Land adjacent to
929 Oldham Road
Manchester

Quantitative Ground Contamination Risk Assessment Report

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EXECUTIVE SUMMARY

The following presents a summary of the main findings of the report. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

It is proposed to develop the land adjacent to 929 Oldham Road, Manchester. The development proposals are understood to comprise the construction of a two-storey house with areas of private garden and car parking.

Reference to geological datasets indicates that the site is expected to be underlain by the Till deposits overlying the Collyhurst Sandstone Formation. The ground investigation confirmed the underlying soils to comprise a variable thickness of made ground, overlying Till deposits.

The Till is classed as a Secondary Undifferentiated Strata. The Collyhurst Sandstone Formation is classed as a Principal Aquifer. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. Groundwater was encountered at the base of the boreholes during the ground investigation, and standing water depths of between 0.69m and 2.20m were recorded during the monitoring period.

A Phase 1 Contaminated Land Assessment identified potential pollutant linkages to be present.

Testing of made ground soils identified the made ground to contain concentrations of heavy metals and PAH compounds which are considered to pose an unacceptable risk to end users of the site.

The concentrations of petroleum hydrocarbons exceed the threshold value for the use of PE water supply pipework.

Remedial measures are required to reduce the risk to end users from the underlying soils. These works should be set out within a remediation strategy, following approval by regulators of the this updated report.

Ground gas monitoring standpipes were installed as part of the ground investigation and were monitored over a two month period. The concentrations of ground gases recorded are not considered to pose an unacceptable risk and no specific remedial measures are considered to be necessary in this regard.

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1. INTRODUCTION

It is proposed to develop the land adjacent to 929 Oldham Road, Manchester. The development proposals are understood to comprise the construction of a two-storey house with areas of private garden and car parking. A copy of the proposed development layout is presented in Appendix A.

GeoSmart Information Ltd. has previously undertaken a Phase 1 Contaminated Land Assessment[1] for the site. The assessment identified potential pollutant linkages associated with the likely presence of made ground, as well as the presence of industrial land uses and a landfill site in the vicinity of the site.

Ashdown Site Investigation Ltd. was requested to undertake a ground investigation and to provide a quantitative risk assessment to assist with the discharge of planning conditions for the site.[2]

The specific objectives of the works were to:

a) Investigate the shallow ground and groundwater conditions prevailing at the site;
b) Test for the presence of contaminants identified by the preliminary conceptual model; and
c) Develop a quantitative conceptual model of the site identifying pollutant linkages relating to end users of the proposed development works, to controlled waters beneath and in the vicinity of the site, or to other off-site sensitive receptors, if identified.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q11240, dated 9th September 2021. The instruction to proceed was received from Howard & Seddon Partnership, on behalf of the client.

This report should be read in conjunction with the previous report prepared for the site by Geosmart Information Ltd.

This issue of the report, "Issue 2", incorporates the results of ground gas monitoring, which was still in progress at the time that Issue 1 of the report was prepared.

[1] EnviroSmart Plus, Report Ref:75070R1, dated August 2021
[2] Manchester City Council, Planning Application No. 125845, Condition 5

2. SITE CONTEXT

2.1 Site Description

The site comprises a rectangular shaped plot of land located to the south of Ceylon Street, Manchester and is centred on the approximate Ordnance Survey national grid reference 387500, 400640. A site location plan is presented as Figure 1.

At the time of the ground investigation, the site comprised a vacant area of land with a vegetated surface. A shipping container for storage was located in the north east of the site and some construction type materials were located along the western boundary.

The site was bounded to Ceylon Street to the north, with a large industrial unit beyond Ceylon Street to the north. A car park is present to the east of the site and a vacant area of scrub land to the south. A school bounds the site to the west.

Current vacant site	**Shipping container in the north east of the site and Ceylon St to the north of the site**
Industrial unit to the north of Ceylon St and School building to the west	**Scrub land to the south of the site**

2.2 Geological and Hydrogeological Data

2.2.1 Expected Geology and Aquifer Designation

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata and Aquifer Designation

Type	Stratum	Aquifer Designation
Superficial	Till, Devensian	Secondary Undifferentiated Aquifer
Bedrock	Collyhurst Sandstone Formation	Principal Aquifer

Till are superficial deposits formed up to 2 million years ago in the Quaternary Period and are sedimentary deposits that are glaciogenic in origin.

The Collyhurst Sandstone Formation comprises a soft red sandstone with abundant beds of "millet seed" sand grains alternating with beds of fine-grained sharp sand with some interbedded grey sandstones locally.

2.2.2 Radon

Table 2. Radon

Section	Risk Assessment
Radon Affected Areas	The site is reported to be within an area where less than 1% of properties are at or above the action level requiring radon gas protection measures to be installed in new buildings.
Radon Protection Measures	No radon protection measures are reported by the British Geological Survey to be necessary in the construction of new dwellings or extensions.

2.2.3 Groundwater Abstractions

The closest groundwater abstraction licence is recorded to lie 607m to the west of the site. The abstraction is for cooling. The status of the abstraction licence is noted to be revoked.

2.2.4 Surface Water Abstractions

The closest surface water abstraction licence is recorded to lie 861m to the north of the site. The abstraction, from a canal, is identified to be for a boiler feed. The status of the abstraction licence is noted to be revoked.

2.2.5 Groundwater Source Protection Zones

The site does not lie within an Environment Agency Source Protection Zone.

2.2.6 Surface Water Features

The nearest recorded significant surface water feature is a canal, located 184m to the south of the site.

3. GROUND INVESTIGATION

3.1 Introduction

The ground investigation comprised the excavation of a series of dynamic sampler boreholes, and hand dug trial pits. The intrusive work was carried out on 13th October 2021. The exploratory hole locations are shown on Figure 2.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix B, together with notes to assist in their interpretation.

3.2 Exploratory Holes

3.2.1 Dynamic Sampler Boreholes

Three boreholes, designated WS01 to WS03, were drilled to depths of 3.00m below ground level.

The boreholes were formed by a series of 1.0m long, open ended, hollow steel tubes of up to 100mm diameter, each containing a removable plastic liner. The tubes, progressively reducing in diameter, were driven into the ground by means of a track-mounted drop weight. Each tube was extracted from the ground using a hydraulically operated jack and the enclosed sample was recovered in its plastic liner.

The system enables sub-samples to be taken for detailed examination and laboratory testing.

3.2.2 Trial Pits

Two trial pits, designated TP01 and TP02, were dug using hand tools to depths of 0.40m and 0.50m below ground level, respectively, to enable representative samples to be obtained.

3.3 Sampling

Disturbed samples of soil were taken at the depths shown in the exploratory hole records and were collected in plastic tubs or amber jars fitted with gas tight lids.

On collection the amber jars were stored in cool boxes with cooling blocks to maintain temperatures below 4°C until transferred to refrigerators upon return to the office and subsequently forwarded to the external accredited chemical testing laboratory.

3.4 Installations

Gas and groundwater monitoring standpipes were installed to depths of between 2.90m and 3.00m in each of the boreholes. Descriptions of the installations are shown on the exploratory hole records in Appendix B.

The concentrations of gases and depths to groundwater have been recorded within the standpipes on six occasions over a two month period, between 21st October and 19th December 2021. The results are presented in Appendix B.

3.5 Laboratory Testing

Laboratory testing was scheduled by Ashdown Site Investigation Ltd. Results from the laboratory tests are provided in Appendix C.

Chemical (contamination) testing of selected samples was undertaken by a laboratory with recognised (UKAS and MCERTS) accreditation for quality control.

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 Surface Covering

A shallow thickness of topsoil, up to 50mm in thickness, was encountered at each exploratory hole position.

4.1.2 Made Ground

In the northern part of the site, TP01 and WS01 recorded a shallow thickness of made ground (up to 0.3m below ground level) comprising sandy gravel / gravelly sand. The gravel fraction comprised variable quantities of limestone, sandstone, ironstone and flint.

Deeper made ground, to depths of between 0.70m and 1.00m was recorded in boreholes WS02 and WS03, respectively, and to the full depth of the trial pit TP02 (0.50m) located in the central/southern part of the site.

The made ground in these positions comprised a shallow thickness (to depths of between 0.20m and 0.30m below ground level) of the sandy gravel/gravelly sand deposits encountered in the north of the site, underlain by a layer of black slightly gravelly clayey sand/sandy clay. The gravel fraction comprised brick, flint, ash-like material and concrete.

4.1.3 Till

Underlying the made ground (where penetrated), the investigation progressed into undisturbed slightly gravelly, slightly sandy clay deposits, generally becoming gravelly sandy clay below depths of between 2.40m and 2.80m. These deposits persisted to the full depth of the investigation and are considered to represent the Till deposits indicated on the published geological map.

4.2 Stability

Instability was recorded locally at depth within borehole WS01.

4.3 Groundwater Conditions

Groundwater was generally encountered at the base of each borehole on completion. Standing water depths of between 0.69m and 2.20m below ground level were recorded in the standpipes during the monitoring period.

It should be noted that water levels within the boreholes may not have equilibrated with the groundwater table at the time the readings were recorded and that groundwater levels should be expected to fluctuate seasonally.

5. QUANTITATIVE CONTAMINATION ASSESSMENT

5.1 Introduction

The Phase 1 Contaminated Land Assessment for the site identified potential pollutant linkages associated with the likely presence of made ground, as well as the presence of industrial land uses and a landfill site in the vicinity of the site.

The preliminary conceptual model for the proposed developments is presented in Appendix D.

5.2 Assessment Strategy

The design of the ground investigation considered the potential contaminant sources identified by the preliminary ground contamination risk assessment.

The exploratory holes were located to provide spatial coverage of the site, with samples of shallow made ground tested for a range of commonly occurring contaminants: heavy metals and polycyclic aromatic hydrocarbon (PAH) compounds. The samples were also screened for asbestos.

Shallow samples of the made ground, along with deeper samples of both the made ground and undisturbed Till deposits were tested for concentrations of petroleum hydrocarbons. Samples of the black slightly gravelly clayey sand / sandy clay made ground recorded in boreholes WS02 and WS03 were tested for a range of volatile organic compounds (VOC).

5.3 Analysis of Contamination Test Results

Comparison of the results of the laboratory testing has been made against the 'Suitable For Use Levels' (S4UL)[3] or, in lieu of an S4UL being developed for lead, the Category 4 Screening Level (C4SL)[4]. These are collectively referred to as soil screening values (SSV).

In view of the development proposal, the SSV utilised in this assessment are those calculated for the generic "Residential" land use[5]. The critical receptor for this land use is considered to be a young female child resident on site from birth to age 6. Exposure routes that are considered include the potential for direct ingestion of the soil, the outdoor and indoor ingestion of dust, the potential inhalation of dust and vapours, ingestion of site grown vegetables and ingestion of soil attached to vegetables.

For the assessment of risk to controlled waters a qualitative assessment has been undertaken based upon the concentrations of contaminants recorded within the soil samples and the information obtained about the sensitivity of the underlying strata or nearby surface water receptors.

[3] Nathanail, C.P, et al., The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015, Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3071.
[4] SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.
[5] As defined within Science Report SC050021/SR3, January 2009, with the amendments discussed in the LQM/CIEH report.

5.3.1 Heavy Metals

The following table summarises the SSV along with the maximum and minimum concentrations of the heavy metals tested for.

Table 3. Summary of Test Results for Heavy Metals

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Arsenic	37	5	10.3	94	1	2
Cadmium	11	5	1.4	6.3	0.5	0
Chromium	910	5	23.3	39	5	0
Copper	2400	5	30.3	241	5	0
Lead	200	5	561	3380	5	5
Mercury	40	5	<LOD	1.8	0.5	0
Nickel	180	5	27.7	59	5	0
Selenium	250	5	<LOD	1.3	1	0
Zinc	3700	5	183	377	5	0
Hexavalent Chromium	6	5	<LOD	<LOD	0.8	0
Water Soluble Boron	290	5	<LOD	2	0.5	0

Each of the samples of made ground tested recorded concentrations of lead in excess of the SSV. Two of the samples of made ground also recorded concentrations of arsenic about the SSV.

The concentrations of heavy metals within the made ground are considered to pose an unacceptable risk to the proposed end users of the site.

At the concentrations recorded, heavy metals would be relatively immobile within the underlying soils. In view of this, and as the Till deposits underlying the made ground are a Secondary Undifferentiated Aquifer and the site is not located within a source protection zone, the concentrations of heavy metals are not considered to pose an unacceptable risk to controlled waters.

5.3.2 Asbestos

No suspected asbestos materials were noted within any of the exploratory holes undertaken at the site.

Five samples of the made ground were screened for the presence of asbestos. None of the samples recorded the presence of any asbestos materials.

There does not appear to be an unacceptable risk to end users from asbestos materials within underlying made ground soils. However, due to the heterogeneity of made ground, there remains the potential for localised asbestos materials to be present away from the intrusive locations, though the likelihood of this would appear to be low. All workers at the site should be made aware of what actions to take in the event that suspected asbestos materials are identified at any time during the development works.

5.3.3 Polycyclic Aromatic Hydrocarbon (PAH) Compounds

The following table summarises the soil screening values, maximum and minimum concentrations for the PAH compounds tested for.

Table 4. Summary of Test Results for PAH Compounds

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Naphthalene	2.3	5	<LOD	1.2	0.1	0
Acenaphthylene	170	5	<LOD	0.5	0.1	0
Acenaphthene	210	5	<LOD	9	0.1	0
Fluorene	170	5	<LOD	5.6	0.1	0
Phenanthrene	95	5	<LOD	61.5	0.1	0
Anthracene	2400	5	<LOD	14.9	0.1	0
Fluoranthene	280	5	<LOD	97.4	0.1	0
Pyrene	620	5	<LOD	81.7	0.1	0
Benz(a)anthracene	7.2	5	<LOD	44.2	0.1	2
Chrysene	15	5	<LOD	51.9	0.1	2
Benzo(b)fluoranthene	2.6	5	<LOD	38.7	0.1	2
Benzo(k)fluoranthene	77	5	<LOD	33	0.1	0
Benzo(a)pyrene	2.2	5	<LOD	39	0.1	2
Indeno(123-cd)pyrene	27	5	<LOD	28.5	0.1	1
Dibenz(ah)anthracene	0.24	5	<LOD	6.7	0.1	3
Benzo(ghi)perylene	320	5	<LOD	23.6	0.1	0

Three of the five samples of made ground tested recorded concentrations of at least one PAH compound above its respective SSV.

The concentrations of PAH compounds within the made ground are considered to pose an unacceptable risk to the proposed end users of the site.

PAH compounds have extremely low solubilities and are therefore relatively immobile within soils. In view of this and as the Till deposits underlying the made ground are a Secondary Undifferentiated Aquifer and the site is not located within a source protection zone, the concentrations of PAH compounds present are not considered to pose an unacceptable risk to controlled waters.

5.3.4 Petroleum Hydrocarbons and VOC

The following table lists the SSV for petroleum hydrocarbon equivalent carbon weight fractions calculated for 1% organic content.

Table 5. SSV for petroleum hydrocarbon equivalent carbon weight fractions

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC 5-6	42	Aromatic EC 5-7	70
Aliphatic EC >6-8	100	Aromatic EC >7-8	130
Aliphatic EC >8-10	27	Aromatic EC >8-10	34
Aliphatic EC >10-12	130	Aromatic EC >10-12	74

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC >12-16	1100	Aromatic EC >12-16	140
Aliphatic EC >16-35	65000	Aromatic EC >16-21	260
Aliphatic EC >35-44	65000	Aromatic EC >21-35	1100
		Aromatic EC >35-44	1100

Whilst full speciation of the concentrations of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken, the results of the testing undertaken can still be compared with the more stringent of the screening values for the respective equivalent carbon weight fraction and, where the concentration recorded is found to be lower, it can be reasonably concluded that no significant risk is present.

No olfactory evidence of petroleum hydrocarbon contamination was encountered in the soils at the site, though the made ground in boreholes WS02 and WS03 and trial pit TP02 was noted to be black.

Higher concentrations of petroleum hydrocarbons were recorded within the black made ground than elsewhere on site, though in all cases the concentrations present were all significantly below the SSV for the more conservative equivalent carbon weight fraction.

No detectable concentrations of VOC (including BTEX compounds) were recorded in the samples tested.

No detectable concentrations of petroleum hydrocarbons were recorded in the deeper samples of made ground or in the Till deposits.

There is not considered to be an unacceptable risk to end users or controlled waters from petroleum hydrocarbons or VOC within the underlying soils.

The concentrations of VOC and petroleum hydrocarbons have been compared to the threshold values for the use of PE water supply pipework as published by united Utilities[6]. The concentrations of petroleum hydrocarbons exceed the threshold value in the sample from WS02.

A detailed assessment of the risk to water supply pipework was beyond the scope of the assessment and the testing was not undertaken at the likely depth or route of water supply pipework. Therefore, it is strongly recommended that designers consult with the proposed water supply company to ascertain whether they require further laboratory testing and assessment specific to proposed routes of services or whether they require the selection of any specific water supply pipe material.

5.4 Analysis of Ground Gas Monitoring Results

5.4.1 Summary of Monitoring Works

The Phase 1 assessment identified two potential sources of ground gas generation; The site being located within a coal mining area, and a landfill located ~190m south of the site.

In respect of the risk from gases from potential coal mining, the preliminary conceptual model noted that the site is located within a "Development Low Risk Area", and mention is made of Coal Authority guidance stating that "whilst coal mining has taken place in this area, it was at

[6] Supplementary guidance for the selection of water pipes in land potentially affected by contamination,

such depth not to pose a public safety or ground stability risk to new development". A "Moderate/Low" Risk was assigned, based on a consequence of "Severe" but a probability of "Unlikely".

The same risk classification, based on the same probability and consequence, was assigned to the risk from ground gases from Mitchell Street Landfill located ~190m south of the site.

The preliminary conceptual model notes that data from Manchester City Council indicates the landfill is producing elevated concentrations of ground gases. However, it also notes that the Rochdale Canal is present between the landfill and the site, which "may well constrain any gas risks", and that the underlying geology (Till) was also expected to constrain any gas risk.

However, given the Moderate/Low risk assigned to the risk from ground gases, monitoring standpipes were installed within the three boreholes, WS01-WS03 and monitoring of the gas concentrations within the standpipes was undertaken on six occasions over a period of two months.

The concentrations of ground gases in WS02 could not be recorded on the second monitoring visit as the standpipe cover was flooded; the gas bung had to be removed from the standpipe to allow the water in the cover to dissipate.

5.4.2 Summary of Monitoring Results

Peak concentrations of carbon dioxide of up to 3.4% were recorded during the monitoring period. No detectable concentrations of methane were recorded during any borehole during any monitoring visit.

In general, no detectable gas flows were recorded, with the exception of a negative flow rate of -0.4l/hr recorded in WS01 during the third monitoring visit.

During the first two monitoring visits, detectable concentrations of carbon monoxide and hydrogen sulphide were recorded, with a maximum concentration of carbon monoxide of 40ppm (0.004%) and a maximum concentration of hydrogen sulphide of 30ppm (0.003%). However, no detectable concentrations of either carbon monoxide or hydrogen sulphide were recorded after the second monitoring visit.

Atmospheric pressures varied between 1000mb and 1025mb during the monitoring period. Monitoring was carried out during periods of both rising and falling atmospheric pressure. The period and frequency of monitoring carried out is considered sufficient to allow a robust assessment of the risk from ground gases.

5.4.3 Calculation of Gas Screening Values

Assessment of the results of the monitoring has been carried out in general accordance with the CIRIA guidance.

The guidance provides a methodology for assessing the risk from ground gases by the calculation of site-specific gas screening values (GSV) for each key asphyxiating or explosive gas (carbon dioxide and methane). These are calculated by multiplying the concentration (percentage/volume) of a gas by a gas flow rate (l/hr).

An assessment has been carried out by calculating the GSV using the highest consistent flow rate recorded multiplied by the highest gas concentration recorded. For the purpose of this assessment the negative flow rate recorded is assumed to be positive.

In the case of methane, where no gas concentrations were recorded, the GSV has been calculated assuming values equal to the limit of detection of the instrument are present.

The following table summarises the calculated GSV:

Table 6. Calculated GSV for Carbon Dioxide and Methane

Gas	GSV
Carbon Dioxide	0.034 x 0.4 = 0.0136
Methane	0.001 x 0.4 = 0.0004

5.4.4 Assessment of Risk from Ground Gases

CIRIA C665 identifies two types of development, "Situation A" and "Situation B". Situation B is low rise housing, with a ventilated underfloor void of a minimum of 150mm. Situation A is for all other housing types that are not Situation B.

5.4.4.1 Situation B - Low Rise Housing

For standard low-rise housing, the NHBC have developed a characterisation system which assigns calculated GSV and typical maximum gas concentrations to four different "traffic light" scenarios.

Elements of Table 8.7 of CIRIA C665, which set out the typical maximum gas concentrations and GSV for the "Traffic Light Classification", are reproduced below.

Table 7. Reproduction of elements of Table 8.7 of C665

Traffic Light Classification	Methane		Carbon Dioxide	
	Typical Maximum Concentration (%)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%)	Gas Screening Value (l/hr)
Green				
	1	0.16	5	0.78
Amber 1				
	5	0.63	10	1.56
Amber 2				
	20	1.56	30	3.10
Red				

5.4.4.2 Situation A – Developments Other than Situation B

For housing types other than Situation B, assessment is undertaken by calculating GSV for both methane and carbon dioxide. The appropriate characteristic situation for the site can then be determined by comparing the highest GSV (for either gas) with the threshold value detailed within Table 8.5 of CIRIA C665, which is partially reproduced below.

Table 8. Reproduction of elements of Table 8.5 of C665

Characteristic Situation	Risk Classification	GSV (CH_4 or CO_2) Threshold (l/hr)	Additional Factors	Typical Source of Generation
1	Very low risk	<0.07	Typical methane of 1% and/or carbon dioxide of 5%. Otherwise consider increase to characteristic situation 2.	Natural soils with low organic content. "Typical" made ground.
2	Low risk	<0.7	Borehole air flow not to exceed 70l/hr. Otherwise consider increase to characteristic situation 3.	Natural soils with high peat/organic content. "Typical" made ground.

5.4.5 Assessment of Calculated GSV

For the calculated GSV, the development would either be characterised as "Green" in relation to developments in Situation B or "Characteristic Situation 1" for those developments in Situation A.

5.4.6 Assessment of Gas Protection Measures Required

5.4.6.3 Situation B – Low Rise Housing

For Situation B Developments, Box 8.4 of C665 specifies the levels of gas protection required for low rise housing based upon the allocated NHBC Traffic Light. This is partially reproduced below.

Table 9. Reproduction of elements of Box 8.4 of C665

Traffic light classification	Protection Measures Required
Green	Negligible gas regime identified and gas protection measures are not considered necessary.

5.4.6.4 Situation A – Developments Other Than Situation B

For Situation A Developments, Both CIRIA C665 and BS8485[7] set out advice on the design of gas protection measures.

[7] BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

Table 8.6 of CIRIA C665 provides the typical scope of gas protective measures, and is partially reproduced below.

Table 10. Reproduction of elements of Table 8.6 of C665

Characteristic Situation	Residential Buildings (not those which belong to Situation B)		Office/commercial/industrial development	
(From Table 8.5)	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions

Under BS8485, it is also necessary to consider the building type which buildings in the development fall into. Table 3 of BS8485 defines the building types with a "Type A building" being those buildings in private ownership, which applies to this development site.

Table 4 of BS8485 identifies the score required for different characteristic situations for different "building types".

Table 11. Reproduction of elements of Table 4 of BS8485

Characteristic Situation	Minimum Gas Protection Score (points)			
	High Risk		Medium Risk	Low Risk
	Type A	Type B	Type C	Type D
1	0	0	0	0

5.4.7 Conclusions

The GSV calculated for the site indicate that the development should be considered as "Green" or "Characteristic Situation 1". Neither CIRIA C665 nor BS8485 recommend any specific gas protection measures for the respective classifications.

The slight increase in concentrations of carbon monoxide and hydrogen sulphide recorded during the first and second monitoring visits are most likely due to the initial disturbance of the soils during the drilling works introducing oxygen into a previously anaerobic environment. As equilibrium conditions have re-established, no detectable concentrations were recorded during subsequent visits, and they are therefore not considered to pose an unacceptable risk to future end users of the site.

5.5 Quantitative Contamination Risk Assessment

5.5.1 Introduction

The risk assessment for the site considers the sources of contamination identified, the receptors that may be present in view of the development proposals and the contaminant pathways by which these may be linked.

A complete pollutant linkage is only deemed to exist where all three are present and a site is considered suitable for use where no complete pollutant linkages are identified.

Where a complete pollutant linkage is considered to be present, an assessment of the level of risk associated with the pollutant linkage has been carried out in line with published guidance[8]. The level of risk is determined using the risk matrix presented in the following table. Classifications of probability, consequence and risk are presented in Appendix E.

Table 12. Risk Assessment Matrix

		Probability			
		Very Low	**Low**	**Moderate**	**High**
Consequence	**Very Minor**	Negligible	Very Low	Low	Low/Moderate
	Minor	Very Low	Low	Low/Moderate	Moderate
	Moderate	Low	Low/Moderate	Moderate	High
	Severe	Low/Moderate	Moderate	High	Very High

5.5.2 Basis of Assessment

The development is to comprise a new residential building together with areas of private garden where end users can expect to come into contact with the underlying soils, where soil derived dusts may be generated and where the growing of fruit and vegetables may feasibly occur. The proposed development layout is presented in Appendix A.

5.5.3 Contamination Sources Identified

The following sources of contamination have been identified by the quantitative contamination risk assessment:

- Made ground containing elevated concentrations of heavy metals and PAH compounds, and concentrations of petroleum hydrocarbons above the threshold value for the use of PE water supply pipework.

5.5.4 Quantitative Conceptual Model

The quantitative conceptual model for the proposed development is presented in Appendix F.

[8] Contaminated Land Risk Assessment: A guide to good practice, CIRIA C552, 2001.

5.6 Risks to Other Potential Receptors

All construction workers must undertake their own risk assessment, based upon the works to be carried out and the proposed method by which this will be achieved, in accordance with current health and safety legislation. Their assessment should take into account all available information about the site, including that presented within this report.

Appropriate working procedures and PPE should be adopted to ensure the health and safety of the site operatives. Instruction should be given in the recognition of potentially hazardous materials. All site personnel should be appropriately briefed on the discovery strategy, presented below, and what actions they must take in the event that further evidence of contamination is identified or suspected.

5.7 Recommendations

As complete pollutant linkages relating to end users have been identified at the site remedial measures will be required as part of the proposed development.

Given the sources of contamination identified at the site the remedial works should comprise either the removal of the made ground or the provision of a cover system overlying any made ground that is to remain within any proposed private garden or soft landscaped areas[9], in order to sever the pollutant linkage.

United Utilities should be contacted in relation to the selection of water supply pipe materials for use as part of the development.

The remediation works ultimately adopted, including the depth and make up (including break layer) of the cover system, should be detailed within a separate remediation strategy, along with a verification plan.

This should be produced once this updated report has been reviewed and approved by the local planning authority. The conclusions drawn and recommendations made within this report should be considered as provisional until such time as the report has been approved by regulators and the relevant condition has been discharged.

5.8 Discovery Strategy

If, during the course of the site clearance and development works, any materials not previously identified by the investigation that are suspected of being 'contaminants' are encountered, then the following procedure should apply:

- All works in that area should cease and the site manager should be informed.
- Advice should be sought from suitably qualified and experienced personnel as to whether any further site inspection, sampling, testing and/or assessment is deemed necessary.
- If required, the conclusions of any assessment and any proposed additional remedial works (if required) should be agreed by the local authority.
- If necessary, full details of any remedial works should be included in the verification report for the site.

[9] In accordance with Section 6 "Cover Systems" of Manchester City Council, Planning & Contaminated Land Technical Guidance, February 2021

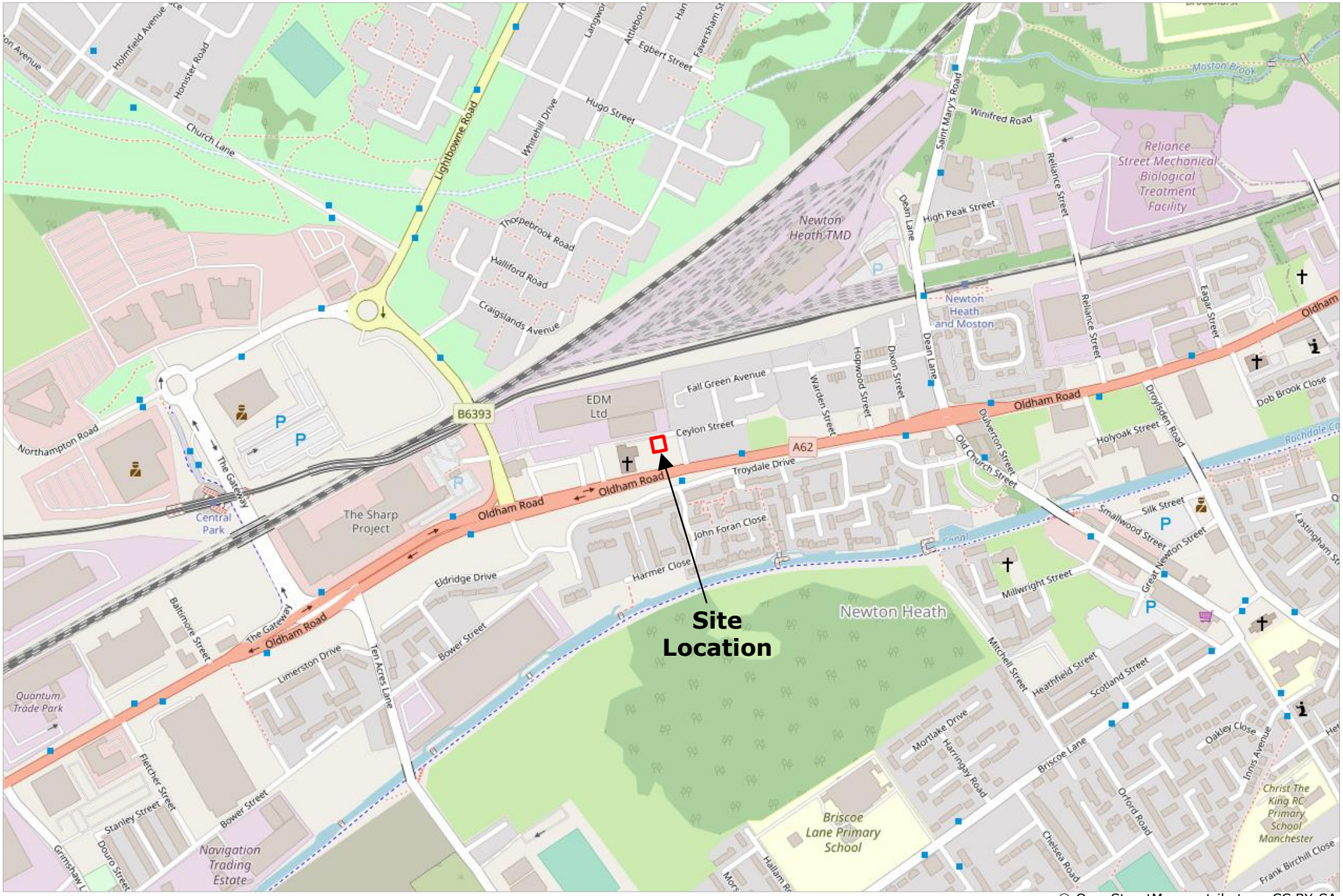
Suspected 'contamination' may take the following form, though it is noted that this list is not exhaustive and site operatives should ask if they are at all unsure of any findings:

- Soil or water looks oily and/or has an oily odour
- Soil or water has a solvent type of odour
- Significant quantities of man-made materials within fill such as paint cans, car parts, glass fragments
- Suspected asbestos containing materials (insulating boards, cement, loose fibres etc.)
- Significant volumes of clinker like or ashy material
- Sand bags, and/or subsurface concrete structures
- Animal carcasses or evidence of animal burial pits

Ashdown Site Investigation Ltd.

FIGURES

Figure 1 Site Location Plan
Figure 2 Site Plan



© OpenStreetMap contributors, CC BY-SA

ASHDOWN SITE INVESTIGATION LIMITED	Site Location Plan	Site Name	Figure No.	Project Reference
		Land adjacent to 929 Oldham Road, Manchester	1	P15349

ASHDOWN SITE INVESTIGATION
L•I•M•I•T•E•D

Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
01273 483119
contact@ashdownsi.co.uk

Site:

Land adjacent to
929 Oldham Road
Manchester

Project Ref:

P15349

Figure No.

2

Drawing Title

Site Plan

Scale

NTS

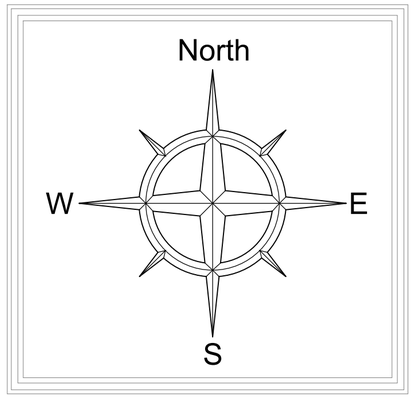
APPENDIX A

Proposed Development Layout

PLEASE NOTE: Based on OS Map

NOTES

ALL DIMENSIONS TO BE CHECKED ON SITE PRIOR TO ANY MANUFACTURING OR FABRICATION AND ANY ANOMALIES TO BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



DRAFT

REV	AMENDMENTS	BY	DATE
A	FIRST ISSUE	TB	13.09.21

PLANNING ISSUE

SUBJECT TO LOCAL AUTHORITY APPROVAL

PROJECT

PROPOSED NEW DWELLING
LAND ADJACENT TO 929 OLDHAM ROAD
MANCHESTER
M40 2EB

CLIENT

MR ZULFI BELAJ

DRAWING TITLE

PROPOSED SITE PLAN

DRAWN	TB	DATE	13.09.21
CHECKED		SCALE	1:100 (A2)
APPROVED			

HOWARD & SEDDON A.R.I.B.A.
CHARTERED ARCHITECTS
64 WASHWAY ROAD
SALE, CHESHIRE, M33 7RE
TEL NO. 0161 - 973 8296
FAX NO. 0161 - 962 3485
E-MAIL : ADMIN@HOWARDANDSEDDON.CO.UK

JOB No.	DRG No.	REVISION
14,902	105	A

APPENDIX B

Exploratory Hole Notes
Exploratory Hole Records
Gas Concentration and Groundwater Monitoring Results

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U	'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
U_o	Sample not obtained
U*	Full penetration of sample not obtained
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample
R	Root Sample
B	Bulk Disturbed Sample
W	Water Sample
J	Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T	Tub Sample
Vi	Vial Sample

In situ Testing

S Standard penetration test (SPT): Using the split spoon sampler.

C Standard Penetration Test (SPT): using a solid cone instead of the sampler - conducted usually in coarse grained soils or weak rocks.

V Shear Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.

H Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.

P Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP	Cable Percussion Borehole
WLS	Dynamic Sampler Borehole using windowless sampler tubes
WS	Dynamic Sampler Borehole using window sampler tubes
TP	Trial Pit excavated using mechanic excavator
HDP	Trial Pit excavated using hand tools

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

3 Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

4 Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

ASHDOWN SITE INVESTIGATION LIMITED
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Tel: 01273 483119

Site Name: Land adjacent to 929 Oldham Road, Manchester

Job Number: P15349

Start Date: 13/10/2021

End Date: 13/10/2021

Borehole Number: **WS01**

Standpipe	Samples and In Situ Testing: Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil.
	J T	0.20					0.05	MADE GROUND: Grey and orange brown gravelly clayey sand. Gravel is angular to subrounded fine to coarse concrete, ironstone, sandstone and flint.
	J T	0.40					0.30	Orange brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint, sandstone and carbonaceous-like material. (Till)
							0.60	Dark orange brown mottled grey gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint, sandstone and carbonaceous-like material. (Till)
							1.20	Brown mottled grey gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint, sandstone and carbonaceous-like material. (Till) becoming brown, orange mottled grey between 1.80m and 2.20m depth.
							2.80	Brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse carbonaceous-like material. (Till)
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater encountered at base of borehole.

Stability: Borehole collapsed to 2.90m depth on completion.

Notes: Hand dug starter pit to 0.70m depth.
Standpipe installed to 2.90m depth; 2.90m to 0.90m slotted pipe with gravel surround; 0.90m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: SC

ASHDOWN SITE INVESTIGATION LIMITED
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Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Land adjacent to 929 Oldham Road, Manchester

Job Number: P15349

Start Date: 13/10/2021

End Date: 13/10/2021

Borehole Number: **WS02**

Standpipe	Samples and In Situ Testing: Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil.
							0.05	MADE GROUND: Grey brown gravelly sand. Gravel is angular to subrounded fine to coarse ironstone.
	J T	0.25					0.20	MADE GROUND: Black gravelly clayey sand. Gravel is angular to subrounded fine to coarse brick, concrete, ironstone and flint.
	J T	0.50					0.40	MADE GROUND: Black slightly gravelly sandy clay. Gravel is brick, flint and ash. becoming red mottled grey below 0.60m depth.
	J	0.80					0.70	Orange brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint and carbonaceous-like material. (Till)
	J	1.00					0.85	Orange brown and light brown mottled grey slightly gravelly slightly sandy CLAY. (Till)
							1.20	Orange brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse sandstone, flint and carbonaceous-like material. (Till)
							1.60	Brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint, sandstone and carbonaceous-like material. (Till)
							2.40	Brown mottled grey slightly gravelly sandy CLAY. Gravel is angular to subrounded flint, sandstone and carbonaceous-like material. (Till)
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater encountered at base of boreholes.

Stability: Borehole stable on completion.

Notes: Hand dug starter pit to 0.70m depth.
Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: SC

ASHDOWN SITE INVESTIGATION LIMITED
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Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Land adjacent to 929 Oldham Road, Manchester

Job Number: P15349

Start Date: 13/10/2021

End Date: 13/10/2021

Borehole Number: **WS03**

Standpipe	Samples and In Situ Testing: Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe (0 5 10 15 20 25 30)	Legend	Depth	Stratum Description
							0.00	Topsoil.
							0.05	MADE GROUND: Grey brown gravelly sand. Gravel is angular to subrounded fine to coarse concrete and limestone.
	J T	0.30					0.20	MADE GROUND: Black gravelly clayey sand. Gravel is angular to subrounded fine to coarse brick, flint and ash with cobbles of brick.
	J	0.80					0.60	MADE GROUND: Black and grey slightly gravelly sandy clay. Gravel is angular to subrounded fine to coarse flint.
	J	1.20					1.00	Dark brown and orange brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint, sandstone and carbonaceous-like material. (Till)
							1.30	Orange brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint, carbonaceous-like material and sandstone. (Till)
							2.60	Brown slightly gravelly very sandy CLAY. Gravel is angular to subrounded fine to coarse flint. (Till)
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater encountered at base of borehole.

Stability: Borehole stable on completion.

Notes: Hand dug starter pit to 1.00m depth.
Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: SC

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Tel: 01273 483119

Site Name: Land adjacent to 929 Oldham Road, Manchester

Job Number: P15349

Start Date: 13/10/2021

End Date: 13/10/2021

Trial Pit Number: **TP01**

Samples and In Situ Testing: Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth/ Reduced Level	Stratum Description
J T	0.10				0.00	Topsoil over,
					0.20	MADE GROUND Grey brown sandy angular to subrounded fine to coarse gravel of limestone.
					0.40	Orange brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. (Till)
						End of trial pit at 0.40m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method: TP

Pit Length: n/a

Pit Width: n/a

Made By: SC

ASHDOWN SITE INVESTIGATION LIMITED
E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Land adjacent to 929 Oldham Road, Manchester

Job Number: P15349

Start Date: 13/10/2021

End Date: 13/10/2021

Trial Pit Number: **TP02**

Samples and In Situ Testing: Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth/ Reduced Level	Stratum Description
					0.00	Topsoil over, MADE GROUND: Grey brown and orange brown sandy angular to subrounded fine to coarse gravel of limestone, flint and concrete.
J T	0.40				0.30	MADE GROUND: Black gravelly clayey sand. Gravel is angular to subrounded fine to coarse brick, ash and flint.
					0.50	End of trial pit at 0.50m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method:	TP
Pit Length:	n/a
Pit Width:	n/a
Made By:	SC

Gas Concentrations and Groundwater Monitoring Results

Site Name:	Land adjacent to 929 Oldham Road, Manchester
Project Ref:	P15349

Position	Date	Time	Dynamic Pressure (pa)	Atmospheric Pressure (mbar)	Atmospheric Trend	Standing Water Depth (m bgl)	Flow Rate (l/hr)				Methane (%)				Carbon Dioxide (%)				Oxygen (%)				CO (ppm)	H_2S (ppm)
							Seconds				Seconds				Seconds				Seconds					
							15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60		
WS01	21/10/2021	11:36	0	1000	Rising	2.19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.7	1.7	1.7	13.0	11.9	11.8	11.4	37	0
WS02	21/10/2021	11:51	0	1000	Rising	1.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	14.0	15.4	15.7	16.0	16	0
WS03	21/10/2021	12:00	0	1000	Rising	2.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	16.0	15.7	16.2	15.4	40	30
WS01	04/11/2021	12:27	0	1008	Rising	2.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	2.9	2.6	2.4	8.0	7.8	8.2	9.0	20	0
WS02	04/11/2021	12:37			Rising	1.02	Standpipe cover flooded, bung had to be removed to drain standpipe cover																	
WS03	04/11/2021	12:41	0	1008	Rising	2.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.5	0.4	0.5	15.7	18.1	18.8	18.7	20	0
WS01	13/11/2021	12:20	0	1007	Rising	2.00	-0.3	-0.4	-0.3	-0.4	0.0	0.0	0.0	0.0	2.4	2.9	2.8	2.8	10.0	7.3	7.3	7.5	0	0
WS02	13/11/2021	12:23	0	1007	Rising	1.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	18.5	20.2	20.4	20.5	0	0
WS03	13/11/2021	12:29	0	1007	Rising	2.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.3	0.3	19.2	19.3	19.5	19.8	0	0
WS01	02/12/2021	11:36	0	1002	Falling	2.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	3.1	3.0	2.7	8.9	8.1	8.3	9.0	0	0
WS02	02/12/2021	11:42	0	1002	Falling	1.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	16.8	18.1	19.1	19.4	0	0
WS03	02/12/2021	11:49	0	1001	Falling	1.90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.7	0.7	0.6	18.7	18.9	19.1	19.2	0	0
WS01	12/12/2021	12:55	0	1010	Falling	2.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.2	1.5	1.7	10.8	9.6	10.8	11.6	0	0
WS02	12/12/2021	13:04	0	1009	Falling	0.69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	19.2	20.1	20.2	20.2	0	0
WS03	12/12/2021	13:12	0	1009	Falling	1.87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.3	0.2	19.5	19.6	19.8	20.0	0	0
WS01	19/12/2021	12:03	0	1025	Falling	2.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	2.8	2.4	12.3	9.8	10.7	11.9	0	0
WS02	19/12/2021	12:09	0	1025	Falling	0.88	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	18.4	19.5	19.7	19.8	0	0
WS03	19/12/2021	12:14	0	1025	Falling	1.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.4	0.3	19.2	19.3	19.5	19.5	0	0

APPENDIX C

Laboratory Test Results

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TN38 9BY
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2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	21-36593
Issue:	1
Date of Issue:	25/10/2021
Contact:	Lab Results
Customer Details:	Ashdown Site Investigation Ltd Unit 3 The Grain Store Ditchling Common Business Park Ditchling Common West SussexBN6 8SG
Quotation No:	Q15-00267
Order No:	9877
Customer Reference:	P15349
Date Received:	18/10/2021
Date Approved:	25/10/2021
Details:	Land Adjacent to 929 Oldham Road, Manchester
Approved by:	

Tim Reeve, Quality Officer

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683

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Sample Summary

Report No.: 21-36593, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
254406	WS01 0.20	13/10/2021	18/10/2021	Sand	
254407	WS01 0.40	13/10/2021	18/10/2021	Silty loam	
254408	WS02 0.25	13/10/2021	18/10/2021	Silty loam	
254409	WS02 0.50	13/10/2021	18/10/2021	Silty loam	
254410	WS02 1.00	13/10/2021	18/10/2021	Silty loam	
254411	WS03 0.30	13/10/2021	18/10/2021	Sandy silty loam	
254412	WS03 0.80	13/10/2021	18/10/2021	Silty loam	
254413	WS03 1.20	13/10/2021	18/10/2021	Sandy silty loam	
254414	TP01 0.10	13/10/2021	18/10/2021	Sandy loam	
254415	TP02 0.40	13/10/2021	18/10/2021	Silty loam	
254416	WS02 0.80	13/10/2021	18/10/2021		

Results Summary

Report No.: 21-36593, issue number 1

			ELAB Reference	254406	254407	254408	254409	254410
			Customer Reference					
			Sample ID					
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	WS01	WS01	WS02	WS02	WS02
			Sample Depth (m)	0.20	0.40	0.25	0.50	1.00
			Sampling Date	13/10/2021	13/10/2021	13/10/2021	13/10/2021	13/10/2021
Determinand	**Codes**	**Units**	**LOD**					
Soil sample preparation parameters								
Material removed	N	%	0.1	47.7	n/t	27.6	n/t	n/t
Description of Inert material removed	N		0	Stones	n/t	Stones,clinker	n/t	n/t
Metals								
Arsenic	M	mg/kg	1	11.1	n/t	44.6	n/t	n/t
Cadmium	M	mg/kg	0.5	6.3	n/t	1.4	n/t	n/t
Chromium	M	mg/kg	5	23.3	n/t	27.9	n/t	n/t
Copper	M	mg/kg	5	30.3	n/t	241	n/t	n/t
Lead	M	mg/kg	5	3380	n/t	589	n/t	n/t
Mercury	M	mg/kg	0.5	0.7	n/t	1.8	n/t	n/t
Nickel	M	mg/kg	5	34.3	n/t	32.4	n/t	n/t
Selenium	M	mg/kg	1	< 1.0	n/t	1.3	n/t	n/t
Zinc	M	mg/kg	5	377	n/t	183	n/t	n/t
Inorganics								
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t	< 0.8	n/t	n/t
Acid Soluble Sulphate (SO4)	U	%	0.02	0.25	n/t	0.08	n/t	n/t
Acid Soluble Sulphate (SO4)	N	mg/kg	200	2500	n/t	800	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	< 0.5	n/t	2.0	n/t	n/t
Miscellaneous								
pH	M	pH units	0.1	9.5	n/t	7.8	n/t	n/t
Soil Organic Matter	U	%	0.1	0.4	n/t	8.0	n/t	n/t
Organics								
>C8-C10 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	3.4	< 1.0	< 1.0
>C21-C35 BCB (EH_1D_Total)	N	mg/kg	1	7.1	< 1.0	9.1	< 1.0	< 1.0
>C35-C40 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total (>C8-C40) BCB (EH_1D_Total)	N	mg/kg	1	7.1	< 1.0	12.6	< 1.0	< 1.0
Polyaromatic hydrocarbons								
Naphthalene	M	mg/kg	0.1	< 0.1	n/t	0.2	n/t	n/t
Acenaphthylene	M	mg/kg	0.1	< 0.1	n/t	< 0.1	n/t	n/t
Acenaphthene	M	mg/kg	0.1	< 0.1	n/t	0.2	n/t	n/t
Fluorene	M	mg/kg	0.1	< 0.1	n/t	0.2	n/t	n/t
Phenanthrene	M	mg/kg	0.1	< 0.1	n/t	2.1	n/t	n/t
Anthracene	M	mg/kg	0.1	< 0.1	n/t	0.3	n/t	n/t
Fluoranthene	M	mg/kg	0.1	< 0.1	n/t	2.5	n/t	n/t
Pyrene	M	mg/kg	0.1	< 0.1	n/t	2.4	n/t	n/t
Benzo(a)anthracene	M	mg/kg	0.1	< 0.1	n/t	1.1	n/t	n/t
Chrysene	M	mg/kg	0.1	< 0.1	n/t	1.5	n/t	n/t
Benzo(b)fluoranthene	M	mg/kg	0.1	< 0.1	n/t	1.2	n/t	n/t
Benzo(k)fluoranthene	M	mg/kg	0.1	< 0.1	n/t	1.3	n/t	n/t
Benzo(a)pyrene	M	mg/kg	0.1	< 0.1	n/t	1.1	n/t	n/t
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	< 0.1	n/t	0.6	n/t	n/t
Dibenzo(a,h)anthracene	M	mg/kg	0.1	< 0.1	n/t	0.2	n/t	n/t
Benzo[g,h,i]perylene	M	mg/kg	0.1	< 0.1	n/t	0.6	n/t	n/t
Total PAH(16)	M	mg/kg	0.4	< 0.4	n/t	15.5	n/t	n/t
Total Petroleum Hydrocarbons								
Total TPH (>C8-C40) (EH_1D_Total)	M	mg/kg	5	n/t	< 5	n/t	< 5	< 5

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Results Summary

Report No.: 21-36593, issue number 1

			ELAB Reference	254411	254412	254413	254414
			Customer Reference				
			Sample ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sample Location	WS03	WS03	WS03	TP01
			Sample Depth (m)	0.30	0.80	1.20	0.10
			Sampling Date	13/10/2021	13/10/2021	13/10/2021	13/10/2021
Determinand	**Codes**	**Units**	**LOD**				
Soil sample preparation parameters							
Material removed	N	%	0.1	37.4	n/t	n/t	58.8
Description of Inert material removed	N		0	Stones,brick,clinker	n/t	n/t	Stones
Metals							
Arsenic	M	mg/kg	1	33.8	n/t	n/t	10.3
Cadmium	M	mg/kg	0.5	1.4	n/t	n/t	3.8
Chromium	M	mg/kg	5	29.0	n/t	n/t	27.0
Copper	M	mg/kg	5	143	n/t	n/t	37.4
Lead	M	mg/kg	5	561	n/t	n/t	1600
Mercury	M	mg/kg	0.5	0.8	n/t	n/t	< 0.5
Nickel	M	mg/kg	5	36.5	n/t	n/t	27.7
Selenium	M	mg/kg	1	< 1.0	n/t	n/t	< 1.0
Zinc	M	mg/kg	5	288	n/t	n/t	257
Inorganics							
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t	n/t	< 0.8
Acid Soluble Sulphate (SO4)	U	%	0.02	0.06	n/t	n/t	n/t
Acid Soluble Sulphate (SO4)	N	mg/kg	200	630	n/t	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	0.8	n/t	n/t	< 0.5
Miscellaneous							
pH	M	pH units	0.1	8.1	n/t	n/t	8.4
Soil Organic Matter	U	%	0.1	5.7	n/t	n/t	1.3
Organics							
>C8-C10 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C10-C12 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C12-C16 BCB (EH_1D_Total)	N	mg/kg	1	13.0	< 1.0	< 1.0	n/t
>C16-C21 BCB (EH_1D_Total)	N	mg/kg	1	57.9	< 1.0	< 1.0	n/t
>C21-C35 BCB (EH_1D_Total)	N	mg/kg	1	243	< 1.0	< 1.0	n/t
>C35-C40 BCB (EH_1D_Total)	N	mg/kg	1	4.7	< 1.0	< 1.0	n/t
Total (>C8-C40) BCB (EH_1D_Total)	N	mg/kg	1	318	< 1.0	< 1.0	n/t
Polyaromatic hydrocarbons							
Naphthalene	M	mg/kg	0.1	1.2	n/t	n/t	< 0.1
Acenaphthylene	M	mg/kg	0.1	0.5	n/t	n/t	< 0.1
Acenaphthene	M	mg/kg	0.1	9.0	n/t	n/t	0.2
Fluorene	M	mg/kg	0.1	5.6	n/t	n/t	0.1
Phenanthrene	M	mg/kg	0.1	61.5	n/t	n/t	1.9
Anthracene	M	mg/kg	0.1	14.9	n/t	n/t	0.5
Fluoranthene	M	mg/kg	0.1	97.4	n/t	n/t	3.7
Pyrene	M	mg/kg	0.1	81.7	n/t	n/t	3.2
Benzo(a)anthracene	M	mg/kg	0.1	44.2	n/t	n/t	1.6
Chrysene	M	mg/kg	0.1	51.9	n/t	n/t	2.0
Benzo(b)fluoranthene	M	mg/kg	0.1	38.7	n/t	n/t	1.7
Benzo(k)fluoranthene	M	mg/kg	0.1	33.0	n/t	n/t	1.6
Benzo(a)pyrene	M	mg/kg	0.1	39.0	n/t	n/t	1.8
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	28.5	n/t	n/t	1.5
Dibenzo(a,h)anthracene	M	mg/kg	0.1	6.7	n/t	n/t	0.3
Benzo[g,h,i]perylene	M	mg/kg	0.1	23.6	n/t	n/t	1.2
Total PAH(16)	M	mg/kg	0.4	537	n/t	n/t	21.3
Total Petroleum Hydrocarbons							
Total TPH (>C8-C40) (EH_1D_Total)	M	mg/kg	5	n/t	< 5	< 5	n/t

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Results Summary

Report No.: 21-36593, issue number 1

ELAB Reference	254415
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	TP02
Sample Depth (m)	0.40
Sampling Date	13/10/2021

Determinand	Codes	Units	LOD	
Soil sample preparation parameters				
Material removed	N	%	0.1	30.3
Description of Inert material removed	N		0	Stones,brick,clinker
Metals				
Arsenic	M	mg/kg	1	94.0
Cadmium	M	mg/kg	0.5	1.6
Chromium	M	mg/kg	5	39.0
Copper	M	mg/kg	5	208
Lead	M	mg/kg	5	899
Mercury	M	mg/kg	0.5	1.3
Nickel	M	mg/kg	5	59.0
Selenium	M	mg/kg	1	< 1.0
Zinc	M	mg/kg	5	276
Inorganics				
Hexavalent Chromium	N	mg/kg	0.8	< 0.8
Acid Soluble Sulphate (SO4)	U	%	0.02	0.09
Acid Soluble Sulphate (SO4)	N	mg/kg	200	930
Water Soluble Boron	N	mg/kg	0.5	0.6
Miscellaneous				
pH	M	pH units	0.1	8.2
Soil Organic Matter	U	%	0.1	5.0
Organics				
>C8-C10 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0
>C10-C12 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0
>C12-C16 BCB (EH_1D_Total)	N	mg/kg	1	3.5
>C16-C21 BCB (EH_1D_Total)	N	mg/kg	1	10.2
>C21-C35 BCB (EH_1D_Total)	N	mg/kg	1	34.9
>C35-C40 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0
Total (>C8-C40) BCB (EH_1D_Total)	N	mg/kg	1	48.6
Polyaromatic hydrocarbons				
Naphthalene	M	mg/kg	0.1	0.5
Acenaphthylene	M	mg/kg	0.1	0.2
Acenaphthene	M	mg/kg	0.1	2.1
Fluorene	M	mg/kg	0.1	1.4
Phenanthrene	M	mg/kg	0.1	12.2
Anthracene	M	mg/kg	0.1	2.9
Fluoranthene	M	mg/kg	0.1	16.1
Pyrene	M	mg/kg	0.1	17.0
Benzo(a)anthracene	M	mg/kg	0.1	14.2
Chrysene	M	mg/kg	0.1	17.2
Benzo(b)fluoranthene	M	mg/kg	0.1	12.8
Benzo(k)fluoranthene	M	mg/kg	0.1	11.4
Benzo(a)pyrene	M	mg/kg	0.1	13.5
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	9.8
Dibenzo(a,h)anthracene	M	mg/kg	0.1	2.5
Benzo[g,h,i]perylene	M	mg/kg	0.1	8.1
Total PAH(16)	M	mg/kg	0.4	142
Total Petroleum Hydrocarbons				
Total TPH (>C8-C40) (EH_1D_Total)	M	mg/kg	5	n/t

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Results Summary

Report No.: 21-36593, issue number 1

			ELAB Reference	254409	254412
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	WS02	WS03
			Sample Depth (m)	0.50	0.80
			Sampling Date	13/10/2021	13/10/2021
Determinand	**Codes**	**Units**	**LOD**		
VOC					
Heptane	N	ug/kg	10	< 10.0	< 10.0
Octane	N	ug/kg	10	< 10.0	< 10.0
Nonane	N	ug/kg	10	< 10.0	< 10.0
Benzene	M	ug/kg	10	< 10.0	< 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0
m+p-xylene	M	ug/kg	10	< 10.0	< 10.0
o-xylene	M	ug/kg	10	< 10.0	< 10.0
cis-1,2-dichloroethene	N	ug/kg	10	< 10.0	< 10.0
1,1-Dichloroethane	M	ug/kg	10	< 10.0	< 10.0
Chloroform	M	ug/kg	10	< 10.0	< 10.0
Tetrachloromethane	M	ug/kg	10	< 10.0	< 10.0
1,1,1-Trichloroethane	M	ug/kg	10	< 10.0	< 10.0
Trichloroethylene	M	ug/kg	10	< 10.0	< 10.0
Tetrachloroethylene	M	ug/kg	10	< 10.0	< 10.0
1,1,1,2-Tetrachloroethane	M	ug/kg	10	< 10.0	< 10.0
1,1,2,2-Tetrachloroetha	M	ug/kg	10	< 10.0	< 10.0
Chlorobenzene	M	ug/kg	10	< 10.0	< 10.0
Bromobenzene	M	ug/kg	10	< 10.0	< 10.0
Bromodichloromethane	M	ug/kg	10	< 10.0	< 10.0
Methylethylbenzene	M	ug/kg	10	< 10.0	< 10.0
1,1-Dichloro-1-propene	M	ug/kg	10	< 10.0	< 10.0
Trans - 1-2 -dichloroethylene	N	ug/kg	10	< 10.0	< 10.0
2,2-Dichloropropane	N	ug/kg	10	< 10.0	< 10.0
Bromochloromethane	N	ug/kg	10	< 10.0	< 10.0
1,2-Dichloroethane	M	ug/kg	10	< 10.0	< 10.0
Dibromomethane	M	ug/kg	10	< 10.0	< 10.0
1,2-Dichloropropane	M	ug/kg	10	< 10.0	< 10.0
cis-1,3-Dichloro-1-propene	M	ug/kg	10	< 10.0	< 10.0
trans-1,3-Dichloro-1-propene	M	ug/kg	10	< 10.0	< 10.0
1,1,2-Trichloroethane	N	ug/kg	10	< 10.0	< 10.0
Dibromochloromethane	N	ug/kg	10	< 10.0	< 10.0
1,3-Dichloropropane	N	ug/kg	10	< 10.0	< 10.0
1,2-dibromoethane	N	ug/kg	10	< 10.0	< 10.0
Styrene	N	ug/kg	10	< 10.0	< 10.0
Propylbenzene	N	ug/kg	10	< 10.0	< 10.0
2-Chlorotoluene	N	ug/kg	10	< 10.0	< 10.0
1,2,4-Trimethylbenzene	N	ug/kg	10	< 10.0	< 10.0
4-Chlorotoluene	N	ug/kg	10	< 10.0	< 10.0
t-butylbenzene	N	ug/kg	10	< 10.0	< 10.0
1,3,5-Trimethylbenzene	N	ug/kg	10	< 10.0	< 10.0
1-methylpropylbenzene	N	ug/kg	10	< 10.0	< 10.0
p-cymene	N	ug/kg	10	< 10.0	< 10.0
1,3-Dichlorobenzene	N	ug/kg	10	< 10.0	< 10.0
Butylbenzene	N	ug/kg	10	< 10.0	< 10.0
1,2-Dibromo-3-chloropropane	N	ug/kg	10	< 10.0	< 10.0
Hexachlorobutadiene	N	ug/kg	10	< 10.0	< 10.0
1-2-3 - Trichlorobenzene	N	ug/kg	10	< 10.0	< 10.0
Naphthalene	N	ug/kg	10	< 10.0	< 10.0
1-2-4 - Trichlorobenzene	N	ug/kg	10	< 10.0	< 10.0
1,4-Dichlorobenzene	N	ug/kg	10	< 10.0	< 10.0
1,2-Dichlorobenzene	N	ug/kg	10	< 10.0	< 10.0
Bromoform	N	ug/kg	10	< 10.0	< 10.0

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Results Summary

Report No.: 21-36593, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
254406	0.20	WS01	Brown sandy Soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t
254408	0.25	WS02	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t
254411	0.30	WS03	Brown sandy Soil,Stones,Brick,Clinker	No asbestos detected	n/t	n/t	n/t	n/t
254414	0.10	TP01	Brown sandy Soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t
254415	0.40	TP02	Brown sandy Soil,Stones,Brick,Concrete	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 21-36593, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	19/10/2021	110	Colorimetry
pH	M	Air dried sample	20/10/2021	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	20/10/2021	115	Ion Chromatography
Total Petroleum Hydrocarbons in solids	M	As submitted sample	19/10/2021	117	GC-FID
Aqua regia extractable metals	M	Air dried sample	19/10/2021	118	ICPMS
PAH (GC-FID)	M	As submitted sample	19/10/2021	133	GC-FID
VOC in solids	M	As submitted sample	22/10/2021	181	GC-MS
Water soluble boron	N	Air dried sample	19/10/2021	202	Colorimetry
Basic carbon banding in soil	N	As submitted sample	19/10/2021	218	GC-FID
Asbestos identification	U	Air dried sample	21/10/2021	280	Microscopy
Soil organic matter	U	Air dried sample	19/10/2021	BS1377:P3	Titrimetry

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Report Information

Report No.: 21-36593, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the sample received.

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

APPENDIX D

Preliminary Conceptual Model

2.6 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
On-Site sources								
1	Potential for **inorganic** and low volatility organic contaminants to be present within the subsurface **soils**	Dermal contact, ingestion & inhalation of soils & soil dust	HH	Future Site occupants	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the potential presence of Made Ground beneath the Site, any residual contamination associated with this material has the potential to impact on future site users particularly within garden areas.
2		Consumption of home grown produce	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
3		Ingress into water supply pipework and subsequent water ingestion	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
4		Building materials in direct contact with aggressive ground	PROP	Future Site buildings	**MILD**	**LOW LIKELIHOOD**	**LOW RISK**	Given the potential presence of Made Ground beneath the Site, it would be considered prudent to verify the underlying ground condition prior to foundation design.
5		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Till, Devensian (a Secondary (undifferentiated) Aquifer)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The superficial aquifer is considered to be of relatively low sensitivity. The superficial geology is likely to offer some protection to the underlying groundwater from any surface based contaminants.
6		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Collyhurst Sandstone Formation (a Principal Aquifer)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	
7		Dissolution into pore water/shallow groundwater and subsequent lateral migration	CW	Rochdale Canal (c. 180 m south)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The risk classification reflects the reasonable distance to the nearest surface water feature and also the likely lined nature of the canal.
8		Dissolution into aqueous phase and preferential migration via drainage structures	CW		**MEDIUM**	**UNLIKELY**	**LOW RISK**	

2.6 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
9	Potential for **volatile organic** contaminants to be present within the subsurface **soils**	Dermal contact, ingestion & inhalation of soils & soil dust	HH	Future Site occupants	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The risk classification reflects the likely absence of any significant sources of volatile organic contamination.
10		Consumption of home grown produce	HH		**MEDIUM**	**UNLIKELY**	**LOW RISK**	
11		Ingress into water supply pipework and subsequent water ingestion	HH		**MEDIUM**	**UNLIKELY**	**LOW RISK**	
12		Migration of vapours to surface; inhalation indoors	HH		**MEDIUM**	**UNLIKELY**	**LOW RISK**	
13		Migration of vapours to surface; inhalation outdoors	HH		**MEDIUM**	**UNLIKELY**	**LOW RISK**	
14		Building materials in direct contact with aggressive ground	PROP	Future Site buildings	**MEDIUM**	**UNLIKELY**	**LOW RISK**	Given the potential presence of Made Ground beneath the Site, it would be considered prudent to verify the underlying ground condition prior to foundation design.
15		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Till, Devensian (a Secondary (undifferentiated) Aquifer)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The risk classification reflects the likely absence of any significant sources of volatile organic contamination.
16		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Collyhurst Sandstone Formation (a Principal Aquifer)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	
17		Dissolution into pore water/shallow groundwater and subsequent migration	CW	Rochdale Canal (c. 180 m south)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The risk classification reflects the likely absence of any significant sources of volatile organic contamination and also the reasonable distance to the nearest surface water feature.
18		Dissolution into aqueous phase and preferential migration via drainage structures	CW		**MEDIUM**	**UNLIKELY**	**LOW RISK**	

2.6 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
19	Potential for **asbestos** containing materials within the subsurface **soils**	Liberation of sub surface ACMs and inhalation of asbestos fibres	HH	Future Site occupants	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given that there have been former structures present on the Site, asbestos-containing material may be present within the subsoils (potentially resulting from past demolition activities).
20	Potential for **dissolved phase** contaminants to be present within **shallow groundwater**	Lateral and vertical groundwater movement via natural or artificial flow paths	CW	Till, Devensian (a Secondary (undifferentiated) Aquifer)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The superficial geology is likely to offer some protection to the underlying groundwater from surface based contaminants.
21		Lateral and vertical groundwater movement via natural or artificial flow paths	CW	Collyhurst Sandstone Formation (a Principal Aquifer)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	
22		Lateral and vertical groundwater movement via natural or artificial flow paths	CW	Rochdale Canal (c. 180 m south)	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The risk classification reflects the reasonable distance to the nearest surface water feature.
23	Potential for elevated **methane** to be present within the sub-surface **soils**	Lateral and vertical migration into on-Site buildings; potential to cause an explosion	HH	On-Site properties and their occupants	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	Based on the prevailing conceptual understanding an appreciable on-Site gas source is considered unlikely. However, because the Site is located within a coal mining area, there is potential for there to be a gas risk which could impact future Site users. According to Coal Authority mapping the Site is within a 'Development Low Risk Area' of the defined coalfield; whilst coal mining has taken place in this area, it was at such depth not to pose a public safety or ground stability risk to new development according to Coal Authority guidance. The risk classification is therefore a reflection of the severity of consequences rather than the likelihood of occurrence.
24		Lateral migration towards off-Site buildings; potential to cause an explosion	HH	Off-Site properties and their occupants	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	
25	Potential for elevated **carbon dioxide** to be present within the subsurface **soils**	Lateral and vertical migration into on-Site buildings; potential to cause asphyxiation	HH	Occupants of on-Site buildings	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	
26		Lateral migration towards off-Site buildings; potential to cause asphyxiation	HH	Occupants of off-Site buildings	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	
27	Potential for **radon** within the subsurface	Lateral migration towards on-Site buildings; potential to cause long term health effects	HH	Occupants of on-Site buildings	**MEDIUM**	**UNLIKELY**	**LOW RISK**	The Site lies in an area where <1% of homes are at or above the UK radon action level (200 Bq/m3).
						OVERALL RISK RATING	**MODERATE/LOW RISK**	

2.6 Preliminary Risk Assessment

Nr	Sources	Pathways	TYPE	Receptors	Consequence	Probability	Risk classification	Comments
Off-Site sources - Industrial Land Uses (mill c. 120 m south west (1893- 1977), works c. 160 m south west (1893-1977), warehouse c. 35 m north west (1991 - present), tank c. 15 m north (1991 - present))								
28	Potential for both inorganic and volatile organic contaminants to be present within the subsurface soils	Dermal contact, ingestion & inhalation of soils & soil dust	HH	Future Site occupants	**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	Given the close proximity of the warehouse and associated tank to the Site (adjacent) there is potential for both inorganic and organic contaminants present associated with this land use, which has the potential to impact future Site users.
29		Consumption of home grown produce	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
30		Ingress into water supply pipework and subsequent water ingestion	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
31		Migration of vapours to surface; inhalation indoors	HH		**MEDIUM**	**LOW LIKELIHOOD**	**MODERATE/LOW RISK**	
32		Migration of vapours to surface; inhalation outdoors	HH		**MEDIUM**	**UNLIKELY**	**LOW RISK**	
Off-Site sources - Land adjacent to Mitchell Street Landfill is located c. 190 m south of the Site; the landfill received Inert, Industrial, Commercial and Household waste between 1973 and 1984.								
33	Potential for elevated **methane** to be present within the sub-surface **soils**	Lateral and vertical migration into on-Site buildings; potential to cause an explosion	HH	On-Site properties and their occupants	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	Given there is a landfill recorded within 200 m of the Site, which Manchester City Council indicates to have elevated concentrations of methane and carbon dioxide present, there is the potential for gas generation and migration which could impact the Site. It is noted however that the presence of the Rochdale Canal in between the landfill and the Site may well constrain any gas risks, as will the Till deposits that are mapped between the two features.
34	Potential for elevated **carbon dioxide** to be present within the subsurface **soils**	Lateral and vertical migration into on-Site buildings; potential to cause asphyxiation	HH	Occupants of on-Site buildings	**SEVERE**	**UNLIKELY**	**MODERATE/LOW RISK**	
						OVERALL RISK RATING	**MODERATE/LOW RISK**	

APPENDIX E

Classification of Probability, Consequence and Risk

Probability of risk being realised	
Classification	Definition
High	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.
Moderate	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	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.
Very Low	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Consequence of risk being realised		
Classification	Category	Definition
Severe	Human Health	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA.
	Controlled Waters	Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.
	Property	Catastrophic damage to buildings/property.
	Ecological Systems	A short term risk to a particular ecosystem or organisation forming part of such ecosystem.
Moderate	Human Health	Chronic damage to Human Health.
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).
	Ecological System	A significant change in a particular ecosystem or organism forming part of such ecosystem.
Minor	Controlled Waters	Pollution of non-sensitive water resources.
	Property	Significant damage to crops, buildings, structures and services.
	Ecological Systems	Damage to sensitive buildings/structures/services or the environment.
Very Minor	Human Health	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).
	Property	Easily repairable effects of damage to buildings, structures and services.
	Project	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve.

Risk classification definitions	
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, 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. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Very Low	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.

APPENDIX F

Quantitative Conceptual Model

Land adjacent to 929 Oldham Road, Manchester				Quantitative Conceptual Model		P15349	
Source	**Receptor**	**Contaminants**	**Pathway**	**Complete Linkage Present?**	**Probability**	**Consequence**	**Risk**
• Made ground soils across the site	End Users	Heavy Metals and PAH Compounds	Dermal contact with soil and dust (indoor & outdoor)	Yes	P3: Moderate	C3: Moderate	Moderate
			Ingestion of soil and indoor dust	Yes	P3: Moderate	C3: Moderate	Moderate
			Consumption of home-grown produce and attached soil	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil dust (indoor and outdoor)	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil vapours	Identified contaminants do not pose a risk via this pathway			N/A
			Inhalation of soil gases/ Risk of explosion	Identified contaminants do not pose a risk via this pathway			N/A
	End Users (via Water Supply Pipework)	Petroleum Hydrocarbons	Contamination of incoming services	Yes	P2: Low	C3: Moderate	Low/Moderate
	Groundwater		Migration to groundwater	No contaminants present at concentrations posing risk to groundwater			N/A
• Potential elevated ground gases from landfill located 190m to the south of the site.	End Users	Ground Gases	Dermal contact with soil and dust (indoor & outdoor)	N/A			N/A
			Ingestion of soil and indoor dust	N/A			N/A
			Consumption of home-grown produce and attached soil	N/A			N/A
			Inhalation of soil dust (indoor and outdoor)	N/A			N/A
			Inhalation of soil vapours	N/A			N/A
			Inhalation of soil gases/ Risk of explosion	Yes	P1: Very Low	C4: Severe	Low/Moderate
	End Users (via Water Supply Pipework)		Contamination of incoming services	N/A			N/A
	Groundwater		Migration to groundwater	N/A			N/A