



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Phase II
GeoEnvironmental
Investigation

The Manchester College

Harpurhey

August 2020

On behalf of

The Manchester College



Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

Tel : 0161 975 6088

Email info@earthenvironmental.co.uk
www.earthenvironmental.co.uk

SITE INVESTIGATION
THE MANCHESTER COLLEGE
HARPURHEY
Report Ref: A3545/20/SI
AUGUST 2020

Prepared on Behalf of:

THE MANCHESTER COLLEGE

By:

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

DISTRIBUTION:

1 electronic copy The Manchester College

SITE INVESTIGATION

THE MANCHESTER COLLEGE, HARPURHEY

Report Reference: A3545/20/SI

Version B.0

Date: 14th August 2020

Prepared for: The Manchester College

Prepared by: Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

Definition of Version Code:

- D. Applied during initial drafting of the report before it has been reviewed.
- C. Applied after the report has been reviewed but before it has been approved by the Project Manager.
- B. Applied after the Project Manager has approved the report ready for issue to the client.
- A. Applied to reports after external/internal review.

The version number starts at "0" and is raised by "1" at each re-type.

Written by:



Luke Glover
Senior GeoEnvironmental Consultant

Approved by:



Adam Czarnecki
Managing Director

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1
2.0	INTRODUCTION	2
2.1	BACKGROUND	2
2.2	PREVIOUS INVESTIGATIONS.....	2
2.3	TERMS OF REFERENCE.....	2
2.4	REPORT SCOPE	2
2.5	LIMITATIONS OF THE STUDY	2
3.0	SITE	4
3.1	SITE LOCATION AND DESCRIPTION.....	4
3.2	PUBLISHED GEOLOGY.....	6
3.3	PROPOSED DEVELOPMENT.....	6
4.0	SITE INVESTIGATION	7
4.1	EXPLORATORY FIELDWORK.....	7
4.2	LABORATORY TESTING	8
5.0	GROUND CONDITIONS ENCOUNTERED	9
5.1	SOIL PROFILE ENCOUNTERED.....	9
5.2	OBSERVABLE INDICATIONS OF CONTAMINATION.....	9
5.3	OBSTRUCTIONS.....	9
5.4	GROUNDWATER	9
6.0	SOIL CONTAMINATION RISK ASSESSMENT.....	10
6.1	TIER I HUMAN HEALTH SOIL RISK ASSESSMENT – GROUNDWORKERS DURING DEVELOPMENT.....	10
6.2	TIER I HUMAN HEALTH SOIL RISK ASSESSMENT – FUTURE SITE USERS.....	10
6.3	SOIL WASTE ASSESSMENT.....	12
7.0	CONCLUSIONS & RECOMMENDATIONS	13
7.1	SOIL CONTAMINATION.....	13
7.2	ASBESTOS.....	13
7.3	SOIL DISPOSAL	13
7.4	RISK TO BURIED (WATER) SERVICES.....	13
7.5	SITE PERSONNEL.....	14
7.6	OTHER MATTERS.....	14

LIST OF FIGURES

Figure 1	Site Location Plan
Figure 2	General Site Photographs
Figure 3	Proposed Development Plan
Figure 4	Exploratory Hole Location Plan

TABLES

Table 1	Summary of Ground Conditions Encountered
Table 2	Summary of Guideline Values for Protection of Workers and the General Public During Development of Contaminated Land
Table 3	Soil Results Comparison with C4SL/S4UL Values
Table 4	Waste Classification of Soils

APPENDICES

Appendix 1	Exploratory Hole Logs
Appendix 2	Dynamic Probing Results
Appendix 3	Chemical Testing Results
Appendix 4	Soil Waste Assessment
Appendix 5	Report Limitations

1.0 EXECUTIVE SUMMARY

Appointment	A Site Investigation has been commissioned by The Manchester College to examine ground conditions for a proposed cold store at a The Manchester College, Harpurhey.
The Investigation	The investigation comprised a window sample borehole, dynamic probing and foundation pits with associated sampling and in situ testing, including laboratory contamination testing.
The Site	The site is located in Harpurhey, Manchester, Northwest England approximately 4.11km from Manchester City Centre at approximate National Grid Reference SD 86023 01956. The site is currently part of the Manchester College campus with the development area covered by a smoking shelter.
Site History	The site was originally rural land adjacent to an unknown industrial building. From 1893, the site consisted of a school building, up until 1977 when it was then modified into a Public Baths and Wash House (and laundry) during its expansion (1977-1980). Most recently the site became part of the college campus of Manchester College.
Ground Conditions Encountered	The exploratory holes encountered Made Ground (up to 2.00m thick) generally overlying alternating clay and sand. Groundwater was encountered at a depth of 2.50m below ground level.
Contamination Assessment	Risk from contamination to groundworkers during development – Low Risk from contamination to future site users – Low. Soil Waste Assessment: 2 samples tested all classified as Non-Hazardous.
<i>This sheet is intended to provide a summary only of the report. It does not provide a definitive engineering analysis for the purposes of costing or construction and is subject to the limitation of the agreed brief.</i>	

2.0 INTRODUCTION

2.1 Background

A Site Investigation has been commissioned by The Manchester College to examine ground conditions for a proposed cold store at The Manchester College in Harpurhey.

2.2 Previous Investigations

Earth Environmental & Geotechnical Ltd, Phase I GeoEnvironmental Desk Study (A3545/20), dated August 2020

The desk study highlighted that site was rural land adjacent to an unknown industrial building. From 1893, the site consisted of a school building until 1977 when it was then modified into a Public Baths and Wash House (and laundry) during its expansion (1977-1980). Most recently the site became part of the college campus of Manchester College. The site is presently covered by hardstanding and used as a smoking shelter.

The risk from soil contamination to commercial end users was considered to be **MODERATE** to **LOW**. The risk to controlled waters was concluded to be **MODERATE** to **LOW**. The risk from ground gas to end users was considered to be **MODERATE** to **LOW**.

An intrusive investigation was recommended in order to carry out geotechnical and contamination testing.

2.3 Terms of Reference

Earth Environmental and Geotechnical Ltd (EEG) have been commissioned by the Client, to undertake a Site Investigation of the site in accordance with proposal A3545/20 dated 2nd July 2020. The objectives of this investigation are as follows:

- *Provide factual information on the work undertaken including sampling location plan, borehole logs and chemical testing.*
- *Tier 1 (semi-quantitative) risk assessment will be undertaken. This will compare the concentrations of soil contaminants identified against current and appropriate published guidelines, in relation to identified receptors, e.g. existing/ future end users and site neighbours.*
- *Classification of soil for offsite disposal.*

2.4 Report Scope

This report presents full factual records of the site work carried out, the ground conditions encountered in the exploratory holes, the in situ and laboratory test results. All information collected has been used to provide an interpretation of the ground conditions, with recommendations on potential ground contamination risks for the proposed development.

2.5 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices or changes in legislation may require a reinterpretation of the report in whole or in part. EEG reserve the right to amend either

conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use by the client and is confidential to them.

Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes particularly at intervening locations. Whilst every effort is made to ensure accuracy of data supplied, all opinions expressed as to the spatial distribution of strata between sampling locations is for guidance only and no responsibility is accepted as to its accuracy.

3.0 THE SITE

3.1 Site Location and Description

The site is located in Harpurhey, Manchester, Northwest England approximately 4km from Manchester City Centre. The approximate National Grid Reference for the centre of the site is SD 86023 01956 (X: 386023, Y: 401956) with the closest postcode being M9 4AF.

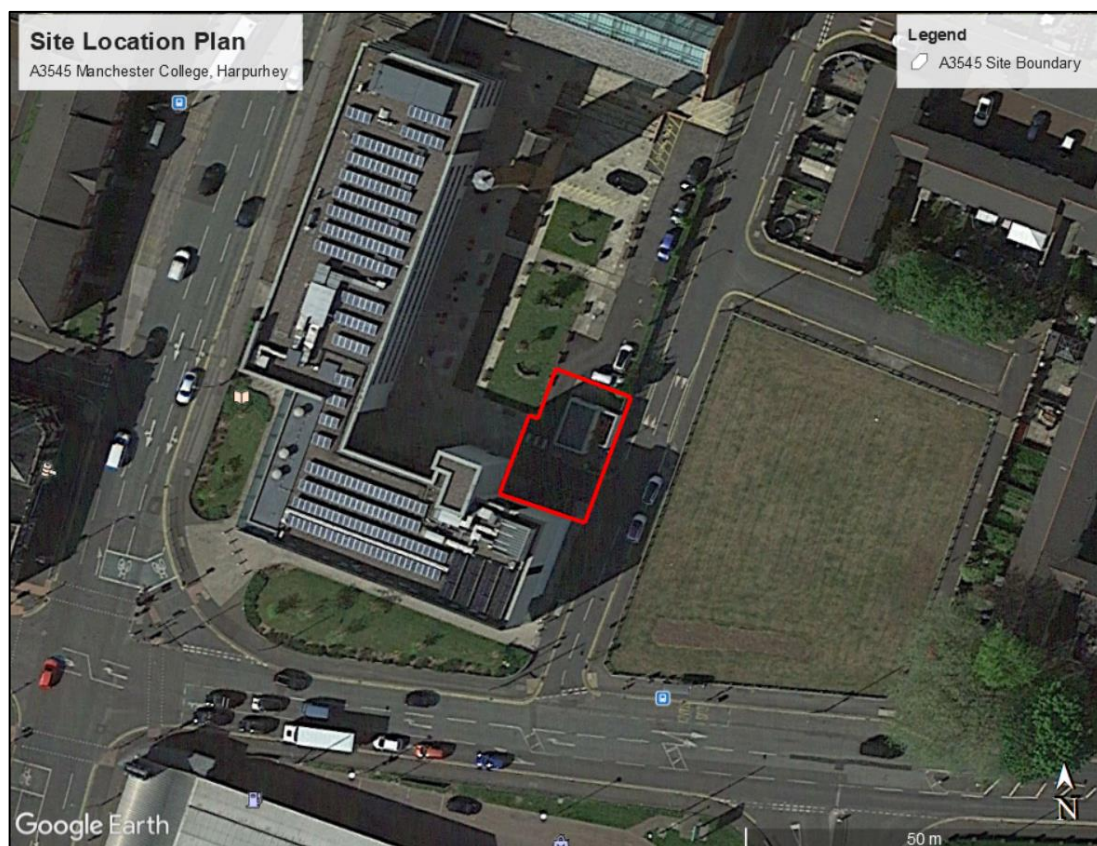
The site is a near rectangular shaped parcel of land with current access via Hemsley Street South to the east. The maximum dimensions of the proposed site are 18m north east to south west and 12m north west to south east. The site occupies an area of approximately 0.02ha. The site is flat and level with Hemsley Street South to the east.

At the time of this investigation, the site was in use as part of The Manchester College campus and comprises pavement, road and a substation. The area being investigation was covered with a smoking shelter.

The general surrounding area comprises predominantly of residential dwellings with the immediate surroundings comprising the rest of the college campus with Hemsley Street South to the south east.

The site location is shown in the aerial photograph presented as Figure 1 below.

Figure 1: Site Location Plan



General site photographs are presented in Figure 2 below.

Figure 2: General Site Photographs

View of the investigation area, looking south west



View across the rest of the site and Manchester College, looking north



3.2 Published Geology

According to the British Geological Survey (BGS), the site is underlain by superficial deposits of Devensian Till, comprising diamicton. The BGS shows the site to be on the boundary between two solid geologies, the Chester Formation, comprising sandstone, and the Manchester Marls Formation, comprising mudstone.

There are 16 borehole records identified within 250m of the site. The closest record is located 24m to the south of the site (BGS Reference: SD80SE899), drilled in 1972 by a cable percussive rig and is summarised below:

- Cobblestone to 0.14m.
- Compact ash, cinder, small stone and brick rubble (fill) to 0.46m.
- Firm yellow brown and grey streaked slightly sandy clay to 1.25m.
- Compact mid-brown moist clayey and silty sand with some small gravel to 2.65m.
- Soft to firm mid to dark brown silty clay to 3.05m.
- Firm dark brown silty clay to 3.80m.
- Firm to stiff mid brown silty clay with occasional small stones to 5.00m.
- Compact mid to dark brown stratified clean to silty medium grain sand with traces of silt to 8.75m.
- Compact mid-brown to dark brown saturated sandy silt with thin bands of silty clay and thin bands of wet medium grained silty sand to 10.00m.

3.3 Proposed Development

It is understood that the Client intends to construct a new cold store. The current site access will be retained.

The proposed development layout details are shown in Figure 3 below.

Figure 3: Proposed Development Plan



4.0 SITE INVESTIGATION

4.1 Exploratory Fieldwork

The fieldwork was carried out by EEG on 16th July 2020 and comprised:

- One window sample borehole (designated WS01) was sunk to a depth of 5.00m below existing ground level. Window sampler boring is carried out with a small, track-mounted rig, which uses a chain-driven trip hammer to drive sampling tubes or penetrometers into the ground. These tools are coupled to the anvil of the hammer by solid drill rods. Sampling tubes comprise “windowless samplers”, which are plain sampler tubes in which a continuous disturbed sample is recovered within a semi-rigid plastic liner. In order to reduce friction within the borehole, sampling tubes of progressively smaller diameter are used as the borehole depth increases. Sampler diameters generally range from between approximately 90mm to 50mm. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Groundwater observations were noted where possible. These observations relate to the time of the investigation only, and do not necessarily reflect seasonal fluctuations. Exploratory hole logs are included in Appendix 1.
- Two hand dug pits (designated TP01 and TP02) were excavated in order to record the existing foundations of the adjacent building. The foundation pit logs are included in Appendix 1.
- One dynamic probe test was carried out to a depth of 5.90m alongside the window sample borehole. The test was terminated at 5.90m due to refusal on dense sand. Dynamic probe tests are conducted with a window sampler type rig, which uses a chain-driven trip hammer to drive a cone-tipped, solid steel penetrometer into the ground. The “super heavy” test (DPSH) uses a 50.5mm diameter cone, and a 63.5kg hammer, falling over a distance of 750mm. The resistance of the ground to the dynamic penetration is given by the number of blows required to drive the cone over depth increments of 100mm (DPN100). The results of the probe test are included as Appendix 2.

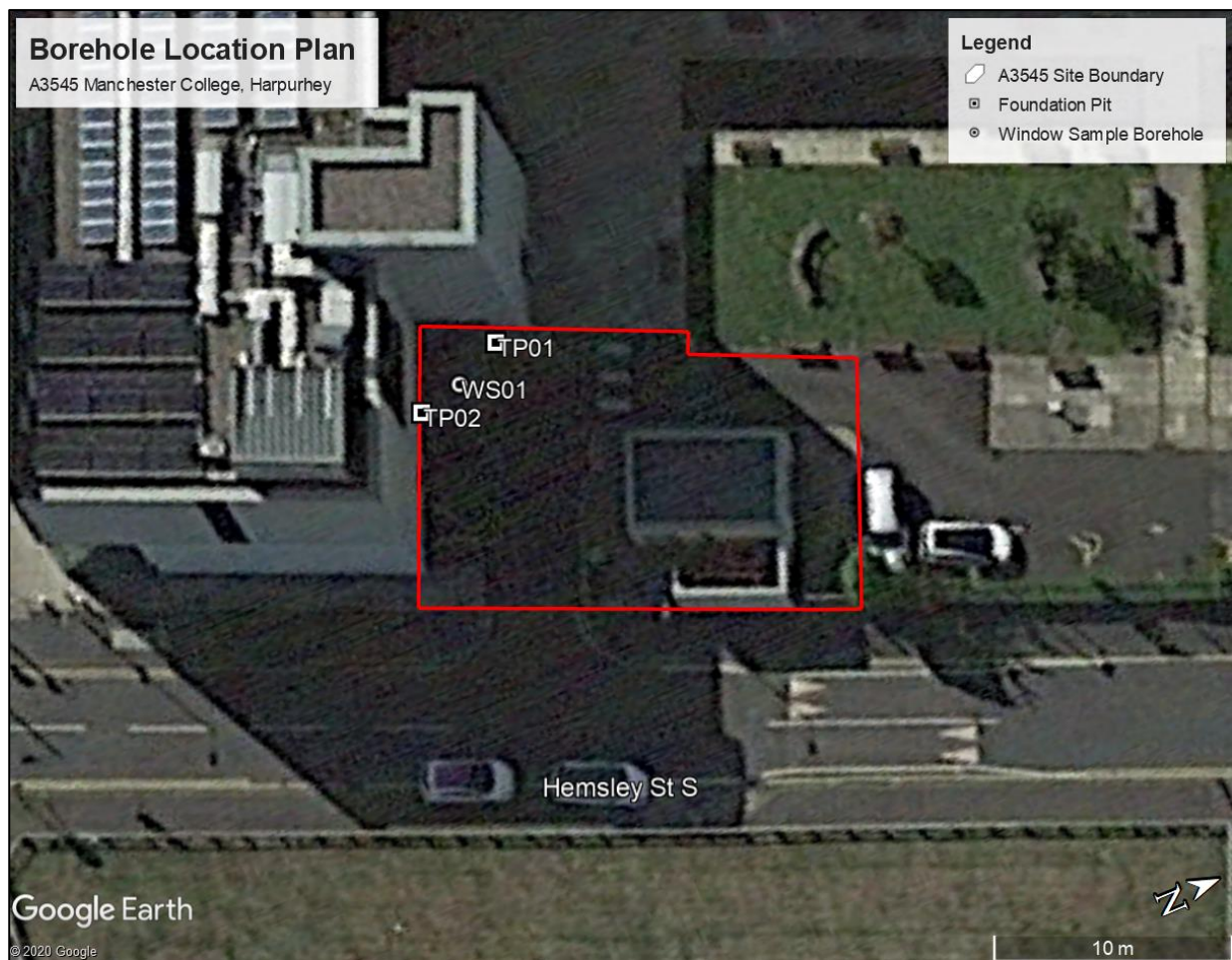
Exploratory hole locations were selected prior to attending site by the Client based on the proposed development layout. Each exploratory location was scanned using a Cable Avoidance Tool (CAT) and Ground Penetrating Radar (GPR) in order to locate unrecorded underground services, and the exploratory locations were repositioned if necessary.

On completion, samples recovered from the site were taken to a specialist laboratory for chemical testing.

All site investigation work was supervised full time by a representative of EEG. The logging of soils and rocks has been carried out in accordance with BS5930⁽²⁰¹⁵⁾ except where superseded by the soil and rock description methodology in BS EN14688-1⁽²⁰⁰²⁾, BS EN 14688-2⁽²⁰⁰⁴⁾ and BS EN 14689-1⁽²⁰⁰³⁾.

An Exploratory Hole Location Plan is presented as Figure 4 overleaf.

Figure 4: Exploratory Hole Location Plan



4.2 Laboratory Testing

The environmental chemistry of the ground was investigated by specialist chemical analysis of selected samples, scheduled by EEG and carried out by DETS.

Chemical analyses were carried out on two soil samples and were submitted for the following suite of determinants:

Asbestos Screen, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Soil Organic Matter, Extractable Petroleum Hydrocarbons (EPH), Speciated Total Petroleum Hydrocarbon (TPH) and Speciated Polyaromatic Hydrocarbons (PAH).

The results of the laboratory contamination tests are discussed in Section 6 and included in Appendix 3.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Soil Profile Encountered

The sequence of strata encountered beneath the site was as follows:

- **Made Ground** – Variable Made Ground was encountered in all the exploratory holes, comprising:
 - A covering of asphalt hardstanding.
 - Slightly clayey gravel (containing gravel of limestone, brick and concrete).
 - Sandy gravel (containing brick, concrete, asphalt, plastic and sandstone).
- **Devensian Till** was encountered in all the exploratory holes, comprising:
 - Sandy clay.
 - Clayey sand (containing rare gravel of mudstone).
 - Medium to coarse sand.

The depths of the various materials encountered in the exploratory holes are summarised in Table 1 below.

Table 1: Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m bgl)			GROUNDWATER (m bgl)
	MADE GROUND	DEVENSIAN TILL		
		CLAY	SAND	
WS01	GL-2.00	2.00-2.20 2.50-4.00 5.00-5.25	2.20-2.50 4.00-5.00 5.25-5.45	2.50
TP01	GL-0.46	-	-	-
TP02	GL-0.45	-	-	-

5.2 Observable Indications of Contamination

Visual/olfactory evidence of contamination was not encountered in any of the exploratory holes during the fieldwork.

5.3 Obstructions

Disregarding the foundations uncovered in the hand pits, no man-made obstructions were encountered in any of the excavations carried out during the fieldwork.

5.4 Groundwater

Groundwater was encountered in WS01 at 2.50m below ground level.

6.0 SOIL CONTAMINATION RISK ASSESSMENT

6.1 Tier I Human Health Soil Risk Assessment – Groundworkers During Development

To assess the risk of soil contamination to construction and ground workers during development, guidelines from the HSE Document 'Protection of workers and the general public during development of contaminated land'⁽¹⁹⁹¹⁾ are used. The document assesses soil contamination test results and classifies the site as being uncontaminated or contaminated with varying degrees of contamination from 'slight' to 'unusually heavy'. The guideline values and laboratory test results are summarised in the following table:

Table 2: Summary of Guideline Values for Protection of Workers and the General Public During Development of Contaminated Land

Contaminant	Typical Values* for:					Test Results	Class
	Uncontaminated Soils	Slight Contamination	Contaminated	Heavy Contamination	Unusually Heavy Contamination		
	Class A	Class B	Class C	Class D	Class E		
pH (alkaline)	7 - 8	8 - 9	9 - 10	10 - 12	12	9.0 – 10.1	B - D
Arsenic	0 - 30	30 - 50	50 - 100	100 - 500	500	11 - 14	A
Cadmium	0 - 1	1 - 3	3 - 10	10 - 50	50	< 0.2 – 0.2	A
Chromium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	9 - 16	A
Copper	0 - 100	100 - 200	200 - 500	500 - 2500	2500	14 - 33	A
Lead	0 - 500	500 - 1000	1000 - 2000	2000 – 1%	1.0%	234 - 260	A
Mercury	0 - 1	1 - 3	3 - 10	10 - 50	50	< 1	A
Nickel	0 - 20	20 - 50	50 - 200	200 - 1000	1000	15 - 18	A
Zinc	0 - 250	250 - 500	500 - 1000	1000 - 5000	5000	92 - 115	A
Boron	0 - 2	2 - 5	5 - 50	50 - 250	250	< 1 - 1	A
Selenium	0 - 1	1 - 3	3 - 10	10 - 50	50	< 3	A
Barium	0-500	500-1000	1000-2000	2000-1.0%	1.0%	172 - 221	A
Beryllium	0 - 5	5 - 10	10 - 20	20 - 50	50	< 0.5	A
Vanadium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	10 - 29	A
Sulphate	0 - 2000	2000 - 5000	5000 – 1%	1% - 5%	5.05%	1753-2136	A - B
Sulphide	0 - 10	10 - 20	20 - 100	100 - 500	500	< 5	A
Cyanide (free)	0 - 1	1 - 5	5 - 50	50 - 100	100	< 2	A
Phenol	0 - 2	2 - 5	5 - 50	50 - 250	250	< 2	A

Based on the above results it is considered there is a low potential risk from soil contamination to construction workers, ground workers and members of the public during construction. Appropriate measures, such as PPE, site health plans, and appropriate disposal of material arisings will mitigate any risk.

6.2 Tier I Human Health Soil Risk Assessment – Future Site Users

The following section provides a Human Health Soil Assessment for future site users. Based on the proposed development type, the following section compares the results of contamination analyses to commercial types of end development as specified by Defra/LQM/CIEH. As part of the contamination assessment, the chemical results obtained by EEG have been screened against accepted compliance criteria, namely:

- Defra C4SL Health Criteria Values (March 2014), where available; and
- Tier 1 assessment values - based on LQM/CIEH Sutable 4 Use Levels⁽²⁰¹⁵⁾ (S4ULs).

The soil chemical testing results are summarised in Table 3 overleaf.

Table 3: Soil Results Comparison with C4SL/S4UL Values

Determinand	C4SL/S4UL Levels Commercial (mg/kg)	WS01 0.60m MG	WS01 1.50m MG	No of Exceedances
Metals				
Arsenic	640	14	11	0
Beryllium	12	< 0.5	< 0.5	0
Boron	240000	< 1	1	0
Cadmium	410	0.2	< 0.2	0
Chromium	8600	9	16	0
Chromium VI	49	< 2	< 2	0
Copper	68000	14	33	0
Lead	2300	234	260	0
Mercury	58	< 1	< 1	0
Nickel	980	18	15	0
Selenium	12000	< 3	< 3	0
Vanadium	9000	10	29	0
Zinc	730000	115	92	0
Petroleum Hydrocarbons				
Benzene	98	< 0.002	< 0.002	0
Toluene	56000	< 0.005	< 0.005	0
Ethylbenzene	5700	< 0.002	< 0.002	0
o-xylenes	6600	< 0.002	< 0.002	0
m-xylenes	62000	< 0.002	< 0.002	0
p-xylenes	5900	< 0.002	< 0.002	0
Aliphatic EC 5-6	3200	< 0.01	< 0.01	0
Aliphatic EC >6-8	7800	< 0.05	< 0.05	0
Aliphatic EC >8-10	2000	< 2	< 2	0
Aliphatic EC >10-12	9700	< 2	< 2	0
Aliphatic EC >12-16	59000	< 3	< 3	0
Aliphatic EC >16-35	1600000	38	< 13	0
Aromatic EC 5-7	26000	< 0.01	< 0.01	0
Aromatic EC >7-8	56000	< 0.05	< 0.05	0
Aromatic EC >8-10	3500	< 2	< 2	0
Aromatic EC >10-12	16000	< 2	< 2	0
Aromatic EC >12-16	26000	< 2	4	0
Aromatic EC >16-21	28000	14	22	0
Aromatic EC >21-35	28000	98	26	0
Polycyclic Aromatic Hydrocarbons				
Naphthalene	190	0.15	0.12	0
Acenaphthylene	83000	< 0.1	< 0.1	0
Acenaphthene	84000	0.21	0.38	0
Fluorene	63000	0.19	0.25	0
Phenanthrene	22000	1.78	2.72	0
Anthracene	520000	0.37	0.5	0
Fluoranthene	23000	2.21	3.33	0
Pyrene	54000	2.13	3.06	0
Benz(a)anthracene	170	0.92	1.23	0
Chrysene	350	1.08	1.42	0
Benzo(a)pyrene	76	1.04	1.09	0
Benzo(b)fluoranthene	44	1.28	1.46	0
Benzo(k)fluoranthene	1200	0.35	0.38	0
Indeno(1,2,3-cd)pyrene	500	0.55	0.55	0
Dibenz(a,h)anthracene	3.5	0.2	0.14	0
Benzo(ghi)perylene	3900	0.56	0.53	0
Phenols				
Phenol	760	< 2	< 2	0
Concentrations in red are above the assessment criteria based on a Commercial End Use. MG = Made Ground				

Based on the previous table, no samples tested contained concentrations of contaminants in exceedance of assessment criteria values relevant to a commercial end use.

Asbestos was detected in the WS01 0.60m sample. This was identified to be present as a bundle of chrysotile fibres. The sample was quantified and found to contain <0.001% wt/wt asbestos.

6.3 Soil Waste Assessment

An assessment of the disposal characteristics of the soil in accordance with Environment Agency guidance WM3.1, edition of June 2018, "Guidance on the classification and assessment of waste" has been carried out on soils recovered from the site, using HazWasteOnline.

The results are summarised in Table 4 below and presented in full in Appendix 4.

Table 4: Waste Classification of Soils

Location	Depth (m bgl)	WM3.1 Classification	Comments
WS01	0.60	Non-Hazardous	-
WS01	1.50	Non-Hazardous	-

As shown above, the soils have been classified as Non-Hazardous in accordance with Environment Agency guidance WM3.1.

7.0 CONCLUSIONS & RECOMMENDATIONS

7.1 Soil Contamination

Based on available soil contamination test results there is a low potential risk from soil contamination to construction workers and ground workers during development, and appropriate measures such as PPE, site health plans, appropriate disposal of material arisings will mitigate any risk. The groundworks contractor must provide a soil management plan including methods of dealing with unanticipated soil contamination encountered during groundworks.

As discussed in the above sections, the contamination tests indicate generally low concentrations of the potential contaminants in relation to a commercial end use. It is therefore considered that, based on the information available, remedial action should not generally be required at this site. Nevertheless, the presence of higher levels of contamination on areas of the site not covered by the current exploratory holes should not be discounted and additional spot checks would be prudent, particularly during groundworks. This testing can be carried out as part of the Soil Management Plan for the site.

7.2 Asbestos

A bundle of chrysotile fibres was detected in WS01 at 0.60m. The sample was quantified and found to contain <0.001% wt/wt (trace) asbestos.

The location at which the asbestos is present (WS01) will be covered by the proposed cold store which will in turn be surrounded by hardstanding. Therefore, no exposure pathways will be present for the sites end users. There is therefore considered to a low risk of asbestos to commercial end users.

However, the risk to groundworkers and adjacent land users/site neighbours during the construction phase is considered moderate due to the potential for generation of airborne fibres.

Basic asbestos management good practice will be required at the site to minimise the risk to construction workers and adjacent land users. As a minimum the following precautions will be required:

- Communicate the risk to site personnel at induction stage
- Ensure soils do not dry out and become dusty.

7.3 Soil Disposal

Soils should be disposed of at a suitable site, registered to take the levels of contamination encountered. The soils collected from all borehole locations have been classified as Non-Hazardous (See Table 4) for the purpose of off-site disposal in accordance with Environment Agency guidance WM3.1.

7.4 Risk to Buried (Water) Services

It is considered that due to the low levels of contamination encountered, standard materials are likely to be appropriate for new water pipes. Further advice should be sought from the local water company.

Previous guidance on buried water pipes was contained in Water Regulations Advisory Scheme (WRAS) Guidance Note No. 9-04-03⁽²⁰⁰²⁾, however this has been superseded by the UK Water Industry Research Report 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' Ref 10/WM/03/21 (January 2011).

7.5 Site Personnel

As with all construction sites, personnel working on the site during the construction period should be encouraged to maintain a high standard of personal hygiene and on-site washing facilities should be available.

7.6 Other Matters

Due diligence is required during the construction period, and should any further evidence of contamination be found, appropriate investigation and / or action should be taken. The significance of any contamination not discovered by this investigation is outside the scope of this report.

APPENDIX 1

EXPLORATORY HOLE LOGS

APPENDIX 2

DYNAMIC PROBING RESULTS

APPENDIX 3

CHEMICAL TESTING RESULTS

APPENDIX 4

SOIL WASTE ASSESSMENT

APPENDIX 5

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2020 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.