



Solutions to Your Contaminated Land Issues

PHASE II A

CONTAMINATED LAND INVESTIGATION

2 HIGHFIELD ROAD, MANCHESTER

Prepared for 4EasyMove

December 2023

Project No. 001EAMOP2

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INTRUSIVE SITE INVESTIGATION

2 HIGHFIELD ROAD, MANCHESTER

FOR

4EASYMOVE

The material and data in this report were prepared under the supervision and direction of the undersigned.

Wesson Environmental

A handwritten signature in black ink, consisting of a stylized 'R' followed by a horizontal line with a small dot above it.

Prepared by: Dr. Richard Wesson
Senior Environmental Consultant

Date: 19 December 2023

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1 INTRODUCTION

1.1 GENERAL

A phase 1 desktop study had been carried out by Advance Consulting Engineers Ltd in December 2020. This concluded that there was some potential for contamination although no specific source had been identified. It was recommended that further investigations were carried out including soils sampling. A remediation strategy was put in place by Castledine Environmental in February 2023. However, this was not based on an intrusive investigation being carried out and this was not considered to be in line with Manchester City Council (MCC) guidance as there was not quantitative basis for remedial measures. However, the proposed gas protection measures which were precautionary were considered to be acceptable. Consequently, an intrusive investigation was required to be carried out.

The measures were agreed with Environmental Protection by Wesson Environmental prior to carrying out investigation works.

1.2 OBJECTIVES

The objectives of the investigation were to:

1. Determine whether a risk to future site users and the wider environment was present as a result of previous land uses and assess whether the near surface soil is suitable for retention in garden areas.
2. If a risk is determined to be present, define what future actions are required to mitigate risks from contaminants in site soils.

1.3 SCOPE OF REPORT

The report comprises:

A Factual Section to report and record soil characteristics specific to the study site.

An Interpretive Section which will address potential issues associated with soil characteristics at the site, taking into account site investigation data, a visual inspection of the site, and planned future site use.

2 SECTION B – INTRUSIVE INVESTIGATION

2.1 GENERAL

The site was visited on 29th November 2023 to enable sampling to take place from the site.

The conceptual model indicates that receptors will be site users, with groundwater unlikely to be receptors and a low likelihood that buildings and service pipes will be receptors. The proposed development is understood to include a residential development.

Features, structures, or certain ground conditions may be present between exploratory hole locations, which are different to that encountered during the investigation and which developers should take into account during construction. Locations of all exploratory holes are presented in Appendix A.

All exploratory holes were logged by a Geo-environmental Engineer in accordance with BS 5930:2015+A1:2020.

2.2 Trial Pitting

5 no. trial pits were advanced to a maximum of 1.0m below ground level (BGL) using a mechanical excavator. The exploratory pit locations were selected to target areas where soft landscaping and utility areas were potentially being planned.

Exploratory locations are shown on Figure 2.

Sample types and depths are recorded on exploratory hole records.

The exploratory logs are presented in Appendix B.

2.3 GROUND CONDITIONS

2.3.1 General

The ground conditions encountered in the trial pits generally comprised MADE GROUND underlain by CLAY. Variable thicknesses of hardstanding in the form of concrete were present on the surface where TP1, TP2 and TP3 were advanced.

2.3.2 MADE GROUND

This comprised a range of materials including ash, clay, and masonry, metal and tiles also present in TP5.

2.3.3 CLAY

There was a soft to firm material brown material. In TP4 subsidiary sand and occasional cobbles of sandstone were present. In the case of TP5, clay was encountered on the north side of the pit from 0.5m bgl, but masonry dominated the south side suggesting a buried structure.

2.4 LABORATORY ANALYSIS

2.4.1 Chemical Analysis:

Laboratory testing was undertaken by i2 analytical at their UKAS and MCERTS accredited laboratory. Soil samples were analysed for:

- Heavy metals
- Polycyclic Aromatic Hydrocarbon (PAH) compounds
- Asbestos
- Soil Organic Matter

3 CONTAMINATION ASSESSMENT AND RISK ASSESSMENT

3.1 Observations and analytical results

3.1.1 Site Observations

A range of anthropogenic materials were encountered in the shallow strata classified as MADE GROUND. This included masonry, ash and in the case of TP5 metals and tiles. No staining or olfactory evidence of contamination was encountered in any samples.

3.1.2 Results of Chemical Analysis on Soil

The full chemical results are given at Appendix C.

The majority of metals were present above LOD in all samples with the exception of cadmium, mercury and selenium. Cadmium was only present above LOD in TP4 at 0.1-0.2 whilst selenium was only present above the relevant figure in TP2 at 0.1-0.2m. Mercury was present above LOD in both samples from TP1 and in TP2 at 0.1-0.2m.

PAH compounds were present above LOD in all samples to some degree. However, it was noted that concentration declined markedly with depth in the trial pits with the exception of TP3 where the concentration increase with depth.

Asbestos was not detected in any sample. .

3.2 Risk Assessment

3.2.1 Site Receptors and Site Use

For the purposes of this report the site has been classified as follows:

Residential with Homegrown Produce

We understand that soft landscaping will be present and therefore we cannot entirely rule out the growing of produce for consumption. Analysis for soil organic matter (SOM) indicated a mean concentration of 1.5% and therefore, for those GAC that are organic matter dependent, the organic matter value of 1% has been used.

3.2.2 Exposure Pathways and Variation in Risk

Site use and duration influences risk of exposure to potentially contaminated soil originating at the site.

Table 3-1 indicates the likely probability of all site receptors of exposure to contaminated soils based on various pathways and daily activity proposed at the site.

Contaminated soil is considered here as a whole – a detailed breakdown concerning specific contaminants exceeding respective guideline levels within the soil follows in section 4.2.4.

Note that this is a table of probability of exposure to potentially contaminated soils only and does not indicate that harm will necessarily result as a direct consequence of this exposure.

Potential exposure pathways with regard to human health may include:

- Ingestion of soils
- Consumption of produce
- Dermal contact
- Inhalation of dust including material backtracked into buildings
- Vapour inhalation

The Advance desktop study contains a relatively generic conceptual site model indicating that the potential for contaminative land uses is low with risk from 'natural and anthropogenic soils' by which we assumed that they mean made ground. It suggests that potential contaminants of concern may include heavy metals and hydrocarbons. We would question the latter, indicating that it initially comprised an agricultural field following which residential properties were present. We suspect that the phrase hydrocarbons has been used as a catch all generic term and whilst this may include polycyclic aromatic hydrocarbon compounds (PAH), site usage indicates that petroleum hydrocarbon (TPH) compounds are unlikely. This is consistent with site observations where no staining or olfactory evidence of TPH was encountered, and we have found on previous sites that even where a detectable odour is present, TPH compounds may be below GAC, with locations where no odour is detected having very low concentrations. The contribution of the vapour inhalation pathway to total exposure by PAH compounds is general minor or does not contribute to the total exposure in calculations using the CLEA software utilised for calculating the S4UL values. Where benzo (a) pyrene is used as a surrogate marker to assess the risks from mixtures of PAH compounds, vapour inhalation does not contribute to total exposure.

It is also unlikely that impacts to controlled waters will occur. Although bedrock is shown as a principal aquifer, the overlying superficial deposits classified as diamicton are classified as a secondary undifferentiated aquifer with the clay observed during trial pitting likely to demonstrate a low permeability. The anticipated contaminants are also considered to demonstrate a relatively low solubility and potential for leaching and migration is therefore considered to be limited.

Where relevant, specific exposure routes are included:

PATHWAY	RECEPTORS		
	Human Health Risk	Risk to Controlled Waters	
Soils affected by Contamination	Site users	Surface waters	Ground water
Outdoor activities	Consumption of produce: L Dermal: L Dust Inhalation: L Ingestion: L Vapour inhalation: LL	Leaching: U Direct Migration: U	Leaching: U Direct Migration: U
Time spent indoors	Dermal: L Dust Inhalation: L Ingestion: L Vapour inhalation: LL		

Table 3-1: Exposure Rankings according to Pathway/ Receptor

KEY: (in accordance with Table 5.5) U: Unlikely LL: Low Likelihood L: Likely HL: Highly Likely

3.2.3 Comparison of Potential Contaminants to Guideline Levels

For determinands that were present above LOD the following GACs were used.

- For heavy metals (except lead and barium), and PAH compounds, LQM/CIEH S4UL¹ values were used. Like the CLEA values these are based on HCVs to describe minimal risk.
- For lead, there is no published CLEA SGV and no LQM/CIEH S4UL value is available. Therefore, the C4SL value was used. This considered conservative especially compared to urban normal background concentrations.
- For barium the values from the CL:AIRE 2010 publication² have been used.

Where determinands were below LOD, no comparison to GAC was carried out.

The location of exceedances is shown in figure 3.

Arsenic and lead were present above GAC in the shallow sample from TP2. (Table 3-2).

Determinand	LOD	Max	GAC
Arsenic	1	41	37
Barium	1	240	1300
Beryllium	0.06	2	1.7
Boron	0.2	1.2	290
Cadmium	0.2	0.7	11
Chromium	1	27	910
Copper	1	84	2400
Lead	1	250	210
Mercury	0.3	0.8	40
Nickel	1	28	130
Selenium	1	1.4	250
Vanadium	1	43	410
Zinc	1	250	3700

Table 3-2. Inorganic determinands compared to GAC (units mg/kg).

Of the PAH compounds, benzo (a) pyrene, benzo (b) fluoranthene, and dibenz(a,h)anthracene exceeded GAC in all samples except for TP2 at 0.4-0.5m, TP3 at 0.1-0.3m, TP4 at 0.4-0.5m and TP5 at 0.4-0.5m, with the latter compound exceeding GAC in TP5 at 0.4-0.5m. Benzo (a) anthracene exceeded GAC only in TP1 at 0.1-0.2m bgl and TP3 at 0.5-0.6m bgl. Chrysene only exceeded GAC in TP3 at 0.5-0.6m. The LQM PAH profiling tool was additionally used to examine the data to determine whether the profile of the PAH mixture was similar to the profiles tested by Culp et al⁸. This indicated that a number of the compounds were within $\pm 2.5x$ the mean of the Culp et al data although in some samples dibenzo (ah) anthracene and benzo (ghi) perylene were outside this range and greater than $10x$ the mean. The data indicates that the exceedance of the coal tar surrogate largely coincided with the exceedance by individual compounds.

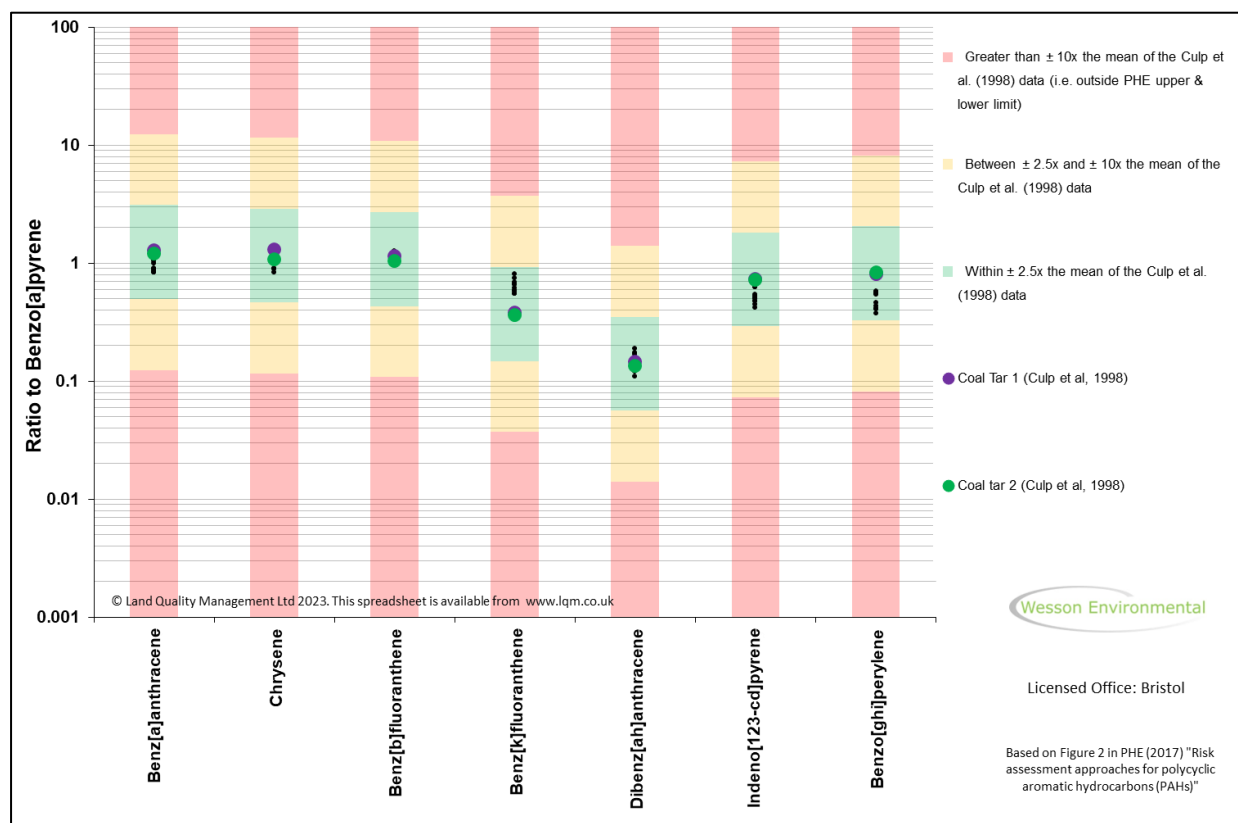


Chart 3-1. Mutagenic PAH compounds mean ratio to benzo (a) pyrene.

Determinand	LOD	Max	GAC
Acenaphthene	0.05	7.2	210
Acenaphthylene	0.05	0.15	170
Anthracene	0.05	8.7	2400
Benzo(a)anthracene	0.05	18	7.2
Benzo(a)pyrene	0.05	18	2.2
Benzo(b)fluoranthene	0.05	20	2.6
Benzo(ghi)perylene	0.05	11	320
Benzo(k)fluoranthene	0.05	6.8	77
Chrysene	0.05	18	15
Dibenz(a,h)anthracene	0.05	2.6	0.24
Fluoranthene	0.05	51	280
Fluorene	0.05	5.7	170
Indeno(1,2,3-cd)pyrene	0.05	9.2	27
Naphthalene	0.05	0.97	2.3
Phenanthrene	0.05	44	95
Pyrene	0.05	47	620
Coal Tar (BaP as a surrogate marker)	N/A	18	0.79

Table 3-3. PAH compounds compared to GAC (units mg/kg)

Using the surrogate marker approach, it can be seen the GAC is exceeded in the majority of samples.

Determinand	TP1	TP1	TP2	TP2	TP3	TP3	TP4	TP4	TP5	TP5	Max	GAC
	0.10-0.20	0.40-0.50	0.10-0.20	0.40-0.50	0.20-0.30	0.50-0.60	0.10-0.20	0.40-0.50	0.10-0.20	0.40-0.50		
BaP	9.1	2.6	6.1	0.16	0.65	18	4.4	0.12	5.8	1.9	18	0.79

Table 3-4. BaP exceedance of GAC using the surrogate marker approach (units mg/kg).

As stated previously, only selected samples were submitted for TPH analysis. Whilst the PID did not indicate that a volatile phase was present, this is due to the speciation of the compounds with only longer chain length determinands present which are unlikely to form a vapour phase. It was also apparent that no BTEX compounds were present above LOD, further indicating the dominance of long chain length petroleum hydrocarbons where present.

3.2.4 Exceedances of guideline value and data distribution.

Under UK risk assessment guidelines, the risk to human health from contaminants such as heavy metals (i.e., those that do not form a vapour phase) considers the shallow soils i.e., the top 0.6m where there is the potential for direct contact, dust generation and plant uptake.

The laboratory data indicates that multiple determinands exceed GAC. However, asbestos fibres were not detected in any samples from shallow soils on site.

The risks from pollutant linkages should be evaluated to enable a determination of whether the risks are acceptable. This requires classification of:

The magnitude of the severity of the risk occurring (Table 3-5)

The magnitude of the likelihood of the risk occurring (Table 3-6)

Classification	Definition
Severe	Short term risk to human health which is likely to result in 'significant harm' as defined by the Environmental Protection Act 1990, Part IIA. Short term risk of pollution of sensitive water resources. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such an organism
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent effects to human health which may easily be prevented by measures such as personal protective clothing, etc. Easily repairable effects of damage to buildings, structures and services

Table 3-5: Classification of severity of risk after CIRIA 552

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 an 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.

Table 3-6: Classification of likelihood of risk after CIRIA 552

To evaluate the risk that each pollutant linkage present on the site poses to a specified receptor, the classifications from each table are compared. It is important that this is only applied where the possibility of an existing pollutant linkage exists. This enables a risk category to be produced that range from 'very high risk' to 'very low risk' (Table 3-7.)

		Consequence			
		Severe	Medium	Mild	Minor
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

Table 3-7: Comparison of consequence with likelihood of risk occurring, after CIRIA 552.

The classification gives a guide to the severity and consequence of risks that have been identified at the site. It is not possible to classify a risk that has been identified as presenting 'no risk'. 'Very low risk' is the lowest risk ranking classification. Whether action is required depends on how acceptable the stakeholder views that risk as being. Table 3-8 shows the action required for specific risk classifications.

Risk classification	Action
Very high risk	A high probability that severe harm could arise to a specified receptor from an identified hazard OR there is evidence that severe harm is currently happening. If the risk is realised it is likely to result in substantial liability If not already undertaken, urgent investigation is required, and remediation measures are likely to be required.
High risk	Harm is likely to arise to a specified receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. If not already undertaken, urgent investigation is required, and remedial works may be necessary in the short term and are likely over the longer term.
Moderate risk	It is possible that harm could arise to a specified receptor from an identified hazard. It is relatively unlikely that any such harm would be severe or if any harm were to occur it is more likely that the harm would be relatively mild. If not already undertaken, investigation is normally required to clarify the risk and determine potential liability. Some remedial works may be required in the longer term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table 3-8: Description of the classified risks and likely action required after CIRIA 552.

The data indicates exceedances by heavy metals in only a single location, TP2 at shallow depth.

PAH compounds are elevated in all samples at 0.1-0.2m with the exception of TP3. In this sample only the deeper sample shows an exceedance of GAC. The deeper samples from TP1, and TP5 also demonstrate PAH concentrations above GAC. In the case of TP3, the pattern is unusual in that the deeper sample from what appear to be natural soils have the highest concentration and we did consider that this may have been the result of samples being mixed up. However, the SOM data is consistent with the pattern demonstrated in other samples, that is organic matter concentration is higher in the shallow samples with a substantial reduction with depth. This is typical of sites we have previously encountered.

Therefore the data indicates that all locations are impacted to some degree by elevated PAH compounds in soils with a single location impacted by heavy metals. Consequently, the elevated concentrations cannot be considered to be a hotspot and site soils as a whole are considered to pose a risk to site users.

Because of the nature of the contaminants, we would consider it unlikely that vapour inhalation pathways are present. As was discussed previously, only a small number of PAH compounds are considered when taking into account vapour phase when calculating S4UL GAC figures and these are acenaphthene, acenaphthylene, anthracene, fluorene, phenanthrene and naphthalene. All make a minor contribution with exception of the latter and none of these exceed GAC. Benzo (a) anthracene, fluoranthene and pyrene do make a minor contribution, but this is less than 0.5% of the total contribution. Therefore risks to site users will occur where soft landscaping is present. Potential pathways are therefore likely to include ingestion of soils and dust, consumption of produce, dermal contact and inhalation of dust.

3.2.5 Water Supply Pipes

The contaminants encountered are unlikely to pose a risk to water supply pipes.

A conceptual site model is presented in

Source	Contaminant	Pathway	Receptor	Severity	Likelihood	Consequence
Made ground and natural sub-soils.	Heavy Metals, PAH,	Ingestion of soils including attached to vegetables	Site Users	Medium	Likely	Mode
		Consumption of home grown produce		Medium	Likely	Mode
		Dermal contact		Medium	Likely	Mode
		Dust inhalation - indoor		Medium	Likely	Mode
		Dust Inhalation - outdoor		Medium	Likely	Mode

Table 3-9.

Source	Contaminant	Pathway	Receptor	Severity	Likelihood	Consequence/ likelihood	Justification
Made ground and natural sub-soils.	Heavy Metals, PAH,	Ingestion of soils including attached to vegetables	Site Users	Medium	Likely	Moderate Risk	Elevated concentrations of heavy metals and in particular PAH compounds detected in site soils.
		Consumption of home grown produce		Medium	Likely	Moderate Risk	
		Dermal contact		Medium	Likely	Moderate Risk	
		Dust inhalation - indoor		Medium	Likely	Moderate Risk	
		Dust Inhalation - outdoor		Medium	Likely	Moderate Risk	

Table 3-9. Tabular site model.

Therefore, based on the exceedances encountered in shallow soils, risks to future site users are currently considered to be **MODERATE**.

4 Surface drainage considerations

We were originally asked to carry out infiltration testing to allow characterisation of site soils to allow design the design of a soakaway or similar means to receive surface water drainage from the site. As can be seen from the figures, the majority of the site is covered with building footprint. It is normally recommended that there is a minimum of 5m between infiltration devices and buildings and this is clearly not possible due to the locations of the proposed property and the neighbouring house. Furthermore, during the site investigation, soils beneath the made ground were found to consist of a clay which generally did not have subsidiary coarser components, and even when these are present, we have found during previous site investigations that the infiltration rate tends to be unsuitable for this method of dealing with surface water drainage.

Therefore, it is recommended that an alternative solution is used. This may comprise either rainwater harvesting or the use of an attenuation tank with a flow control device on the output before discharging to mains drainage or a combination of the two. This will require calculation of the storage volume required which will be dependent on the drained area and on the attenuation outflow which must be agreed with the drainage provider.

4.1 Conclusions and recommendations

The overall risk to site users from contaminants in the shallow soils is considered to be **MODERATE** with the current soils in place due to the presence of PAH compounds and lead. It is considered unlikely that a risk to controlled waters is present based on the data available. A risk to water supply pipes are considered to be unlikely.

The site is not suitable for infiltration drainage and rainwater harvesting and/or attenuation storage should be specified which will discharge to mains drainage. The parameters must be calculated based on the acceptable outflow and drained area.

Remediation of soils in areas where soft landscaping is proposed should be carried out. This will necessitate removal of soils and replacement with clean materials. We would recommend that soils in these areas are excavated to a depth of 600mm and replaced with clean materials that are suitable for this use. This may comprise a mixture of sub soils and topsoils with a compacted hard dig layer at the base. Any remediation carried out will need to be validated

independently. A remedial method statement should be produced separately and include not only the methodology but also validation measures and a discovery strategy.

Should during any works on the site, evidence of contamination become apparent, this should be reported to the Local Authority contaminated land officer.

4.2 STATEMENT OF LIMITATIONS

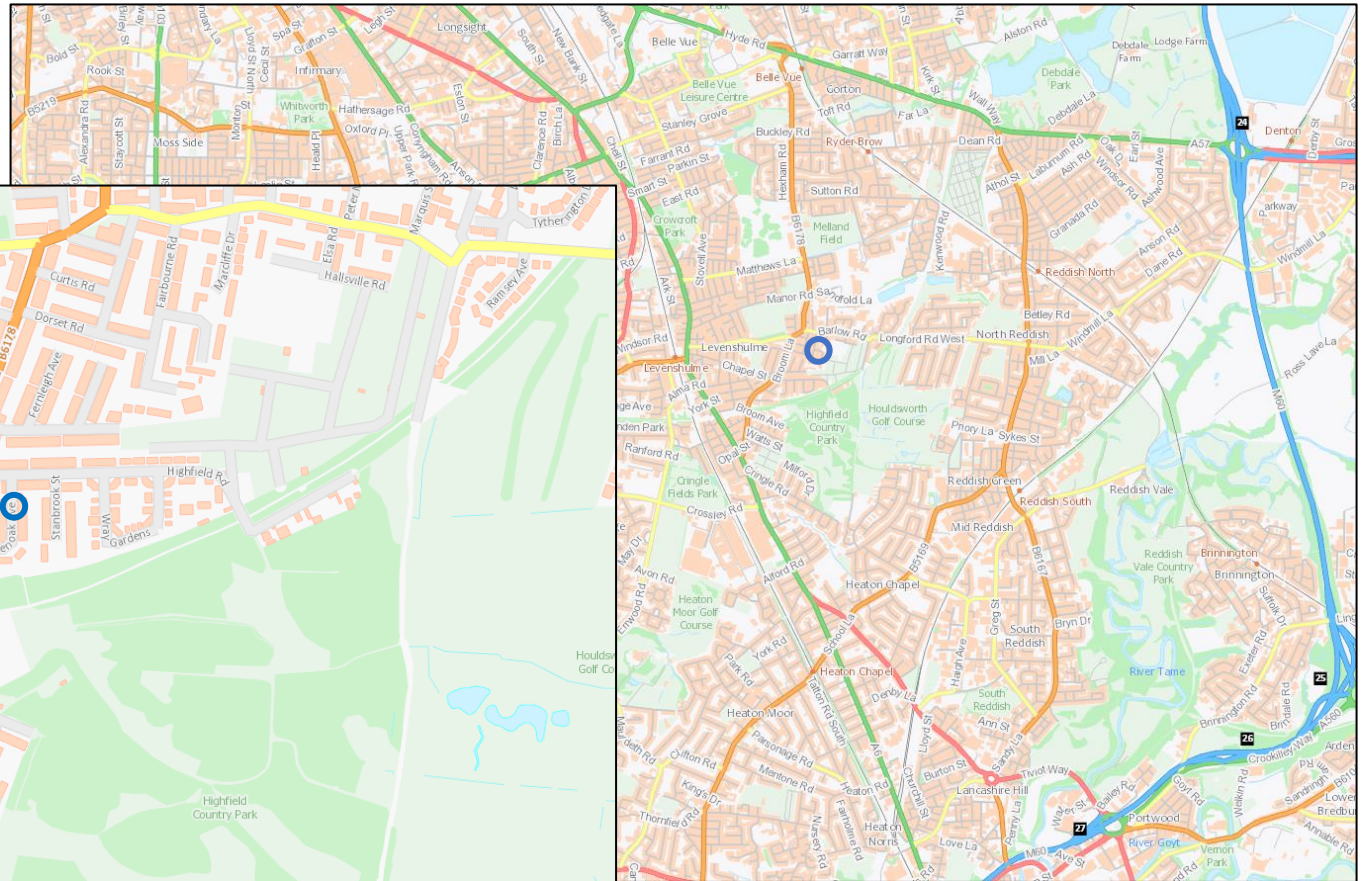
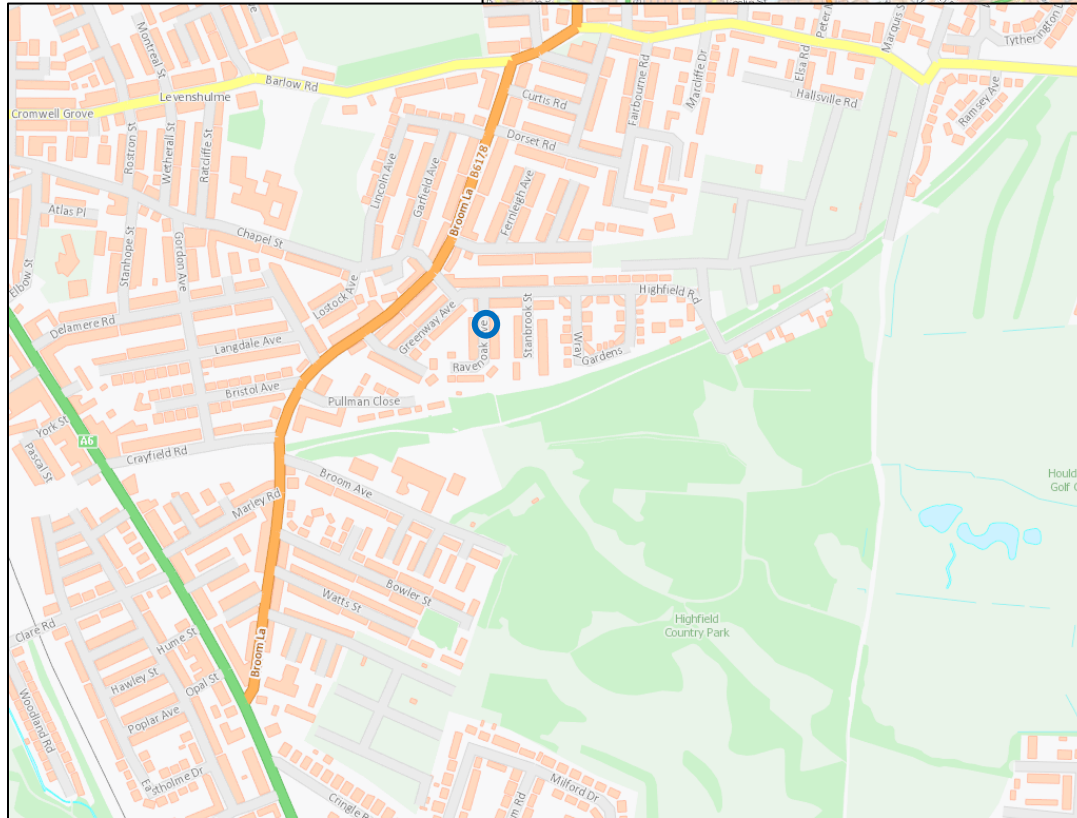
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5 REFERENCES

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Appendix A

Figures



KEY:

 Approximate Site Location

DO NOT SCALE



TITLE:

Site Location Plan

PROJECT:

2, Highfield Road, Manchester

PROJECT NO:

001EAMOP2

DATE:

19/12/23

SCALE:

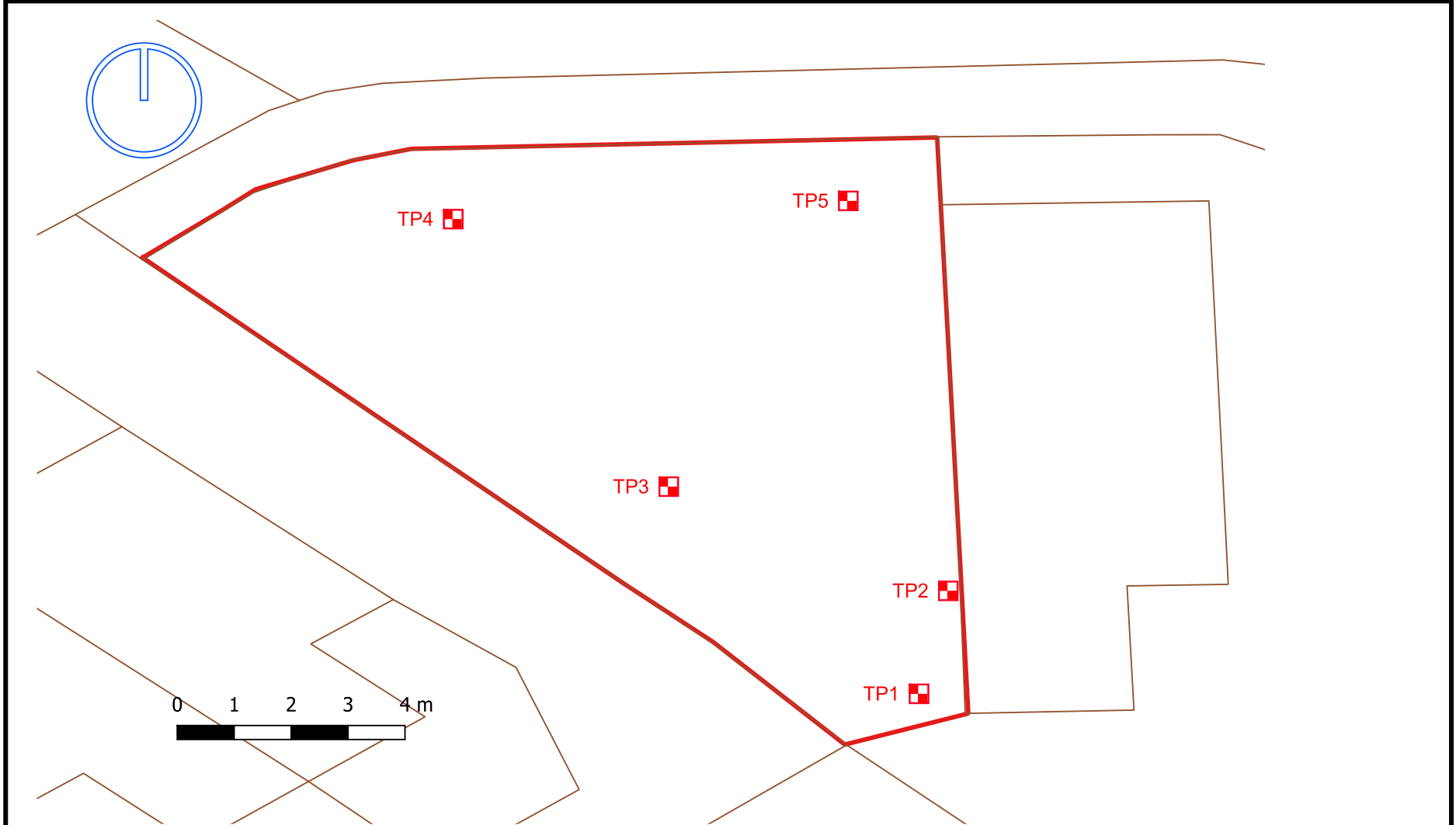
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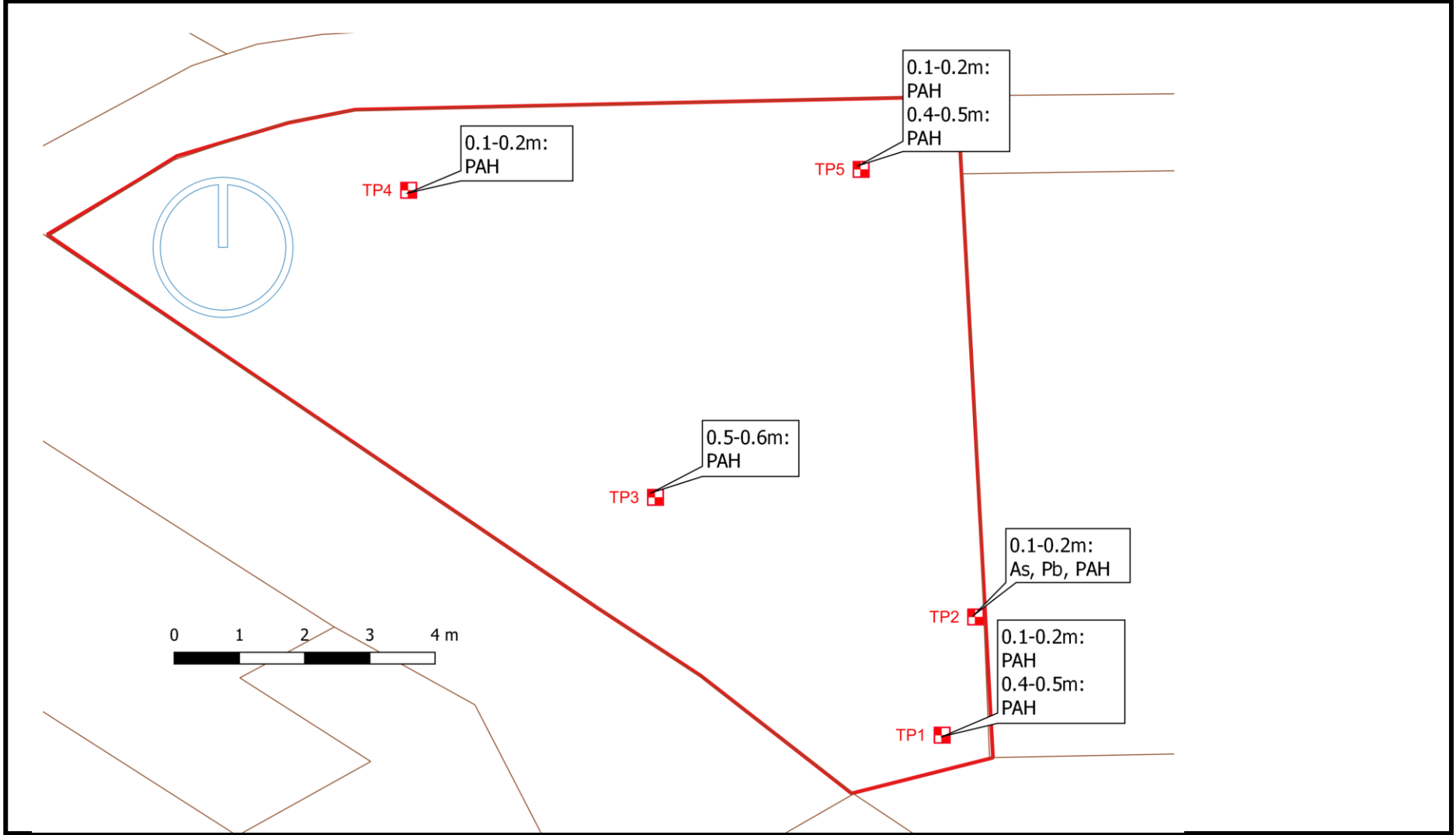
RW

DWG NO:

Figure 1

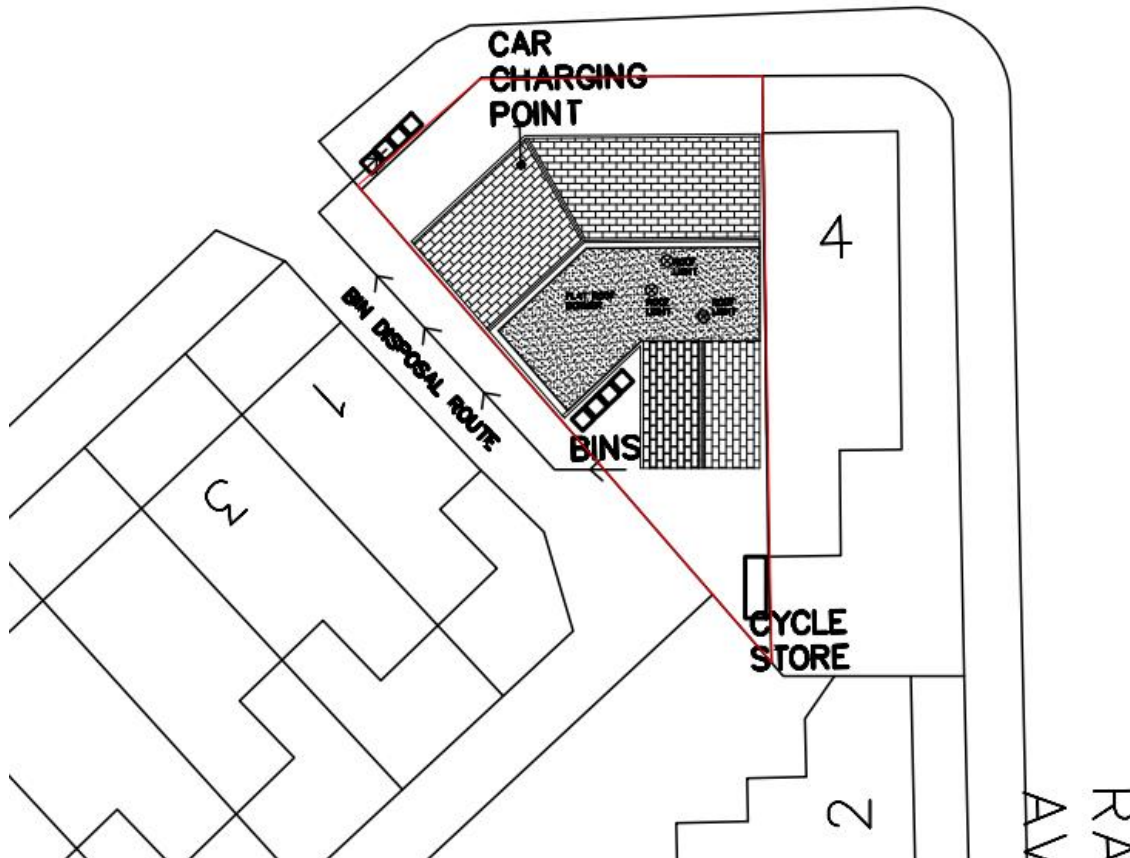


KEY: Trial Pit Locations DO NOT SCALE	Wesson Environmental	TITLE: Sample Locations		
		PROJECT: 2, Highfield Road, Manchester		
		PROJECT NO: 001EAMOP2		DATE: 19/12/23
		SCALE: As Shown	DRAWN: RW	DWG NO: Figure 2



KEY:  Trial Pit Locations DO NOT SCALE			TITLE: Locations of Exceedance of GAC PROJECT: 2, Highfield Road, Manchester PROJECT NO: 001EAMOP2 DATE: 19/12/23 SCALE: As Shown DRAWN: RW DWG NO: Figure 3	
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HIGHFIELD
ROAD



KEY:

DO NOT SCALE

Wesson Environmental

TITLE:

Proposed Site Layout

PROJECT:

2, Highfield Road, Manchester

PROJECT NO:

001EAMOP2

DATE:

19/12/23

SCALE:

As Shown

DRAWN:

RW

DWG NO:

Figure 4

Appendix B

Exploratory Hole Logs

GEO-ENVIRONMENTAL LOG: TP1

PROJECT NO.: 001EAMOP2

DRILLING DATE: November 29, 2023

TOTAL DEPTH: 0.9

PROJECT: 2, Highfield Road,

DRILLING CO.: Martin

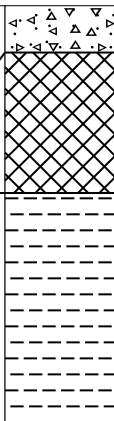
COORDINATES: CLIENT: Manchester
4-easymove Property

METHOD: Mini-Digger

LOGGED BY: Richard Wesson

ADDRESS: 2 Highfield Road, Manchester, M19 3JX

NOTES:

Depth (m)	Material Description	Graphic	Samples			Depth Scale
			No.	Moisture	Type	
Ground Surface at (m)						
0	<u>Paving slabs laid on concrete</u> CONCRETE <u>Black clay with ash and masonry fragments</u> MADE GROUND <u>Firm brown CLAY</u> CLAY					0
	0.1 m					
	0.4 m					
	0.9 m					
1	End of Test Hole at 0.9 (m)					1

GEO-ENVIRONMENTAL LOG: TP2

PROJECT NO.: 001EAMOP2

DRILLING DATE: November 29, 2023

TOTAL DEPTH: 0.9

PROJECT: 2, Highfield Road,

DRILLING CO.: Martin

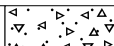
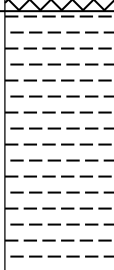
COORDINATES: CLIENT: Manchester
4-easymove Property

METHOD: Mini-Digger

LOGGED BY: Richard wesson

ADDRESS: 2 Highfield Road, Manchester, M19 3JX

NOTES:

Depth (m)	Material Description	Graphic	Samples			Depth Scale
			No.	Moisture	Type	
Ground Surface at (m)						
0	<u>Thin skim layer</u> CONCRETE					0
	0.1 m					
	<u>Black clay with ash and masonry fragments</u> MADE GROUND					
	0.3 m					
	<u>Soft brown CLAY</u> CLAY					
	0.9 m					
1	End of Test Hole at 0.9 (m)					1

GEO-ENVIRONMENTAL LOG: TP3

PROJECT NO.: 001EAMOP2

DRILLING DATE:

TOTAL DEPTH: 0.9

PROJECT: 2, Highfield Road,

DRILLING CO.: Martin

COORDINATES: ☐

Manchester

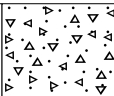
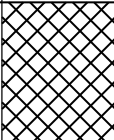
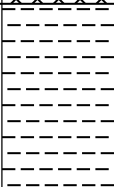
METHOD: Mini-digger

LOGGED BY: Richard Wesson

CLIENT: 4-easymove Property

ADDRESS: 2 Highfield Road, Manchester, M19 3JX

NOTES:

Depth (m)	Material Description	Graphic	Samples			Depth Scale
			No.	Moisture	Type	
Ground Surface at (m)						
0	<u>Thin skim layer</u> CONCRETE					0
	0.2 m					
	<u>Black clay with ash and masonry fragments</u> MADE GROUND					
	0.5 m					
	<u>Soft brown CLAY</u> CLAY					
	0.9 m					
1	End of Test Hole at 0.9 (m)					1

GEO-ENVIRONMENTAL LOG: TP4

PROJECT NO.: 001EAMOP2

DRILLING DATE: November 29, 2023

TOTAL DEPTH: 0.9

PROJECT: 2, Highfield Road,

DRILLING CO.: Martin

COORDINATES: ☐

Manchester

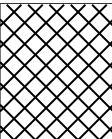
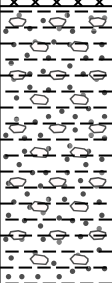
METHOD: Mini-digger

LOGGED BY: Richard Wesson

CLIENT: 4-easymove Property

ADDRESS: 2 Highfield Road, Manchester, M19 3JX

NOTES:

Depth (m)	Material Description	Graphic	Samples			Depth Scale
			No.	Moisture	Type	
Ground Surface at (m)						
0	<u>Black clay with ash and masonry fragments</u> MADE GROUND				D	0
	0.3 m					
	<u>Soft grey mottled slightly sandy brown CLAY with occasional cobbles of sandstone.</u> Sandy cobbly CLAY				D	
	0.9 m					
1	End of Test Hole at 0.9 (m)					1

GEO-ENVIRONMENTAL LOG: TP5

PROJECT NO.: 001EAMOP2

DRILLING DATE: November 29, 2023

TOTAL DEPTH: 1

PROJECT: 2, Highfield Road,

DRILLING CO.: Martin

COORDINATES: ☐CLIENT: Manchester
4-easymove Property

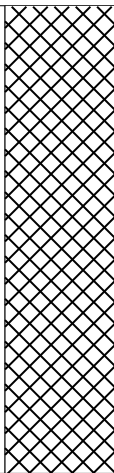
METHOD: Mini-digger

LOGGED BY: Richard Wesson

ADDRESS: 2 Highfield Road, Manchester, M19 3JX

NOTES:

Samples from south side.

Depth (m)	Material Description	Graphic	Samples			Depth Scale
			No.	Moisture	Type	
Ground Surface at (m)						
0	<u>Black clay with ash, metal, tiles and masonry. Masonry dominate south side of pit. Clay apparent on north side from 0.5m.</u> MADE GROUND				D	0
1	End of Test Hole at 1 (m)					1 m
2						2
3						3

Appendix C

Chemical Analysis Results



Richard Wesson
Wesson Environmental Ltd
145-147 East Street
Bristol
BS3 4EJ

i2 Analytical Ltd.
7 Woodshots Meadow,
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WD18 8YS
t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: richard@wessonenvironmental.co.uk

Analytical Report Number : 23-72584

Project / Site name:	Lovenshulme	Samples received on:	01/12/2023
Your job number:	001EAMOP2	Samples instructed on/ Analysis started on:	01/12/2023
Your order number:		Analysis completed by:	12/12/2023
Report Issue Number:	1	Report issued on:	12/12/2023
Samples Analysed:	10 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-72584
Project / Site name: Lovenshulme

Lab Sample Number				2897820	2897821	2897822	2897823	2897824
Sample Reference				TP1	TP1	TP2	TP2	TP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10-0.20	0.40-0.50	0.10-0.20	0.40-0.50	0.20-0.30
Date Sampled				29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	19	16	17	15	24
Total mass of sample received	kg	0.001	NONE	1	0.8	0.8	0.8	0.8

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSA	DSA	DSA	DSA	DSA

General Inorganics

Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.1	1.4	2.4	0.5	2
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.82	0.82	0.57	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.1	0.05	0.13	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	3.4	1.2	1.4	0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	2	0.79	0.81	0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	20	6.6	11	0.33	0.44
Anthracene	mg/kg	0.05	MCERTS	4	1.4	2.2	0.07	0.05
Fluoranthene	mg/kg	0.05	MCERTS	26	7.8	17	0.49	0.82
Pyrene	mg/kg	0.05	MCERTS	23	6.9	16	0.47	0.87
Benzo(a)anthracene	mg/kg	0.05	MCERTS	9.5	3	6.5	0.2	0.54
Chrysene	mg/kg	0.05	MCERTS	10	3.1	6.6	0.2	0.65
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	11	3.3	7	0.2	0.63
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	3.7	1.2	3.3	0.09	0.36
Benzo(a)pyrene	mg/kg	0.05	MCERTS	9.1	2.6	6.1	0.16	0.65
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	4.1	1.3	2.9	0.1	0.31
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1	0.34	0.73	< 0.05	0.1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	5	1.5	3.6	0.13	0.36

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	133	41.8	84.6	2.54	5.78
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	28	19	41	12	18
Barium (aqua regia extractable)	mg/kg	1	MCERTS	170	150	240	61	100
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.7	1.4	2	0.74	0.97
Boron (water soluble)	mg/kg	0.2	MCERTS	0.9	1	0.3	0.4	1.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	25	24	27	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	59	41	84	11	43
Lead (aqua regia extractable)	mg/kg	1	MCERTS	150	85	250	17	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	0.4	0.8	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	28	27	15	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.4	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	39	34	43	42	27
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	97	220	32	49

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-72584
Project / Site name: Lovenshulme

Lab Sample Number				2897825	2897826	2897827	2897828	2897829
Sample Reference				TP3	TP4	TP4	TP5	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.60	0.10-0.20	0.40-0.50	0.10-0.20	0.40-0.50
Date Sampled				29/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	10	16	13	14
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	0.8	0.8

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSA	DSA	DSA	DSA	DSA

General Inorganics

Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.8	1.3	0.4	2.4	1.7
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.97	< 0.05	< 0.05	0.43	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.13	< 0.05	0.15	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	7.2	0.61	< 0.05	0.63	0.16
Fluorene	mg/kg	0.05	MCERTS	5.7	0.37	< 0.05	0.41	0.12
Phenanthrene	mg/kg	0.05	MCERTS	44	3.8	< 0.05	4.8	1.5
Anthracene	mg/kg	0.05	MCERTS	8.7	0.87	< 0.05	1.2	0.32
Fluoranthene	mg/kg	0.05	MCERTS	51	7.9	0.22	10	3.2
Pyrene	mg/kg	0.05	MCERTS	47	7.5	0.22	9.7	3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	18	4	0.1	5	1.7
Chrysene	mg/kg	0.05	MCERTS	18	4	0.12	4.8	1.7
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	20	4.8	0.13	6.6	1.9
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	6.8	1.9	< 0.05	2.4	1.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	18	4.4	0.12	5.8	1.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	9.2	2.4	0.05	3.6	1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	2.6	0.76	< 0.05	1.1	0.32
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	11	2.9	0.08	4.3	1.3

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	268	46.1	1.04	61	19.2
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10	14	11	16	23
Barium (aqua regia extractable)	mg/kg	1	MCERTS	81	150	71	180	200
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.84	1.2	0.93	1.2	1.6
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.2	0.4	< 0.2	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.7	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	17	24	18	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	26	46	19	57	49
Lead (aqua regia extractable)	mg/kg	1	MCERTS	36	97	16	120	92
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	19	15	22	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	30	28	29	31	41
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	58	120	35	150	250

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



Analytical Report Number : 23-72584
Project / Site name: Lovenshulme

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2897820	TP1	None Supplied	0.10-0.20	Brown clay and sand with gravel.
2897821	TP1	None Supplied	0.40-0.50	Brown clay and sand with gravel.
2897822	TP2	None Supplied	0.10-0.20	Brown clay and sand with gravel.
2897823	TP2	None Supplied	0.40-0.50	Brown clay and sand with gravel.
2897824	TP3	None Supplied	0.20-0.30	Brown clay and sand with gravel.
2897825	TP3	None Supplied	0.50-0.60	Brown clay and sand with gravel.
2897826	TP4	None Supplied	0.10-0.20	Brown loam and sand with gravel and vegetation.
2897827	TP4	None Supplied	0.40-0.50	Brown clay and sand with gravel.
2897828	TP5	None Supplied	0.10-0.20	Brown loam and sand with gravel and vegetation.
2897829	TP5	None Supplied	0.40-0.50	Brown loam and sand with gravel and vegetation.

Analytical Report Number : 23-72584
Project / Site name: Lovenshulme

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

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

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

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