

***Table 11.5.4a** – Cohesive Glaciofluvial Deposits Moisture Condition Value*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Natural Moisture Content %	Moisture Condition Value
SA102	72.84	1.25	18.9	8.5

Full details of the results of MC/MCV testing are presented in *Appendix D*.

Granular Glaciofluvial Deposits

Two Moisture Condition Value test was undertaken within the granular deposits, *Table 11.5.4b*.

***Table 11.5.4b** – Granular Glaciofluvial Deposits Moisture Condition Value*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Natural Moisture Content %	Moisture Condition Value
SA101	71.12	1.35	5.9	11.6
SA103	73.07	1.00	19	6.5

Full details of the results of MC/MCV testing are presented in *Appendix D*.

11.5.5 Plasticity Indices and Liquid Limit

Plasticity Indices and Liquid Limit have been determined for the cohesive Glaciofluvial Deposits.

The Plasticity Indices (PI) of the deposits are determined to be between 12% and 13%.

The Liquid Limit (LL) of the deposits is determined to be between 30% and 32%.

The Plasticity Limits (PL) of the deposits were determined to be between 17% and 20%.

11.5.6 Undrained Shear Strength

The Undrained Shear Strength has been determined for the cohesive Glaciofluvial Sheet Deposits.

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Cohesive Glaciofluvial Deposits

The Undrained Shear Strength (Cu) of cohesive Glaciofluvial Deposits from the Unconsolidated Undrained Triaxial Multistage testing undertaken on remoulded samples, compacted in accordance with the requirements of Series 600 SHW, *Table 11.5.6*.

***Table 11.5.6** – Cohesive Glaciofluvial Deposits Undrained Shear Strength*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Undrained Shear strength (kPa)	Indicative Strength
SA102	72.84	1.25	129	High
SA103	73.07	1.00	46	Medium

11.5.7 Angle of Shearing Resistance using a Shear Box

The Angle of Shearing Resistance has been determined for the granular Glaciofluvial Deposits, undertaken on remoulded samples. The results are shown in *Table 11.5.7.*

***Table 11.5.7** – Cohesive Glaciofluvial Deposits Undrained Shear Strength*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	Angle of Shearing Resistance
SA101	72.84	1.25	21.5

11.5.8 CBR Remoulded

CBR Remoulded tests have been undertaken on samples obtained on site.

Cohesive Glaciofluvial Sheet Deposits

Two CBR Remoulded test was undertaken within the cohesive Glaciofluvial Deposits. The results have been plotted against elevation*, Figure 11.5.8a*

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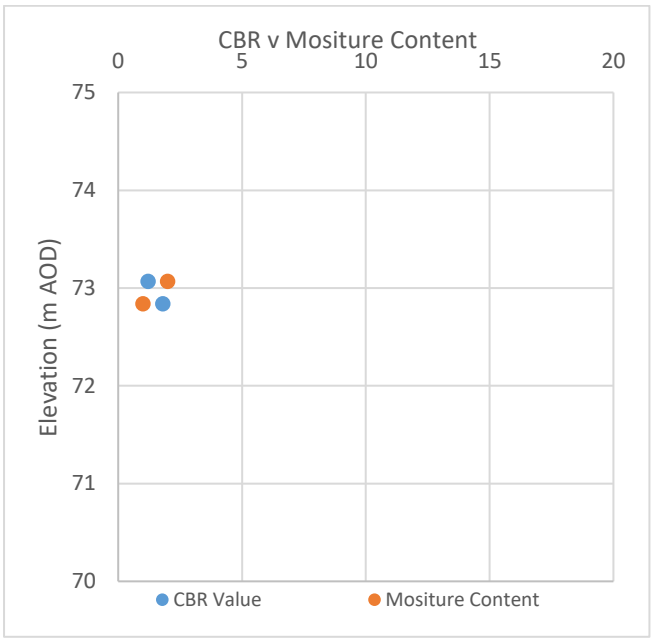

Figure 11.5.8a *– Cohesive Glaciofluvial Deposits Remoulded CBR Value*

Granular Glaciofluvial Sheet Deposits

One CBR Remoulded test was undertaken within the granular Glaciofluvial Deposits. The results have been plotted against elevation*, Figure 11.5.8b*

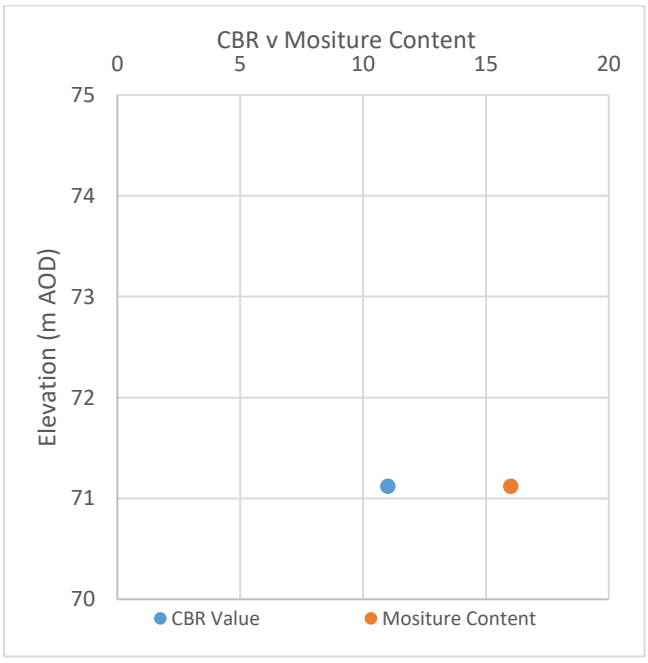

Figure 11.5.8b *– Granular Glaciofluvial Deposits Undrained Shear Strength*

11.5.9 Odometer Consolidation

The Coefficient of Consolidated, Mv, has been determined for the cohesive Glaciofluvial Deposits.

Two Odometer Consolidation tests were undertaken on the cohesive deposits, *Table 11.5.9*.

***Table 11.5.9** – Cohesive Glaciofluvial Deposits Undrained Shear Strength*

Exploratory Hole Location	Elevation (m AOD)	Depth (m bgl)	m^2/MN
SA102	72.84	1.25	0.098
SA103	73.07	1.00	0.092

The results indicate low compressibility soils.

11.5.10 Concrete Aggressivity

One result was obtained from laboratory testing for the granular Glaciofluvial Sheet Deposits, summarised in *Table 11.5.10a* and *Table 11.5.10b* below

***Table 11.5.10a –** Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Test Type	Value
Granular Glaciofluvial	pH	7.18
	Water Soluble Sulphate (mg/l)	10

***Table 11.5.10b –** Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Design Sulphate Class	ACEC Class (1)
Granular Glaciofluvial	DS-1	AC-1

11.5.11 Classification

Generally, the shallow soils comprised cohesive and granular deposits, however in accordance to Series 600 Tables 6/1 & 6/2, both deposits are likely to be suitable as class 7A or Class 2B.

However due to limited preliminary testing and due to material variability, the assumed material classifications are subject to further testing and conforming to the requirements of an Earthworks Specification, produced to corroborate the material requirements for their proposed end-use. This section provides an initial guide for further development of an Earthworks Specification.

The preliminary testing indicates that the materials at their natural state are likely to be wet of OMC. This may become more significant in wet seasons. Due to the cohesive component of the materials encountered in both cohesive and granular deposits, it is lilkely that drying through

turning and conventional dynamic methods may not be acceptable, therefore it is anticipated the modification of the material will be required for the purposes of moisture control, utilising methods such as lime/cement stabilisation/modification. Where this is to be undertaken, further testing must be undertaken to ensure the materials remain suitable for re-use and do not exhibit issues such as, but not limited to, expansion or reduced compaction. In addition, it is likely that due to weather conditions, soil modification or stabilisation could be required even where laboratory testing has indicated suitable moisture contents., if the deposits moisture contents are determined to be variable of those encountered in the localised ground investigations. The moisture control techniques shall be confirmed when an earthworks strategy and end-use of the materials is confirmed. It must be noted the available information is limited and may vary at detailed testing stage which will be require prior to preparation of any Earthworks Specification.

The suitability of the strength provided by the deposits post compaction must be further tested, however the limited testing has indicated variability. The undrained shear strength testing undertaken on limited cohesive deposits, remoulded and compacted in accordance with Series 600 SHW requirements, indicates high strength clay, post compaction.

The CBRs within the cohesive (as per BS5930:2020 description) are determined to be relatively low at natural moisture contents. Further testing is advised upon to determine if CBRs are uniformly low across the site. The CBR values within the granular deposits (as per BS5930:2020 description) are recorded to be relatively higher.

No concrete aggressivity testing was undertaken. It is recommended the soils are subject to concrete aggressivity testing.

Concrete aggressivity of the ground conditions within the granular glaciofluvial sheet deposits indicate that the soils are within the DS-1 AC-1 classification.

11.6 Road and Hardstanding Design

For the purposes of pavement design and in accordance with Interim Advice Note 73/06 2009, a minimum CBR of 2.5% must be adopted for all roads. This guidance indicates that pavements founded on ground with a minimum CBR of 2.5% will not require regular maintenance.

Two preliminary CBR tests were undertaken on site. The results are summarised in *Table 11.6*. These are not relevant to materials if removed and placed back in an engineering manner. In addition, the CBR values are weather dependant and may reduce if materials are deteriorated due to weather conditions. The CBR values may also vary from location to location. The CBRs presented within this report are only preliminary and further testing must be undertaken for confirmation. Future values of CBR may vary from those recorded during the Curtins ground investigations due to various reasons, such as localised soft spots, weather conditions, variable depths, etc..

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***Table 11.6** –CBR Test Results*

Exploratory Hole Location	Depth of Test	Average CBR Value (%)
CBR501	0.20	5.1

The shallow cohesive Glaciofluvial Deposits should provide a suitable formation for new pavements/roads.

11.7 Soakaways

Three soakaways were undertaken in the area of the proposed multi-storey car park. SA101 and SA103 were undertaken within the granular glaciofluvial deposits and SA102 within cohesive glaciofluvial deposits to a maximum depth of 2.20m bgl.

The Infiltration Test results are typically calculated using

$$Soil\ Infilteration\ Rate\ f = \frac{V_{p75-25}}{a_{s50}.t_{p75-25}} \qquad \textbf{[Equation 5]}$$

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 10.8. It was not possible to complete more than one test in each location due to the slow infiltration rate.

***Table 11.7 –** Soakaway Test Results*

Location	V_{p75-25} (m^3)	a_{s50} (m^2)	t_{p75-25} (s)	Infiltration Rate Test 1
SA101	0.614	3.961	7200	$2.15x10^{-5}$
SA102	0.504	3.540	7200	$1.98x10^{-5}$
SA103	0.648	3.960	7200	$2.27x10^{-5}$

Based on the observed soakaway and calculated infiltration rate, the material in SA101 - SA103 is not considered suitable for the efficient use of soakaways.

11.8 Chemical Attack on Buried Concrete

The site has been classified in accordance with BRE Special Digest (Ref. 14) and laboratory testing undertaken accordingly in *Section 4.0*. Based on the laboratory test results it is considered that for made ground, glaciofluvial deposits, glacial till and Chester Formation a Design Sulphate Class may be taken as DS-1 and an ACEC class for the site of AC-1s would be appropriate.

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12.0 Geo-environmental Conclusions & Recommendations

12.1 Conclusions

12.1.1 Ground and Groundwater 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 no exceedances have been noted with respect to the GAC thresholds. No suspected asbestos containing materials (ACMs) were identified within any of the exploratory hole logs or during laboratory screening.

A **Low** risk rating is identified to site end-users and construction workers, from soils during inhalation and ingestion of soil or dust.

A **Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) following the ground investigation, where no major sources of contamination were identified and limited pathways due to low permeability superficial deposits.

A **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 and residents. This corresponds to a Characteristic Gas Situation assessed as CS1 classification, therefore no gas protection measures in accordance with BS8485 are required.

12.2 Recommendations

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

1) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within *Appendix C.*

2) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer.

3) An earthworks specification must be designed, supervised and undertaken prior to construction.

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13.0 References

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Appendix A – Drawings

- *MSCP Exploratory Hole Location Plan* (June 2021), Curtins Drawing Ref. 20200-CUR-MSCP-00-DR-G-2001

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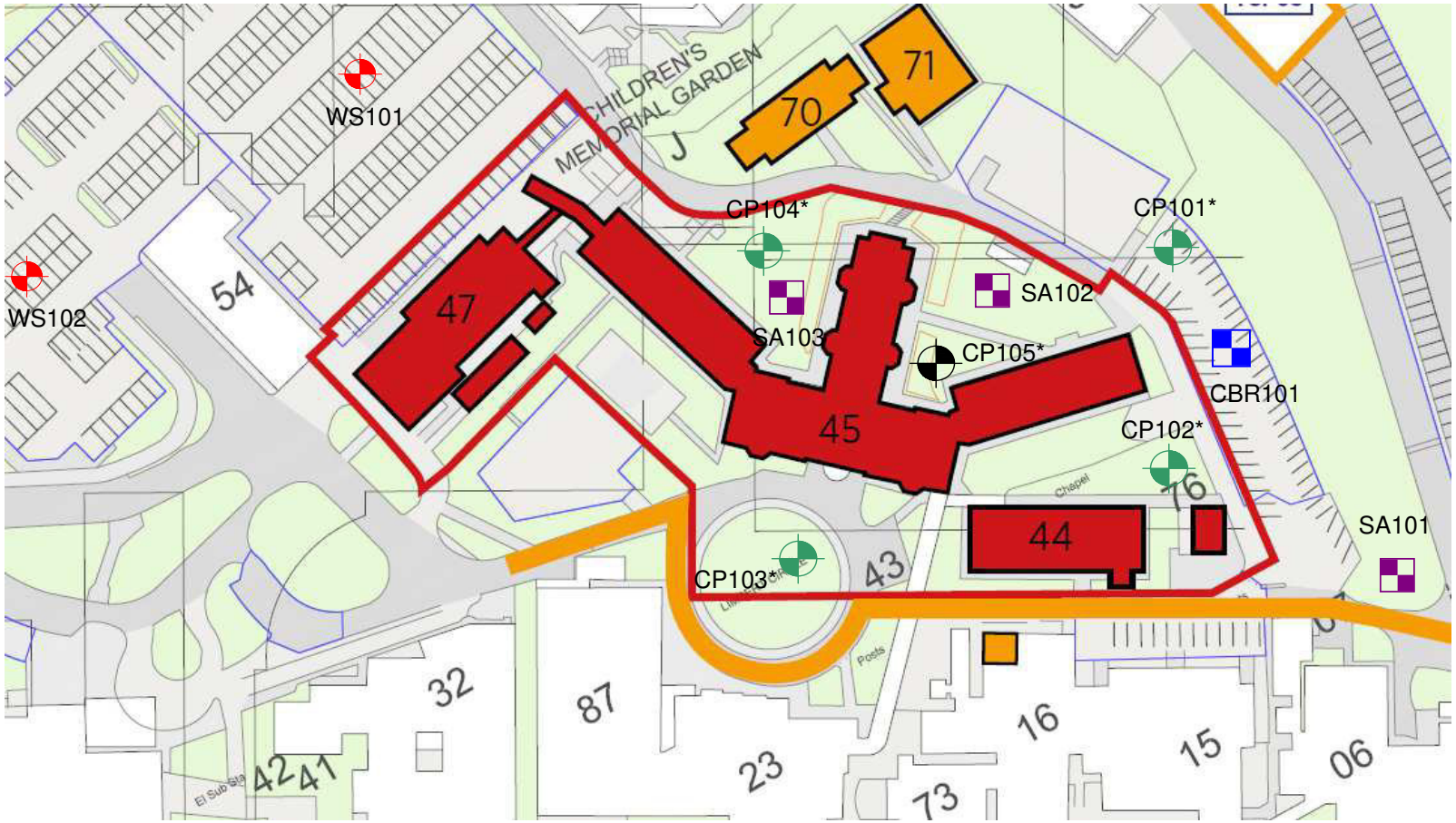

CABLE PERCUSSIVE BOREHOLE TO 25M FOLLOWED ON WITH OPEN HOLE ROTARY TO 35M

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

WINDOW SAMPLE BOREHOLE LOCATION UP TO 5M

CBR TEST

SOAKAWAY TESTS TO 2M

* MONITORING INSTALLATION

Rev:	Description:	Date:	By:	Chkd:

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Status:
INFORMATION

Project:
NORTH MANCHESTER GENERAL HOSPITAL

Drg Title:
MSCP EXPLORATORY HOLE LOCATION PLAN

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	01/06/2021	PN	RA

Drg No:	Rev:
20200-CUR-MSCP-00-DR-G-2001	P01

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Appendix B – Exploratory Hole Logs

- Cable Percussive with Geobore S Follow On, BH101 – BH105
- Photographic Record Rock Cores, BH105
- Trial Pit Logs, SA101 – SA103
- Window Sample Borehole Logs, WS101 – WS102

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Borehole Log

Borehole No. **BH101**

Sheet 1 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385116.59 - 402416.88	Hole Type CP
Location: North Manchester General Hospital		Level: 74.16	Scale 1:50
Client: Bruntwood		Dates: 08/04/2021 - 20/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	74.06		ASPHALT
		0.35	ES		0.35	73.81		MADE GROUND: Light brown/grey sandy angular to subrounded fine to medium gravel of aggregate, limestone and brick. Sand is medium to coarse.
		1.20		N=8 (1,2/2,3,1,2)				MADE GROUND: Light brown gravelly medium to coarse sand with moderate ash content. Gravel is angular to subrounded fine to coarse including brick, slate and concrete.
		2.00		N=8 (2,2/3,2,1,2)				
		3.00		N=17 (2,2/4,4,4,5)	3.00	71.16		Stiff brown slightly gravelly CLAY with frequent sand bands. Sand is fine to medium. Gravel is subangular to rounded fine to coarse including mudstone and sandstone.
		4.00	B		4.00	70.16		Medium dense light brown fine SAND.
		4.00		N=10 (1,2/2,3,2,3)				
		5.00		N=14 (2,2/3,3,4,4)				
		6.50		N=26 (3,4/5,6,7,8)				
		6.50 - 6.95	B					
		8.00 - 8.45	U	Ublow=100	7.80	66.36		Stiff brown slightly silty CLAY.
		9.50		N=50 (6,6/11,11,14,14)	9.50	64.66		Very stiff brown very sandy CLAY with frequent sand bands. Sand is fine to medium.
								Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH101**

Sheet 2 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385116.59 - 402416.88	Hole Type CP
Location: North Manchester General Hospital		Level: 74.16	Scale 1:50
Client: Bruntwood		Dates: 08/04/2021 - 20/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼	11.00 - 11.45	B					
		12.50		N=45 (5,8/10,11,12,12)	12.50	61.66		Very dense light brown fine to medium SAND.
		14.00 - 14.45	U	Ublow=125	13.70	60.46		Very stiff brown slightly gravelly CLAY with frequent sand bands. Sand is fine to medium. Gravel is subrounded to rounded fine to coarse including sandstone and mudstone.
		15.50		N=42 (6,7/7,10,11,14)				
		17.00 - 17.45	U	Ublow=130				
		18.50		N=36 (5,8/36 for 230mm)				
		20.00 - 20.45	U	Ublow=125				

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH101**

Sheet 3 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385116.59 - 402416.88	Hole Type CP
Location: North Manchester General Hospital		Level: 74.16	Scale 1:50
Client: Bruntwood		Dates: 08/04/2021 - 20/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		21.50		N=50 (7,9/10,12,14,14)				
		22.00 - 22.45	B		22.10	52.06		Very dense light brown fine SAND.
		23.00		50 (10,15/50 for 185mm)				
		23.00 - 23.45	D		23.50	50.66		Very stiff brown very sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.
		26.00		50 (7,12/50 for 220mm)				
		27.50		51 (8,10/51 for 210mm)	27.50	46.66		Very stiff brown/grey silty CLAY with frequent sand bands. Sand is coarse.
		29.00		50 (8,13/50 for 155mm)				

21 22 23 24 25 26 27 28 29 30

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH101**

Sheet 4 of 4

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords:	385116.59 - 402416.88	Hole Type CP
Location:	North Manchester General Hospital		Level:	74.16	Scale 1:50
Client:	Bruntwood		Dates:	08/04/2021 - 20/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		30.50		N=50 (4,7/50 for 240mm)				
		32.00		N=50 (7,9/11,12,12,15)				
		33.50		N=47 (7,11/47 for 255mm)				
					35.00	39.16		End of borehole at 35.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH102**

Sheet 1 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385093.30 - 402388.76	Hole Type CP
Location: North Manchester General Hospital		Level: 73.84	Scale 1:50
Client: Bruntwood		Dates: 12/03/2021 - 17/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES		0.45	73.39		GRASS over MADE GROUND: Dark brown slightly sandy slighly gravelly clay with low cobble content and frequent rootlets. Sand is fine to medium. Gravel is angular to subrounded fine to coarse including brick, ceramic, concrete and glass. Cobbles are angular of brick.
					0.70	73.14		MADE GROUND: Dark brown/black slightly clayey angular to subangular fine to coarse gravel of brick, slate and ceramic with high ash content. Sand is medium to coarse.
		1.20		N=8 (1,1/2,2,2,2)				Loose light brown fine SAND.
		2.00 2.00 - 2.45	B	N=7 (1,1/1,2,2,2)				
		3.00		N=23 (3,4/5,6,6,6)	3.00	70.84		Medium dense brown slighty silty fine SAND.
		4.00 4.00 - 4.45	B	N=17 (2,3/3,4,5,5)				
		5.00		N=15 (2,3/3,4,4,4)	4.80	69.04		Firm brown slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.
		6.50 - 6.95	U	Ublow=125				
		8.00		N=42 (6,10/9,9,10,14)	8.00	65.84		Dense light brown fine SAND.
		9.50		N=43 (6,9/10,11,10,12)				

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH102**

Sheet 2 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385093.30 - 402388.76	Hole Type CP
Location: North Manchester General Hospital		Level: 73.84	Scale 1:50
Client: Bruntwood		Dates: 12/03/2021 - 17/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		11.00		N=28 (4,5/6,7,7,8)				
					12.00	61.84		Very stiff brown slightly silty CLAY with sand lenses. Sand is medium to coarse.
		12.50 - 12.95	U	Ublow=110				
		14.00		N=35 (5,7/8,8,10,9)				
		15.50 - 15.95	U	Ublow=130				
		17.00		N=33 (6,6/7,8,8,10)				
		18.50 - 18.95	U	Ublow=128				
		20.00		N=34 (6,7/7,8,9,10)				

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH102**

Sheet 3 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385093.30 - 402388.76	Hole Type CP
Location: North Manchester General Hospital		Level: 73.84	Scale 1:50
Client: Bruntwood		Dates: 12/03/2021 - 17/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					21.00	52.84		Dense light brown fine SAND.	21
		21.50		N=38 (6,8/8,9,10,11)					
		22.00 - 22.45	D		22.00	51.84		Very stiff brown sandy CLAY. Sand is fine to medium.	22
		23.00 - 23.45	U	Ublow=130					23
									24
		24.50		50 (25 for 135mm/50 for 125mm)					
		24.50 - 24.95	U						25
		26.00 - 26.45	U	Ublow=130					26
									27
									28
		29.00		N=50 (6,8/9,13,20,8)					
		29.00 - 29.45	U	Ublow=125					29
					29.50	44.34		Very stiff brown slightly silty CLAY with sand lenses. Sand is medium to coarse.	
								Continued on next sheet	30

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH102**

Sheet 4 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385093.30 - 402388.76	Hole Type CP
Location: North Manchester General Hospital		Level: 73.84	Scale 1:50
Client: Bruntwood		Dates: 12/03/2021 - 17/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		31.00		N=50 (5,8/50 for 285mm)	31.00	42.84		Very stiff brown very sandy CLAY. Sand is fine to medium.
		32.50 - 32.95	U	Ublow=130				
					33.00	40.84		Very stiff brown slightly silty CLAY with sand lenses. Sand is fine to medium.
		34.50		N=50 (6,8/50 for 270mm)				
		34.50 - 34.95	D					
					35.00	38.84		End of borehole at 35.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH103**

Sheet 1 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385029.94 - 402405.88	Hole Type CP
Location: North Manchester General Hospital		Level: 73.93	Scale 1:50
Client: Bruntwood		Dates: 31/03/2021 - 15/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40	73.53		GRASS over TOPSOIL: Black slightly clayey gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse gravel of mudstone and sandstone.
		0.60	ES		0.70	73.23		MADE GROUND: Dark grey silty slightly gravelly fine to medium sand. Gravel is angular to subangular fine of sandstone.
		1.20		N=8 (1,2/1,2,2,3)				Loose light brown fine SAND.
		1.20 - 1.65	B					
		2.00		N=7 (1,2/1,2,2,2)				
		3.00		N=20 (2,3/4,5,5,6)				
					3.60	70.33		Stiff brown slightly silty gravelly CLAY. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.
		4.00 - 4.45	U	Ublow=100				
		5.00		N=17 (2,2/3,4,5,5)				
		6.50 - 6.95	U	Ublow=130				
		8.00		N=28 (4,5/6,7,7,8)				
		9.50 - 9.95	U	Ublow=130				
		10.00 - 10.50	B					

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH103**

Sheet 2 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385029.94 - 402405.88	Hole Type CP
Location: North Manchester General Hospital		Level: 73.93	Scale 1:50
Client: Bruntwood		Dates: 31/03/2021 - 15/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					10.10	63.83		Dense brown medium SAND.
		11.00		N=30 (3,5/6,7,8,9)				
		12.50 - 12.95	U	Ublow=125	12.40	61.53		Stiff brown slightly gravelly CLAY. Gravel is subrounded to rounded fine to coarse including sandstone and mudstone.
		14.00		50 (8,17/50 for 190mm)	14.00	59.93		Very stiff brown sandy CLAY. Sand is fine to medium.
		15.50 - 15.95	U	Ublow=130				
		17.00		N=40 (7,9/10,11,10,9)				
		18.50 - 18.95	U	Ublow=130				
					20.00	53.93		Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH103**

Sheet 3 of 4

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords:	385029.94 - 402405.88	Hole Type CP
Location:	North Manchester General Hospital		Level:	73.93	Scale 1:50
Client:	Bruntwood		Dates:	31/03/2021 - 15/04/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00		50 (25 for 145mm/50 for 225mm)				Very dense light brown fine SAND.
		21.50		50 (25 for 135mm/50 for 150mm)				
		23.00		50 (25 for 145mm/50 for 185mm)				
		23.50 - 23.95	B		23.50	50.43		Very stiff brown CLAY with frequent sand bands. Sand is fine to medium.
		24.50		50 (9,12/50 for 225mm)				
		26.00		N=49 (7,9/10,11,13,15)				
		27.50		N=50 (7,7/50 for 290mm)				
		29.00		N=50 (10,11/12,13,15,10)	29.00	44.93		Very dense reddish brown slightly clayey SAND.

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No.
BH103
Sheet 4 of 4

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords:	385029.94 - 402405.88	Hole Type CP
Location:	North Manchester General Hospital		Level:	73.93	Scale 1:50
Client:	Bruntwood		Dates:	31/03/2021 - 15/04/2021	Logged By

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 180mm)				
		32.00		50 (25 for 65mm/50 for 180mm)	32.00	41.93		Very dense reddish brown fine to medium SAND.
		33.50		50 (25 for 115mm/50 for 165mm)				
		35.00		N=50 (25 for 110mm/14,14,15,7)	35.00	38.93		End of borehole at 35.00 m

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Remarks
Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH104**

Sheet 1 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385054.63 - 402456.12	Hole Type CP
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 09/03/2021 - 23/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	73.99		GRASS over TOPSOIL: Brown slightly sandy clay with frequent rootlets. Sand is fine to medium.
		0.50	ES					MADE GROUND: Dark brown/black slightly sandy angular to subrounded fine to coarse gravel of brick, glass, slate with a high ash content. Sand is medium to coarse.
		1.20		N=9 (1,2/2,2,3,2)	1.20	72.89		Firm brown slightly sandy CLAY with rare gravel. Sand is fine to medium. Gravel is subangular to subrounded, fine to medium of mixed lithologies.
		2.00		N=15 (2,3/3,4,4,4)				
		2.50	B		2.50	71.59		Medium dense light brown slightly silty fine SAND.
		3.00		N=20 (2,2/5,5,5,5)	3.00	71.09		Stiff brown silty CLAY with frequent sand lenses. Sand is medium to coarse.
		4.00 4.00 - 4.45	D	N=26 (4,6/8,8,5,5)	4.00	70.09		Stiff brown very sandy CLAY. Sand is medium to coarse. Becoming silty at 5.70m.
		5.00		N=26 (5,6/8,7,6,5)				
		6.50 - 6.95	B		6.50	67.59		Medium dense brown slightly silty fine SAND.
		8.00		N=13 (1,2/3,3,3,4)				
		9.50		N=20 (3,4/4,5,6,5)				
								Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH104**

Sheet 2 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385054.63 - 402456.12	Hole Type CP
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 09/03/2021 - 23/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		11.00		N=19 (1,2/4,5,5,5)				
		12.50 12.50 - 12.95	B	N=20 (2,3/4,5,6,5)				
					13.10	60.99		Stiff brown silty CLAY.
		14.00 - 14.45	U	Ublow=130				
		15.50		50 (7,7/50 for 200mm)	15.50	58.59		Very stiff brown slightly silty sandy CLAY. Sand is fine to medium.
		17.00 - 17.45	U	Ublow=130				
		18.50		N=42 (7,7/8,10,10,14)				
		20.00 - 20.45	U	Ublow=127				

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH104**

Sheet 3 of 4

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385054.63 - 402456.12	Hole Type CP
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 09/03/2021 - 23/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.60 - 21.00	B		20.60	53.49		Very dense light brown fine SAND.
		21.50		N=50 (7,9/50 for 245mm)				
					22.50	51.59		Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to rounded fine to coarse including sandstone and mudstone.
		23.00 - 23.45	U	Ublow=126				
		24.50		N=43 (8,7/10,11,10,12)				
		24.50 - 24.95	D					
					25.00	49.09		Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to rounded fine to coarse including sandstone and mudstone.
		26.00		50 (25 for 75mm/50 for 70mm)				
		27.50		50 (15,10/50 for 30mm)				
		29.00		50 (25 for 75mm/50 for 75mm)				

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH104**

Sheet 4 of 4

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords:	385054.63 - 402456.12	Hole Type CP
Location:	North Manchester General Hospital		Level:	74.09	Scale 1:50
Client:	Bruntwood		Dates:	09/03/2021 - 23/03/2021	Logged By

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 150mm)				
		32.00		50 (25 for 75mm/50 for 75mm)				
		33.50		50 (25 for 75mm/50 for 75mm)				
		35.00		50 (25 for 75mm/50 for 75mm)	35.00	39.09		End of borehole at 35.00 m

Remarks
Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH105**

Sheet 1 of 5

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385071.48 - 402425.46	Hole Type CP
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 04/03/2021 - 19/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.05	74.04		GRASS over TOPSOIL: Brown slightly sandy clay with frequent rootlets. Sand is medium to coarse.
					0.45	73.64		MADE GROUND: Red/brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse incuding brick and ceramic.
					0.70	73.39		MADE GROUND: Red/brown angular to subangular gravel of brick, slate and moderate ash content. Frequent intact bricks.
					0.90	73.19		Loose brown slightly clayey medium to coarse SAND.
		1.20		N=4 (1,1/1,1,1,1)				Firm light brown mottled grey very sandy CLAY. Sand is medium to coarse. Medium to coarse sand band recorded between 1.20m and 1.40m.
		2.00		N=19 (1,1/5,5,5,4)				Stiff dark brown slightly sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone. Becoming very stiff at 6.50m and sand band between 3.35 and 3.45m.
		2.00 - 2.45	D		2.20	71.89		
		3.00		N=23 (2,4/5,5,6,7)				
		3.00 - 3.45	D					
		4.00		N=30 (3,2/6,7,8,9)				
		4.00 - 4.45	D					
		5.00		N=22 (3,/5,6,5,6)				
		6.50		N=32 (5,6/7,7,8,10)				
		6.50 - 695.00	D					
		8.00 - 8.45	U	Ublow=120				
		9.50		N=23 (4,4/5,6,6,6)				
		9.50 - 9.95	D					

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH105**

Sheet 2 of 5

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385071.48 - 402425.46	Hole Type CP
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 04/03/2021 - 19/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		11.00 11.00 - 11.45	B	N=31 (5,6/7,7,8,9)	11.00	63.09		Dense light brown silty fine SAND.	11
		12.50		N=33 (6,7/7,8,9,9)					12
					13.00	61.09		Very stiff brown sandy CLAY. Sand is fine to medium.	13
		14.00 - 14.45	D						14
					15.00	59.09		Very stiff dark brown very sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of sandstone, coal and mudstone.	15
		15.50 15.50 - 15.95	D	N=26 (6,5/5,6,7,8)					16
		17.00 - 17.45	U	Ublow=130					17
		18.50		N=36 (5,5/6,9,9,12)					18
									19
		20.00 - 20.45	U	Ublow=128					20

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH105**

Sheet 3 of 5

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385071.48 - 402425.46	Hole Type CP
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 04/03/2021 - 19/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		21.50		N=36 (5,6/7,8,9,12)				
		22.50	B		22.50	51.59		Dense light brown fine SAND.
		23.00 - 23.45	U	Ublow=130	22.90	51.19		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to well rounded fine to medium including sandstone and mudstone.
		24.50		N=41 (6,7/8,10,11,12)				
		26.00		50 (9,11/50 for 210mm)				
		27.50		50 (18,17/50 for 150mm)				
		29.00		75 (25 for 75mm/75 for 225mm)				

21 22 23 24 25 26 27 28 29 30

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

AGS

Borehole Log

Borehole No. **BH105**

Sheet 4 of 5

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords:	385071.48 - 402425.46	Hole Type CP
Location:	North Manchester General Hospital		Level:	74.09	Scale 1:50
Client:	Bruntwood		Dates:	04/03/2021 - 19/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		30.50		75 (25 for 75mm/75 for 225mm)				
		32.00		50 (25 for 75mm/50 for 20mm)	32.00	42.09		Very stiff reddish brown CLAY with frequent sand lenses. Sand is medium to coarse.
		33.50		50 (25 for 75mm/50 for 130mm)				
		35.00		50 (25 for 75mm/50 for 75mm)				
		36.50		42 (25 for 75mm/42 for 8mm)				
		38.00		50 (25 for 75mm/50 for 40mm)				
		39.50		50 (25 for 75mm/50 for 75mm)				

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m.

Borehole Log

Borehole No. **BH105**
Sheet 5 of 5

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords: 385071.48 - 402425.46	Hole Type CP
Location:	North Manchester General Hospital		Level: 74.09	Scale 1:50
Client:	Bruntwood		Dates: 04/03/2021 - 19/03/2021	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		41.00		50 (25 for 75mm/50 for 145mm)				
		42.50		50 (25 for 75mm/50 for 10mm)	42.50	31.59		Weak reddish brown medium to coarse SANDSTONE. *From 42.50m to 42.66 recovered as non-intact core of sandy gravel.* *42.66m to 43.70m 0-10 degrees closely spaced locally very closely spaced, planar rough* *From 43.70m to 44.00m no recovery.* *44.00m to 44.27m 0 -10 degrees very closely spaced, planar rough* *From 44.27m to 44.38m recovered as non-intact core of sandy cobbles.*
					44.38	29.71		Medium strong reddish brown fine to medium SANDSTONE. *44.38m to 45.50m 0 - 10 degrees very closely spaced locally closely spaced, planar rough*
					45.50	28.59		Medium strong reddish brown medium to coarse SANDSTONE. *45.50m to 46.9m 0 - 10 degrees closely spaced to medium spaced, planar rough* *From 46.90m to 47.00m no recovery.* *47.00m to 48.25m 0 - 10 degrees closely spaced to medium spaced, planar rough* *From 48.25m to 48.30m recovered as non-intact core of sandy cobbles.* *48.30m to 50.00m 0 - 10 degrees closely spaced to medium spaced, planar rough*
					50.00	24.09		End of borehole at 50.00 m

41 42 43 44 45 46 47 48 49 50

Remarks
Service inspection pit hand excavated from GL to 1.20m.

AGS

Rotary Core Log

Borehole No. **BH105** Sheet 5 of 5

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385071.48 - 402425.46	Hole Type RC
Location: North Manchester General Hospital		Level: 74.09	Scale 1:50
Client: Bruntwood		Dates: 04/03/2021 - 19/03/2021	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
			NI				42.50	31.59		Weak reddish brown medium to coarse SANDSTONE. *From 42.50m to 42.66 recovered as non-intact core of sandy gravel.* *42.66m to 43.70m 0-10 degrees closely spaced locally very closely spaced, planar rough*
		42.50 - 44.00	13	80	70	30				*From 43.70m to 44.00m no recovery.*
			NR							*44.00m to 44.27m 0 -10 degrees very closely spaced, planar rough*
			11				44.38	29.71		*From 44.27m to 44.38m recovered as non-intact core of sandy cobbles.* Medium strong reddish brown fine to medium SANDSTONE. *44.38m to 45.50m 0 - 10 degrees very closely spaced locally closely spaced, planar rough*
		44.00 - 45.50	NI 12.5	93	97	33				
		45.50 - 47.00	8	93	93	60	45.50	28.59		Medium strong reddish brown medium to coarse SANDSTONE. *45.50m to 46.9m 0 - 10 degrees closely spaced to medium spaced, planar rough*
			NR							*From 46.90m to 47.00m no recovery.*
		47.00 - 48.50	6	100	97	76				*47.00m to 48.25m 0 - 10 degrees closely spaced to medium spaced, planar rough*
			NI							*From 48.25m to 48.30m recovered as non-intact core of sandy cobbles.*
		48.50 - 50.00	8	100	100	84				*48.30m to 50.00m 0 - 10 degrees closely spaced to medium spaced, planar rough*
							50.00	24.09		End of borehole at 50.00 m

41 42 43 44 45 46 47 48 49 50

Remarks
Service inspection pit hand excavated from GL to 1.20m.

AGS





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Trial Pit Log

Trialpit No **SA101**

Sheet 1 of 1

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385118.84 - 402347.71 Level: 72.48	Date 19/03/2021
Location: North Manchester General Hospital		Dimensions (m): 2 × 1, Depth 2.10	Scale 1:40
Client: Bruntwood			Logged PN

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	72.28		GRASS over TOPSOIL: Brown slightly sandy clay with frequent rootlets. Sand is medium to coarse.
				0.50	71.98		MADE GROUND: Dark brown slightly clayey slightly gravelly medium to coarse sand with low cobble content. Gravel is subangular medium to coarse including brick and sandstone. Cobbles are subangular of brick and concrete.
							Light brown slightly clayey medium to coarse SAND.
				2.10	70.38		End of pit at 2.10 m

Remarks: Machine excavated trial pit to 2.00m bgl. No groundwater encountered. See Appendix D for soakway results.

Stability: Pit remained stable and open throughout.

Trial Pit Log

Trialpit No **SA102**

Sheet 1 of 1

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385086.70 - 402427.41 Level: 74.09	Date 18/03/2021
Location: North Manchester General Hospital		Dimensions (m): 2 × 1, Depth 2.00	Scale 1:40
Client: Bruntwood			Logged PN

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	73.89		GRASS over TOPSOIL: Brown slightly sandy clay with frequent rootlets. Sand is fine to medium.
				0.50	73.59		MADE GROUND: Firm reddish brown slightly clayey gravelly medium to coarse sand with moderate cobble content. Gravel is subangular fine to medium including brick and concrete. Cobbles are subangular of brick.
				1.00	73.09		MADE GROUND: Dark brown slightly clayey gravelly medium to coarse sand with moderate ash content. Gravel is anglar fine to coarse inlcuding brick and sandstone. Cobbles are subangular of brick and sandstone.
				1.10	72.99		Light brown gravelly medium SAND. Gravel is subangular to subrounded medium to coarse of sandstone.
				1.20	72.89		Dark brown very gravelly fine to medium SAND. Gravel is angular medium to coarse including coal and sandstone.
				2.00	72.09		Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse including mudstone.
							End of pit at 2.00 m

Remarks: Machine excavated trial pit to 2.00m bgl. No groundwater encountered. See Appendix D for soakway results.

Stability: Pit remained stable and open throughout.

Trial Pit Log

Trialpit No
SA103
Sheet 1 of 1

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385059.27 - 402455.44 Level: 74.01	Date 18/03/2021
Location: North Manchester General Hospital		Dimensions (m): 2 × 1, Depth 2.00	Scale 1:40
Client: Bruntwood			Logged PN

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	73.71		GRASS over TOPSOIL: Brown slightly sandy clay with frequent rootlets. Sand is fine to medium.
				0.70	73.31		MADE GROUND: Dark grey very gravelly coarse sand with low cobble content and moderate ash content. Gravel is angular fine to coarse including brick and ash. Cobbles are angular of brick.
				1.50	72.51		Firm dark brown mottled grey sandy CLAY. Sand is fine to medium.
				2.00	72.01		Stiff brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of mudstone. End of pit at 2.00 m

Remarks: Machine excavated trial pit to 2.00m bgl. No groundwater encountered. See Appendix D for soakway results.

Stability: Pit remained stable and open throughout.

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: NMGH Masterplanning	Project No. 076686.300	Co-ords: 385008.14 - 402522.57	Hole Type WS
Location: North Manchester General Hospital		Level: 71.65	Scale 1:50
Client: Bruntwood		Dates: 09/03/2021 - 09/03/2021	Logged By PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.12	71.53		ASPHALT
								MADE GROUND: Brown slightly sandy angular to subrounded fine to coarse gravel including brick, concrete and metal with moderate ash and cobble content. Cobbles are angular of brick and intact bricks.
	▼	1.20		N=29 (4,8/9,8,6,6)				
		1.45 - 1.80	ES		1.40	70.25		Medium dense light brown slightly clayey fine to medium SAND.
					1.70	69.95		Firm light brown slightly sandy slighty gravelly CLAY. Sand is medium to coarse. Grvel is subangular to subrounded fine to coarse including sandstone and mudstone.
		2.00		N=11 (4,3/3,4,2,2)				
					2.80	68.85		Medium dense light brown/orange fine to medium SAND.
		3.00		N=17 (4,4/6,4,4,3)	3.00	68.65		End of borehole at 3.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater at 1.00m bgl, no rise noted.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name:	NMGH Masterplanning	Project No. 076686.300	Co-ords:	384927.74 - 402518.84	Hole Type WS
Location:	North Manchester General Hospital		Level:	71.57	Scale 1:50
Client:	Bruntwood		Dates:	09/03/2021 - 09/03/2021	Logged By PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.12	71.45		ASPHALT
		0.35	ES		0.30	71.27		MADE GROUND: Light brown/grey sandy angular to subrounded fine to medium gravel of aggregate, limestone and brick. Sand is medium to coarse.
		1.20		N=13 (2,6/6,3,2,2)				MADE GROUND: Dark brown very gravelly medium to coarse SAND. Gravel is subangular to subrounded fine to coarse including brick, slate and concrete. No recovery from 1.00m to 1.80m
					1.80	69.77		MADE GROUND: Intact bricks
					2.00	69.57		End of borehole at 2.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered.

Appendix C – Chemical Laboratory Testing Results

- Envirolab, Environmental Chemistry Analysis Results, Soils
    - Final Analytical Test Report Ref. 21-02515-1
    - Final Analytical Test Report Ref. 21-02827-1
    - Final Analytical Test Report Ref. 21-03841-1
    - Final Analytical Test Report Ref. 21-02515-1 WAC
    - Final Analytical Test Report Ref. 21-02827-1 WAC

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envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/02515
Issue Number: 1 **Date:** 18 March, 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 - MSCP
Project Ref: 076686
Order No: EBMA2726
Date Samples Received: 10/03/21
Date Instructions Received: 11/03/21
Date Analysis Completed: 18/03/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 21/02515

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: 076686

Lab Sample ID	21/02515/1	21/02515/2	21/02515/3					Units	Limit of Detection	Method ref
Client Sample No	WS101	WS101	WS102							
Client Sample ID										
Depth to Top	0.20	1.45	0.35							
Depth To Bottom										
Date Sampled	09-Mar-21	09-Mar-21	09-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AB	4A	2ABE							
% Stones >10mm$_A$	36.8	<0.1	32.2					% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	9.88	8.80	8.95					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.28	0.03	0.04					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\#}$	9.7	0.3	4.5					% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	3	1	3					mg/kg	1	A-T-024s
Boron (water soluble)$_D$	1.1	<1.0	<1.0					mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	0.8	<0.5	0.9					mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	26	6	16					mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	13	5	9					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1					mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	71	4	146					mg/kg	1	A-T-024s
Mercury$_D$	0.62	<0.17	1.34					mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	17	5	10					mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1					mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	70	18	83					mg/kg	5	A-T-024s

Envirolab Job Number: 21/02515

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: 076686

Lab Sample ID	21/02515/1	21/02515/2	21/02515/3					Units	Limit of Detection	Method ref
Client Sample No	WS101	WS101	WS102							
Client Sample ID										
Depth to Top	0.20	1.45	0.35							
Depth To Bottom										
Date Sampled	09-Mar-21	09-Mar-21	09-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AB	4A	2ABE							
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	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: 21/02515

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: 076686

Lab Sample ID	21/02515/1	21/02515/2	21/02515/3					Units	Limit of Detection	Method ref
Client Sample No	WS101	WS101	WS102							
Client Sample ID										
Depth to Top	0.20	1.45	0.35							
Depth To Bottom										
Date Sampled	09-Mar-21	09-Mar-21	09-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AB	4A	2ABE							
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.54	<0.01	0.15					mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.03	<0.01	0.05					mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	1.09	<0.02	0.33					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	3.42	<0.04	1.92					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	3.57	<0.04	1.99					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	4.22	<0.05	2.20					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	1.58	<0.05	0.92					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	1.43	<0.07	0.77					mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	3.15	<0.06	1.92					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.32	<0.04	0.20					mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	6.05	<0.08	3.54					mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.36	<0.01	0.09					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	1.88	<0.03	1.04					mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.07	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	4.05	<0.03	1.31					mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	7.19	<0.07	3.59					mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	39	<0.08	20					mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/02515

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: 076686

Lab Sample ID	21/02515/1	21/02515/2	21/02515/3					Units	Limit of Detection	Method ref
Client Sample No	WS101	WS101	WS102							
Client Sample ID										
Depth to Top	0.20	1.45	0.35							
Depth To Bottom										
Date Sampled	09-Mar-21	09-Mar-21	09-Mar-21							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AB	4A	2ABE							
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	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	3	<1	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	8	<1	2					mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	43	<1	31					mg/kg	1	A-T-055s
Total Aliphatics$_A$	54	<1	34					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	<1					mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A$	6	<1	3					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	44	<1	21					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	179	<1	92					mg/kg	1	A-T-055s
Total Aromatics$_A$	230	<1	116					mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	284	<1	151					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: North Manchester General Hospital - MSCP

Clients Project No: 076686

Project No: 21/02515

Date Received: 11/03/2021 (pm)

Cool Box Temperatures (°C): 6.2

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.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/02827
Issue Number: 1 **Date:** 30 March, 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 - MSGP
Project Ref: 076686
Order No: EBMA2740
Date Samples Received: 16/03/21
Date Instructions Received: 18/03/21
Date Analysis Completed: 30/03/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 21/02827

Client Project Name: North Manchester General Hospital - MSGP

Client Project Ref: 076686

Lab Sample ID	21/02827/1	21/02827/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP104	CP102								
Depth to Top	0.45	0.50								
Depth To Bottom										
Date Sampled	10-Mar-21	12-Mar-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	4ABE								
% Stones >10mm$_A$	12.6	2.8						% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.82	8.00						pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.02	0.08						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\#}$	8.7	10.7						% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	24	24						mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	0.9	1.0						mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	86	156						mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	16	17						mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1						mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	145	337						mg/kg	1	A-T-024s
Mercury$_D$	<0.17	0.39						mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	37	36						mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1						mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	135	181						mg/kg	5	A-T-024s

Envirolab Job Number: 21/02827

Client Project Name: North Manchester General Hospital - MSGP

Client Project Ref: 076686

Lab Sample ID	21/02827/1	21/02827/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP104	CP102								
Depth to Top	0.45	0.50								
Depth To Bottom										
Date Sampled	10-Mar-21	12-Mar-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	4ABE								
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	NAD								A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	N/A								A-T-045

Envirolab Job Number: 21/02827

Client Project Name: North Manchester General Hospital - MSGP

Client Project Ref: 076686

Lab Sample ID	21/02827/1	21/02827/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP104	CP102								
Depth to Top	0.45	0.50								
Depth To Bottom										
Date Sampled	10-Mar-21	12-Mar-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	4ABE								
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.07	2.08						mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.17						mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.09	2.63						mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.28	9.85						mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.22	8.57						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.33	11						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.12	3.82						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.11	3.83						mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.35	10.9						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.89						mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	0.74	19.6						mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.04	1.39						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.10	3.52						mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.04	0.30						mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.56	14.6						mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.74	19.1						mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	3.79	112						mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/02827

Client Project Name: North Manchester General Hospital - MSGP

Client Project Ref: 076686

Lab Sample ID	21/02827/1	21/02827/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP104	CP102								
Depth to Top	0.45	0.50								
Depth To Bottom										
Date Sampled	10-Mar-21	12-Mar-21								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	4A	4ABE								
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	0.02						mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	1	7						mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<5						mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	2	8						mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	2	13						mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	10	32						mg/kg	1	A-T-055s
Total Aliphatics$_A$	15	61						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	12						mg/kg	1	A-T-055s
Aro >C10-C12$_A$	2	11						mg/kg	1	A-T-055s
Aro >C12-C16$_A$	7	114						mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	11	414						mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	33	1060						mg/kg	1	A-T-055s
Total Aromatics$_A$	55	1610						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	70	1670						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: North Manchester General Hospital - MSGP

Clients Project No: 076686

Project No: 21/02827

Date Received: 18/03/2021 (am)

Cool Box Temperatures (°C): 9.2, 12.1

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.

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/03611
Issue Number: 1 **Date:** 19 April, 2021

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

Project Manager: EBMA/Philippa Neesham
Project Name: NMGH, Multistorey Car Park
Project Ref: BO76686
Order No: EBMA2808
Date Samples Received: 06/04/21
Date Instructions Received: 07/04/21
Date Analysis Completed: 18/04/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Danielle Brierley
Client Manager

Envirolab Job Number: 21/03611

Client Project Name: NMGH, Multistorey Car Park

Client Project Ref: BO76686

Lab Sample ID	21/03611/1							Units	Limit of Detection	Method ref
Client Sample No	ES1									
Client Sample ID	CP103									
Depth to Top	0.60									
Depth To Bottom										
Date Sampled	31-Mar-21									
Sample Type	Soil - ES									
Sample Matrix Code	3E									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH$_D$ M#	6.14							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#	1.6							% 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#	0.7							mg/kg	0.5	A-T-024s
Copper$_D$ M#	25							mg/kg	1	A-T-024s
Chromium$_D$ M#	16							mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1							mg/kg	1	A-T-040s
Lead$_D$ M#	29							mg/kg	1	A-T-024s
Mercury$_D$	<0.17							mg/kg	0.17	A-T-024s
Nickel$_D$ M#	15							mg/kg	1	A-T-024s
Selenium$_D$ M#	<1							mg/kg	1	A-T-024s
Zinc$_D$ M#	44							mg/kg	5	A-T-024s

Envirolab Job Number: 21/03611

Client Project Name: NMGH, Multistorey Car Park

Client Project Ref: BO76686

Lab Sample ID	21/03611/1							Units	Limit of Detection	Method ref
Client Sample No	ES1									
Client Sample ID	CP103									
Depth to Top	0.60									
Depth To Bottom										
Date Sampled	31-Mar-21									
Sample Type	Soil - ES									
Sample Matrix Code	3E									
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD									A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A									A-T-045

Envirolab Job Number: 21/03611

Client Project Name: NMGH, Multistorey Car Park

Client Project Ref: BO76686

Lab Sample ID	21/03611/1							Units	Limit of Detection	Method ref
Client Sample No	ES1									
Client Sample ID	CP103									
Depth to Top	0.60									
Depth To Bottom										
Date Sampled	31-Mar-21									
Sample Type	Soil - ES									
Sample Matrix Code	3E									
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02							mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.07							mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.06							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.08							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07							mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.08							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04							mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	0.16							mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.08							mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.16							mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	0.69							mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03611

Client Project Name: NMGH, Multistorey Car Park

Client Project Ref: BO76686

Lab Sample ID	21/03611/1							Units	Limit of Detection	Method ref
Client Sample No	ES1									
Client Sample ID	CP103									
Depth to Top	0.60									
Depth To Bottom										
Date Sampled	31-Mar-21									
Sample Type	Soil - ES									
Sample Matrix Code	3E									
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$_A^{M\#}$	<1							mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1							mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	2							mg/kg	1	A-T-055s
Total Aliphatics$_A$	2							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$_A$	<1							mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1							mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1							mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	2							mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	8							mg/kg	1	A-T-055s
Total Aromatics$_A$	11							mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	13							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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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, Multistorey Car Park

Clients Project No: BO76686

Project No: 21/03611

Date Received: 07/04/2021 (am)

Cool Box Temperatures (°C): 5.2

Lab Sample ID	21/03611/1
Client Sample No	ES1
Client Sample ID/Depth	CP103 0.60m
Date Sampled	31/03/21
Deviation Code	
F	✓

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

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/03611/1
Client Sample No	ES1
Client Sample ID/Depth	CP103 0.60m
Date Sampled	31/03/21
Cyanide (total)	✓

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.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/03841
Issue Number: 1 **Date:** 21 April, 2021

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

Project Manager: EBMA/Philippa Neesham
Project Name: NMGH - MSCP
Project Ref: 076686
Order No: EBMA2809
Date Samples Received: 12/04/21
Date Instructions Received: 13/04/21
Date Analysis Completed: 21/04/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/03841

Client Project Name: NMGH - MSCP

Client Project Ref: 076686

Lab Sample ID	21/03841/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	12-Apr-21									
Sample Type	Soil - ES									
Sample Matrix Code	6A									
% Stones >10mm$_A$	11.3							% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.78							pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{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\#}$	1.6							% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	2							mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0							mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	0.5							mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	19							mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	27							mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1							mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	14							mg/kg	1	A-T-024s
Mercury$_D$	2.79							mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	18							mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	2							mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	65							mg/kg	5	A-T-024s

Envirolab Job Number: 21/03841

Client Project Name: NMGH - MSCP

Client Project Ref: 076686

Lab Sample ID	21/03841/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	12-Apr-21									
Sample Type	Soil - ES									
Sample Matrix Code	6A									
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD									A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A									A-T-045

Envirolab Job Number: 21/03841

Client Project Name: NMGH - MSCP

Client Project Ref: 076686

Lab Sample ID	21/03841/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	12-Apr-21									
Sample Type	Soil - ES									
Sample Matrix Code	6A									
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.06							mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.10							mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.28							mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.30							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.30							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.17							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.12							mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.30							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04							mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	0.62							mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.04							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.18							mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.45							mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.56							mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	3.48							mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/03841

Client Project Name: NMGH - MSCP

Client Project Ref: 076686

Lab Sample ID	21/03841/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101									
Depth to Top	0.40									
Depth To Bottom										
Date Sampled	12-Apr-21									
Sample Type	Soil - ES									
Sample Matrix Code	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$_A$	<1							mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1							mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	3							mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	5							mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	19							mg/kg	1	A-T-055s
Total Aliphatics$_A$	27							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$_A$	<1							mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1							mg/kg	1	A-T-055s
Aro >C12-C16$_A$	3							mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	8							mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	23							mg/kg	1	A-T-055s
Total Aromatics$_A$	36							mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	63							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
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 - MSCP

Clients Project No: 076686

Project No: 21/03841

Date Received: 13/04/2021 (am)

Cool Box Temperatures (°C): 2.8

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.

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Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

Final Test Report

Envirolab Job Number:	21/02515		
Issue Number:	1	Date:	9-Apr-21

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 - MSCP
Project Ref:	76686
Order No:	EBMA2726
Date Samples Received:	10-Mar-21
Date Instructions Received:	11-Mar-21
Date Analysis Completed:	9-Apr-21

Notes - Soil analysis

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

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

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

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be 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

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

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

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.

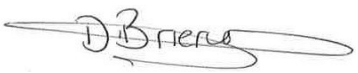
Please contact us if you need any further information.

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Danielle Brierley
Client Manager

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	21/02515/1				
Client Sample Number				WS101		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID								
Depth to Top				0.2				
Depth to Bottom								
Date Sampled				09/03/2021				
Sample Type				Soil - ES				
Sample Matrix Code				4AB				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	N	N	**9.89**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.2**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.06**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**4**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**4.44**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**39.3**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**107**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**0.041**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.019	**0.190**	0.5	2	25
Barium	A-T-025	N	N	0.063	**0.630**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.003	**0.030**	0.5	10	70
Copper	A-T-025	N	N	0.009	**0.090**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.001	**0.010**	0.5	10	30
Nickel	A-T-025	N	N	0.002	**0.020**	0.4	10	40
Lead	A-T-025	N	N	0.052	**0.520**	0.5	10	50
Antimony	A-T-025	N	N	0.013	**0.130**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.032	**0.320**	4	50	200
Chloride	A-T-026	N	N	17	**169**	800	15000	25000
Fluoride	A-T-026	N	N	0.8	**8.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	45	**455**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	118	**1180**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	9.0				
Conductivity (µS/cm)	A-T-037	N	N	235				
Mass Sample (kg)				0.214				
Dry Matter (%)	A-T-044	N	N	81.8				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	21/02515/2				
Client Sample Number				WS101		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID								
Depth to Top				1.45				
Depth to Bottom								
Date Sampled				09/03/2021				
Sample Type				Soil - ES				
Sample Matrix Code				4A				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	N	N	**8.72**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.02**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.02**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**1.1**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**0.28**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**<0.08**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**<10**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.002	**0.020**	0.5	2	25
Barium	A-T-025	N	N	0.040	**0.400**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	<0.001	**<0.01**	0.5	10	70
Copper	A-T-025	N	N	0.003	**0.030**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.002	**0.020**	0.5	10	30
Nickel	A-T-025	N	N	<0.001	**<0.01**	0.4	10	40
Lead	A-T-025	N	N	0.003	**0.030**	0.5	10	50
Antimony	A-T-025	N	N	0.007	**0.070**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.005	**0.050**	4	50	200
Chloride	A-T-026	N	N	16	**159**	800	15000	25000
Fluoride	A-T-026	N	N	0.4	**4.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	17	**172**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	44	**440**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	6.4				
Conductivity (µS/cm)	A-T-037	N	N	88				
Mass Sample (kg)				0.212				
Dry Matter (%)	A-T-044	N	N	82.6				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	21/02515/3				
Client Sample Number				WS102		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID								
Depth to Top				0.35				
Depth to Bottom								
Date Sampled				09/03/2021				
Sample Type				Soil - ES				
Sample Matrix Code				2ABE				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	N	N	**9.03**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.49**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.06**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**2.5**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**1.31**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**20.3**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**81**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.005	**0.050**	0.5	2	25
Barium	A-T-025	N	N	0.120	**1.200**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.001	**0.010**	0.5	10	70
Copper	A-T-025	N	N	0.005	**0.050**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.002	**0.020**	0.5	10	30
Nickel	A-T-025	N	N	<0.001	**<0.01**	0.4	10	40
Lead	A-T-025	N	N	0.047	**0.470**	0.5	10	50
Antimony	A-T-025	N	N	0.006	**0.060**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.023	**0.230**	4	50	200
Chloride	A-T-026	N	N	3	**34**	800	15000	25000
Fluoride	A-T-026	N	N	0.6	**6.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	12	**116**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	67	**670**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	6.9				
Conductivity (µS/cm)	A-T-037	N	N	135				
Mass Sample (kg)				0.192				
Dry Matter (%)	A-T-044	N	N	91				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

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Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

Final Test Report

Envirolab Job Number:	21/02827		
Issue Number:	1	Date:	22-Apr-21

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 - MSGP
Project Ref:	76686
Order No:	EBMA2740
Date Samples Received:	16-Mar-21
Date Instructions Received:	18-Mar-21
Date Analysis Completed:	22-Apr-21

Notes - Soil analysis

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

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

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Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be 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

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

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

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.

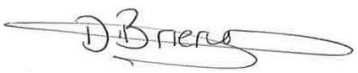
Please contact us if you need any further information.

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Danielle Brierley
Client Manager

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	21/02827/1				
Client Sample Number								
Client Sample ID				CP104				
Depth to Top				0.45				
Depth to Bottom								
Date Sampled				10/03/2021				
Sample Type				Soil - ES				
Sample Matrix Code				4A				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	N	N	**7.82**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.03**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**<0.01**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**8.2**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**7.15**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**3.81**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**16**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.001	**0.010**	0.5	2	25
Barium	A-T-025	N	N	0.053	**0.530**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	<0.001	**<0.01**	0.5	10	70
Copper	A-T-025	N	N	0.003	**0.030**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.004	**0.040**	0.5	10	30
Nickel	A-T-025	N	N	<0.001	**<0.01**	0.4	10	40
Lead	A-T-025	N	N	0.001	**0.010**	0.5	10	50
Antimony	A-T-025	N	N	<0.001	**<0.01**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.002	**0.020**	4	50	200
Chloride	A-T-026	N	N	<1.00	**<10**	800	15000	25000
Fluoride	A-T-026	N	N	0.6	**6.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	2	**24**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	63	**630**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	7.7				
Conductivity (µS/cm)	A-T-037	N	N	127				
Mass Sample (kg)				0.219				
Dry Matter (%)	A-T-044	N	N	79.9				

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	21/02827/2				
Client Sample Number						Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID				CP102				
Depth to Top				0.5				
Depth to Bottom								
Date Sampled				12/03/2021				
Sample Type				Soil - ES				
Sample Matrix Code				4ABE				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	N	N	**8.00**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.05**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**<0.01**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	N	N	**13.1**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	N	N	**11.5**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**113**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**61**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.003	**0.030**	0.5	2	25
Barium	A-T-025	N	N	0.048	**0.480**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	<0.001	**<0.01**	0.5	10	70
Copper	A-T-025	N	N	0.004	**0.040**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.005	**0.050**	0.5	10	30
Nickel	A-T-025	N	N	<0.001	**<0.01**	0.4	10	40
Lead	A-T-025	N	N	0.002	**0.020**	0.5	10	50
Antimony	A-T-025	N	N	<0.001	**<0.01**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.004	**0.040**	4	50	200
Chloride	A-T-026	N	N	6	**58**	800	15000	25000
Fluoride	A-T-026	N	N	2.1	**21.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	8	**82**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	60	**600**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	7.6				
Conductivity (µS/cm)	A-T-037	N	N	120				
Mass Sample (kg)				0.244				
Dry Matter (%)	A-T-044	N	N	71.8				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

Appendix D – Geotechnical Laboratory Testing Results

- Envirolab, Environmental Geotechnical Analysis Results
    - Final Analytical Test Report Ref. 21-04370-1
    - Final Analytical Test Report Ref. 21-04852-2
    - Final Analytical Test Report Ref. 21-05105-1
    - Final Analytical Test Report Ref. 21-05471-1
- i2 Analytical Ltd, Environmental Geotechnical Analysis Results
    - Final Analytical Test Report Ref. 21-64337
- IFA, Geotechnical Analysis Results
    - Test Report No. 2880514/2
    - Test Report No. 2280531/1
    - Test Report No. 2280547/1
    - Test Report No. 2280557/2

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/04370
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/Rob Allen
Project Name: North Manchester General Hospital - MSCP
Project Ref: B076686
Order No: EBMA2814
Date Samples Received: 11/03/21
Date Instructions Received: 25/04/21
Date Analysis Completed: 24/05/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 21/04370

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: B076686

Lab Sample ID	21/04370/1	21/04370/2	21/04370/3	21/04370/4	21/04370/5	21/04370/6	21/04370/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP105	CP105	CP105	CP105	CP105	CP102	CP102			
Depth to Top	3.00	6.50	11.00	17.00	23.00	4.00	9.50			
Depth To Bottom			11.45	17.45	23.45	4.45	9.95			
Date Sampled	04-Mar-21	04-Mar-21	05-Mar-21	08-Mar-21	08-Mar-21	12-Mar-21	12-Mar-21			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	3	3	3		6		4A			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	-	6.5	-	<0.1	% w/w	0.1	A-T-044
pH$_D^{M\#}$	5.52	7.94	8.15	-	8.32	-	7.97	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.01	0.08	0.04	-	0.05	-	0.02	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
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	-	-	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: 21/04370

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: B076686

Lab Sample ID	21/04370/8	21/04370/9	21/04370/10	21/04370/11	21/04370/12	21/04370/13	21/04370/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP102	CP102	CP102	CP104	CP104	CP104	CP104			
Depth to Top	26.00	32.50	15.50	2.50	14.00	20.00	24.50			
Depth To Bottom	26.45	32.95	15.95		14.45	20.45	24.95			
Date Sampled	16-Mar-21	17-Mar-21	15-Mar-21	09-Mar-21	10-Mar-21	11-Mar-21	12-Mar-21			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code				3			5			
% Stones >10mm$_A$	-	-	-	<0.1	-	-	<0.1	% w/w	0.1	A-T-044
pH$_D^{M\#}$	-	-	-	7.18	-	-	7.42	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	-	-	-	<0.01	-	-	<0.01	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
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s$_A$	Appended	Appended	-	-	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	-	-	Appended	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: 21/04370

Date Received: 25/04/2021 (am)

Project: North Manchester General Hospital - MSCP

Cool Box Temperatures (°C):

Clients Project No: B076686

Lab Sample ID	21/04370/1	21/04370/2	21/04370/3	21/04370/5	21/04370/7	21/04370/11	21/04370/14
Client Sample No							
Client Sample ID/Depth	CP105 3.00m	CP105 6.50m	CP105 11.00-11.45m	CP105 23.00-23.45m	CP102 9.50-9.95m	CP104 2.50m	CP104 24.50-24.95m
Date Sampled	04/03/21	04/03/21	05/03/21	08/03/21	12/03/21	09/03/21	12/03/21
Deviation Code							
F	✓	✓	✓	✓	✓	✓	✓

Key

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

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/04370/1	21/04370/2	21/04370/3	21/04370/5	21/04370/7	21/04370/11	21/04370/14
Client Sample No							
Client Sample ID/Depth	CP105 3.00m	CP105 6.50m	CP105 11.00-11.45m	CP105 23.00-23.45m	CP102 9.50-9.95m	CP104 2.50m	CP104 24.50-24.95m
Date Sampled	04/03/21	04/03/21	05/03/21	08/03/21	12/03/21	09/03/21	12/03/21
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.

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT
SUPPLEMENT TO TEST REPORT 21/04852/1

Amendments: Request for Additional Analysis

Envirolab Job Number: 21/04852
Issue Number: 2 **Date:** 03 June, 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 - Multi Story Car Park
Project Ref: 76686
Order No: EBMA2851
Date Samples Received: 26/04/21
Date Instructions Received: 05/05/21
Date Analysis Completed: 03/06/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 21/04852

Client Project Name: North Manchester General Hospital - Multi Story Car Park

Client Project Ref: 76686

Lab Sample ID	21/04852/1	21/04852/2	21/04852/3	21/04852/4	21/04852/5	21/04852/6	21/04852/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH105	BH105	BH105	BH105	BH105	BH105	BH105			
Depth to Top	42.73	45.15	45.83	46.68	47.27	47.97	48.82			
Depth To Bottom	42.84	45.26	45.96	46.92	47.47	48.14	49.02			
Date Sampled	25-Mar-21	25-Mar-21	25-Mar-21	25-Mar-21	25-Mar-21	25-Mar-21	25-Mar-21			
Sample Type	Soil - C	Soil - C	Soil - C	Soil - C	Soil - C	Soil - C	Soil - C			
Sample Matrix Code	1			1						
% Stones >10mm$_A$	<0.1	-	-	<0.1	-	-	-	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.39	-	-	8.03	-	-	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	-	-	<0.01	-	-	-	g/l	0.01	A-T-026s
Point Load (Single) ISRM 2007$_A$	Appended	Appended	Appended	-	Appended	-	-			Subcon IFA
UCS (Rock) ISRM 2007$_A$	-	-	-	Appended	-	Appended	Appended			Subcon IFA

Envirolab Job Number: 21/04852

Client Project Name: North Manchester General Hospital - Multi Story Car Park

Client Project Ref: 76686

Lab Sample ID	21/04852/8							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH105									
Depth to Top	49.50									
Depth To Bottom	49.76									
Date Sampled	25-Mar-21									
Sample Type	Soil - C									
Sample Matrix Code	1									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	6.87							pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01							g/l	0.01	A-T-026s
Point Load (Single) ISRM 2007$_A$	Appended									Subcon IFA

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.
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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:
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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 - Multi Story Car Park

Clients Project No: 76686

Project No: 21/04852

Date Received: 05/05/2021 (am)

Cool Box Temperatures (°C): 6.2

Lab Sample ID	21/04852/1	21/04852/4	21/04852/8
Client Sample No			
Client Sample ID/Depth	BH105 42.73-42.84m	BH105 46.68-46.92m	BH105 49.50-49.76m
Date Sampled	25/03/21	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	21/04852/1	21/04852/4	21/04852/8
Client Sample No			
Client Sample ID/Depth	BH105 42.73-42.84m	BH105 46.68-46.92m	BH105 49.50-49.76m
Date Sampled	25/03/21	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 ± 3°C), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/05105
Issue Number: 1 **Date:** 08 June, 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 - MSCP
Project Ref: B076686
Order No: EBMA2872
Date Samples Received: 07/04/21
Date Instructions Received: 11/05/21
Date Analysis Completed: 08/06/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Danielle Brierley
Client Manager

Envirolab Job Number: 21/05105

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: B076686

Lab Sample ID	21/05105/1	21/05105/2	21/05105/3	21/05105/4	21/05105/5	21/05105/6	21/05105/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP103	CP103	CP103	CP103	CP101	CP101	CP101			
Depth to Top	4.00	9.50	18.50	23.50	6.50	14.00	20.00			
Depth To Bottom	4.45	9.95	18.95		6.95	14.45	20.45			
Date Sampled	31-Mar-21	01-Apr-21	06-Apr-21	09-Apr-21	08-Apr-21	09-Apr-21	09-Apr-21			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5			3AE	5					
% Stones >10mm$_A$	<0.1	-	-	<0.1	<0.1	-	-	% w/w	0.1	A-T-044
pH$_D^{M\#}$	6.52	-	-	8.23	7.37	-	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	<0.01	-	-	0.08	0.03	-	-	g/l	0.01	A-T-026s
Moisture Content of Soil (Oven Dried Method)$_A^{\#}$	Appended	Appended	Appended	-	-	Appended	Appended			Subcon IFA
Multistage Shear Strength in triaxial cell without measurement of pore pressure (1x 100mm diameter s$_A$	-	Appended	Appended	-	-	Appended	Appended			Subcon IFA
Particle Size Distribution (Wet Sieving Method)$_A^{\#}$	Appended	-	-	Appended	Appended	-	-			Subcon IFA
One-Dimensional Consolidation Properties. 75mm Sample. 5 Loads BS 1377-5:1990 Clause 3$_A$	-	Appended	Appended	-	-	Appended	Appended			Subcon IFA

Envirolab Job Number: 21/05105

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: B076686

Lab Sample ID	21/05105/8							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101									
Depth to Top	23.50									
Depth To Bottom										
Date Sampled	09-Apr-21									
Sample Type	Soil									
Sample Matrix Code	5A									
% Stones >10mm$_A$	2.6							% w/w	0.1	A-T-044
pH$_D^{M\#}$	8.32							pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.02							g/l	0.01	A-T-026s
Moisture Content of Soil (Oven Dried Method)$_A^{\#}$	Appended									Subcon IFA
4 point Liquid & Plastic Limit by Cone Penetrometer$_A^{\#}$	Appended									Subcon IFA

REPORT NOTES

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Soil chemical analysis:
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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'.
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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:
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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 - MSCP

Clients Project No: B076686

Project No: 21/05105

Date Received: 11/05/2021 (am)

Cool Box Temperatures (°C): 8.3

Lab Sample ID	21/05105/1	21/05105/4	21/05105/5	21/05105/8
Client Sample No				
Client Sample ID/Depth	CP103 4.00-4.45m	CP103 23.50m	CP101 6.50-6.95m	CP101 23.50m
Date Sampled	31/03/21	09/04/21	08/04/21	09/04/21
Deviation Code				
F	✓	✓	✓	✓

Key

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

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/05105/1	21/05105/4	21/05105/5	21/05105/8
Client Sample No				
Client Sample ID/Depth	CP103 4.00-4.45m	CP103 23.50m	CP101 6.50-6.95m	CP101 23.50m
Date Sampled	31/03/21	09/04/21	08/04/21	09/04/21
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 ± 3°C), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/05471
Issue Number: 1 **Date:** 08 June, 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 - MSCP
Project Ref: B076686
Order No: EBMA2874
Date Samples Received: 11/03/21
Date Instructions Received: 19/05/21
Date Analysis Completed: 08/06/21

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Danielle Brierley
Client Manager

Envirolab Job Number: 21/05471

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: B076686

Lab Sample ID	21/05471/1	21/05471/2	21/05471/3	21/05471/4	21/05471/5	21/05471/6	21/05471/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP105	CP105	CP102	CP102	CP102	CP102	CP104			
Depth to Top	14.00	20.50	13.00	23.50	29.50	9.50	17.50			
Depth To Bottom						9.95				
Date Sampled	06-Mar-21	06-Mar-21	08-Mar-21			10-Mar-21	11-Mar-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	6	6		6		6	6			
% Stones >10mm$_A$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	% w/w	0.1	A-T-044
pH$_D^{M\#}$	8.12	8.19	-	8.22	-	7.63	8.23	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.13	0.07	-	0.14	-	<0.01	0.07	g/l	0.01	A-T-026s
Moisture Content of Soil (Oven Dried Method)$_A^{\#}$	Appended	Appended	Appended	Appended	Appended	Appended	Appended			Subcon IFA
4 point Liquid & Plastic Limit by Cone Penetrometer$_A^{\#}$	Appended	Appended	Appended	Appended	Appended	Appended	Appended			Subcon IFA

Envirolab Job Number: 21/05471

Client Project Name: North Manchester General Hospital - MSCP

Client Project Ref: B076686

Lab Sample ID	21/05471/8	21/05471/9	21/05471/10	21/05471/11				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP104	CP103	CP101	CP101						
Depth to Top	13.00	16.00	8.50	17.50						
Depth To Bottom										
Date Sampled	31-Mar-21	01-Apr-21	08-Apr-21	09-Apr-21						
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D						
Sample Matrix Code	6			6						
% Stones >10mm$_A$	1.1	-	-	<0.1				% w/w	0.1	A-T-044
pH$_D^{M\#}$	8.08	-	-	8.27				pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.07	-	-	0.06				g/l	0.01	A-T-026s
Moisture Content of Soil (Oven Dried Method)$_A^{\#}$	Appended	Appended	Appended	Appended						Subcon IFA
4 point Liquid & Plastic Limit by Cone Penetrometer$_A^{\#}$	Appended	Appended	Appended	Appended						Subcon IFA

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Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
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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 - MSCP

Clients Project No: B076686

Project No: 21/05471

Date Received: 19/05/2021 (am)

Cool Box Temperatures (°C): 7.8

Lab Sample ID	21/05471/1	21/05471/2	21/05471/4	21/05471/5	21/05471/6	21/05471/7	21/05471/8	21/05471/11
Client Sample No								
Client Sample ID/Depth	CP105 14.00m	CP105 20.50m	CP102 23.50m	CP102 29.50m	CP102 9.50-9.95m	CP104 17.50m	CP104 13.00m	CP101 17.50m
Date Sampled	06/03/21	06/03/21			10/03/21	11/03/21	31/03/21	09/04/21
Deviation Code								
E (no date)			✓	✓				
F	✓	✓			✓	✓	✓	✓

Key

E (no date) *No sampling date provided (all results affected if not provided)*

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

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/05471/1	21/05471/2	21/05471/6	21/05471/7	21/05471/8	21/05471/11
Client Sample No						
Client Sample ID/Depth	CP105 14.00m	CP105 20.50m	CP102 9.50-9.95m	CP104 17.50m	CP104 13.00m	CP101 17.50m
Date Sampled	06/03/21	06/03/21	10/03/21	11/03/21	31/03/21	09/04/21
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 ± 3°C), ISO 18400-120:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

TEST CERTIFICATE

Liquid and Plastic Limits

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

4041

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

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Philippa Neesham
Site Address: North Manchester General Hospital

Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03/2021
Date Received: 23/03/2021
Date Tested: 09/04/2021
Sampled By: Client

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

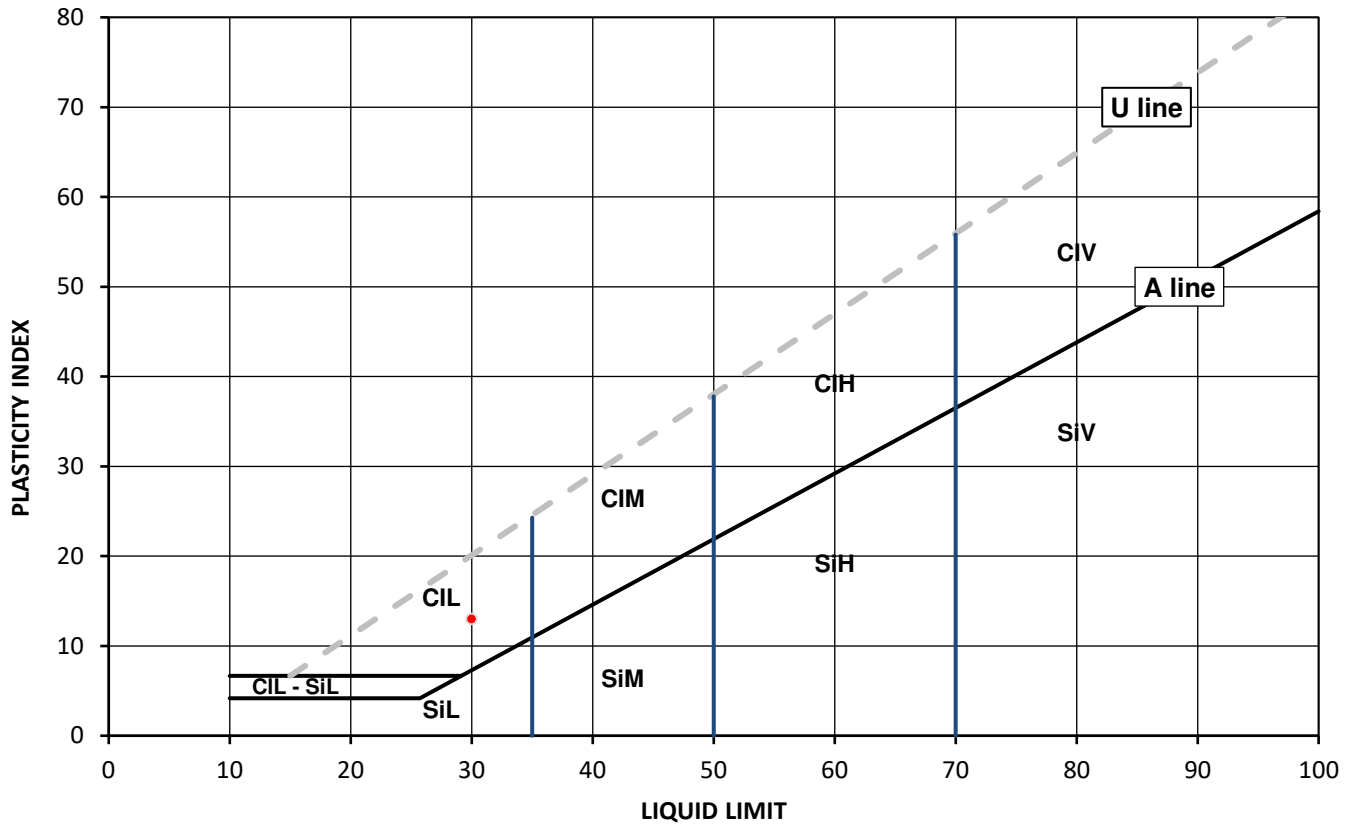
Test Results:

Laboratory Reference: 1812967
Hole No.: SA102
Sample Reference: Not Given
Soil Description: Dark brown slightly gravelly slightly clayey silty SAND

Depth Top [m]: 1.25
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
17	30	17	13	91



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

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

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

Remarks: Re-issue 1: Additional results of TXL

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

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 236.10

TEST CERTIFICATE

Liquid and Plastic Limits

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

4041

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

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	09/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

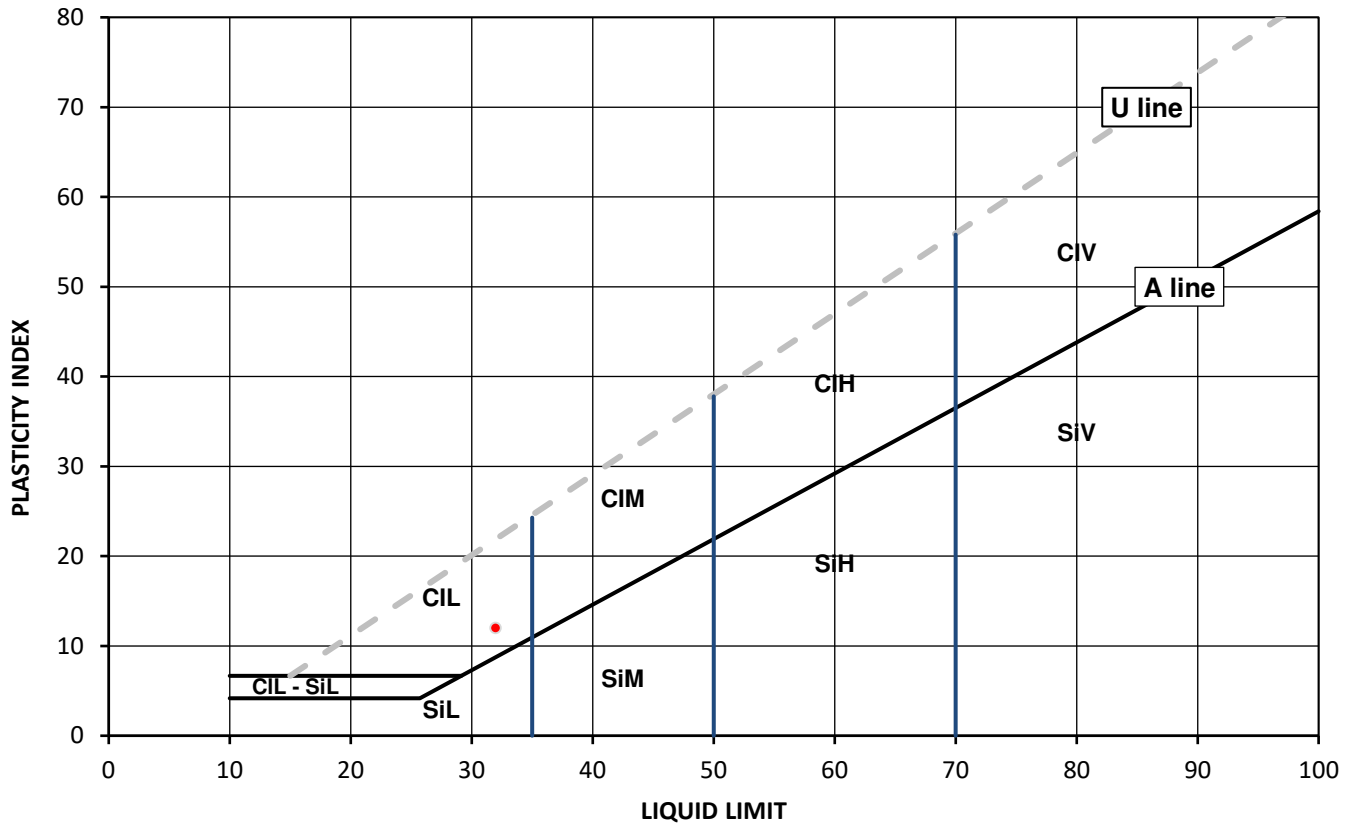
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1812968	Depth Top [m]:	1.00
Hole No.:	SA103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Dark brown slightly clayey very silty SAND		

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	32	20	12	100



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

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

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

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 236.10

SUMMARY REPORT

Summary of Classification Test Results

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

4041

Tested in Accordance with:

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

Client: CURTINS

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Philippa Neesham

Site Address: North Manchester General Hospital

Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03 - 19/03/2021
Date Received: 23/03/2021
Date Tested: 09/04/2021
Sampled By: Client

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

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
1812966	SA101	Not Given	1.35	Not Given	B	Dark brown slightly gravelly slightly clayey silty SAND		13											
1812967	SA102	Not Given	1.25	Not Given	B	Dark brown slightly gravelly sandy clayey SILT	Atterberg 4 Point	17		91	30	17	13			2.70			
1812968	SA103	Not Given	1.00	Not Given	B	Dark brown slightly clayey very silty SAND	Atterberg 4 Point	19		100	32	20	12			2.69			

Note: # Non accredited; NP - Non plastic

Comments: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 238.12

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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

4041

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG
Contact: Philippa Neesham
Site Address: North Manchester General Hospital

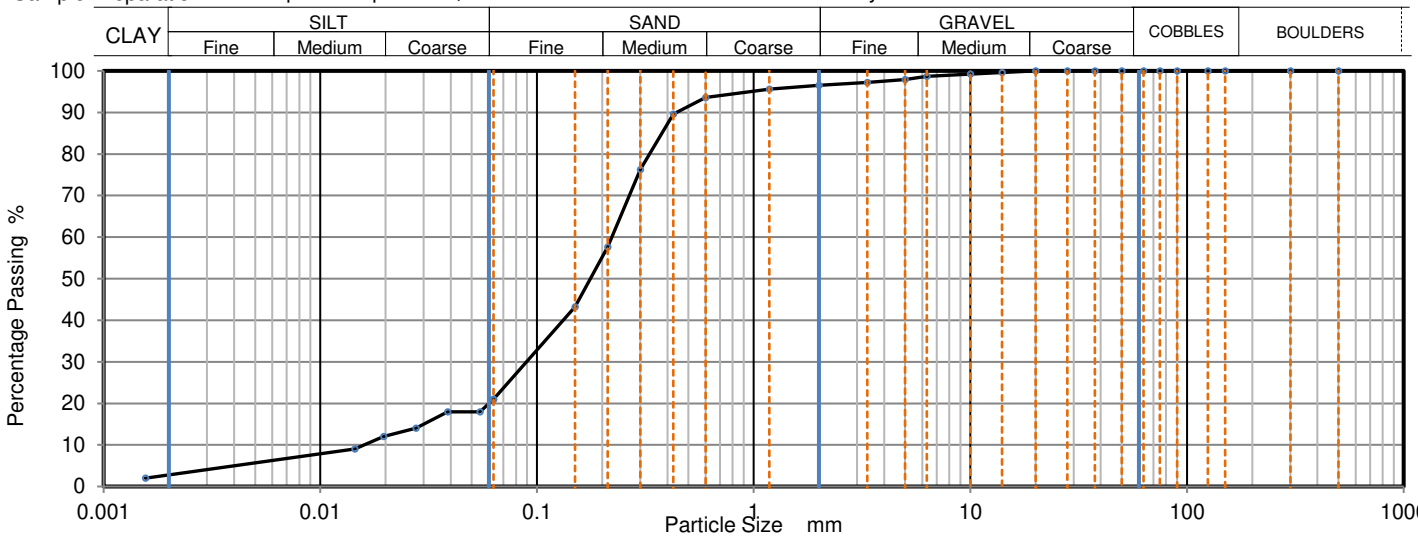
Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 19/03/2021
Date Received: 23/03/2021
Date Tested: 09/04/2021
Sampled By: Client

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

Test Results:

Laboratory Reference: 1812966
Hole No.: SA101
Sample Reference: Not Given
Sample Description: Dark brown slightly gravelly slightly clayey silty SAND
Sample Preparation: Sample was quartered, oven dried at 107.2 °C and broken down by hand.

Depth Top [m]: 1.35
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	21
300	100	0.0546	18
150	100	0.0386	18
125	100	0.0276	14
90	100	0.0196	12
75	100	0.0144	9
63	100	0.0016	2
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5	98		
3.35	97	Particle density	(assumed)
2	97	2.65	Mg/m3
1.18	96		
0.6	94		
0.425	90		
0.3	76		
0.212	58		
0.15	43		
0.063	21		

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	76
Silt	17
Clay	3

Grading Analysis		
D100	mm	20
D60	mm	0.222
D30	mm	0.0901
D10	mm	0.016
Uniformity Coefficient		14
Curvature Coefficient		2.3

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

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

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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

4041

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG
Contact: Philippa Neesham
Site Address: North Manchester General Hospital

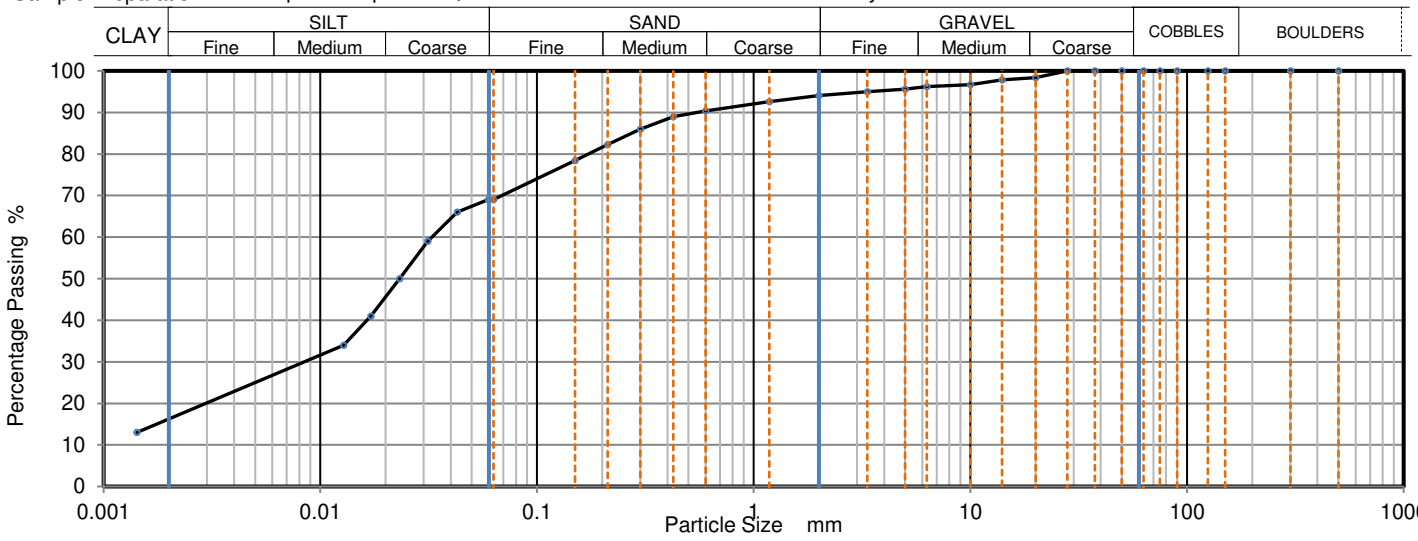
Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03/2021
Date Received: 23/03/2021
Date Tested: 09/04/2021
Sampled By: Client

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

Test Results:

Laboratory Reference: 1812967
Hole No.: SA102
Sample Reference: Not Given
Sample Description: Dark brown slightly gravelly clayey sandy SILT
Sample Preparation: Sample was quartered, oven dried at 107.2 °C and broken down by hand.

Depth Top [m]: 1.25
Depth Base [m]: Not Given
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0596	69
300	100	0.0429	66
150	100	0.0313	59
125	100	0.0232	50
90	100	0.0171	41
75	100	0.0128	34
63	100	0.0014	13
50	100		
37.5	100		
28	100		
20	98		
14	98		
10	97		
6.3	96		
5	96		
3.35	95	Particle density	(measured)
2	94	2.70	Mg/m3
1.18	93		
0.6	90		
0.425	89		
0.3	86		
0.212	82		
0.15	78		
0.063	69		

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	25
Silt	53
Clay	16

Grading Analysis		
D100	mm	28
D60	mm	0.0323
D30	mm	0.00824
D10	mm	
Uniformity Coefficient		> 23
Curvature Coefficient		

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

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

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

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

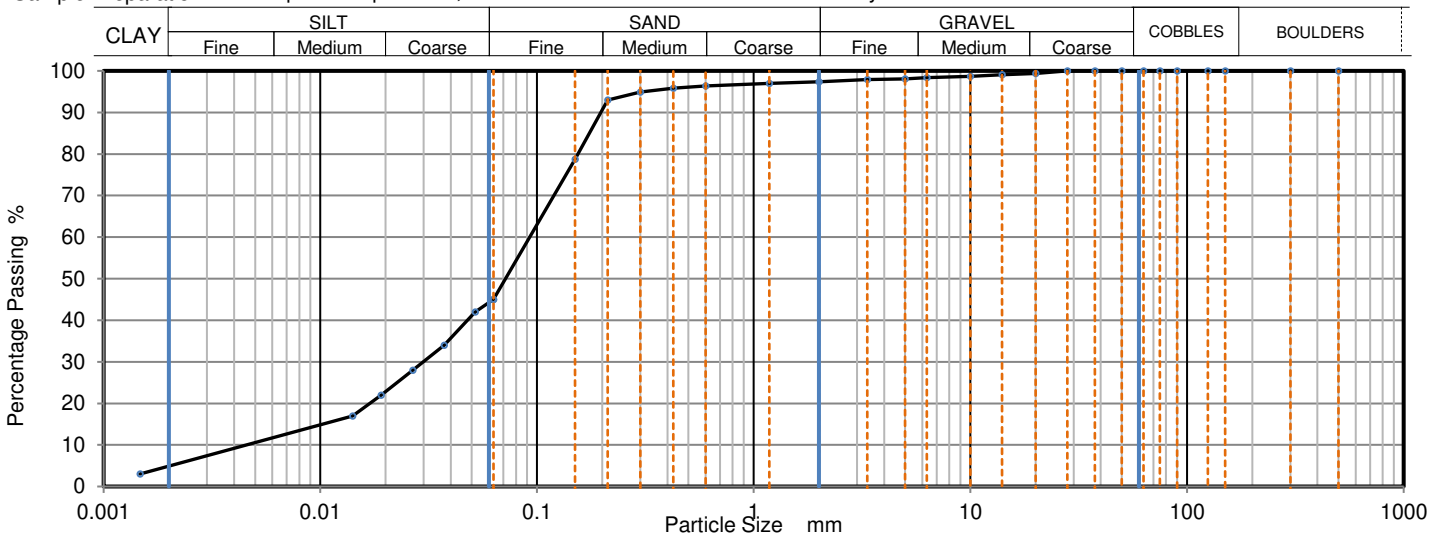
4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	09/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

Laboratory Reference:	1812968	Depth Top [m]:	1.00
Hole No.:	SA103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly clayey very silty SAND		
Sample Preparation:	Sample was quartered, oven dried at 107.2 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	45
300	100	0.0519	42
150	100	0.0373	34
125	100	0.0267	28
90	100	0.0191	22
75	100	0.0141	17
63	100	0.0015	3
50	100		
37.5	100		
28	100		
20	99		
14	99		
10	99		
6.3	98		
5	98		
3.35	98	Particle density	(measured)
2	97	2.69	Mg/m3
1.18	97		
0.6	96		
0.425	96		
0.3	95		
0.212	93		
0.15	79		
0.063	45		

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	53
Silt	39
Clay	5

Grading Analysis		
D100	mm	28
D60	mm	0.0931
D30	mm	0.0302
D10	mm	0.00471
Uniformity Coefficient		20
Curvature Coefficient		2.1

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

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

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 100.20

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Light Compaction

Tested in Accordance with:
BS 1377-4: 1990

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

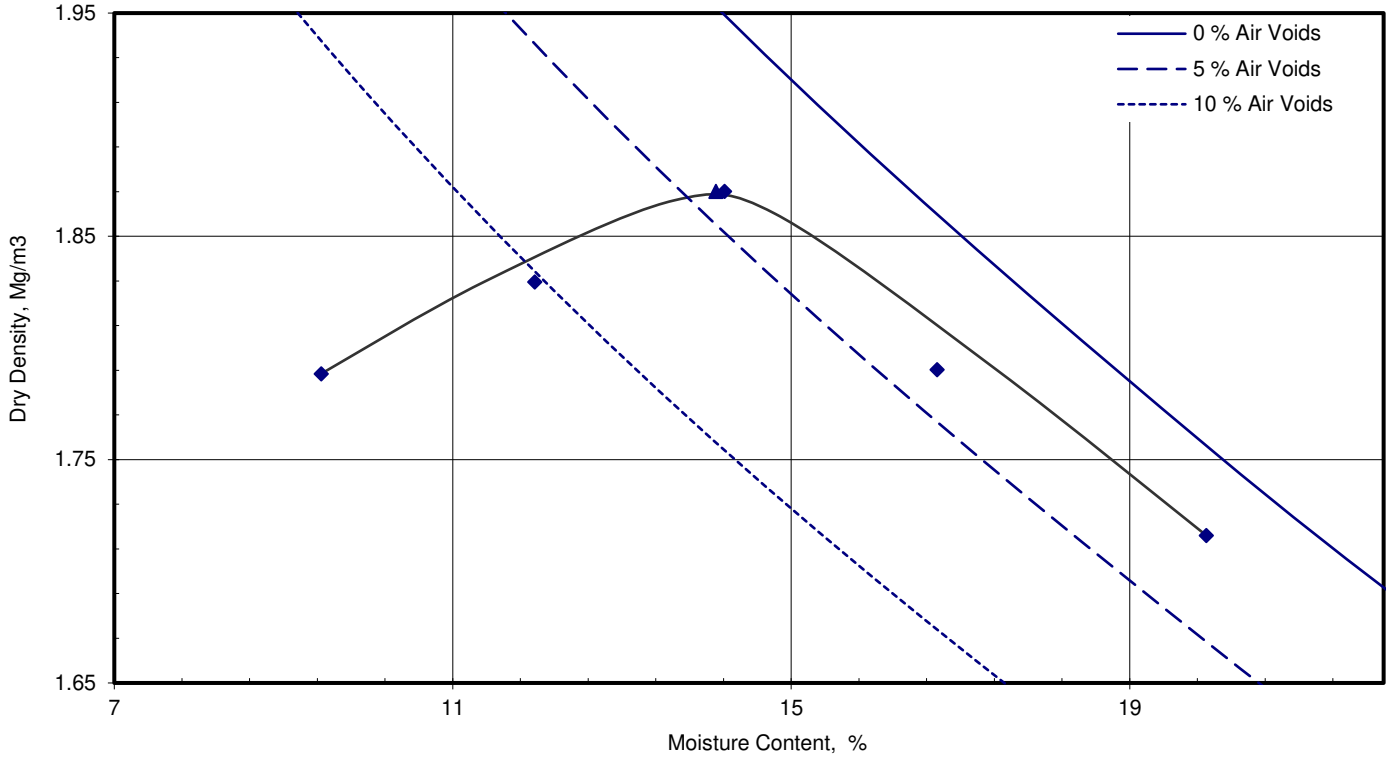
4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

Laboratory Reference:	1812967	Depth Top [m]:	1.25
Hole No.:	SA102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy clayey SILT		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	9.4	12	14	17	20
Dry Density	Mg/m³	1.79	1.83	1.87	1.79	1.72

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	2
Particle Density - Measured using gas jar	Mg/m³	2.70
As received Moisture Content	%	17
Maximum Dry Density	Mg/m³	**1.87**

Optimum Moisture Content	%	**14**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.4 using 2.5kg [light] Rammer

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 109.21

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Light Compaction

Tested in Accordance with:
BS 1377-4: 1990

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

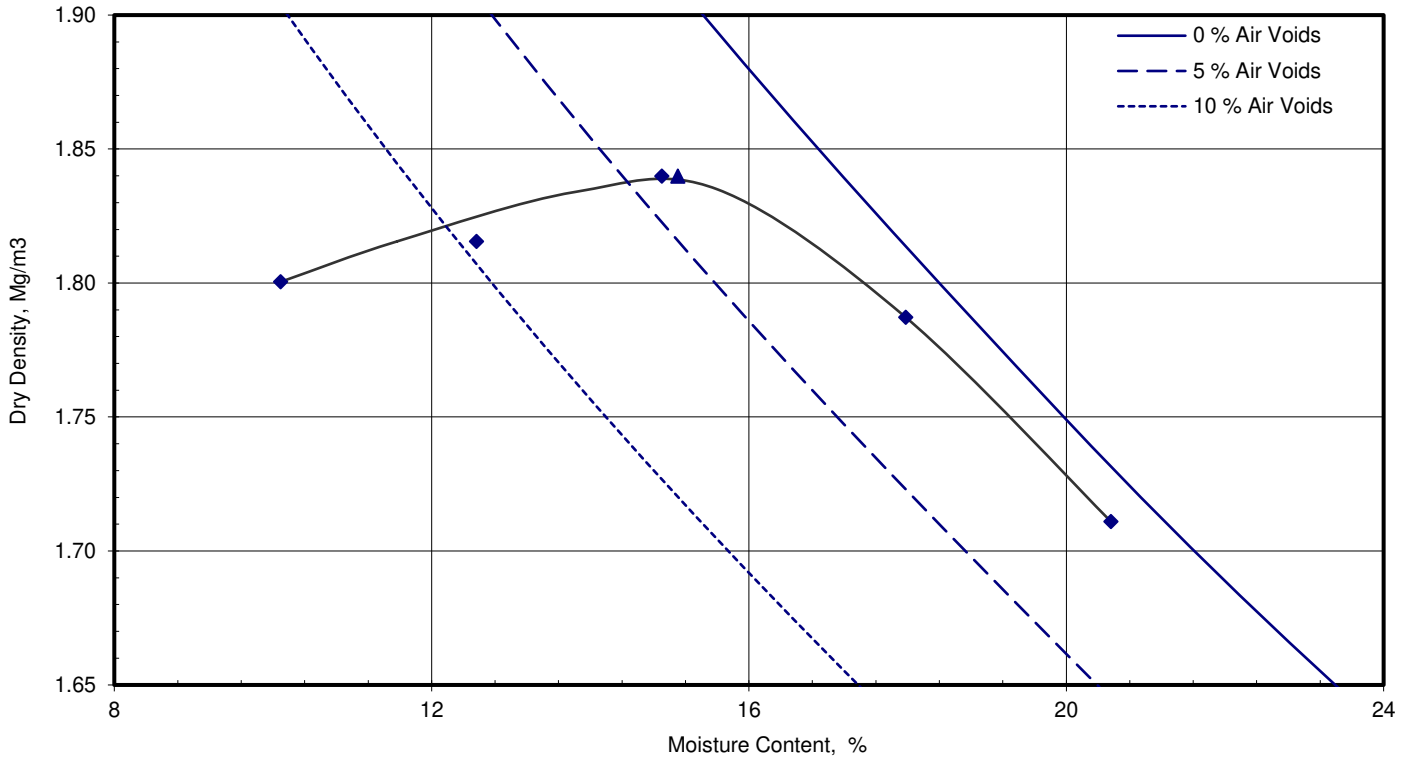
4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	09/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

Laboratory Reference:	1812968	Depth Top [m]:	1.00
Hole No.:	SA103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly clayey very silty SAND		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	10	13	15	18	21
Dry Density	Mg/m³	1.80	1.82	1.84	1.79	1.71

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	1
Particle Density - Measured using gas jar	Mg/m³	2.69
As received Moisture Content	%	19
Maximum Dry Density	Mg/m³	**1.84**

Optimum Moisture Content	%	**15**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.4 using 2.5kg [light] Rammer

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 109.21

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Heavy Compaction

Tested in Accordance with:
BS 1377-4: 1990

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

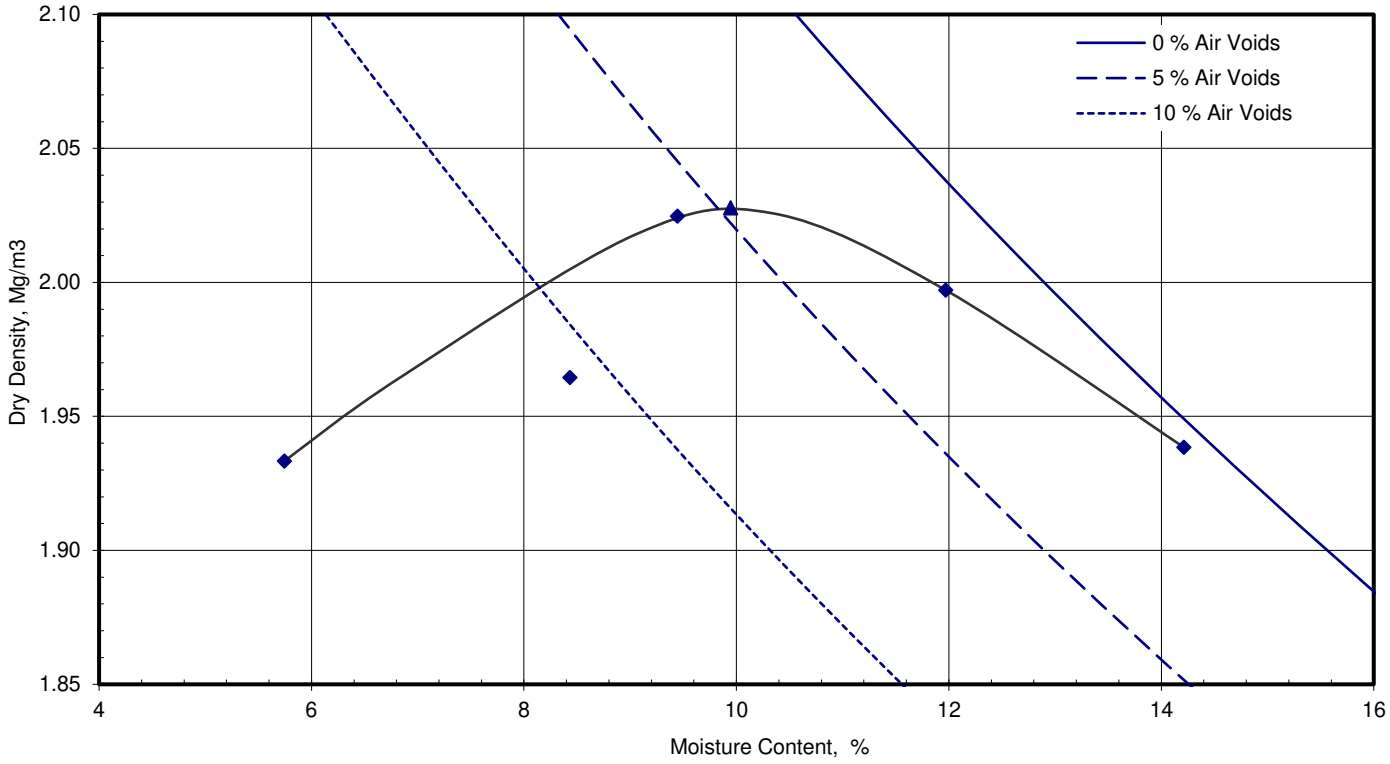
4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

Laboratory Reference:	1812967	Depth Top [m]:	1.25
Hole No.:	SA102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy clayey SILT		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	5.7	8.4	9.4	12	14
Dry Density	Mg/m³	1.93	1.96	2.02	2.00	1.94

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	2
Particle Density - Measured using gas jar	Mg/m³	2.70
As received Moisture Content	%	17
Maximum Dry Density	Mg/m³	**2.03**

Optimum Moisture Content	%	**9.9**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.6 using 4.5kg [heavy] Rammer

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 110.21

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Heavy Compaction

Tested in Accordance with:
BS 1377-4: 1990

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

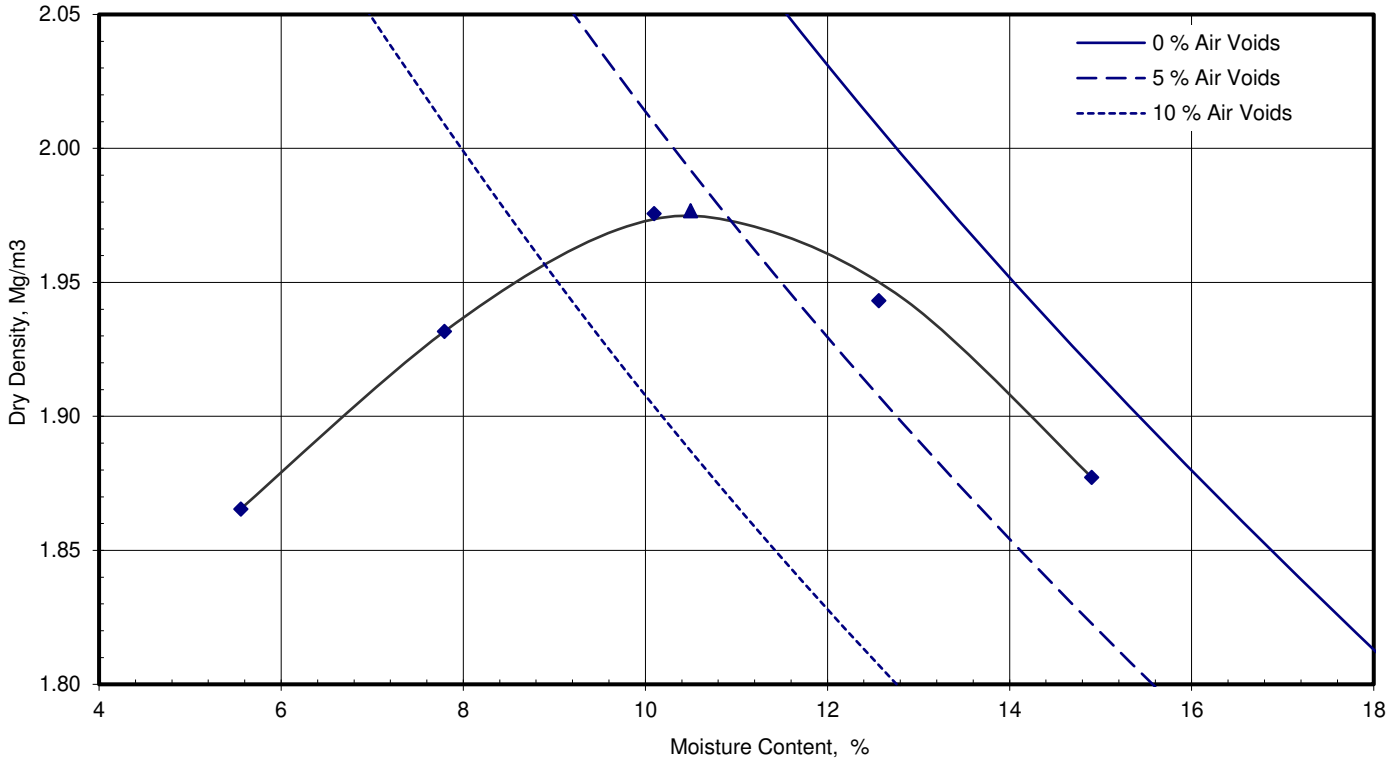
4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	09/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

Laboratory Reference:	1812968	Depth Top [m]:	1.00
Hole No.:	SA103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly clayey very silty SAND		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	5.6	7.8	10	13	15
Dry Density	Mg/m³	1.87	1.93	1.98	1.94	1.88

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	1
Particle Density - Measured using gas jar	Mg/m³	2.69
As received Moisture Content	%	19
Maximum Dry Density	Mg/m³	**1.98**

Optimum Moisture Content	%	**10**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.6 using 4.5kg [heavy] Rammer

Remarks: Re-issue 1: Additional results of TXL

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Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 110.21

TEST CERTIFICATE

Dry Density/ Moisture Content

Relationship Vib. Hammer Compaction

Tested in Accordance with:
BS 1377-4: 1990: Clause 3.7

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

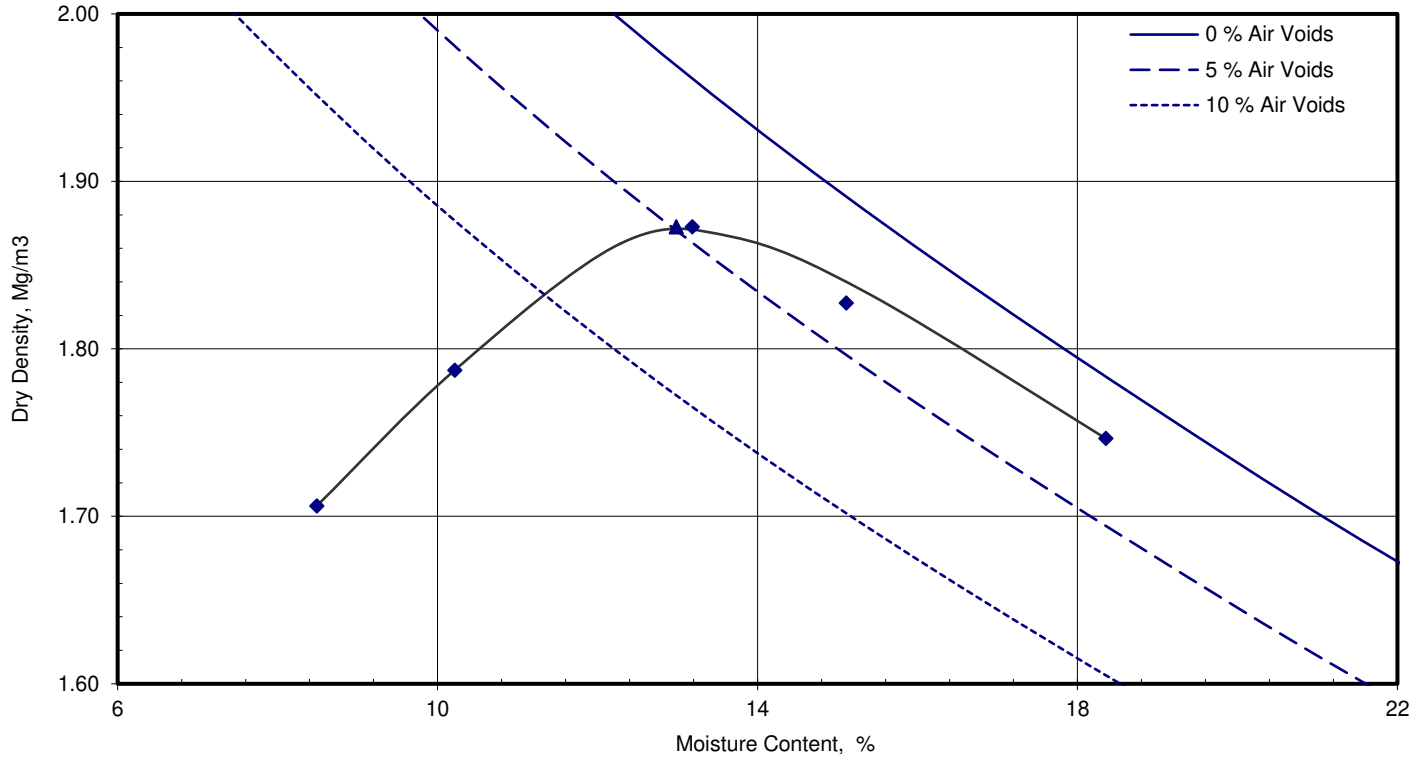
4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	8.5	10	13	15	18
Dry Density	Mg/m³	1.71	1.79	1.87	1.83	1.75

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m³	2.65
As received Moisture Content	%	13
Maximum Dry Density	Mg/m³	**1.87**

Optimum Moisture Content	%	**13**

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 111.21

TEST CERTIFICATE

Determination of California Bearing Ratio

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

4041

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

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

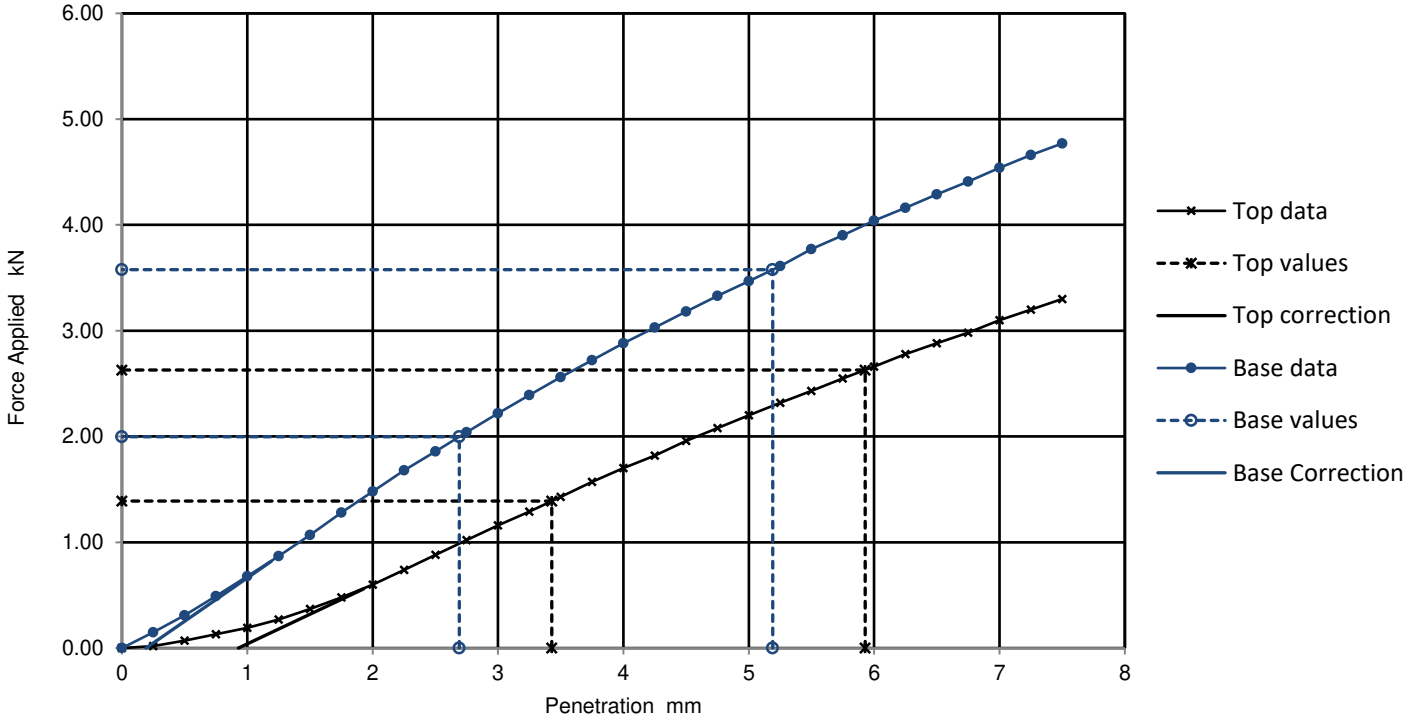
Test Results:

Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		

Specimen Preparation:

Condition	Remoulded			Soaking details	Not soaked
Details	Recompacted with specified standard effort using vibrating hammer			Period of soaking	days
				Time to surface	days
				Amount of swell recorded	mm
Material retained on 20mm sieve removed		0	%	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	2.10	Mg/m3	Surcharge applied	8 kg
	Dry density	1.82	Mg/m3		4.8 kPa
	Moisture content	15	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	11.0	13.0	13.0		16
BASE	Yes	15.0	18.0	18.0		15

Remarks: Re-issue 1: Additional results of TXL

Test/ Specimen specific remarks:

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 108.15

TEST CERTIFICATE

Determination of California Bearing Ratio

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

4041

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

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

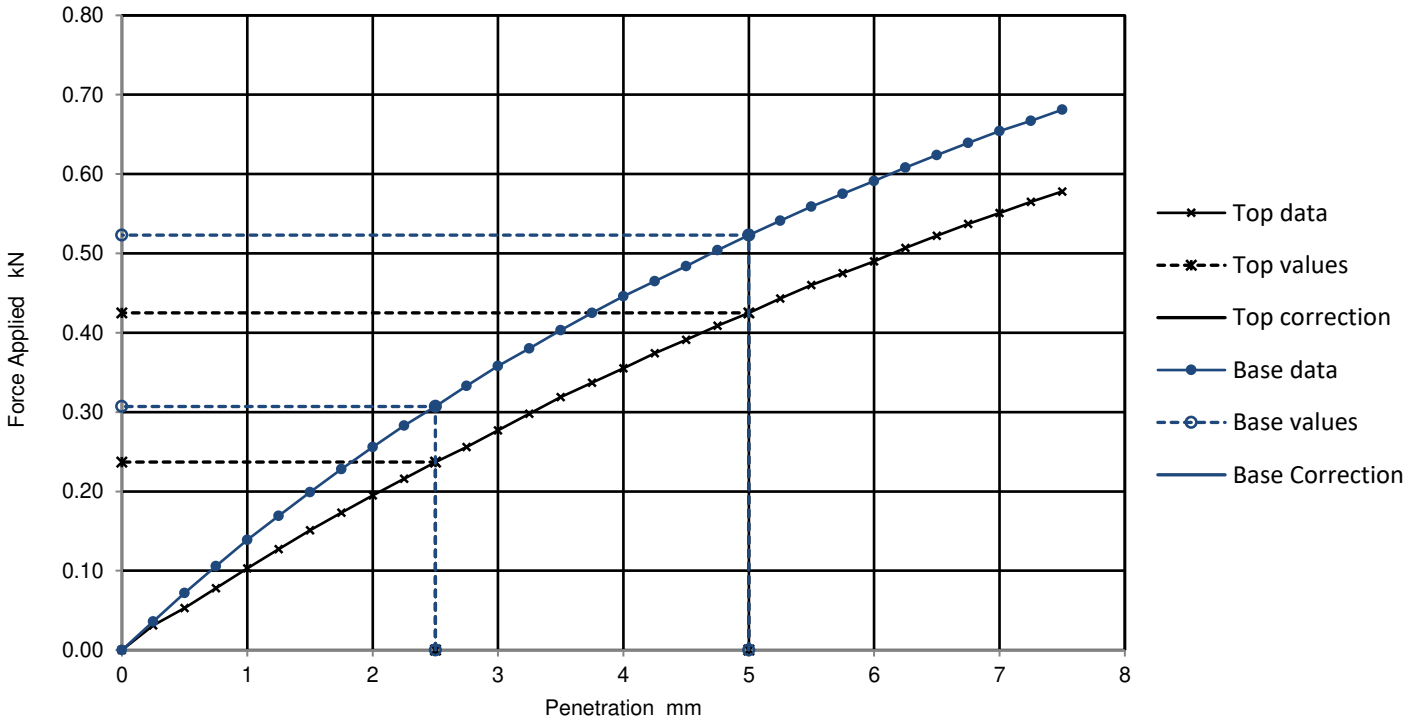
Laboratory Reference:	1812967	Depth Top [m]:	1.25
Hole No.:	SA102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy clayey SILT		

Specimen Preparation:

Condition	Remoulded	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	2 %	Dry density after soaking	Mg/m3

Initial Specimen details	Bulk density	2.08	Mg/m3	Surcharge applied	8 kg
	Dry density	1.78	Mg/m3		4.8 kPa
	Moisture content	17	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	1.8	2.1	2.1		17
BASE	No	2.3	2.6	2.6		17

Remarks: Re-issue 1: Additional results of TXL

Test/ Specimen specific remarks:

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PL Deputy Head of Geotechnical Section
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Date Reported: 30/04/2021

GF 108.15

TEST CERTIFICATE

Determination of California Bearing Ratio

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

4041

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

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

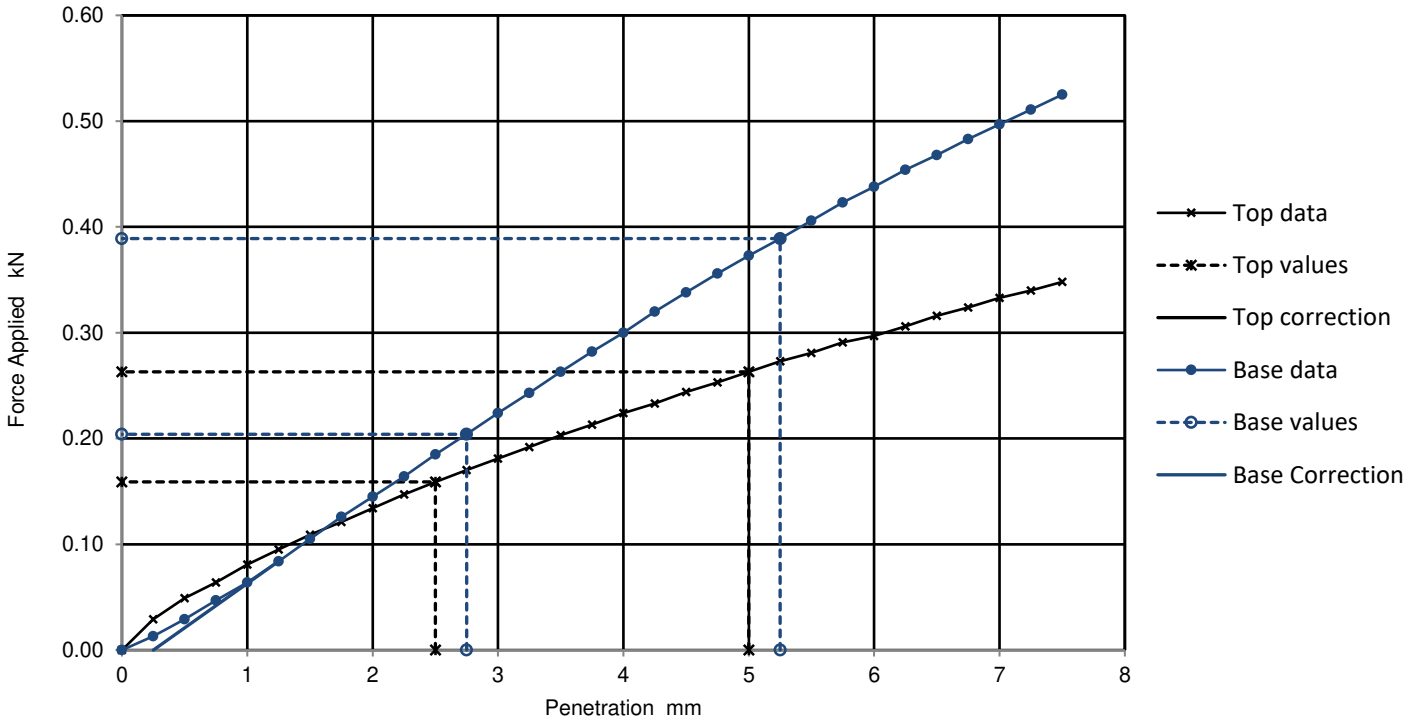
Laboratory Reference:	1812968	Depth Top [m]:	1.00
Hole No.:	SA103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly clayey very silty SAND		

Specimen Preparation:

Condition	Remoulded	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	1 %	Dry density after soaking	Mg/m3

Initial Specimen details	Bulk density	2.11	Mg/m3	Surcharge applied	8 kg
	Dry density	1.84	Mg/m3		4.8 kPa
	Moisture content	15	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	1.2	1.3	1.3		15
BASE	Yes	1.5	1.9	1.9		15

Remarks: Re-issue 1: Additional results of TXL

Test/ Specimen specific remarks:

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Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 108.15

TEST CERTIFICATE

Moisture Condition Value / Moisture Content Relationship

Tested in Accordance with:
BS 1377-4: 1990: Clause 5.5

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

4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

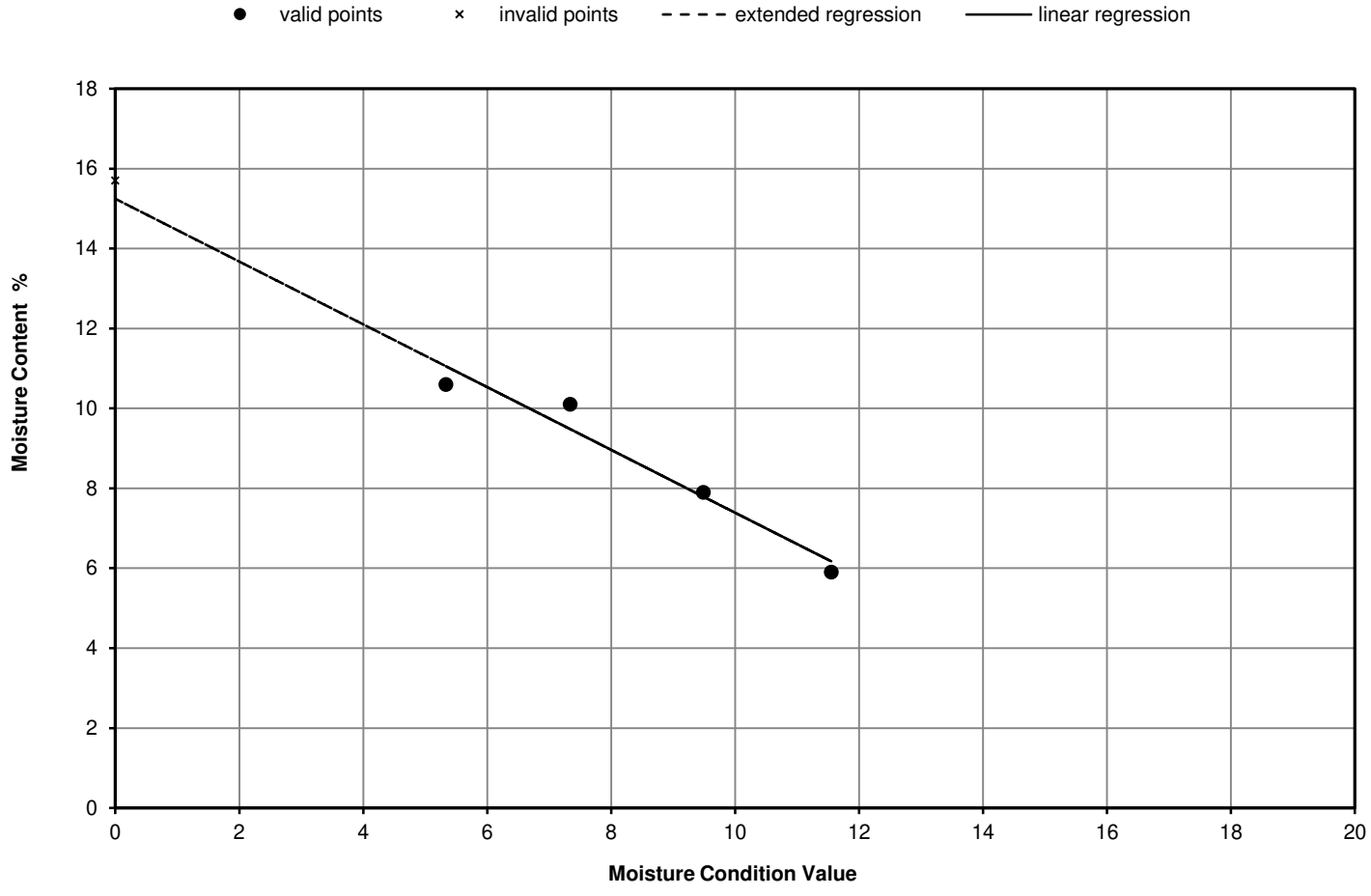
Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		

Sample preparation

Amount of material larger than 20mm sieve removed	2	%
Natural Moisture Content of sample	13	%
Initial Moisture Content of test sample below 20mm	16	%
Single sample tested		

Table of results

MCV Test Number	1	2	3	4	5
Moisture Content, %	15.7	5.9	7.9	10.1	10.6
Moisture Condition Value		11.6	9.5	7.3	5.3
MCV report	1.1	11.6	9.5	7.3	5.3
Effective / Valid data point	NO	YES	YES	YES	YES
Specimen remarks					



Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 163.8

TEST CERTIFICATE

Moisture Condition Value / Moisture Content Relationship

Tested in Accordance with:
BS 1377-4: 1990: Clause 5.5

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

4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	15/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

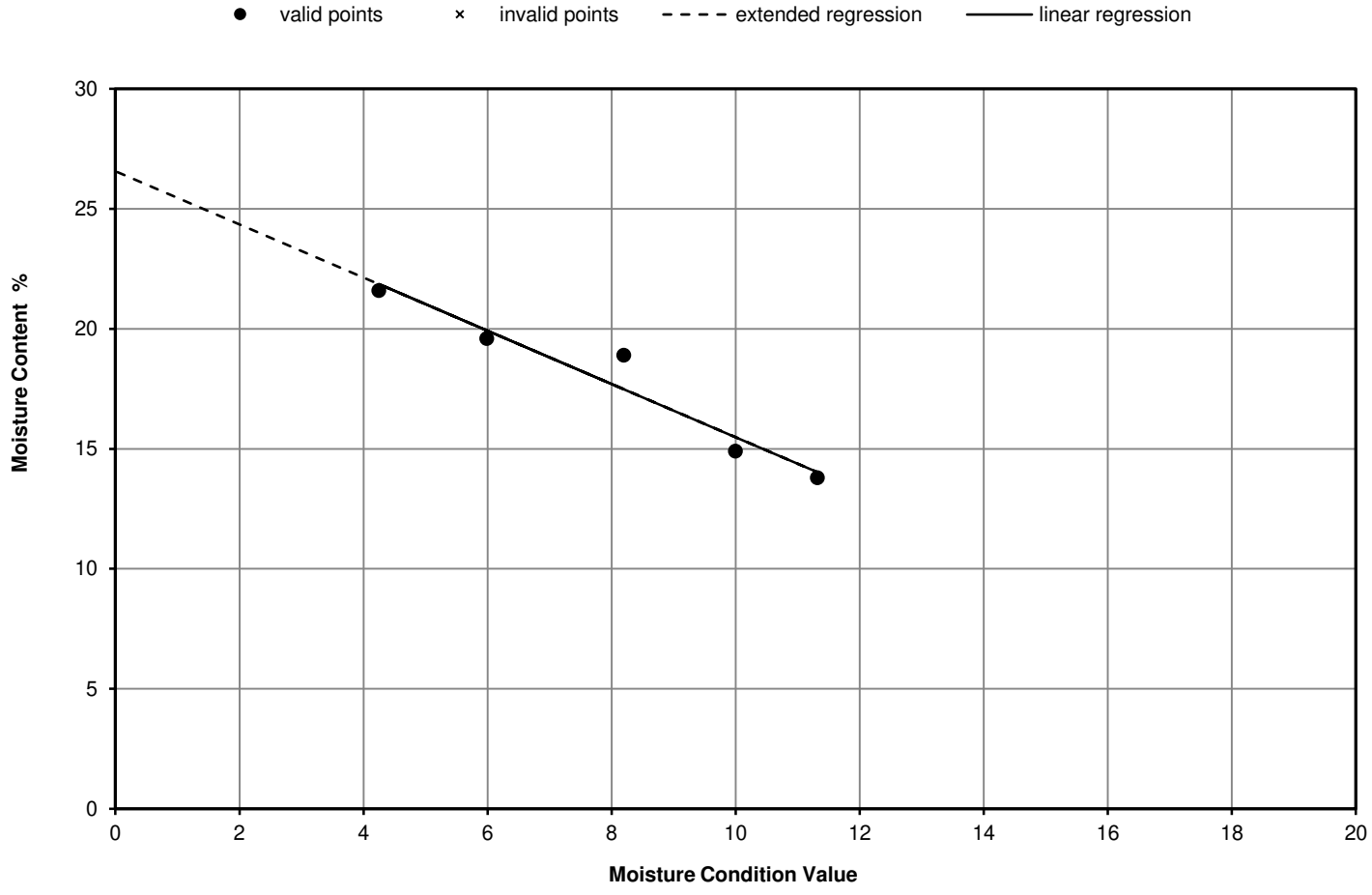
Laboratory Reference:	1812967	Depth Top [m]:	1.25
Hole No.:	SA102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy clayey SILT		

Sample preparation

Amount of material larger than 20mm sieve removed	2	%
Natural Moisture Content of sample	17	%
Initial Moisture Content of test sample below 20mm	19	%
Single sample tested		

Table of results

MCV Test Number	1	2	3	4	5
Moisture Content, %	18.9	21.6	19.6	14.9	13.8
Moisture Condition Value	8.2	4.2	6.0	10.0	11.3
MCV report	8.2	4.2	6	10	11.3
Effective / Valid data point	YES	YES	YES	YES	YES
Specimen remarks					



Remarks: Re-issue 1: Additional results of TXL

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Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 163.8

TEST CERTIFICATE

Moisture Condition Value / Moisture Content Relationship

Tested in Accordance with:
BS 1377-4: 1990: Clause 5.5

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

4041

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	18/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	16/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

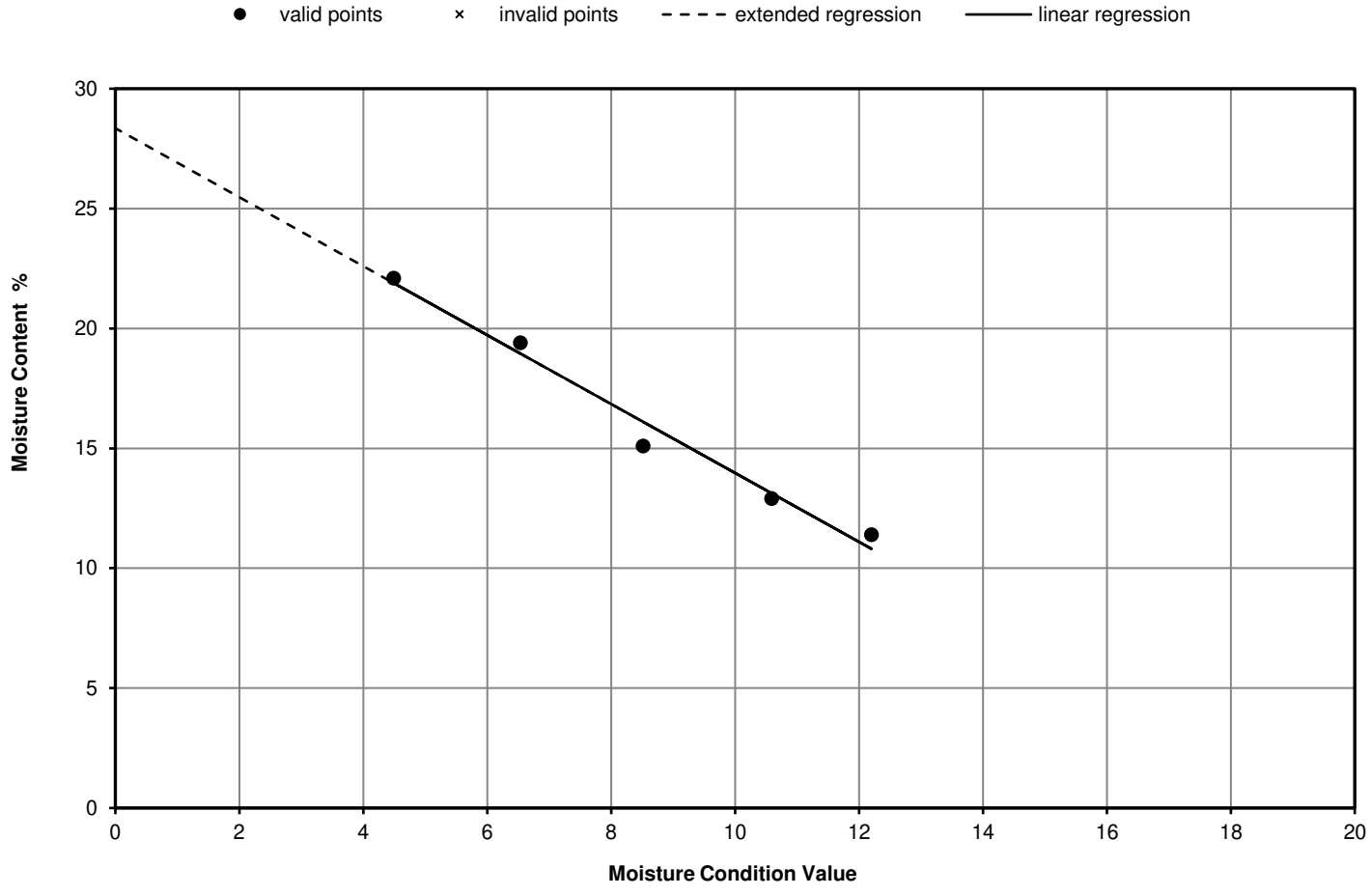
Laboratory Reference:	1812968	Depth Top [m]:	1.00
Hole No.:	SA103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly clayey very silty SAND		

Sample preparation

Amount of material larger than 20mm sieve removed	1	%
Natural Moisture Content of sample	19	%
Initial Moisture Content of test sample below 20mm	19	%
Single sample tested		

Table of results

MCV Test Number	1	2	3	4	5
Moisture Content, %	19.4	22.1	11.4	12.9	15.1
Moisture Condition Value	6.5	4.5	12.2	10.6	8.5
MCV report	6.5	4.5	12.2	10.6	8.5
Effective / Valid data point	YES	YES	YES	YES	YES
Specimen remarks					



Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 163.8

TEST CERTIFICATE

One Dimensional Consolidation Test

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

4041

Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG
Contact: Philippa Neesham
Site Address: North Manchester General Hospital

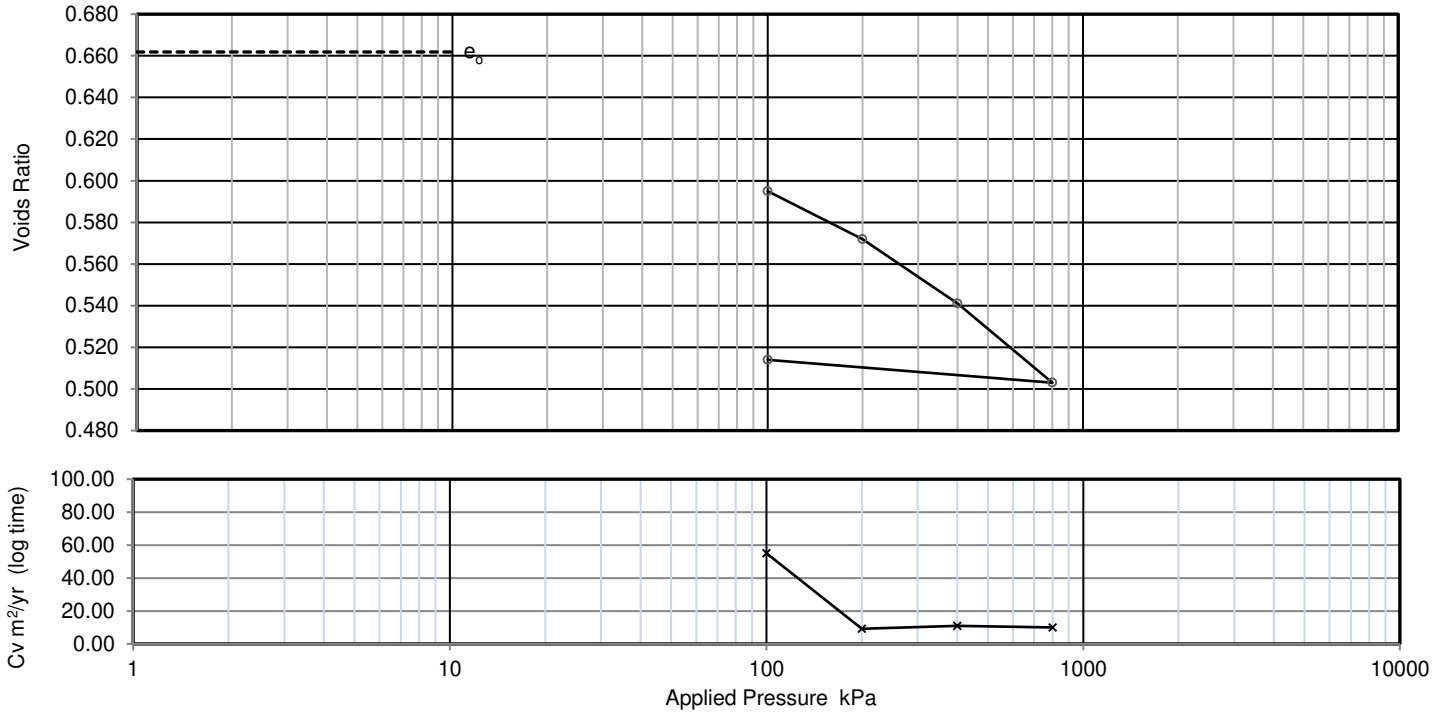
Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03/2021
Date Received: 23/03/2021
Date Tested: 14/04/2021
Sampled By: Client

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

Test Results:

Laboratory Reference: 1812967
Hole No.: SA102
Sample Reference: Not Given
Sample Description: Dark brown slightly gravelly sandy clayey SILT

Depth Top [m]: 1.25
Depth Base [m]: Not Given
Sample Type: B



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.662	-	-	-	-
100	0.595	0.4	55	N/A	0.0012
200	0.572	0.15	9.2	9.3	0.0013
400	0.541	0.098	11	13	0.0014
800	0.503	0.062	10	11	0.0013
100	0.514	0.011			

Preparation

Index tests

Orientation of the sample	N/A		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.01	-	mm
Height	20.00	18.23	mm
Moisture Content	23	22	%
Bulk density	1.97	2.14	Mg/m3
Dry density	1.59	1.75	Mg/m3
Voids Ratio	0.662	0.514	
Saturation	94	115	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks: Test carried out on lump
Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 172.15

TEST CERTIFICATE

One Dimensional Consolidation Test

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

4041

Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG
Contact: Philippa Neesham
Site Address: North Manchester General Hospital

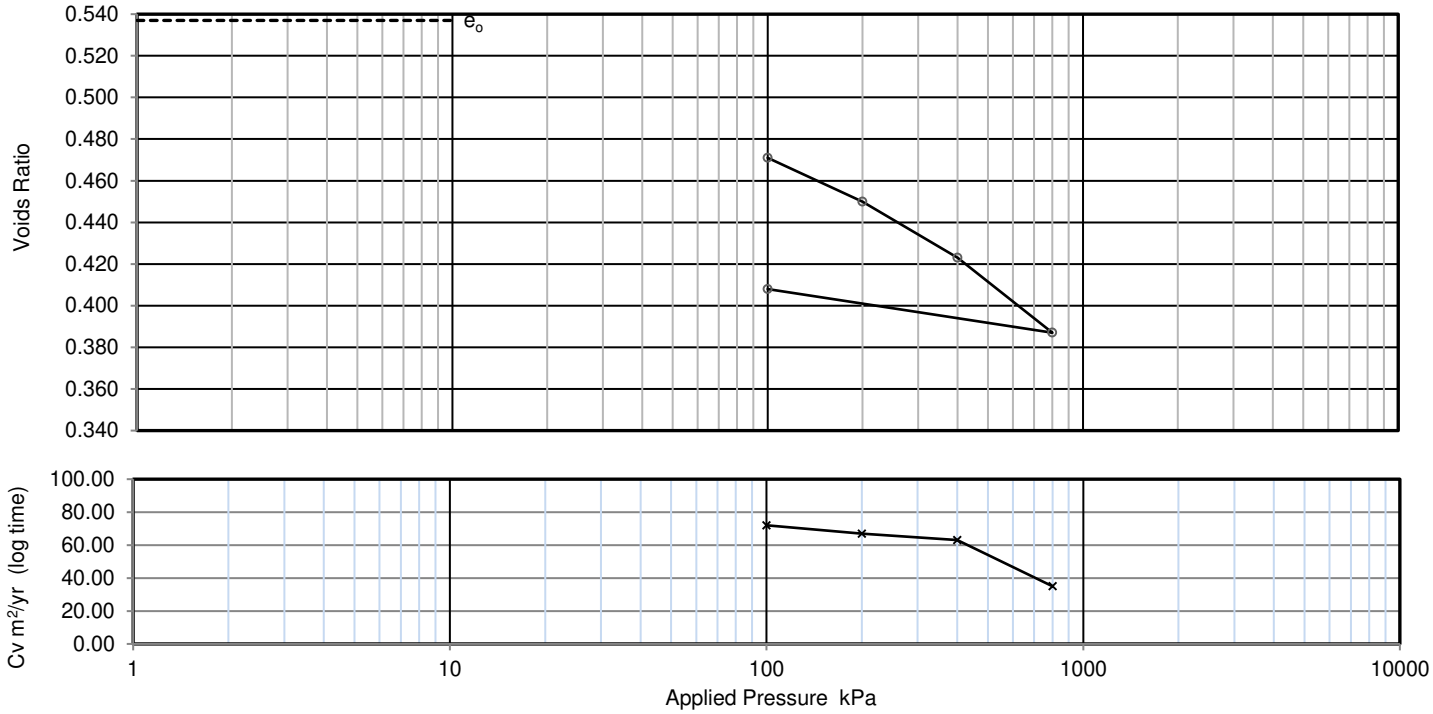
Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03/2021
Date Received: 23/03/2021
Date Tested: 14/04/2021
Sampled By: Client

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

Test Results:

Laboratory Reference: 1812968
Hole No.: SA103
Sample Reference: Not Given
Sample Description: Dark brown slightly clayey very silty SAND

Depth Top [m]: 1.00
Depth Base [m]: Not Given
Sample Type: B



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.537	-	-	-	-
100	0.471	0.43	72	95	0.0013
200	0.450	0.14	67	71	0.00043
400	0.423	0.092	63	56	0.00063
800	0.387	0.063	35	60	N/A
100	0.408	0.021			

Preparation

Index tests

Orientation of the sample	N/A		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	19.97	18.30	mm
Moisture Content	18	17	%
Bulk density	2.04	2.20	Mg/m3
Dry density	1.72	1.88	Mg/m3
Voids Ratio	0.537	0.408	
Saturation	90	110	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks: Test carried out on lump
Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 172.15

TEST CERTIFICATE

Shear Strength using the Small Shearbox Apparatus

Tested in Accordance with:
BS 1377-7: 1990: Clause 4.5.4

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

UKAS TESTING 4041

Environmental Science

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	13/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

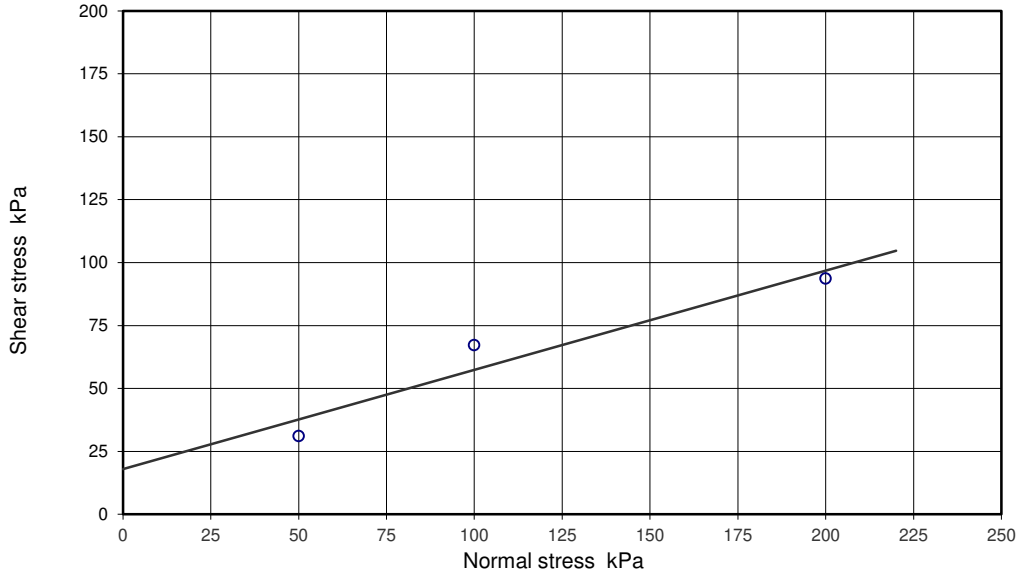
Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		

Preparation Details

Specimen Details	Test No.	1	2	3				
Initial	Height	20.1	20.1	20.1				mm
	Length	60.0	60.0	60.0				mm
	Breadth	60.0	60.0	60.0				mm
	Particle Density - (assumed)	2.65	2.65	2.65				Mg/m³
	Bulk Density	1.83	1.83	1.83				Mg/m³
	Moisture Content	11.8	11.8	11.8				%
	Dry density	1.64	1.64	1.64				Mg/m³
	Voids ratio	0.616	0.616	0.616				
	Degree of Saturation	51	51	51				%
Consolidation	Consolidation / Normal Stress applied	50	100	200				kPa
	Change in height during consolidation	0.980	1.280	1.840				mm
	Voids ratio after consolidation	0.537	0.513	0.468				
After test	Final Moisture content	20.4	19.5	18.4				%

Shearing stage(s)

Rate of displacement	Peak	1.00000	1.00000	1.00000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	4.03	4.98	3.13				mm
	Shear stress	31.1	67.2	93.6				kPa
	Vertical Movement at peak shear stress	0.43	0.40	0.32				mm
Residual values, (x)	No. of traverses (including peak run)	1	1	1				
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	18	-
Ø '	degrees	21.5	-

Residual strength, (x)

c 'R	kPa	not assessed	-
Ø 'R	degrees	not assessed	-

Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 174.10

TEST CERTIFICATE

Shear Strength using the Small Shearbox Apparatus

Tested in Accordance with:
BS 1377-7: 1990: Clause 4.5.4

UKAS TESTING
4041

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

Environmental Science

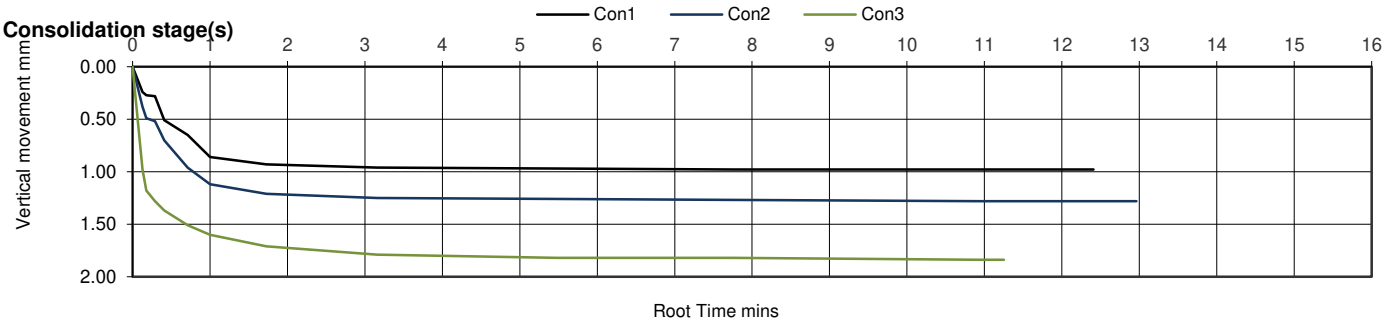
Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	13/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

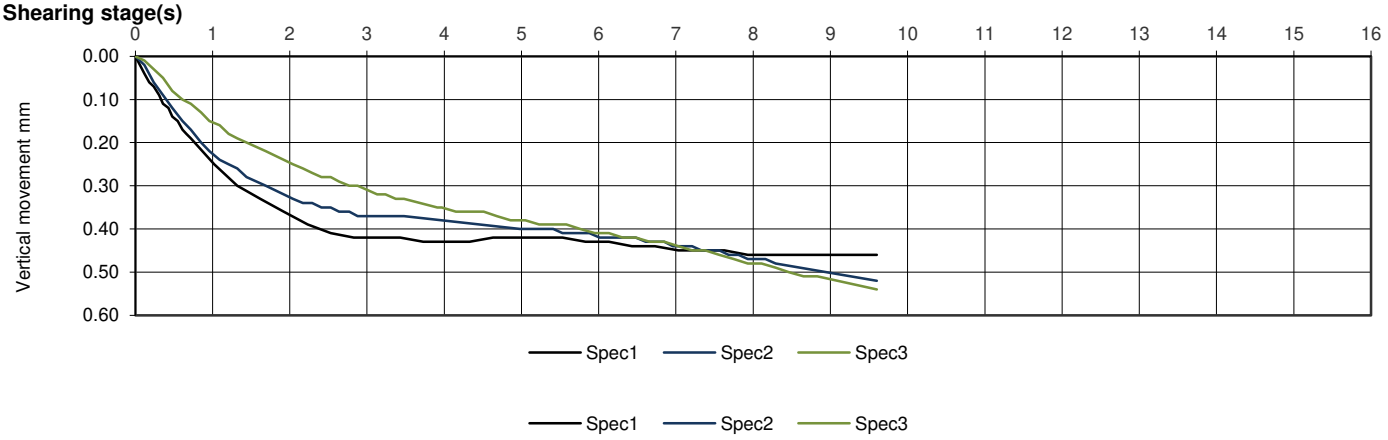
Test Results:

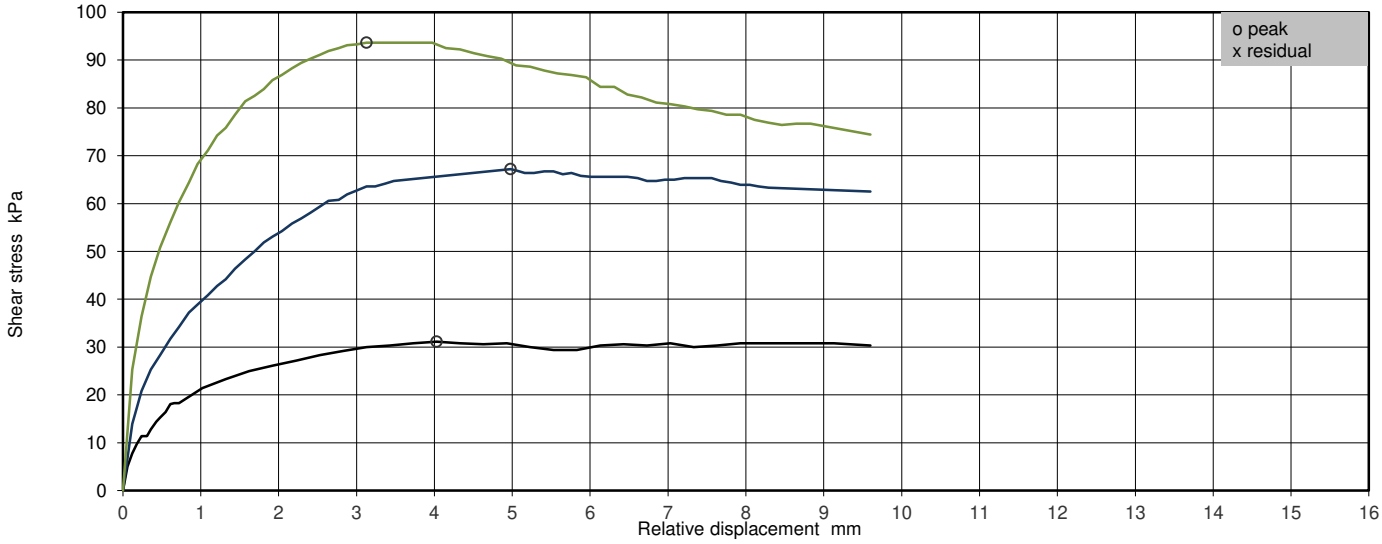
Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		

Consolidation stage(s)



Shearing stage(s)





Remarks: Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 174.10

TEST CERTIFICATE

Shear Strength using

the Small Shearbox Apparatus

Tested in Accordance with:
BS 1377-7: 1990: Clause 4.5.4

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

UKAS TESTING 4041

Environmental Science

Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	19/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

Test Results:

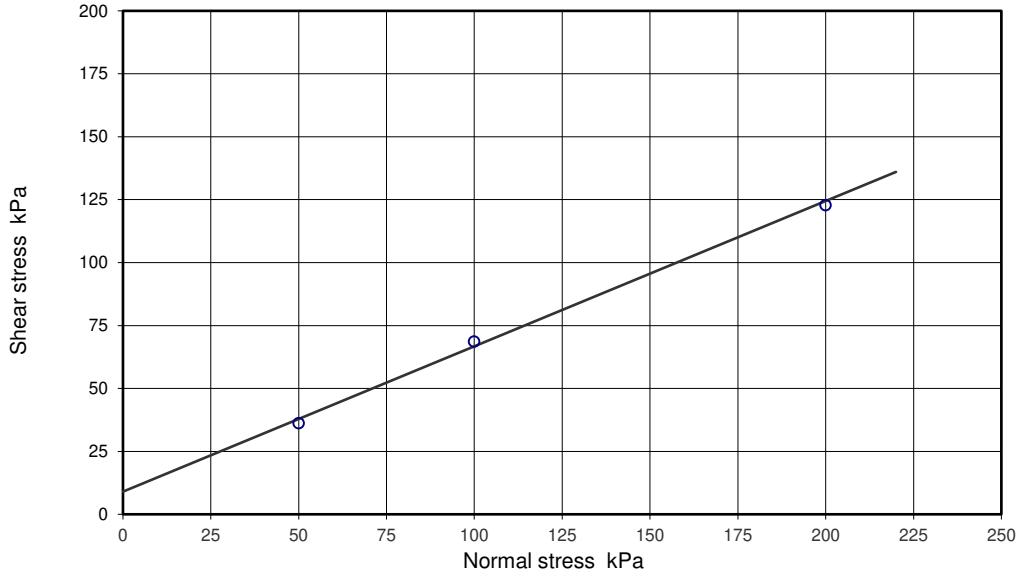
Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		

Preparation Details

Specimen Details	Test No.	1	2	3				
Initial	Height	20.1	20.1	20.1				mm
	Length	60.0	60.0	60.0				mm
	Breadth	60.0	60.0	60.0				mm
	Particle Density - (assumed)	2.65	2.65	2.65				Mg/m³
	Bulk Density	1.94	1.94	1.94				Mg/m³
	Moisture Content	12.7	12.7	12.7				%
	Dry density	1.72	1.72	1.72				Mg/m³
	Voids ratio	0.541	0.541	0.541				
	Degree of Saturation	62	62	62				%
Consolidation	Consolidation / Normal Stress applied	50	100	200				kPa
	Change in height during consolidation	0.240	0.830	0.930				mm
	Voids ratio after consolidation	0.523	0.477	0.470				
After test	Final Moisture content	19.8	19.6	19.2				%

Shearing stage(s)

Rate of displacement	Peak	0.07620	0.07620	0.07620				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	2.53	7.81	3.43				mm
	Shear stress	36.1	68.6	122.8				kPa
	Vertical Movement at peak shear stress	0.15	0.19	0.16				mm
Residual values, (x)	No. of traverses (including peak run)	1	1	1				
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	9.0	-
Ø '	degrees	30.0	-

Residual strength, (x)

c 'R	kPa	not assessed	-
Ø 'R	degrees	not assessed	-

Remarks: Test carried out in accordance with Specification for Highway Works Series 600 Clause 636 Cohesive Material – sample recompacted at optimum moisture content to 92 % ± 2% maximum dry density; immersed for 1 day; consolidated for 1 day; shearing speed determined based on consolidation graph. Re-issue 1: Additional results of TXL

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

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 174.10

TEST CERTIFICATE

Shear Strength using the Small Shearbox Apparatus

Tested in Accordance with:
BS 1377-7: 1990: Clause 4.5.4

UKAS TESTING
4041

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

Environmental Science

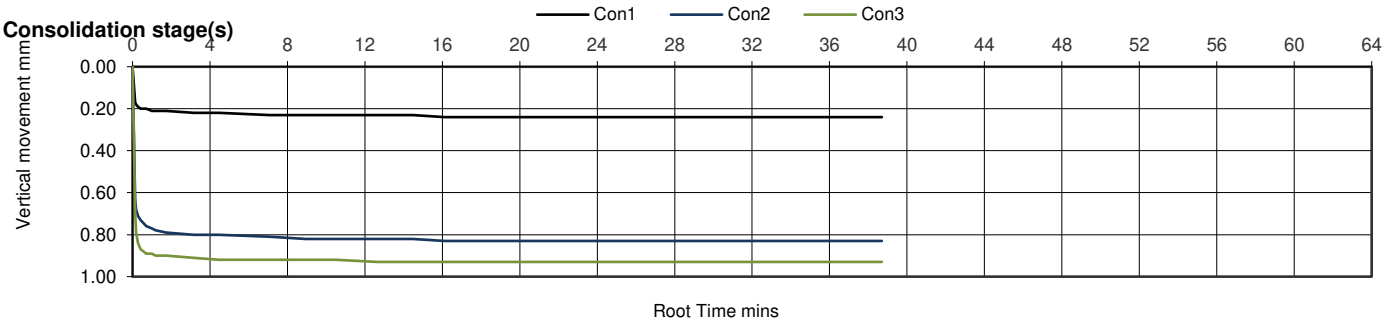
Client:	CURTINS	Client Reference:	076686-MSCP
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	21-64337
		Date Sampled:	19/03/2021
		Date Received:	23/03/2021
Contact:	Philippa Neesham	Date Tested:	19/04/2021
Site Address:	North Manchester General Hospital	Sampled By:	Client

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

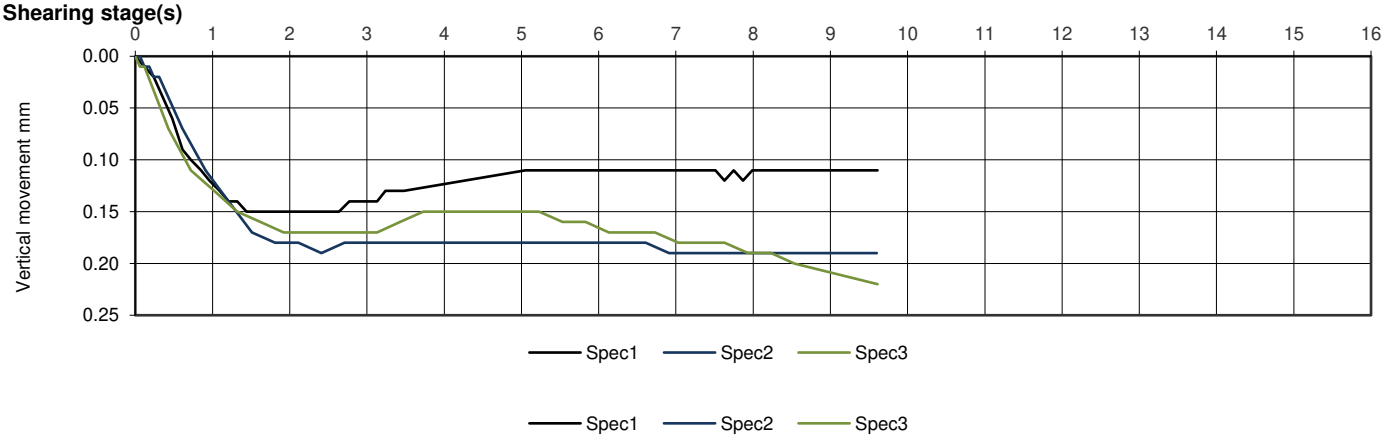
Test Results:

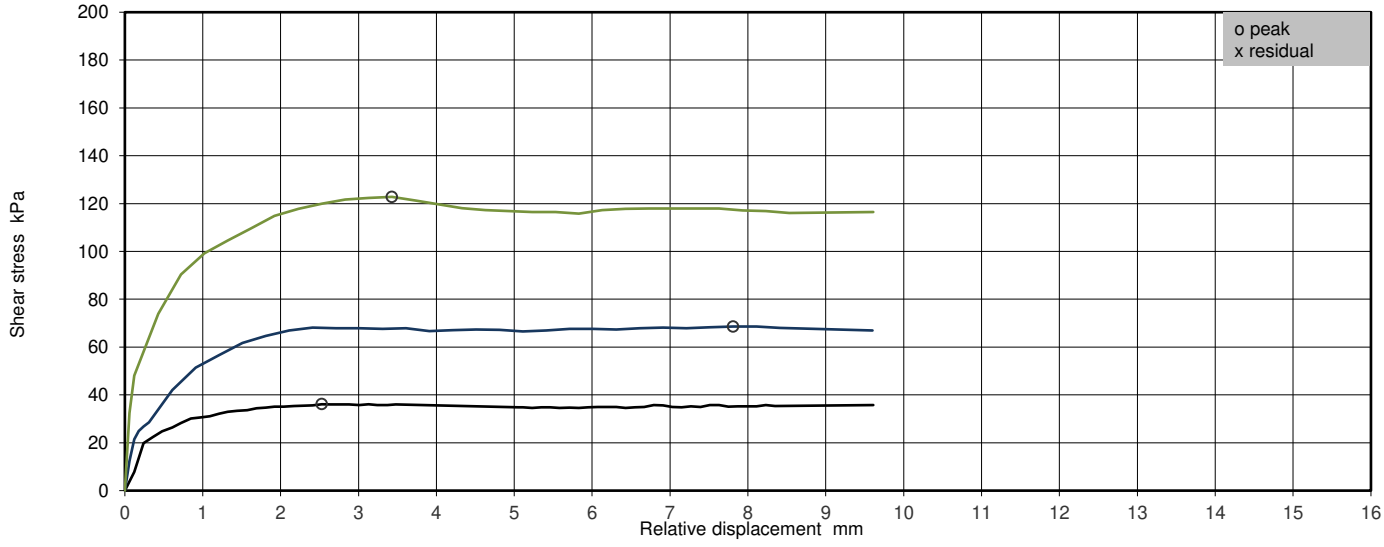
Laboratory Reference:	1812966	Depth Top [m]:	1.35
Hole No.:	SA101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly slightly clayey silty SAND		

Consolidation stage(s)



Shearing stage(s)





Remarks: Test carried out in accordance with Specification for Highway Works Series 600 Clause 636 Cohesive Material – sample recompacted at optimum moisture content to 92 % ± 2% maximum dry density; immersed for 1 day; consolidated for 1 day; shearing speed determined based on consolidation graph. Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 174.10

TEST CERTIFICATE

Unconsolidated Undrained Triaxial Compression

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

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG
Contact: Philippa Neesham
Site Address: North Manchester General Hospital

Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03/2021
Date Received: 23/03/2021
Date Tested: 09/04/2021
Sampled By: Client

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

Test Results:

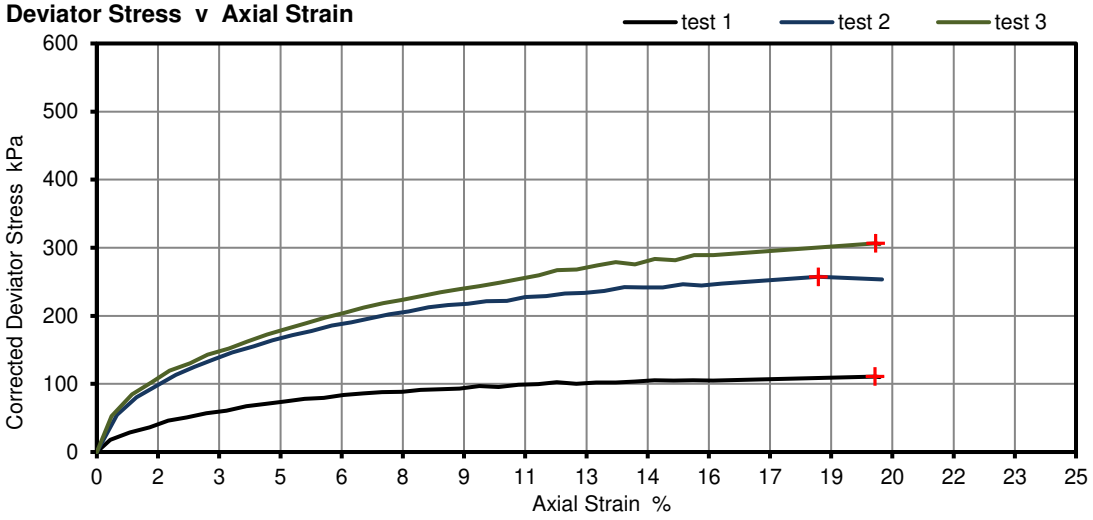
Laboratory Reference: 1812967
Hole No.: SA102
Sample Reference: Not Given
Sample Description: Dark brown slightly gravelly sandy clayey SILT

Depth Top [m]: 1.25
Depth Base [m]: Not Given
Sample Type: B

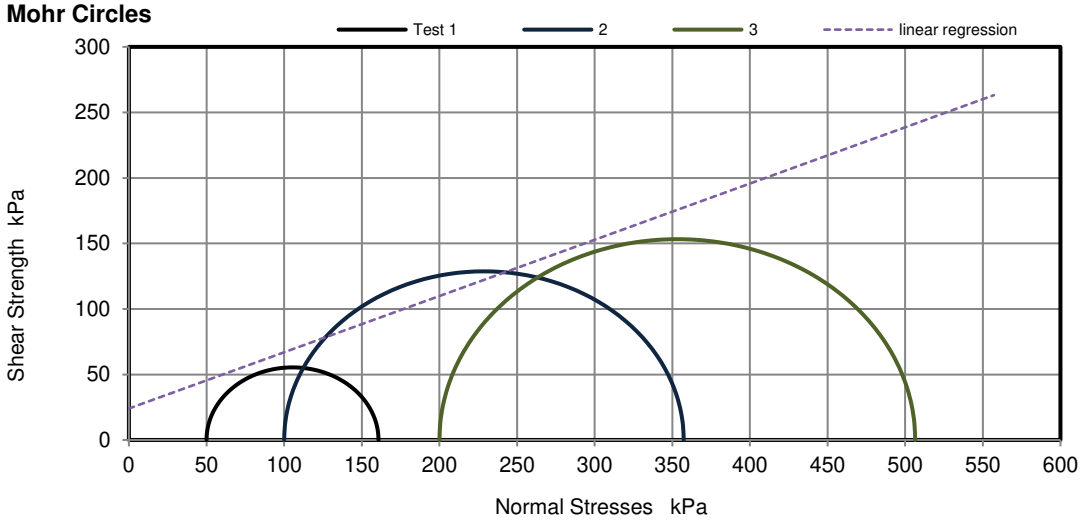
Test Number	1	2	3	
Length	75.79	75.72	77.00	mm
Diameter	37.46	37.05	37.37	mm
Bulk Density	2.09	2.07	2.10	Mg/m3
Moisture Content	17	17	17	%
Dry Density	1.79	1.77	1.79	Mg/m3
Membrane Correction	2.65	2.13	2.46	kPa

Rate of Strain	2.00	2.00	2.00	%/min
Cell Pressure	50	100	200	kPa
Axial Strain at failure	19.9	18.4	19.9	%
Deviator Stress, (σ1 - σ3)f	111	257	306	kPa
Shear strength, cu	55	129	153	kPa
Mode of failure	Compound	Compound	Compound	
Membrane thickness	0.26	0.22	0.24	mm

Deviator Stress v Axial Strain



Mohr Circles



Test 1



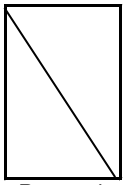
Test 2



Test 3



Position within sample



Linear Regression:
ϕu 23.2 °
cu 24 kPa

Note: Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Remarks: Recompacted at NMC.
Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 185.11

TEST CERTIFICATE

Unconsolidated Undrained Triaxial Compression

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

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: CURTINS
Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG
Contact: Philippa Neesham
Site Address: North Manchester General Hospital

Client Reference: 076686-MSCP
Job Number: 21-64337
Date Sampled: 18/03/2021
Date Received: 23/03/2021
Date Tested: 09/04/2021
Sampled By: Client

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

Test Results:

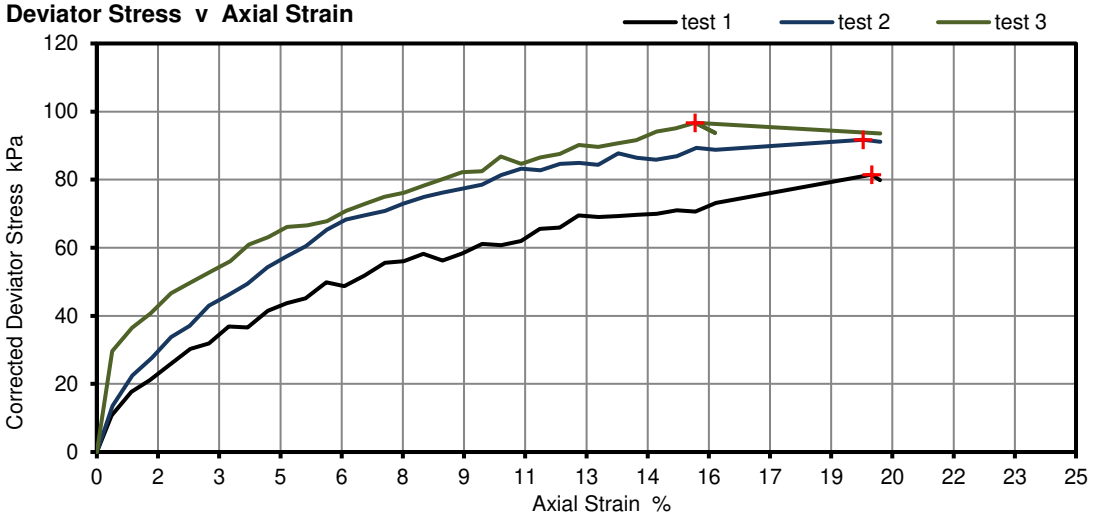
Laboratory Reference: 1812968
Hole No.: SA103
Sample Reference: Not Given
Sample Description: Dark brown slightly clayey very silty SAND

Depth Top [m]: 1.00
Depth Base [m]: Not Given
Sample Type: B

Test Number	1	2	3	
Length	77.87	77.53	76.59	mm
Diameter	37.64	37.34	37.55	mm
Bulk Density	2.07	2.09	2.10	Mg/m3
Moisture Content	19	19	19	%
Dry Density	1.73	1.75	1.76	Mg/m3
Membrane Correction	2.13	2.33	1.97	kPa

Rate of Strain	2.00	2.00	2.00	%/min
Cell Pressure	50	100	200	kPa
Axial Strain at failure	19.8	19.6	15.3	%
Deviator Stress, (σ1 - σ3)f	81	92	97	kPa
Shear strength, cu	41	46	48	kPa
Mode of failure	Compound	Compound	Compound	
Membrane thickness	0.21	0.23	0.24	mm

Deviator Stress v Axial Strain



Test 1



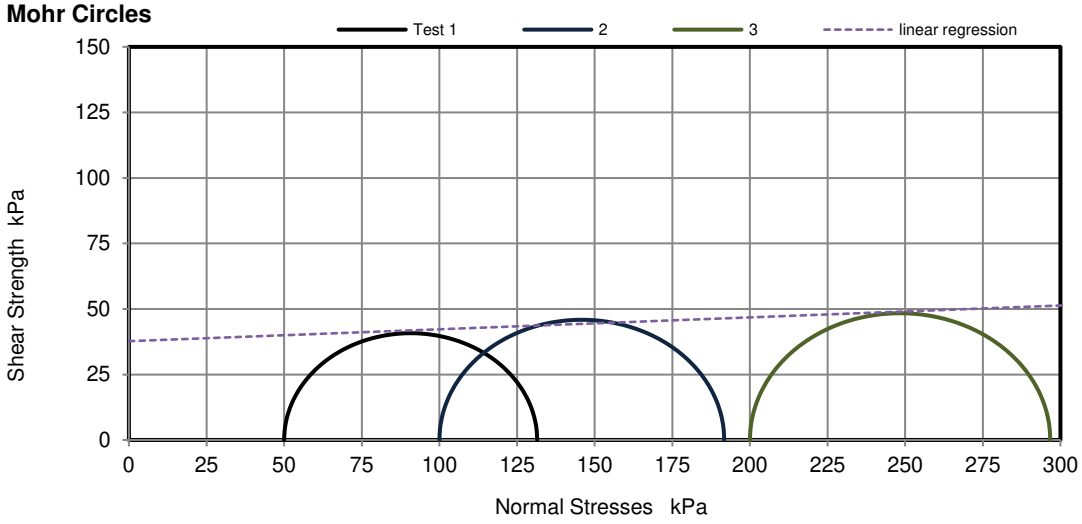
Test 2



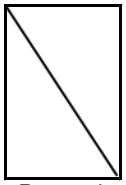
Test 3



Mohr Circles



Position within sample



Linear Regression:
ϕu 2.6 °
cu 38 kPa

Note: Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Remarks: Recompacted at NMC.
Re-issue 1: Additional results of TXL

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Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 30/04/2021

GF 185.11

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ. Tel: 0191 482 8500 Fax: 0191 482 8520
washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2280514 / 2

Site: North Manchester General Hospital MSCP

Job Number: 2280514

Originating Client: Envirolab

Originating Reference: 21/04370

Date Sampled: Not Given

Date Scheduled: 28/04/2021

Date Testing Started: 04/05/2021

Date Testing Finished: 19/05/2021

Previous Reports		Amendments	Date Issued
1	Interim		14/05/2021

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 20/05/2021

Constructionline Part of Capita plc

Ian Farmer Associates (1998) Limited. Registered in England and Wales, No. 3661447.
Registered Office: Spring Lodge 172 Chester Road, Helsby, Frodsham, England, WA6 0AR.
Offices in: **Cornwall** (01872) 261775. **Coventry** (024) 7630 3422. **Harpenden** (01582) 460018. **Llanelli** (01554) 566566.
Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

IAN FARMER ASSOCIATES

Laboratory Test Report 2280514 / 2

Site: North Manchester General Hospital – MSCP **Job Number:** 2280514

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 %						
CP102	9.50	D7	19									Brown silty CLAY
CP102	15.50	U10	14	Sieved	90	15	30	18	12	-0.25	CL	Brown slightly gravelly, silty CLAY
CP104	24.50	D14	17	Sieved	77	21		NP				Brown gravelly, sandy SILT
CP105	3.00	D1	17	Sieved	94	18	32	14	18	0.21	CL	Brown slightly gravelly, slightly sandy, 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

UKAS TESTING 1464

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

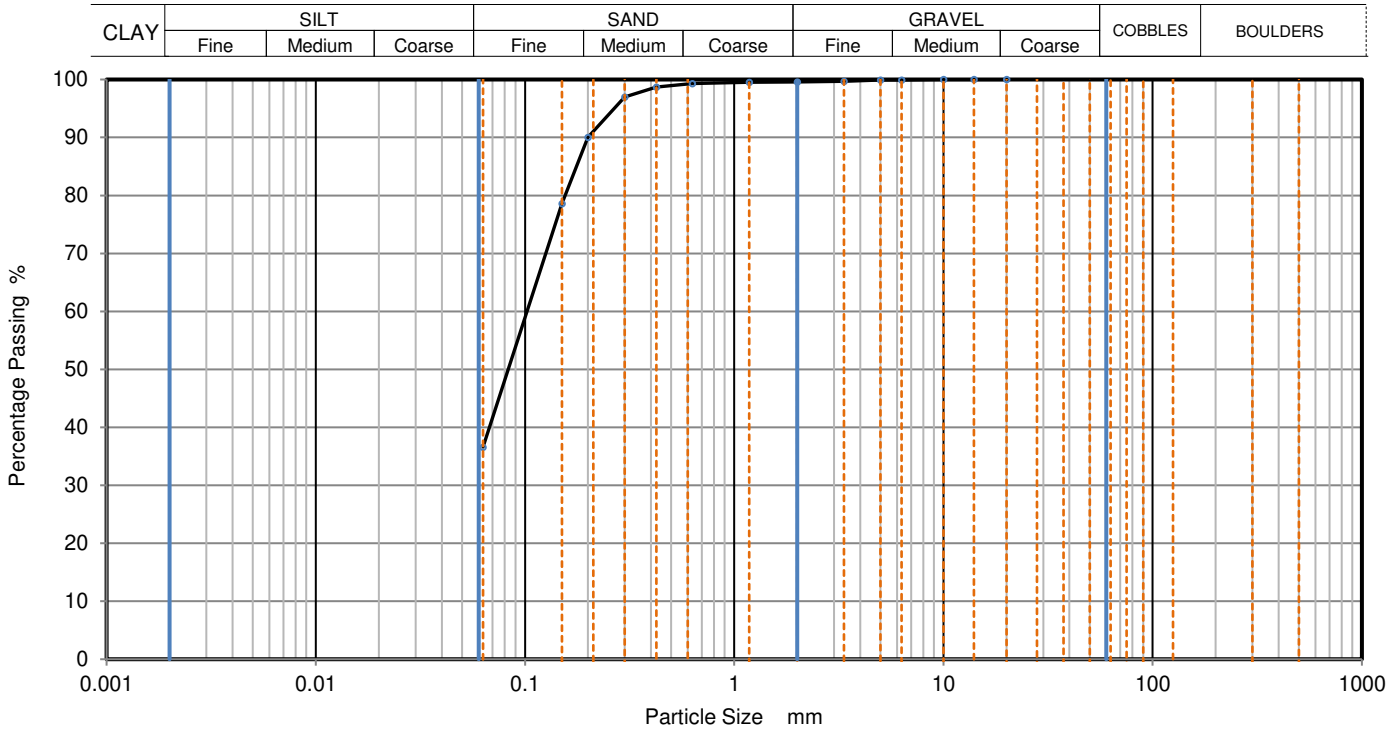
Laboratory Test Report 2280514 / 2

Site: North Manchester General Hospital – MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP102	4.00	B6	Wet Sieve	Brown silty, clayey 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	99		
0.3	97		
0.2	90		
0.15	79		
0.063	37		

Dry Mass of sample, g: 1339

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	63
Fines <0.063mm	37

Grading Analysis		
D100	mm	10
D60	mm	0.102
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

UKAS TESTING 1464

IAN FARMER ASSOCIATES

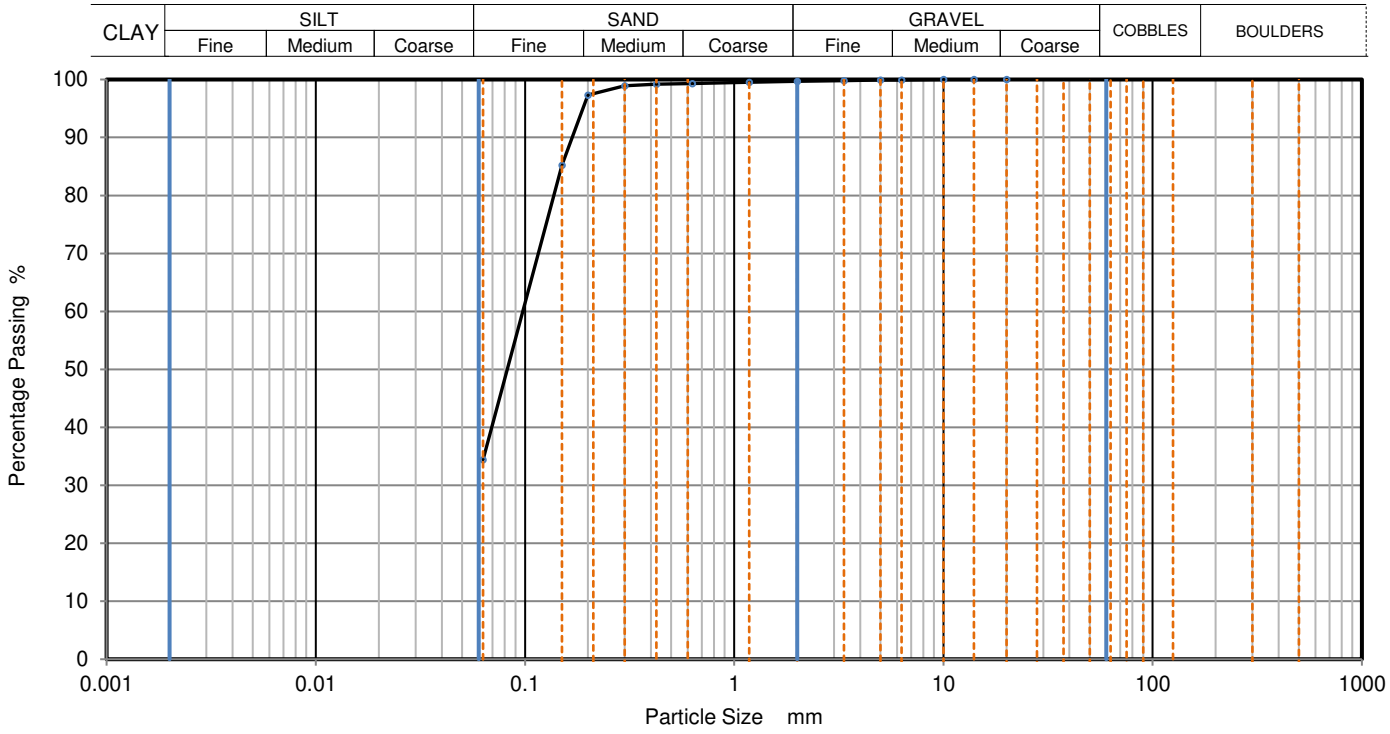
Laboratory Test Report 2280514 / 2

Site: North Manchester General Hospital – MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP104	2.50	B11	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	100		
1.18	100		
0.63	99		
0.425	99		
0.3	99		
0.2	97		
0.15	85		
0.063	34		

Dry Mass of sample, g: 979

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	65
Fines <0.063mm	34

Grading Analysis		
D100	mm	10
D60	mm	0.0976
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

UKAS TESTING 1464

IAN FARMER ASSOCIATES

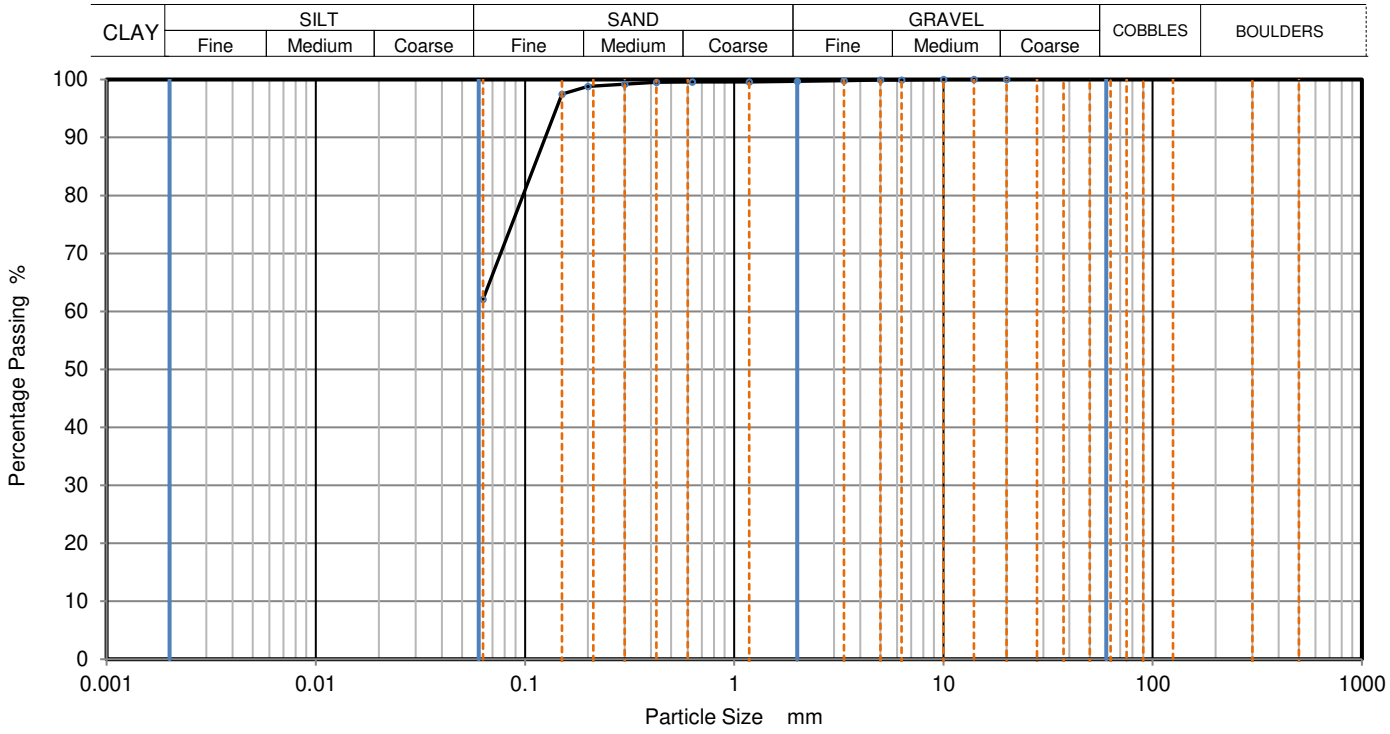
Laboratory Test Report 2280514 / 2

Site: North Manchester General Hospital – MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP105	11.00	B3	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	100		
0.425	100		
0.3	99		
0.2	99		
0.15	98		
0.063	62		

Dry Mass of sample, g: 1044

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	38
Fines <0.063mm	62

Grading Analysis		
D100	mm	10
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

UKAS TESTING 1464

IAN FARMER ASSOCIATES

Laboratory Test Report	2280514 / 2

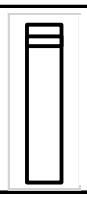
Site: North Manchester General Hospital MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 6

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

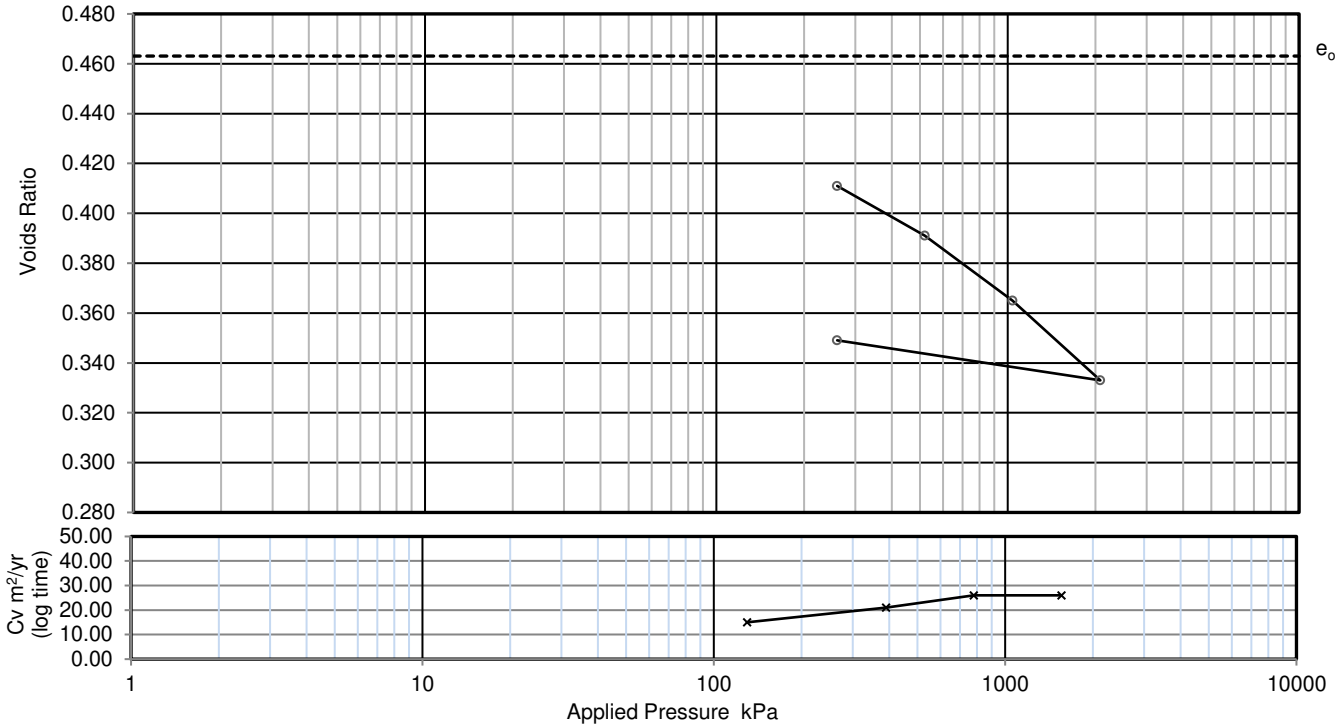
Borehole / Trial Pit	Depth (m)	Sample	Description
CP102	26.00	U8	Brown gravelly, sandy SILT

Initial Specimen



Length of Sample (mm)	300.00
Depth from top of specimen (mm)	30.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.97
Particle density (Mg/m³)	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	-	-	-	-	0.463
260	0.14	15	17	0.00079	0.411
520	0.053	21	39	0.0014	0.391
1,040	0.036	26	39	0.0017	0.365
2,080	0.022	26	40	0.0019	0.333
260	0.0066				0.349

	Initial	Final
Height (mm)	19.14	17.65
Moisture Content (%)	19	16
Bulk density (Mg/m³)	2.16	2.29
Dry density (Mg/m³)	1.81	1.96
Voids Ratio	0.463	0.349
Degree of Saturation (%)	109	125

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280514 / 2

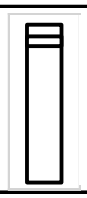
Site: North Manchester General Hospital MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 7

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

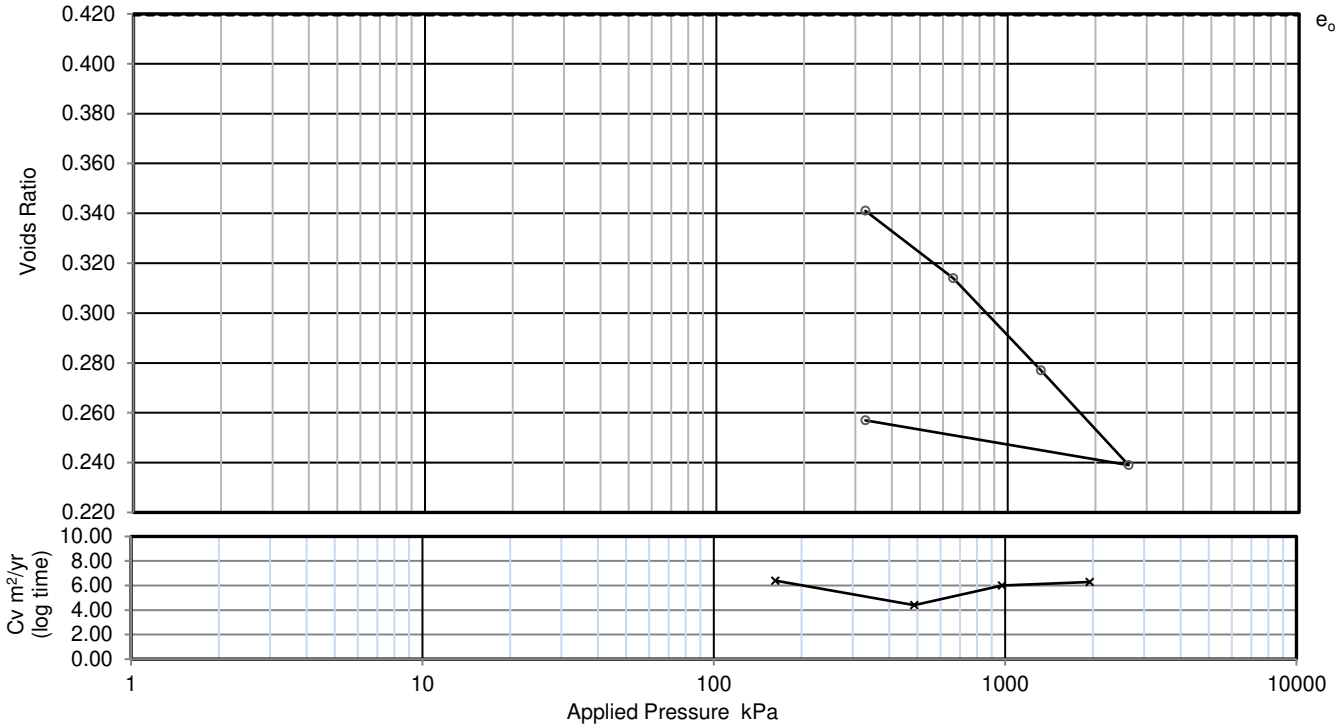
Borehole / Trial Pit	Depth (m)	Sample	Description
CP102	32.50	U9	Brown sandy, silty CLAY

Initial Specimen



Length of Sample (mm)	95.62
Depth from top of specimen (mm)	12.67
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.01
Particle density (Mg/m³)	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	-	-	-	-	0.420
325	0.17	6.4	14	0.001	0.341
650	0.06	4.4	7.6	0.0016	0.314
1,300	0.037	6	7.7	0.0019	0.277
2,600	0.023	6.3	7.5	0.0019	0.239
325	0.0064				0.257

	Initial	Final
Height (mm)	19.03	16.84
Moisture Content (%)	18	15
Bulk density (Mg/m³)	2.20	2.42
Dry density (Mg/m³)	1.87	2.11
Voids Ratio	0.420	0.257
Degree of Saturation (%)	112	152

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280514 / 2

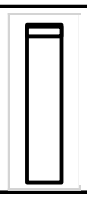
Site: North Manchester General Hospital MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 8

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

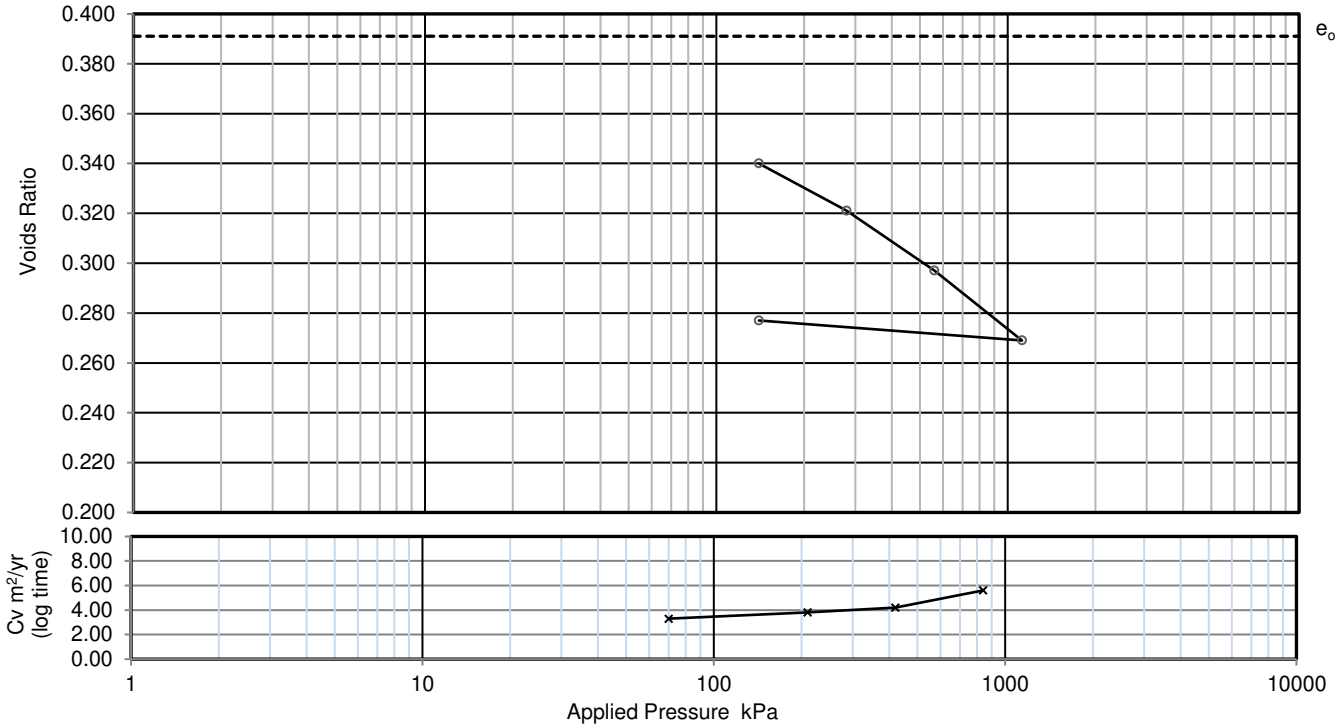
Borehole / Trial Pit	Depth (m)	Sample	Description
CP104	14.00	U12	Brown sandy, silty CLAY

Initial Specimen



Length of Sample (mm)	214.62
Depth from top of specimen (mm)	12.75
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.02
Particle density (Mg/m³)	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	-	-	-	-	0.391
140	0.26	3.3	8.2	0.00084	0.340
280	0.1	3.8	7.3	0.0013	0.321
560	0.066	4.2	9.1	0.0011	0.297
1,120	0.038	5.6	9	0.0014	0.269
140	0.0067				0.277

	Initial	Final
Height (mm)	20.00	18.37
Moisture Content (%)	15	12
Bulk density (Mg/m³)	2.19	2.33
Dry density (Mg/m³)	1.91	2.07
Voids Ratio	0.391	0.277
Degree of Saturation (%)	101	117

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280514 / 2

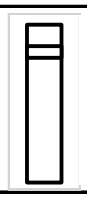
Site: North Manchester General Hospital MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 9

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

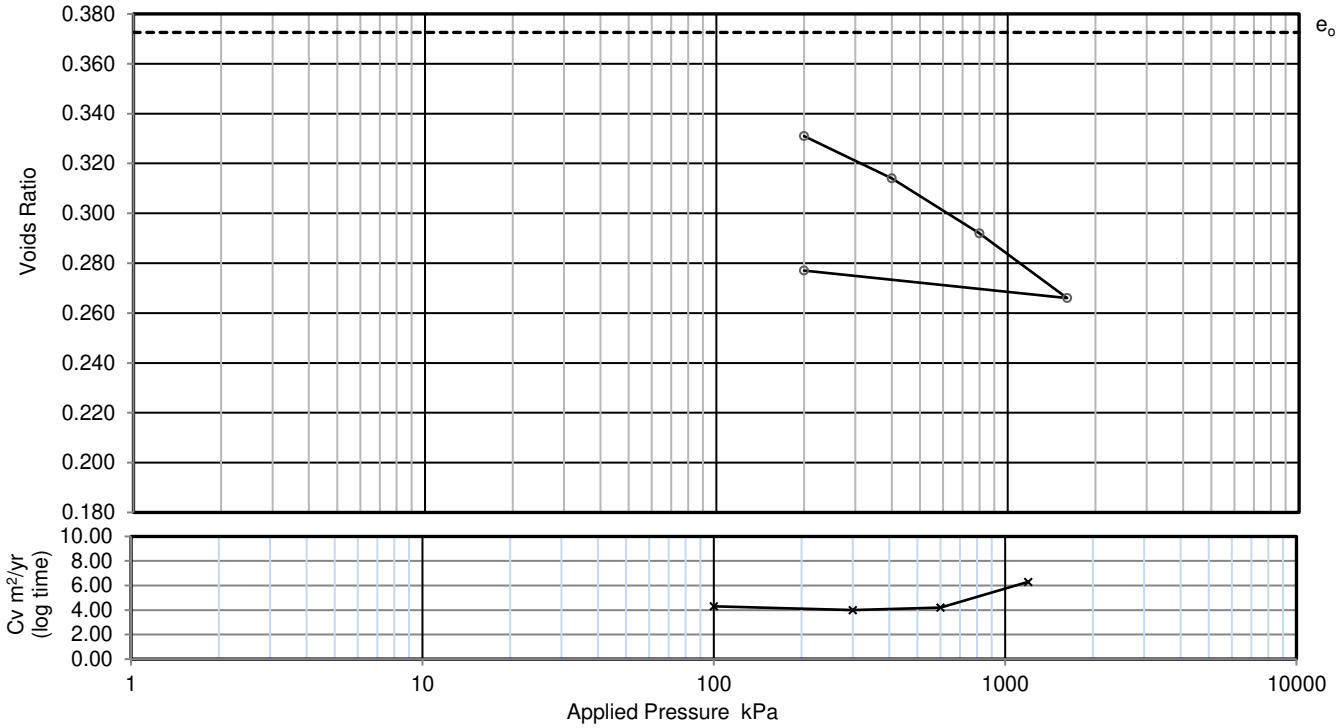
Borehole / Trial Pit	Depth (m)	Sample	Description
CP104	20.00	U13	Brown sandy, silty CLAY

Initial Specimen



Length of Sample (mm)	91.00
Depth from top of specimen (mm)	15.63
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.01
Particle density (Mg/m³)	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	-	-	-	-	0.373
200	0.15	4.3	12	0.0005	0.331
400	0.061	4	7.7	0.001	0.314
800	0.043	4.2	7.6	0.001	0.292
1,600	0.026	6.3	9.5	0.0016	0.266
200	0.0065				0.277

	Initial	Final
Height (mm)	19.98	18.59
Moisture Content (%)	15	13
Bulk density (Mg/m³)	2.22	2.35
Dry density (Mg/m³)	1.93	2.08
Voids Ratio	0.373	0.277
Degree of Saturation (%)	107	125

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280514 / 2

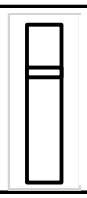
Site: North Manchester General Hospital MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 10

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

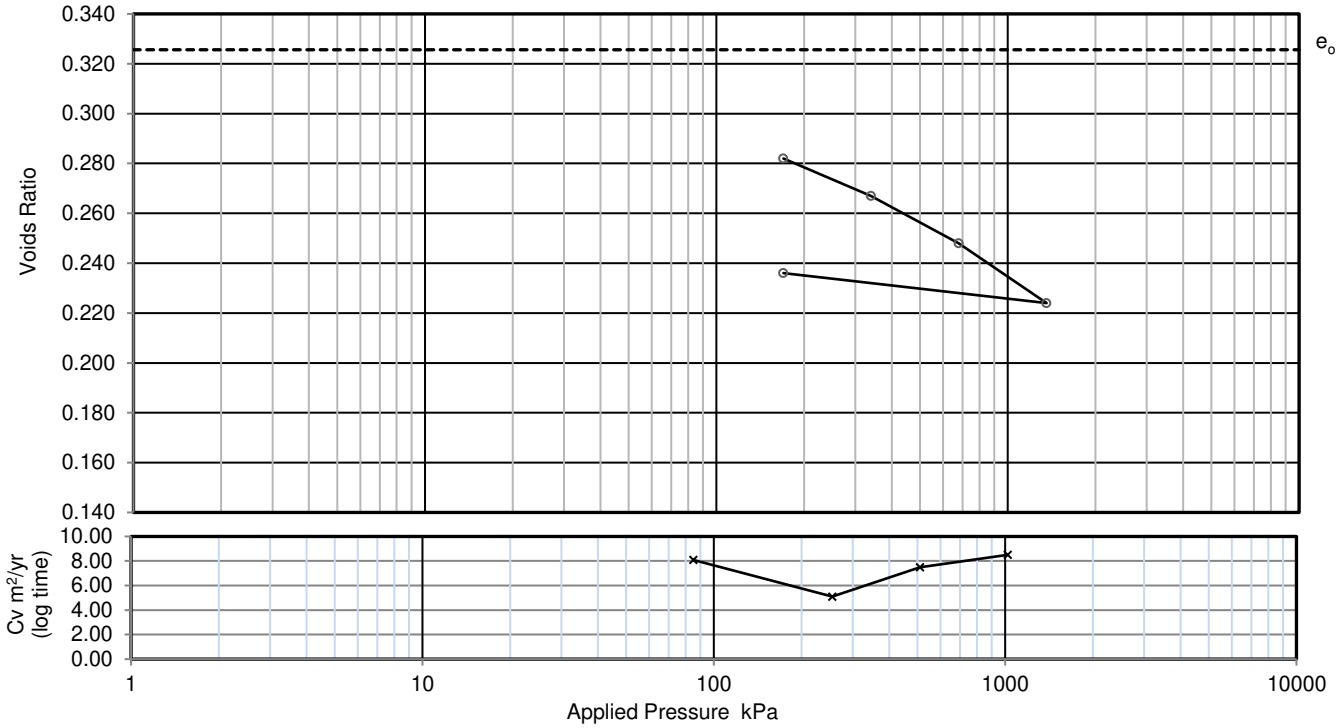
Borehole / Trial Pit	Depth (m)	Sample	Description
CP105	17.00	U4	Brown sandy, silty CLAY

Initial Specimen



Length of Sample (mm)	121.76
Depth from top of specimen (mm)	35.40
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.03
Particle density (Mg/m³)	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	-	-	-	-	0.326
170	0.19	8.1	14	0.0011	0.282
340	0.066	5.1	9.2	0.00079	0.267
680	0.045	7.5	12	0.0014	0.248
1,360	0.028	8.5	12	0.0017	0.224
170	0.0081				0.236

	Initial	Final
Height (mm)	19.10	17.81
Moisture Content (%)	14	12
Bulk density (Mg/m³)	2.28	2.41
Dry density (Mg/m³)	2.00	2.14
Voids Ratio	0.326	0.236
Degree of Saturation (%)	112	139

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280514 / 2

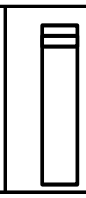
Site: North Manchester General Hospital MSCP **Job Number:** 2280514

Client: Envirolab **Page:** 11

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

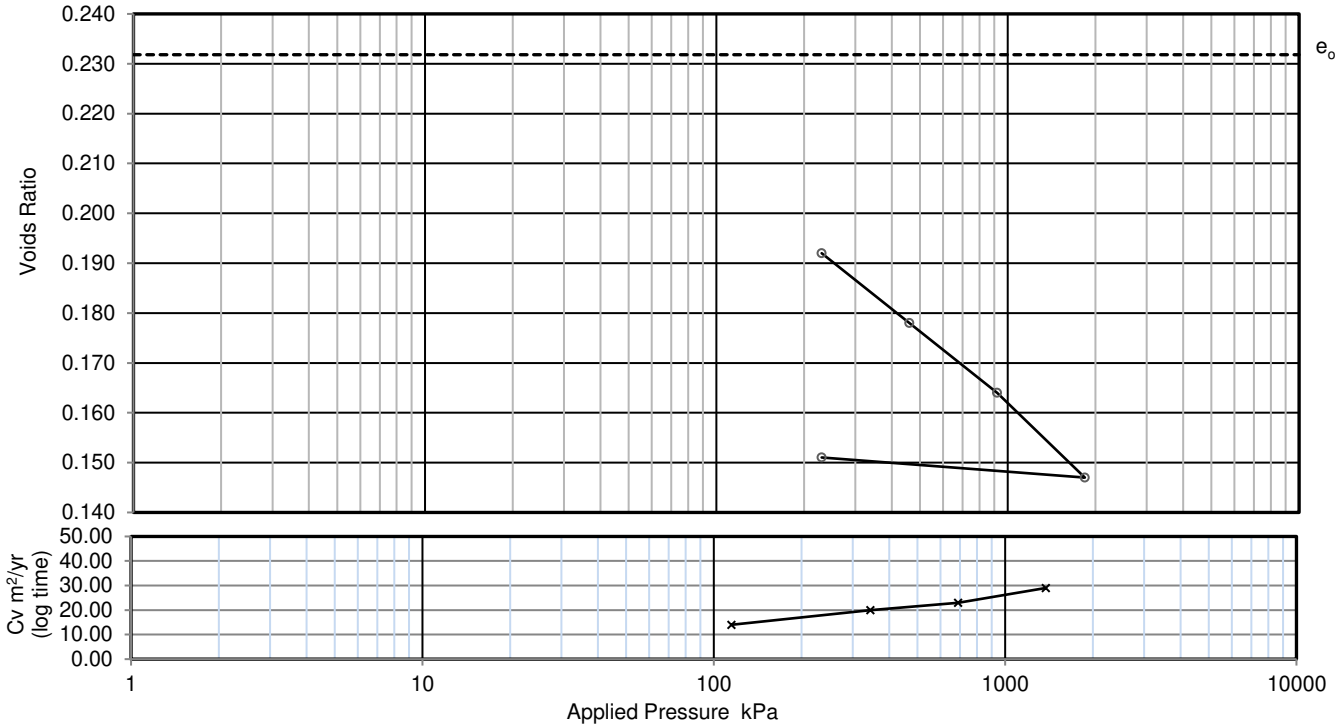
Borehole / Trial Pit	Depth (m)	Sample	Description
CP105	23.00	U5	Brown gravelly, sandy, silty CLAY

Initial Specimen



Length of Sample (mm)	249.68
Depth from top of specimen (mm)	32.92
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.90
Particle density (Mg/m³)	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	-	-	-	-	0.232
230	0.14	14	18	0.00087	0.192
460	0.051	20	23	0.00079	0.178
920	0.027	23	20	0.0011	0.164
1,840	0.015	29	23	0.0013	0.147
230	0.0019				0.151

	Initial	Final
Height (mm)	19.24	17.97
Moisture Content (%)	9.1	8.7
Bulk density (Mg/m³)	2.35	2.50
Dry density (Mg/m³)	2.15	2.30
Voids Ratio	0.232	0.151
Degree of Saturation (%)	104	153

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

Final Test Report - 2280514 / 2

Site:	North Manchester General Hospital MSCP
Job Number:	2280514
Originating Client:	Envirolab

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Report Issue Date: 20/05/2021

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F.A.O.

Final Test Report - 2280531 / 1

Site:	MSCP
Job Number:	2280531
Originating Client:	Envirolab
Originating Reference:	21/04852
Date Sampled:	Not Given
Date Scheduled:	07/05/2021
Date Testing Started:	17/05/2021
Date Testing Finished:	21/05/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 21/05/2021

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: MSCP **Job Number:** 2280531

Client: Envirolab **Page:** 2

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH105	46.68	C4	Brown SANDSTONE	99.1	101.5	*1	2.04	9.7	as received	0.5094	AC	7.2	
BH105	47.97	C6	Pink/Brown SANDSTONE	100.2	106.6	*1.1	2.05	13.9	as received	0.4986	AC	9.3	
BH105	48.82	C7	Brown SANDSTONE	100.3	85.7	*0.9	2.06	12.3	as received	0.4975	F	6.9	

Notes
1 ISRM p87 test 1, water content at 105 ± 3 oC, specimen as tested for UCS
2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density
3 ISRM p153 part 1, determination of Uniaxial Compressive Strength (UCS) of Rock Materials
above notes apply unless annotated otherwise in the remarks

*Denotes length diameter ratio outside ISRM specification

Mode of failure :
S - Single shear MS - multiple shear
AC - Axial cleavage F - Fragmented

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2280531 / 1

Site: MSCP **Job Number:** 2280531

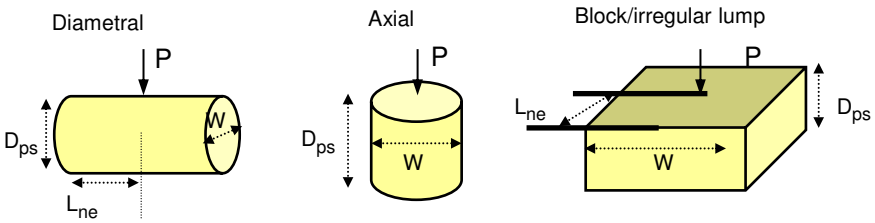
Client: Envirolab **Page:** 3

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH105	42.73	C1	Brown SANDSTONE As received	D	U	YES	19.0	102.0	102.0	96.0	0.2	102.0	0.02	0.03	
BH105	42.73	C1	Brown SANDSTONE As received	A	U	YES		100.6	35.6	8.6	0.2	67.5	0.05	0.06	
BH105	45.15	C2	Red/Brown SANDSTONE As received	D	U	YES	51.5	100.5	100.5	98.5	2.8	100.5	0.27	0.38	
BH105	45.15	C2	Red/Brown SANDSTONE As received	A	U	YES		100.2	64.7	60.7	2.1	90.9	0.26	0.34	
BH105	45.83	C3	Pink/Red SANDSTONE As received	D	U	YES	29.6	101.2	101.2	99.2	0.6	101.2	0.06	0.08	
BH105	45.83	C3	Pink/Red SANDSTONE As received	A	U	YES		100.4	85.7	81.7	1.2	104.7	0.11	0.15	
BH105	47.27	C5	Brown SANDSTONE As received	D	U	YES	67.1	100.6	100.6	97.6	1.2	100.6	0.12	0.16	
BH105	47.27	C5	Brown SANDSTONE As received	A	U	NO		100.4	78.1	72.1	1.5	99.9	0.15	0.20	
BH105	49.5	C8	Brown SANDSTONE As received	D	U	YES	119.3	100.5	100.5	98.5	1.0	100.5	0.10	0.14	
BH105	49.5	C8	Brown SANDSTONE As received	A	U	NO		100.4	110.9	95.9	3.3	119.0	0.23	0.35	

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 - 2280531 / 1

Site:	MSCP
Job Number:	2280531
Originating Client:	Envirolab

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Report Issue Date: 21/05/2021

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F.A.O.

Final Test Report - 2280547 / 1

Site:	NW GH
Job Number:	2280547
Originating Client:	Envirolab
Originating Reference:	21/05105
Date Sampled:	Not Given
Date Scheduled:	17/05/2021
Date Testing Started:	20/05/2021
Date Testing Finished:	07/06/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 07/06/2021

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IAN FARMER ASSOCIATES

Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

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 Water 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 %	Water Content %						
CP101	14.00	U	15.7									Brown slightly sandy, gravelly, silty CLAY
CP101	20.00	U	15.4									Brown gravelly, silty CLAY
CP101	23.50	D	7.2									Brown silty CLAY
CP103	3.00	B	22.8									Brown silty, clayey SAND
CP103	9.50	U	22.4									Brown slightly gravelly, silty CLAY
CP103	18.50	U	15.6									Brown silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution

UKAS TESTING 1464

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

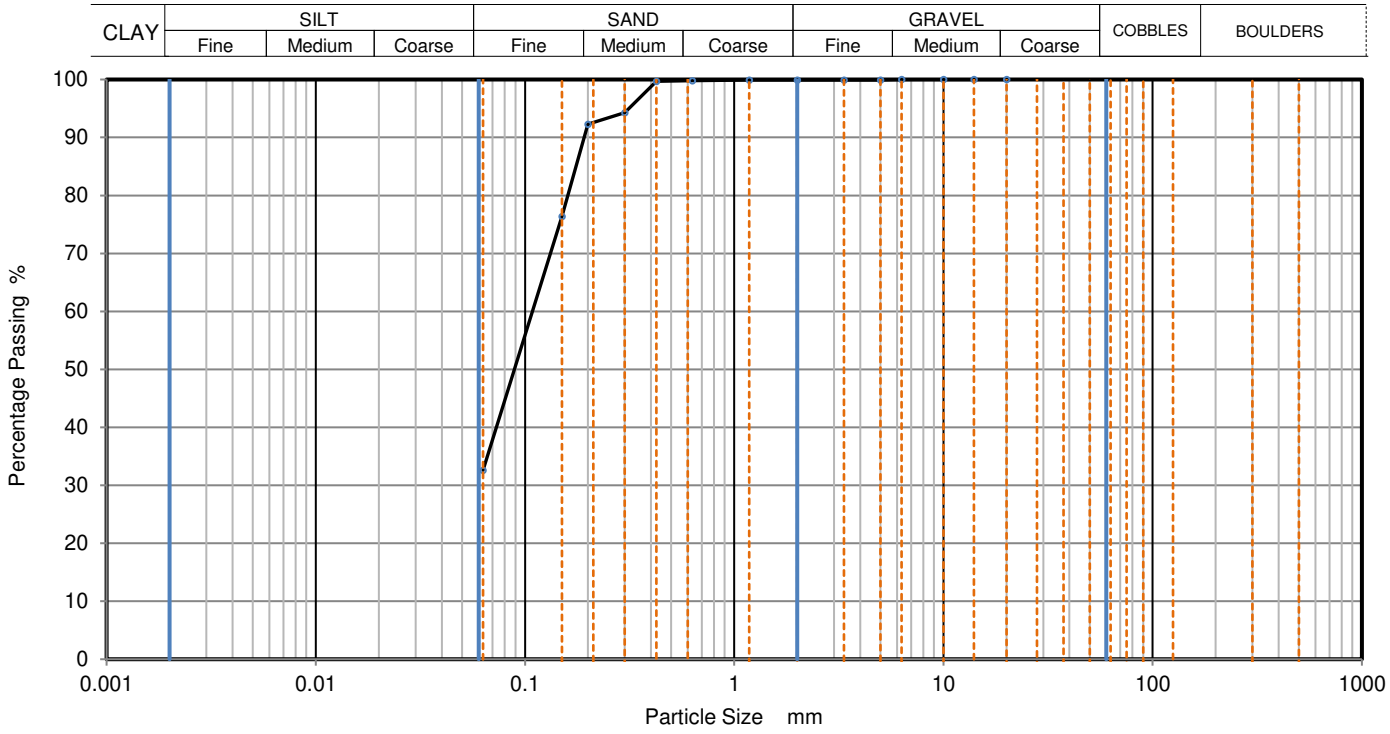
Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP101	6.50	B	Wet Sieve	Brown silty, clayey 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	100		
0.425	100		
0.3	94		
0.2	92		
0.15	76		
0.063	33		

Dry Mass of sample, g: 1357

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	67
Fines <0.063mm	33

Grading Analysis		
D100	mm	6.3
D60	mm	0.108
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

UKAS TESTING 1464

IAN FARMER ASSOCIATES

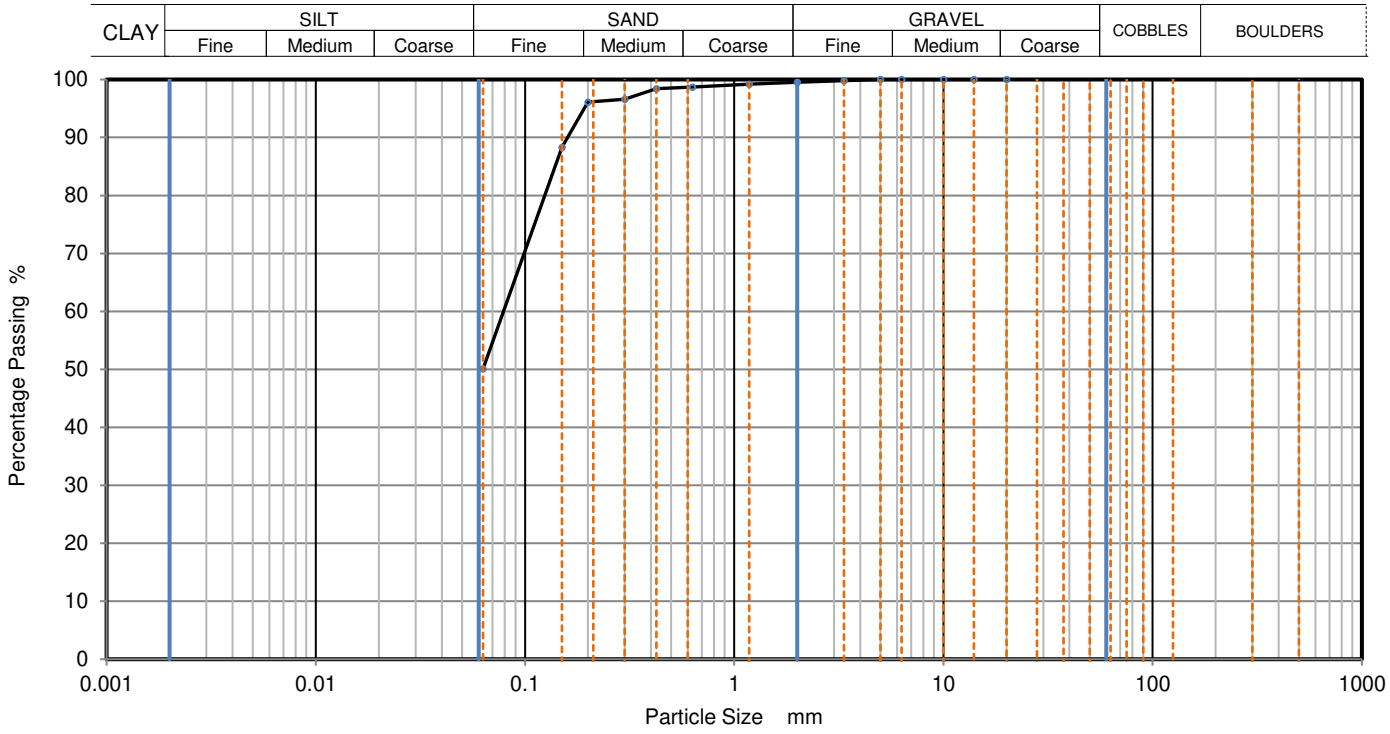
Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP103	3.00	B	Wet Sieve	Brown silty, clayey 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	99		
0.63	99		
0.425	98		
0.3	97		
0.2	96		
0.15	88		
0.063	50		

Dry Mass of sample, g: 1329

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	49
Fines <0.063mm	50

Grading Analysis		
D100	mm	5
D60	mm	0.0788
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

UKAS TESTING 1464

IAN FARMER ASSOCIATES

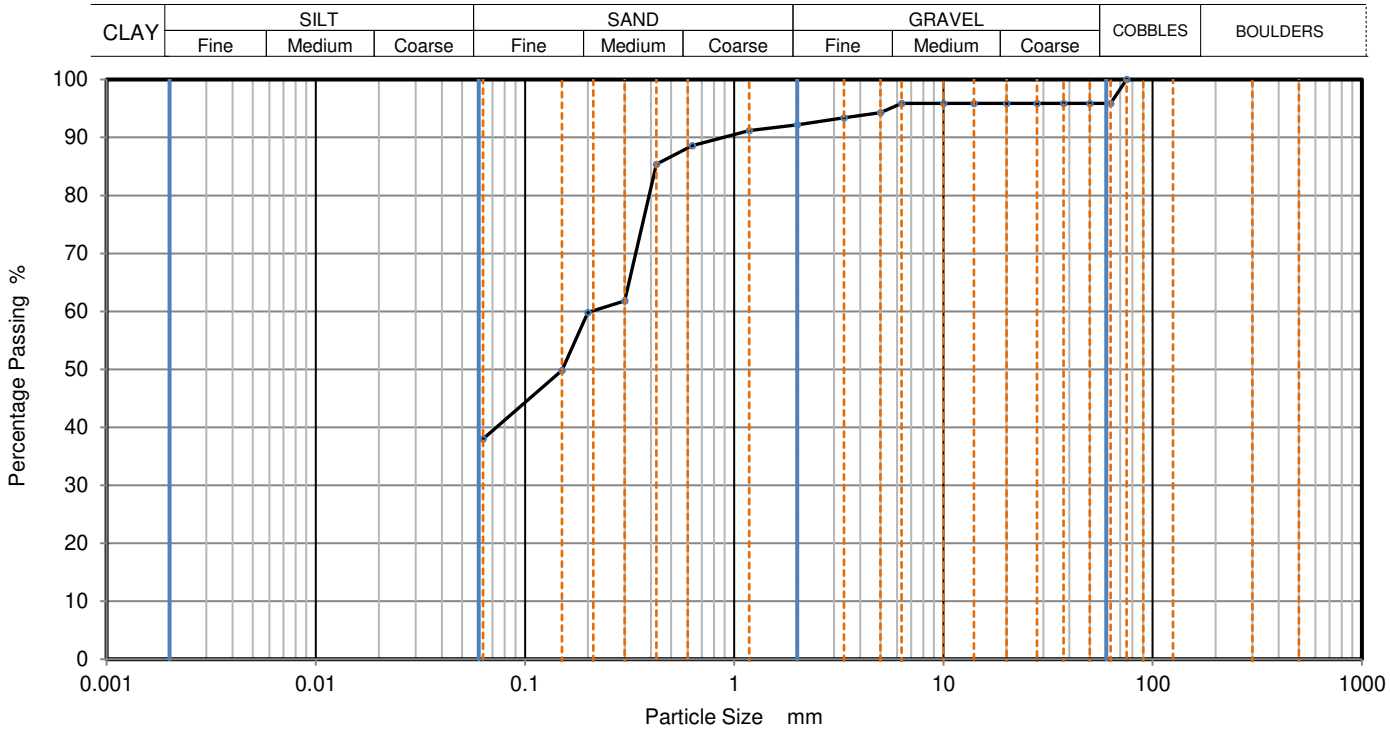
Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
CP103	23.50	B	Wet Sieve	Brown slightly gravelly, silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	96		
50	96		
37.5	96		
28	96		
20	96		
14	96		
10	96		
6.3	96		
5	94		
3.35	93		
2	92		
1.18	91		
0.63	89		
0.425	85		
0.3	62		
0.2	60		
0.15	50		
0.063	38		

Dry Mass of sample, g: 2029

Sample Proportions	% dry mass
Very coarse	4
Gravel	4
Sand	54
Fines <0.063mm	38

Grading Analysis		
D100	mm	75
D60	mm	0.207
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

UKAS TESTING 1464

IAN FARMER ASSOCIATES

Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 6

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

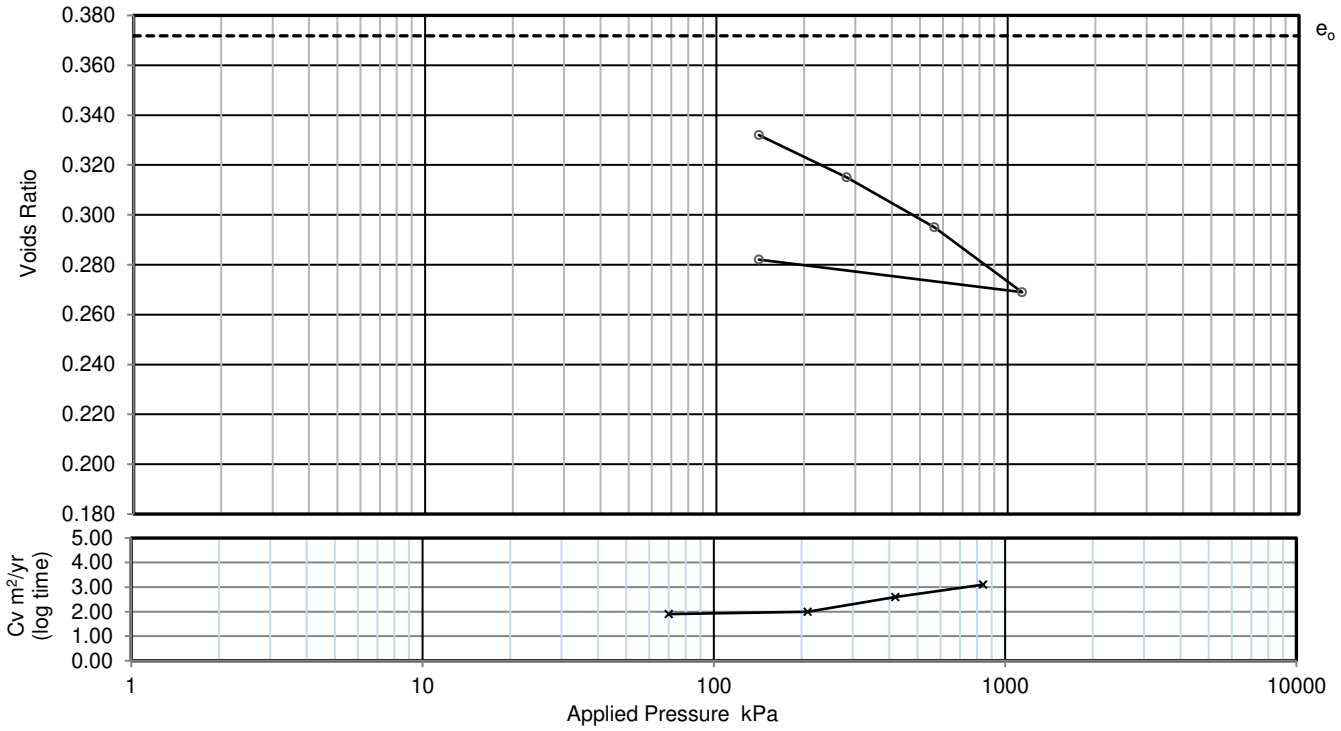
Borehole / Trial Pit	Depth (m)	Sample	Description
CP101	14.00	U	Brown slightly sandy, gravelly, silty CLAY

Initial Specimen



Length of Sample (mm)	363.45
Depth from top of specimen (mm)	41.05
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.97
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
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	-	-	-	-	0.372
140	0.21	1.9	7.8	0.00048	0.332
280	0.087	2	3.5	0.0007	0.315
560	0.056	2.6	4.6	0.0011	0.295
1,120	0.036	3.1	4.9	0.0015	0.269
140	0.011				0.282

	Initial	Final
Height (mm)	20.01	18.70
Moisture Content (%)	16	14
Bulk density (Mg/m³)	2.24	2.35
Dry density (Mg/m³)	1.93	2.07
Voids Ratio	0.372	0.282
Degree of Saturation (%)	113	128

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 7

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

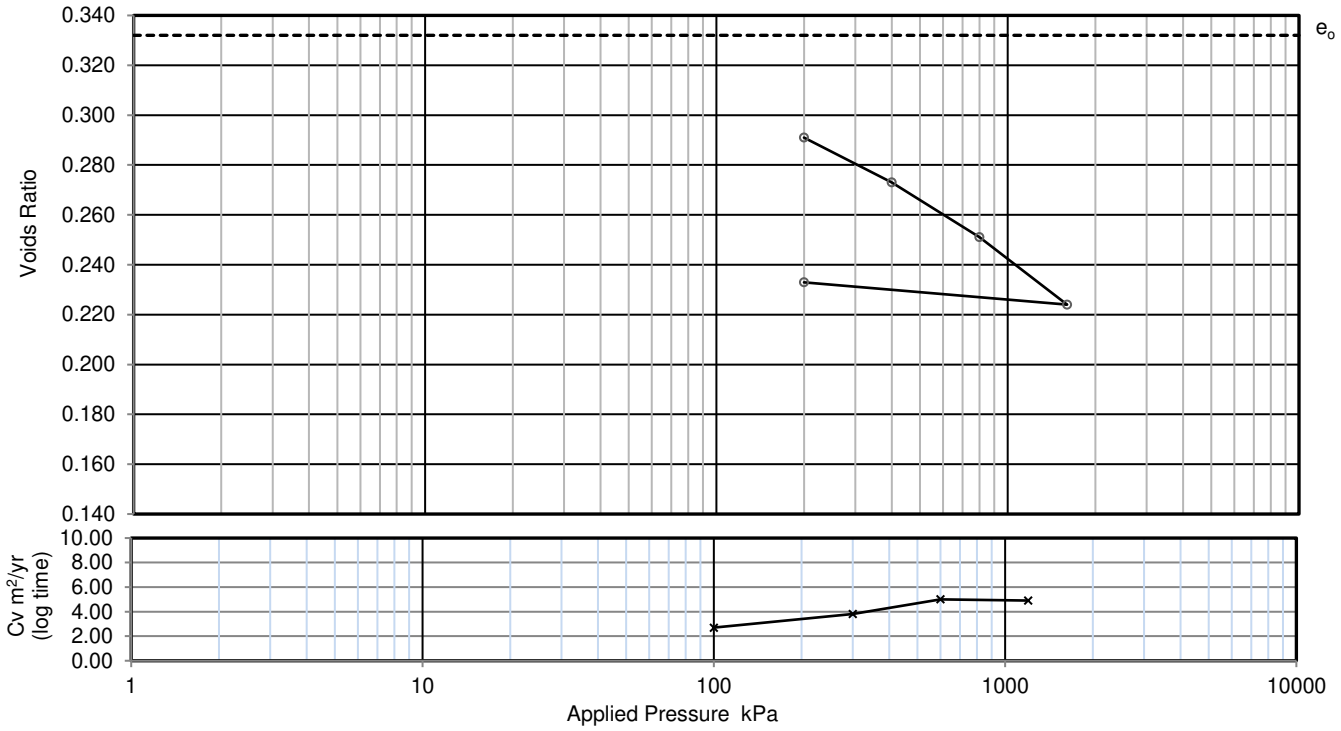
Borehole / Trial Pit	Depth (m)	Sample	Description
CP101	20.00	U	Brown gravelly, silty CLAY

Initial Specimen



Length of Sample (mm)	395.52
Depth from top of specimen (mm)	42.29
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.98
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
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	-	-	-	-	0.332
200	0.16	2.7	3.1	0.0008	0.291
400	0.068	3.8	7.1	0.00098	0.273
800	0.043	5	8.3	0.0014	0.251
1,600	0.026	4.9	8	0.0014	0.224
200	0.005				0.233

	Initial	Final
Height (mm)	19.01	17.59
Moisture Content (%)	16	13
Bulk density (Mg/m³)	2.30	2.42
Dry density (Mg/m³)	1.99	2.15
Voids Ratio	0.332	0.233
Degree of Saturation (%)	124	145

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2280547 / 1

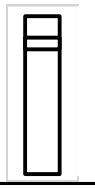
Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 8

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

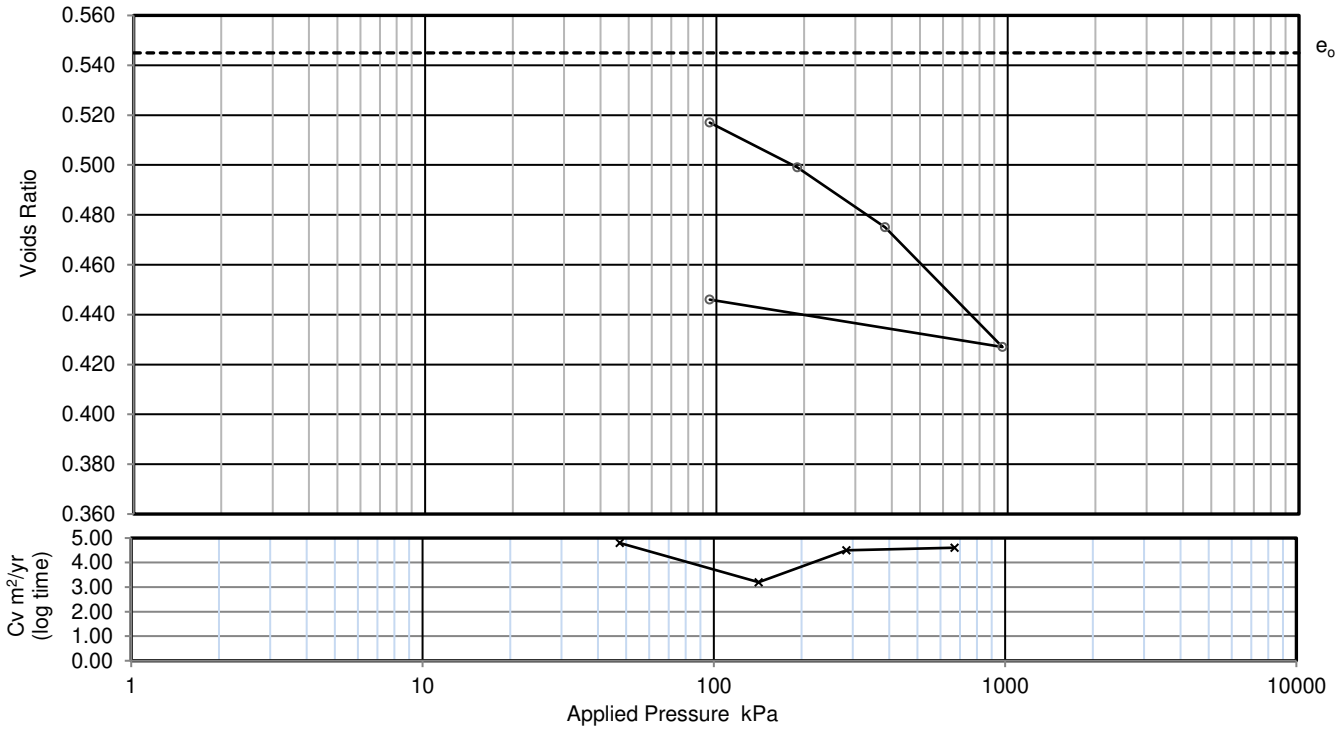
Borehole / Trial Pit	Depth (m)	Sample	Description
CP103	9.50	U	Brown slightly gravelly, silty CLAY

Initial Specimen



Length of Sample (mm)	439.00
Depth from top of specimen (mm)	80.82
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.98
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
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	-	-	-	-	0.545
95	0.19	4.8	14	0.00059	0.517
190	0.12	3.2	4	0.00085	0.499
380	0.085	4.5	10	0.0014	0.475
960	0.056	4.6	9	0.0014	0.427
95	0.016				0.446

	Initial	Final
Height (mm)	18.99	17.78
Moisture Content (%)	21	19
Bulk density (Mg/m³)	2.08	2.18
Dry density (Mg/m³)	1.72	1.83
Voids Ratio	0.545	0.446
Degree of Saturation (%)	103	113

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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2280547 / 1

Site: NW GH **Job Number:** 2280547

Client: Envirolab **Page:** 9

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

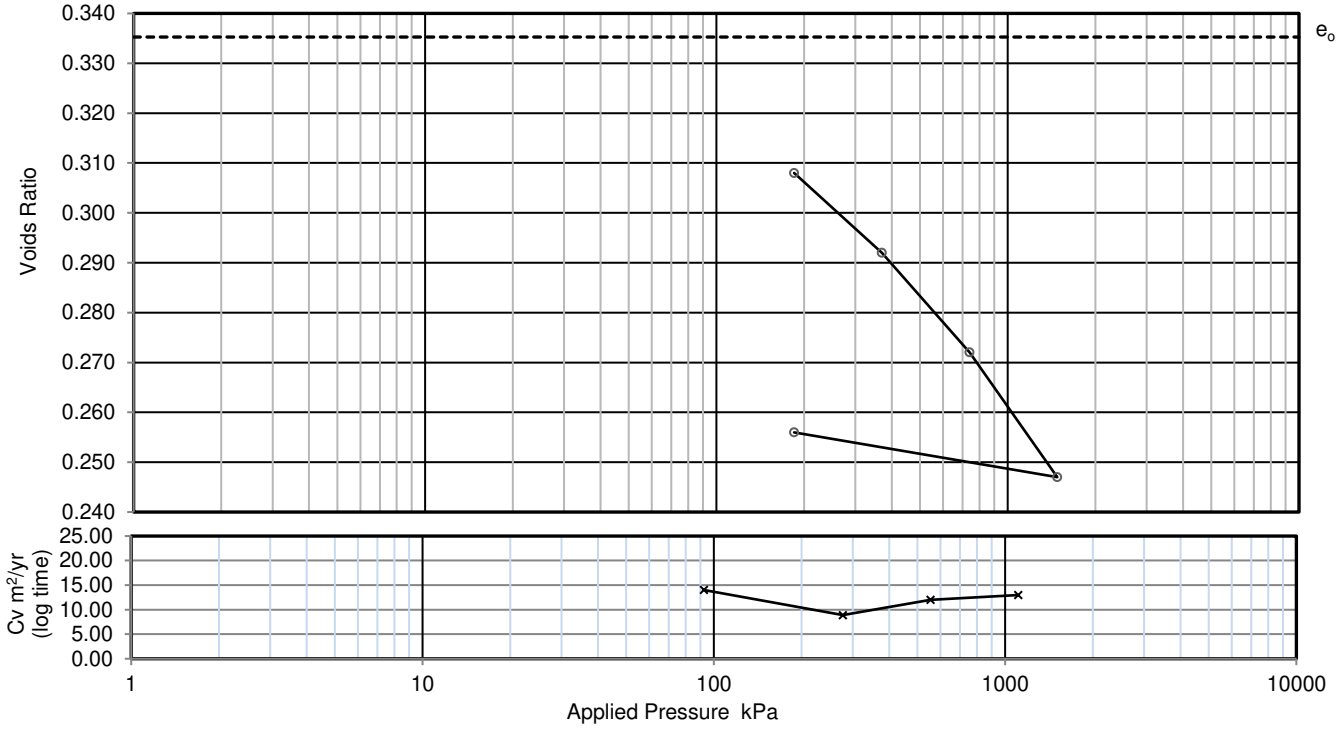
Borehole / Trial Pit	Depth (m)	Sample	Description
CP103	18.50	U	Brown silty CLAY

Initial Specimen



Length of Sample (mm)	140.46
Depth from top of specimen (mm)	27.34
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.99
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
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	-	-	-	-	0.335
185	0.11	14	21	0.00076	0.308
370	0.066	8.9	31	0.00085	0.292
740	0.043	12	33	0.0011	0.272
1,480	0.026	13	30	0.0012	0.247
185	0.0054				0.256

	Initial	Final
Height (mm)	19.10	17.97
Moisture Content (%)	13	12
Bulk density (Mg/m³)	2.24	2.36
Dry density (Mg/m³)	1.98	2.11
Voids Ratio	0.335	0.256
Degree of Saturation (%)	103	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

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280547 / 1

Site: NW GH **Job Number:** 2280547

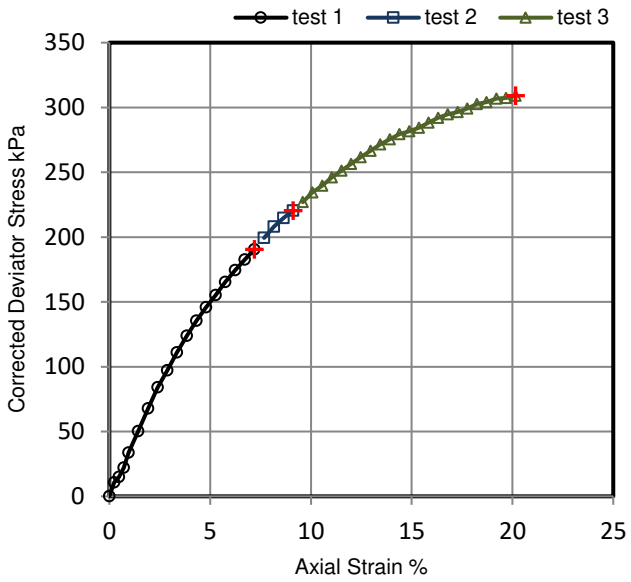
Client: Envirolab **Page:** 10

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

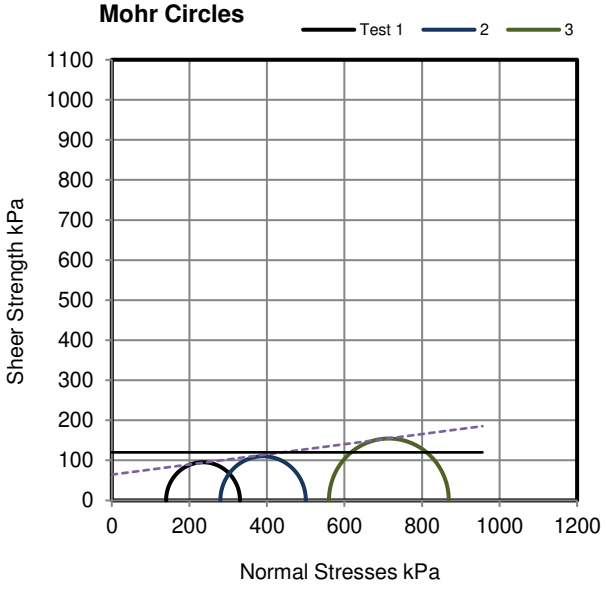
Borehole / Trial Pit	Depth (m)	Sample	Description
CP101	14.00	U	Brown slightly sandy, gravelly, silty CLAY

Initial Sample	Original Length (mm)	363.45		
	Depth from Top (mm)	31.29		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		208.40		
Diameter (mm)		103.62		
Moisture Content (%)		15.7		
Bulk Density (Mg/m3)		2.11		
Dry Density (Mg/m3)		1.82		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		0.96		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	140	280	560
	Axial Strain (%)	7	9	20
	Membrane Corr. (kPa)	0.3	0.4	0.8
	Deviator Stress (σ1 - σ3)f (kPa)	191	220	309
	Undrained Shear Strength, CU = ½(σ1 - σ3)f (kPa)	95	110	155
	Mode of Failure	Plastic		

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 120 kPa

Linear Regression

ϕu 7.2 °

cu 64 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)

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280547 / 1

Site: NW GH **Job Number:** 2280547

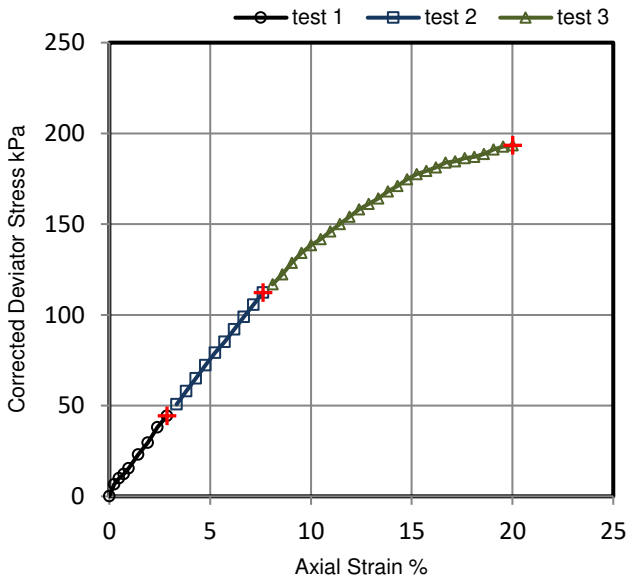
Client: Envirolab **Page:** 11

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

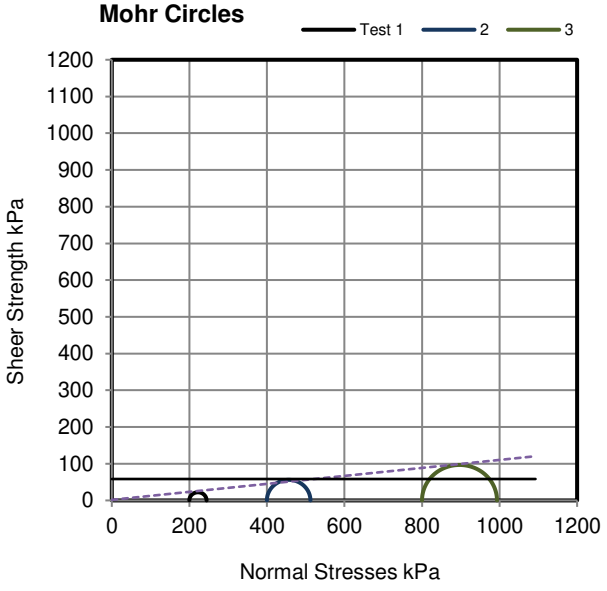
Borehole / Trial Pit	Depth (m)	Sample	Description
CP101	20.00	U	Brown gravelly, silty CLAY

Initial Sample	Original Length (mm)	278.46		
	Depth from Top (mm)	57.41		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		209.89		
Diameter (mm)		101.16		
Moisture Content (%)		15.4		
Bulk Density (Mg/m3)		2.22		
Dry Density (Mg/m3)		1.92		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		0.95		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	200	400	800
	Axial Strain (%)	3	8	20
	Membrane Corr. (kPa)	0.2	0.4	0.8
	Deviator Stress (σ1 - σ3)f (kPa)	44	112	193
	Undrained Shear Strength, CU = ½(σ1 - σ3)f (kPa)	22	56	97
	Mode of Failure	Compound		

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 58 kPa

Linear Regression

ϕu 6.2 °

cu 2 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)

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report	2280547 / 1

Site: NW GH **Job Number:** 2280547

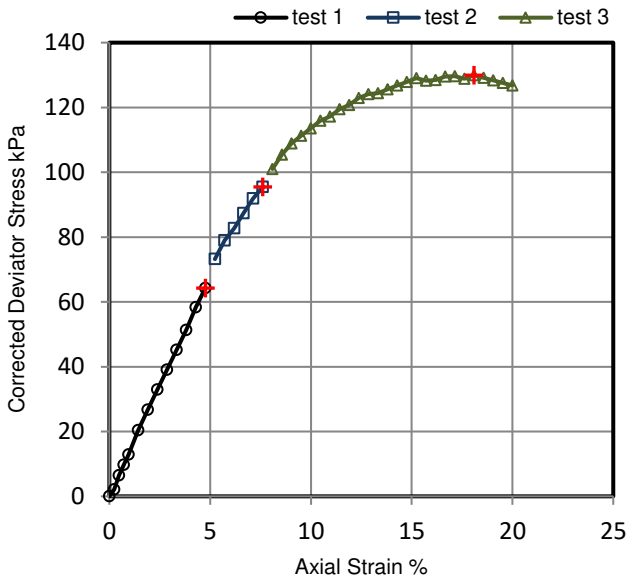
Client: Envirolab **Page:** 12

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

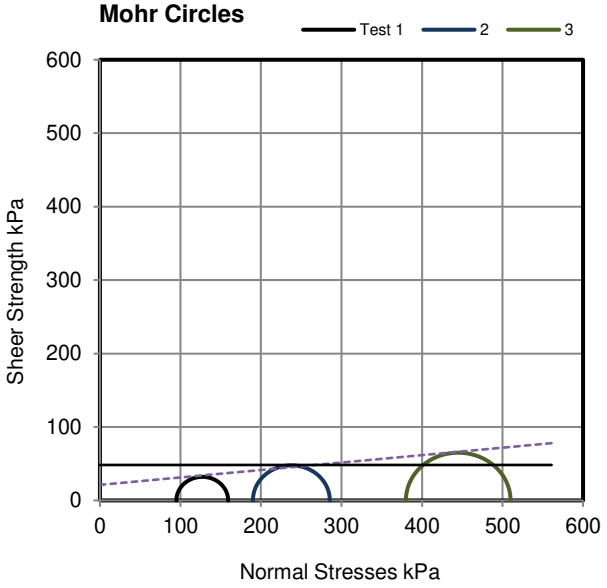
Borehole / Trial Pit	Depth (m)	Sample	Description
CP103	9.50	U	Brown slightly gravelly, silty CLAY

Initial Sample	Original Length (mm)	317.93		
	Depth from Top (mm)	45.49		
	Condition	Undisturbed		
	Orientation	Vertical		
Length (mm)		210.08		
Diameter (mm)		102.36		
Moisture Content (%)		22.4		
Bulk Density (Mg/m3)		2.10		
Dry Density (Mg/m3)		1.71		
Membrane Thickness (mm)		0.2		
Membrane Type		Latex		
Rate of Strain (%/min)		0.95		
Test Results	Stage Number	1	2	3
	Cell Pressure (kPa)	95	190	380
	Axial Strain (%)	5	8	18
	Membrane Corr. (kPa)	0.3	0.4	0.7
	Deviator Stress (σ1 - σ3)f (kPa)	64	95	130
	Undrained Shear Strength, CU = ½(σ1 - σ3)f (kPa)	32	48	65
	Mode of Failure	Compound		

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 48 kPa

Linear Regression

ϕu 5.8 °

cu 21 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)

UKAS TESTING 1464

Result reported relates only to the sample tested.

Final Test Report - 2280547 / 1

Site:	NW GH
Job Number:	2280547
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: 07/06/2021

IAN FARMER ASSOCIATES

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washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2280557 / 2

Site: NW GH

Job Number: 2280557

Originating Client: Envirolab

Originating Reference: 21/05471

Date Sampled: Not Given

Date Scheduled: 21/05/2021

Date Testing Started: 28/05/2021

Date Testing Finished: 07/06/2021

Previous Reports		Amendments	Date Issued
1	Interim		04/06/2021

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 08/06/2021

Constructionline
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AGS

IAN FARMER ASSOCIATES

Laboratory Test Report 2280557 / 2

Site: NW GH **Job Number:** 2280557

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 %						
CP101	8.50	D	26	Natural	100	26	40	19	21	0.33	CI	Brown silty CLAY
CP101	17.50	D	15	Natural	94	16	29	17	12	-0.11	CL	Brown slightly gravelly, silty CLAY
CP102	9.50	D	15	Natural	100	15		NP				Brown slightly gravelly SAND
CP102	13.00	D	20	Natural	97	21	33	11	22	0.43	CL	Brown silty CLAY
CP102	23.50	D	10	Sieved	86	11	19	15	4	-1.05	ML	Brown sandy CLAY/SILT
CP102	29.50	D	15	Natural	100	15	30	20	10	-0.50	CL	Brown silty CLAY
CP103	16.00	D	24	Natural	100	24	32	20	12	0.33	CL	Brown silty CLAY
CP104	13.00	D	20	Natural	100	20	35	20	15	0.00	CL/CI	Brown silty CLAY
CP104	17.50	D	14	Natural	98	14	27	17	10	-0.28	CL	Brown silty CLAY
CP105	14.00	D	14	Natural	100	14	31	16	15	-0.13	CL	Brown silty CLAY
CP105	20.50	D	21	Natural	100	21	40	22	18	-0.06	CI	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

UKAS TESTING 1464

Results reported relate only to the samples tested.

Final Test Report - 2280557 / 2

Site:	NW GH
Job Number:	2280557
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: 08/06/2021

Appendix E – Ground Gas Monitoring Results

- Gas Monitoring Visits 1 – 6

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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 - MSCP	**Date:**	23/04/2021
Job Number:	B076686.300	**Visit:**	1
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						
BH101	74.16	1019	-29.0	0.0	0.0	0.0	1.3	1.3	18.5	0	65	26.34 47.82	33.20 40.96	1
BH102	73.84	1020	0.0	0.0	0.0	0.0	0.0	0.0	20.3	0	0	24.93 48.91	33.66 40.18	
BH103	73.93	1019	0.0	0.0	0.0	0.0	0.0	0.0	19.8	0	0	24.50 49.43	35.75 38.18	
BH104	74.09	1019	0.0	0.0	0.0	0.0	0.7	0.4	19.1	0	0	8.28 65.81	9.10 64.99	
BH105	74.09	1019	0.0	0.0	0.0	0.0	0.5	0.5	17.4	0	87	-	-	2

Notes

1 Flow decreased to 0 after 5 minutes
2 Unable to measure water - pipe collapse

Logged by

EM

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 - MSCP	**Date:**	05/05/2021
Job Number:	B076686.300	**Visit:**	2
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						
BH101	74.16	-	-	-	-	-	-	-	-	-	-	-	-	1
BH102	73.84	998	0.0	0.0	0.0	0.0	4.1	3.1	2.7	0	0	24.16 49.68	34.00 39.84	
BH103	73.93	998	0.0	0.0	0.0	0.0	0.1	0.1	20.1	0	0	27.47 46.46	35.40 38.53	
BH104	74.09	998	0.0	0.0	0.0	0.0	1.3	0.7	20.2	0	0	8.33 65.76	9.00 65.09	
BH105	74.09	998	0.0	0.0	0.0	0.0	0.4	0.4	18.8	0	80	Dry	3.90	2

Notes

1 Borehole collapsed at ground level, could not open borehole cover
2 Unable to measure water - pipe collapse

Logged by

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

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GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1 - MSCP	**Date:**	13/05/2021
Job Number:	B076686.300	**Visit:**	3
Client:	MFT	**Weather:**	Rain
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					
BH101	74.16	999	-3.8	-3.0	0.0	0.0	0.0	0.0	20.9	0	0	27.52 46.64	33.10 41.06
BH102	73.84	999	0.0	0.0	0.0	0.0	0.0	0.0	20.9	0	0	24.80 49.04	33.20 40.64
BH103	73.93	999	0.0	0.0	0.0	0.0	0.1	0.1	19.4	0	0	23.95 49.98	35.48 38.45
BH104	74.09	999	0.8	0.0	0.0	0.0	2.0	2.0	18.0	0	0	8.25 65.84	9.00 65.09
BH105	74.09	999	-0.3	-0.1	0.0	0.0	0.5	0.5	19.2	0	0	-	-

Notes

1 Pipe collapsed

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GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1 - MSCP	**Date:**	27/05/2021
Job Number:	B076686.300	**Visit:**	4
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					
BH101	74.16	1009	-0.7	-0.6	0.0	0.0	0.2	0.2	20.0	0	0	26.95 47.21	31.91 42.25
BH102	73.84	-	-	-	-	-	-	-	-	-	-	- -	- -
BH103	73.93	-	-	-	-	-	-	-	-	-	-	- -	- -
BH104	74.09	1009	-	-	0.0	0.0	0.1	0.1	19.8	29	134	8.20 65.89	8.74 65.35
BH105	74.09	-	-	-	-	-	-	-	-	-	-	- -	- -

Notes

1 Unable to access

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GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1 - MSCP	**Date:**	03/06/2021
Job Number:	B076686.300	**Visit:**	5
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
			Max	SS	Max	SS	Max	SS					
BH101	74.16	1019	0.0	0.0	0.0	0.0	0.0	0.0	19.2	125	872	26.80 47.36	32.09 42.07
BH102	73.84	1019	-0.5	-0.1	0.0	0.0	0.0	0.0	21.7	0	0	21.83 52.01	33.05 40.79
BH103	73.93	1019	0.0	0.0	0.0	0.0	0.1	0.1	19.9	0	0	25.50 48.43	35.25 38.68
BH104	-	-	-	-	-	-	-	-	-	-	-	- -	- -
BH105	-	-	-	-	-	-	-	-	-	-	-	- -	- -

Notes

1 Borehole destroyed

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GAS MONITORING LOG SHEET

Project:	NMGH - Stage 1 - MSCP	**Date:**	11/06/2021
Job Number:	B076686.300	**Visit:**	6
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
			Max	SS	Max	SS	Max	SS					
BH101	74.16	1012	0.0	0.0	0.0	0.0	0.0	0.0	19.7	0	0	26.61 47.55	32.07 42.09
BH102	73.84	1011	-0.1	0.0	0.0	0.0	1.9	1.9	8.2	0	0	24.90 48.94	33.80 40.04
BH103	73.93	1011	0.0	0.0	0.0	0.0	0.0	0.0	20.1	0	0	25.09 48.84	34.98 38.95
BH104	-	-	-	-	-	-	-	-	-	-	-	- -	- -
BH105	-	-	-	-	-	-	-	-	-	-	-	- -	- -

Notes

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Appendix F – GAC Screening Thresholds

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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

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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.

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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 *high probability* that *severe harm* could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	*Harm* is *likely to arise* to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	*It is possible* that without appropriate further action *harm could arise* to a designated receptor. It is relatively *unlikely* that any such harm would be *severe,* and if any harm were to occur it is *more likely* that such harm would be *relatively mild.*
Low Risk	*It is possible* that *harm could arise* to a designated receptor from an identified hazard. It is *likely* that, at worst, if any harm was realised any effects would be *mild.*
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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