GeoAssist Limited

Civil, Environmental & Geotechnical

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Phase II Contaminated Land Risk Assessment

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Phase II Contaminated Land Risk Assessment

1. Introduction

This report is an account of a Phase II Contaminated Land Risk Assessment carried out by GeoAssist Limited at the request of the Client, Jadebricks (Charles Street) Ltd, for the proposed development of a 15 storey purpose built student accommodation scheme on land formerly used for parking cars at Charles Street.

The work was commissioned following the receipt of instruction to proceed issued by Gardiner & Theobald LLP on behalf of the Client on the 31 October 2023.

The purpose of this Phase II investigation is to provide information following the conclusions of the Preliminary Contaminated Land Risk Assessment report, referenced 6134 VCM PCLRA and dated October 2023, in order to ensure that the site:

- Is assessed in accordance with the UK government methodology outlined online in Land Contamination Risk Management (LCRM)
- Satisfies the relevant requirements of the National Planning Policy Framework September 2023.
- Is suitable for the intended proposed land use. In this case, as a centrally managed mixed use development.

The approximate grid reference for the centre of the site is 384240, 397490 and the total area of the site is approximately 400m^2. The area of the site scheduled for investigation is outlined with a solid red line on the site plan in Appendix A1. The positions of exploratory holes are also indicated on the plan. The proposed development plan is shown in appendix A2.

2. Description of the Site

2.1 Present

The site is located on intersection of Charles Street and York Street in the centre of Manchester. The site forms a rectangular shape and the topography of the site is relatively level with the surrounding ground and streets. There are no permanent structures on site and the site is presently horded from public view and is being used as a car park and site offices. The ground cover is made up of a metalled/tarmacadam surface with no obvious soft landscaping noted. The site boundary is formed by; a motor vehicle repair garage yard operating in the railway arches to the north, Bracken House to the east, Charles Street to the south over which lies a recent development and York Street to the west.

2.2 Proposed

It is understood that the development incorporates:

- The development of a new 15 storey purpose built student accommodation scheme. The plan for the site does not indicate any associated basement levels with the development. The proposed development plan for the Site forms appendix A2 to this report.

3. Review Of Previous Reports

There is no indication that previous subsurface ground investigations have been undertaken on this site.

Ground investigations are known to have been carried on the adjacent plot (60 Charles Street) which has been subject to redevelopment in recent years. The principal findings of which noted the presence of made ground up to 3m depth underlain by superficial drift deposits of sand and gravel and clays and bedrock deposits of sandstone at round 8.50m depth. Nine samples of made ground and upper natural drift deposits were analysed of which 2 samples of made ground were noted to contain levels of Lead elevated above the assessment criteria. Remediation was not required as a consequence of total sitewide hard cover.

The issues to be covered in the present investigation are to provide information in respect of any potentially unacceptable geo-environmental risks arising from previous land uses both on site and in the immediate area, and the potential for any sources of contamination to impact both present and future receptors, including:

- Human
- Controlled waters via established pathways
- Property
- Adjoining land

4. Preliminary Conceptual Model

The original outline conceptual model can be found in the Phase I Preliminary Contaminated Land Risk Assessment as referenced in section 1 of this report.

Potential Source /Hazard	Nature of Hazard (Risk Level to site given a Commercial end use	Contaminants Associated with Source	Potential Pathway	Potential Receptor
Previous & Present ON SITE Land uses:				
1. Terraced Property Possible infilled cellars / Made Ground	Ground contamination Low to Moderate Risk	Heavy Metals PAH Asbestos	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
2. Car Parking/ construction compound	Ground contamination Low Risk	None	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
Previous OFF SITE land uses within 250m as indicated by Historical Plans Including:				
3. Cotton Mill	Ground contamination Low to Moderate Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
4. Warehouse	Ground contamination Low Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
5. Saw Mill	Ground contamination Low Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
6. Cotton Mills Engineering Works Infilled reservoir Coal wharfs, Ropewalk Gasometer, Dye, Printing, Oil and Rubber Works ALL REDEVELOPED	Ground contamination Low Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
7. Coal Workings & Mineral Extraction	Geotechnical Hazard Low Risk	None	Ground Collapse Subsidence	Humans (site users) Future Buildings & Services
	Ground contamination Low Risk	None	None	Site Users Services
	Mine Gas Low Risk	None	None	Humans (site users) Future Buildings & Services

5. Intrusive Investigation

5.1 Intrusive Investigation objectives

The objectives of the site investigation are to collect data to confirm whether or not the soils beneath the site in their current state pose a risk by reason of substances within or under the land that;

- Significant harm is being caused or there is significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

Data to describe the following parameters has been collected at a suitable spatial resolution in accordance with BS10175, 2015:

- Soil Characteristics including type of material
- Chemical profile of the soil.
- Hydrological regime beneath the site

These data will be used to refine a conceptual site model and confirm the existence of any established contaminant linkage in accordance with the UK government methodology outlined online in Land Contamination Risk Management (LCRM) as well as The Environment Agency Requirements for Land Contamination Reports, 2005 where appropriate.

5.2 Intrusive Investigation Strategy

The ground investigation was carried out in accordance with British Standard 5930: 2015 Code of Practice for Site Investigations and BS BS10175: 2015 Investigation of potentially contaminated sites where relevant.

All fieldwork was supervised by suitably qualified GeoAssist Limited Environmental Engineers.

The geotechnical laboratory testing was carried out at GeoAssist's own laboratory testing facility in Stockport. The analytical testing was carried out in an independent UKAS accredited Laboratory.

5.3 Methods Used for Forming Exploratory Holes

The exploratory holes drilled across the Site as part of this investigation were established using:

- Windowless sampling percussive drilling methods with casing advancement
- Cable percussive drilling methods with casing advancement
- Rotary core drilling methods

Information provided by the Client regarding the position of proposed structures areas was used to inform a decision on the actual exploratory hole locations whilst taking account of positions that could be reasonably accessed within operational site office compound/car park. In general, deeper rotary boreholes were used to establish the geotechnical parameters for construction purposes and groundwater levels for environmental monitoring purposes. These exploratory holes were located in positions on the footprint of the proposed structures. Windowless sampling holes were used in all other areas where the requirement for drilling deep holes into the parent material was not justified. The location of services was also considered during the positioning of

the exploratory holes. A plan showing the locations of the exploratory holes established as part of the investigation forms Appendix A1 to this report.

5.4 Exploratory Hole Programme

In total 5 exploratory holes were established across the Site by GeoAssist utilising various exploration techniques as outlined below:

- Two exploratory holes BH1 & BH2 were undertaken using a light cable percussive rig in the superficial deposits and supplemented by using a rotary rig for proving the bedrock at depth.
- Three exploratory holes WS1 to WS3 were undertaken across the Site using windowless sampling techniques. All of these holes were terminated on the drift deposit / weathered Sandstone Bedrock boundary.
- Hand excavated inspection pits were undertaken at each exploratory hole location using BS 8020 compliant tools in order to avoid services.

The details of the strata in the exploratory holes were recorded by a suitably qualified Professional Engineer. Upon completion the WS series exploratory holes were converted to shallow depth gas monitoring standpipes. Exploratory holes BH1 & BH2 were converted to deeper depth groundwater standpipes sealed into the sandstone bedrock beneath the Site.

All intrusive work was carried out in accordance with:

- British Standard 5930: 2015 Code of Practice for Site Investigations
- British Standard 10175: 2011 where applicable

The fieldwork for all exploratory holes except the deeper rotary element of BH2 was completed in November and December 2023 in mixed weather conditions. The rotary follow-on element of BH2 is planned to be completed in January 2024 and the information from which will be used for geotechnical purposes. The location of the exploratory holes is shown on the Site plan in Appendix A1.

5.5 Field Sampling and Testing

For the windowless sample exploratory holes, a non-targeted borehole layout supplemented by some judgmental sampling was selected as the most appropriate strategy for this site. Representative samples were taken of all the strata encountered in the exploratory holes. Once exposed samples to be subjected to chemical analysis were immediately placed into a suitable container and stored in a cool dark sample box prior to submission to the laboratory in order to prevent alteration of the composition of the samples. In all cases 500ml wide necked amber glass jars were used with a Teflon faced foamed polyethylene cap liner that offers excellent chemical resistance with the compressibility and sealing properties of polyethylene foam. These containers were filled with sample, sealed and delivered to the laboratory for testing. Samples for volatile compounds were placed into appropriate containers with a screw cap and pierceable septum as supplied by the testing laboratory specifically appropriate to the determinand. These containers were filled with sample sealed and delivered to the laboratory for testing. Water samples for screening purposes were collected following the Site operations and stored in Amber glass

bottles with cap liners as described previously. These containers were filled with water samples, collected in accordance with the guidance referenced in BS5930:2015+A1:2020 and BS ISO 5667-11 2009, sealed and delivered to the laboratory for testing. Observations of groundwater conditions were recorded throughout the fieldwork operations.

All other samples were stored in airtight containers and returned to the laboratory for examination and geotechnical testing where necessary.

A photo ionisation detector (PID) was used to indicate the likelihood of the presence of volatile organic compounds within the upper made ground during the fieldwork and in the laboratory. The results are included in section 6 of this report. Readings in excess of 200ppm indicate that analytical options for determining Volatile Organic Compounds should be considered.

6. Laboratory Investigation

6.1 Contamination Testing

In total 16 (14 soil and 2 groundwater) samples were collected and subjected to elements of the suite of chemical testing as outlined below. All tests were conducted by i2 Analytical under UKAS Testing No 4041. The results of all the chemical analysis tests are given in appendix C1 & C3.

Soils		Waters	
Arsenic	Acenaphthene	Arsenic	Acenaphthene
Boron (water-soluble)	Acenaphthylene	Boron (water-soluble)	Acenaphthylene
Cadmium	Anthracene	Cadmium	Anthracene
Chromium	Benzo(a)Anthracene	Chromium	Benzo(a)Anthracene
Chromium VI	Benzo(a)Pyrene		Benzo(a)Pyrene
Copper	Benzo(b/k)Fluoranthene	Copper	Benzo(b/k)Fluoranthene
Cyanide(Total)	Benzo(ghi)Perylene	Cyanide(Total)	Benzo(ghi)Perylene
Cyanide(free)	Chrysene		Chrysene
Lead	Dibenzo(ah)Anthracene	Lead	Dibenzo(ah)Anthracene
Mercury	Fluoranthene	Mercury	Fluoranthene
Nickel	Fluorene	Nickel	Fluorene
pH	Indeno(123-cd)Pyrene	pH	Indeno(123-cd)Pyrene
Phenols(Mono)	Naphthalene	Phenols(Mono)	Naphthalene
Selenium	Phenanthrene	Selenium	Phenanthrene
SO4(Total)	Pyrene	SO4(Total)	Pyrene
Sulphide	BTEX & MTBE	Sulphide	Speciated TPH
Sulphur(Free)	Speciated TPH	Zinc	BTEX & MTBE
Thiocyanate			
Zinc	Asbestos ID (screen)		

6.2 Exploratory Holes and Associated Sampling.

A photo ionisation detector (PID) with a 10.6eV lamp was used as a screening tool to indicate the likelihood of the presence of volatile organic compounds throughout the profile of the shallow soils in the laboratory. The PID results are all given as isobutylene equivalents and are included within Table 6.2.

Table 6.2 Summary of Peak PID profiling within BH series exploratory holes with 100% isobutylene equivalent

Ref	Depth (m)	Isobutylene Equiv. (ppm)	Toluene CF 10.6eV (ppm)	TWA PEL 8hrs. (ppm)
BH1	0.50	0.8		
BH1	1.50	4		
BH1	2.50	0		
BH2	0.60	0.2		
BH2	1.50	0		

The results of the exploratory hole Peak PID testing confirmed that levels of volatile contaminants were low across the site. The highest readings being recorded in BH1 at 1.50m depth. The readings were not considered indicative of VOC issues.

7. Subsurface Stratigraphy

The subsoil profile obtained from the exploratory holes consists of made ground to depths between 2.20m to 3.30m over sandy gravel with cobbles (Fluvio Glacial Till) over gravelly sandy silty clay (Glacial Till) over sandstone bedrock (Sherwood Sandstone).

Table 7 Conceptual Ground Model

Strata	Depth of Strata (m) below ground level	
	Top	Base
Made Ground - MG Concrete/Tarmac Hard standing over generally granular material including clayey sandy gravel and brick fragments	Ground Level	2.20 to 3.30
Fluvio Glacial Till - FG Sandy Gravels with cobbles Absent in WS1 &BH2	2.50 to 3.30	4.20 to 5.20
Glacial Till – GT Clay with sands and gravels	4.20 to 5.20	4.90 to 6.00
Sherwood Sandstone Weathered to Silty Sand/Sandstone - S1	4.90 to 6.00	19.00 Not proved in WS1 to WS3
Sherwood Sandstone – Very weak to weak Sandstone – S2	19.00	>30m

Further details of the subsurface stratigraphy can be found in the exploratory hole log sheets which form Appendix B1 to this report.

8. Groundwater

Groundwater was encountered at levels between 25.84 mAOD and 26.64 mAOD during the course of the fieldwork. The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall. Subsequent monitoring of groundwater levels spanning a period from 04th December 2023 to 03rd Jan 2024 in the standpipe installations at WS1 to WS3 and BH1 and BH2 confirm the groundwater levels to range between 26.3 mAOD to 26.9 mAOD. The readings obtained are considered to be generally representative of the steady state groundwater levels across the site. Elsewhere, it is possible that localised pockets of perched water could be encountered within the superficial geology during site works especially above more impermeable soils.

Table 8.0 Groundwater observation summary showing the lowest and highest levels recorded during the fieldwork and the subsequent monitoring period.

	During Fieldwork Nov/Dec 2023	During Monitoring Period Dec/Jan 2023/24
Lowest observed Level (mAOD)	25.84	26.31
Highest observed Level (mAOD)	26.64	26.88

Table 8.1 Fluctuation of lowest and highest groundwater levels during monitoring periods.

Monitoring Point Ref	Lowest (mAOD)	Highest (mAOD)	Fluctuation/Range (m)
		2021 Readings	
BH1	26.64	26.80	0.16
BH2	26.63	26.78	0.15
		2023 Readings	
WS1	26.31	26.51	0.38
WS2	25.84	26.69	0.85
WS3	26.43	26.88	0.45

The data from the monitoring of groundwater levels across the Site have been used to formulate the groundwater contour plots which form appendix A4 to this report. When viewed in tandem with the diurnal peak flow rates for the River Medlock at London Road gauging station the data confirms that the groundwater is likely to be hydraulically linked with basal flows in the nearby River Medlock. The River Medlock has a very short course and a small catchment. The River is heavily engineered and culverted along much of its approach to, and course through Manchester City Centre. As a result of the short course, small catchment and heavy engineering the Medlock Hydrographs show very quick response times to precipitation events and the hydrographs can be described as

flashy ie very little lag time with quick and steep rises in water levels but equally as quick falls in water levels following precipitation events.

The data from monitoring groundwater to date indicates that the groundwater regime flows to the south. However, it should be noted that the monitoring data was obtained during a short period of time over which river levels were generally higher and it is possible that the groundwater flow direction will be reversed during low river flow events of any significant duration.

9. Ground Gas

Ground gas risk monitoring is presently in process and a separate risk assessment report will prepared for the site in due course upon completion of the monitoring readings. The monitoring readings taken to date indicate a low risk and that ground gas is not likely to be a significant issue.

10. Part IIA Legislation

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a new regime for the control of specific threats to health or the environment from existing land contamination. In accordance with the Act and the statutory guidance document on The Contaminated Land (England) Regulations 2000, the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only "contaminated land" where it appears to the regulatory authority, by reason of substances within or under the land that

- Significant harm is being caused or there is significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

The guidance defines "risk" as the combination of

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A source, i.e. a substance that is capable of causing pollution or harm;
- A receptor (or target). i.e. something which could be adversely affected by the contaminant; and
- A pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is missing there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

10.1 Assessment Methodology

In order to assess the environmental risk posed by potential contaminants within the near surface soils considering the final levels of the scheme, GeoAssist Limited undertook an initial screen of the laboratory results using GeoAssist Limited Generic Assessment Criteria (GACs) and where applicable Category 4 Screening Levels as given as part of Appendix C2.

The GeoAssist Limited GACs and Category 4 Screening levels (C4SLs herein) are generated in consideration of the proposed end use of the Site, in this case as commercial land given the managed residential element of the development. Contaminant concentrations below the GACs and or C4SLs levels are considered not to warrant further risk assessment. Concentrations of potential contaminants above the GACs and C4SLs levels require further consideration of the potential pollutant linkages. It should be noted that exceedance of the GACs and or C4SLs levels does not necessarily mean that the Site requires remediation, although this is dependent on the nature, type and depth of the contaminant and further justification may be required.

10.2 Soils

For assessment of the soil analysis results with regard to potential human health risks, GeoAssist Limited GACs are selected from the following sources which represent minimal risk to site users:

CLEA Soil Guideline Values (SGVs). These values have been developed by the Department of the Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) using the Contaminated Land Exposure Assessment (CLEA) Model, and are considered to be protective of human health (considered to be a potential receptor on site).

To date, SGVs have been published for only a limited suite of contaminants, with SGVs derived for each contaminant for three different land use scenarios namely:

- residential
- allotments
- commercial and industrial.

The proposed assessment of this site is as commercial land as this is considered to be the most appropriate land use scenario for the proposed situation on site given the managed residential element of the development.

Chartered Institute of Environmental Health Generic Assessment Criteria (LQM CIEH GAC) have been used where available and where CLEA SGVs have not yet been published.

Where CLEA or LQIM CIEH GAC values are not available, Atkins at Risk GAC values have been selected as appropriate all of which represent a minimal risk to receptors.

C4SLs have been used in conjunction with the above GAC and these represent a Low Level of Toxicological Concern (LLTC herein). LLTC represent an intake of low concern that remains suitably protective of health, and definitely does not approach an intake level that could be defined as Significant Possibility of Significant Harm.

The CLEA guidelines state that for each contaminant, apart from lead, the upper 95th percentile of the mean measured concentration should be calculated where appropriate and this value should be compared to the applicable screening value (defined here as the GeoAssist Limited GACs).

For Lead impacts the geometric mean should be calculated and compared to the GAC or C4SL.

The CLEA model states that, 'the contamination is assumed to be at or within 1 m of the surface (CLR10 page 10 now withdrawn). It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway. Typically, volatile compounds only significantly affect the indoor inhalation pathway.

10.3 Waters

The controlled waters risk assessment has been conducted in accordance with the risk assessment methodology presented in the Environment Agency Document titled Remedial Targets Methodology – Hydrological Risk Assessment for Land Contamination and dated October 2006.

The method presents three levels of assessment. For each successive level of assessment, more site specific data are required to refine the model. It should be noted that statistical analysis of chemical analysis results using this method is not accepted. A level I assessment has been conducted for this site.

A summary of the levels is presented below:

Table 10.3.1 Remedial Targets Workbook levels

Level	Summarised Description
I (one)	Considers the impact of contaminant concentrations ignoring dilution, dispersion and attenuation, This level of assessment is based on the following generic screening criteria: 1. Groundwater Threshold Values 2. Environmental Quality Standards (EQS) 3. UK Drinking Water Standards (UK DWS) 4. World Health Organisation Drinking Water Guidelines (WHO DWS)
II (two)	Considers the effect of dilution by controlled water directly beneath the Site using site specific data.
III (three)	Considers the risks when natural attenuation including degradation, dispersion and retardation of the contaminant are taken into account within the saturated aquifer.

Table 10.3.2 Summary of identified groundwater impacts.

Determinand	Assessment Criteria (mg/kg)	No of samples tested	No of samples exceeding SGV/GAC	Max Value (mg/kg)	Location	Comment	Further action required
Anthracene	0.4	2	1	0.44	BH1-W1-4.80	Minor exceedance	No

The analytical laboratory test results and analysis for waters are presented in appendix C3 & C4.

The assessment has identified an single occurrence of Anthracene marginally elevated above the EQS for surface water. It should be noted that the Target methods are directly applicable to surface waters and not groundwater and are used for guidance only. The volume or hydraulic loading rate of the discharge of ground water to the nearest surface water is low to the extent that only minimal dilution in underlying groundwater will be needed to avoid pollution. Consequently, the level I assessment of risk to controlled waters and aquatic ecosystems from soluble or free phase contaminants is classified as low in this case and no further quality monitoring is recommended at this stage.

10.4 Subsoil Deposits

The soils contaminants that were identified above the GeoAssist Limited GACs, SGVs and C4SLs for a commercial end use from the GeoAssist Limited investigations are summarized below.

Table 10.4 Tier one summary of identified soils impacts.

Determinand	Target Soil Value (mg/kg) Comm.	No of tests	No of samples exceeding SGV/GAC	Max Value (mg/kg)	Treat as a Hotspot	US95 Value or Geometric Mean (for Lead)	Further action required
tier one							
None Identified							

[sm] Surrogate marker approach

The analytical laboratory test results and analysis are presented in appendix C1 & C2 and have not identified potential risks to end users of the Site from elevated levels of anthropogenic contamination within the made ground or upper natural drift deposits on the Site.

Asbestos has not been identified within the made ground samples screened.

11. Discussion

The assessment of the chemical laboratory analytical tests has identified that the soils on this site pose little risk to present site end users or proposed development site end users when assessed in accordance with the current UK methodology. Consequently, the risk to end users from ground contamination is classified as low given a commercial and centrally managed residential end use scenario of the site.

Removal of some of the upper made ground will be undertaken as part of site preparation and enabling works. The final proposed scheme for the Site will involve the significant removal of near surface soils over the entire area of the Site and replacement at a reduced level with standard construction materials such as crushed rock sub-base and concrete slabs, or hardstanding. In these areas this will suffice to break the source pathway linkage and hence preclude any further possibility of the source impacting end user receptors.

It is understood that the ground floor of the proposed development will incorporate a walled garden formed directly off a new concrete floor slab in raised isolated planters.

The soft landscaped areas of the Site will have a suitable growth medium such as British Standard Topsoil to a depth of at least 600mm. Any imported non first generation soil or aggregate materials will need to be tested at a rate of not less than 1 test per 20m^3 of imported material or where imported volumes are less than 60m^3 a minimum of 3 tests per source will be required.

It should be noted that as a direct consequence of the observed level of the water table at this site porous surfacing and or soakaway type drainage for the disposal of surface water from rooftops is not recommended at this time without clear details of anticipated volumes and levels for the scheme at the Site. Instead an alternative attenuation and greenfield release option via an EA approved device should be explored.

Analysis of drift materials and overlying made ground indicate that the underlying principal aquifer beneath the Site and any close by controlled waters are highly unlikely to be at significant risk from the soils on this site as a function of the relatively low levels and immobility of the determinants identified in the made ground and drift materials.

The assessment of the chemical laboratory analytical tests on groundwater samples has identified that the groundwater generally complies with the Environmental Quality Standards for Surface Water with the exception of a minor PAH exceedance of 0.04 ug/l above the tier one threshold. It should be noted that the EQS levels used as part of the Level I remedial targets workbook method are directly applicable to surface waters and not groundwater and are used for guidance only. Consequently, the level I assessment of risk to controlled waters and aquatic ecosystems from soluble or free phase contaminants is classified as low in this case and no further quality monitoring is required.

Waste Acceptance Criteria testing (WAC herein) has not been undertaken. The results of the solid soils analysis indicate that soils arising from excavations on site are likely to be classified as inert for disposal purposes. However, It is recommended that the advice of a specialist waste haulage contractor be sought prior to disposal. WAC testing should be undertaken on actual excavated stockpiles of spoil intended for off-site disposal to landfill. It should be noted that disposal at landfill is not the only option for materials leaving the Site and off site recycling of all arisings through a recognised EA hub site using the voluntary code of practice (COP) could present opportunities for significant savings over traditional landfilling.

The results of asbestos fibre screening indicate that Asbestos fibres were not detected in the samples of made ground submitted for analysis. However, this does not completely preclude the possibility that ACM could occur within the made ground on site. Ground works contractors are those most at risk and it is the duty of the principal contractor to apply appropriate measures under the Health & Safety at Work Act 1974 and the Control of Asbestos Regulations 2012 where applicable.

The risk to construction workers from on site generated dusts as part of the site preparatory works is assessed to be low as a function of the age class of the receptor and the anticipated limited exposure durations of this group. Nonetheless, it is recommended that standard PPE & RPE including correctly fitted particulate masks and disposable coveralls and gloves should be worn by operatives as a matter of course during removal of made ground.

The risk to building services from chemical attack is likely to be low given the low risk status of the site. The route of service pipes should be assessed when information for proposed connections become available. It is likely that these will enter the site directly from the street rather than be laid across the site.

12. Remediation

Given the soils and groundwater on site present a low risk to both, site end user receptors and the wider environment, the production of a remediation scheme is not deemed to be a requirement on this site.

13. Conceptual Model

The updated conceptual model based on the information and test results presented in this report including contamination sources, pathways and receptors is presented below.

Table 13 Amended Conceptual Site Model based on information as presented within this report.

Potential Source /Hazard	Nature of Hazard (Risk Level to site given a Commercial end use	Contaminants Associated with Source	Potential Pathway	Potential Receptor
	Previous & Present ON SITE Land uses:			
1. Terraced Property Possible infilled cellars / Made Ground	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA	See GRA	Vertical and Lateral Migration	Site Users Future Buildings & Services
2. Car Parking/ construction compound	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA	See GRA	Vertical and Lateral Migration	Site Users Future Buildings & Services
	Previous OFF SITE land uses within 250m as indicated by Historical Plans Including:			
3. Cotton Mill	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA	See GRA	Vertical and Lateral Migration	Site Users Future Buildings & Services
4. Warehouse	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA	See GRA	Vertical and Lateral Migration	Site Users Future Buildings & Services
5. Saw Mill	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA	See GRA	Vertical and Lateral Migration	Site Users Future Buildings & Services
6. Cotton Mills Engineering Works Infilled reservoir Coal wharfs, Ropewalk Gasometer, Dye, Printing, Oil and Rubber Works ALL REDEVELOPED	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA	See GRA	Vertical and Lateral Migration	Site Users Future Buildings & Services
7. Coal Workings & Mineral Extraction	Geotechnical Hazard Low Risk	None	Ground Collapse Subsidence	Humans (site users) Future Buildings & Services
	Ground contamination Low Risk	None Identified	None Identified 100% Hard Standing Cover	Site Users Services
	Mine Gas See GRA	See GRA	None	Humans (site users) Future Buildings & Services

Only sources that have not been present on site in the past or currently are considered within the off site category. Unless the information is deemed to be pertinent to the analysis.

14. Conclusions

Evidence presented elsewhere within this report indicates that there is:

- A Low Risk to end user receptors from soil contamination at the site in its present condition
- The site presents a Low Risk to controlled waters and the wider environment in its present condition
- The proposed development presents a Low Risk to end user receptors from soil contamination.
- The proposed development presents a Low Risk to controlled waters and the wider environment.

14.1 Supplementary Recommendations

Careful observations will be made during site preparation and foundation works to confirm the current assessment of site conditions. Any evidence of contamination not previously identified will be brought to the attention of the LPA as soon as is practicably possible.





Matthew Benson MSc. GMICE
Geotechnical/Environmental Engineer

Mark Richardson MSc CEng MICE
Technical Director

Field investigations have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions are, and can be, variable and have only been tested at isolated locations across the site. Therefore, the potential exists for ground conditions to be encountered which are different to those considered in this report. Chemical analysis was conducted for a number of parameters based on an expert understanding of the historical and operational data available at the time and it should not be inferred or otherwise, that other chemical species are not present.

This report has been prepared by GeoAssist Limited with all reasonable professional skill, care and diligence within the terms of the contract with Jadebricks (Charles Street) Ltd. The report is confidential to Jadebricks (Charles Street) Ltd, their/the named persons, advisors and bankers, and GeoAssist Limited accepts no responsibility of whatever nature to third parties to whom this report may be divulged. GeoAssist Limited owns the copyright in this report. All rights are reserved and unauthorised use is prohibited. Jadebricks (Charles Street) Ltd may use the report for their/her/his own purposes.

Appendix A

A1 Site Plan & Exploratory Hole Locations
A2 Proposed Site Plan
A3 Rock Head Contour Plan
A4 Groundwater Contour Plans

6134GALv1.00



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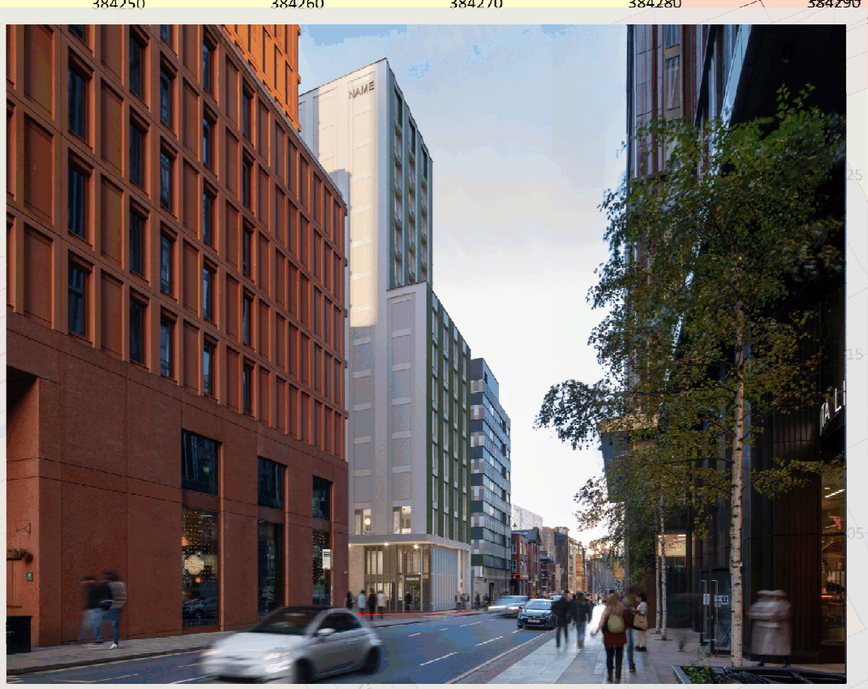
GeoAssist Limited
Civil, Environmental & Geotechnical
Telephone: +44 (0) 161 480 8885 e-mail : info@geoassist.co.uk

A1 Site Plan

Site Name	Charles Street
Location	Manchester
GeoAssist Ref	6134VCM
Client	Jadebricks (Charles Street) Ltd
	Apartment 2.2, 19 Trevor Square Knightsbridge London SW7 1DZ
Planning Consultant	(dp)2 Ltd.
NGR (centre of site)	384240,397490
Production Date	Jan 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Do Not Scale

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A2 Development Plan

Site Name	Charles Street
Location	Manchester
GeoAssist Ref	6134VCM
Client	Jadebricks (Charles Street) Ltd
	Apartment 2.2, 19 Trevor Square Knightsbridge London SW7 1DZ
Planning Consultant	(dp)2 Ltd.
NGR (centre of site)	384240,397490
Production Date	Jan 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

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A3 Rockhead Plan

Site Name	Charles Street
Location	Manchester
GeoAssist Ref	6134VCM
Client	Jadebricks (Charles Street) Ltd
	Apartment 2.2, 19 Trevor Square Knightsbridge London SW7 1DZ
Planning Consultant	(dp)2 Ltd.
NGR (centre of site)	384240,397490
Production Date	Jan 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Rockhead Contours by interpolation between known data points from both on site and off site publicly available information sources.

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A4 GW Contour Plan

Site Name	Charles Street
Location	Manchester
GeoAssist Ref	6134VCM
Client	Jadebricks (Charles Street) Ltd
	Apartment 2.2, 19 Trevor Square Knightsbridge London SW7 1DZ
Planning Consultant	(dp)2 Ltd.
NGR (centre of site)	384240,397490
Production Date	Jan 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Based on Groundwater Levels Obtained on 03/01/2024

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A4 GW Contour Plan

Site Name	Charles Street
Location	Manchester
GeoAssist Ref	6134VCM
Client	Jadebricks (Charles Street) Ltd
	Apartment 2.2, 19 Trevor Square Knightsbridge London SW7 1DZ
Planning Consultant	(dp)2 Ltd.
NGR (centre of site)	384240,397490
Production Date	Jan 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Based on Groundwater Levels Obtained on 8/12/2023

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Appendix B

B1 Exploratory Hole Logs

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: WS1
Sheet: 1

Project: Charles Street
Location: Manchester

Consultant: (dp)2 Ltd.
Client: Jadebricks (Charles Street) Ltd

Equipment: Archway Dart Rig with WLS sampling

Ground Level: 31.21 m.AOD
Co-ordinates: Easting: 384242.1(m) Northing: 397476.8(m)
Dates: 14/11/2023 to 14/11/2023

Drilling Foreman: M Walton
Engineer/Geologist: M Benson

STRATUM DESCRIPTION	Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests: Depth (m) from	to	Sample Type/No	Blow Count N/(U)	Field Records
Tarmac	0.10	31.11	MG					14/11/2023: Inspection Pit excavated with hand tools to 1.00m depth.
CONCRETE	0.30	30.91	MG					
Very loose grey sandy gravel - MADE GROUND	(1.20)		MG	0.50	0.60	ES1		
				1.00		CP1	1	
	1.50	29.71		1.50	1.60	ES2		
Orange/brown sandy brick fragments and rubble and plastic fragments - MADE GROUND	(0.50)		MG					
	2.00	29.21		2.00		CP2	8	
Loose dark grey sandy silty clay, brick and concrete fragments - MADE GROUND	(0.50)		MG	2.30	2.40	ES3		
	2.50	28.71						
Grey/brown slightly gravelly very silty fine to medium SAND	(0.50)		FG	2.70	2.80	ES4		
	3.00	28.21		3.00		CP3	1	
Soft grey/brown low stength sandy silty CLAY	(0.60)		FG					
	3.60	27.61						Hand vane at 3.50m - 32kPa
Loose light brown and grey/brown slightly gravelly silty fine to medium SAND	(0.70)		FG	4.00		CP4	6	
	4.30	26.91						
Stiff grey high strength sandy silty CLAY	(0.50)		GT					Hand vane at 4.50m - 108kPa
	4.80	26.41						
Dense orange/brown silty SAND and GRAVEL	(0.40)		GT	5.00		CP5	32	
	5.20	26.01						
Very stiff brown very high strength gravelly sandy silty CLAY with orange/brown sandstone fragments at base	(0.80)		GT					Hand penetrometer at 5.50m - >250kPa
	6.00	25.21		6.00		CP6	60+	
Very dense orange/brown silty fine to medium SAND - completely weathered Sandstone - Interpreted Stratum	(1.45)		S1					
Dynaic probing only from 6.00m				7.00		CP7	60+	On completion of exploratory hole at 7.45m. Water level at 4.90m depth. 50mm ground gas/groundater monitoring standpipe installed to 5.00m depth with response zone from 1.00 to 5.00m
	7.45	23.76						
Exploratory Hole complete at 7.45m								

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Benson
Date: 14/11/2023
Checked: M Richardson
Date: 30/11/2023
Site Ref: 6134/VCM
Scale 1:50 nominal

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: WS2
Sheet: 1

Project: Charles Street
Location: Manchester

Consultant: (dp)2 Ltd.
Client: Jadebricks (Charles Street) Ltd

Equipment: Archway Dart Rig with WLS sampling

Ground Level: 30.94 m.AOD
Co-ordinates: Easting: 384231.3(m) Northing: 397488.6(m)
Dates: 20/11/2023 to 20/11/2023

Drilling Foreman: M Walton
Engineer/Geologist: M Benson

STRATUM DESCRIPTION	Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests: Depth (m) from	to	Sample Type/No	Blow Count N/(U)	Field Records
Tarmac	0.10	30.84	MG					20/11/2023: Inspection Pit excavated with hand tools to 1.00m depth.
CONCRETE	0.30	30.64	MG					
Very loose grey/brown sandy gravel - MADE GROUND	(1.70)		MG	1.50	1.60	ES1	4	
				1.50		CP1		
	2.00	28.94		2.00		CP2	8	
Loose dark grey sandy gravel with cobbles - MADE GROUND	(0.50)		MG					
	2.50	28.44		2.50	2.60	ES2		
Brown clayey silty sandy GRAVEL	(0.50)		FG					
	3.00	27.94		3.00		CP3	17	
Medium dense to dense brown and grey silty sandy GRAVEL with cobbles	(1.50)		FG	3.10	3.20	ES3		
				4.00		CP4	50	
	4.50	26.44						
Stiff grey high strength silty CLAY	4.70	26.24	GT					Hand penetrometer at 4.60m - 135kPa
Orange/brown clayey gravelly silty SAND	5.00	25.94	GT					
Dense brown clayey silty SAND	(0.40)		GT	5.00		CP5	31	
	5.40	25.54						
Very stiff brown very high strength gravelly very sandy silty CLAY	(0.60)		GT					Hand penetrometer at 5.70m - >250kPa
	6.00	24.94		6.00		CP6	60+	
Very dense orange/brown silty fine to medium SAND with sandstone fragments - completely weathered Sandstone	(0.45)		S1					On completion of exploratory hole at 6.45m. Water level at 5.10m depth. 50mm ground gas/groundwater monitoring standpipe installed to 5.80m depth with response zone from 1.00 to 5.80m
	6.45	24.49						
Exploratory Hole complete at 6.45m								

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Benson
Date: 21/11/2023
Checked: M Richardson
Date: 30/11/2023
Site Ref: 6134/VCM
Scale 1:50 nominal

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: WS3
Sheet: 1

Project: Charles Street
Location: Manchester

Consultant: (dp)2 Ltd.
Client: Jadebricks (Charles Street) Ltd

Equipment: Archway Dart Rig with WLS sampling

Ground Level: 30.73 m.AOD
Co-ordinates: Easting: 384229.1(m) Northing: 397499.6(m)
Dates: 17/11/2023 to 17/11/2023

Drilling Foreman: M Walton
Engineer/Geologist: M Benson

STRATUM DESCRIPTION	Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests: Depth (m) from	to	Sample Type/No	Blow Count N/(U)	Field Records
0 Tarmac	0.10	30.63	MG					17/11/2023: Inspection Pit excavated with hand tools to 1.00m depth.
CONCRETE	0.30	30.43	MG					
Grey/brown sandy gravel - MADE GROUND	0.50	30.23	MG					
Brown with orange/brown sandy gravel, brick fragments and rubble - MADE GROUND	(0.50) 1.00	29.73	MG	0.80	0.90	ES2		
1				1.00		CP1	21	
Orange/brown silty sandy brick and concrete fragments - MADE GROUND	(0.60) 1.60	29.13	MG					
Medium dense grey/brown clayey silty sand with brick fragments - MADE GROUND			MG	1.70	1.80	ES3		
2	(0.90) 2.50	28.23	MG	2.00		CP2	7	
Grey/brown sandy silty clay with brick and pottery fragments - MADE GROUND	(0.40) 2.90	27.83	MG	2.70	2.80	ES4		
3 Medium dense grey/brown slightly silty sandy GRAVEL with cobbles	(1.00) 3.90	26.83	FG	3.00		CP3	14	
4 Medium dense orange/brown slighly gravelly silty fine to medium SAND	(0.60) 4.50	26.23	FG	4.00		CP4	28	
Very stiff very high strength gravelly sandy silty CLAY	(0.40) 4.90	25.83	GT					Hand penetrometer at 4.60m - >250kPa
5 Very dense orange/brown silty fine to medium SAND - completely weathered Sandstone	(0.45) 5.35	25.38	S1	5.00		CP5	60+	On completion of exploratory hole at 5.35m. Water level at 4.30m depth. 50mm ground gas/groundwater monitoring standpipe installed to 4.20m depth with response zone from 1.00 to 4.20m
Exploratory Hole complete at 5.40m								
6								
7								
8								
9								
10								

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Benson
Date: 20/11/2023
Checked: M Richardson
Date: 30/11/2023
Site Ref: 6134/VCM
Scale 1:50 nominal

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: BH1
Sheet: 1

Consultant: (dp)2 Ltd.

Client: Jadebricks (Charles Street) Ltd

Project: Charles Street
Location: Manchester

Equipment: Dando LCP Rig (200mm casing) + Rotary Rig with water (T6H core 75mm) and air/mist flush (412F core 72mm and PW casing 140mm)

Ground Level: 31.14 m.AOD
Co-ordinates: Easting: 384242.6(m) Northing: 397479.3(m)
Dates: 21/11/2023 to 07/12/2023

Lead Driller: M Benson Assistant Driller: M Walton

STRATUM DESCRIPTION

Site Geotechnical Engineer/Geologist: M Benson

Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Depth (m) from	to	Ref.	Count N/(U) T %	S %	RQD %	Field Records
0.10	31.04	MG							
Tarmac / CONCRETE 0.30	30.84	MG							21/11/2023: Inspection Pit excavated with hand tools to 1.00m depth.
Very loose grey/brown sandy gravel, brick, concrete and timber fragments - MADE GROUND			0.50	0.60	D1				
			0.50	0.60	ES1				
			1.00	1.45	P1		2		P1 at 1.00m - 1,1/0,1,0,1
(1.90)		MG							
			1.50	1.60	D2				
			1.50	1.60	ES2				
2.20	28.94								
Soft to firm grey mottled brown sandy silty to very silty CLAY with organic inclusions			2.30	2.75	P2		7		P2 at 2.30m - 1,1/1,2,2,2
			2.50	2.60	D3				
(1.20)		FG							
			3.10	3.55	P3		25		P3 at 3.10m - 3,5/6,6,6,7
3.40	27.74								
Medium dense to dense orange/brown silty SAND and GRAVEL with cobbles			3.50	3.60	D4				
			4.20	4.65	P4		(26)		P4 at 4.20m - 7,6/4,5,7,8
(1.80)		FG							
			4.50	4.60	D5				21/11/2023: Water struck at 4.80m depth. Water level after 20mins 4.80m
			4.80		W1				
			5.00	5.45	P5		(30)		P5 at 5.00m - 4,5/5,8,9,12
5.20	25.94								
Stiff to very stiff brown gravelly sandy silty CLAY			5.50	5.60	D6				
(0.80)		GT							
6.00	25.14								
Very dense orange/brown silty fine to medium SAND - completely weathered Sandstone			6.00	6.45	P6		54		P6 at 6.00m - 8,8/9,10,15,20
(1.00)		S1	6.50	6.60	D7				22/11/2023: Hard Boring Sandstone 7.00m to 9.10m -1.0hr
7.00	24.14		7.00	7.34	P7				P7 at 7.00m - 17,21/73 for 115mm
Very weak to weak orange/brown inferior cemented subhorizontal bedded silty fine to medium grained SANDSTONE									22/11/2023: Water struck at 7.10m depth. Water level after 20mins 6.40m
(2.20)		S1							
9.20	21.94		9.10	9.30	P8				P8 at 9.10m - 23,30/50 for 50mm
Very weak to weak orange/brown inferior cemented subhorizontal bedded silty fine to medium grained SANDSTONE									22/11/2023: LCP hole completed at 9.20m. Standing Water 7.30m. 150mm dia Casing at 9.00m.
(0.80)		S1							
10.00	21.14		9.20	10.50	C1	100			05/12/2023: Rotary Drilling

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Richardson
Date: 08/12/2023
Checked: M Benson
Date:
Site Ref: 6134/VCM
Scale 1:50 nominal

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: BH1
Sheet: 2

Consultant: (dp)2 Ltd.

Client: Jadebricks (Charles Street) Ltd

Project: Charles Street
Location: Manchester

Equipment: Dando LCP Rig (200mm casing) + Rotary Rig with water (T6H core 75mm) and air/mist flush (412F core 72mm and PW casing 140mm)

Ground Level: 31.14 m.AOD
Co-ordinates: Easting: 384242.6(m) Northing: 397479.3(m)
Dates: 21/11/2023 to 07/12/2023

Lead Driller: M Benson Assistant Driller: M Walton

STRATUM DESCRIPTION

Site Geotechnical Engineer/Geologist: M Benson

STRATUM DESCRIPTION	Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests/Core Records: Depth (m) from to	Ref.	Count N/(U) T %	S %	RQD %	Field Records
Continued Stratum. Very weak to weak orange/brown inferior cemented subhorizontal bedded silty fine to medium grained SANDSTONE									commenced at 9.20m with air/mist flush. 05/12/2023: Water level 4.70m. 412F Rotary Coring from 9.20m to 15.00m with air/mist flush.
				10.50 12.00	C2	89			
				12.00 13.50	C3	100			
				13.50 15.00	C4	100			
	(9.00)		S1						06/12/2023: Water level at 4.70m depth. 412F Rotary Coring from 15.00m to 27.00m with air/mist flush.
				15.00 16.50	C5	80			
									Core run 16.50 to 18.00 split core line poor recovery
				16.50 18.00	C6	40			
				18.00 19.50	C7	90			
	19.00	12.14							
Weak orange/brown inferior cemented subhorizontal bedded silty fine to medium grained SANDSTONE	(1.00)		S2						
	20.00	11.14							

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Richardson
Date: 08/12/2023
Checked: M Benson
Date:
Site Ref: 6134/VCM
Scale 1:50 nominal

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: BH1
Sheet: 3

Consultant: (dp)2 Ltd.

Client: Jadebricks (Charles Street) Ltd

Project: Charles Street
Location: Manchester

Equipment: Dando LCP Rig (200mm casing) + Rotary Rig with water (T6H core 75mm) and air/mist flush (412F core 72mm and PW casing 140mm)

Ground Level: 31.14 m.AOD
Co-ordinates: Easting: 384242.6(m) Northing: 397479.3(m)
Dates: 21/11/2023 to 07/12/2023

Lead Driller: M Benson Assistant Driller: M Walton
Site Geotechnical Engineer/Geologist: M Benson

STRATUM DESCRIPTION	Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests/Core Records: Depth (m) from to	Ref.	Count N/(U) T %	S %	RQD %	Field Records
20 Continued Stratum. Weak orange/brown inferior cemented subhorizontal bedded silty fine to medium grained SANDSTONE				19.50 21.00	C8	93			
21				21.00 22.50	C9	100			
22									
23				22.50 24.00	C10	90			
24									
25	(10.00)		S2	24.00 25.50	C11	67			
26				25.50 27.00	C12	100			07/12/2023: Water level at 4.50m depth. 412F Rotary Coring from 27.00m to 30.00m with air/mist flush.
27				27.00 28.50	C13	100			
28									
29				28.50 30.00	C14	100			07/12/2023: On completion of drilling at 30.00m depth. Water level at 4.50m depth. 50mm Groundwater monitoring standpipe installed to 15.00m depth with response zone from 6.00m to 15.00m
30 Exploratory Hole complete at 30.00m	30.00	1.14							

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Richardson
Date: 08/12/2023
Checked: M Benson
Date:
Site Ref: 6134/VCM
Scale 1:50 nominal

GeoAssist Limited

Exploratory Hole Record Sheet

Ref: BH2
Sheet: 1

Consultant: (dp)2 Ltd.

Client: Jadebricks (Charles Street) Ltd

Project: Charles Street
Location: Manchester

Equipment: Dando LCP Rig (150mm casing) + Rotary Rig with water and air/mist flush (412F core 72mm)

Ground Level: 30.83 m.AOD
Co-ordinates: Easting: 384232(m) Northing: 397499.7(m)
Dates: 24/11/2023 to

Lead Driller: M Benson Assistant Driller: M Walton
Site Geotechnical Engineer/Geologist: M Benson

STRATUM DESCRIPTION

Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Depth (m) from	to	Ref.	Count N/(U) T %	S %	RQD %	Field Records
0 Tarmac 0.10	30.73	MG							24/11/2023: Inspection Pit excavated with hand tools to 1.00m depth.
CONCRETE 0.30	30.53	MG							
Dark brown/grey gravelly sandy silty clay with brick fragments - MADE GROUND 0.60	30.23	MG	0.60	0.80	D1				
			0.60	0.70	ES1				
Very loose dark brown clayey sandy gravel, brick and concrete fragments - MADE GROUND									
1			1.00	1.45	P1		3		P1 at 1.00m - 4,2/1,0,1,1
			1.50	1.35	D2				
			1.50	1.60	ES2				
(2.70)		MG							
2			2.00	2.45	P2		3		P2 at 2.00m - 2,1/1,1,0,1
			2.50	2.60	D3				
3									
3.30	27.53		3.30	3.75	P3		26		P3 at 3.30m - 2,3/5,7,6,8
Grey/brown sndy silty CLAY with sand bands and inclusions			3.50	3.60	D4				
(0.90)		FG							
4									24/11/2023: Water struck at 4.20m depth. Water level after 20mins 4.20m
4.20	26.63		4.20	4.65	P4		44		P4 at 4.20m - 4,7/7,9,12,16
Stiff to very stiff brown slightly gravelly sandy silty CLAY			4.30		W1				
			4.50	4.60	D5				
(1.00)		GT							
5			5.00	5.45	P5		32		P5 at 5.00m - 6,6/7,6,9,10
5.20	25.63								
Dense to very dense orange/brown silty fine to medium SAND with sandstone fragments - completely weathered Sandstone			5.50	5.60	D6				
(1.10)		S1							24/11/2023: Water struck at 6.00m depth. Water level after 20mins 5.60m
6			6.00	5.12	P6		79		P6 at 6.00m - 4,8/12,17,24,26
6.30	24.53								
Dense orange/brown silty fine to medium SAND - completely weathered Sandstone			6.40	6.50	D7				
7									
(1.70)		S1	7.20	7.65	P7		44		P7 at 7.20m - 5,7/7,11,11,15
8.00	22.83								29/11/2023: Hard Boring Sandstone 8.00m to 9.10m -2.0hrs
8 Very dense orange/brown silty fine to medium SAND - completely weathered Sandstone			8.40	8.48	P8				P8 at 8.40m - (50 for 75mm)
(1.10)		S1	8.50	8.60	D8				
9									
9.10	21.73		9.10	9.17	P9				P9 at 9.10m - (50 for 70mm)
LCP complete at 9.10m. Rotary to follow									29/11/2023: LCP hole completed at 9.10m. Water level at 7.40m depth. 150mm dia Casing at 9.00m.
10									

Remarks:

The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

Logged: M Richardson
Date: 08/12/2023
Checked: M Benson
Date:
Site Ref: 6134/VCM
Scale 1:50 nominal

Appendix C

C1 i2 Analytical Laboratory Test Results Soils

C2 Analysis of Soils Results with Assessment Criteria

C3 i2 Analytical Laboratory Test Results Water

C4 Analysis of Water Results with Assessment Criteria

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Analytical Report Number : 23-70564

Project / Site name:	Charles Street, Manchester	**Samples received on:**	22/11/2023
Your job number:	6134 VCM	**Samples instructed on/ Analysis started on:**	22/11/2023
Your order number:	2231121	**Analysis completed by:**	01/12/2023
Report Issue Number:	1	**Report issued on:**	01/12/2023
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.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-70564
Project / Site name: Charles Street, Manchester
Your Order No: 2231121

Lab Sample Number				2887500	2887501	2887502	2887503	2887504
Sample Reference				WS1	WS1	WS1	WS1	WS2
Sample Number				C1	C2	C3	C4	C1
Depth (m)				0.50	1.50	2.30	2.70	1.50
Date Sampled				21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023
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	73	65	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	4.6	4.8	19	18	2.9
Total mass of sample received	kg	0.001	NONE	0.4	0.5	0.5	0.4	0.3
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSO	DSO	DSO	N/A	DSO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	12.5	12.3	10.4	8.5	9.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	1	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	0.296	0.394	0.793	0.044	0.024
Sulphide	mg/kg	1	MCERTS	1.9	27	27	1.2	5.3
Total Sulphur	%	0.005	MCERTS	0.109	0.189	0.312	0.017	0.016

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.48	0.22	0.11	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.34	0.08	0.38	< 0.05	0.06
Anthracene	mg/kg	0.05	MCERTS	0.07	< 0.05	0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.51	0.16	0.6	< 0.05	0.07
Pyrene	mg/kg	0.05	MCERTS	0.43	0.16	0.63	< 0.05	0.07
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.21	0.09	0.36	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.21	0.08	0.4	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.2	0.1	0.47	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.09	< 0.05	0.16	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.19	0.08	0.36	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.08	< 0.05	0.2	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.09	< 0.05	0.24	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	2.42	1.23	4.07	< 0.80	< 0.80

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-70564
Project / Site name: Charles Street, Manchester
Your Order No: 2231121

Lab Sample Number				2887500	2887501	2887502	2887503	2887504
Sample Reference				WS1	WS1	WS1	WS1	WS2
Sample Number				C1	C2	C3	C4	C1
Depth (m)				0.50	1.50	2.30	2.70	1.50
Date Sampled				21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.1	6.5	26	6	1.4
Barium (aqua regia extractable)	mg/kg	1	MCERTS	210	310	640	59	300
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.2	0.46	0.9	0.44	0.15
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	0.4	0.7	0.6	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.6	2.4	< 0.2	0.6
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11	13	33	10	2.5
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	49	240	8.8	6.5
Lead (aqua regia extractable)	mg/kg	1	MCERTS	21	150	1200	14	6.6
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.6	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	5.4	9.5	56	6.9	3.9
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	11	16	46	16	2.5
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	48	110	530	21	15

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

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Analytical Report Number: 23-70564
Project / Site name: Charles Street, Manchester
Your Order No: 2231121

Lab Sample Number				2887505	2887506	2887507	2887508	2887509
Sample Reference				WS2	WS2	WS3	WS3	WS3
Sample Number				C2	C3	C2	C3	C4
Depth (m)				2.50	3.10	0.80	1.70	2.70
Date Sampled				21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023
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	14	7.5	15	16	19
Total mass of sample received	kg	0.001	NONE	0.3	0.4	0.3	0.7	0.3
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSO	N/A	DSO	DSO	DSO
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.9	8.3	10.8	8.2	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	0.102	0.012	0.139	0.083	0.052
Sulphide	mg/kg	1	MCERTS	3.9	< 1.0	2.2	< 1.0	< 1.0
Total Sulphur	%	0.005	MCERTS	0.051	0.005	0.062	0.042	0.029
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	1.3	< 0.05	0.13	0.15	0.18
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.58	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.35	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	4.1	< 0.05	0.09	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.83	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	5	0.05	0.11	0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	4.7	< 0.05	0.11	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.3	< 0.05	0.06	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	2.2	< 0.05	0.09	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	2.7	< 0.05	0.09	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.86	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.2	< 0.05	0.07	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.2	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.15	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	29.8	< 0.80	< 0.80	< 0.80	< 0.80

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-70564
Project / Site name: Charles Street, Manchester
Your Order No: 2231121

Lab Sample Number				2887505	2887506	2887507	2887508	2887509
Sample Reference				WS2	WS2	WS3	WS3	WS3
Sample Number				C2	C3	C2	C3	C4
Depth (m)				2.50	3.10	0.80	1.70	2.70
Date Sampled				21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	2.3	7.8	16	13
Barium (aqua regia extractable)	mg/kg	1	MCERTS	190	20	300	61	45
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	0.29	0.57	1.3	0.61
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	0.3	0.6	0.7	1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	< 0.2	1	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	12	13	12	12	10
Copper (aqua regia extractable)	mg/kg	1	MCERTS	160	7.7	30	350	730
Lead (aqua regia extractable)	mg/kg	1	MCERTS	320	5.6	59	160	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.8	< 0.3	< 0.3	0.5	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	12	11	20	14
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	27	12	21	24	15
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	100	23	45	77	220

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

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Analytical Report Number : 23-70564
Project / Site name: Charles Street, Manchester

* 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 *
2887500	WS1	C1	0.5	Brown sand with gravel and stones.
2887501	WS1	C2	1.5	Brown sand with gravel and stones.
2887502	WS1	C3	2.3	Brown clay and sand with gravel.
2887503	WS1	C4	2.7	Brown clay and sand.
2887504	WS2	C1	1.5	Brown sand with gravel.
2887505	WS2	C2	2.5	Brown sand with gravel and brick.
2887506	WS2	C3	3.1	Brown sand with gravel.
2887507	WS3	C2	0.8	Brown sand with gravel and brick.
2887508	WS3	C3	1.7	Brown sand with gravel.
2887509	WS3	C4	2.7	Brown clay and sand with gravel.

Analytical Report Number : 23-70564
Project / Site name: Charles Street, Manchester

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
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-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 cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser.	L080-PL	W	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-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.

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Analytical Report Number : 23-72325

Project / Site name:	Charles Street Manchester	**Samples received on:**	30/11/2023
Your job number:	6134-VCM	**Samples instructed on/ Analysis started on:**	30/11/2023
Your order number:	2231129	**Analysis completed by:**	11/12/2023
Report Issue Number:	1	**Report issued on:**	11/12/2023
Samples Analysed:	4 soil samples		

Izabela Wójcik
Signed:

Izabela Wójcik
Senior 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.

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Analytical Report Number: 23-72325
Project / Site name: Charles Street Manchester
Your Order No: 2231129

Lab Sample Number				2896383	2896384	2896385	2896386
Sample Reference				BH1	BH1	BH2	BH2
Sample Number				C1	C2	C1	C2
Depth (m)				0.50	1.50	0.60	1.50
Date Sampled				29/11/2023	29/11/2023	29/11/2023	29/11/2023
Time Taken				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
Moisture Content	%	0.01	NONE	11	13	14	14
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.3	0.4
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DBU	DBU	DBU	DBU

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.9	8.4	8.7	8.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	0.108	0.115	0.039	0.062
Sulphide	mg/kg	1	MCERTS	1.7	3.2	< 1.0	6.9
Total Sulphur	%	0.005	MCERTS	0.074	0.046	0.031	0.045

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	2.7	0.18	0.11
Acenaphthylene	mg/kg	0.05	MCERTS	0.07	0.1	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.35	7.2	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.37	5.3	< 0.05	0.08
Phenanthrene	mg/kg	0.05	MCERTS	2.2	28	0.2	0.71
Anthracene	mg/kg	0.05	MCERTS	0.69	7.9	< 0.05	0.15
Fluoranthene	mg/kg	0.05	MCERTS	1.3	25	0.21	0.64
Pyrene	mg/kg	0.05	MCERTS	1.2	19	0.22	0.69
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.29	8.7	0.12	0.32
Chrysene	mg/kg	0.05	MCERTS	0.42	8.5	0.13	0.35
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.51	8.8	0.12	0.3
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.23	3.5	0.06	0.11
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.35	7	0.1	0.25
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.27	3.3	< 0.05	0.13
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.85	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.31	3.8	< 0.05	0.14

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	8.52	141	1.34	3.98

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Analytical Report Number: 23-72325
Project / Site name: Charles Street Manchester
Your Order No: 2231129

Lab Sample Number				2896383	2896384	2896385	2896386
Sample Reference				BH1	BH1	BH2	BH2
Sample Number				C1	C2	C1	C2
Depth (m)				0.50	1.50	0.60	1.50
Date Sampled				29/11/2023	29/11/2023	29/11/2023	29/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7	8.2	11	11
Barium (aqua regia extractable)	mg/kg	1	MCERTS	1400	830	170	82
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.63	0.55	0.95	0.84
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	0.4	0.4	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	2.5	1	0.7	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	14	20	13
Copper (aqua regia extractable)	mg/kg	1	MCERTS	25	32	35	57
Lead (aqua regia extractable)	mg/kg	1	MCERTS	76	110	84	84
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.5	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	14	25	16
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	18	16	23	20
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	150	140	75	46
Monoaromatics & Oxygenates							
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-
Ethylbenzene	µg/kg	5	NONE	< 5.0#	< 5.0#	-	-
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-
o-xylene	µg/kg	5	NONE	< 5.0#	< 5.0#	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	-	-
Petroleum Hydrocarbons							
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.02	NONE	< 0.020	< 0.020	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.05	NONE	< 0.050	< 0.050	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	8.7	20	-	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	< 10	< 10	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	NONE	< 0.010	< 0.010	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.05	NONE	< 0.050	< 0.050	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	1.7	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	4.3	15	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	11	44	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	12	47	-	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	-	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	40	140	-	-

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

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Analytical Report Number : 23-72325
Project / Site name: Charles Street Manchester

* 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 *
2896383	BH1	C1	0.5	Brown clay and sand with gravel.
2896384	BH1	C2	1.5	Brown clay and sand with gravel and brick.
2896385	BH2	C1	0.6	Brown clay and sand with gravel.
2896386	BH2	C2	1.5	Brown sand with gravel and brick.

Analytical Report Number : 23-72325
Project / Site name: Charles Street Manchester

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
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-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 cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser.	L080-PL	W	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 23-72325
Project / Site name: Charles Street Manchester

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
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-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.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

- Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised

Soils Risk Assessment

Site Reference: 6134 VCM
Project Site: Charles Street
Project Location: Manchester
Client: Jadebricks (Charles Street) Ltd

i2 Reference	Commercial	WS1	WS1	WS1	WS1	WS2	WS2	WS2	WS3	WS3	WS3	BH1	BH1	BH2	BH2
Customer Sample Ref:	C4SL / S4UL	0.50	1.50	2.30	2.70	1.50	2.50	3.10	0.80	1.70	2.70	0.50	1.50	0.60	1.50
	SOM 6% GAC	21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023	21/11/2023	29/11/2023	29/11/2023	29/11/2023	29/11/2023
Determinand	LQM II														
Arsenic	640	3.1	6.5	26	6	1.4	14	2.3	7.8	16	13	7	8.2	11	11
Boron (water-soluble)	240000	1.2	0.4	0.7	0.6	0.2	1.2	0.3	0.6	0.7	1	0.5	0.4	0.4	0.6
Cadmium	410	0.6	0.6	2.4	0.2	0.6	0.5	0.2	1	0.2	0.2	2.5	1	0.7	0.2
Chromium*	8600	11	13	33	10	2.5	12	13	12	12	10	14	14	20	13
Chromium VI	49	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Copper	68000	18	49	240	8.8	6.5	160	7.7	30	350	730	25	32	35	57
Cyanide(Total)	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cyanide(free)**	34	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lead	2300	21	150	1200	14	6.6	320	5.6	59	160	140	76	110	84	84
Mercury	58	0.3	0.3	0.6	0.3	0.3	0.8	0.3	0.3	0.5	0.5	0.3	0.5	0.3	0.4
Nickel	980	5.4	9.5	56	6.9	3.9	21	12	11	20	14	22	14	25	16
pH	-	12.5	12.3	10.4	8.5	9.1	8.9	8.3	10.8	8.2	8.4	9.9	8.4	8.7	8.6
Phenols(Mono)	3200	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Selenium	12000	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SO4(Total)	-	0.296	0.394	0.793	0.044	0.024	0.102	0.012	0.139	0.083	0.052	0.108	0.115	0.039	0.062
Sulphide	-	1.9	27	27	1.2	5.3	3.9	1	2.2	1	1	1.7	3.2	1	6.9
Sulphur(Free)	-	0.109	0.189	0.312	0.017	0.016	0.051	0.005	0.062	0.042	0.029	0.074	0.046	0.031	0.045
Thiocyanate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	730000	48	110	530	21	15	100	23	45	77	220	150	140	75	46
Acenaphthene	100000	0.05	0.05	0.05	0.05	0.05	0.58	0.05	0.05	0.05	0.05	0.35	7.2	0.05	0.05
Acenaphthylene	100000	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.1	0.05	0.05
Anthracene	540000	0.07	0.05	0.05	0.05	0.05	0.83	0.05	0.05	0.05	0.05	0.69	7.9	0.05	0.15
Benzo(a)Anthracene	-	0.21	0.09	0.36	0.05	0.05	2.3	0.05	0.06	0.05	0.05	0.29	8.7	0.12	0.32
Benzo(a)Pyrene SM	77	0.19	0.08	0.36	0.05	0.05	2.2	0.05	0.07	0.05	0.05	0.35	7	0.1	0.25
Benzo(b)Fluoranthene	-	0.2	0.1	0.47	0.05	0.05	2.7	0.05	0.09	0.05	0.05	0.51	8.8	0.12	0.3
Benzo(ghi)Perylene	-	0.09	0.05	0.24	0.05	0.05	1.4	0.05	0.05	0.05	0.05	0.31	3.8	0.05	0.14
Benzo(k)Fluoranthene	-	0.09	0.05	0.16	0.05	0.05	0.86	0.05	0.05	0.05	0.05	0.23	3.5	0.06	0.11
Chrysene	-	0.21	0.08	0.4	0.05	0.05	2.2	0.05	0.09	0.05	0.05	0.42	8.5	0.13	0.35
Dibenzo(ah)Anthracene	-	0.05	0.05	0.05	0.05	0.05	0.15	0.05	0.05	0.05	0.05	0.05	0.85	0.05	0.05
Fluoranthene	23000	0.51	0.16	0.6	0.05	0.07	5	0.05	0.11	0.05	0.05	1.3	25	0.21	0.64
Fluorene	71000	0.05	0.05	0.05	0.05	0.05	0.35	0.05	0.05	0.05	0.05	0.37	5.3	0.05	0.08
Indeno(123-cd)Pyrene	-	0.08	0.05	0.2	0.05	0.05	1.2	0.05	0.05	0.05	0.05	0.27	3.3	0.05	0.13
Naphthalene	1100	0.05	0.48	0.22	0.11	0.05	1.3	0.05	0.13	0.15	0.18	0.05	2.7	0.18	0.11
Phenanthrene	23000	0.34	0.08	0.38	0.05	0.06	4.1	0.05	0.09	0.05	0.05	2.2	28	0.2	0.71
Pyrene	54000	0.43	0.16	0.63	0.05	0.07	4.7	0.05	0.11	0.05	0.05	1.2	19	0.22	0.69
PAH(total)	500	2.42	1.23	4.07	0.8	0.8	29.8	0.8	0.8	0.8	0.8	8.52	141	1.34	3.98
Asbestos	Not-detected	Not-detected	Not-detected	Not-detected	-	Not-detected	Not-detected	-	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
TPH (C6-C8 aliphatic)	530	-	-	-	-	-	-	-	-	-	-	0.02	0.02	-	-
TPH (C8-C10 aliphatic)	150	-	-	-	-	-	-	-	-	-	-	0.05	0.05	-	-
TPH (C10-C12 aliphatic)	760	-	-	-	-	-	-	-	-	-	-	1	1	-	-
TPH (C12-C16 aliphatic)	4300	-	-	-	-	-	-	-	-	-	-	2	2	-	-
TPH (C16-C21 aliphatic)	110000	-	-	-	-	-	-	-	-	-	-	8	8	-	-
TPH (C21-C35 aliphatic)	110000	-	-	-	-	-	-	-	-	-	-	8.7	20	-	-
TPH (C5-C7 aromatic)	300	-	-	-	-	-	-	-	-	-	-	0.01	0.01	-	-
TPH (C7-C8 aromatic)	660	-	-	-	-	-	-	-	-	-	-	0.01	0.01	-	-
TPH (C8-C10 aromatic)	190	-	-	-	-	-	-	-	-	-	-	0.05	0.05	-	-
TPH (C10-C12 aromatic)	380	-	-	-	-	-	-	-	-	-	-	1	1.7	-	-
TPH (C12-C16 aromatic)	660	-	-	-	-	-	-	-	-	-	-	4.3	15	-	-
TPH (C16-C21 aromatic)	930	-	-	-	-	-	-	-	-	-	-	11	44	-	-
TPH (C21-C35 aromatic)	1700	-	-	-	-	-	-	-	-	-	-	12	47	-	-
Benzene	2.4	-	-	-	-	-	-	-	-	-	-	0.005	0.005	-	-
Toluene	7.5	-	-	-	-	-	-	-	-	-	-	0.005	0.005	-	-
EthylBenzene	260	-	-	-	-	-	-	-	-	-	-	0.005	0.005	-	-
M/P Xylene	310	-	-	-	-	-	-	-	-	-	-	0.005	0.005	-	-
O Xylene	330	-	-	-	-	-	-	-	-	-	-	0.005	0.005	-	-

All Units mg/kg unless otherwise stated — Indicates Exceedance of Applicable Level

*Criteria Assumes Chromium III

**Criteria is derrived considering acute effects on 1-2yo Female Receptor ingesting a single dose of 3g of soil

**Criteria is derrived considering Total TPH (C10 to C35) is formed entirley of a 50:50 Aliphatic and Aromatic Split C8-C10 range

Basis of Assessment Criteria:	EA 2005 WAC (Human Health Value)	C4SL
	LQM S4UL	Atrisk 06

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UKAS TESTING
4041

Environmental Science

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Analytical Report Number : 23-73340

Project / Site name:	Charles Street, Manchester	**Samples received on:**	06/12/2023
Your job number:	6134-VCM	**Samples instructed on/ Analysis started on:**	06/12/2023
Your order number:	2231205	**Analysis completed by:**	13/12/2023
Report Issue Number:	1	**Report issued on:**	13/12/2023
Samples Analysed:	2 water samples		

Signed:

Dominika Liana
Junior 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.

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical i2 Environmental Science

Analytical Report Number: 23-73340
Project / Site name: Charles Street, Manchester

Your Order No: 2231205

Lab Sample Number				2902260	2902261
Sample Reference				BH1	BH2
Sample Number				W1	W1
Depth (m)				4.80	4.30
Date Sampled				05/12/2023	05/12/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH (L099)	pH Units	N/A	ISO 17025	7.7	7.4
Total Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0	< 1.0
Free Cyanide (Low Level 1 µg/l)	µg/l	1	NONE	< 1.0	< 1.0
Thiocyanate as SCN	µg/l	200	ISO 17025	< 200	< 200
Sulphate as SO4	mg/l	0.045	ISO 17025	274	230
Total Sulphur	µg/l	15	NONE	91000	77000
Sulphide	µg/l	5	NONE	< 5.0	< 5.0
Total Phenols					
Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	< 1.0
Speciated PAHs					
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	3.25	< 0.01
Fluorene	µg/l	0.01	ISO 17025	1.57	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	1.9	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.44	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	0.28	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.17	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Total PAH					
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	7.61	< 0.16
Heavy Metals / Metalloids					
Boron (dissolved)	µg/l	10	ISO 17025	200	280
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15	< 0.15
Barium (dissolved)	µg/l	0.06	ISO 17025	140	57
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.04	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1	< 0.5
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	6.4	16
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.3	1.3

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

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Analytical Report Number : 23-73340
Project / Site name: Charles Street, Manchester

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 water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode.	In-house method	L029-PL	W	NONE
Thiocyanate in water	Determination of thiocyanate in water by discreet analyser (colorimetry). Accredited matrices SW, GW, PW.	In house method based on SMWW 4500-CN-M. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Free cyanide (low level) in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE

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.

Groundwater Risk Assessment

Site Reference: 6134 VCM
Project Site: Charles Street
Project Location:
Client: Jadebricks (Charles Street) Ltd

SAL Reference	Ass. Criteria	2902260	2902261
Customer Sample Ref:		BH1 - W1	BH2 - W1
		4.80	4.30
Determinand		05/12/2023	05/12/2023
Arsenic	50	0.15	0.15
Boron (water-soluble)	2000	200	280
Cadmium	5	0.04	0.03
Chromium	250	0.2	0.2
Chromium VI	5	5	5
Copper	28	1	0.5
Cyanide(Total)	50	1	1
Cyanide(free)	50	1	1
Lead	250	0.2	0.2
Mercury	1	0.05	0.05
Nickel	200	6.4	16
pH	9	7.7	7.4
Phenols(Mono)	300	1	1
Selenium	10	0.6	0.6
SO4(Total)	400000	274	230
Sulphide	-	5	5
Sulphur(Free)	-	91000	77000
Thiocyanate	-	200	200
Zinc	500	1.3	1.3
Acenaphthene	-	3.25	0.01
Acenaphthylene	-	0.01	0.01
Anthracene	0.4	0.44	0.01
Benzo(a)Anthracene	-	0.01	0.01
Benzo(a)Pyrene	0.7	0.01	0.01
Benzo(b/k)Fluoranthene	-	0.01	0.01
Benzo(ghi)Perylene	-	0.01	0.01
Chrysene	-	0.01	0.01
Dibenzo(ah)Anthracene	-	0.01	0.01
Fluoranthene	1	0.28	0.01
Fluorene	-	1.57	0.01
Indeno(123-cd)Pyrene	-	0.01	0.01
Naphthalene	2.4	0.01	0.01
Phenanthrene	-	1.9	0.01
Pyrene	-	0.17	0.01
PAH(total)	-	7.61	0.16

All Units µg/l unless otherwise stated

##	Indicates Exceedance of Water Assessment Criteria
##	Limit of detection gretaer than Target Value

RBDTGSTV 2010 EQS or EQS2 UK WSR01 WHO2006

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