



e3p

Phase II Geoenvironmental Site Assessment
Laystall Street, Manchester

Reference: 15-140-R1-1
Date: March 2022



PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Laystall Street
Manchester
M1 2JZ

Prepared for:

Great Places Housing Group

greatplaces
HOUSING GROUP

Report Ref: 15-140-R1-1

Date Issued: March 2022

Laystall Street, Manchester

Phase II Geoenvironmental Site Assessment
March 2022

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EXECUTIVE SUMMARY

Site Address	Land off Laystall Street, Manchester, M1 2JZ	
Grid Reference	E 384978, N 398263	
Site Area	0.11 Ha	
Proposed Development	E3P understands that Great Places Housing Group are intending the proposed acquisition and future redevelopment of a parcel of land off Laystall Street, Manchester for an intended residential end-use with associated utility infrastructure.	
Current Site Use	The site is currently occupied by a large brick industrial building (former clothing factory) to the east of the site with a large L-shaped basement. The west of the site is a hardstanding car park. A line of semi-mature/mature trees is present along the southwest site boundary.	
Site History	The earliest historical mapping in 1851 indicates terraced residential housing across the majority of the site and a Public House in the northwest. By 1908 the majority of the residential housing is demolished, and an L-shaped industrial building is noted in the east of the site. By 1965 a clothing factory is also present in the east of the site. The terraced housing in the west was demolished Pre 1988. By 1993 the site appears in the same configuration as the present day.	
Environmental Setting	Drift Geology	Till (Devensian – CLAY) across the site.
	Bedrock Geology	Chester Sandstone Formation – SANDSTONE.
	Faults	A fault is located 228 m southwest.
	Hydrogeology	Undifferentiated strata (drift) overlying principal aquifer (solid). No potable groundwater abstractions have been identified within a 1 km radius.
	Hydrology	Rochdale Canal is located 96 m northwest.
	Flood Risk	Unaffected by flooding from rivers.
Previous Reports	The following previous reports have been completed for the site:  Earth Environmental & Geotechnical - Phase I Desk Study (Ref: A3664/20, August 2020). A summary of the pertinent points is provided in Section 2.0 of this report.	
Utility Locations	Utility connections are available throughout the surrounding streets. A BT connection is present in the west of the site.	
Landfill Sites and Ground Gases	There are no identified landfill sites located within 500 m of the site.	
Radon	Unaffected – no special precautions required.	
Coal Mining/Land Stability	The site is not affected by shallow coal mining.	
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.	



Initial Conceptual Site Model	Contaminant Sources ✚ Made Ground associated with construction and demolition activities and industrial land use – PAHs, heavy metals, hydrocarbon compounds ACM, ground gas. ✚ Clothing factory, waste paper mill, nearby historical industrial land uses, tanks (spillages and leakages of fuel etc) – PAHs, hydrocarbon compounds, heavy metals, SVOCs, VOCs. Pathways ✚ Dermal contact and ingestion. ✚ Vapour inhalation. ✚ Dust inhalation. ✚ Volatilisation/ explosion ✚ Vertical and lateral migration. Receptors ✚ Future site users (proposed residential end-users and construction workers). ✚ Buildings (proposed residential units) ✚ Rochdale Canal ✚ Principal aquifer
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GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: ✚ 6 x window sample boreholes, ✚ 2 x cable percussive boreholes and ✚ Construction of environmental monitoring installations.
Ground Conditions	Made Ground – 0.00 m bgl to 2.05 m bgl Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m and 2.05 m bgl. Made Ground deposits generally comprise asphalt or concrete overlying light grey sandy gravel of concrete and limestone (MOT sub-base). Underneath the sub-base, Made Ground was identified as brown sandy gravelly clay with cobbles. Gravel comprises fine to coarse, angular to subangular brick, ash and clinker and cobbles comprise subangular brick. DRIFT – 0.80 m bgl to >18.80 m bgl Drift deposits were encountered within all exploratory locations to depths of 18.80 m bgl. The drift deposits generally comprise stiff to very stiff brown mottled grey slightly gravelly CLAY with gravel of sandstone and mudstone.



	Dense brown slightly gravelly fine SAND with gravel of sandstone was identified in CP101 between 17.00 m and 18.80 m bgl.
	SOLID – Not Encountered The solid bedrock geology was not encountered during the ground investigation. The depth of bedrock is not recorded on the closest BGS boreholes.
	GROUNDWATER – Groundwater was encountered as occasional seepages between 1.40 m bgl and 2.00 m bgl during the site investigation with monitoring recording groundwater levels between 0.90 m and 2.40 m bgl.

CONTAMINATED LAND ASSESSMENT

Human Health	The Tier I human health risk assessment identified elevated concentrations of lead, non-volatile PAHs and asbestos. The risk to chronic human health associated with the elevated concentrations of inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils. The specific design and installation process for the appropriate cover systems will be clearly defined within a site remediation and enabling works strategy. Asbestos in the form of loose amosite fibres (<0.001%) has also been identified within the Made Ground in WS105. No visual signs of ACM were encountered during the ground investigation. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model. Except for the clay in WS202, chemical analysis of the natural clay drift deposits suggests that these soils will be acceptable for use as subsoil within the proposed garden and landscaped areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site. Further assessment is required following the demolition of the existing buildings.
Controlled Waters	A series of leachate and groundwater samples obtained from the underlying soils and boreholes were tested for a range of relevant determinands. The analysis has identified elevated concentrations of copper, lead, nickel, selenium, zinc, total cyanide and fluoranthene in both leachate and groundwater samples. It should be noted that the Tier I assessment criteria provides a conservative view, which may overstate the risk. Inorganic determinants identified above are of a general low solubility and therefore mobility, suggesting that these will not migrate to controlled water receptors. E3P has completed an m-BAT and lead screening risk assessment to assess the potential risk to surface water quality. Both assessments have confirmed, the relevant heavy metal concentrations are not bioavailable and therefore do not pose a risk to aquatic life. In addition, cohesive drift deposits to depths in excess of 15.00 m will inhibit migration towards the underlying principal aquifer and nearby surface watercourses.



	Based on the above, there is considered to be no unacceptable level of risk to the controlled water receptors.
Ground Gas	Ground gas monitoring completed to date suggests that the site can be classified as CS1. This will be confirmed on completion of the monitoring.
Potable Water Infrastructure	This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation. Initial indications suggest that barrier pipe will be required.

GEOTECHNICAL ASSESSMENT

Underground Obstructions	Significant obstructions will be present beneath the existing buildings. During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.
Allowable Bearing Pressure	The underlying natural clay drift deposits have been assessed as being very stiff medium strength to very stiff very high strength with a net allowable bearing pressure (ABP) in the order of 135–470 kN/m² between 1.00 – 3.00 m bgl. Stiff to very stiff clays were encountered to 15.50 mbgl with a net allowable bearing pressure (ABP) in the order of 112–383 kN/m². The natural granular drift deposits (gravelly sands) were assessed as having a net ABP of circa 300 kN/m² between 17.00 – 18.50 m bgl.
Foundation Options	Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff glacial clay. Where proposed levels remain similar, plots could likely be constructed using strip or trench fill foundations bearing on the underlying stiff to very stiff clays, subject to the required bearing stratum being present at a shallow depth and the absence of tree influence. Where the suitable founding stratum is greater than 2.50 m bgl, an engineered foundation will be required. Based on the basement survey levels, the Made Ground is known to extend to depths in excess of 3.00 m bgl, therefore an engineered foundation solution will be required in the location of the existing building footprint. At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, based on our extensive experience of similar sites, we would anticipate that the final foundation solution would be a combination of the following: ✿ Shallow strip foundations bearing on stiff to very stiff CLAY at circa 1.00 m bgl; ✿ Trench fill to support reinforced strip foundations in areas of variable ground and/or potential tree influence; and, ✿ Driven piles or VSC where the founding strata are encountered at greater depths.



Building Floor Slabs	Ground-bearing floor slabs are unlikely to be viable given the anticipated depths of reworked Made Ground > 600 mm and shallow cohesive soils.
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Heave Precautions	The clay is deemed to be medium volume change potential, therefore heave precautions will be required. If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams. If the ground floor slab is to be constructed with a beam and block floor, a minimum subfloor void of 250 mm is required within any structures located in the zone of conjectured tree influence, an engineered design will be required for piled plots. If the ground floor slab is constructed with a cast-in-situ suspended floor slab, then heave precautions that can tolerate 100 mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.
Soakaway Drainage	The site is underlain by likely low permeability clay soils which would preclude the use of infiltration drainage systems.
Sulphate Assessment	The soils at the site generally meet Class DS-1, AC-1s. Elevated sulphate concentrations meeting Class DS-3, AC-2s were noted within the Made Ground deposits in WS104 at 1.55 m.
CBR Design %	Granular soils can be re-engineered to ensure 5% within the subgrade during favourable climatic conditions. Natural clay soils will provide a CBR in the order of 3–5% during drier climatic periods. However, if water is allowed to shed onto the formation, the CBR will reduce to < 2%, which will require specialist engineering of the subgrade.
Cut/Fill	Development levels are unknown at this time; however, an element of cut-and-fill works will be required to prepare the development platform.
Civil Engineering Excavations	Made Ground present beneath the site is likely to be loosely compacted and possibly prone to collapse.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste</i> .

RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

-  Further post demolition ground investigation.
-  Plot-specific foundation schedule (upon receipt of the final development levels).
-  Arboricultural survey.
-  Geotechnical earthworks strategy (infrastructure).
-  Remediation and enabling works strategy.



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DRAWING LIST

15-140-001 - Site Location Plan
15-140-003 - Historical Features Plan
15-140-004 - Site Features Plan
15-140-005 - Exploratory Hole Location Plan
15-140-006 - Depth of Made Ground Plan
15-140-008 - Depth to Founding Strata Plan
15-140-010 - Conceptual Site Model
15-140-018 - Human Health Contamination Exceedances Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Great Places Housing Group to undertake a detailed Phase II Geoenvironmental Site Assessment for a parcel of industrial land off Laystall Street in Manchester.

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed development for a proposed low-rise residential development.

1.2. PROPOSED DEVELOPMENT

A proposed development layout has not been provided to date.

1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:

- ✦ Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document *Land Contamination: Risk Management (LCRM) (2019)*.
- ✦ Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified.
- ✦ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ✦ Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- ✦ Provide recommendations regarding future works required.

1.4. SCOPE OF WORKS

The scope of work includes the following elements:

- ✦ Review of previous information;
- ✦ Design of suitable intrusive ground investigation;
- ✦ Window sample probeholes with, and construction of, environmental monitoring installations;
- ✦ Deep cable percussive boreholes;
- ✦ In-situ geotechnical testing;
- ✦ Chemical and geotechnical laboratory analysis;
- ✦ Groundwater monitoring and sampling;
- ✦ Ground gas monitoring;



-  Contamination risk assessment and conceptual site model;
-  Geotechnical assessment and interpretation; and
-  Factual and interpretive reporting.

1.5. LIMITATIONS

Approximately 50 % of the site could not be investigated within this phase of works due to the presence of the existing building to the east of the site. E3P have not been made aware of any internal inspections of the building to date.

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



2. GROUND INVESTIGATION

2.1. REVIEW OF PHASE I DESK STUDY

The pertinent points from the previously completed Earth Environmental & Geotechnical Phase I Desk Study (Ref: A3664/20, August 2020) are summarised below:

- ✳ A fault is located 228 m southwest.
- ✳ A BGS borehole located 105 m west of the site identifies brick and clay fill to 3.00 m bgl underlain by stiff and very stiff brown-grey mottled boulder CLAY to 15.00 m bgl.
- ✳ The site is in an area where the hazard rating is very low with regard to shrink-swell clays, collapsible deposits, landslides and running sands and negligible with regard to compressible deposits and dissolution of soluble rocks.
- ✳ The site is not located within a Coal Authority Development High-Risk Area.
- ✳ The site is not located in a radon affected area.
- ✳ The bedrock geology is a principal aquifer. The closest groundwater abstraction is located 750 m south. There are no potable groundwater abstractions within 1 km.
- ✳ The site is not located within 500 m of a source protection zone.
- ✳ The closest surface water feature is Rochdale Canal located 96 m west.
- ✳ There are no landfill sites within 500 m.
- ✳ Seven historical waste sites are recorded within 500 m. The closest is a waste paper mill formerly located on-site, dated 1932.
- ✳ There are 112 records of historical tanks identified within 500 m of the site. The closest records refer to 5 unspecified tanks located 5 m southwest of the site, dated 1953–1967.
- ✳ The earliest historic mapping records residential properties and a public house on site. A clothing factory was located on-site by 1948. The residential properties in the west were demolished Pre 1968. The western sector was utilised as a car park by 2001.
- ✳ There is a gentle gradient to the south of the site.

2.2. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between 25th January 2022 and 15th February 2022. The works are summarised in Table 2.1.



2.3. LIMITATIONS OF THE INVESTIGATION

The ground investigation was limited by the existing industrial buildings in the east of the site. Further investigation will be required following the demolition of the buildings.

2.4. SCOPE OF INVESTIGATION

TABLE 2.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General ground conditions including the presence/nature of obstructions	WS101	Window Sample Probehole	3.45	0.5–1.2
	WS102		3.44	0.5–2.0
	WS103		2.44	0.5–1.0
	WS104		3.44	2.0–3.0
	WS105		3.44	0.5–2.0
	WS106		2.41	0.4–0.9
Investigation of deeper soil horizons	CP101	Cable Percussive Borehole	18.80	N/A
	CP102		15.00	N/A

Window sample probeholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

The cable percussive boreholes were advanced to investigate the deeper soil horizons and to undertake in-situ detailed geotechnical testing.

The sampling locations are illustrated in Drawing 15-140-005 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix V.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater recovered for chemical analysis.

2.5. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix V and presented in Table 3.5 and discussed in Section 5.



2.6. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analyses comprising:

- ✦ Metals.
- ✦ pH, total sulphate, water-soluble sulphate (2:1 extract).
- ✦ Sulphide.
- ✦ Cyanide.
- ✦ Phenols.
- ✦ Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- ✦ Semi-Volatile Organic Compounds (SVOC).
- ✦ Volatile Organic Compounds (VOC).
- ✦ Asbestos identification and quantification.
- ✦ Banded total petroleum hydrocarbon (TPH).
- ✦ Total organic carbon (TOC).
- ✦ Soil leachate analysis.

I2 Analytical undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 4.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

- ✦ Atterberg limits determinations;
- ✦ Moisture content;
- ✦ Consolidation tests; and
- ✦ Single-stage triaxial tests.

Laboratory analysis sheets are included in Appendix VIII and are summarised in Section 5.



3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 3.1.

TABLE 3.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)			
	MADE GROUND	STIFF CLAY	VERY STIFF CLAY	GRAVELLY SAND
WS101	0.00–1.20	–	1.20–3.45	–
WS102	0.00–2.00	–	2.00–3.44	–
WS103	0.00–1.00	1.00–2.00	2.00–2.44	–
WS104	0.00–1.90	–	1.90–3.44	–
WS105	0.00–2.05	–	2.05–3.44	–
WS106	0.00–1.20	1.20–2.00	2.00–2.41	–
CP101	0.00–0.90	0.90–9.50	9.50–17.00	17.00–18.80
CP102	0.00–0.80	–	0.80–15.00	–

3.2. MADE GROUND

Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m and 2.05 m bgl.

Made Ground deposits generally comprise asphalt or concrete overlying light grey sandy gravel of concrete and limestone (MOT sub-base). Underneath the sub-base, Made Ground was identified as brown sandy gravelly clay with cobbles. Gravel comprises fine to coarse, angular to subangular brick, ash and clinker and cobbles comprise subangular brick.

A Depth of Made Ground Plan is presented as Drawing 15-140-006 in Appendix III.

3.3. DRIFT DEPOSITS

Drift deposits were encountered within all exploratory locations to depths of 18.80 m bgl. The drift deposits generally comprise stiff to very stiff brown mottled grey slightly gravelly CLAY with gravel of sandstone and mudstone.

Dense brown slightly gravelly fine SAND with gravel of sandstone was identified in CP101 between 17.00 and 18.80 m bgl.

3.4. SOLID GEOLOGY

The solid bedrock geology was not encountered during the ground investigation. The depth to bedrock is not recorded on the closest BGS boreholes.



3.5. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in Appendix V and are summarised in Table 3.2.

TABLE 3.2 SUMMARY GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m)	NOTES
WS102	2.00	Seepage
CP102	1.40	Seepage

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free-phase hydrocarbon product, if present. These results are summarised in Table 4.8.

3.6. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has been identified during the site investigation and this is summarised in Table 3.3.

TABLE 3.3 SUMMARY VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

LOCATION	DEPTH (m)	STRATUM	NOTES
WS102	1.65	Made Ground	Hydrocarbon Odour

3.7. SOIL CONSISTENCY

Undrained shear strength values were measured using laboratory undrained triaxial tests. Results of the tests are presented in Table 3.4, which indicate the clay soils to be very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.

Results of the standard penetration tests, including undrained shear strengths derived from SPTs are included in Table 3.5.

TABLE 3.4 SUMMARY OF UNDRAINED SHEAR STRENGTH TEST RESULTS

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m ²)	CONSISTENCY
WS104	2.5–3.0	Very stiff brown slightly gravelly sandy CLAY.	222	Very Stiff



TABLE 3.5 STANDARD/CONE PENETRATION TEST RESULTS

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SP T "N" VALUE	CORRECTE D "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS101	1.00	Made Ground: Gravelly clay	18	18.15	N/A	High strength	Very Stiff	90.73	186.55
WS101	1.00	Slightly gravelly CLAY	18	18.15	N/A	High strength	Very Stiff	90.73	186.55
WS101	2.00	Slightly gravelly CLAY	36	32.89	N/A	Very high strength	Very Stiff	164.44	338.08
WS101	3.00	Slightly gravelly CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS102	1.00	Made Ground: Very clayey sand	19	19.15	Medium Dense	N/A	N/A	N/A	191.55
WS102	2.00	CLAY	25	22.84	N/A	High strength	Very Stiff	114.19	234.78
WS102	3.00	CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS103	1.00	CLAY	13	13.11	N/A	Medium strength	Stiff	65.53	134.73
WS103	2.00	CLAY	50	45.68	N/A	Very high strength	Very Stiff	228.38	469.56
WS104	1.00	MADE GROUND: Gravelly clay	21	21.17	N/A	High strength	Very Stiff	105.86	217.64
WS104	2.00	CLAY	30	27.41	N/A	High strength	Very Stiff	137.03	281.74
WS104	3.00	CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS105	1.00	MADE GROUND: Gravelly clay	14	14.11	N/A	Medium strength	Stiff	70.57	145.09
WS105	2.00	Slightly gravelly clay	29	26.49	N/A	High strength	Very Stiff	132.46	272.34
WS105	3.00	Slightly gravelly clay	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00



Laystall Street, Manchester

Phase II Geoenvironmental Site Assessment

March 2022

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SP T "N" VALUE	CORRECTE D "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS106	1.00	MADE GROUND: Gravelly clay	14	14.11	N/A	Medium strength	Stiff	70.57	145.09
WS106	2.00	CLAY	50	45.68	N/A	Very high strength	Very Stiff	228.38	469.56
CP101	2.00	CLAY	16	14.62	N/A	Medium strength	Stiff	73.08	150.26
CP101	4.00	Slightly gravelly CLAY	13	10.98	N/A	Medium strength	Stiff	54.92	112.91
CP101	6.50	Slightly gravelly CLAY	15	12.25	N/A	Medium strength	Stiff	61.23	125.89
CP101	9.50	Slightly gravelly CLAY	31	24.98	N/A	High strength	Very Stiff	124.92	256.84
CP101	12.50	CLAY with sand bands	50	36.53	N/A	Very high strength	Very Stiff	182.65	375.53
CP101	14.00	CLAY with sand bands	37	25.63	N/A	High strength	Very Stiff	128.15	263.48
CP101	15.50	CLAY with sand bands	42	27.66	N/A	High strength	Very Stiff	138.32	284.39
CP101	17.00	Gravelly SAND	50	31.39	Dense	N/A	N/A	N/A	313.89
CP101	18.50	Gravelly SAND	50	29.98	Medium Dense	N/A	N/A	N/A	299.76
CP102	2.50	CLAY	42	37.30	N/A	Very high strength	Very Stiff	186.52	383.48
CP102	4.50	Slightly gravelly CLAY	42	35.13	N/A	Very high strength	Very Stiff	175.64	361.11
CP102	7.00	Slightly gravelly CLAY	42	34.17	N/A	Very high strength	Very Stiff	170.85	351.27
CP102	10.00	Slightly gravelly CLAY	42	33.82	N/A	Very high strength	Very Stiff	169.10	347.67
CP102	13.00	Very sandy CLAY	42	30.13	N/A	Very high strength	Very Stiff	150.67	309.79
CP102	14.50	Very sandy CLAY	42	28.60	N/A	High strength	Very Stiff	143.01	294.02



NOTES

* The Allowable Bearing Pressure (ABP) should be considered indicative.

The interpretation of in situ mass undrained shear strength (c_u) data from SPT Blow Count (N) results and the influence of the Plasticity Index (PI) was reported in Standard Penetration Test in Insensitive Clays and Soft Rocks. Stroud (1974). The standard penetration test and the engineering properties of glacial materials subsequently. Stroud and Butler (1975) and (1989).

Allowable bearing pressure on sands. Soil Mechanics in Engineering Practice Terzaghi, K. & Peck, R.B. 1996.



3.8. CONSOLIDATION

An undisturbed sample of Glacial Till was submitted for oedometer analysis. The results are provided in Table 3.6.

TABLE 3.6 OEDOMETER CONSOLIDATION RESULTS

LOCATION	DEPTH (m)	SAMPLE TYPE	MOISTURE CONTENT (%)	OEDOMETER CONSOLIDATION		
				PRESSURE RANGE (kPa)	M _v (m ² /MN)	C _v (m ² /year)
WS104	2.50 – 3.00	U100	17	0–55	0.062	48.896
				55–110	0.071	11.361
				110–220	0.094	3.041
				220–440	0.074	2.140
				440–55	0.054	1.474

When considered at over-burden pressure with an additional load of 110 kPa the coefficient of volume compressibility (M_v) ranged from 0.071 m²/MN up to 0.094 m²/MN. The material is considered to be low compressibility.

The rate at which settlement is likely to occur is determined by the coefficient of consolidation (C_v). Based on a load of up to 55 kPa the Glacial Till gives an M_v of 0.062 m²/MN and a C_v of 48.896 m²/yr. For loads up to 440 kPa, the Glacial Till gives an M_v of 0.074 m²/MN and a C_v of 2.140 m²/yr.

3.9. SOIL PLASTICITY

The Atterberg limits determinations, summarised in Table 3.7, show the clay to be of low to medium plasticity.

TABLE 3.7 SUMMARY OF PLASTICITY INDEX TEST RESULTS

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425 µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS101	1.00-1.45	12	20	40	20	100	20.00	Medium
WS103	2.00-2.45	18	20	41	21	97	20.37	Medium
WS104	2.00-2.45	17	20	40	20	87	17.40	Low
WS105	2.00-2.45	14	20	42	22	100	22.00	Medium

The results of the Atterberg limits testing confirmed that the soils would be deemed to be Low to Medium Volume Change Potential in accordance with the classification system utilised by the LABC/NHBC industry guidance.



3.10. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised in Table 3.8), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

Elevated sulphate concentrations meeting Class DS-3, AC-2s were noted within the Made Ground deposits in WS104 at 1.55 m.

TABLE 3.8 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
WS102	0.75	0.012	8.7	DS-1, AC-1s
WS102	1.65	0.18	7.5	DS-1, AC-1s
WS104	1.55	1.9	7.5	DS-3, AC-2s
WS105	0.85	0.17	8.0	DS-1, AC-1s
WS106	1.40	0.062	8.2	DS-1, AC-1s



4. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The results of this comparison have been summarised in Table 4.1.



TABLE 4.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH -WAY	ASSESSMENT
Arsenic	mg/kg	37	8	36	-	1	No Further Action
Cadmium	mg/kg	11	8	1.9	-	1	No Further Action
Chromium (VI)	mg/kg	6.0	8	<4.0	-	1	No Further Action
Lead	mg/kg	200	8	2500 380 210	WS104 1.55 m WS103 0.40 m WS102 2.60 m	1	Further Action
Mercury	mg/kg	1.2	8	1.1	-	4	No Further Action
Nickel	mg/kg	130	8	38	-	1	No Further Action
Selenium	mg/kg	250	8	<1.0	-	1	No Further Action
Copper	mg/kg	2400	8	420	-	1	No Further Action
Zinc	mg/kg	3700	8	620	-	1	No Further Action
Cyanide – Total	mg/kg	791	8	1.6	-	1	No Further Action
Phenols – Total	mg/kg	120	5	<1.0	-	1	No Further Action
Asbestos	Fibres	NFD	6	<0.001 %	WS105 0.85 m	3	Further Action
Naphthalene	mg/kg	2.3	8	0.32	-	4	No Further Action
Acenaphthylene	mg/kg	170	8	<0.05	-	2	No Further Action
Acenaphthene	mg/kg	210	8	0.40	-	1	No Further Action
Fluorene	mg/kg	170	8	0.26	-	1	No Further Action
Phenanthrene	mg/kg	95	8	9.3	-	2	No Further Action
Anthracene	mg/kg	2400	8	1.2	-	2	No Further Action
Fluoranthene	mg/kg	280	8	11	-	2	No Further Action
Pyrene	mg/kg	620	8	11	-	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	8	4.5	-	2	No Further Action
Chrysene	mg/kg	15	8	4.9	-	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	8	4.5 3.3 2.8	WS104 1.55 m WS102 1.65 m WS102 2.60 m	2	Further Action
Benzo(k)Fluoranthene	mg/kg	77	8	2.0	-	2	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	8	4.1 2.8 2.3	WS104 1.55 m WS102 1.65 m WS102 2.60 m	2	Further Action
Indeno(123-cd)Pyrene	mg/kg	27	8	1.8	-	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	8	0.59 0.36 0.30	WS104 1.55 m WS102 1.65 m WS102 2.60 m	2	Further Action
Benzo(ghi)Perylene	mg/kg	320	8	2.3	-	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	8	<1.0	-	4	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	8	<0.1	-	4	No Further Action



DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
TPH C8-C10 (aliphatic)*	mg/kg	27	8	<0.1	-	4	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	8	3.9	-	4	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	8	13	-	4	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	8	48	-	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	8	240	-	1	No Further Action

Notes

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 1 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Referring to Table 4.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a residential end-use for the following contaminants:

- ☛ Lead;
- ☛ Benzo(b)Fluoranthene;
- ☛ Benzo(a)Pyrene;
- ☛ Dibenzo(a,h)Anthracene;
- ☛ Asbestos (Amosite)

Asbestos in the form of loose amosite fibres (<0.001 %) has been identified in the Made Ground in WS105 at 0.85 m bgl.

No significant concentrations of VOCs were identified in the soils submitted for chemical analysis.

In relation to these exceedances, the following can be determined:

- ☛ The main exposure pathways based on the Tier I exceedances are:
 - Soil ingestion;
 - Dermal contact and ingestion;
 - Consumption of homegrown vegetables; and
 - Fibre/dust inhalation.



- ✳ The exceedances for all determinands are associated with Made Ground deposits (0.40 – 1.65 m bgl) and the natural clay soils in WS102 at 2.60 m bgl.

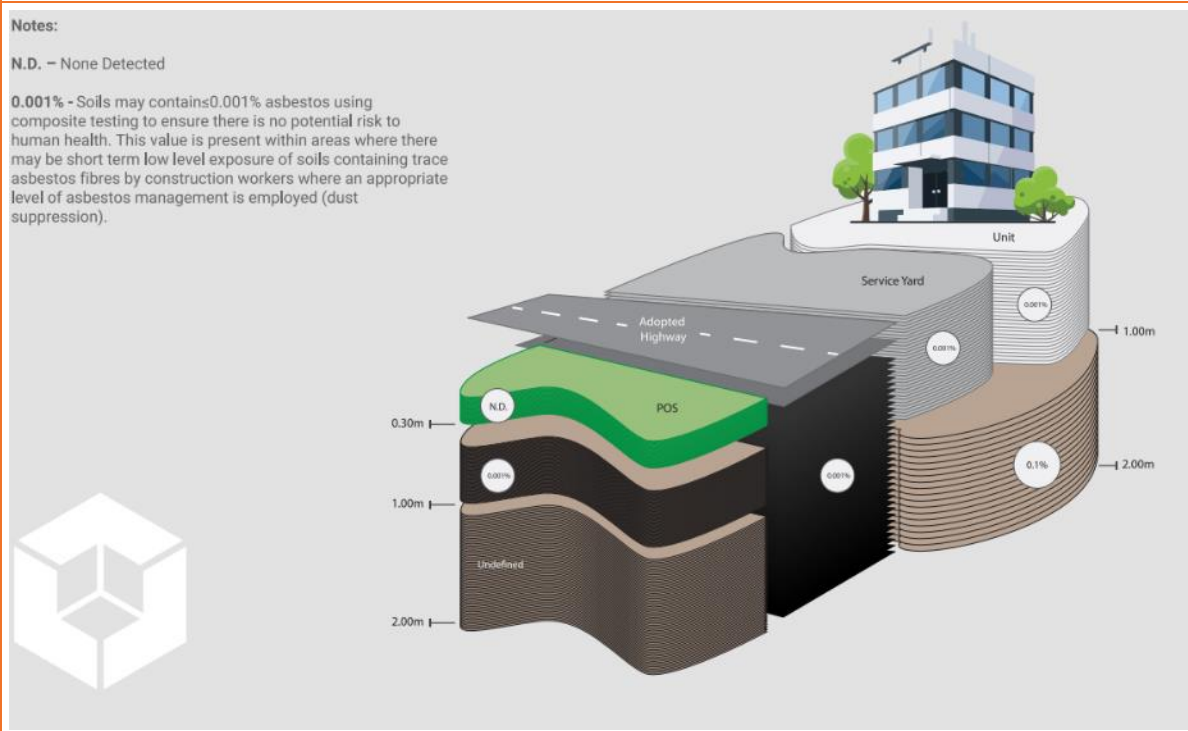
HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

All of the identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion of soils, inhalation of particulate and consumption of homegrown vegetables. The risk to chronic human health associated with the elevated concentrations of inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils.

The specific design and installation process for the appropriate cover systems will be clearly defined within a site remediation and enabling works strategy.

Asbestos in the form of loose amosite fibres has also been identified within the Made Ground in WS105. No visual signs of ACM were encountered during the ground investigation. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model shown in Figure 4.1.

FIGURE 4.1 ASBESTOS RISK MITIGATION CONCEPTUAL SITE MODEL



Notes

ND None Detect

0.001% Soils may contain ≤ 0.001% asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be a short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression)

0.1% Soils at a depth of >1.00m bgl may contain <0.1% asbestos using composite testing where they will not be likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with Asbestos JIWG risk assessment tools.

Undefined- this will be dependent upon soils encountered during earthworks, which may be placed at these depths to ensure no potential risk to human health.



With the exception of the natural clay in WS202, chemical analysis of the natural clay drift deposits suggests that these soils will be acceptable for use as subsoil within the proposed garden and landscaped areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.

Further assessment will be required following the demolition of the existing buildings.



4.2. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 4.2.

TABLE 4.2 CONTROLLED WATERS CONCEPTUAL MODEL AND SENSITIVITY PROFILE

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground Lead and PAH impact is present within the Made Ground within the context of a residential development with only one location identifying olfactory evidence of hydrocarbon impact (WS102). However, no significant hydrocarbon, VOC and SVOC impact has been identified to date. Further post demolition investigation is required to fully assess the underlying Made Ground.		Medium
Pathway		
Vertical Migration Clay drift deposits are present beneath the Made Ground to depths in excess of 15.00 m bgl. The presence of this low permeability drift will offer protection to the underlying aquifer and inhibit vertical migration.		Low
Lateral migration The presence of low permeability drift will inhibit lateral migration to nearby watercourses.		Low
Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated	Low
Aquifer Classification in Bedrock	Principal aquifer – the risk is reduced given the distance to the closest groundwater abstraction.	High
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected.	Low
Distance to the Closest Groundwater Abstraction Point	The closest groundwater abstraction is located 750 m south. There are no potable groundwater abstractions within 1 km.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	The closest surface water feature is Rochdale Canal located 96 m west.	Low
The ICSM developed within the context of the site setting has not identified any viable pollutant pathways, however the closest and most sensitive receptor would be the lateral migration of potentially mobile phase-soluble contaminants towards the Rochdale Canal. The risk to this is reduced given the distance from site and presence of underlying clay soils.		



To ensure a robust appraisal of the identified risk to controlled waters, E3P has identified the sources of potential contamination that represent a risk to controlled waters from the initial CSM, we have then assessed the availability of ground investigation data in the form of analysis of the solid phase (soil) and dissolved phase within the perched groundwater or aquifer. The results of this assessment are presented in Table 4.3.

TABLE 4.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

CONTAMINANT	ASSESSMENT RATING	DISCUSSION
BTEX > 1 mg/kg	The soil data analysis has not identified any detectable concentrations of VOCs above 1mg/kg or TPH C5 to C6 that might otherwise be indicative of VOC impact.	None
Total VOC > 1 mg/kg		
Total SVOC > 1 mg/kg	SVOC analysis recorded concentrations below the laboratory LOD.	None
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.	None
C10-C12 > 10 mg/kg	All concentrations are below 3.9 mg/kg.	None
C12-C16 > 50 mg/kg	All concentrations of C12-C16 are below 13 mg/kg.	None
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.	None
Naphthalene > 2 mg/kg	Concentrations of naphthalene above 2 mg/kg have not been recorded.	None
Total PAH > 10 mg/kg	Total concentrations of low-solubility PAH compounds greater than 10 mg/kg have been detected with a maximum concentration of 57.9 mg/kg in WS104 at 1.55 m bgl.	Further discussion
PCB > 1 mg/kg	No potential sources of PCB have been identified	None
Heavy metals > 500 mg/kg	Concentrations of heavy metals above 500 mg/kg have been recorded in WS103 at 0.40 m bgl with a zinc concentration of 620 mg/kg and WS104 at 1.55 m bgl with a lead concentration of 2500 mg/kg.	Further discussion

The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground and groundwater samples to environmental quality standards (EQS) in the first instance and in the absence of these to drinking water standards (DWS).

These are presented in Table 4.4.



TABLE 4.4 COMPARISON OF GROUNDWATER AND LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA								
Arsenic	µg/l	50	10	2	4.44	-	3	<1.0	-	No Further Action
Cadmium	µg/l	0.08-0.25	5	2	0.04	-	3	0.13	-	No Further Action
Chromium (VI)	µg/l	3.4	-	2	-	-	3	<5.0	-	No Further Action
Chromium (III)	µg/l	4.7	50	2	3.3	-	3	3.0	-	No Further Action
Copper	µg/l	1	2000	2	11 5.3	WS104 WS102	3	13 9.6 7.9	WS102 1.65 m WS101 0.30 m WS105 0.85 m	Further Action
Total Cyanide	µg/l	1	50	2	1.4	WS104	3	1.2	WS102 1.65 m	Further Action
Lead	µg/l	1.2	10	2	0.3	-	3	4.4 3.2 3.0	WS102 1.65 m WS105 0.85 m WS101 0.30 m	Further Action
Mercury	µg/l	-	1.0	2	<0.05	-	3	<0.5	-	No Further Action
Nickel	µg/l	4	20	2	14	WS102	3	13	WS102 1.65 m	Further Action
Selenium	µg/l	-	10	2	13	WS104	3	<4.0	-	Further Action
Zinc	µg/l	10.9	-	2	5.1	-	3	26 18 14	WS102 1.65 m WS105 0.85 m WS101 0.30 m	Further Action
pH	6-9			2	7.3 – 7.5	-	3	8.0 – 8.9	-	No Further Action
Polycyclic Aromatic Hydrocarbons										
Naphthalene	µg/l	2	10*	2	<0.01	-	3	<0.01	-	No Further Action
Anthracene	µg/l	0.1	10*	2	<0.01	-	3	<0.01	-	No Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10*	2	<0.01	-	3	<0.01	-	No Further Action



DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA								
Benzo[k]fluoranthene	µg/l	0.00017*	10*	2	<0.01	-	3	<0.01	-	No Further Action
Benzo(a)pyrene	µg/l	0.00017*	10*	2	<0.01	-	3	<0.01	-	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	2	<0.01	-	3	<0.01	-	No Further Action
Fluoranthene	µg/l	0.0063	10*	2	0.76 0.60	WS102 WS104	3	<0.01	-	Further Action
Benzo(ghi)perylene	µg/l	1.7–4	10*	2	<0.01	-	3	<0.01	-	No Further Action
Aromatic Hydrocarbon ⁵										
TPH C5-C6 (benzene)	µg/l	10	1	2	<1.0	-	3	<1.0	-	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	2	<1.0	-	3	<1.0	-	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20	300	2	<1.0	-	3	<1.0	-	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	2	<10	-	3	<10	-	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	2	<10	-	3	<10	-	No Further Action
TPH C12-C16	µg/l	2	90 ⁵	2	<10	-	3	<10	-	No Further Action
TPH C16-C35	µg/l	50#	90 ⁵	2	<10	-	3	<10	-	No Further Action
Aliphatic Hydrocarbon ⁵										
TPH C5-C6	µg/l	–	15000	2	<1.0	-	3	<1.0	-	No Further Action
TPH C6-C8	µg/l	–	15000	2	<1.0	-	3	<1.0	-	No Further Action
TPH C8-C10	µg/l	–	300	2	<1.0	-	3	<1.0	-	No Further Action
TPH C10-C12	µg/l	–	300	2	<10	-	3	<10	-	No Further Action
TPH C12-C16	µg/l	–	300	2	<10	-	3	<10	-	No Further Action
TPH C16-C21	µg/l	–	300**	2	<10	-	3	<10	-	No Further Action



DETERMINAND	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA								
TPH C21-C35	µg/l	–	300**	2	<10	-	3	<10	-	No Further Action
Volatile Organic Compounds										
Tetrachloroethylene	µg/l	0.4	10	2	<1.0	-	0	-	-	No Further Action
Trichloroethylene	µg/l	10	10	2	<1.0	-	0	-	-	No Further Action
Trichlorobenzene	µg/l	0.4	–	2	<1.0	-	0	-	-	No Further Action
Trichloromethane	µg/l	2.5	–	2	<1.0	-	0	-	-	No Further Action
Dichloromethane	µg/l	20	200	2	<1.0	-	0	-	-	No Further Action
Carbon Tetrachloride	µg/l	12	3	2	<1.0	-	0	-	-	No Further Action
Vinyl Chloride	µg/l	–	0.3	2	<1.0	-	0	-	-	No Further Action

Notes

Solubility <0.01µg/l

AA – Annual Average

MAC- Maximum Admissible Concentration

* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



4.2.1. CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the EQS values for the following inorganic compounds:

-  Copper
-  Total cyanide
-  Lead
-  Nickel
-  Selenium
-  Zinc
-  Fluoranthene

4.2.2. M-BAT ASSESSMENT

Due to exceedances in both groundwater and leachate samples for copper, nickel and zinc, an m-BAT assessment has been completed to assess the bioavailability of the metals with respect to surface water receptors. The chemical values from the groundwater analysis have been input into the assessment.

Where the Risk Characterisation Ratio (RCR) is greater than 1, this indicates the bioavailable concentration is above the EQS and the receptor is therefore at risk. In this instance, groundwater chemical data for DOC was input into the m-BAT for the onsite locations.

The m-BAT assessment has confirmed that there are no exceedances of the RCR and the metals are not considered bioavailable.

In light of the above assessment, E3P do not consider the site to pose an unacceptable level of risk to surface waters for copper, zinc and nickel.

4.2.3. FINAL PB SCREENING TOOL

Lead is not included in the M-BAT tool as it is not a full bioavailable EQS, however, a separate assessment using the Pb screening tool has been completed for lead. The assessment confirms that there are no exceedances of the RCR.

In light of the above assessment, E3P does not consider the site to pose an unacceptable level of risk to surface waters for lead.



4.2.4. DISCUSSION OF CONTROLLED WATERS RISK ASSESSMENT

Historically, the site was a clothing factory. Chemical by-products of manufacturing processes and compounds within the Made Ground may have subsequently leached down into the underlying ground and contaminated groundwater both within Made Ground and natural drift deposits.

The exceedances of heavy metals are likely to be associated with the Made Ground identified across the site.

It should be noted that the Tier I assessment criteria provides a conservative view, which may overstate the risk. Inorganic determinants identified above are of a general low solubility and therefore mobility, suggesting that these will not migrate to controlled water receptors.

As the m-BAT and Pb screening tools have confirmed, the heavy metal contaminants identified within Table 4.4. are not bioavailable and do not pose a risk to aquatic life.

The cohesive drift deposits to depths in excess of 15.00 m will inhibit migration towards the underlying principal aquifer and nearby surface watercourses. There is considered to be a low risk to controlled waters and the wider environment as no complete pollutant linkage can be determined.

Based on the above, there is considered to be no unacceptable level of risk to the controlled water receptors.

4.3. GROUND GAS

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in:

- CIRIA Report 665 – Assessing risks posed by hazardous ground gases to buildings (2007)
- BS8485:2015+A1:2019 – Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

BS8485:2015+A1:2019 provides guidance on the level of gas protection requirements based upon the characteristic situation (CS) and the proposed development based on building type.

Therefore, in accordance with BS8485:2015+A1:2019, based on the measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) shall be derived for each monitoring point, from which the site characteristic hazardous gas flow rate (Q_{hgs}), and then the Characteristic Situation (CS) can be determined.

The following equation should be utilised:

$$Q_{hg} = q \left(\frac{C_{hg}}{100} \right)$$

Where:

q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe
 C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

The subsequent derived gas screening value (GSV) should be the maximum Q_{hg} (flow rate x concentration as a percentage volume) for all the monitoring events.



A 'worst case check' may be carried out using the maximum recorded flow in any hole with the maximum concentration in any hole to present the plausible worst-case conditions. Adoption of the worst case Q_{hg} requires thorough justification and reference to the CSM.

The final derived GSV can then be used to characterise the site as summarised in Table 4.5.

TABLE 4.5 SITE CHARACTERISATION BY GSV (BS8485:2015+A1:2019)

CS	HAZARD POTENTIAL	GSV (l/hr) FOR METHANE AND CARBON DIOXIDE	ADDITIONAL FACTORS
CS1	Very Low	< 0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	< 0.70	Typical measured flow rate <70 l/h (otherwise consider an increase to CS3)
CS3	Moderate	< 3.5	N/A
CS4	Moderate to High	< 15	N/A
CS5	High	< 70	N/A
CS6	Very High	> 70	N/A

Notes

1. The CS is equivalent to the characteristic GSV in CIRIA C665.
2. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter should be considered.
3. Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, multiplied by the concentration in the air stream of the particular gas being considered.
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

NHBC guidance (Report No 10627R01) can also be considered, if appropriate, which is based on standard residential houses with precast concrete floors (block and beam) / suspended cast in situ concrete floor slabs.

The thresholds for GSVs based upon NHBC guidance are provided in Table 4.6.

TABLE 4.6 THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH NHBC REPORT NO 10627R01 – RESIDENTIAL END USE

NHBC – SUBFLOOR VOID				
CLASSIFICATION	Methane ¹		Carbon Dioxide ¹	
	TYPICAL MAXIMUM CONCENTRATION ³ (%V/V)	GAS SCREENING VALUE ^{2,4} (l/hr)	TYPICAL MAXIMUM CONCENTRATION ³ (%V/V)	Gas Screening Value ^{2,4} (l/hr)
Green	< 1	< 0.16	< 5	< 0.78
Amber 1	< 5	< 0.63	< 10	< 1.56
Amber 2	< 5	< 1.56	< 30	< 3.10
Red	> 20	> 1.56	> 30	> 3.10

Notes

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decider as to what Traffic Light is allocated;



2. Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, as defined in Wilson and Card (1999), which is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

It should be noted that in the first instance, this assessment has been carried out in accordance with BS8485:2015+A1:2019 and the thresholds given in Table 4.5.

4.3.1. INVESTIGATION RATIONALE

The ICSM has identified that the underlying Made Ground may represent a potential source of ground gas generation. Based on the identification of these sources, E3P has determined that the site represents a low ground gas source generation potential.

Within the context of the proposed residential end-use and ground gas generation potential, the gas assessment requires that six visits are required over three months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for low gas hazard sites (Made Ground with limited degradable material, organic clay of limited thickness) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

TABLE 4.7 GROUND GAS MONITORING LOCATION RATIONALE

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Made Ground	0.50–1.20
WS102	Made Ground	0.50–2.00
WS103	Made Ground	0.50–1.00
WS104	Natural CLAY Drift – General Coverage	2.00–3.00
WS105	Made Ground	0.50–2.00
WS106	Made Ground	0.40–0.90

4.3.2. MONITORING METHODOLOGY

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) (hydrogen sulphide) were measured using a calibrated infrared gas analyser (GFM435) with gas flow rates measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 500 seconds at each location, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded.

The results of the ground gas monitoring are presented in Table 4.8.

In addition to the raw data, the results for each individual standpipe have been assessed with reference to guidance provided in BS8485:2015+A1:2019. Based on the initial peak measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) have been derived for each monitoring point, from which an individual Characteristic Situation (CS) can ultimately be determined.



TABLE 4.8 SUMMARY OF GROUND GAS MONITORING RESULTS

WELL	STRATA	DATE	CH ₄ PEAK (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ Q _{hg} (l/hr)	CO ₂ PEAK (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ Q _{hg} (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1010	Steady	0.1	0.1	0.50-1.20	1.20	Dry
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.3	1004	Rising	0.1	0.1		1.20	Dry
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.2	1011	Rising	0.1	0.1		1.05	Dry
WS102	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1010	Steady	0.1	0.1	0.50-2.00	2.10	1.70
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1004	Rising	0.1	0.1		2.10	1.90
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.1	1012	Rising	0.1	0.1		1.95	1.60
WS103	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1012	Steady	0.1	0.1	0.50-1.00	1.00	Dry
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1004	Rising	0.1	0.1		1.00	Dry
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.1	1012	Rising	0.1	0.1		0.75	Dry
WS104	Natural CLAY Drift	01/02/2022	0.1	0.1	0.0001	0.4	0.4	0.0004	19.2	1013	Steady	0.1	0.1	2.00-3.00	3.00	0.90
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.3	1005	Rising	0.1	0.1		3.00	2.30
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.0	1012	Rising	0.1	0.1		2.85	2.40
WS105	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.5	1015	Steady	0.1	0.1	0.50-2.00	1.95	1.85
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1005	Rising	0.1	0.1		1.95	Dry
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.2	1012	Rising	0.1	0.1		1.80	1.70
WS106	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.5	1016	Steady	0.1	0.1	0.40-0.90	0.90	Dry
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1005	Rising	0.1	0.1		0.90	Dry
		28/02/2022	0.1	0.1	0.0001	0.2	0.1	0.0002	19.0	1012	Rising	0.1	0.1		0.75	Dry



CIRIA Characteristic Situation	Q_{hg}		
 CS1	<0.07	Typical Max CO2 <5 % Typical Max CH4 <1 %	Values in BOLD exceed CS1 Thresholds
 CS2	<0.7	Flow rate not to exceed 70 l/hr otherwise consider increase to CS3	Values in BLUE denote water above level of response zone (flooded)
 CS3	<3.5		
CS4	<15	Quantitative Risk Assessment required to evaluate scope of protective measures	



4.4. SUMMARY OF MONITORING RESULTS

4.4.1. GROUNDWATER

WS104 was flooded during the first monitoring visit.

WS101, WS103 and WS106 were recorded as dry during the monitoring visits completed to date.

Groundwater was recorded between depths of 0.90 m and 2.40 m bgl.

4.4.2. BAROMETRIC PRESSURE

Visit 1 was undertaken during a period of steady pressure and visits 2 and 3 were undertaken during rising pressure.

Further visits will be undertaken to ensure data is obtained during low/falling atmospheric pressure.

4.4.3. GAS FLOW

Throughout the monitoring visits completed to date, flow rates were recorded to be 0.1 l/hr (limit of detection of the analyser).

4.4.4. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.1 % v/v (limit of detection of the analyser).

Carbon dioxide concentrations ranged from 0.1 % v/v to 0.4 % v/v, below the 5% v/v threshold.

4.4.5. CONCLUSION

The determined Characteristic Situation for each standpipe for each visit is presented in Table 4.9. This indicates that based on the peak flow rates the monitoring visits classify as Characteristic Situation (CS)1 – Very Low Gas Risk.



TABLE 4.9 GAS RISK PROFILE AND LOCATION

WELL	DATE	DEPTH TO WATER (m bgl)	MAX FLOW (l/hr)	MAX CH ₄ (%V/V)	MAX CH ₄ Q _{hg} (l/hr)	MAX CO ₂ (%V/V)	MAX CO ₂ Q _{hg} (l/hr)	CHARACTERISTIC SITUATION	NHBC TRAFFIC LIGHT
WS101	01/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS102	01/02/2022	1.70	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	1.90	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	1.60	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS103	01/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS104	01/02/2022	0.90	0.1	0.1	0.0001	0.4	0.0004	CS1	Green
	14/02/2022	2.30	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	2.40	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS105	01/02/2022	1.85	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	1.70	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS106	01/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	Dry	0.1	0.1	0.0001	0.2	0.0002	CS1	Green

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Preliminary ground gas monitoring suggests that the site can be classified as CS1, and it is considered that gas protection measures will not be required.

Further assessment will be required following the demolition of the existing buildings.



4.5. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication "Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites"

TABLE 4.10 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold (mg/kg)	Concentrations at <u>Current</u> pipeline depth (mg/kg)
Total VOC	0.5	N/A
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	13
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	582
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	N/A
Ethers*	0.5	N/A
Nitrobenzene*	0.5	N/A
Ketones*	0.5	N/A
Aldehydes*	0.5	N/A
Amines	Fail	N/A
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	Yes	
Is free product present in soil and groundwater?	None	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	No significant hydrocarbon impact has been identified at depth.	
Will soils impacted with above determinands likely be utilised elsewhere on site?	Currently unknown.	
Will soils be imported to site as part of any future earth works	Currently unknown. The importation of materials may affect the WIR Risk Assessment which should be updated after completion.	

Notes - Pipe line depth normally between 0.75m–1.35m

Based on the assessment of current site conditions and limited understanding of site levels and re-use of existing materials, it is likely that barrier pipe will be required at the proposed development.



4.6. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 4.11 has been prepared for the site.

TABLE 4.11 CONCEPTUAL MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Heavy Metals, non-volatile PAH (Made Ground)	Dermal contact. Dermal contact and ingestion.	Future site users. Off-site receptors.	Likely	High	LOW
Assessment: The Tier I human health risk assessment has identified elevated concentrations of lead, non-volatile PAHs and asbestos at depths from 0.40 m bgl to 2.60 m bgl. In WS102, a hydrocarbon odour was encountered at 1.65 m bgl, and elevated lead and speciated PAHs (benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene) were encountered within the underlying natural CLAY deposits. All of the identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion of soils, inhalation of particulate and consumption of homegrown vegetables. Recommendation: Cover system to garden and landscaped areas will prevent exposure to future site users. Construction works completed with PPE and provision of welfare. Further assessment is required following the demolition of the existing buildings.						
PL3	ACM in Made Ground	Inhalation of dust.	Future site users. Buildings. Off-site land users.	Likely	High	LOW
Assessment: Asbestos in the form of loose amosite fibres (<0.001 %) has been identified in the Made Ground in WS105 at 0.85 m bgl. Recommendation: The soils will require placement in accordance with the asbestos CSM. Construction works completed with PPE and provision of welfare. A pre demolition survey will be required for the existing buildings.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL4	Volatile contaminants such as hydrocarbons, solvents (Made Ground, Clothing Works)	Inhalation of vapours. Migration through permeable strata and preferential pathways.	Future site users. Off-site receptors.	Likely	Low	To be determined
Assessment: No elevated concentrations have been identified to date. Recommendation: Further post-demolition investigation is required. If volatile contamination is identified, it may be necessary to complete a hotspot removal where these soils may be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity.						
PL4	Methane, carbon dioxide (Made Ground)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users.	Low likelihood	Low	LOW
Assessment: Deep Made Ground has been identified as a potential source of hazardous ground gas. Recommendation: Initial monitoring suggests that the site can be classified as CS1, however, this will be confirmed on completion of the monitoring.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL5	Mobile contaminants (Made Ground, Clothing Works)	Surface runoff. Migration through permeable strata and preferential pathways. Perched waters migration.	Groundwater (principal aquifer). Surface water (Rochdale Canal).	Low Likelihood	Low	LOW
Assessment: The Tier 1 risk assessment does not suggest a risk to controlled waters and no source of potentially mobile contamination has been identified to date.						
Recommendation: Further assessment is required following the demolition of the existing buildings.						
PL6	Sulphate (potential ash within Made Ground)	Sulphate attack on concrete.	Building structure.	Likely	Moderate	LOW
Assessment: Elevated sulphate concentrations meeting Class DS-3, AC-2s were noted within the Made Ground deposits in WS104 at 1.55 m.						
Recommendation: Concrete should be designed in accordance with the chemical testing results.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL7	Organic contaminants such as hydrocarbons, solvents (Made Ground, Clothing Works)	Ingestion of tainted water supply.	Future site users. Water pipes.	Likely	Moderate	LOW
Assessment: Elevated concentrations of TPH have been identified at the proposed pipeline depth (0.75 m – 1.35 m).						
Recommendation: Based on the assessment of current site conditions, it is likely that barrier pipe will be required. This will need to be confirmed with a UKWIR risk assessment post remediation and enabling works.						
PL8	Phytotoxic contaminants (Made Ground)	Direct Contact (plant uptake).	Flora.	Likely	Low	LOW
Assessment: Contamination has been encountered within shallow Made Ground across the site which may be taken up by flora in soft landscaping.						
Recommendation: Installation of a clean cover system within any areas of soft landscaping to prevent plant uptake of contaminants.						

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants;



5. GEOTECHNICAL ASSESSMENT

5.1. PROPOSED DEVELOPMENT

E3P understands that Great Places Housing Group are intending the proposed acquisition and future redevelopment of a parcel of land off Laystall Street, Manchester for an intended residential end-use with associated utility infrastructure.

A proposed development layout has not been provided to date.

5.2. SUMMARY OF GROUND CONDITIONS

Made Ground

- Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m and 2.05 m bgl.
- Made Ground deposits generally comprise asphalt or concrete overlying light grey sandy gravel of concrete and limestone (MOT sub-base). Underneath the sub-base, Made Ground was identified as brown sandy gravelly clay with cobbles. Gravel comprises fine to coarse, angular to subangular brick, ash and clinker and cobbles comprise subangular brick.

Drift Deposits

- Drift deposits were encountered within all exploratory locations to depths of 18.80 m bgl. The drift deposits generally comprise stiff to very stiff brown mottled grey slightly gravelly CLAY with gravel of sandstone and mudstone.
- Dense brown slightly gravelly fine SAND with gravel of sandstone was identified in CP101 between 17.00 and 18.80 m bgl.

Solid Geology

- The solid bedrock geology was not encountered during the ground investigation. The depth to bedrock is not recorded on the closest BGS boreholes.

Groundwater

- Groundwater was encountered as occasional seepages between 1.40 m bgl and 2.00 m bgl during the site investigation with monitoring recording groundwater levels between 0.90 m and 2.40 m bgl.



5.3. SITE PREPARATION

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:

- ✿ Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- ✿ Demolition of all existing buildings and removal of hardstanding.
- ✿ Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ✿ Buried structures and old foundations should be excavated from below the proposed development footprint with the resulting void backfilled.

5.4. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 5.1.

TABLE 5.1 SUMMARY OF ABP

GRANULAR SOILS			
Description	Depth (Range m bgl)	Relative Density	Allowable Bearing Pressure (kN/m ²)
Gravelly SAND	17.00–18.50	Medium Dense–Dense	300–314
COHESIVE SOILS			
Description	Depth (range m bgl)	Undrained Shear Strength (Cu) (kN/m ²)	Allowable Bearing Pressure (kN/m ²)
Stiff medium strength slightly gravelly CLAY	1.00–2.00	66–73	135–150
Very stiff high strength to very high strength slightly gravelly CLAY	1.00–2.00	91–228	187–470
Very stiff very high strength slightly gravelly CLAY	3.00	217	447
Stiff medium strength to very stiff very high strength slightly gravelly CLAY	4.00–15.50	55–187	112–383



Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff glacial clays.

Where proposed levels remain similar, it is likely that plots could be constructed using strip or trench fill foundations bearing on the underlying stiff to very stiff clays, subject to the required bearing stratum being present at a shallow depth and the absence of tree influence.

Where the suitable founding stratum is greater than 2.50 m bgl, an engineered foundation will be required. Based on the basement survey levels, the Made Ground is known to extend to depths in excess of 3.00 m bgl, therefore an engineered foundation solution will be required in the location of the existing building footprint.

At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, based on our extensive experience of similar sites, we would anticipate that the final foundation solution would be a combination of the following:

- ✳ Shallow strip foundations bearing on stiff to very stiff CLAY at circa 1.00 m bgl;
- ✳ Trench fill to support reinforced strip foundations in areas of variable ground and/or potential tree influence; and,
- ✳ Driven piles or VSC where the founding strata are encountered at greater depths.

To determine if VSC is viable at the subject site, E3P has completed a Ground Improvement Design Risk Matrix that is summarised in Table 5.2.

TABLE 5.2 GROUND IMPROVEMENT DESIGN RISK MATRIX

RISK ITEM	COMMENT	PASS/FAIL
Soft clays with an undrained shear strength less than 30 kN/m ²	CLAY soils are generally stiff to stiff with Cu > 80 kN.	PASS
Ground with peat layers close to foundation level or the base of the stone column, or where intermediate layers of peat are thicker than 200 mm, either as a single layer or the sum of the thicknesses of individual layers throughout the length of the stone column	None identified.	PASS
Voided filled ground, e.g. old water tanks, pottery, glass bottles, concrete rubble or brick fill of unsuitable grading	Made Ground will require removal and processing to render the site suitable for VSC. The existing buildings substructure will also require excavation and processing into a graded aggregate suitable for vibro treatment.	PASS – on completion of enabling works
Loose or non-engineered fill not previously subject to rising or fluctuating water levels saturation	None identified.	PASS



RISK ITEM	COMMENT	PASS/FAIL
Filled ground still settling or expected to settle under its own weight or due to the effects of surcharging/upfilling where there is a high organic content or where decay is continuing	None identified,	PASS
Fill, containing degradable material where organic material forms more than 15% of fill by volume	None identified.	PASS
Clays with a plasticity index greater than 40%	None identified.	PASS
Highly sensitive soils liable to collapse or remoulding	None identified.	PASS
Cohesive soils with trees in influencing distance	Plots where tree influence has been modelled and will either be subject to a piled or mass trench-fill solution.	PASS
Overall Risk Rating and Suitability for Vibratory Ground Improvement		PASS

A summary of anticipated foundations is presented in Table 5.3.

TABLE 5.3 ANTICIPATED FOUNDATIONS

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (m bgl)	GROUND WATER (m bgl)	TARGET STRATUM	TREES	FOUNDATION TYPE	TYPE OF CONCRETE
WS101	1.65	N/A	Stiff CLAY	N	Trench Fill	DS-1 AC-1s
WS102	2.45	2.00	Stiff CLAY	N	Trench Fill	DS-1 AC-1s
WS103	1.45	N/A	Stiff CLAY	N	Trench Fill	DS-1 AC-1s
WS104	2.35	N/A	Stiff CLAY	N	Trench Fill	DS-3 AC-2s
WS105	2.50	N/A	Stiff CLAY	Y	Trench Fill/ Pile/VSC	DS-1 AC-1s
WS106	1.65	N/A	TBC	Y	Trench Fill	DS-1 AC-1s
CP101	1.35	N/A	Stiff CLAY	N	Strip	DS-1 AC-1s
CP102	1.25	1.40	Stiff CLAY	Y	Strip	DS-1 AC-1s

It is recommended that, at working drawing stage, a foundation schedule is prepared for the development taking account of the physical change of natural clay soils and the current/proposed locations of trees.



5.5. GROUND FLOOR SLABS

Current building control regulations require that where infilled ground is present to depths in excess of 600 mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.

In this instance, it is considered that for the majority of substructures, the underlying stratum would have in excess of 600 mm of infill and, as such, a suspended floor slab will be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave precautions) will be required in the construction of the substructure.

5.6. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils, which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectured zones of influence.

The clay is deemed to be medium volume change potential, therefore heave precautions will be required. If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams.

If the ground floor slab is to be constructed with a beam and block floor, a minimum subfloor void of 250 mm is required within any structures located in the zone of conjectured tree influence, an engineered design will be required for piled plots.

If the ground floor slab is constructed with a cast in-situ suspended floor slab, then heave precautions that can tolerate 100 mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.

A summary of heave precautions is presented in Table 5.4.



TABLE 5.4 SUMMARY OF HEAVE PRECAUTIONS

		MINIMUM VOID DIMENSION FOR FOUNDATIONS, GROUND BEAMS AND SUSPENDED IN-SITU CONCRETE GROUND FLOORS		MINIMUM VOID DIMENSIONS UNDER PRECAST CONCRETE AND SUSPENDED TIMBER FLOORS
Plasticity Index of Soil	Required Foundation Depth (m)	Thickness of Void Former Against Side of Foundation or Ground Beam (mm)	Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm)	Void Dimension (mm)
High Plasticity (> 40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	35	150	300
	1.5–2.0	25	75	
Moderate Plasticity (20–40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	25	100	250
	1.5–2.0	25	50	
Low Plasticity (< 20)	2.0–2.5	N/A	50	200
	> 2.0	No Special Precautions		

5.7. HIGHWAYS CONSTRUCTION

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

5.8. DRAINAGE

The presence of substantial depths of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Furthermore, the site is predominantly underlain likely low-permeability gravelly CLAY. Therefore, the use of soakaway drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured, it is not recommended that soakaways are utilised for disposal of surface water runoff.

If soakaway drainage is to be considered, full BRE 365 testing must be completed to inform the detailed design.



5.9. CONCRETE DURABILITY

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).

Elevated sulphate concentrations meeting Class DS-3, AC-2s were noted in the Made Ground in WS104 at 1.55 m.

5.10. EXCAVATIONS

Site observations indicated that excavations should be feasible in the near-surface with normal plant; however, obstructions will be present beneath the existing buildings. It is anticipated that any obstructions will be grubbed out during the reduced-level dig for the substructure works.

However, due to the depth and variability of the Made Ground and the likelihood of trench collapse, it is considered that all excavations are supported or battered back in accordance with the guidance contained in CIRIA R97.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations then consideration should be given to the potential for dewatering gravels in the surrounding areas that may cause structural damage to building substructures in close proximity to the site.

TABLE 5.5 CIVIL ENGINEERING EXCAVATION RISK MATRIX

RISK ITEM	PRESENT	COMMENT
Running Sands	No	No running sand has been identified.
Minor Water Ingress	Yes	Minor water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	No	Shallow bedrock has not been identified.



5.11. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated into the site works:

- ✳ Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and sub-formations to foundations and pavement construction.
- ✳ Excavations, where access is required, should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.
- ✳ It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to the provision of space for settling tanks or an attenuation pond.
- ✳ Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- ✳ The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, include the use of personnel protective equipment (PPE).



5.12. GEOTECHNICAL RISK REGISTER

POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON-SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils		TBC	TBC	No volatile contamination has been identified to date, however, further assessment is required following the demolition of the existing buildings. Material deemed to have a potential vapour risk may require hotspot removal, resulting in the requirement to backfill the resulting void. Should significant backfill be needed deeper or specialist foundations may be required in those areas.
Obstructions		All	75	The site has been subject to historical development and obstructions will be present beneath the existing buildings.
Artificially levelled and filled platforms		All	100	The site appears to have been levelled and artificially backfilled.
Trench collapse		All	100	Made Ground present beneath the site is likely to be loosely compacted and possibly prone to collapse.
Mature trees		South	10	Arboriculture survey required to determine areas of potential tree influence. The site is predominantly surfaced by hardstanding, however, semi-mature trees are present along the south-west site boundary.
Volume change potential clay		All	100	The clay is deemed to be medium volume change potential, therefore heave precautions will be required.
Running sands		N/A	N/A	Data searches indicate low risk.
Ground dissolution		N/A	N/A	Data searches indicate no hazard.
Concrete design		WS104	10	Elevated sulphate concentrations meeting Class DS-3, AC-2s were noted in the Made Ground in WS104 at 1.55 m.



POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON-SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Low-permeability ground		On-site	100	Soakaways unlikely to be effective in areas where low permeability cohesive deposits are present or where areas of potentially contaminated soil and groundwater are present.
Services/sensitive structures		-	-	Services are present throughout the surrounding streets. Piling may not be possible within close proximity to any sensitive infrastructure.
Abnormal foundation solutions		TBC	TBC	An abnormal foundation solution may be required where deep Made Ground is present (MTF, VSC, Pile).
Areas not investigated		East	50	Further investigation is required beneath the building footprint.



5.13. FURTHER WORKS

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

-  Further post demolition ground investigation.
-  Plot-specific foundation schedule (upon receipt of the final development levels).
-  Arboricultural survey.
-  Geotechnical earthworks strategy (infrastructure).
-  Remediation and enabling works strategy.



6. CONCLUSIONS AND RECOMMENDATIONS

6.1. CONTAMINATED LAND ASSESSMENT

Human Health	The Tier I human health risk assessment identified elevated concentrations of lead, non-volatile PAHs and asbestos. The risk to chronic human health associated with the elevated concentrations of inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils. The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy. Asbestos in the form of loose amosite fibres (<0.001 %) has also been identified within the Made Ground in WS105. No visual signs of ACM were encountered during the ground investigation. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model. With the exception of the clay in WS202, chemical analysis of the natural clay drift deposits suggests that these soils will be acceptable for use as subsoil within the proposed garden and landscaped areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site. Further assessment will be required following the demolition of the existing buildings.
Controlled Waters	Low risk to controlled waters pending further assessment.
Ground Gas	Characteristic Situation 1/Green (pending completion of gas monitoring).
Potable Water	This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation. Current indications suggest that barrier pipe will be required.



6.2. GEOTECHNICAL ASSESSMENT

Significant obstructions will be present beneath the existing buildings.

During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff glacial clay.

Where proposed levels remain similar, it is likely that plots could be constructed using strip or trench fill foundations bearing on the underlying stiff to very stiff clays, subject to the required bearing stratum being present at a shallow depth and the absence of tree influence.

Where the suitable founding stratum is greater than 2.50 m bgl, an engineered foundation will be required. Based on the basement survey levels, the Made Ground is known to extend to depths in excess of 3.00 m bgl, therefore an engineered foundation solution will be required in the location of the existing building footprint.

At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, based on our extensive experience of similar sites, we would anticipate that the final foundation solution would be a combination of the following:

-  Shallow strip foundations bearing on stiff to very stiff CLAY at circa 1.00 m bgl;
-  Trench fill to support reinforced strip foundations in areas of variable ground and/or potential tree influence; and
-  Driven piles or VSC where the founding strata are encountered at greater depths.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



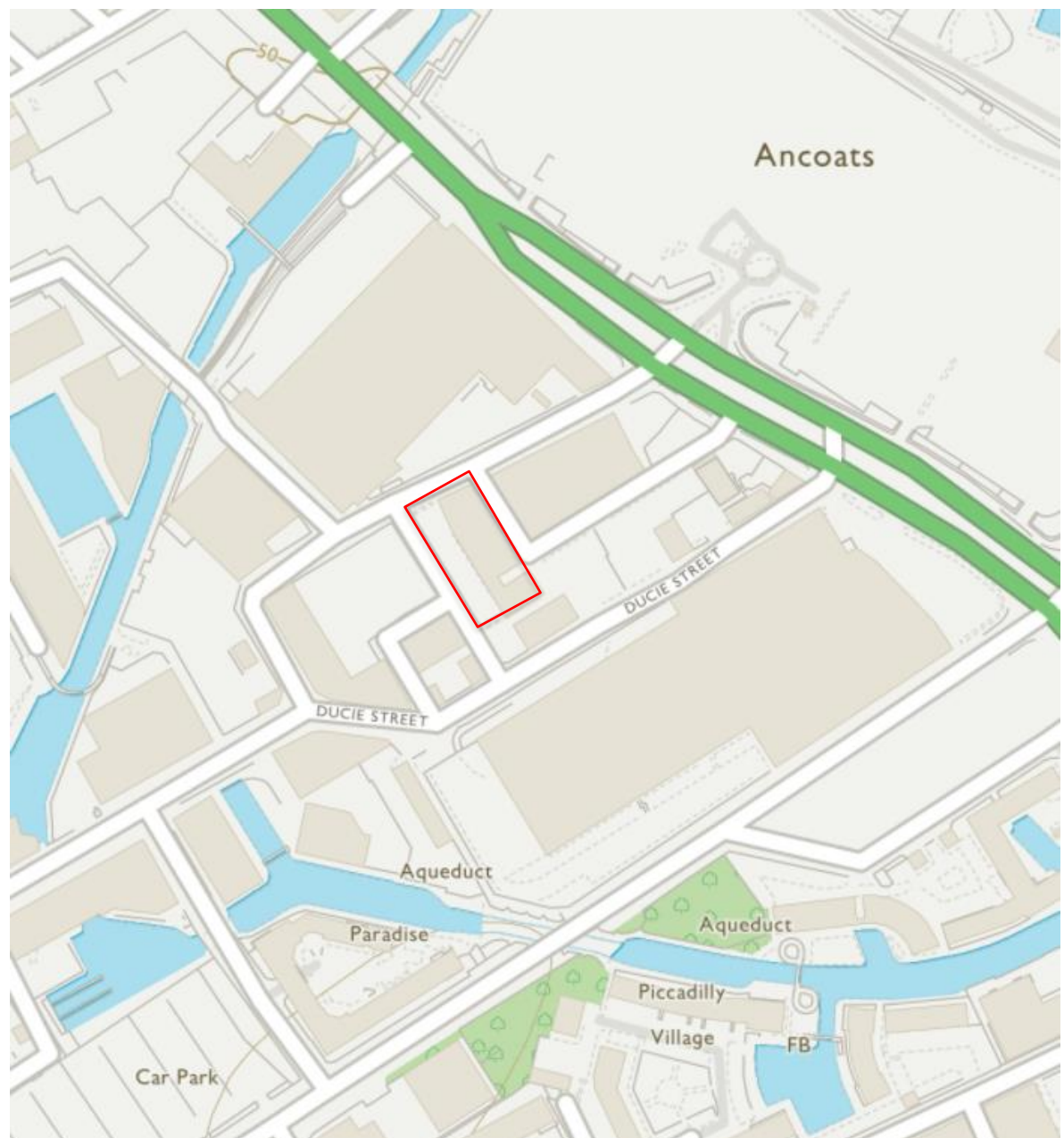
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection



APPENDIX III

DRAWINGS

DRAWING 15-140-001 – SITE LOCATION PLAN





Historical Features

- Former Residential Housing
- Clothing Factory
- Public House
- Former Buildings
- Buildings

Notes:

P1	REVC	09.03.2022	EB	NS
P1	REVB	08.03.2022	EB	NS
P1	REVA	07.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

Job Title:

Laystall Street, Manchester

Job No:

15-140

Drawing No:

003

Drawing Title:

Historical Features Plan

Date:

09.03.2022

Scale:

NTS @ A3

 **e3p**

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
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Site Features Former Clothing Factory Car Park Outside Space Semi Mature / Mature Trees Wooden Gate	Notes:					Client: Great Places Housing Group		Job No: 15-140	Date: 09.03.2022	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk			
								Drawing No: 004	Scale: NTS @ A3				
	P1 P1 P1	REVC REVB REVA	09.03.2022 08.03.2022 07.03.2022	EB EB LM	NS NS NS	Job Title: Laystall Street, Manchester		Drawing Title: Site Features Plan				The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	
	Phase	Issue	Date	Drawn	Checked								



Location Symbols WS101(MW) Approximate Window Sample Probehole Location with Install						Notes:	Client:	Job No:	Date:	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk				
	CP101 Approximate Cable Percussive Borehole Location													
										Great Places Housing Group		Drawing No:	Scale:	
										005		NTS @ A3		
										Job Title:		Drawing Title:		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.
										Laystall Street, Manchester		Exploratory Hole Location Plan		
					P1	REVA	20.01.2022	CB	PW					
					Phase	Issue	Date	Drawn	Checked					



Location Symbols

- Approximate Window Sample Probehole Location with Install
- Approximate Cable Percussive Borehole Location

Made Ground Depth (m)

- Depth of Made Ground 0.50 - 0.99m
- Depth of Made Ground 1.00 - 1.49m
- Depth of Made Ground 1.50 - 1.99m
- Depth of Made Ground 2.00 - 2.49m
- Depth of Made Ground >2.50

Notes:

P1	REVB	08.03.2022	EB	NS
P1	REVA	06.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

Job Title:

Laystall Street, Manchester

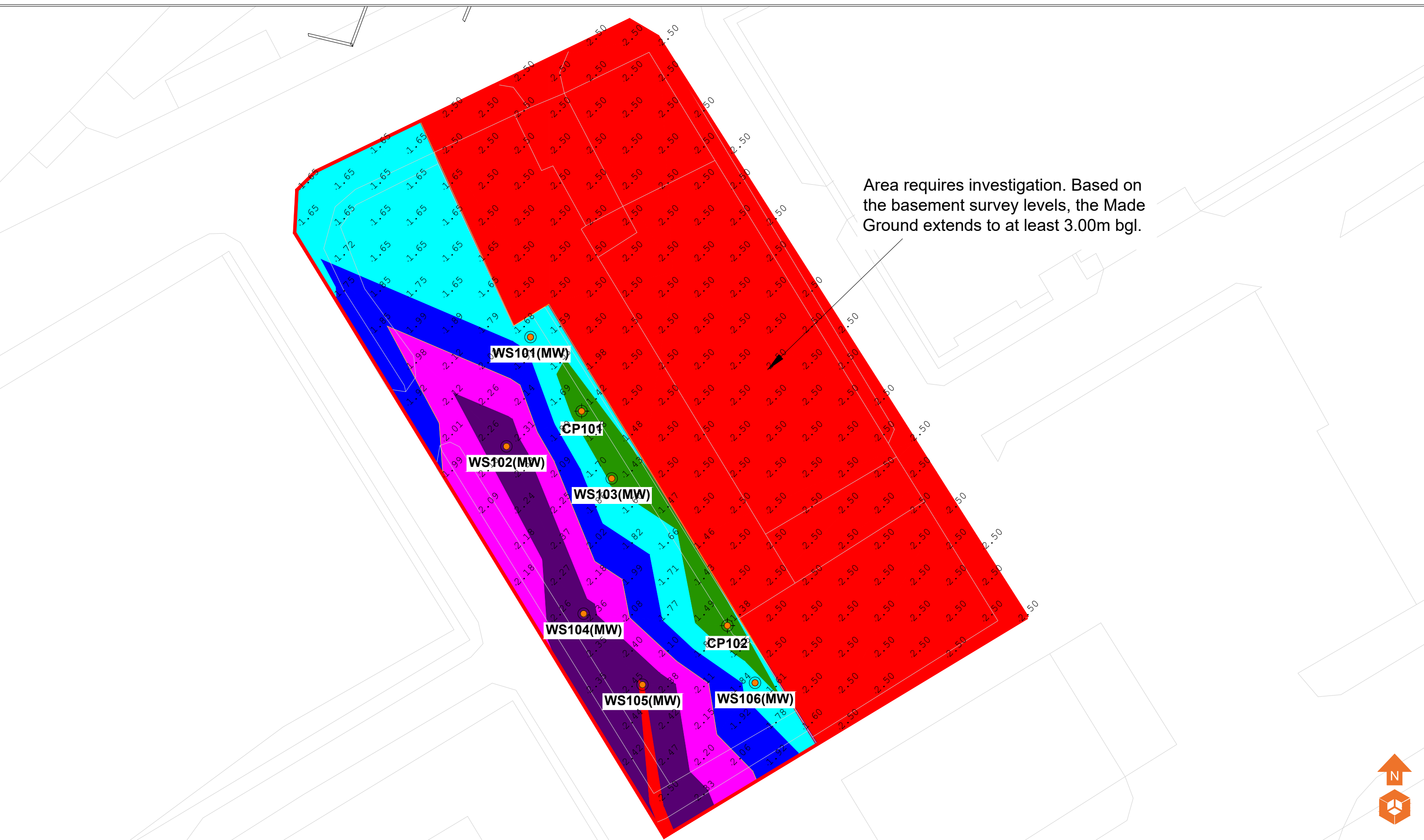
Job No:	15-140	Date:	08.03.2022
Drawing No:	006	Scale:	NTS @ A3

Drawing Title:

Depth to Made Ground Plan

Environmental Engineering Partnership Ltd
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Location Symbols

Approximate Window Sample Probehole Location with Install

Approximate Cable Percussive Borehole Location

Shallow Spread Footings

Depth to Founding Strata 0.00 - 1.24m

Depth to Founding Strata 1.25 - 1.49m

Mass Trench Fill Footings

Depth to Founding Strata 1.50 - 1.74m

Depth to Founding Strata 1.75 - 1.99m

Depth to Founding Strata 2.00 - 2.24m

Engineered Footings

Depth to Founding Strata 2.25 - 2.49m

Depth to Founding Strata >2.50m

Notes:

P1	REVB	08.03.2022	EB	NS
P1	REVA	08.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

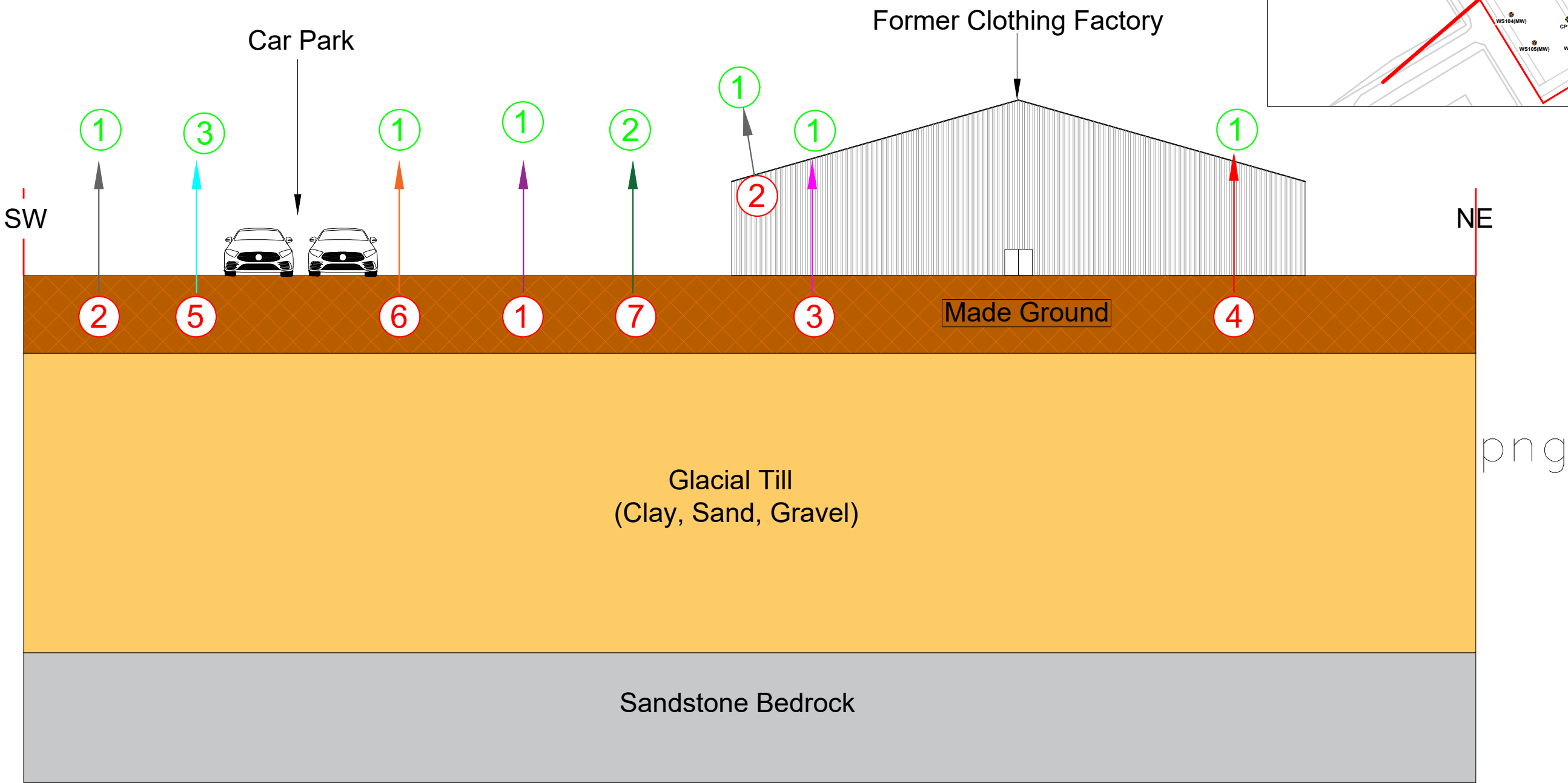
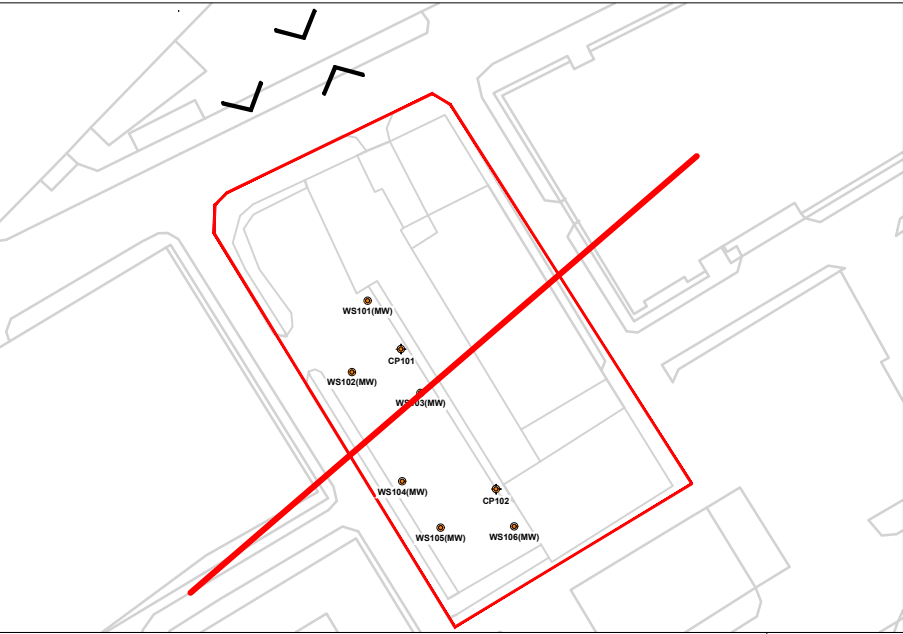
Job Title:

Laystall Street, Manchester

Job No:	15-140	Date:	08.03.2022
Drawing No:	008	Scale:	NTS @ A3
Drawing Title:		Depth to Founding Strata Plan	

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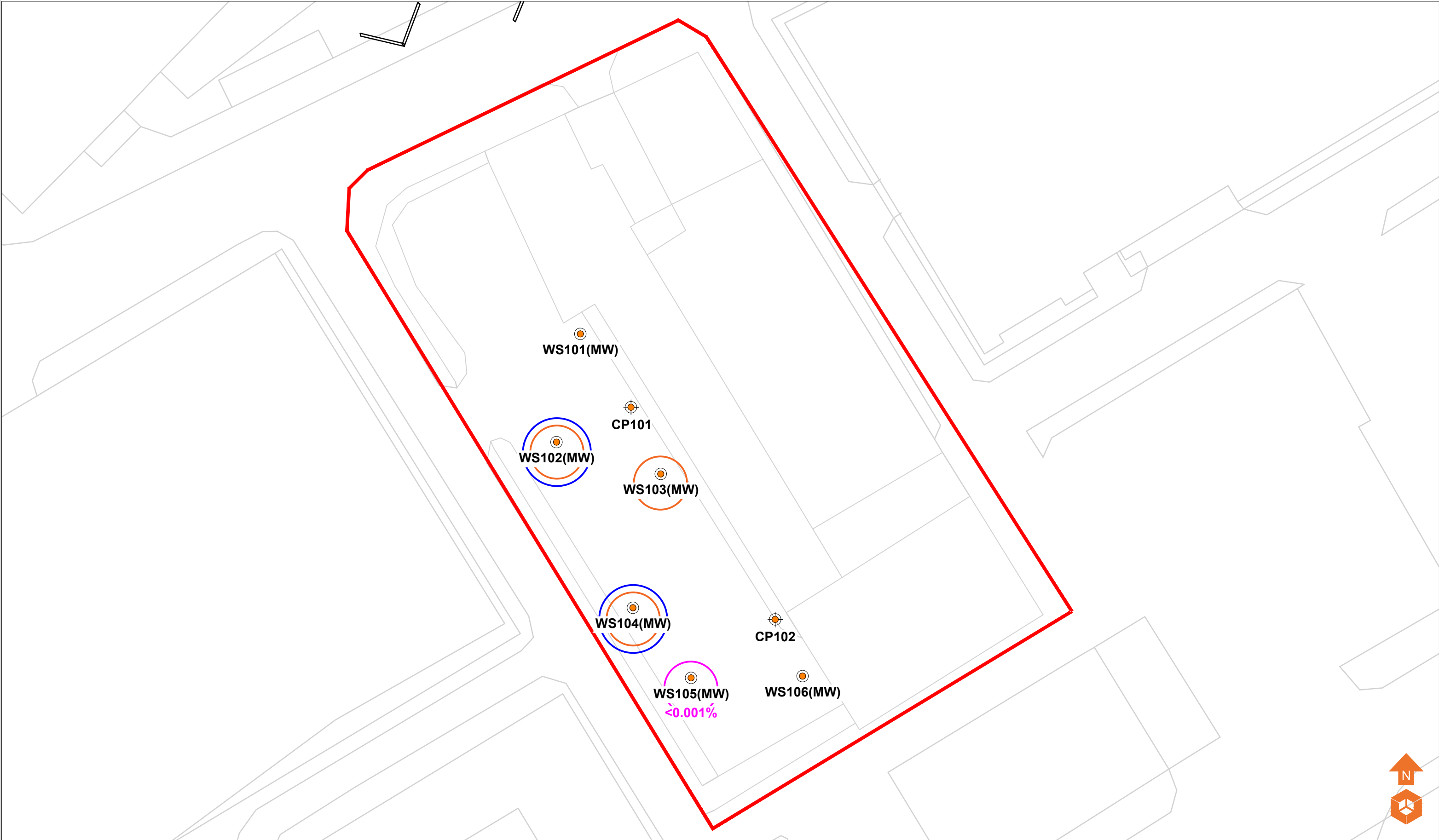




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Geology Key Made Ground Glacial Till Sandstone Bedrock	Sources ① Heavy Metals, non volatile PAH ② Asbestos ③ Hazardous Ground Gas ④ Possible volatile contaminants ⑤ PH & Sulphate ⑥ Organic contaminants (Hydrocarbons) ⑦ Phytotoxic contaminants
---	---



Location Symbols

WS101(MW)

Approximate Window Sample Probehole Location with Install

CP101

Approximate Cable Percussive Borehole Location

Contamination Exceedances

Lead

Asbestos

Non Volatile PAH

Notes:

P1	REVA	07.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

Job Title:

Laystall Street, Manchester

Job No:

15-140

Drawing No:

018

Date:

07.03.2022

Scale:

NTS @ A3

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Contamination Exceedances Plan

APPENDIX IV

PHOTOGRAPHS

PLATE 1 CAR PARK ENTRANCE – FACING SOUTH WEST



PLATE 2 TREES ALONG SOUTH WEST SITE BOUNDARY



PLATE 3 FACTORY BUILDING



PLATE 4 WS102 ARISINGS



PLATE 5 WS105 ARISINGS



PLATE 6 WS106 ARISINGS



APPENDIX V

E3P EXPLORATORY HOLE LOGS

				Borehole Log				Borehole No. WS101 Sheet 1 of 1	
Project Name: Laystall Street				Project No. 15140		Co-ords: 384965E - 398272N		Hole Type WS	
Location: Manchester				Level:				Scale 1:50	
Client: Great Places Housing Group				Dates: 25/01/2022				Logged By E Canham	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.09		Asphalt and concrete.		
		0.30	ES				MADE GROUND: Light grey slightly clayey slightly sandy gravel. Gravel is fine to medium angular to subangular of concrete. (Sub base)		
					0.50				
					0.60				
		1.00	SPT	N=18 (3,2/3,3,5,7)	0.65		MADE GROUND: Dark brown mottled orangish brown gravelly clay. Gravel is fine to coarse angular to subangular of brick, ceramic, glass and bitumen.	1	
					1.10		Asphalt and concrete.		
					1.20		MADE GROUND: Reddish brown clayey gravel with occasional cobbles. Gravel is fine to coarse angular to subangular of brick. Cobbles are subangular of brick at 0.70m bgl and 1.00m bgl.		
		1.50	ES				MADE GROUND: Yellowish brown gravelly clay. Gravel is fine to coarse angular to subangular of brick.	2	
		2.00	SPT	N=36 (2,5/6,8,9,13)			Very stiff very high strength brown mottled grey slightly gravelly CLAY. Gravel is fine subangular to sub rounded of mudstone.		
		3.00	SPT	N=50 (5,9/11,13,13,13)				3	
				3.45		End of Borehole at 3.45m	4		
							5		
							6		
							7		
							8		
							9		
							10		

Remarks 1. Refused on very stiff very high strength clay at 3.45m bgl. 2. Monitoring well installed. 3. Response zone at 0.50-1.20m 4. Broken out using corer for 10 minutes.									
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Project Name: Laystall Street

Project No.
15140

Co-ords: 384964E - 398268N

Hole Type
WS

Location: Manchester

Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 25/01/2022

Logged By
E Canham

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.09			Asphalt and concrete.	
					0.20			MADE GROUND: Light grey slightly clayey slightly sandy gravel. Gravel is fine to medium angular to subangular of concrete. (Sub base)	
					0.45			MADE GROUND: Brown mottled orangish brown and grey gravelly clay with pockets of fine to medium light brown sand and rare cobble. Gravel is fine to coarse angular to subangular of brick, ash and concrete. Cobble is subangular of brick at 0.40m bgl.	
		0.75	ES		0.85			MADE GROUND: Brown slightly gravelly very clayey sand with rare cobble. Gravel is fine to medium subangular to subrounded of sandstone, brick and ash. Cobble is subangular of brick at 0.70m bgl. Becomes gravelly at 0.75m bgl. Gravel is fine to medium subangular of mudstone.	1
		1.00	SPT	N=19 (4,3/4,4,6,5)	1.50			MADE GROUND: Brick.	
					1.60			MADE GROUND: Yellow, black, red and white multicoloured clayey very gravelly sand. Gravel is fine to medium angular to subangular of brick.	
		1.65	ES		2.00			MADE GROUND: Dark brown gravelly clay with black band at 1.65m bgl and rare cobble. Gravel is fine to medium angular to subangular of bitumen, brick and ash. Cobble is subangular of brick at 1.95m bgl. (Hydrocarbon odour at 1.65m bgl).	2
		2.00	SPT	N=25 (1,1/3,5,8,9)	3.00			Very stiff high strength brown mottled grey CLAY. Becomes very high strength circa 3.00m. End of Borehole at 3.44m	
		2.60	ES		3.44				3
		3.00	SPT	50 (3,7/50 for 290mm)					4
									5
									6
									7
									8
									9
									10

Remarks

1. Refused on very stiff very high strength clay at 3.44m bgl. 2. Monitoring well installed. 3. Response zone at 0.50-2.00m 3. Water strike encountered at 2.00m bgl. 4. Broken out using corer for 10 minutes. 5. Hydrocarbon odour at 1.65m bgl.

				Borehole Log				Borehole No. WS103 Sheet 1 of 1	
Project Name: Laystall Street				Project No. 15140		Co-ords: 384968E - 398267N		Hole Type WS	
Location: Manchester				Level:		Scale 1:50			
Client: Great Places Housing Group				Dates: 25/01/2022		Logged By E Canham			

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.09		Asphalt and concrete.		
		0.40	ES		0.30		MADE GROUND: Light grey slightly clayey slightly sandy gravel. Gravel is fine to medium angular to subangular of concrete. (Sub base)		
		1.00	SPT	N=13 (1,3/3,3,3,4)	1.00		MADE GROUND: Brown mottled black gravelly clay with frequent cobbles. Gravel is fine to coarse angular to subangular of ash, brick and clinker. Cobbles are subangular of brick.	1	
		1.20	ES				Stiff medium strength brown mottled grey CLAY. Becomes very stiff very high strength circa 2.00m bgl.		
		1.50 - 2.00	U						
		2.00	SPT	50 (4,7/50 for 290mm)	2.44		End of Borehole at 2.44m	2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks 1. Refused on very stiff very high strength clay at 2.44m bgl. 2. Monitoring well installed. 3. Response zone at 0.50-1.00m 4. Broken out using corer for 10 minutes.									
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Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Laystall Street

Project No.
15140

Co-ords: 384968E - 398260N

Hole Type
WS

Location: Manchester

Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 25/01/2022

Logged By
E Canham

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			Asphalt and concrete.	
					0.30			MADE GROUND: Light grey slightly clayey slightly sandy gravel. Gravel is fine to medium angular to subangular of concrete. (Sub base)	
		0.80	ES					MADE GROUND: Reddish brown mottled grey slightly sandy slightly gravelly clay with rare cobble. Gravel is fine to coarse subangular to subrounded of brick, concrete, ash and sandstone. Cobble is subangular of sandstone at 0.95m bgl.	1
		1.00	SPT	N=21 (2,3/3,7,5,6)	1.00			MADE GROUND: Brownish grey mottled black gravelly clay. Gravel is fine to coarse angular to subangular of brick, bitumen and ceramic.	
		1.55	ES		1.40			MADE GROUND: Dark greyish brown mottled black sandy gravelly clay with pockets of white fine to medium sand. Gravel is fine to medium angular to subangular of brick, bitumen and ceramic.	2
		2.00	SPT	N=30 (2,4/5,7,9,9)	1.70			MADE GROUND: Light grey mottled yellowish brown gravelly clayey sand. Gravel is fine angular to subangular of brick and mudstone.	
		2.20	ES		1.75			MADE GROUND: Dark brown slightly gravelly slightly sandy clay. Gravel is fine to medium angular to subangular of wood, ceramic, brick and bitumen.	3
		2.50 - 3.00	U		1.90			MADE GROUND: Yellowish brown mottled grey slightly gravelly clay. Gravel is fine to coarse angular to subangular of bitumen and brick.	
		3.00	SPT	50 (4,7/50 for 290mm)	2.00			Very stiff high strength brown mottled grey CLAY. Becomes very high strength circa 3.00m.	4
					3.44			End of Borehole at 3.44m	

Remarks

1. Refused on very stiff very high strength clay at 3.44m bgl. 2. Monitoring well installed. 3. Response zone at 2.00-3.00m 4. Broken out using corer for 15 minutes.

Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Laystall Street

Project No.
15140

Co-ords: 384971E - 398254N

Hole Type
WS

Location: Manchester

Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 25/01/2022

Logged By
E Canham

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.09			Asphalt and concrete.	
					0.30			MADE GROUND: Light grey slightly clayey slightly sandy gravel. Gravel is fine to medium angular to subangular of concrete. (Sub base)	
					0.40			MADE GROUND: Orangish brown slightly gravelly slightly sandy clay. Gravel is fine to medium angular to subangular of brick and concrete.	
		0.85	ES		0.80			MADE GROUND: Brick with band of yellowish brown silty fine to medium sand at 0.60m bgl.	1
		1.00	SPT	N=14 (1,1/1,1,2,10)				MADE GROUND: Greyish brown and black gravelly clay with rare rootlets. Gravel is fine to medium angular to subangular of sandstone, brick and bitumen.	
		1.50	ES		1.45			MADE GROUND: Greyish brown, black, and white multicoloured gravelly very sandy clay. Gravel is fine to coarse subangular to angular of brick, ash, sandstone, bitumen and clinker.	2
		2.00	SPT	N=29 (1,3/4,7,8,10)	2.00			MADE GROUND: Very stiff high strength light brown clay with frequent wood fragments.	
		2.50	ES		2.05			Very stiff high strength brown mottled grey slightly gravelly CLAY. Gravel is fine to medium subangular to sub rounded of mudstone and sandstone. Becomes very high strength circa 3.00m bgl.	3
		3.00	SPT	50 (3,6/50 for 290mm)					
					3.44			End of Borehole at 3.44m	4
									5
									6
									7
									8
									9
									10

Remarks

1. Refused on very stiff very high strength clay at 3.44m bgl. 2. Monitoring well installed. 3. Response zone at 0.50-2.00m 4. Broken out using corer for 10 minutes.

				Borehole Log				Borehole No. WS106 Sheet 1 of 1	
Project Name: Laystall Street				Project No. 15140		Co-ords: 384978E - 398250N		Hole Type WS	
Location: Manchester				Level:		Scale 1:50			
Client: Great Places Housing Group				Dates: 25/01/2022		Logged By E Canham			

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.09		Asphalt and concrete.		
					0.30		MADE GROUND: Light grey slightly sandy gravel. Gravel is fine to medium angular to subangular of concrete. (Sub base)		
	0.50	ES			0.50		MADE GROUND: Dark greyish brown slightly sandy slightly gravelly clay. Gravel is fine to coarse angular to subangular of sandstone, brick and ash.	1	
	1.00	SPT	N=14 (2,2/1,3,4,6)		1.10		MADE GROUND: Brown very sandy gravelly clay with occasional rootlets and frequent cobbles. Gravel is fine to coarse subangular to angular of brick, ash and clinker. Cobbles are subangular of brick.		
	1.40	ES			1.20		MADE GROUND: Orange slightly gravelly clay with rare rootlets. Gravel is fine to medium subangular of brick.	2	
		2.00	SPT	50 (6,12/50 for 260mm)			Stiff medium strength yellowish brown mottled grey CLAY with rare rootlets and orange streaks and band of light grey mottled yellow sandy clay at 1.65-1.68m bgl. Becomes very stiff very high strength circa 2.00m bgl.		
					2.41		End of Borehole at 2.41m		
								3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks 1. Refused on very stiff very high strength clay at 2.41m bgl. 2. Monitoring well installed. 3. Response zone at 0.40-0.90m 4. Broken out using corer for 10 minutes.									
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Borehole Log

Borehole No.

CP101

Sheet 1 of 2

Project Name: Laystall Street

Project No.
15140

Co-ords: -

Hole Type
CP

Location: Manchester

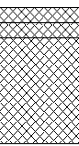
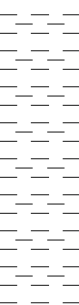
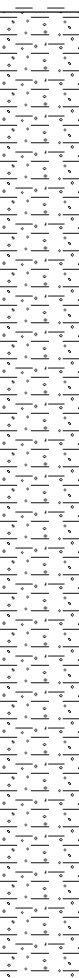
Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 01/02/2022 - 04/02/2022

Logged By
SRL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
		Depth (m)	Type	Results								
		0.20	B	N=16 (2,2/3,3,5,5)	0.10 0.20			MADE GROUND: Asphalt.	1			
								MADE GROUND: Light grey sandy gravel. Gravel is fine to medium angular to subangular of limestone and concrete (sub base).				
		0.90	B		0.90			MADE GROUND: Brown clayey gravel with cobbles. Gravel is fine to coarse angular to subangular of brick and ash. Cobbles are subangular of brick.				
		1.20	U					Stiff medium strength brown mottled grey CLAY.				
		1.65	D	N=13 (1,2/2,3,4,4)	3.00		Stiff medium strength brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular to subrounded sandstone and mudstone.	2				
		2.00	D									
		2.00										
		3.00	U									
		3.45	D	N=15 (3,3/4,3,4,4)	9.50		Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to medium subangular to subrounded mudstone and	3				
		4.00	B									
		4.00										
		5.00	U									
		5.45	D	N=31 (3,4/6,8,8,9)					4			
		6.50	B									
		6.50										
		8.00	U									
		8.45	D									
		9.50	B	9.50								
		9.50										

Continued on next sheet

Remarks
Complete.



Borehole Log

Borehole No.

CP101

Sheet 2 of 2

Project Name: Laystall Street

Project No.
15140

Co-ords: -

Hole Type
CP

Location: Manchester

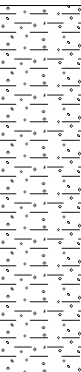
Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 01/02/2022 - 04/02/2022

Logged By
SRL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		11.00	U		12.50			sandstone.	11
		11.45	D						12
		12.50	B	50 (5,11/50 for 285mm)					13
		12.50							
		14.00	B	N=37 (9,8/10,9,9,9)	17.00			Very stiff very high strength reddish brown CLAY with bands of dense brown SAND. Very stiff high strength from 14.00m bgl.	14
		14.00							15
		15.50	B	N=42 (4,6/5,8,10,19)					16
		15.50							
		17.00	B	50 (25 for 135mm/50 for 115mm)	18.80			Dense brown slightly gravelly fine SAND. Gravel is fine to medium subangular to subrounded sandstone.	17
		17.00							18
		18.50		50 (9,10/50 for 150mm)					19
								End of borehole at 18.80 m	20

Remarks
Complete.



Borehole Log

Borehole No.

CP102

Sheet 1 of 2

Project Name: Laystall Street

Project No.
15140

Co-ords: -

Hole Type
CP

Location: Manchester

Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 04/02/2022 - 16/02/2022

Logged By
SRL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	B		0.10 0.20			MADE GROUND: Asphalt.	
		0.80	B		0.80			MADE GROUND: Light grey sandy gravel. Gravel is fine to medium angular to subangular of limestone and concrete (sub base).	1
		2.50		N=19 (1,2/3,4,5,7)	3.30			MADE GROUND: Brown gravelly clay with cobbles. Gravel is fine to coarse angular to subangular of ash and brick. Cobbles are subangular of brick. Very stiff high strength brown mottled grey CLAY.	2
		4.50		N=24 (1,4/3,5,7,9)				Very stiff high strength brown slightly gravelly CLAY with occasional sand bands and cobbles. Gravel is fine to medium subangular to subrounded of sandstone and mudstone. Cobbles are subangular of sandstone.	3
		7.00		N=35 (4,4/8,8,9,10)					4
		10.00		N=30 (12,10/7,7,8,8)					5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks
Complete.



Borehole Log

Borehole No.

CP102

Sheet 2 of 2

Project Name: Laystall Street

Project No.
15140

Co-ords: -

Hole Type
CP

Location: Manchester

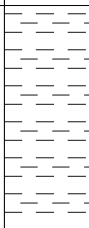
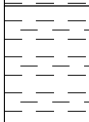
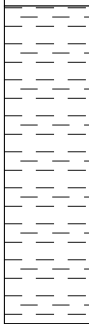
Level:

Scale
1:50

Client: Great Places Housing Group

Dates: 04/02/2022 - 16/02/2022

Logged By
SRL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		13.00		50 (7,11/50 for 250mm)	11.50				11
					12.10				12
					12.90			13	
		14.50		50 (6,9/50 for 210mm)	15.00			14	
							End of borehole at 15.00 m		15
								16	
								17	
								18	
								19	
								20	

Remarks
Complete.

APPENDIX VI

CHEMICAL TESTING

RESULTS

Peter Winstanley

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Taylor Road
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Manchester
M41 7JQ

e: pwinstanley@e3p.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-35642

Project / Site name:	Laystall Streat	Samples received on:	26/01/2022
Your job number:	15 140	Samples instructed on/ Analysis started on:	26/01/2022
Your order number:	000417	Analysis completed by:	02/02/2022
Report Issue Number:	1	Report issued on:	02/02/2022
Samples Analysed:	3 leachate samples - 8 soil samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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

Analytical Report Number: 22-35642
Project / Site name: Laystall Street
Your Order No: 000417

Lab Sample Number				2151094	2151095	2151096	2151097	2151098
Sample Reference				WS101	WS102	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.75	1.65	2.60	0.40
Date Sampled				25/01/2022	25/01/2022	25/01/2022	25/01/2022	25/01/2022
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	46	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	2.4	14	23	19	21
Total mass of sample received	kg	0.001	NONE	1.0	0.40	1.0	1.0	0.40

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	-	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	SSZ	SSZ	SSZ	-	SSZ

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	8.7	7.5	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1.6
Total Sulphate as SO ₄	mg/kg	50	MCERTS	-	350	690	-	-
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	-	0.012	0.18	-	-
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	-	23	350	-	-
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	-	11.7	177	-	-
Sulphide	mg/kg	1	MCERTS	-	3.0	15	-	-
Total Sulphur	mg/kg	50	MCERTS	-	160	850	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	0.3	3.0	-	-

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	0.32	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	0.23	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	0.22	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.23	0.29	-	2.3	0.78
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	0.50	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.33	0.40	-	4.1	1.2
Pyrene	mg/kg	0.05	MCERTS	0.34	0.47	-	4.0	1.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.27	-	2.2	0.72
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.21	-	2.0	0.71
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.23	-	2.8	0.78
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.12	-	0.66	0.39
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.24	-	2.3	0.72
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	1.0	0.35
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	0.30	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	1.2	0.45

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	0.90	2.23	-	24.1	7.28
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Analytical Report Number: 22-35642
Project / Site name: Laystall Street
Your Order No: 000417

Lab Sample Number	2151094	2151095	2151096	2151097	2151098
Sample Reference	WS101	WS102	WS102	WS102	WS103
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	0.75	1.65	2.60	0.40
Date Sampled	25/01/2022	25/01/2022	25/01/2022	25/01/2022	25/01/2022
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	3.0	6.5	24	19	36
Barium (aqua regia extractable)	mg/kg	1	MCERTS	22	-	-	250	290
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.09	-	-	1.3	1.4
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	-	-	0.4	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	< 0.2	< 0.2	0.8	1.9
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	10	21	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	11	18	81	80	420
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.0	24	200	210	380
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	1.1
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	4.2	12	32	33	38
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	4.1	-	-	40	50
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	30	34	85	220	620

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	3.9	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0	5.8	12	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	< 1.0	31	24	6.3
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	< 1.0	34	130	11
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	89	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	MCERTS	< 10	< 10	71	260	17

VOCs

Chloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Chloroethane	µg/kg	1	NONE	-	-	< 1.0	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	< 1.0	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	< 1.0	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-	-
Benzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-

Analytical Report Number: 22-35642
Project / Site name: Laystall Street
Your Order No: 000417

Lab Sample Number				2151094	2151095	2151096	2151097	2151098
Sample Reference				WS101	WS102	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.75	1.65	2.60	0.40
Date Sampled				25/01/2022	25/01/2022	25/01/2022	25/01/2022	25/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Tetrachloroethene	µg/kg	1	NONE	-	-	< 1.0	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Styrene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Tribromomethane	µg/kg	1	NONE	-	-	< 1.0	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	< 0.1	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	< 0.2	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	< 0.2	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	< 0.1	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	< 0.1	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	< 0.1	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-

Analytical Report Number: 22-35642
Project / Site name: Laystall Streat
Your Order No: 000417

Lab Sample Number				2151094	2151095	2151096	2151097	2151098
Sample Reference				WS101	WS102	WS102	WS102	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.75	1.65	2.60	0.40
Date Sampled				25/01/2022	25/01/2022	25/01/2022	25/01/2022	25/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	0.32	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	< 0.3	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	0.21	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	7.7	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	1.0	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	9.0	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	9.2	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	< 0.3	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	3.4	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	3.2	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	3.3	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	1.2	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	2.8	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	1.2	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	0.36	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	1.5	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-35642
Project / Site name: Laystall Street
Your Order No: 000417

Lab Sample Number	2151099	2151100	2151101
Sample Reference	WS104	WS105	WS106
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	1.55	0.85	1.40
Date Sampled	25/01/2022	25/01/2022	25/01/2022
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status
Stone Content	%	0.1	NONE
Moisture Content	%	0.01	NONE
Total mass of sample received	kg	0.001	NONE
		0.40	0.50
		0.40	

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Amosite	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	< 0.001	-
Asbestos Analyst ID	N/A	N/A	N/A	SSZ	SSZ	

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.5	8.0	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	13000	1100	230
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	1.9	0.17	0.062
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	3700	340	120
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	1870	169	62.2
Sulphide	mg/kg	1	MCERTS	100	4.4	< 1.0
Total Sulphur	mg/kg	50	MCERTS	4900	460	140
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.7	1.7	0.8

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.40	0.26	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.23	0.26	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	9.3	2.1	< 0.05
Anthracene	mg/kg	0.05	MCERTS	1.2	0.44	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	11	2.9	< 0.05
Pyrene	mg/kg	0.05	MCERTS	11	3.0	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.5	1.6	< 0.05
Chrysene	mg/kg	0.05	MCERTS	4.9	1.3	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	4.5	1.7	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	2.0	0.68	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	4.1	1.4	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.8	0.72	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.59	0.21	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.3	0.82	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	57.9	17.4	< 0.80
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Analytical Report Number: 22-35642
Project / Site name: Laystall Street
Your Order No: 000417

Lab Sample Number				2151099	2151100	2151101
Sample Reference				WS104	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				1.55	0.85	1.40
Date Sampled				25/01/2022	25/01/2022	25/01/2022
Time Taken				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	19	8.6
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	28	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	34	88	25
Lead (aqua regia extractable)	mg/kg	1	MCERTS	2500	150	17
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.8	0.5	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	12	34	31
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	370	180	57

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	12	13	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	48	42	< 1.0
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	62	240	< 1.0
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	16	300	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	MCERTS	140	600	< 10

VOCs

Chloromethane	µg/kg	1	ISO 17025	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-

Analytical Report Number: 22-35642
Project / Site name: Laystall Street
Your Order No: 000417

Lab Sample Number				2151099	2151100	2151101
Sample Reference				WS104	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				1.55	0.85	1.40
Date Sampled				25/01/2022	25/01/2022	25/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Tetrachloroethene	µg/kg	1	NONE	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-

Analytical Report Number: 22-35642
Project / Site name: Laystall Streat
Your Order No: 000417

Lab Sample Number				2151099	2151100	2151101
Sample Reference				WS104	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				1.55	0.85	1.40
Date Sampled				25/01/2022	25/01/2022	25/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 22-35642
Project / Site name: Laystall Streat
Your Order No: 000417

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2151100	WS105	0.85	139	Loose Fibres	Amosite	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number: 22-35642
Project / Site name: Laystall Streat

Your Order No: 000417

Lab Sample Number	2151102	2151103	2151104
Sample Reference	WS101	WS102	WS105
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	1.65	0.85
Date Sampled	25/01/2022	25/01/2022	25/01/2022
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status

General Inorganics

pH (automated)	pH Units	N/A	ISO 17025	8.6	8.9	8.0
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	1.2	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	2.8	2.5	< 1.0
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cadmium (dissolved)	µg/l	0.08	ISO 17025	0.13	< 0.08	0.10
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.7	3.0	2.0
Copper (dissolved)	µg/l	0.7	ISO 17025	9.6	13	7.9
Lead (dissolved)	µg/l	1	ISO 17025	3.0	4.4	3.2
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	3.2	13	2.8
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	14	26	18



Analytical Report Number: 22-35642
Project / Site name: Laystall Streat

Your Order No: 000417

Lab Sample Number	2151102	2151103	2151104
Sample Reference	WS101	WS102	WS105
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	1.65	0.85
Date Sampled	25/01/2022	25/01/2022	25/01/2022
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_1D_TOTAL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-35642

Project / Site name: Laystall Streat

* 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 *
2151094	WS101	None Supplied	0.3	Brown clay and sand with stones and gravel
2151095	WS102	None Supplied	0.75	Brown clay and sand with gravel.
2151096	WS102	None Supplied	1.65	Brown clay and loam with gravel.
2151097	WS102	None Supplied	2.6	Brown clay and loam with brick and gravel
2151098	WS103	None Supplied	0.4	Brown clay and loam with brick and gravel
2151099	WS104	None Supplied	1.55	Brown clay and sand with brick and stones.
2151100	WS105	None Supplied	0.85	Brown clay with brick and tar.
2151101	WS106	None Supplied	1.4	Brown clay and sand with gravel.

Analytical Report Number : 22-35642

Project / Site name: Laystall Streat

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
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
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	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
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
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 leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	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
pH at 20oC in leachate (automated)	Determination of pH in leachate by electrometric measurement.	In house method.	L099B	W	ISO 17025

Analytical Report Number : 22-35642

Project / Site name: Laystall Streat

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
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
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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 Sulphur in soil	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
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	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
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
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	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' 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.



Analytical Report Number : 22-35642

Project / Site name: Laystall Streat

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
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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.

Analytical Report Number : 22-35642

Project / Site name: Laystall Streat

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
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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



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Analytical Report Number : 22-37182

Project / Site name:	Laystall Street	Samples received on:	02/02/2022
Your job number:	15 140	Samples instructed on/ Analysis started on:	02/02/2022
Your order number:	000520	Analysis completed by:	09/02/2022
Report Issue Number:	1	Report issued on:	09/02/2022
Samples Analysed:	2 water samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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



Analytical Report Number: 22-37182

Project / Site name: Laystall Street

Your Order No: 000520

Lab Sample Number	2159200	2159201
Sample Reference	WS102	WS104
Sample Number	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied
Date Sampled	02/02/2022	02/02/2022
Time Taken	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection Accreditation Status

General Inorganics

pH	pH Units	N/A	ISO 17025	7.3	7.5
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	1.4
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	6.97	21.1

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	< 1.0
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	150	60
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	4.44	2.31
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.04	0.04
Chromium (dissolved)	µg/l	0.2	ISO 17025	3.3	2.6
Copper (dissolved)	µg/l	0.5	ISO 17025	5.3	11
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	480	88
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	14	3.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	8.5	13
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.1	5.0

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_2D_TOTAL_#1_#2	µg/l	10	NONE	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10



Analytical Report Number: 22-37182
Project / Site name: Laystall Street

Your Order No: 000520

Lab Sample Number				2159200	2159201
Sample Reference				WS102	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				02/02/2022	02/02/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

VOCs

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0



Analytical Report Number: 22-37182
Project / Site name: Laystall Street

Your Order No: 000520

Lab Sample Number				2159200	2159201
Sample Reference				WS102	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				02/02/2022	02/02/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	0.27	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	0.33	0.30
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	0.76	0.60
Pyrene	µg/l	0.01	ISO 17025	0.74	0.55



Analytical Report Number: 22-37182
Project / Site name: Laystall Street

Your Order No: 000520

Lab Sample Number				2159200	2159201
Sample Reference				WS102	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				02/02/2022	02/02/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	0.22	< 0.01
Chrysene	µg/l	0.01	ISO 17025	0.23	< 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
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 22-37182

Project / Site name: Laystall Street

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-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
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
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
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
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	ISO 17025
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
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' 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.



Analytical Report Number : 22-37182

Project / Site name: Laystall Street

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
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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

APPENDIX VII

ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene ⁽ⁱⁱⁱ⁾	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C ₅ -C ₆ (aliphatic)	
TPH C ₆ -C ₈ (aliphatic)	
TPH C ₈ -C ₁₀ (aliphatic)	
TPH C ₁₀ -C ₁₂ (aliphatic)	
TPH C ₁₂ -C ₁₆ (aromatic)	
TPH C ₁₆ -C ₂₁ (aromatic)	
TPH C ₂₁ -C ₃₅ (aromatic)	



APPENDIX VIII

GEOTECHNICAL TESTING

RESULTS



LABORATORY REPORT



4043

Contract Number: PSL22/0899

Report Date: 15 March 2022

Client's Reference:

Client Name: E3P
Taylor Road
Urmston
Manchester
M41 7JQ

For the attention of: Eleanor Canham

Contract Title: Laystall Street

Date Received: 4/2/2022
Date Commenced: 4/2/2022
Date Completed: 10/3/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Senior Technician)

S Eyre
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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Laystall Street

Contract No:

PSL22/0899

Client Ref:

000418

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



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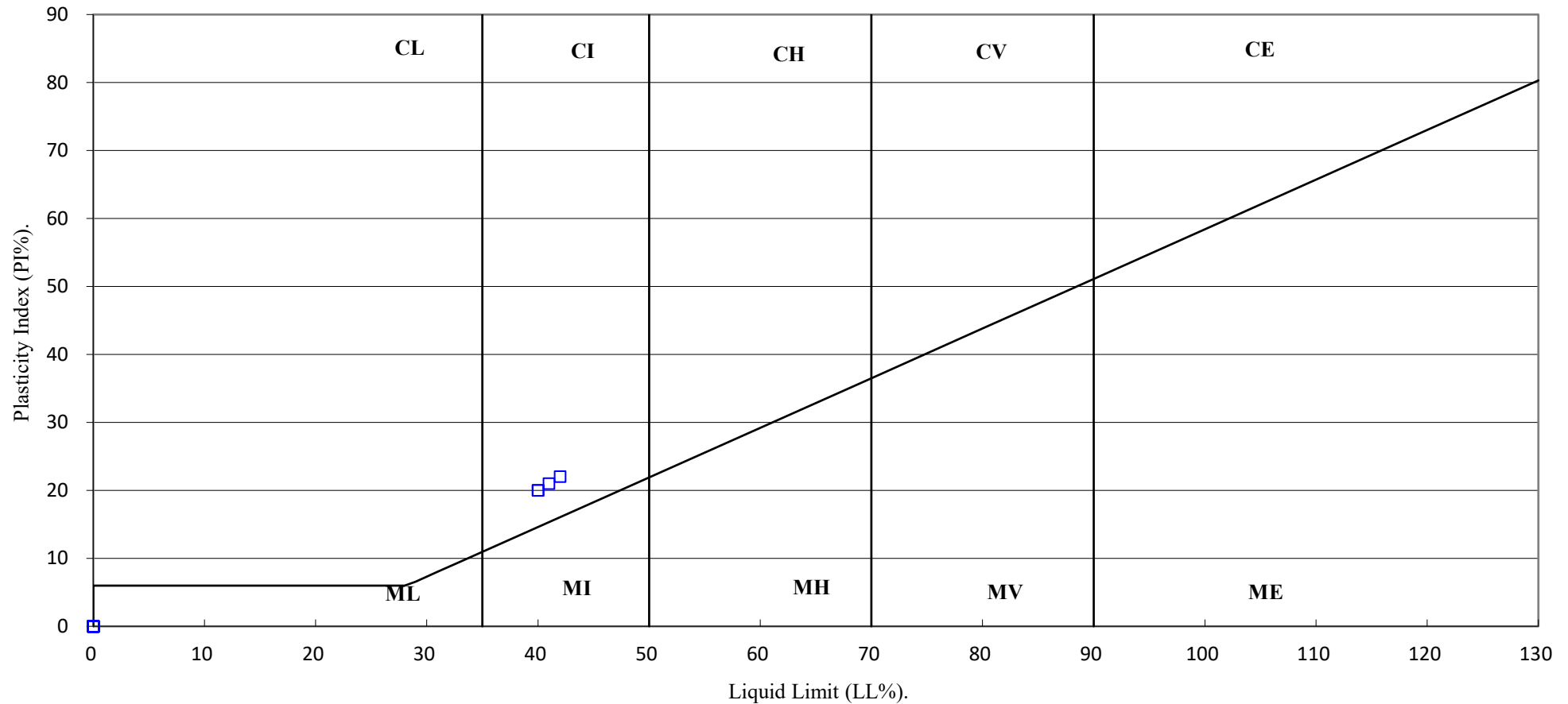
Contract No:

PSL22/0899

Client Ref:

000418

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

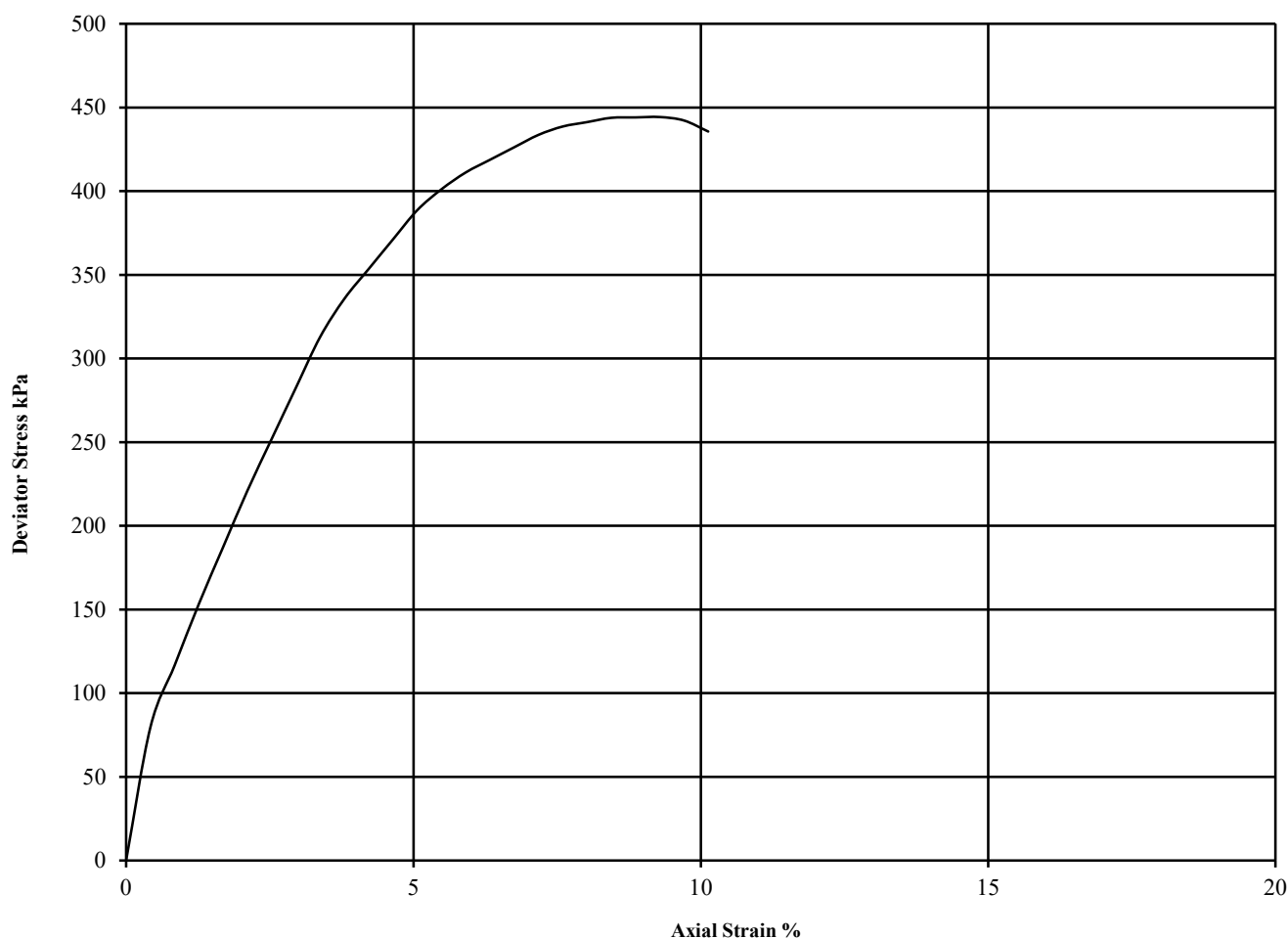
Hole Number: WS104

Top Depth (m): 2.50

Sample Number:

Base Depth (m): 3.00

Sample Type U



Diameter (mm):		65	Height (mm):		154	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.54 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	17	1.93	1.65	55	444	222	9.3	Brittle	

* Single stage test due to early brittle failure



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ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: WS104

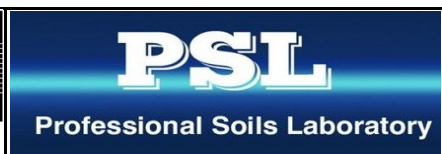
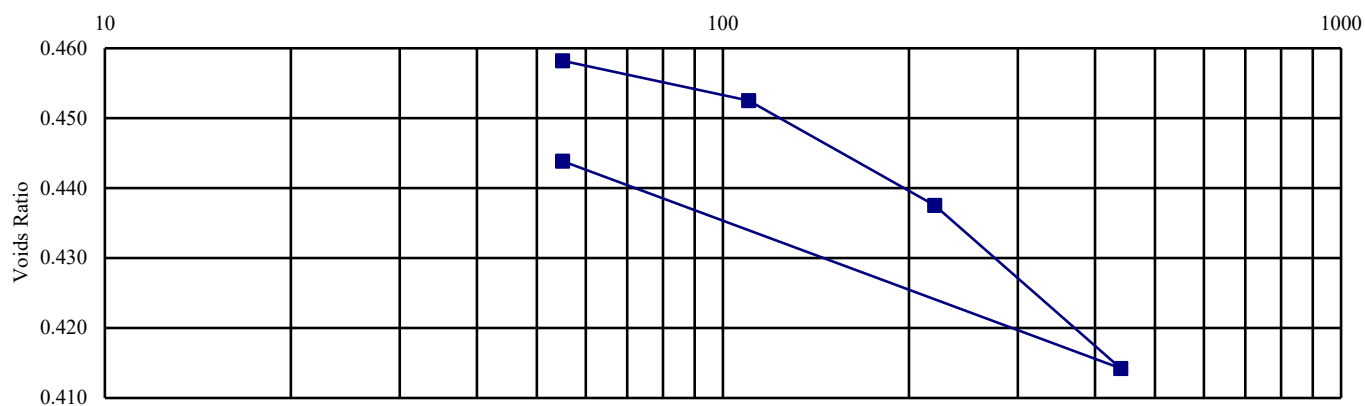
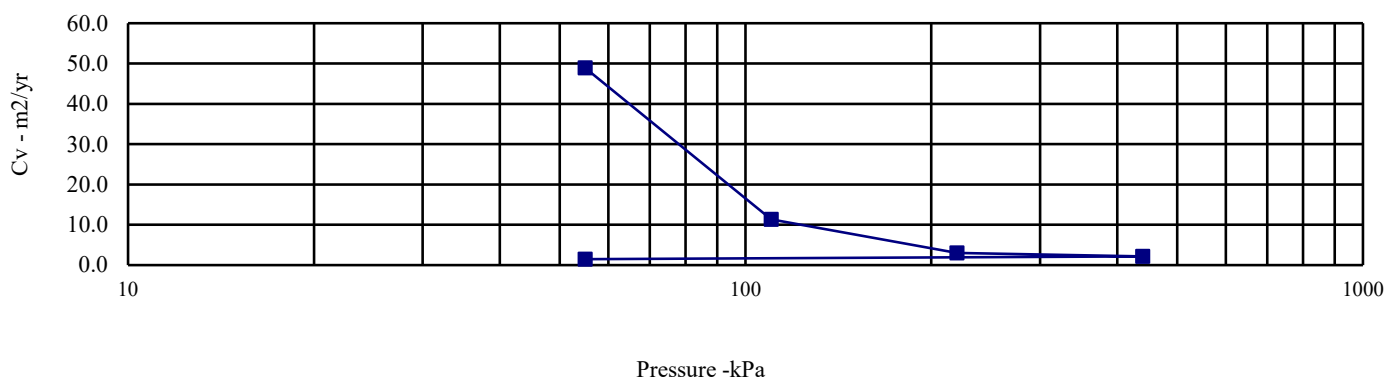
Top Depth (m): 2.50

Sample Number:

Base Depth (m) : 3.00

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	17	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.12	0	55	0.062	48.896	Method used to	
Dry Density (Mg/m3):	1.81	55	110	0.071	11.361	determine CV:	T90
Voids Ratio:	0.463	110	220	0.094	3.041	Nominal temperature	
Degree of saturation:	98.7	220	440	0.074	2.140	during test ' C:	20
Height (mm):	20.1	440	55	0.054	1.474	Remarks:	
Diameter (mm)	50.04					See summary of soil descriptions	
Particle Density (Mg/m3):	2.65						
Assumed							



Laystall Street

Contract No:

PSL22/0899

Client Ref:

'000418

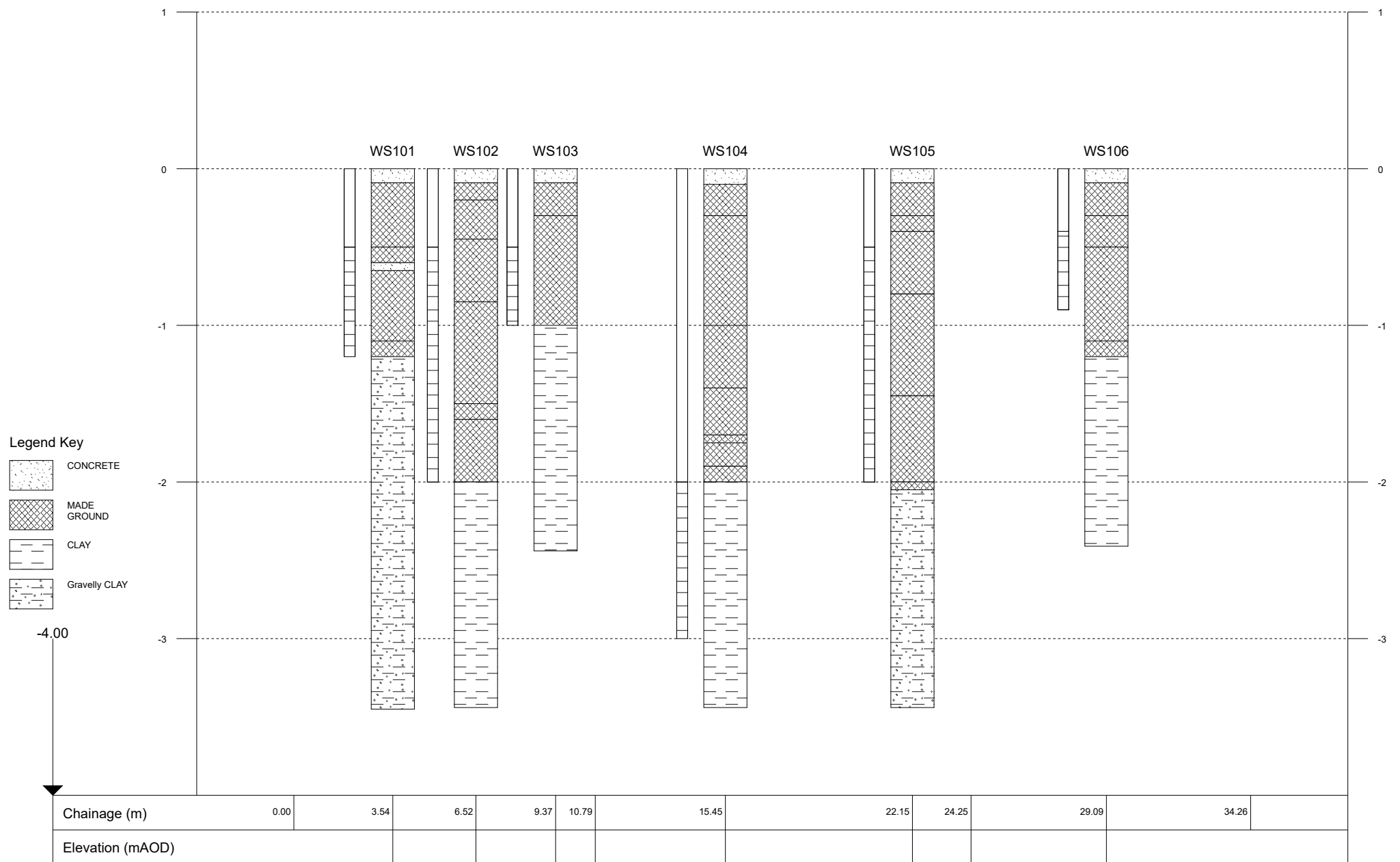
APPENDIX IX GEOLOGICAL CROSS SECTIONS

Title: Section line 1

Vertical Scale: 1:33

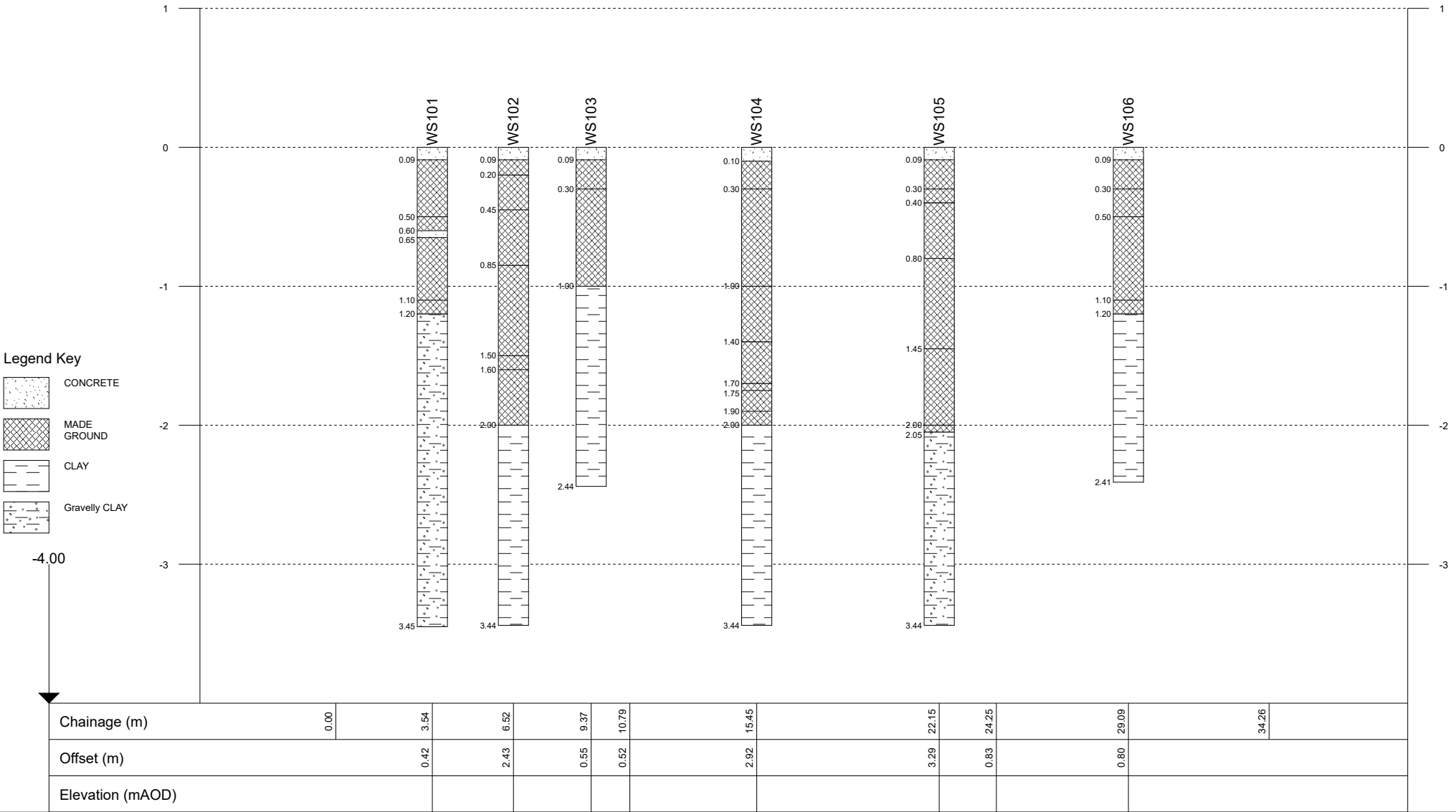
Horizontal Scale: 1:185

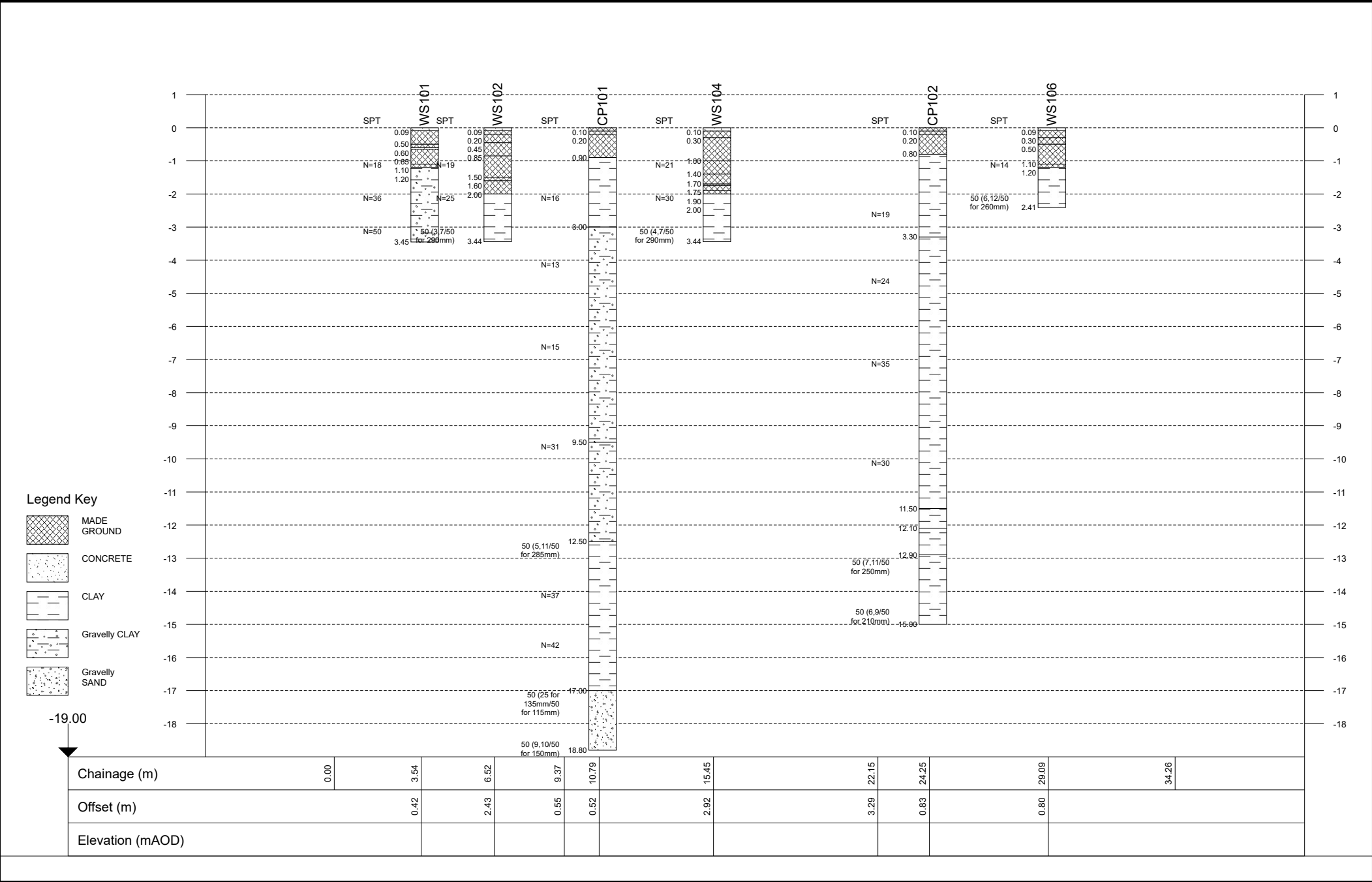
Engineer:

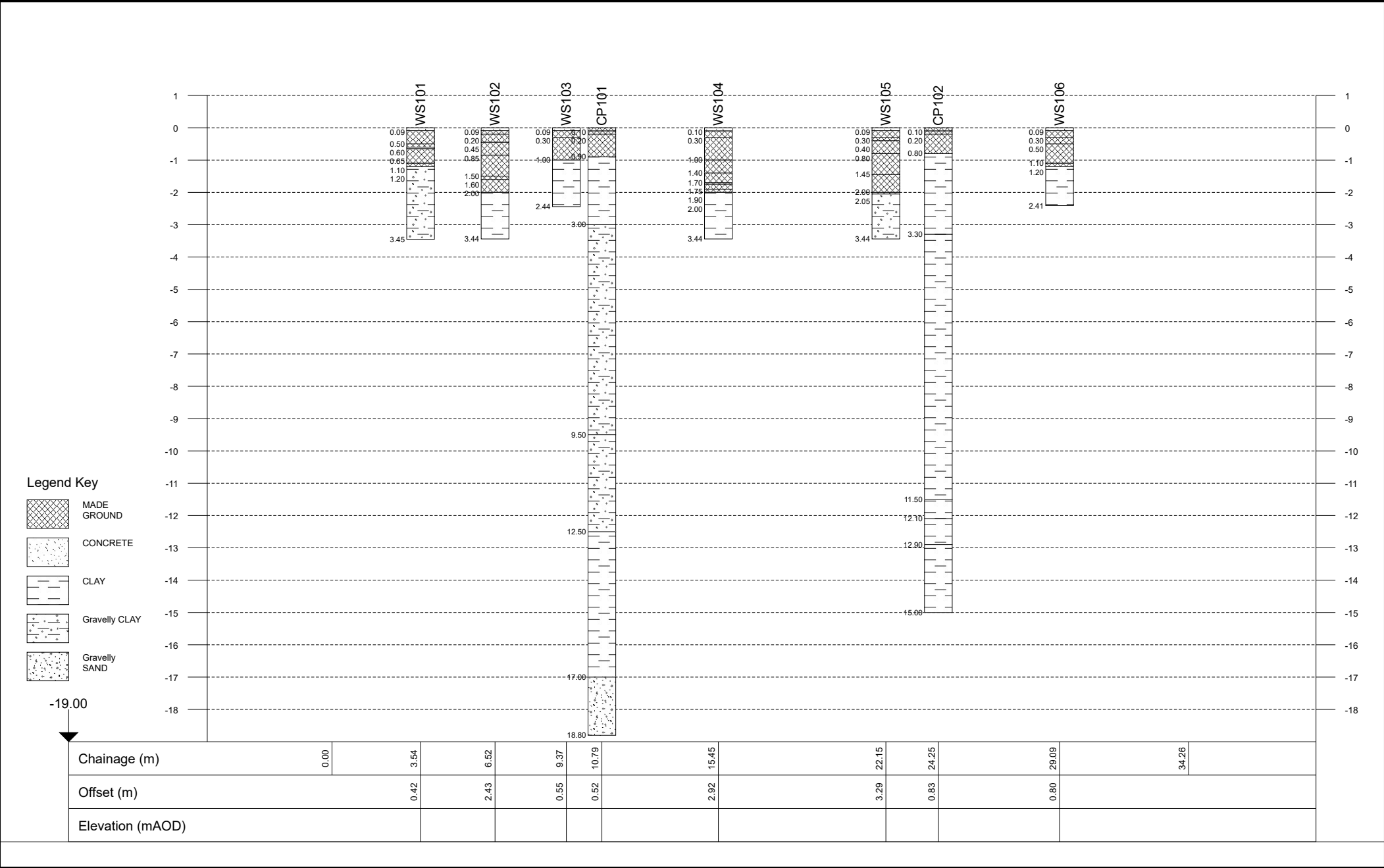


Project Id: 15140
Project Title: Laystall Street
Location: Manchester
Client: Great Places Housing Group

Title: Section line 1
Vertical Scale: 1:39
Horizontal Scale: 1:199
Engineer:







APPENDIX X

CONTROLLED WATERS

SCREENING TOOLS

(m-BAT Assessment and
Pb Screening Tool)

Metal Bioavailability Assessment Tool (M-BAT)

[Back](#)

Calculate

Clear Data

[illegible]

Pb Screening Tool 1.0

Back

Calculate

Clear Data

[illegible]