PHASE II SITE INVESTIGATION REPORT
OF LAND AT
PLANT HILL ROAD
MANCHESTER

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1.0 INTRODUCTION

1.1 Instruction

1.1.1 GeoCon Site Investigations Ltd (GeoCon) have been commissioned by Shape Consulting Engineers to undertake a Phase II Geoenvironmental Site Investigation on land at a former police station at Plant Hill Road, Manchester.

1.1.2 It is understood that this is required following the results of a Phase I Preliminary Risk Assessment carried out by Curtins in May 2021, referenced 077873-CUR-00-XX-RP-GE-014, which should be referred to in conjunction with this report.

1.1.3 This report is therefore provided to establish the potential for contamination at the site as a result of current and historic land uses both on site and within influencing distance of the site, to understand the type nature and extent of contamination present, and, to identify the ground conditions and provide details of the engineering properties of the underlying soils and rocks encountered with subsequent recommendations on suitable foundation solutions for the proposed development.

1.1.4 This report is written in accordance with the guidance set out in Land Contamination Risk Management (LCRM), Guiding Principles for Land Contamination (GPLC) 1 – 3, and the National Planning Policy Framework (NPPF).

1.2 Scope of Works

1.2.1 Prior to commencing the site works the proposed scope of investigation was as follows, however the proposed scope will be subject to change dependent upon site conditions, access, restrictions and obstructions. The actual works undertaken following the completion of the site works and any on site amendments are detailed in section 3.0.

- Ten dynamic sample boreholes to a nominal depth of up to 5.45mbgl or refusal.
- Insitu environmental and geotechnical sampling, and insitu geotechnical testing.
- Full supervision of all works by engineering geologist including sampling and detailed geotechnical descriptions to BS5930, EN ISO 14688-1 EN ISO 14688-2 and EN ISO 14689 of all strata types encountered within the exploratory holes.
- The installation of four gas and groundwater monitoring wells to a nominal depth of up to 5.00mbgl.
- Subsequent groundwater monitoring on six occasions over a three month period in accordance with CIRIA 665 commencing approximately one week after the completion of the ground investigation.
- A suite of chemical laboratory analysis.
- A suite of geotechnical laboratory analysis.
- Production of an interpretative report including Generic Quantitative Risk Assessment (GQRA) and updated Conceptual Site Model (CSM), and ground gas risk assessment, and geotechnical assessment.

1.3 Previous Investigations

1.3.1 GeoCon are in general agreement with the previous Phase 1 report carried out by Curtins in May 2021. The findings of the previous report are summarised below.

1.3.2 Due to the sites historical use and the historical surrounding land uses the risk to site end users is considered Moderate/Low in respect to contamination within any Made Ground.

1.3.3 The nearest historical landfills are recorded at 13m south and 41m northeast of the site. A water course 41m east of the south was backfilled in the 1950's.

1.3.4 The site is recorded as being underlain by superficial deposits of a Secondary Undifferentiated Aquifer and a bedrock of a Secondary B Aquifer. The site is not located within a Source Protection Zone and there are no potable groundwater abstraction points within 500m.

1.3.5 The nearest surface water feature is 154m to the southeast which flows south. There are no surface abstraction points within 1km.

1.3.6 The Site lies within a Coal Minig reporting area, however the Pennine Lower and Middle Coal Measures Formation and associated mine entries, coal outcrops and probable shallow coal mine workings are located from 1km to the north east, therefore risk from shallow coal mining is considered to be low.

1.4 Reliance and Limitations

1.4.1 This report has been prepared using published information and information provided by the Client and their professional advisers which has been made available to GeoCon at the time of writing only. GeoCon accepts no liability for any changes resulting from new information which has become available since this time.

1.4.2 This report is provided for the sole use of the client and their professional advisors and is confidential to them unless agreed otherwise in writing. This report may only be used and relied on once the work has been paid for in full.

1.4.3 GeoCon owes no duty of care and has no liability to any third party who is not authorised by GeoCon to use this report. Any unauthorised third parties using information contained in this report do so at their own risk.

1.4.4 This assessment has been carried out to determine the potential risks posed to future end users, along with other key receptors, resulting from potential contamination at the site, based on the proposed development. Should any revisions in the development proposals result in a change any assessment parameters detailed in this report, a re-assessment of the risk should be carried out.

1.4.5 Whilst this report may reference observations made regarding the presence of features/ issues such as invasive species, ACM, site drainage and evidence of structural abnormalities, this report does not constitute specialist surveys on these matters. Should further specialist surveys be carried out in this regard, the findings of these should be reported to GeoCon so that we may determine if this has any impact on the findings of this report.

1.4.6 The assessment and interpretation of the factual data obtained as part of this Phase II Site Investigation has been undertaken in accordance with standard consulting practice and with current national and international guidance.

1.4.7 This report presents the observations made during the Phase II Site Investigation and the factual data obtained. The conclusions and recommendations in this report are limited to those which can be made based on the findings of the survey and information provided by third parties. GeoCon assumes all third party data to be true and correct. No responsibility can be accepted by GeoCon for inaccuracies in the information provided by any other party.

1.4.8 This report is written in the context of an agreed scope of works and should not be used in a different context. Furthermore, new information, improved practices, and changes in legislation may require the reinterpretation of the report in whole or in part after its original issue. GeoCon reserve the right to alter

their conclusions and recommendations in the light of further information that may become available. This report is provided for the sole use of the client and their professional advisers and is confidential to them unless agreed otherwise in writing.

1.4.9 Ground conditions can be variable and change rapidly, especially in areas of Made Ground, however it is assumed that the ground conditions encountered and observed are typical and representative of the site as a whole. Most specifically with regard to this limited investigation, the ground conditions have been determined from a limited number of exploratory holes formed across the site, therefore only a small percentage of the total area of the site has been investigated. Interpolation between exploratory holes has enabled a general picture of the subsurface conditions to be produced. Conclusions drawn from the ground investigation should be read in this context. GeoCon cannot accept responsibility for any situations resulting from locally unforeseen ground conditions occurring between exploratory holes.

1.4.10 In addition, subsurface conditions including contaminant concentrations and groundwater levels may vary spatially with time. This factor should be given due consideration in the event that the information contained within this report is used after any significant period of time has elapsed.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

2.1.1 The site is located at the former police station at Plant Hill Road, Manchester, at approximate National Grid Reference NGR: SD 85190:03449 (centre of the site).

2.1.2 A site location plan is presented as Drawing No. GSI 1941/01 in Appendix A.

2.2 Site Description

2.2.1 The site is an irregular shaped piece of land with an approximate area of 0.19Ha.

2.2.2 The topography of the site is generally flat with localised undulations. Surrounding elevation slightly decreases towards the north.

2.2.3 The site is currently occupied by a derelict former police station with mixed hardstanding and soft landscaping overgrown with grass and shrubs. One storey building is located in the east of site which at the time of the walkover was boarded up. Underground tanks can be seen in the southwest of site.

2.2.4 An approximate distribution of the surface covering is given below in Table 2.1: Site Surface Covering.

Table 2.1: Site Surface Covering

Type of Surface Cover	Distribution (%)
Soft Ground (grassed and landscaped areas)	10
Hardstanding	50
Roadways	0
Buildings	40
Water (ponds, streams)	0

2.2.5 The site is bound by Bank House Road to the east, Plant Hill Road in the south. The north is bound by a bricked wall separating the primary school and site. A one storey building separates the western boundary of site and adjacent mature tree line.

2.2.6 Access to the site is via Plant Hill Road from the south through two double metal padlocked gates.

2.2.7 A selection of photographs from the site walkover are presented as GSI 1941/02 in Appendix B.

2.3 Surrounding Area

2.3.1 The current surrounding land use to the site is generally a mixture of residential and commercial properties towards the north and west. Mature forest and playing fields south and east of site.

2.3.2 The topography of the surrounding area is generally flat; contour maps show a slight decline in elevation to the south east.

2.4 Future Site Usage

2.4.1 It is currently proposed to construct 21 housing units including a mixture of 1 bed 2 person units and 2 bed 3 person units: Development at the site includes a partial demolition of the existing police station on site, as shown on drawing (ref: E1236 – Plant Hill Road, Manchester) and contained with Appendix A.

3.0 GROUND INVESTIGATION

3.1 General

3.1.1 The intrusive investigation was carried out between 30th and 31st September 2023.

3.1.2 The specification and scope of works for the ground investigation has been provided by GeoCon.

3.1.3 The ground investigation has been carried out in accordance with BS5930 and the UK Specification for Ground Investigation Second Edition 2012.

3.1.4 All strata descriptions were undertaken in accordance with BS5930 Amendment 1; EN ISO 14688 -1; EN ISO 14688 -2; and EN ISO 14689.

3.1.5 The final scope of the ground investigation was as per the scope of works as defined in section 1.2.

3.1.6 The ground investigation was carried out to determine the geotechnical and geoenvironmental properties of the soils and rock beneath the site for a proposed residential development at the site.

3.1.7 The locations of the exploratory holes were specified by GeoCon and were positioned to gain key information beneath the site in relation to the proposed development.

3.1.8 All locations were checked against buried service location plans and then scanned with a Cable Avoidance Tool (CAT) and Genny prior to excavation, and a permit to dig was then issued. Each location was then continued by hand down to a minimum of 1.20mbgl to clear any buried services or other subsurface obstructions. All locations were then checked again with a Cable Avoidance Tool (CAT) at the base of the hand excavated inspection pit by GeoCon prior to commencement of drilling.

3.1.9 All access permissions were arranged by Shape Consulting Engineers prior to the ground investigation commencing.

3.1.10 An exploratory hole location plan is presented in Appendix A as drawing number GSI 1941/02.

3.2 Dynamic Sample Boreholes

3.2.1 Ten dynamic sample boreholes were drilled at the site referenced DS01 to DS10 and were drilled to depths of between 1.00 and 5.45mbgl.

3.2.2 The Dynamic sample boreholes were drilled using a tracked Dynamic sample rig in order to facilitate geoenvironmental sampling and to gain an understanding of the environmental and geotechnical properties of the soils and rock beneath the site, and to facilitate the installation of groundwater monitoring standpipes.

3.2.3 The dynamic sample boreholes were drilled using 100mm diameter barrel reducing in size with depth. to achieve the target depths.

3.2.4 All dynamic sample borehole logs are presented in Appendix B.

3.3 Sampling and Insitu Testing

3.3.1 The environmental and geotechnical sampling regime and insitu testing regime included the following:

- Environmental samples for subsequent chemical analysis were taken from each strata type, with a minimum of three samples taken from the upper 1.00 m, then at 1.00 m intervals in Made Ground with a minimum of one sample from the natural strata.

- Small disturbed samples taken from each strata type and then at 1.00 m intervals thereafter.
- Bulk disturbed samples taken at 1.00 m intervals to a depth of 5.00 mbgl, then 1.50 m intervals thereafter
- Insitu Standard Penetration Tests (SPTs) were carried out at 1.00 m intervals down to 5.00 mbgl and at 1.50 m intervals thereafter in granular soils to collate insitu strength information (relative density) for the soils beneath the site.

3.3.2 Soil samples were collected for environmental and geotechnical analysis by the engineering geologist on site based on physical and visual inspection in addition to standard sampling.

3.3.3 All samples were stored in pre-chilled cool-boxes prior to immediate dispatch to laboratory. Where there has been a delay in transporting the samples to the laboratory, samples have been kept in a cool dark storage unit inside cool boxes packed with ice, which is regularly replaced to maintain sample quality.

3.3.4 The environmental samples were subsequently transported to a chemical laboratory in plastic tubs, glass jars and soils vials. The geotechnical samples were subsequently transported to a geotechnical laboratory in prepared bulk bags and plastic tubs.

3.4 Installations and Backfill

3.4.1 Four of the dynamic sample boreholes were installed with combined gas and ground water monitoring standpipes. The details of the gas and ground water monitoring standpipes are summarised below in **Error! Reference source not found.**Table 3.1: Gas and Groundwater Monitoring Installations:

Table 3.1: Gas and Groundwater Monitoring Installations

BH ID	Installation Depth (mbgl)	Response Zone (mbgl)	Installation Date	Strata	Comments
DS01	5.00	1.00-4.00	30/08/23	Natural Clay	N/A
DS04	4.00	1.00-4.00	30/08/23	Natural Clay	N/A
DS06	4.50	1.00-4.50	31/08/23	Natural Clay	N/A
DS07	4.00	1.00-4.00	31/08/23	Natural Clay	N/A

3.4.2 Full details of the installations and backfill are presented on the relevant exploratory hole logs.

3.4.3 All monitoring standpipes are constructed using 50mm slotted pipe with a Geosock filter and gravel surround medium within the response zone, and 50mm plain pipe with a bentonite seal above the response zone (minimum 0.50m thick).

3.4.4 All remaining exploratory holes were backfilled with arisings and made level at the surface to a similar condition as prior to the work.

3.5 Groundwater

3.5.1 Where groundwater was encountered a waiting period of 20 minutes was allowed to monitor any change (rise or fall) in the levels of each groundwater strike.

3.6 Groundwater Monitoring

3.6.1 Groundwater monitoring has been carried out across the site on six occasions in conjunction with the gas monitoring regime, to establish the standing water levels beneath the site, and facilitate groundwater sampling.

3.7 Laboratory testing

3.7.1 Chemical laboratory testing was subsequently carried out on selected samples of soil. Further details of the chemical laboratory testing are given within section 5.0 – Chemical Testing and Results.

3.7.2 All chemical laboratory testing has been scheduled by GeoCon.

3.7.3 Geotechnical laboratory testing was subsequently carried out on selected samples of soil. Further details of the geotechnical laboratory testing are given within section 7.0 – Geotechnical Testing and Results.

3.7.4 All geotechnical laboratory testing has been scheduled by GeoCon.

3.8 Restrictions

3.8.1 No restrictions were encountered during this site investigation that would have prevented parts of the site being accessed and consequently resulting in any of the exploratory locations being abandoned.

4.0 GROUND CONDITIONS

4.1 Published Geology

4.1.1 The British Geological Survey shows the site to be underlain by the geological succession outlined below **Error! Reference source not found.**

Table 4.1: Published Geology

Geology	Description /strata	BGS General Description (Lexicon)
Artificial	None recorded	N/A
Superficial	Till	No BGS description is available; however, these deposits are generally gravelly clay with cobbles and varying silt sand and gravel content.
Bedrock	Manchester Marls Formation	Red Marl (calcareous mudstone and siltstone) with thin beds of fossiliferous marine limestone and dolomite.

4.2 General

4.2.1 A generalised summary of the ground conditions encountered, depths to base, and thickness recorded from the exploratory hole records is presented below in Table 4.2: Summary of Ground Conditions.

Table 4.2: Summary of Ground Conditions

Geology / Strata	Depth (mbgl)				Thickness (m)		Locations encountered
	Top		Base		Min	Max	
	Min	Max	Min	Max			
Made Ground	0.00	-	0.30	1.00	0.30	1.00	All Exploratory Locations
Till	0.30	1.00	4.45	5.45	3.45	5.15	DS01, DS03, DS04, DS05, DS06, DS07, DS08, DS09, DS10
Groundwater	**Strike depth (mbgl)**		**Rest Level (mbgl)**		**Locations encountered**		
	Min	**Max**	**Min**	**Max**			
Seepage	-	-	-	-	Not encountered		
Strike	1.00	2.00	-	-	DS01, DS02, DS05, DS06, DS07, DS08, DS09, DS10		
SWL only (no obvious strike)	-	-	-	-	Not encountered		

4.2.2 The general ground conditions encountered have been summarised below.

4.2.3 Detailed strata descriptions are presented on the dynamic sample borehole logs presented in Appendix B.

4.3 Made Ground

4.3.1 Made Ground was encountered in DS01 to DS08 exploratory hole locations from ground level to depths of between, 0.30 and 1.00mbgl.

Hardstanding:

4.3.2 Hardstanding was encountered in DS01 to DS08 from ground level to depths of between 0.05 and 0.15mbgl, and generally comprised asphalt and concrete.

Granular Made Ground:

4.3.3 Granular Made Ground materials were encountered in DS01 to DS08 and DS10 beneath the topsoil or hardstanding to depths of between 0.30 and 1.00mbgl, and generally comprised sandy gravel with fragments of brick, asphalt, and concrete.

Cohesive Made Ground:

4.3.4 Cohesive Made Ground materials were encountered DS06, DS07, DS09 from beneath the topsoil or hardstanding to depths of between 0.10 and 1.00mbgl, and generally comprised sandy gravelly clay with fragments of brick.

4.4 Topsoil

4.4.1 Topsoil was encountered in DS09 and DS10 from ground level to depths of 0.10 mbgl, and generally comprised sandy gravelly clay, with frequent rootlets.

4.5 Superficial Deposits

4.5.1 Clay deposits were encountered in all locations, with exception of DS02, directly beneath the made ground or sand deposits and were unproven to depths of between 0.50 and 5.45mbgl, and generally comprised soft to very stiff sandy gravelly clay.

4.5.2 Sand deposits were encountered in DS01, DS09, DS10 directly beneath the clay or made ground deposits and were proven to depths of between 0.30 and 5.45mbgl, and generally comprised medium dense gravelly sand.

4.5.3 These soils are considered to represent the superficial Till.

4.6 Bedrock

4.6.1 Bedrock was not encountered during this ground investigation.

4.7 Groundwater

4.7.1 Groundwater was encountered in eight of the ten exploratory holes formed across the site. Further details are as follows:-

- DS01 – strike at 2.00mbgl remaining stable after 20 minutes.
- DS02 – strike at 1.00mbgl remaining stable after 20 minutes.
- DS05 – strike at 2.00mbgl remaining stable after 20 minutes.
- DS06 – strike at 2.00mbgl remaining stable after 20 minutes.
- DS07 – strike at 2.00mbgl remaining stable after 20 minutes.
- DS08 – strike at 1.00mbgl remaining stable after 20 minutes.
- DS09 – strike at 2.00mbgl remaining stable after 20 minutes.
- DS10 – strike at 2.00mbgl remaining stable after 20 minutes.

4.8 Groundwater Monitoring

4.8.1 A groundwater monitoring regime was carried out at the site to establish the ground water levels beneath the site, which included monitoring on six occasions. Table 4.3: Groundwater Monitoring

Results, below presents the details of the groundwater monitoring regime. All boreholes were purged and developed accordingly to prior to the groundwater monitoring.

Table 4.3: Groundwater Monitoring Results

Exploratory Hole ID	Base of Hole (mbgl)	Standing Water Level (SWL) (mbgl)					
		Date of Visit					
		08/09/23	22/09/23	11/10/23	20/10/23	03/11/23	17/11/23
DS01	4.80	4.20	4.16	4.10	4.10	4.22	4.23
DS04	3.95	Dry	3.94	3.70	3.67	3.70	3.90
DS06	3.88	0.79	0.79	0.70	0.80	0.90	0.59
DS07	3.66	0.95	0.68	0.63	0.53	0.63	0.60

N/R = Not recorded

4.9 Obstructions

4.9.1 No obstructions were encountered during this ground investigation.

4.10 Contamination

4.10.1 No visual or olfactory evidence of contamination was encountered or observed during this ground investigation, in particular no obvious visual or olfactory evidence of mobile contamination was observed during the ground investigation.

5.0 CHEMICAL TESTING AND RESULTS

5.1 General

5.1.1 All samples were sent to a UKAS accredited chemical testing laboratory, and MCERTS were used where available. The analytical strategy focussed on a general suite of potential contaminants and the analytical suites are summarised in Table 5.1: Summary of Chemical Testing Suite. Chemical results have been screened against current guideline values where applicable for a residential end use.

5.1.2 All chemical testing results are presented in Appendix C.

Table 5.1: Summary of Chemical Testing Suite

Testing	Comment	No. of soil samples analysed
General heavy metals and inorganics suite including: Arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, phenol, selenium, zinc, pH, and water soluble sulphate	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	7
Speciated PAH	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	7
TPH CWG	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	4
Asbestos Screen	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	7

5.2 Chemical Testing Results - Soil

5.2.1 Only detectable concentrations of contaminants reported above the laboratory detection limits are presented below in Table 5.2: Summary of Soil Chemical Testing Results. All other samples recorded contaminant concentrations below laboratory detection limits.

5.2.2 All chemical results have initially been compared against screening criteria for a residential end use with plant.

5.2.3 Total Organic Carbon (TOC) was analysed in all three samples from the site. The results of the TOC recorded values between 0.5 and 2.9%. From this Soil Organic Matter (SOM has been calculated at values of between 0.86 and 5.00. Therefore, a worst-case scenario of 1% SOM has been used where appropriate in the chemical assessment overleaf.

Table 5.2: Summary of Soil Chemical Testing Results

Determinand	No. Of samples analysed	Screening value (mg/kg) (where applicable)	Determinand concentration range (mg/kg)		No of Samples exceeding screening value
			Min	Max	
Cyanide (total)	7	34	BD	BD	0
Phenols - Total by HPLC	7	280	BD	BD	0
Arsenic	7	37	2.4	19	0

Cadmium	7	11	BD	1.4	0
Copper	7	2400	14	61	0
Chromium	7	910	5.1	28	0
Hexvalent Chromium	7	6	BD	BD	0
Lead	7	210	13	330	**3**
Mercury	7	1.2	BD	0.9	0
Nickel	7	180	4.4	98	0
Selenium	7	250	BD	BD	0
Zinc	7	3700	15	150	0
Acenaphthene	7	210	BD	0.16	0
Acenaphthylene	7	170	0.05	1.3	0
Anthracene	7	2400	BD	0.31	0
Benzo(a)anthracene	7	7.2	BD	0.5	0
Benzo(a)pyrene	7	2.2	BD	0.91	0
Benzo(b)fluoranthene	7	2.6	BD	0.90	0
Benzo(ghi)perylene	7	320	BD	0.82	0
Benzo(k)fluoranthene	7	77	BD	0.4	0
Chrysene	7	15	BD	0.58	0
Dibenzo(ah)anthracene	7	0.24	BD	0.17	0
Fluoranthene	7	280	0.08	1.2	0
Fluorene	7	170	BD	0.12	0
Indeno(123-cd) pyrene	7	27	BD	0.65	0
Naphthalene	7	2.3	BD	0.12	0
Phenanthrene	7	95	0.05	0.77	0
Pyrene	7	620	0.08	1.1	0
Ali >C5-C6	4	42	0.1	0.1	0
Ali >C6-C8	4	100	0.1	0.1	0
Ali >C8-C10	4	27	0.1	0.1	0
Ali >C10-C12	4	130	1	1	0
Ali >C12-C16	4	1100	2	3.2	0
Ali >C16-C21	4	260	8	12	0
Ali >C21-C35	4	1100	8	47	0
Aro >C5-C7	4	70	0.1	0.1	0
Aro >C7-C8	4	130	0.1	0.1	0
Aro >C8-C10	4	34	0.1	0.1	0
Aro >C10-C12	4	74	1	1	0
Aro >C12-C16	4	140	2	2	0
Aro >C16-C21	4	260	10	10	0
Aro >C21-C35	4	1100	10	67	0
BTEX - Benzene	4	0.087	BD	BD	0
BTEX - Toluene	4	130	BD	BD	0
BTEX - Ethyl Benzene	4	47	BD	BD	0
BTEX - m & p Xylene	4	56	BD	BD	0
BTEX - o Xylene	4	60	BD	BD	0
MTBE	4	27.6	BD	BD	0

BD = Below Detection

NGV = No Guideline Screening Value Available

5.2.4 Seven samples were analysed for asbestos screen. Loose fibres of chrysolite, were detected in one sample taken from DS03 at 0.40m.

6.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

6.1 Criteria for interpretation

6.1.1 The regime for contaminated land was set out in Part IIA of the Environmental Protection Act (EPA) 1990, as inserted by S.57 of The Environment Act 1995 and came into effect in England on 1st April 2000 as The Contaminated Land (England) Regulations 2000 (SI 2000/227). These regulations were subsequently updated with the provision of The Contaminated Land (England) Regulations 2006 (SI 2006/1380), which consolidated the previous regulations and amendments and added in provisions regarding radioactive contaminated land. These regulations came into force on 4th August 2006. This modified the wording for "Contaminated Land" under Part IIA of the EPA. Section 78A (2) defines contaminated land as "land which appears to be in such a condition, by reason of substances in, on or under the land, that:

- significant harm is being caused, or there is a significant possibility of significant harm being caused (SPOSH);

Human Health Receptors

6.1.2 An initial Generic Quantitative Risk Assessment (GQRA) for human health has been undertaken by comparison of the soil analytical results with published guidance criteria. These can be classified as Generic Assessment Criteria (GAC) or Soil Screening Values (SSV's) and are widely referred to by consultants, Regulatory Authorities and other professionals within the industry and include the following:

- Land Quality Management (LQM) Chartered Institute of Environmental Health (CIEH) have published a series of GACs / SSV's via the CLEA v1.06 software which are applicable to the UK for common determinands.
- Defra Category 4 Screening Levels 2014 (C4SL's) for assessment of land affected by contamination.
- Current published Soil Guideline Values (SGVs) published by the Environmental Agency (EA).
- Contaminated Land: Applications in Real Environments (CL:AIRE) 'The Soil Generic Assessment Criteria for Human Health Risk Assessment' GAC's via the CLEA v1.06 software (updated version of the v1.04 update after the release of LQM GAC's).

6.1.3 It should be noted that the above guidance criteria are generally restricted with depth i.e. the values quoted with reference to human health are generally only applicable in the top 1.00m of soil and do not (dependant on the conceptual site model and conditions identified on site) necessarily identify significant harm. Further detailed quantitative risk assessment (DQRA) may be required.

6.1.4 A list of the screening criteria used for soils is presented in Appendix D.

6.2 Risk to Human Health

6.2.1 The majority of the chemical determinands analysed recorded levels below the relevant screening criteria for a residential end use with plant uptake with the exception of Lead.

6.2.2 Elevated concentrations of the above determinands are listed below in Table 6.1: Chemical Determinands Exceeding Screening Criteria

Table 6.1: Chemical Determinands Exceeding Screening Criteria

Location ID	Depth Range (mbgl)	Determinand Concentration Result (mg/kg)
Lead - Screening Criteria = 210mg/kg		
DS03	0.40	330
DS06	0.30	260

DS07	0.70	270

6.2.3 Based on the above, contamination does appear to be present beneath part of the site within the Made Ground The elevated levels of contamination may represent either localised hotspots of contamination or could be representative of the site as a whole. At this stage it is not possible to determine the full extent of the soil contamination.

6.2.4 It is understood that the proposed development comprises residential properties with shared gardens and associated access road and driveways.

6.2.5 Therefore, a pollutant linkage is considered to be present and the risk to human end users are considered to be **moderate**[LD1] at this stage.

6.2.6 Risks to construction workers are considered to be **moderate**. All construction workers should wear appropriate Personal Protective Equipment (PPE) including latex gloves and dust masks. Provisions should be made for water on site to 'damp down' any dust in dry conditions.

6.2.7 Risks to neighbours / general public are considered to be **moderate**. Provisions should be made for water on site to 'damp down' any dust in dry conditions.

6.2.8 In areas where site soils are to be exposed at the surface such as areas of landscaping then these areas will need remedial action. Alternatively, additional sampling and analysis and further risk assessment could be undertaken to potentially reduce the volumes of soils requiring remedial action / removal from site and potentially delineate and reduce this area.

6.2.9 Possible remedial options at this stage would be as follows:

1. Made Ground materials are removed from the site and replaced with clean imported materials to provide a "cover system".
2. Alternative remediation of the site.

6.2.10 Based on the above, it is recommended that a remediation strategy is commissioned for the site and the proposed remedial design is agreed with the Local Planning Authority.

6.2.11 A watching brief should be maintained during construction to ensure that any unsuitable materials are removed at the time.

6.2.12 Should any erroneous materials or previously unidentified contamination be encountered during construction then further sampling and analysis may be required.

6.2.13 The above recommendations should be agreed in principle with the Local Planning Authority prior to development to avoid any delays or complications at a later stage.

6.3 Risk to Controlled Waters

Groundwater

6.3.1 The Environmental Agency aquifer classification scheme indicates that the superficial aquifer designation for the site is classed as Secondary Undifferentiated Aquifer and the bedrock aquifer designation for the site is classed as Secondary B Aquifer.

6.3.2 There are no licensed groundwater abstraction points within 1000m of the site.

6.3.3 The site is not located within a source protection zone (SPZ).

6.3.4 Therefore, based on the above information, the results of the soil testing, the generally impermeable geology beneath the site, and considering that natural attenuation, dilution and dispersion will take place, the risks to groundwater and drinking waters are considered to be **low** at this stage.

Surface Water

6.3.5 There are no major surface water courses within 250m of the site.

6.3.6 The nearest surface water feature to the site is unnamed body of water located approximately 154m to the southwest. The water source located a steady decline in elevation from site.

6.3.7 Therefore, based on the above information, the results of the soil testing, the distance of the surface water receptor to the site, and considering that natural attenuation, dilution and dispersion will take place, the risks to surface waters are considered to be **low** at this stage.

6.4 Ground Gas Risk Assessment

General

6.4.1 There are two historical landfill sites within 50m of the site boundary. There is an area of potentially infilled land located within 41m of the site.

6.4.2 Made Ground was also encountered beneath the site and was proven to depths of up to 1.00mbgl.

6.4.3 Gas monitoring has been carried out at the above site on six occasions over a three-month period to assess the risks to the proposed commercial development from potential hazardous ground gasses.

6.4.4 Ground gas monitoring standpipes have been installed at a depth of between 4.00-5.00mbgl with response zones placed within the Made Ground and natural deposits (where the Made Ground was less than 3.00m thick) beneath the site.

6.4.5 It is considered that hazardous ground gasses if present would migrate vertically upwards through the permeable sands beneath the site into the proposed development.

Results

6.4.6 The monitoring period has been carried between 8th September 2023 and 17th November 2023.

6.4.7 The following ground gas risk assessment was carried out in accordance with CIRIA 665, CIRIA 149 and BS 8485.

6.4.8 The full results of the gas monitoring regime are presented Appendix F, and are summarised below.

6.4.9 Where possible, monitoring has been carried out under a minimum of two occasions where low and falling atmospheric pressure were present together.

6.4.10 Methane concentrations ranged between 0.0 and 0.3 % v/v; Carbon dioxide concentrations ranged between 0.2 and 5.6 % v/v; oxygen concentrations ranged between 0.4 and 21.0% v/v; and flows were recorded between 0.00 and -5.00 l/hr during the monitoring period.

6.4.11 Gas concentrations recorded were fairly consistent with respect to each monitoring location during the monitoring period.

6.4.12 In the case of any negative flows, it should be assumed that any negative flows can become positive and therefore the any negative GSV's should be taken as positive.

6.4.13 Hydrogen sulphide concentrations were recorded at 0.00 ppm.

6.4.14 Carbon monoxide concentrations were recorded at 0.00ppm.

6.4.15 Based on these recorded values a maximum Gas Screening Values (GSVs) for methane were calculated at 0.00 l/hr; and a maximum GSV for carbon dioxide were calculated at 0.0018 and -0.0034 l/hr.

Conclusions and Recommendations

6.4.16 Based on the above information, elevated CO2 (>5.00%) was recorded on one occasion and the site has been categorised as falling under Characteristic Situation (CS2) low risk.

6.4.17 Low level gas protection measures are required. These measures include a membrane and sub-floor void to create a permeability contrast to limit the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. Ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours.

6.4.18 Professional advice should be sought from a suitably qualified structural engineer as to the appropriateness of any gas protection scheme to the intended construction. All gas protection measures should be designed by a competent person and they should refer to BS 8485 and BRE 414.

6.4.19 It is recommended that the above conclusions should be agreed with the local Planning Authority to gain their approval prior to commencing with the construction of the new development.

6.4.20 Following the installation of any gas resistant membranes the local authority may require verification to prove the membrane has been installed correctly.

6.4.21 With regards carbon monoxide: Information provided by the World Health Organisation (WHO) provides air quality guidelines for Europe 2000, which provides time weighted average exposures that have been determined in such a way that the carboxyhaemoglobin (COHb) level of 2.5% is not exceeded. These are as follows:

- 87ppm for 15 minutes
- 52ppm for 30 minutes
- 26ppm for one hour
- 9ppm for eight hours

6.4.22 In addition, recommended WHO European guidelines for indoor air quality is as follow:

- 6ppm for twenty four hours so as not to exceed 2% COHb for chronic exposure.

6.4.23 CIRIA 665 provides occupational exposures limits for carbon monoxide of 200ppm for short term exposure and 30ppm for long term exposure.

6.4.24 Based on the above, the risks from carbon monoxide are considered to be **very low**.

6.4.25 Therefore, based on the above results, no protection is considered necessary against carbon monoxide.

6.4.26 With regards hydrogen sulphide: Information taken directly from the HSE (Health & Safety Executive) Online provides the following:

- 0.0047 ppm is the recognition threshold of human smell, the concentration at which 50% of humans can detect the characteristic odour of hydrogen sulphide.
- 10-20 ppm is the borderline concentration for eye irritation.
- 50-100 ppm leads to eye damage.

- At 150-250 ppm the olfactory nerve is paralyzed after a few inhalations, and the sense of smell disappears, often together with awareness of danger.
- 320-530 ppm leads to pulmonary edema with the possibility of death.
- 530-1000 ppm causes strong stimulation of the central nervous system and rapid breathing, leading to loss of breathing.
- Concentrations over 1000 ppm cause immediate collapse with loss of breathing, even after inhalation of a single breath.

6.4.27 CIRIA 665 provides occupational exposures limits for hydrogen sulphide of 10ppm for short term exposure and 5ppm for long term exposure.

6.4.28 Based on the above, the risks from hydrogen sulphide are considered to be **very low**.

6.4.29 Therefore, based on the above results, no protection is considered necessary against hydrogen sulphide.

6.5 Plants and Native grasses

6.5.1 Any plants that may be grown at the site in areas of landscaping may potentially be at risk from phytotoxic elements in any artificial soils beneath the site. Guideline screening values are currently available for copper, nickel and zinc which are considered to be the most harmful to plant life.

6.5.2 All three chemical Determinands recorded levels below the relevant phytotoxic screening criteria. In addition, all plant growth appeared normal during the site walkover. Given the above and the generally low potential for contamination and the results of the wider soil analysis, the risks to plants and native grasses are considered to be very low. These risks will be mitigated by the remedial measures set out in section 6.2.9 above.

6.6 Buried Services and Utilities

6.6.1 Any organic contamination present in the soils or groundwater beneath the site would pose a risk of premature failure to below ground services via chemical reaction. Based on the chemical analysis carried out during this ground investigation, the risks to buried services and pipelines are considered to be **low**.

6.6.2 It is the responsibility of the utility providers to confirm the risk status and determine what materials should be used in the provision of any newly proposed buried services and utilities based on the results of the chemical analysis with this report. A copy of this report should therefore be provided to the utility contractors.

6.6.3 It is recommended that prior to the placement of any newly proposed buried services, that adequate testing of the soils of which the pipes / cables will be laid in is carried out to determine the suitability of those soils for the utility provider's equipment.

6.7 Updated Conceptual Site Model (CSM)

6.7.1 Following the results of the site investigation and above assessment, an updated Conceptual Site Model (CSM) has been produced overleaf as Table 6.3: Updated Conceptual Site Model (CSM).

Table 6.3: Updated Conceptual Site Model (CSM)

Potential Sources	Contaminants of Concern	Potential Pathway	Potential Receptor	Potential Pollutant Linkage	Probability	Consequence	Risk Classification	Action / Mitigation / Justification
Made Ground both on site and within influencing distance of the site Current and former land uses both on site and within influencing distance of the site	Heavy metals, sulphates and inorganics PAH's Asbestos	Ingestion Inhalation Dermal Contact	**Human health** Including current site users, future site users	Considered potentially active	Likely	Medium	**Moderate**	Contamination has been identified at the site; therefore remedial measures will be required. Further sampling and analysis is required to delineate contaminant 'hotspots'
			Human health Construction workers	Considered potentially active	Likely	Medium	**Moderate**	Construction personnel to adhere to standard PPE guidelines and hygienic site practices to control risk.
			Human health Neighbouring residents	Considered potentially active	Low likelihood	Medium	**Low to Moderate**	Contamination has been identified at the site; therefore dust control measures and soils / groundwater containment should be used during construction to minimise risk to neighbouring residents / the general public.
Landfill sites Potentially infilled Land (ponds, quarries, reservoirs etc) Made Ground Natural organic soils Coal mining (on and off-site sources)	Hazardous ground gases including CO_2, CH_4 CO, H_2S Vapours	Inhalation Explosion	**Human health** Including current site users, future site users, neighbouring residents and constructions workers	Considered potentially active	Low likelihood	Mild	**Low**	The results of the gas monitoring classify the site as CS-2, therefore special precaution measures are required in accordance with BS 8485.
		Explosion	**Buildings**	Considered potentially active	Unlikely	Medium	**Low**	The results of the gas monitoring classify the site as CS-2, therefore special precaution measures are required in accordance with BS 8485.

Potential Sources	Contaminants of Concern	Potential Pathway	Potential Receptor	Potential Pollutant Linkage	Probability	Consequence	Risk Classification	Action / Mitigation / Justification
Made Ground on site Current and former land uses on site	Heavy metals, sulphates and inorganics PAH's	Lateral and vertical migration and leaching of contaminants into local groundwater	**Underlying Aquifer** (Potable water)	Considered potentially active	Unlikely	Minor	**Very low**	Contamination has been identified within the soils at the site; Remedial measures are required. However, due to the aquifer designations below the site and no recorded abstraction points within significant distances of the site No further action required in terms of potable water.
Made Ground on site Current and former land uses on site	Heavy metals, sulphates and inorganics PAH's	Lateral and vertical migration and leaching of contaminants into surface water bodies via permeable strata and features.	Local **water courses** and associated flora and fauna	Considered active	Unlikely	Mild	**Very low**	Contamination has been identified within the soils at the site; Remedial measures are required. However, due to the aquifer designations below the site and no recorded abstraction points within significant distances of the site No further action required in terms of local water courses.
Made Ground beneath the site Current and former site uses	Phytotoxic elements	Plant uptake	**Plants and vegetation**	Considered potentially active	Low likelihood	Mild	**Low**	Contamination has been identified at the site; therefore remedial measures are required.

7.0 GEOTECHNICAL TESTING AND RESULTS

7.1 In-situ Testing

7.1.1 In-situ Standard Penetration Tests (SPTs) were undertaken in accordance with BS1377 (1990) within the window sample boreholes. A summary of the insitu testing is given below in Table 7.1: Insitu Geotechnical Testing:

Table 7.1: Insitu Geotechnical Testing

Strata	Depth Range (mbgl) vs SPT N Value	Locations Encountered
Clay	1.20 – 5.00: N = 6-30	DS01, DS03, DS04, DS05, DS06, DS07, DS09
Sand	1.20 – 5.00: N = 13-26	DS01, DS09, DS10

NR = Not Recorded In This Strata

7.2 Laboratory Testing

7.2.1 A programme of geotechnical laboratory testing was undertaken in accordance with BS1377 (1990) 'Methods of tests for soils for civil engineering purposes. All samples were sent to a UKAS accredited geotechnical testing laboratory. The geotechnical testing regime has been summarised below in Table 7.2: Geotechnical Laboratory Analysis.

Table 7.2: Geotechnical Laboratory Analysis

BS 1377 Test Number	Test Description	Quantity Analysed
BS 1377 1990: Part 2. Clause 3.2	Moisture content	5
BS 1377 1990: Part 2. Clause 4.3, 5.3 & 5.4	Atterberg Limits	5
BS 1377 1990: Part 3. Clause 5.3 & BRE CP2/79	BRE SD 1	3

7.2.2 The results of the geotechnical testing are presented in Appendix E.

Plasticity Index

7.2.3 Atterberg limit testing was carried out on selected samples of cohesive soils taken from the site to establish the plasticity index of the clay beneath the site. The results of this testing is presented below in Table 7.3: Atterberg Limits Testing Results.

Table 7.3: Atterberg Limits Testing Results

Test	Range
Moisture Content (%)	20-23
Liquid Limit (%)	29-51
Plastic Limit (%)	14-23
Plasticity Index (%)	15-28
Modified plasticity index (%)	15-27

7.2.4 Based on these results the clay beneath the site can be classed as low to high plasticity.

7.2.5 Chapter 4.2 'Building near Trees' of the NHBC standards indicates that from the testing results, the modified plasticity index is between 15 and 27% and therefore, the clay beneath the site is of low to medium volume change potential.

BRE SD 1

7.2.6 Three soil samples were analysed for BRE SD 1 suite to assess the risk to buried concrete at the site, which includes total sulphate, water soluble sulphate, pH and total sulphur. The results of the testing are summarised below in Table 7.4: Summary of BRE SD 1 Results.

Table 7.4: Summary of BRE SD 1 Results

Test	Soil Test - Results Range
Total sulphate (%)	<0.01 - 0.01
Water soluble sulphate (mg/l)	23 - 38
Total sulphur (%)	0.01 - 0.06
pH	7.6 - 8.8
Total Potential Sulphate (%)	0.03 - 0.18
Potential amount of Oxidisable Sulphate Present (%)	0.02 - 0.17

7.2.7 Design/mix of buried concrete should be undertaken in accordance with the "Aggressive Chemical Environment for Concrete" (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground).

7.2.8 The above results indicate that pyrite is unlikely to be present within the soils beneath the site.

8.0 GEOTECHNICAL ASSESSMENT

8.1 General

8.1.1 It is understood that the proposed development will comprise the construction of 21 housing units including a mixture of 1 bed 2 person units and 2 bed 3 person units.

8.1.2 At this stage GeoCon have not been provided with any loadings for the proposed development.

8.1.3 The recommendations given below assume that ground levels intended for the redevelopment will be similar to those existing at present. If ground levels are subject to significant change as part of the proposed development, then the recommendations in this report may require reinterpretation.

8.2 Geotechnical Model

8.2.1 Ten dynamic sample boreholes were advanced across the site on a basis of targeting proposed structures and as a general coverage assessment of the site as a whole.

8.2.2 The ground conditions encountered within the exploratory holes are summarised below in **Error! Reference source not found.**.

Table 8.1: Summary of Ground Conditions

Stratum	Depth Range to Base of Stratum (mbgl) (Thickness Range)	Relative Density / Undrained Shear Strength	Notes
Made Ground and Topsoil			
Made Ground	0.30 to 1.00m (0.30 to 1.00m+)	Not recorded.	Made Ground was encountered in DS01-DS08 and comprised a mixture of granular and cohesive soils.
Natural Strata			
Cohesive Soils	3.60 to 5.45m+ (0.40 to 4.95m+)	Strength from Field Description Soft to very stiff Strength from In-situ Field Testing 1.20: N = 6-16 2.00: N = 10-17 3.00: N = 12-30 4.00: N = 19-50 5.00: N = 15-26	Clay / silt was encountered in DS01, DS03-DS10 holes directly beneath the Made Ground and other granular deposits generally comprising sandy gravelly clay. Moisture Contents: 20 – 23% Liquid Limits: 29 – 51% Plastic Limits: 14 – 23% Plasticity Indices*: 15 – 28% Consistency Index: 0.5 – 1.0 The Atterberg Limit tests indicate that the cohesive soil is of low to high plasticity, of low to medium volume change potential (NHBC classification), and on the basis of the consistency index is firm to stiff.
Granular Soils	1.20 to 5.45m+ (0.40 to 3.00m+)	Strength from Field Description *Medium dense* Strength from In-situ Field Testing 1.20: N = 19 2.00: N = 15 3.00: N = 20 4.00: N = 13-18 5.00: N = 20-26 and comprised	Sand, Sand & gravel was encountered in DS09 and DS10 directly beneath the Made Ground and cohesive material.

* - Corrected for fines content in accordance with NHBC Chapter 4.2.

NR = Not Recorded In This Strata

8.2.3 Groundwater was encountered in DS01, DS02, DS05, DS06, DS07, DS08, DS09 and DS10 between 1.00-2.00mbgl during the site work. Standing water levels have been recorded during the monitoring period between 0.53 and 4.20mbgl with some locations being recorded as dry on selected visits.

8.3 Foundations

Shallow Foundations

8.3.1 Where Made Ground is either not present or present only at shallow depths, it would be possible to adopt strip or spread foundations in the underlying cohesive soils, which generally consists of *soft to stiff clay*. It is considered that this material will provide a suitable bearing stratum, provided that the foundations are placed within a single soil type, and generally described as being present in a firm (or higher) insitu condition. It is considered that strip or spread foundations constructed within this material at a minimum depth of 2.00mbgl could be designed assuming an allowable increase in load given below in **Error! Reference source not found.**.

Table 8.2: Allowable increase in stress

Foundation Parameter	Strip Footings (m)			Spread Foundation (m)		
Foundation Width (m)	0.60	1.00	1.50	1.00	2.00	3.00
Foundation Depth (m)	2.00			2.00		
Allowable Increase in Stress (kN/m^2)	120	115	110	180	165	155

8.3.2 The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 50kN/m^2 at the foundation depths. Settlements at the above loading intensities should remain within tolerable limits (<25mm) for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place. Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil.

8.3.3 Once excavated, the formation may be subject to heave, which may result in settlement when the new foundation loads are applied. The designer should ensure that any settlement would remain within serviceable limits for the new and existing structures.

8.3.4 It is recommended that foundations are placed in one soil type to avoid any differential settlement. If this is not possible due to the varying depth of cohesive and granular soils, then foundations would need to be locally deepened and placed within the clays or suitably reinforced if spanning across soil types. Foundations would need to be designed by a suitably structural engineer.

8.3.5 Foundation depths may need to be increased where they are within influencing distance of trees. Heave precautions may also be required. Advice on these issues is given in NHBC Standards Chapter 4.2.

General Advice

8.3.6 All foundations should be designed by a suitably competent structural engineer in line with current guidance and good practice.

8.3.7 Interactions between new and existing foundations would need to be considered, as would the potential for differential settlement between new and existing structures. A construction joint should be incorporated at the interface between any new and existing structures. Particular care will be required to ensure that the new basement does not adversely impact the existing foundations.

8.4 Floor Slabs

8.4.1 In accordance with NHBC Standards 2010 (Chapters 4.2, 5.1 and 5.2); BS 8103-1; and based on proven ground conditions it is recommended that suspended floor slabs are used at this site due to the potential for heave / shrinkage from the underlying cohesive soils immediately beneath the site.

8.5 Concrete

8.5.1 A review of the pH and sulphate concentrations indicates that all concrete used in the foundations at this site should be designed to "Design Sulphate Class" DS-1, and the "Aggressive Chemical Environment for Concrete" (ACEC) class AC-1.

8.6 Groundwater and Excavations

8.6.1 Groundwater is likely to represent a particular problem to the construction of the proposed development at this site. However, it should be recognized that slight seepages and minor water entries may combine in any long trench excavations to create a significant volume of water which may cause local problems during the construction phase. Any minor groundwater seepages or significant standing water within excavations made upon this site may be removed by using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped. Advice on Groundwater Control is given in CIRIA Report No 515 – Groundwater Control Design and Practice.

8.6.2 It is recommended that the borehole installations is are grouted up during the construction works to prevent it from acting as a future conduit for potential artesian water.

8.6.3 Foundation excavations should be feasible using conventional plant.

8.6.4 The stability of the excavation faces cannot be guaranteed, thus temporary support to the excavation faces may become necessary. Alternatively, subject to space constraints, excavations could be battered back to a suitable angle of repose. However, if there is a requirement to protect nearby structures or services, appropriate supports may still be required. Advice on excavation support is given in CIRIA Report No 97 – Trenching Practice.

8.7 Road Pavement

8.7.1 Any new pavements will require assessment of the existing sub grade in terms of its California Bearing Ratio (CBR) to facilitate the actual pavement design.

8.7.2 It is recommended that CBR testing is carried out at the site along any proposed access roads prior to construction to confirm the CBR design value.

8.8 Sustainable Drainage

8.8.1 In accordance with National Planning and Policy Framework (NPPF) the Planning Authority are likely to insist that surface water drainage from any new-build or redevelopment complies with current design practices for Sustainable Urban Drainage (SUD's) construction of separate drainage systems for foul and surface water. Surface water shall be required to be attenuated reducing the discharge of water from the site requiring treatment and disposal. A 20% reduction in surface water discharge rates off the site is to be expected – allowing for the 1 in 100 year storm event and allowing for climate change.

8.8.2 Based on the ground conditions encountered it is unlikely that sustainable drainage would be suitable at the site, however due to the thickness of Made Ground overlying the natural deposits, it may not be practical or feasible. If sustainable drainage is to be considered, it is recommended that soak-away testing is carried out in accordance with BRE 365 at the site to establish the sites suitability for sustainable drainage.

8.9 Existing structures

8.9.1 Any existing structures and foundations if found should be grubbed up and replaced with a suitable engineered granular backfill and should be compacted in layers.

9.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

9.1 Waste Soils Characterisation

9.1.1 Any excavation works may potentially produce waste soils for which appropriate waste management will be required. Any soils requiring removal and disposal from site would require appropriate classification testing prior to disposal and the results would need to be confirmed with the landfill operator. Isolated hotspots if encountered may need to be taken off as Non-Hazardous or Hazardous waste. Any off-site disposal of soil requires careful management and due consideration of appropriate legislation, guidance and Duty of Care responsibilities.

9.1.2 A Hazardous Waste Assessment should be carried out on any materials requiring removal and disposal from site. Waste Acceptance Criteria (WAC) testing may also be required and the results of the Hazardous Waste Assessment and WAC testing (if appropriate) should be presented to the landfill operator for their confirmation of waste category.

9.2 Imported Fill

9.2.1 Any imported fill will be subject to specific quality requirements, particularly in any proposed areas of landscaping. Allowance should be made for the testing of imported fill materials prior to emplacement to ensure suitability should the materials be delivered with no testing certification.

9.3 Construction Activities

9.3.1 Due consideration should be given to the suppression of noise, dust and vibration emissions from the site during construction.

9.4 Material Re-Use

9.4.1 Any site won soils / materials may be available for reuse across the site subject to the appropriate classification, analysis and engineered solution.

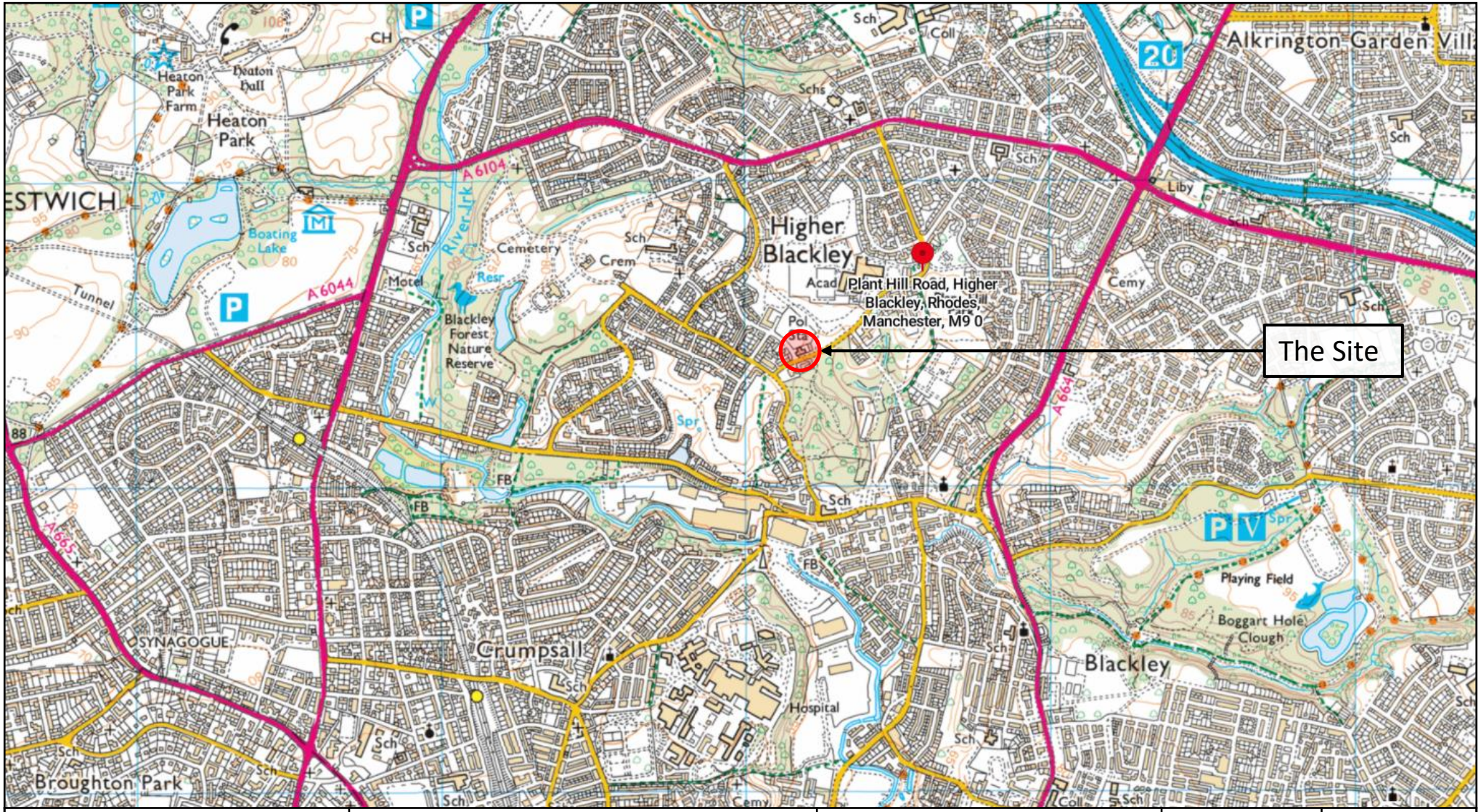
9.4.2 Any natural topsoil or Made Ground topsoil may be suitable for reuse across the site in any proposed landscaped areas subject to appropriate chemical testing.

10.0 REFERENCES

- *Atkins: AtRisk Soil Screening Values and Water Screening Values.*
- *Bowles, J. E. (1996): Foundation analysis and design, McGraw-Hill, New York.*
- *British Geological Survey (BGS): 1:50'000 geological maps of the area.*
- *British Geological Survey (BGS): Open geoscience online mapping tool.*
- *BS 5930: Code of Practice for Site Investigation Amendment 2.*
- *BS 10175: Code of Practice for the Investigation of Potentially Contaminated Sites.*
- *BRE 211 Radon: Guidance on protective measures for new buildings.*
- *BRE 365: Soakaway Design.*
- *BRE 410 (2004): Working platforms for tracked plant: Good practice guide to the design, installation, maintenance and repair of ground-supported working platforms, BRE Press, Garston.*
- *Cheshire Brine Subsidence Compensation Board: Cheshire Salt Search.*
- *CIRIA 552: Contaminated Land Risk Assessment; A Guide to Good Practice 2001.*
- *CIRIA 665: Assessing the Risks Posed by Hazardous Ground Gases for Buildings 2007.*
- *CIRIA 758D: Abandoned Mine Workings Manual.*
- *Coal Authority: Coal authority mining report and Cheshire brine subsidence report.*
- *Contaminated Land: Applications in Real Environments (CL:AIRE): 'The Soil Generic Assessment Criteria for Human Health Risk Assessment' GAC's.*
- *David Norbury: Soil and Rock Descriptions in Engineering Practice.*
- *Defra C4SL's: Development of Category 4 Screening Levels for assessment of land affected by contamination Department of the Environment: DOE industry profiles.*
- *EN ISO 14688-1: Geotechnical investigation and testing -- Identification and classification of soil -- Part 1: Identification and description.*
- *EN ISO 14688-2: Geotechnical investigation and testing -- Identification and classification of soil -- Part 2: Principles for a classification.*
- *EN ISO 14689: Geotechnical investigation and testing -- Identification and classification of rock -- Part 1: Identification and description.*
- *Environment Agency (EA): EA Online & What's in my back yard.*
- *Environment Agency (EA): Soil Guideline Values (SGVs).*
- *Environment Agency (EA): Waste Management Paper WM3.1 June 2018 edition "Guidance on the Classification and Assessment of Waste"*
- *HazWasteOnline*
- *International Society of Rock Mechanics (ISRM): Commission on Testing Methods (1985) Suggested Method for Determining Point Load Strength, Int. J. Rock Mech. Min. Sci. and Geomech. Abstr. 22, 1985, pp.51-60.*
- *Land Contamination Risk Management (LCRM), Guiding Principles for Land Contamination (GPLC) 1 – 3.*
- *Land Quality Management (LQM): Generic Screening Criteria (GACs).*
- *Landmark: Envirocheck report and Envirocheck analysis online historical mapping tool.*
- *National Planning Policy Framework (NPPF).*
- *Ordnance survey: OS Landranger map for the area; OS open data online mapping tool.*
- *R&D Publication CLR 8: Assessment of risks to human health from land contamination.*
- *R&D Publication CLR 10: The Contaminated Land Exposure Model (CLEA).*
- *R&D Publication CLR 11: Model Procedure for the Management of Contaminated Land DEFRA 2004.*
- *Stroud M.A: The standard penetration test in insensitive clays, Proceedings of the European Symposium on Penetration Testing, Stockholm, 1975, Vol 2,pp 367 – 75.*
- *UK Specification for Ground Investigation Second Edition 2012.*

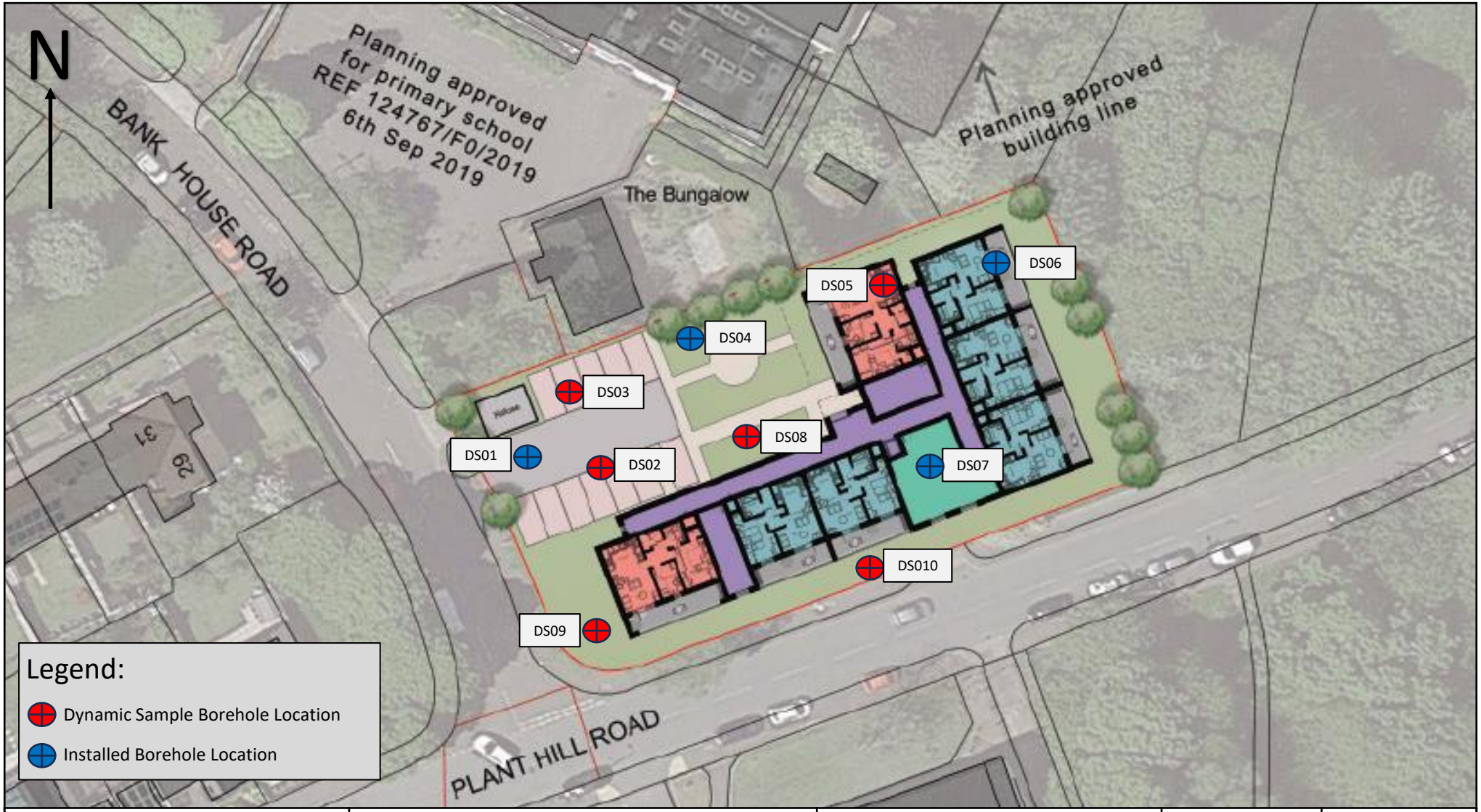
APPENDIX A

DRAWINGS



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Web: www.geoconsiteinvestigations.com

PROJECT ID	DRAWING NUMBER	SCALE
GSI 1941 Plant Hill, Manchester	GSI 1941/01	N.T.S
TITLE	**DATE**	**DRAWN BY**
Site Location Plan	September 2023	MP



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PROJECT ID	DRAWING NUMBER	SCALE
GSI 1941 Plant Hill, Manchester	GSI 1941/02	N.T.S
TITLE	**DATE**	**DRAWN BY**
Exploratory Hole Location Plan (on the proposed development plan)	September 2023	MP

E1236 - Plant Hill Road, Manchester

006 - Proposed Site Plan Option 3

scale 1:500 @ A3



Unit Type		Area (Sqm)		Number of units	Units Total Area
1B2P		51		15	765
2B3P		64		6	384
Total				**21**	**1149**
Circulation					468
Communal					189
GIFA					**1923**

Considerations
Access pending highways
Potential primary school on adjoining site
Existing bungalow becomes car park
Potential demolition contamination of basements

APPENDIX B

DYNAMIC SAMPLE BOREHOLE LOGS

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS01**

Project No: GSI 1941	Easting:	Start Date: 30/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 30/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Sampling & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
0.15	ES1		0.05		MADE GROUND: Black ASPHALT.		
0.30	ES2		0.20		MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and rare brick. Gravel is subangular to subrounded, fine to medium limestone.		
0.50	D4		0.40		MADE GROUND: Reddish brown sandy GRAVEL with frequent brick. Gravel is angular to subangular, fine to medium.		
0.60	ES3				Light grey sandy gravelly CLAY. Gravel is subrounded, fine mudstone.		
1.00	D5						
1.20	SPT	N = 7			(TILL)		
			1.30		Soft light brown silty very sandy CLAY.		
					(TILL)		
2.00	D6					▼	
2.00	SPT	N = 15			*Stiff below 2.00mbgl.*		
3.00	D7						
3.00	SPT	N = 24					
4.00	D8						
4.00	SPT	N = 25					
			4.50		Medium dense fine to medium SAND.		
					(TILL)		
5.00	D9						
5.00	SPT	N = 26					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 2.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS02**

Project No: GSI 1941	Easting:	Start Date: 30/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 30/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.15		MADE GROUND: Dark grey CONCRETE with 5mm rebar.		
0.30	ES1				MADE GROUND: Light brown clayey sandy GRAVEL with frequent brick and concrete. Gravel is angular to subangular, fine to coarse mudstone.		
0.50	D3						
0.60	ES2						
			1.00				

1.00
2.00
3.00
4.00
5.00

Dynamic Sample Run Details			
Top	Base	Diameter	Recovery

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.00mbgl. Groundwater encountered at 1.00mbgl. Borehole abandoned at 1.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS03**

Project No: GSI 1941	Easting:	Start Date: 30/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 30/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Well
Depth (m)	Type	Results				
			0.05		MADE GROUND: Black ASPHALT.	
0.15	ES1		0.20		MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and rare brick. Gravel is subangular to subrounded, fine to medium limestone.	
0.40	ES2		0.50		MADE GROUND: Reddish brown sandy GRAVEL with frequent brick, wood gravel and concrete. Gravel is angular to subangular, fine to coarse mudstone.	
0.60	ES3				Firm Light brown sandy gravelly CLAY (TILL)	
1.00	D4					
1.20	SPT	N = 12				
2.00	D5				*Stiff below 2.00mbgl.*	
2.00	SPT	N = 17				
3.00	D6					
3.00	SPT	N = 23				
4.00	D7					
4.00	SPT	N = 20				
5.00	D8					
5.00	SPT	N = 26				
			5.45			

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater not encountered.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS04**

Project No: GSI 1941	Easting:	Start Date: 30/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 30/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Sampling & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.05		MADE GROUND: Black ASPHALT.		
0.25	ES1		0.30		MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and concrete. Gravel is subangular to subrounded, fine to medium limestone.		
0.45	ES2		0.50		MADE GROUND: Reddish brown sandy GRAVEL with frequent brick fragments and rare glass. Gravel is angular to subangular, fine to coarse.		
0.60	ES3				Firm light brown sandy gravelly CLAY. Gravel is subrounded, fine to medium mudstone and sandstone. (TILL)		
1.20	SPT	N = 14					
1.50	D4						
2.00	SPT	N = 17					
2.50	D5						
3.00	SPT	N = 27					
3.50	D6						
4.00	SPT	N = 19					
4.50	D7				*Light brown fine to medium SAND lense.*		
5.00	SPT	N = 25					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater not encountered.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS05**

Project No: GSI 1941	Easting:	Start Date: 30/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 30/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.05		MADE GROUND: Black ASPHALT.		
0.15	ES1		0.20		MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and concrete. Gravel is subangular to subrounded, fine to medium limestone.		
0.60	ES2		0.50		MADE GROUND: Reddish brown sandy GRAVEL with frequent brick. Gravel is angular to subangular, fine to medium.		
1.00	D3				Firm light brown sandy gravelly CLAY. Gravel is subrounded, fine to medium mudstone and sandstone. (TILL)		
1.20	SPT	N = 11					
2.00	D4					▼	
2.00	SPT	N = 16			*Stiff below 2.00mbgl.*		
3.00	SPT	N = 24					
4.00	D5						
4.00	SPT	N = 19					
5.00	SPT	N = 24					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 2.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS06**

Project No: GSI 1941	Easting:	Start Date: 31/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 31/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.05		MADE GROUND: Black ASPHALT.		
0.30	ES1		0.20		MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and rare brick. Gravel is subangular to subrounded, fine to medium limestone.		
0.60	ES2		0.50		MADE GROUND: Dark brown clayey sandy GRAVEl with frequent brick and concrete. Gravel is angular to subangular, fine to coarse mudstone and sandstone.		
			0.90		MADE GROUND: Dark brown sandy gravelly CLAY with occasional brick fragments. Gravel is subangular to subrounded, fine to medium mudstone.		
1.00							
1.20	ES3				Firm light brown sandy gravelly CLAY. Gravel is subrounded, fine to mudstone and sandstone. (TILL)		
1.20	SPT	N = 13					
1.50	D4				*Light brown fine to medium SAND lense.*		
2.00	SPT	N = 16			*Stiff below 2.00mbgl*		
2.50	D5						
3.00	SPT	N = 30					
3.50	D6						
4.00	SPT	N = 20					
4.50	D7						
5.00	SPT	N = 19					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 2.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS07**

Project No: GSI 1941	Easting:	Start Date: 31/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 31/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.05		MADE GROUND: Black ASPHALT.		
0.30	ES1		0.20		MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and rare brick. Gravel is subangular to subrounded, fine to medium limestone.		
0.70	ES2		0.40		MADE GROUND: Dark brown clayey sandy GRAVEL with frequent brick and concrete. Gravel is angular to subangular, fine to coarse mudstone and sandstone.		
1.00			1.00		MADE GROUND: Dark brown sandy gravelly CLAY with occasional brick fragments. Gravel is subangular to angular, fine to medium mudstone.		
1.20	ES3				Stiff light brown sandy gravelly CLAY. Gravel is subrounded, fine to medium mudstone and sandstone. (TILL)		
1.20	SPT	N = 16					
1.50	D4						
2.00	D5					▼	
2.00	SPT	N = 16					
3.00	D6						
3.00	SPT	N = 22					
4.00	D7				*Very stiff below 4.00mbgl.*		
4.00	SPT	N = 50 for 290mm					
			4.45				
5.00							

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	4.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 2.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS08**

Project No: GSI 1941	Easting:	Start Date: 31/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 31/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
					MADE GROUND: Dark grey CONCRETE with 5mm rebar.		
			0.15				
0.25	ES1				MADE GROUND: Dark grey sandy GRAVEL with frequent tarmacadam and brick. Gravel is subangular to subrounded, fine to medium limestone.		
0.40	ES2		0.30				
0.60	ES3		0.50		MADE GROUND: Dark brown clayey sandy GRAVEL with frequent brick and concrete. Gravel is angular to subangular, fine to medium mudstone and sandstone.		
1.00	D4				Soft light brown sandy gravelly CLAY. Gravel is subrounded, fine to medium mudstone and sandstone. (TILL)	▼	
1.20	SPT	N = 6					
2.00	D5				*Firm below 2.00mbgl.*		
2.00	SPT	N = 10					
3.00	SPT	N = 12			*Light brown fine to medium SAND lense.*		
4.00	SPT	N = 22			*Stiff below 4.00mbgl.*		
					Light brown fine to medium SAND lense.		
5.00	D6				*Firm to stiff below 5.00mbgl.*		
5.00	SPT	N = 15					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 1.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS09**

Project No: GSI 1941	Easting:	Start Date: 31/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 31/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Samplng & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.10		TOPSOIL: Dark brown sandy gravelly CLAY with frequent rootlets. Gravel is subrounded, fine to medium mudstone.		
0.20	ES1		0.30		MADE GROUND: Dark brown sandy gravelly CLAY with occasional brick. Gravel is subangular to subrounded, fine to medium mudstone.		
0.40	ES2				Light grey gravelly fine to medium SAND. Gravel is subrounded, fine to medium mudstone.		
0.80	D3		0.70		(TILL)		
					Light brown gravelly fine to medium SAND. Gravel is subrounded, fine to medium mudstone. (TILL)		
1.20	SPT	N = 16	1.20		Stiff Light brown sandy gravelly CLAY. Gravel is subrounded, fine to medium mudstone and sandstone. (TILL)		
1.50	D4						
2.00	SPT	N = 10			*Firm below 2.00mbgl.*	▼	
					Light brown fine to medium SAND lense.		
2.60	D5						
3.00	SPT	N = 15			*Firm to stiff below 3.00mbgl.*		
					Light brown fine to medium SAND lense.		
3.60	D6		3.60		Medium dense light brown fine to medium SAND. (TILL)		
4.00	SPT	N = 18					
5.00	SPT	N = 21					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	4.00	70	
4.00	5.00	70	20

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 2.00mbgl.

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DYNAMIC SAMPLE BOREHOLE LOG

Borehole ID: **DS10**

Project No: GSI 1941	Easting:	Start Date: 31/08/2023
Project Name: Plant Hill Road, Manchester	Northing:	End Date: 31/08/2023

Client	Hole Type	Level	Logged By	Scale	Page Number
Shape Consulting	DS		MP	1:30	Page1 of 1

Sampling & Insitu Testing			Depth	Legend	Strata Description	Water Strike	Well
Depth (m)	Type	Results					
			0.10		TOPSOIL: Dark brown sandy gravelly CLAY with frequent rootlets. Gravel is subrounded, fine to medium mudstone. MADE GROUND: Dark brown sandy GRAVEL with occasional brick. Gravel is subangular to subrounded, fine to medium mudstone.		
			0.60		Medium dense light brown gravelly SAND. Gravel is subrounded, fine mudstone and sandstone. (TILL)		
1.20	SPT	N = 19					
2.00	SPT	N = 15				▼	
3.00	SPT	N = 20					
			3.60		Light brown sandy gravelly CLAY. Gravel is subrounded, fine to medium mudstone and sandstone. (TILL)		
4.00	SPT	N = 13	4.00		Medium dense light brown fine to medum SAND. (TILL)		
5.00	SPT	N = 20					
			5.45				

Dynamic Sample Run Details

Top	Base	Diameter	Recovery
1.20	3.00	79	
3.00	5.00	70	

Remarks: Area C.A.T scanned prior to breaking ground. Service pit excavated to 1.20mbgl. Groundwater encountered at 2.00mbgl.

APPENDIX C

CHEMICAL TESTING RESULTS

Liam Daley
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e: Geocon Group

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 : 23-54608

Project / Site name:	Plant Hill Road	**Samples received on:**	01/09/2023
Your job number:	GSI 1941	**Samples instructed on/ Analysis started on:**	05/09/2023
Your order number:	PO 23 0438	**Analysis completed by:**	13/09/2023
Report Issue Number:	1	**Report issued on:**	13/09/2023
Samples Analysed:	7 soil samples		

Signed:

Adam Fenwick
Technical Reviewer
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.

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

Analytical Report Number: 23-54608
Project / Site name: Plant Hill Road
Your Order No: PO 23 0438

Lab Sample Number				2800684	2800685	2800686	2800687	2800688
Sample Reference				DS03	DS05	DS06	DS07	DS08
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.15	0.30	0.70	0.40
Date Sampled				31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	25	72	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	14	1.8	12	13	15
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.9	0.8	0.8
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile- Loose Fibres	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSO	DSO	DSO	DSO	DSO
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	11.5	8.9	8.5	7.8	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.4	2.9	1.2	0.6	1.9
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.12	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	1.3	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.16	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.12	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.77	0.1	0.14	0.05	0.28
Anthracene	mg/kg	0.05	MCERTS	0.15	0.31	0.05	< 0.05	0.06
Fluoranthene	mg/kg	0.05	MCERTS	1.2	0.34	0.3	0.08	0.32
Pyrene	mg/kg	0.05	MCERTS	1.1	0.72	0.33	0.08	0.34
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.5	0.13	0.16	< 0.05	0.21
Chrysene	mg/kg	0.05	MCERTS	0.58	0.35	0.2	< 0.05	0.2
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.62	0.9	0.26	< 0.05	0.24
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.31	0.4	0.12	< 0.05	0.09
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.42	0.91	0.21	< 0.05	0.18
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.23	0.65	0.11	< 0.05	0.09
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.17	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.26	0.82	0.14	< 0.05	0.12
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	6.38	7.21	2.02	< 0.80	2.13
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19	2.4	10	8.6	15
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.2	1.4	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	28	16	18	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	41	49	61	31	44
Lead (aqua regia extractable)	mg/kg	1	MCERTS	330	13	260	270	76
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	98	26	16	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	150	56	140	49	47

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Analytical Report Number: 23-54608
Project / Site name: Plant Hill Road
Your Order No: PO 23 0438

Lab Sample Number				2800684	2800685	2800686	2800687	2800688
Sample Reference				DS03	DS05	DS06	DS07	DS08
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.15	0.30	0.70	0.40
Date Sampled				31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	-	< 5.0	-	< 5.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.1	NONE	0.1	-	< 0.10	-	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	3.2	-	3.2	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	12	-	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	47	-	61	-	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	62	-	73	-	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	MCERTS	< 2.0	-	< 2.0	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	24	-	67	-	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	33	-	69	-	< 10

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

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Analytical Report Number: 23-54608
Project / Site name: Plant Hill Road
Your Order No: PO 23 0438

Lab Sample Number				2800689	2800690
Sample Reference				DS09	DS10
Sample Number				None Supplied	None Supplied
Depth (m)				0.20	0.30
Date Sampled				31/08/2023	31/08/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	7.9	11
Total mass of sample received	kg	0.001	NONE	0.9	0.8
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSO	DSO
General Inorganics					
pH - Automated	pH Units	N/A	MCERTS	7.7	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.5	0.9
Total Phenols					
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0
Speciated PAHs					
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.06
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.09	0.39
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.08
Fluoranthene	mg/kg	0.05	MCERTS	0.18	0.6
Pyrene	mg/kg	0.05	MCERTS	0.17	0.53
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.09	0.3
Chrysene	mg/kg	0.05	MCERTS	0.09	0.39
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.09	0.38
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.16
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.08	0.28
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.15
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.17
Total PAH					
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	3.49
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.4	11
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	5.1	14
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14	40
Lead (aqua regia extractable)	mg/kg	1	MCERTS	21	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	4.4	13
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	15	64

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Analytical Report Number: 23-54608
Project / Site name: Plant Hill Road
Your Order No: PO 23 0438

Lab Sample Number				2800689	2800690
Sample Reference				DS09	DS10
Sample Number				None Supplied	None Supplied
Depth (m)				0.20	0.30
Date Sampled				31/08/2023	31/08/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Monoaromatics & Oxygenates					
Benzene	µg/kg	5	MCERTS	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	-	< 5.0
o-xylene	µg/kg	5	MCERTS	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0
Petroleum Hydrocarbons					
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.1	NONE	-	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.1	NONE	-	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.1	NONE	-	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	MCERTS	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	MCERTS	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	MCERTS	-	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	-	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.1	NONE	-	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.1	NONE	-	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.1	NONE	-	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	MCERTS	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	MCERTS	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	-	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	MCERTS	-	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	-	< 10

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

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Analytical Report Number : 23-54608
Project / Site name: Plant Hill Road

* 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 *
2800684	DS03	None Supplied	0.4	Brown clay and sand with stones and gravel
2800685	DS05	None Supplied	0.15	Brown clay and sand with stones and gravel
2800686	DS06	None Supplied	0.3	Brown clay and sand with gravel and vegetation.
2800687	DS07	None Supplied	0.7	Brown clay and sand with gravel.
2800688	DS08	None Supplied	0.4	Brown clay and sand with gravel.
2800689	DS09	None Supplied	0.2	Brown clay and sand with gravel and vegetation.
2800690	DS10	None Supplied	0.3	Brown clay and sand with brick and vegetation.

Analytical Report Number : 23-54608
Project / Site name: Plant Hill Road

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	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
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
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
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Analytical Report Number : 23-54608
Project / Site name: Plant Hill Road

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

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 D

CHEMICAL SCREENING CRITERIA

GeoCon Site Investigations Ltd

GENERIC SCREENING CRITERIA
FOR
GENERIC QUANTITATIVE RISK ASSESSMENT

January 2023

Compound / Determinands	Source / Reference	Residential WITH consumption of home-grown vegetables			Residential WITHOUT consumption of home-grown vegetables			Commercial			Allotments			Public Open Space - Residential			Public Open Space - Parks		
		1 % SOM	2.5% SOM	6 % SOM	1 % SOM	2.5% SOM	6 % SOM	1 % SOM	2.5% SOM	6 % SOM	1 % SOM	2.5% SOM	6 % SOM	1 % SOM	2.5% SOM	6 % SOM	1 % SOM	2.5% SOM	6 % SOM
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals																			
Antimony	C	141	-	222	437	-	437	4650	-	4650	-	-	58.3	749	-	749	3090	-	3090
Arsenic	A	37	37	37	40	40	40	640	640	640	43	43	43	79	79	79	170	170	170
Barium	C	56.8	-	110	1340	-	1340	22000	-	22000	-	-	18.1	2680	-	2680	5770	-	63
Beryllium	A	1.7	1.7	1.7	1.7	1.7	1.7	12	12	12	35	35	35	2.2	2.2	2.2	532	532	532
Boron	A	290	290	290	11000	11000	11000	240000	240000	240000	45	45	45	21000	21000	21000	46000	46000	46000
Cadmium (pH 6, 7, 8)	A	11	11	11	85	85	85	190	190	190	1.9	1.9	1.9	120	120	120	532	532	532
Chromium III	A	910	910	910	910	910	910	8600	8600	8600	18000	18000	18000	1500	1500	1500	33000	33000	33000
Chromium VI	A	6	6	6	6	6	6	33	33	33	1.8	1.8	1.8	7.7	7.7	7.7	220	220	220
Copper	A	2400	2400	2400	7100	7100	7100	68000	68000	68000	520	520	520	12000	12000	12000	44000	44000	44000
Lead	B	210	210	210	330	330	330	6000	6000	6000	84	84	84	760	760	760	1400	1400	1400
Mercury (elemental)	A	1.2	1.2	1.2	1.2	1.2	1.2	58	58	58	21	21	21	16	16	16	30	30	30
Mercury (Inorganic)	A	40	40	40	56	56	56	1100	1100	1100	19	19	19	120	120	120	240	240	240
Mercury (methyl)	A	11	11	11	15	15	15	320	320	320	6	6	6	40	40	40	68	68	68
Molybdenum	C	95.2	-	97.4	673	673	673	17600	17600	17600	17	17	17	1360	1360	1360	2880	2880	2880
Nickel	A	180	180	180	180	180	180	980	980	980	230	230	230	230	230	230	3400	3400	3400
Selenium	A	250	250	250	430	430	430	12000	12000	12000	88	88	88	1100	1100	1100	1800	1800	1800
Vanadium	A	410	410	410	1200	1200	1200	9000	9000	9000	91	91	91	2000	2000	2000	5000	5000	5000
Zinc	A	3700	3700	3700	40000	40000	40000	730000	730000	730000	620	620	620	81000	81000	81000	170000	170000	170000
Non-Metals / Inorganics																			
Free-Cyanide (Total)	C	34	34	34	34	34	34	373	373	373	34	34	34	34	34	34	34	34	34
Phenol and Chlorophenols																			
Phenol	A	280	550	1100	750	1300	2300	760	1500	3200	66	140	280	760	1500	3200	760	1500	3200
Chlorophenols	A	0.87	2	4.5	94	150	210	3500	4000	4300	0.13	0.3	0.7	620	620	620	1100	1100	1100
Pentachlorophenol	A	0.22	0.52	1.2	27	29	31	400	400	400	0.03	0.08	0.19	60	60	60	110	120	120
Poly Aromatic Hydrocarbons (PAH)																			
Acenaphthene	A	210	510	1100	3000	4700	6000	84000	97000	100000	34	85	200	15000	15000	15000	29000	30000	30000
Acenaphthylene	A	170	420	920	2900	4600	6000	83000	97000	100000	28	69	160	15000	15000	15000	29000	30000	30000
Anthracene	A	2400	5400	11000	31000	35000	37000	520000	540000	540000	380	950	2200	74000	74000	74000	150000	150000	150000
Benzo(a)anthracene	A	7.2	11	13	11	14	15	170	170	180	2.9	6.5	13	29	29	29	49	56	62
Benzo(a)pyrene	A	2.2	2.7	3	3.2	3.2	3.2	35	35	36	0.97	2	3.5	5.7	5.7	5.7	11	12	13
Benzo(b)fluoranthene	A	2.6	3.3	3.7	3.9	4	4	44	44	45	0.99	2.1	3.9	7.1	7.2	7.2	13	15	16
Benzo(ghi)perylene	A	320	340	350	360	360	360	3900	4000	4000	290	470	640	640	640	640	1400	1500	1600
Benzo(k)fluoranthene	A	77	93	100	110	110	110	1200	1200	1200	37	75	130	190	190	190	370	410	440
Chrysene	A	15	22	27	30	31	32	350	350	350	4.1	9.4	19	57	57	57	93	110	120
Dibenzo(ah)anthracene	A	0.24	0.28	0.3	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.27	0.43	0.57	0.57	0.58	1.1	1.3	1.4
Fluoranthene	A	280	560	890	1500	1600	1600	23000	23000	23000	52	130	290	3100	3100	3100	6300	6300	6400
Fluorene	A	170	400	860	2800	3800	4500	63000	68000	71000	27	67	160	9900	9900	9900	20000	20000	20000
Indeno(123-cd)pyrene	A	27	36	41	45	46	46	500	510	510	9.5	21	39	82	82	82	150	170	180
Naphthalene	A	2.3	5.6	13	2.3	5.6	13	190	460	1100	4.1	10	24	4900	4900	4900	1200	1900	3000
Phenanthrene	A	95	220	440	1300	1500	1500	2200	22000	23000	15	38	90	3100	3100	3100	6200	6200	6300
Pyrene	A	620	1200	2000	3700	3800	3800	54000	54000	54000	110	270	620	7400	7400	7400	15000	15000	15000
PAH (Total 16)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum Hydrocarbons (TPH CWG)																			
MTBE	C	27.6	-	220	33.3	-	318	3140	-	22400	-	-	108	73600	-	75000	70800	-	117000
Benzene	A	0.087	0.17	0.37	0.38	0.7	1.4	27	47	90	0.017	0.034	0.075	72	72	73	90	100	110
Toluene	A	130	290	660	880	1900	3900	56000	110000	180000	22	51	120	56000	56000	56000	87000	95000	100000
Ethylbenzene	A	47	110	260	83	190	440	5700	13000	27000	16	39	91	24000	24000	25000	17000	22000	27000
o-Xylene	A	60	140	330	88	210	480	6600	15000	33000	28	67	160	41000	42000	43000	17000	24000	33000
m-Xylene	A	59	140	320	82	190	450	6200	14000	31000	31	74	170	41000	42000	43000	17000	24000	32000
p-Xylene	A	56	130	310	79	180	430	5900	14000	30000	29	69	160	41000	42000	43000	17000	24000	31000
TPH Aliphatic EC5-6	A	42	78	160	42	78	160	3200	5900	12000	730	1700	3900	570000	590000	600000	95000	130000	180000
TPH Aliphatic EC>6-8	A	100	230	530	100	230	530	7800	17000	40000	2300	5600	13000	600000	610000	620000	150000	220000	320000
TPH Aliphatic EC>8-10	A	27	65	150	27	65	150	2000	4800	11000	320	770	1700	13000	13000	13000	14000	18000	21000
TPH Aliphatic EC>10-12	A	130	330	760	130	330	770	9700	23000	47000	2200	4400	7300	13000	13000	13000	21000	23000	24000
TPH Aliphatic EC>12-16	A	1100	2400	4300	1100	2400	4400	59000	82000	90000	11000	13000	13000	13000	13000	13000	25000	25000	26000
TPH Aliphatic EC>16-35	A	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	260000	270000	270000	250000	250000	250000	450000	480000	490000
TPH Aliphatic EC>35-44	A	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	260000	270000	270000	250000	250000	250000	450000	480000	490000
TPH Aromatic EC5-7	A	70	140	300	370	690	1400	26000	46000	86000	13	27	57	56000	56000	56000	76000	84000	92000
TPH Aromatic EC>7-8	A	130	290	660	860	1800	3900	56000	110000	180000	22	51	120	56000	56000	56000	87000	95000	100000
TPH Aromatic EC>8-10	A	34	83	190	47	110	270	3500	8100	17000	8.6	21	51	5000	5000	5000	7200	8500	9300
TPH Aromatic EC>10-12	A	74	180	380	250	590	1200	16000	28000	34000	13	31	74	5000	5000	5000	9200	9700	10000
TPH Aromatic EC>12-16	A	140	330	660	1800	2300	2500	36000	37000	38000	23	57	130	5100	5100	5000	10000	10000	10000
TPH Aromatic EC>16-21	A	260	540	930	1900	1900	1900	28000	28000	28000	46	110	260	3800	3800	3800	7600	7700	7800
TPH Aromatic EC>21-35	A	1100	1500	1700	1900	1900	1900	28000	28000	28000	370	820	1600	3800	3800	3800	7800	7800	7900
TPH Aromatic EC>35-44	A	1100	1500	1700	1900	1900	1900	28000	28000	28000	370	820	1600	3800	3800	3800	7800	7800	7900
TPH Aliphatic + Aromatic EC>44-70	A	1600	1800	1900	1900	1900	1900	28000	28000	28000	1200	2100	3000	3800	3800	3800	7800	7800	7900

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GeoCon Site Investigations Ltd

January 2023

GENERIC SCREENING CRITERIA

FOR

GENERIC QUANTITATIVE RISK ASSESSMENT

Generic Screening Criteria Reference Guide:	
Soils - Generic Screening Criteria Source Reference	
A	LQM/CIEH S4ULs for Human Health Risk Assessment Values 2015
B	Defra C4SL's 2014
C	AtRisk Soil Screening Values and Water Screening Values Produced by Atkins 2017
D	NHBC Technical Extra 15 - 2014
E	UK (CLEA) Soil Guideline Value 2009
F	CL:AIRE GAC Values December 2009
Waters - Generic Screening Criteria Source Reference	
1	Environmental Quality Standard from List 2 EC Dangerous Substances Directive (76/464/EEC) - Freshwater
2	Environmental Quality Standard from EC Surface Water Abstraction Directive (75/440/EEC) - Imperative (A1)
3	Drinking Water Standard from World Health Organisation (WHO) Guidelines for Drinking Water Quality, 1984 - health value
4	Environmental Quality Standard from List 2 EC Dangerous Substances Directive (76/464/EEC) - Freshwater (hardness related)
5	Environmental Quality Standard from EC Surface Water Abstraction Directive (75/440/EEC) - Imperative (A2)
6	Drinking Water Standard from World Health Organisation (WHO) Guidelines for Drinking Water Quality, 1984 - ATO
7	Ayscough *et al.* (2002) Proposed Environmental Quality Standards for Ethylbenzene in Water (EA R&D Technical Report P2-115/TR4).
8	UK Drinking Water Inspectorate - threshold for objectionable odour/taste of 5µg/l to 10µg/l
9	US EPA advisory limits (1997). As published in Environment Agency "The fuel additive MTBE a groundwater protection issue?" booklet.
10	Ahlberg *et al.* (2001) An Environmental Risk Assessment of MTBE use in Europe. ECETOC/EFOA Task Force on ERA of MTBE.
11	Environmental Quality Standard from List 1 EC Dangerous Substances Directive (76/464/EEC) - Freshwater
12	As Presented in Appendix 8 "Selected Water Quality Standards" in Hydrogeological Risk Assessments for Landfills (LFTGN01 - Environment Agency, March 2003).
13	UK Drinking Water Standards (DWS)
14	Environment Agency, Environmental Quality Standards (EQS) 2015
Abbreviations	
SOM	Soil Organic Matter

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APPENDIX E

GEOTECHNICAL TESTING RESULTS

LABORATORY REPORT

Contract Number: PSL23/8272

Report Date: 18 October 2023

Client's Reference: GSI 1941/23/0439

Client Name: Geocon Site Investigations Ltd

Suite 2, Marple House
39 Stockport Road
Marple
Stockport
SK6 6BD

For the attention of: Graham Boultbee/Liam Daley/Ian Walker/Matt Styles

Project Name: Plant Hill, Manchester

Date Received: 28/9/2023
Date Commenced: 28/9/2023
Date Completed: 18/10/2023

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 (Assistant Laboratory Manager)
S Eyre (Senior Technician)
M Fennell (Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
DS05			2.00		Brown slightly gravelly sandy CLAY
DS06			1.50		Brown mottled grey very sandy CLAY
DS08			1.00		Brown mottled grey very sandy CLAY
DS09			0.80		Brown SAND
DS10			1.50		Brown SAND

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Plant Hill, Manchester

Contract No:
PSL23/8272
Client Ref:
GSI 1941

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
DS05			2.00		23			51	23	28	98	High Plasticity CH
DS06			1.50		23			31	15	16	100	Low Plasticity CL
DS08			1.00		20			29	14	15	100	Low Plasticity CL
DS09			0.80		16				NP			
DS10			1.50		18				NP			

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Plant Hill, Manchester

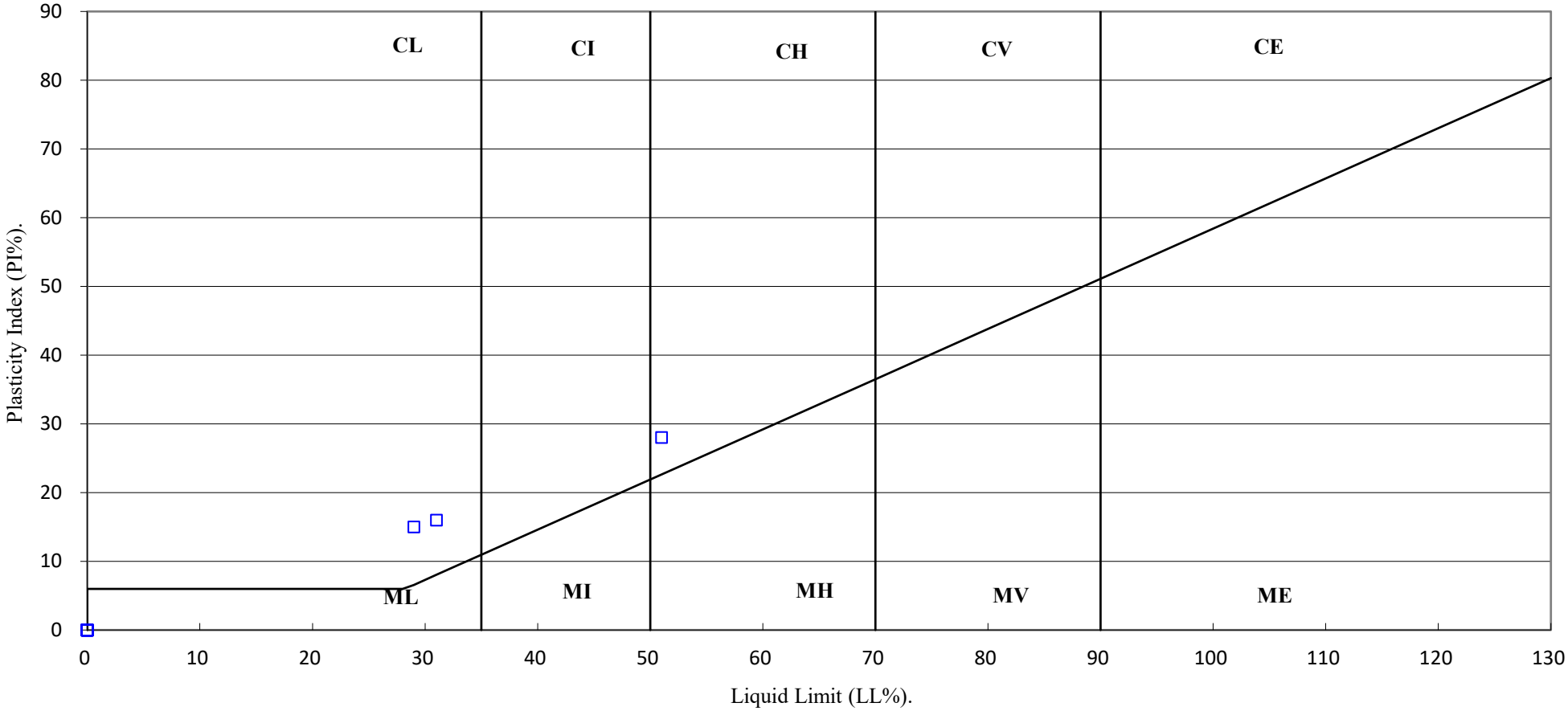
Contract No:

PSL23/8272

Client Ref:

GSI 1941

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043 / PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	Plant Hill, Manchester	Contract No: PSL23/8272 Client Ref: GSI 1941

4161

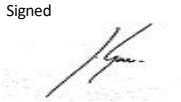
CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

Professional Soils Laboratory
5/7 Hexthorpe Road
Hexthorpe
Doncaster
DN4 0AR

Analytical Test Report:	**L23/06075/PSL - 23-38207**

Your Project Reference:	**PSL23/8272 Plant Hill, Manchester**		
Your Order Number:	PSL23/8272	Samples Received / Instructed:	12/10/2023 / 12/10/2023
Report Issue Number:	1	Sample Tested:	12/10 to 19/10/2023
Samples Analysed:	3 soil samples	Report issued:	19/10/2023

Signed



James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 10.10.2023

Issued by: J. Gane

Issue No: 4

Rev No: 4

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L23/06075/PSL - 23-38207

Project Reference - PSL23/8272 Plant Hill, Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			320042	320043	320044
Client Sample ID			-	-	-
Client Sample Location			DS03	DS06	DS08
Client Sample Type			-	-	-
Client Sample Number			-	-	-
Depth - Top (m)			1.00	2.50	2.00
Depth - Bottom (m)			1.00	2.50	2.00
Date of Sampling			30/08/2023	31/08/2023	31/08/2023
Time of Sampling			-	-	-
Sample Matrix			Clay	Clay	Clay
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	35	23	38
Acid Soluble Sulphate	(%)	u	0.01	< 0.01	0.01
Total Sulphur	(%)	UKAS	0.02	0.01	0.06
pH Value	pH Units	MCERTS	7.6	8.8	7.7
Water Soluble Chloride	(mg/l)	u	4.8	3.5	8.1
Water Soluble Nitrate (As NO_3)	(mg/l)	u	< 1.0	< 1.0	< 1.0
Water Soluble Magnesium	(mg/l)	u	19	2.4	6.0
Water Soluble Ammonium Ion	(mg/l)	u	1.3	1.3	1.3

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Leicester
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L23/06075/PSL - 23-38207

Project Reference - PSL23/8272 Plant Hill, Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
320042	-	DS03	-	-	Brown silty clay	-	-	100
320043	-	DS06	-	-	Brown slightly sandy silty clay	-	-	100
320044	-	DS08	-	-	Brown slightly sandy silty clay	-	-	100

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L23/06075/PSL - 23-38207

Project Reference - PSL23/8272 Plant Hill, Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
320042	-	DS03	-	-	
320043	-	DS06	-	-	
320044	-	DS08	-	-	

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L23/06075/PSL - 23-38207

Project Reference - PSL23/8272 Plant Hill, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)
1377MGICP	BS1377 WS Magnesium (ICP)	Oven dried	Passing 2mm test sieve	Water Soluble Magnesium testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 10.

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L23/06075/PSL - 23-38207

Project Reference - PSL23/8272 Plant Hill, Manchester

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
320042	-	DS03	-	-	BS1377 Total Sulphur Content by HTC	RX
320042	-	DS03	-	-	MS - CL - Anions by Aquakem (2:1Extract)	RX
320042	-	DS03	-	-	MS - CL - pH in Soils	RX
320043	-	DS06	-	-	BS1377 Total Sulphur Content by HTC	RX
320043	-	DS06	-	-	MS - CL - Anions by Aquakem (2:1Extract)	RX
320043	-	DS06	-	-	MS - CL - pH in Soils	RX
320044	-	DS08	-	-	BS1377 Total Sulphur Content by HTC	RX
320044	-	DS08	-	-	MS - CL - Anions by Aquakem (2:1Extract)	RX
320044	-	DS08	-	-	MS - CL - pH in Soils	RX

APPENDIX F

GAS AND GROUNDWATER MONITORING RESULTS

Gas Monitoring Results Sheet

GeoCon Site Investigations Ltd
Suite 2 Marple House,
39 Stockport Road,
Marple,
Stockport.
SK6 6BD
Tel: 0161 713 0174
email: info@geoconsiteinvestigations.com
Online: www.geoconsiteinvestigations.com

Site: Plant Hill, Manchester
Project Number: GSI 1941
National Grid Reference: XXXX
Instrument: GFM 436 & Dip meter

Monitoring Point Reference	Date	Atmospheric pressure (mb)	Flow Range (l/hr)		Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Methane Gas Screening Value (GSV) (l/hr)	Carbon Dioxide Gas Screening Value (GSV) (l/hr)	Hydrogen Sulphide (ppm)	Carbon Monoxide (ppm)	Standing Water Level (mbgl)	Well Depth (mbgl)
			Peak	Steady	Peak	Steady	Peak	Steady	Low	Steady						
DS01	08 September 2023	1001	0	0.0	0.0	0.0	2.9	2.9	17.8	17.8	0.0000	0.0000	0.0	0.0	4.20	4.80
	22 September 2023	1002	0	-0.1	0.0	0.0	3.4	3.4	17.1	17.1	0.0000	-0.0034	0.0	0.0	4.16	4.80
	11 October 2023	1000	-5	-0.1	0.0	0.0	2.0	2.0	18.0	18.0	0.0000	-0.0020	0.0	0.0	4.10	4.80
	20 October 2023	968	0	0.0	0.0	0.0	4.9	4.9	0.4	0.4	0.0000	0.0000	0.0	0.0	4.10	4.80
	03 November 2023	960	0	0.0	0.0	0.0	4.7	4.7	0.8	0.8	0.0000	0.0000	0.0	0.0	4.22	4.80
	17 November 2023	1007	0	0.0	0.0	0.0	3.6	3.6	3.4	3.4	0.0000	0.0000	0.0	0.0	4.23	4.80
DS04	08 September 2023	1001	0	0.0	0.0	0.0	2.3	2.3	16.0	16.0	0.0000	0.0000	0.0	0.0	DRY	3.95
	22 September 2023	1002	0	0.0	0.0	0.0	2.2	2.2	15.2	15.2	0.0000	0.0000	0.0	0.0	3.94	3.95
	11 October 2023	1000	0	0.0	0.0	0.0	0.7	0.7	14.2	14.2	0.0000	0.0000	0.0	0.0	3.70	3.95
	20 October 2023	968	0	0.0	0.0	0.0	3.8	3.8	2.4	2.4	0.0000	0.0000	0.0	0.0	3.67	3.95
	03 November 2023	960	0	0.0	0.0	0.0	5.6	5.6	0.6	0.6	0.0000	0.0000	0.0	0.0	3.70	3.95
	17 November 2023	1007	0	0.0	0.0	0.0	3.4	3.4	4.0	4.0	0.0000	0.0000	0.0	0.0	3.90	3.95
DS06	08 September 2023	1001	0	0.0	0.0	0.0	0.2	0.2	21.0	21.0	0.0000	0.0000	0.0	0.0	1.01	3.88
	22 September 2023	1002	0	0.0	0.0	0.0	0.4	0.4	20.4	20.4	0.0000	0.0000	0.0	0.0	0.79	3.88
	11 October 2023	1000	0	0.0	0.0	0.0	1.1	1.1	17.9	17.9	0.0000	0.0000	0.0	0.0	0.70	3.88
	20 October 2023	968	0	0.0	0.3	0.3	0.8	0.8	19.2	19.2	0.0000	0.0000	0.0	0.0	0.80	3.88
	03 November 2023	960	0	0.0	0.0	0.0	0.1	0.1	20.4	20.4	0.0000	0.0000	0.0	0.0	0.90	3.88
	17 November 2023	1007	0	0.2	0.0	0.0	0.9	0.9	17.8	17.8	0.0000	0.0018	0.0	0.0	0.59	3.88
DS07	08 September 2023	1001	0	0.0	0.0	0.0	0.5	0.5	19.2	19.2	0.0000	0.0000	0.0	0.0	0.95	3.66
	22 September 2023	1002	0	0.1	0.0	0.0	0.6	0.6	19.6	19.6	0.0000	0.0006	0.0	0.0	0.68	3.66
	11 October 2023	1000	0	0.0	0.0	0.0	0.3	0.3	18.3	18.3	0.0000	0.0000	0.0	0.0	0.63	3.66
	20 October 2023	968	0	0.0	0.0	0.0	0.3	0.3	18.7	18.7	0.0000	0.0000	0.0	0.0	0.53	3.66
	03 November 2023	960	0	0.0	0.0	0.0	0.2	0.2	18.7	18.7	0.0000	0.0000	0.0	0.0	0.63	3.66
	17 November 2023	1007	-3	-0.2	0.0	0.0	0.2	0.2	17.1	17.1	0.0000	-0.0004	0.0	0.0	0.60	3.66
											0.0000	0.0000				
											0.0000	0.0000				
											0.0000	0.0000				
											0.0000	0.0000				
											0.0000	0.0000				
											0.0000	0.0000				
Maximum			**0.1**	**0.2**	**0.3**	**0.3**	**5.6**	**5.6**	**0.4**	**0.4**	**0.0000**	**0.0018**	**0.0**	**0.0**		

Additional Information:

Date	Engineer	Weather	Air Temperature (°C)	Ground Conditions	Pressure Trend	Comments
08 September 2023	LR	Dry	22.0	Damp	Steady	N/A
22 September 2023	MP	Light rain	13.0	Wet	Rising	N/A
11 October 2023	AH	Rain	12.0	Wet	Steady	N/A
20 October 2023	AH	Light rain	12.0	Wet	Steady	N/A
03 November 2023	AH	Overcast	10.0	Wet	Steady	N/A
17 November 2023	AH	Light rain/drizzle	4.0	Wet	Steady	N/A

* All monitoring point locations are monitored for a minimum of 60 seconds, and both the peak reading and the steady / rest readings are recorded
* BD = Below the detection limit of the gas analyser (0.1units)
* NR = No reading taken
* NA = Not Applicable