

Ref: 16-948-L1-1
Date: 12 December 2023

Luke Powell
21Living Ltd
On behalf of

First 4 Building Services Ltd
Croft Court E13
Walter Leigh Way
Leigh
WN7 3PT

By email: Luke Powell <Luke@21living.co.uk>

GEOENVIRONMENTAL SITE INVESTIGATION THE ROCK, BURY

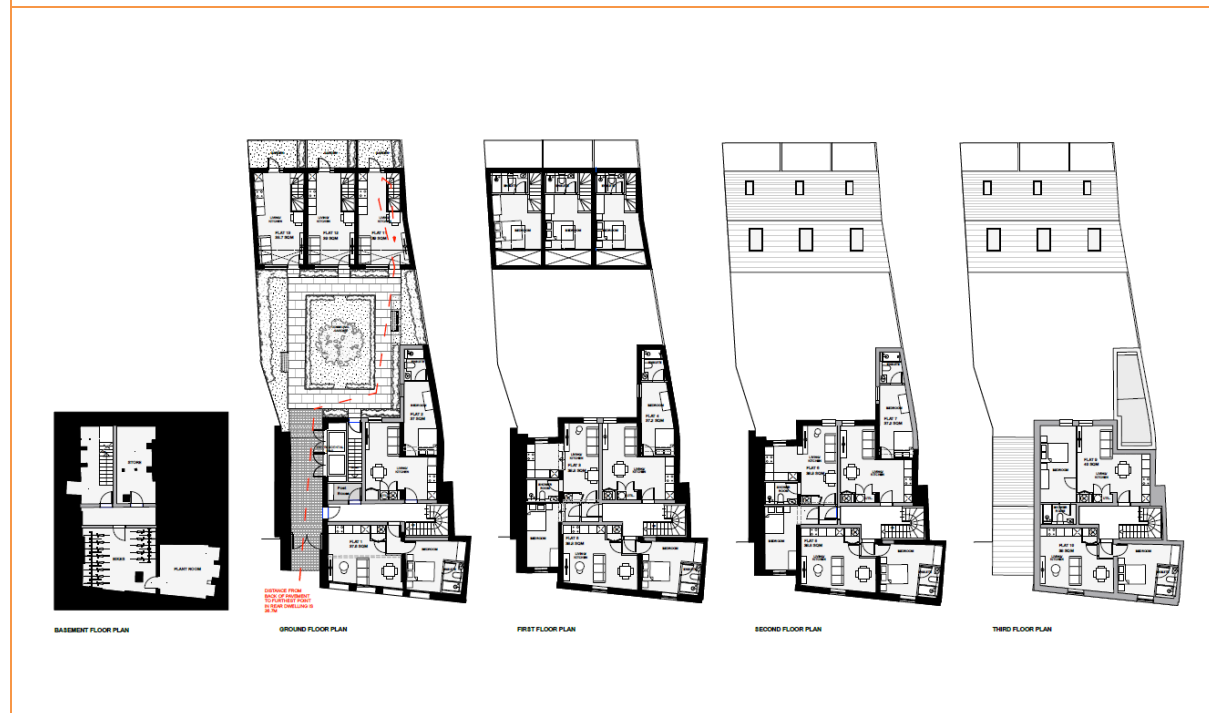
1. INTRODUCTION & BACKGROUND

Planning permission has been granted by Bury Council (application no. 69572) for the following development at 137 The Rock, Bury, BL9 0ND:

Part demolition, conversion and extension of the existing building to provide 10 no. supported living units; Construction of detached building to rear containing a further 3 no. supported living units.

A proposed development layout plan is provided in Figure 1.1 and attached to this letter.

FIGURE 1.1 PROPOSED DEVELOPMENT PLAN



The development is subject to the following contaminated land conditions:

Condition 4: No development shall commence unless and until:-

-  *A contaminated land Preliminary Risk Assessment report to assess the actual/potential contamination and/or ground gas/landfill gas risks at the Site shall be submitted to, and approved in writing by, the Local Planning Authority;*
-  *Where actual/potential contamination and/or ground gas/landfill gas risks have been identified, detailed site investigation and suitable risk assessment shall be submitted to, and approved in writing by the Local Planning Authority;*
-  *Where remediation/protection measures is/are required, a detailed Remediation Strategy shall be submitted to, and approved in writing by, the Local Planning Authority.*

The preliminary risk assessment has been completed by Groundtech Consulting (report ref: GRO-23038-4205, dated March 2023). The pertinent (geo-environmental) findings of the assessment are summarised as follows:

-  Historical mapping suggests that pre-1849 the Site was predominantly covered by buildings including a public house. A pump was indicated along the central western boundary. A central yard was present amongst the buildings. Pre-1890, the buildings were depicted as a hotel and the pump was no longer recorded. Pre-1910, the Site was again depicted as a public house. No other significant changes were identified from the historical mapping after 1910 to the present day. It is understood that the building has since been converted to shop units and offices.
-  Previous uses in the surrounding area have included Vulcan Iron Works, sawmills and timber yards, Paradise Leather Works, cotton weaving, spinning and waste mills, a confectionary works, unspecified works, factories and mills, warehouses, a paper works, a tyre depot, reservoirs and evidence of landfilling activities.
-  Made Ground associated with the Site's development history was identified as a possible source of contamination, and may contain likely contaminants such as PAHs, Asbestos, Heavy Metals and may also be a source of Ground Gases.
-  Significant potential off-site sources of ground gases have also been identified in the form of a historic landfill (103 m northwest), infilled reservoirs and a burial ground. If shallow mine workings are present beneath the Site, these may also be a source of mine gases.

2. GROUND INVESTIGATION

A ground investigation has been undertaken to the rear of 137 The Rock, where three new residential units are proposed along with a communal garden are proposed.

2.1. LIMITATIONS

The ground investigation was not intended to provide a geotechnical assessment or investigate the potential for mine workings. This report provides a geoenvironmental (contaminated land) assessment only.

Due to limited access to the rear of the property at the time of investigation, samples were obtained using hand digging/auguring equipment as opposed to mechanical excavation or drilling. Exploratory holes are therefore referenced 'HP' to represent 'hand pit'. It was therefore outside the scope of this investigation to install gas and groundwater monitoring wells.



The external areas at the time were used for storage of building materials and predominantly still covered by concrete/hardstanding, which impeded excavations. Excavations were predominantly undertaken in areas where hardstanding was broken/removed.

2.2. SUMMARY OF GROUND INVESTIGATION

Exploratory fieldwork was completed on a singular visit on 20th November 2023 and is summarised in Table 2.1.

TABLE 2.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)
To target rear gardens of proposed new residential units.	HP102	Manually Excavated Hand Pit	1.00
	HP103		0.85
	HP104		1.10
	HP106		0.50
To target proposed central communal garden area.	HP101		0.90
	HP105		1.15

The exploratory hole locations are illustrated on Drawing no. 16-948-005 attached to this letter. The ground conditions encountered are summarised in Section 2.2 and presented on the logs, attached to this letter.

2.3. GROUND CONDITIONS

2.3.1. MADE GROUND

Made Ground deposits were encountered within each of the exploratory holes to a maximum proven depth of 0.70 m bgl (HP104). The base of Made Ground was not proven in HP106 at 0.50 m bgl.

Generally, the Made Ground deposits comprised greyish black/brown gravelly clay with fragments of brick, concrete and sandstone.

In HP103, the gravelly clay was overlain by cobble stones and a greyish black ash layer.

Similarly, in HP106, the gravelly clay was overlain by a concrete slab with plastic membrane barrier and sandstone gravel (subbase/MOT).

Other than ashy inclusions in the Made Ground, no visual or olfactory signs of contamination were observed during the ground investigation.

2.3.2. DRIFT DEPOSITS

Drift deposits were encountered beneath the Made Ground in each of the locations except for HP106, where the base of Made Ground was not proven.

The drift generally comprised yellowish brown sandy gravelly CLAY. Inferred soft yellowish grey and brown CLAY was encountered in HP104 and HP105.



Exploratory holes did not extend beyond 1.10 m bgl, so reference has been made to nearby BGS borehole records for the deeper geology. Boreholes located c. 150 m east of the site record sand/gravel beyond c. 2.00 m.

2.3.3. SOLID GEOLOGY

The solid geology was not encountered and based on the Phase 1 Desk Study, is anticipated at a depth >10.60 m bgl, based on a nearby borehole (located 120 m northeast).

2.3.4. GROUNDWATER

No groundwater strikes were encountered during the ground investigation.

2.4. LABORATORY ANALYSIS

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

- ✳ Metals.
- ✳ Cyanide.
- ✳ Phenols.
- ✳ Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- ✳ Asbestos identification.
- ✳ Banded total petroleum hydrocarbon (TPH).
- ✳ Total Organic Carbon (TOC).

i2 Analytical undertook the analytical work, and the testing results are included with this letter, discussed in Section 3, and appended to this letter.

3. TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

Samples were obtained from each of the exploratory hole locations for chemical analysis. Four samples of Made Ground (including one sample of ashy material) and three samples of natural soil were submitted to i2 Laboratory for the following suite of contaminants:

- ✳ Heavy Metals / Inorganics.
- ✳ pH, total sulphate, water-soluble sulphate (2:1 extract).
- ✳ Speciated polycyclic aromatic hydrocarbons (PAH).
- ✳ Banded total petroleum hydrocarbon (TPH).
- ✳ Asbestos identification.
- ✳ Total Organic Content (TOC).



E3P has undertaken a Tier 2 qualitative risk assessment to determine if any potential contaminants within the underlying soils pose an unacceptable level of risk to the identified receptors.

3.1. HUMAN HEALTH RISK ASSESSMENT (LQ1)

At Tier 2 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267) for residential end use **with** plant uptake with soil organic matter (SOM) 1%.

The results of this comparison have been summarised within Table 3.1.

TABLE 3.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	37	7	38.00	HP104 at 0.20 m bgl	1	Further Action
Cadmium	mg/kg	11	7	<0.20	-	1	No Further Action
Chromium (VI)	mg/kg	6.0	7	<1.80	-	1	No Further Action
Lead	mg/kg	200	7	250.00	HP104 at 0.20 m bgl	1	Further Action
Mercury	mg/kg	1.2	7	1.00	-	3	No Further Action
Nickel	mg/kg	130	7	42.00	-	1	No Further Action
Selenium	mg/kg	250	7	< 1.00	-	1	No Further Action
Copper	mg/kg	2400	7	150.00	-	1	No Further Action
Zinc	mg/kg	3700	7	120.00	-	1	No Further Action
Cyanide – Total	mg/kg	791	7	< 1.00	-	1	No Further Action
Phenols – Total	mg/kg	120	6	< 1.00	-	1	No Further Action
Asbestos	Fibres	NFD	0	NFD	-	4	No Further Action
Naphthalene	mg/kg	2.3	7	0.69	-	3	No Further Action
Acenaphthylene	mg/kg	170	7	0.11	-	2	No Further Action
Acenaphthene	mg/kg	210	7	3.50	-	1	No Further Action
Fluorene	mg/kg	170	7	2.40	-	1	No Further Action
Phenanthrene	mg/kg	95	7	30.00	-	2	No Further Action
Anthracene	mg/kg	2400	7	5.40	-	2	No Further Action
Fluoranthene	mg/kg	280	7	45.00	-	2	No Further Action
Pyrene	mg/kg	620	7	43.00	-	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	7	25.00	-	2	No Further Action
Chrysene	mg/kg	15	7	25.00	-	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	7	27.00	HP104 at 0.20m bgl	2	Further Action
Benzo(k)Fluoranthene	mg/kg	77	7	11.00	-	2	No Further Action



DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Benzo(a)Pyrene	mg/kg	2.2	7	23.00	HP104 at 0.20m bgl	2	Further Action
Indeno(123-cd)Pyrene	mg/kg	27	7	11.00	-	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	7	3.40	HP104 at 0.20m bgl	2	Further Action
Benzo(ghi)Perylene	mg/kg	320	7	13.00	-	2	No Further Action
TPH C5-C6 (aliphatic)	mg/kg	42	7	<0.10	-	4	No Further Action
TPH C6-C8 (aliphatic)	mg/kg	100	7	<1.00	-	4	No Further Action
TPH C8-C10 (aliphatic)	mg/kg	27	7	<1.00	-	4	No Further Action
TPH C10-C12 (aliphatic)	mg/kg	74	7	<2.00	-	4	No Further Action
TPH C12-C16 (aliphatic)	mg/kg	140	7	6.50	-	1	No Further Action
TPH C16-C21 (aromatic)	mg/kg	260	7	70.00	-	1	No Further Action
TPH C21-C35 (aromatic)	mg/kg	1100	7	130.00	-	1	No Further Action

Notes

Main pathways: PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = vapour inhalation (indoor), PL4 = dust inhalation; PL5 = vertical/lateral migration; PL6 = corrosion of concrete; PL7=tainting of water supply; PL8 = uptake by plants

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

*US EPA GAC value for residential soil has been used in absence of S4UL.

3.1.1. SUMMARY OF RESULTS

Referring to Table 3.1 the result of this direct comparison indicates that the data exceeds the screening criteria for residential end-use with plant uptake for the following contaminants:

☼ Arsenic, lead, Benzo(b)Fluoranthene, Benzo(a)Pyrene and Dibenzo(a,h)Anthracene

However, when considering the proposed end use of the Site (supported living accommodation) with communal gardens, the potential for direct vegetable uptake and consumption of home grown produce is reduced. The data has therefore also been compared to less conservative GAC values applicable to a residential end use without plant uptake for comparative assessment.

The increased GAC values mean that lead and arsenic are no longer in exceedance, however, the PAH compounds remain in exceedance, thus the potential risk to end users remains and must be considered further.

3.1.2. DISCUSSION

Concentrations of heavy metals and non-volatile PAHs were detected in exceedance of the chosen GAC values. The contaminant exceedances were recorded within the identified layer of Made Ground comprising of ash in HP104 (0.20 m bgl), the location of HP104 is shown in Drawing No. 16-948-005.



PAH compounds are common derivatives of combustion and are therefore typical in ashy soils. Given this ashy layer was encountered beneath the cobble stones in HP104, it is considered that it may be present in other areas beneath existing cobble stones/concrete hardstanding as a subbase type layer, rather than being an isolated hotspot.

The identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion of soils. The risk to chronic human health associated with the elevated concentrations of inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system or removal of affected materials in the proposed communal gardens/landscaping to remove the potential for direct exposure to impacted soils.

If a cover system is installed, this would require a 600 mm reduction in levels to accommodate the full thickness of cover, which would ultimately result in exposing non-contaminated natural subsoils, thus negating the requirement for the cover system.

It is therefore recommended that on removal of cobbles/hardstanding, any ashy material, if encountered, is carefully stripped/removed and segregated for off-site disposal or placement in an area of no future sensitivity e.g. below a plot or beneath hardstanding where the pollutant pathway is broken. A watching brief to ensure these materials are removed would be recommended, along with a validation report.

With respect to risks from ground gas, monitoring has not been undertaken. Ground conditions have been found to comprise minimal Made Ground over natural cohesive low permeability soils. The Made Ground is of limited thickness and low organic content, so it is not considered to represent a significant source of ground gas.

A landfill is identified 100 m to the north of the Site, which would be a credible source of migrating ground gas, however, the Geotech Preliminary Risk Assessment includes commentary from the regulatory authority, which notes that the landfill site was filled between 1893 and early 1970s (reduced risk over extended timeframe) and a vent trench has been installed along the north and south boundary and a cut off wall at the eastern boundary (thus preventing gas migration). The risks associated with the landfill are therefore reduced/mitigated.

There does however remain the risk from potential mine gas associated with possible workings in underlying coal seams. The risks may be mitigated by low permeability drift, however the thickness of the cohesive deposits is unknown. Nearby BGS boreholes located c. 150 m east of the site record sand/gravel beyond c. 2.00 m, which may present a viable permeable pathway for gas migration, albeit 'capped' with impermeable clay.

The Site is also located within an area at risk from radon. A BGS radon report is recommended to determine the site-specific risk; however, in the absence of this and potential risk from ground gas, it is recommended that CS2 gas protection measures be incorporated into the new residential units as a precautionary measure.

4. CONCLUSIONS

- ✿ Exceedances of heavy metals and non-volatile PAH compounds have been found to be present in HP104 at 0.20 m bgl in a layer of ashy Made Ground. This ashy layer may be present beneath hardstanding in other areas of the Site.
- ✿ It is recommended that any ashy material, if encountered on removal of hardstanding, is carefully stripped/removed and segregated for off-site disposal or placement in an area of no future sensitivity. A watching brief to ensure these materials are removed would be recommended, along with a validation report.



- ✳ In the absence of ground gas monitoring, given the Site is in a coal mining area and potentially at risk from radon, it is recommended that CS2 gas protection measures are incorporated into the new residential units as a precautionary measure. A gas protection measure design statement may be required, along with validation by a competent assessor.

Yours sincerely,

Jessica Sheridan
Senior Geoenvironmental Consultant

For and on behalf of E3P Ltd

Enclosed:

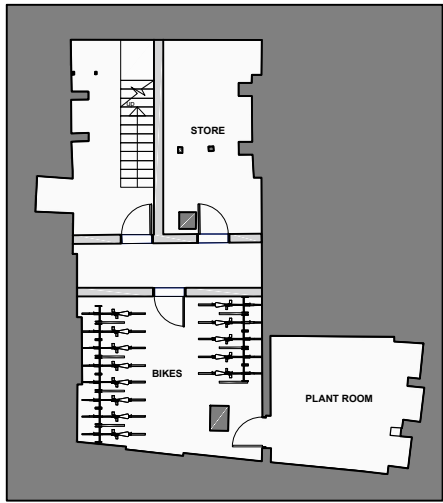
Drawings

- 16-948-002 – Proposed Development Plan
- 16-948-003 – Historical Features Plan
- 16-948-004 – Site Features Plan
- 16-948-005 – Exploratory Hole Location Plan
- 16-948-006 – Depth of Made Ground Plan
- 16-948-010 – Conceptual Site Model
- 16-948-018 – Contamination Issues Plan

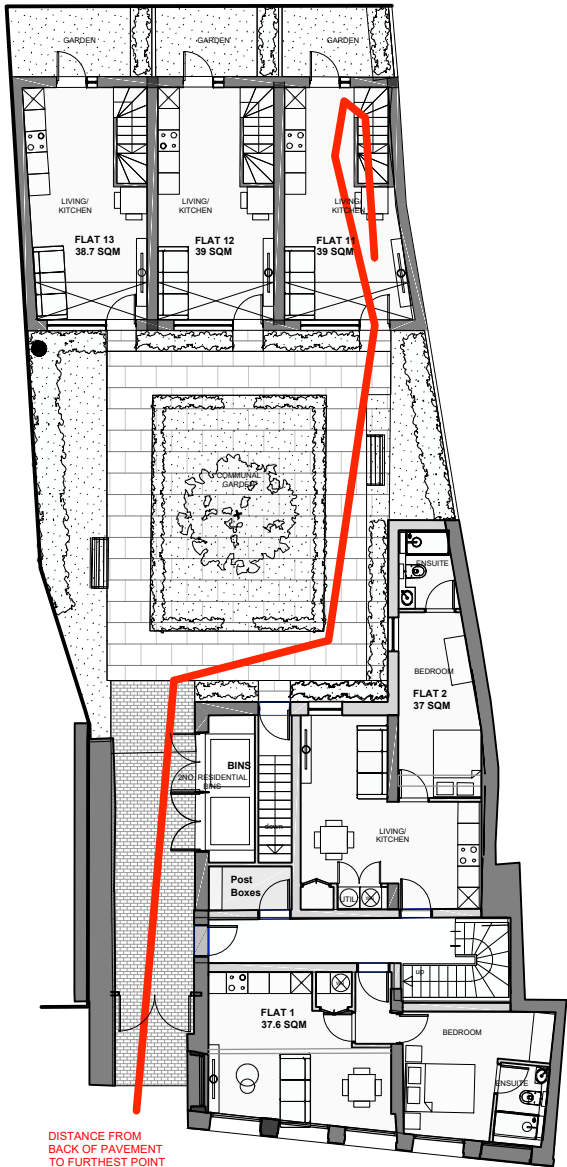
Chemical Testing – I2 Analytical Report Ref: 23-70333-1

Exploratory Hole Logs

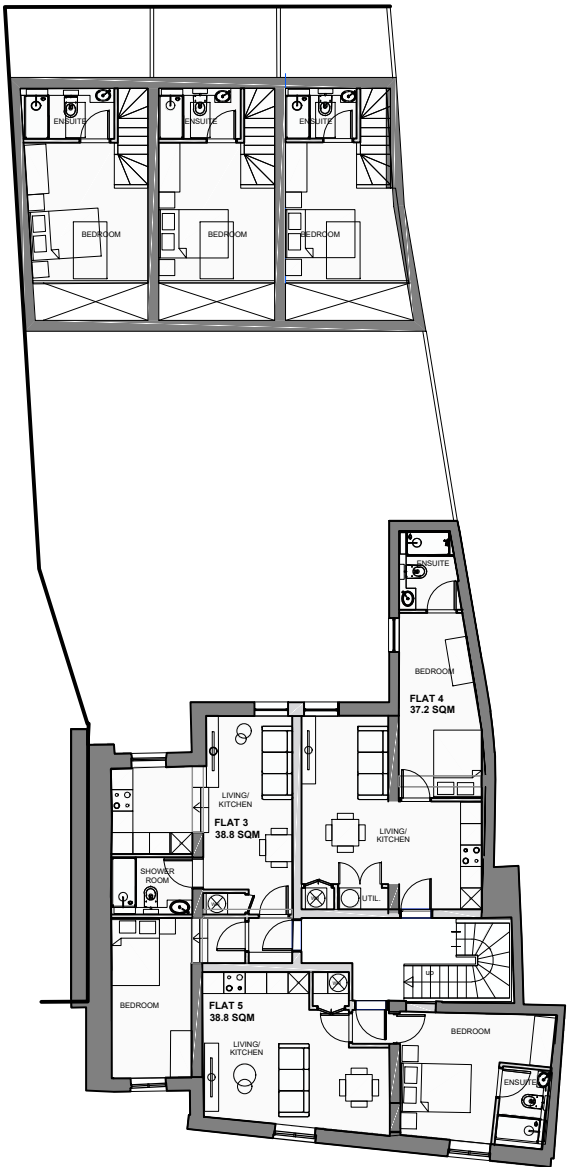




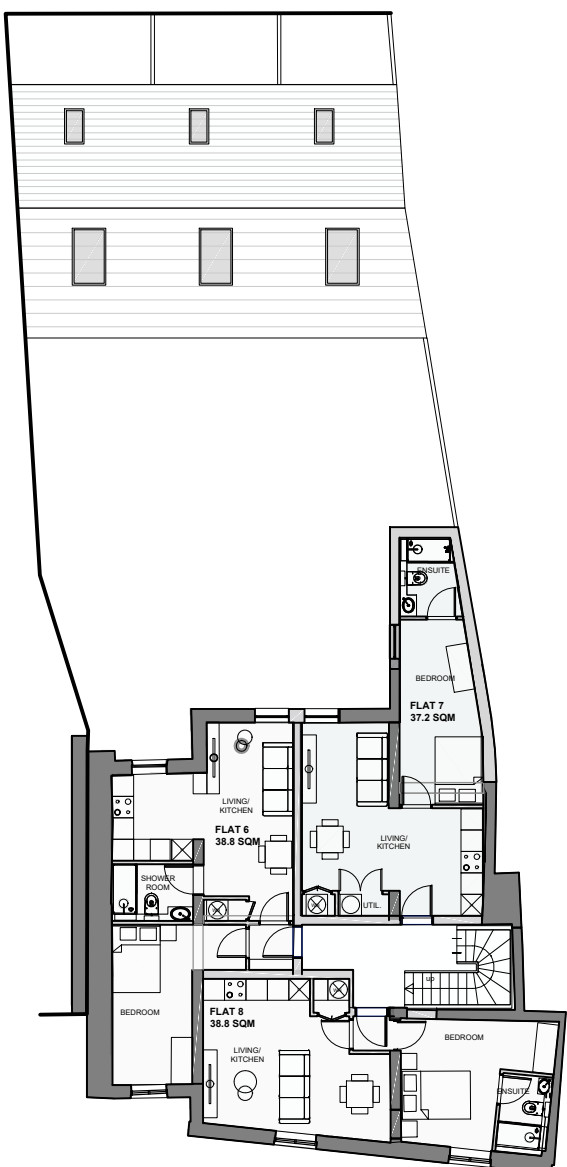
BASEMENT FLOOR PLAN



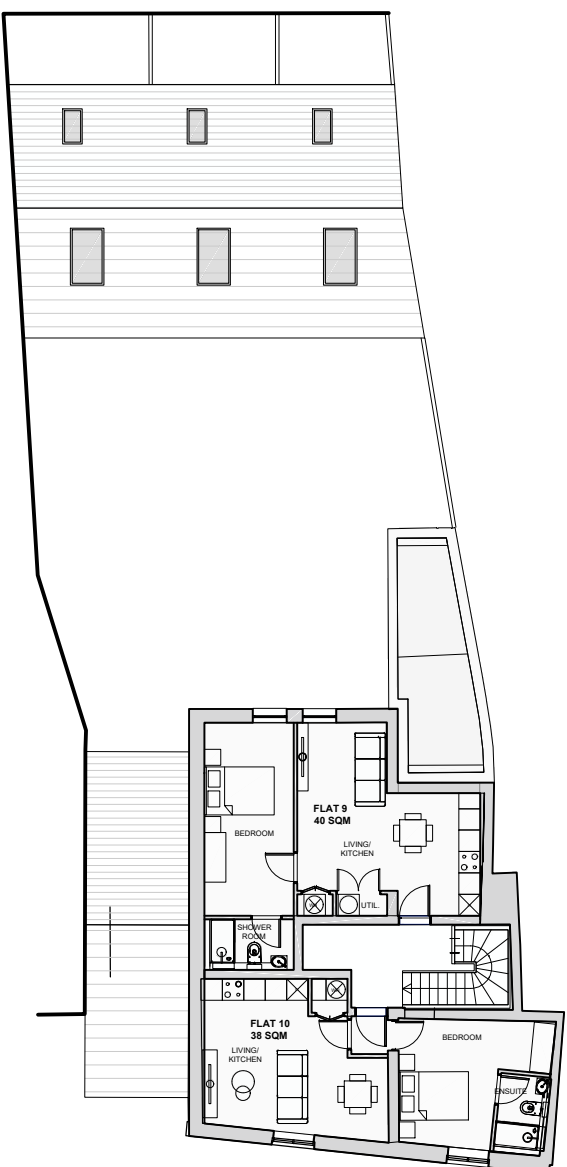
GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



Notes:					
P1	REVA	06.12.2023	EB	JC	JS
Phase	Issue	Date	Drawn	Checked	PM

Client:		First 4 Building Services Ltd	
Job Title:		The Rock, Bury	

Job No:	16-948
Drawing No:	002

Date:	06.12.2023
Scale:	NTS @ A3



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Location Symbols

 Approximate Hand Dug Pit Location

Notes:

P1	REVA	23.11.2023	EB	JS	JS
Phase	Issue	Date	Drawn	Checked	PM

Client:

First 4 Building Services Ltd

Job Title:

The Rock, Bury

Job No:

16-948

Drawing No:

005

Drawing Title:

Exploratory Hole Location Plan

Date:

23.11.2023

Scale:

NTS@ A3

 **e3p**

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Location Symbols

Approximate Hand Dug Pit Location

Made Ground Depth (m)

	Depth of Made Ground 0.10 - 0.19m
	Depth of Made Ground 0.20 - 0.29m
	Depth of Made Ground 0.30 - 0.39m
	Depth of Made Ground 0.40 - 0.49m
	Depth of Made Ground 0.50 - 0.59m
	Depth of Made Ground 0.60 - 0.69m
	Depth of Made Ground 0.70 - 0.79m

Notes:

P1	REVA	06.12.2023	EB	JS	JS
Phase	Issue	Date	Drawn	Checked	PM

Client:

First 4 Building Services Ltd

Job Title:

The Rock, Bury

Job No:

16-948

Drawing No:

006

Date:

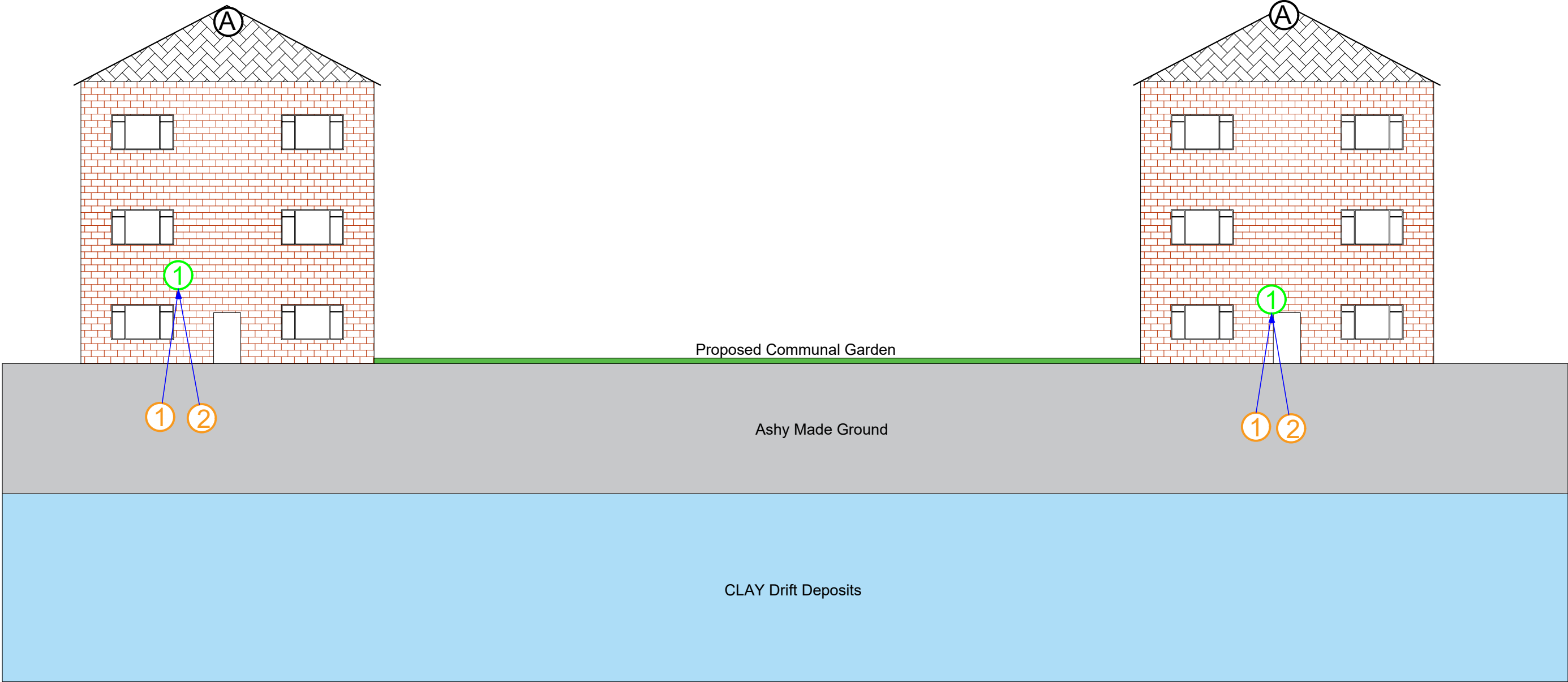
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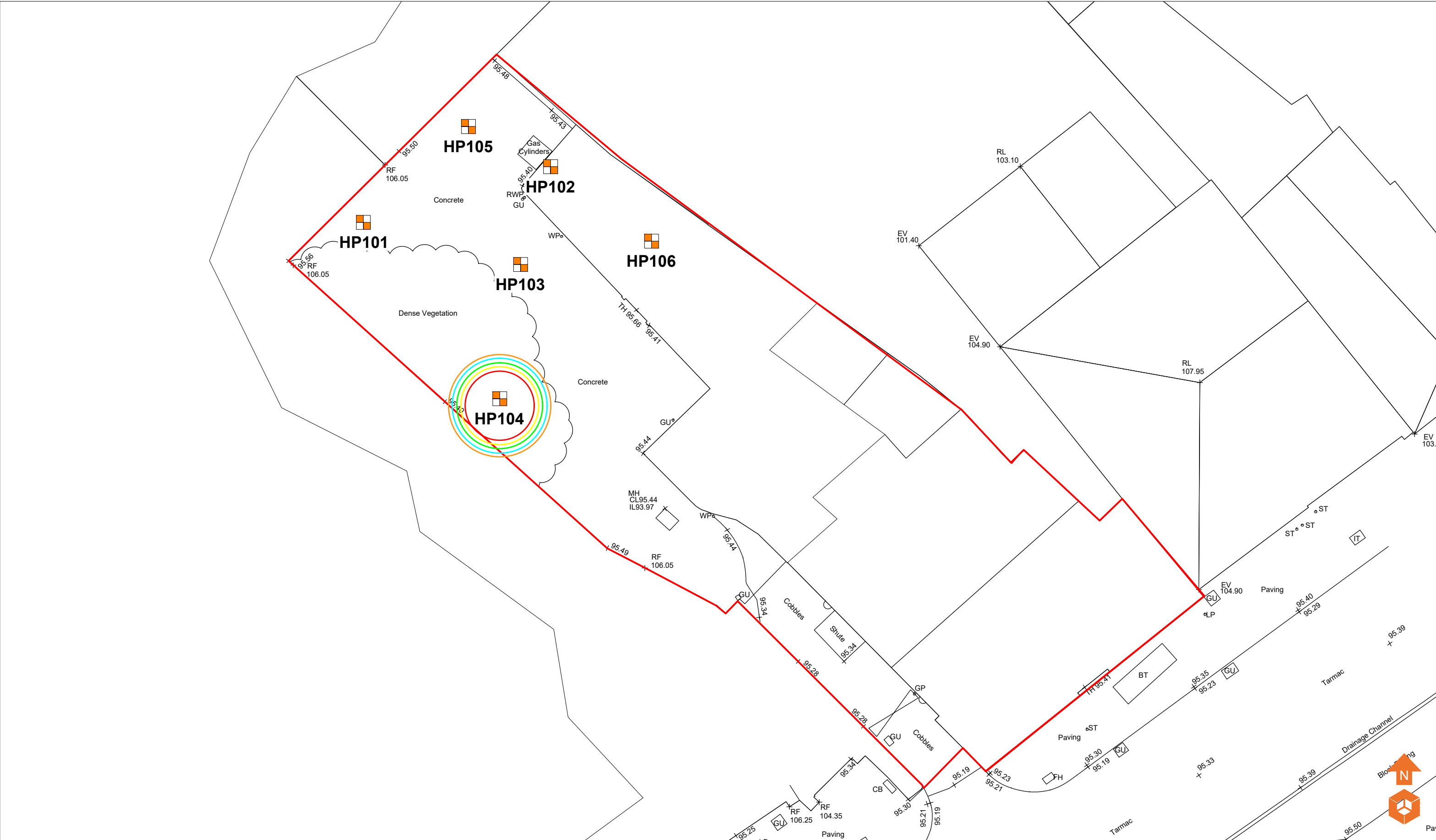
NTS@ A3

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Geology Key Ashy Made Ground Clay Drift Deposits Proposed Communal Garden	Sources ① Heavy Metals - Made Ground ② Non Volatile PAH - Made Ground	Pathways Dermal Contact / Ingestion	Receptors ① Residential End Users	Site Features A Proposed Multi Storey Flats	Notes:					Client:		Job No:		Date:		e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
										First 4 Building Services Ltd		Drawing No:		Scale:		
										010		NTS				
					Job Title:					Drawing Title:		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.				
					The Rock, Bury					Conceptual Site Model						
					P1	REVA	07.12.2023	EB	JS							
					Phase	Issue	Date	Drawn	Checked							



Location Symbols Approximate Hand Dug Pit Location		Contamination Exceedances Arsenic Lead Benzo(b)Fluoranthene Bezo(k)Fluranthene Dibenzo(a,h)Anthracene						Notes:						Client: First 4 Building Services Ltd		Job No: 16-948		Date: 06.12.2023		e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk	
								Job Title: The Rock, Bury		Drawing No: 018		Scale: NTS@ A3									
		P1 REVA 06.12.2023 EB JC JS Phase Issue Date Drawn Checked PM								Drawing Title: Contamination Issues Plan		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.									

Project Name: The Rock	Project No. 16948	Co-ords: 380694.00 - 411020.00 Level:	Date 20/11/2023
Location: Bury		Dimensions (m): 0.15 0.15	Scale 1:30
Client: First 4 Electrical		Depth 0.90	Logged J. James

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.10			MADE GROUND: Greyish black gravelly clay. Gravel of fine to coarse brick, concrete and shale. Yellowish brown sandy gravelly CLAY. Gravel is fine to medium subrounded sandstone.	
	0.50	ES						
				0.90			End of Pit at 0.90m	

Trial Pit Photographs



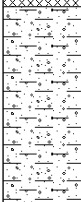
Handpit 101

Handpit 101

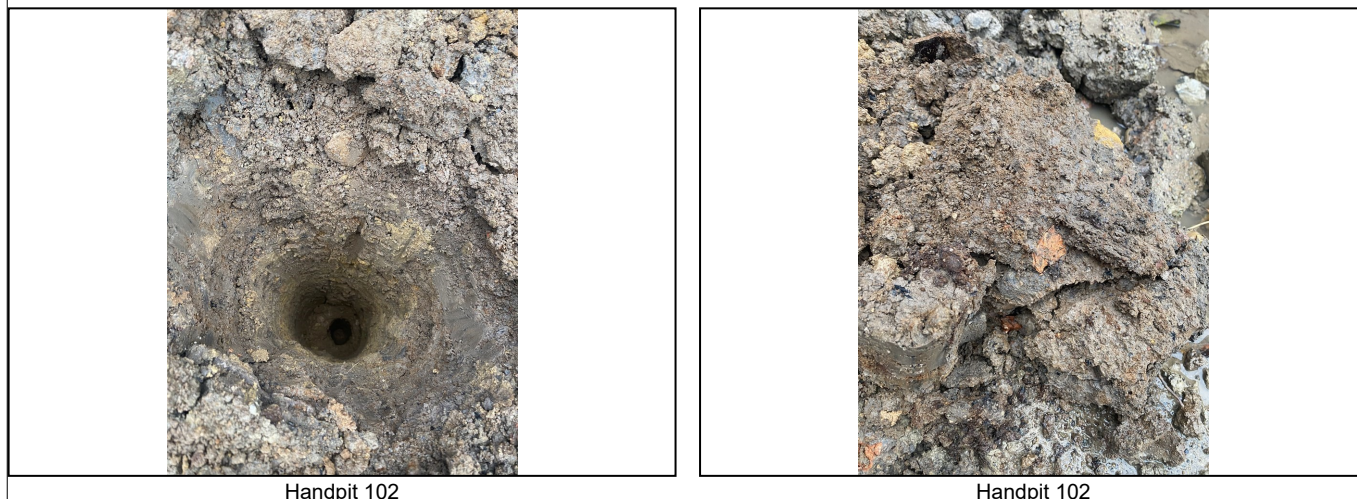
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Stability: STABLE

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Location: Bury		Dimensions (m): 0.15 0.15	Scale 1:30
Client: First 4 Electrical		Depth 1.00	Logged J. James

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			MADE GROUND: Greyish brown sandy slightly gravelly clay. Gravel of fine to medium subrounded sandstone and occasional brick fragments.	
	1.00	ES		1.00			Yellowish brown sandy gravelly CLAY. Gravel is fine to medium subrounded sandstone.	
							End of Pit at 1.00m	1
								2
								3
								4

Trial Pit Photographs



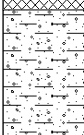
Handpit 102

Handpit 102

Remarks:

Stability: STABLE

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Location: Bury		Dimensions (m): 0.15 0.15	Scale 1:30
Client: First 4 Electrical		Depth 0.85	Logged J. James

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30			MADE GROUND: Grey gravelly clay. Gravel of fine to medium brick, concrete and mudstone.	
	0.70	ES		0.85			Yellowish brown sandy gravelly CLAY. Gravel is fine to medium subrounded sandstone.	
							End of Pit at 0.85m	

Trial Pit Photographs



Handpit 103

Handpit 103

Remarks:

Stability: STABLE

Project Name: The Rock	Project No. 16948	Co-ords: 380703.00 - 411026.00 Level:	Date 20/11/2023
Location: Bury		Dimensions (m): 0.15 0.15	Scale 1:30
Client: First 4 Electrical		Depth 1.10	Logged J. James

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.10 0.25		MADE GROUND: Cobble stone. MADE GROUND: Greyish black ash layer.		
	0.50	ES		0.70		MADE GROUND: Greyish black gravelly clay. Gravel of fine to medium, concrete and shale.		
	0.90	ES		1.10		Soft yellowish grey CLAY.		
						End of Pit at 1.10m		

Trial Pit Photographs



Handpit 104

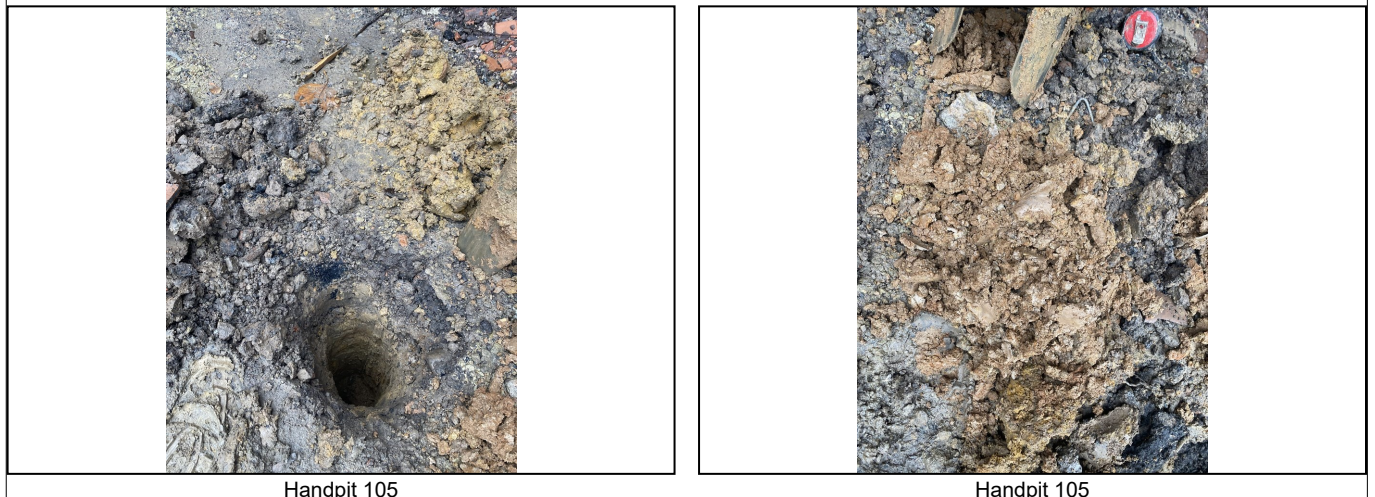
Remarks:

Stability: STABLE

Project Name: The Rock	Project No. 16948	Co-ords: 380698.00 - 411016.00 Level:	Date 20/11/2023
Location: Bury		Dimensions (m): 0.15	Scale 1:30
Client: First 4 Electrical		Depth 1.15	Logged J. James

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.40	ES		0.10			MADE GROUND: Black clay with ash fragments of tarmacadam. Yellowish brown sandy gravelly CLAY. Gravel is fine to medium subrounded sandstone.	
	1.00	ES		0.60			Soft brown sandy CLAY.	1
				1.15			End of Pit at 1.15m	2
								3
								4

Trial Pit Photographs



Handpit 105

Handpit 105

Remarks:

Stability: STABLE

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Croxley Green
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Analytical Report Number : 23-70333

Project / Site name:	The Rock, Bury	Samples received on:	21/11/2023
Your job number:	16-948	Samples instructed on/ Analysis started on:	21/11/2023
Your order number:	006809	Analysis completed by:	28/11/2023
Report Issue Number:	1	Report issued on:	28/11/2023
Samples Analysed:	7 soil samples		



Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 23-70333
Project / Site name: The Rock, Bury
Your Order No: 006809

Lab Sample Number				2886498	2886499	2886500	2886501	2886502
Sample Reference				HP101	HP102	HP103	HP103	HP104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.10	0.20	0.70	0.20
Date Sampled				20/11/2023	20/11/2023	20/11/2023	20/11/2023	20/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	15	18	21	21	20
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3	0.4	0.4

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.6	6.9	6.3	5.7	6.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	170	640	550	-	1200
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.008	0.14	0.047	-	0.026
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	16	280	94	-	52
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	8	141	47.2	-	26.1
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	2.3
Total Sulphur	mg/kg	50	MCERTS	72	330	300	-	730
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.5	1.3	1.6	0.9	4.1

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.07	0.29	0.05	0.69
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.11
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	3.5
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	2.4
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.15	< 0.05	0.24	30
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	5.4
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.18	< 0.05	0.32	45
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.17	< 0.05	0.32	43
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.07	< 0.05	0.19	25
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.13	< 0.05	0.21	25
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.1	< 0.05	0.2	27
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.05	< 0.05	0.08	11
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.06	< 0.05	0.15	23
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.07	11
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	3.4
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.09	13

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	0.98	< 0.80	1.92	266
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Analytical Report Number: 23-70333
Project / Site name: The Rock, Bury
Your Order No: 006809

Lab Sample Number				2886498	2886499	2886500	2886501	2886502
Sample Reference				HP101	HP102	HP103	HP103	HP104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.10	0.20	0.70	0.20
Date Sampled				20/11/2023	20/11/2023	20/11/2023	20/11/2023	20/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.9	12	12	7.8	38
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	24	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	-	0.46	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	-	0.2	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 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	18	13	14	-	16
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	38	43	21	150
Lead (aqua regia extractable)	mg/kg	1	MCERTS	15	86	62	27	250
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.3	< 0.3	< 0.3	1
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	14	12	14	42
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	25	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	46	68	46	43	120

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	6.5
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	70
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	130
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10	< 10	13
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10	< 10	220

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

Analytical Report Number: 23-70333
Project / Site name: The Rock, Bury
Your Order No: 006809

Lab Sample Number				2886503	2886504
Sample Reference				HP104	HP105
Sample Number				None Supplied	None Supplied
Depth (m)				0.90	1.00
Date Sampled				20/11/2023	20/11/2023
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	20	17
Total mass of sample received	kg	0.001	NONE	0.3	0.3

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.1	-
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	140	-
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.014	-
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	29	-
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	14.3	-
Sulphide	mg/kg	1	MCERTS	1	-
Total Sulphur	mg/kg	50	MCERTS	100	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.4	0.5

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
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	0.06	0.06
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80
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Analytical Report Number: 23-70333
Project / Site name: The Rock, Bury
Your Order No: 006809

Lab Sample Number				2886503	2886504
Sample Reference				HP104	HP105
Sample Number				None Supplied	None Supplied
Depth (m)				0.90	1.00
Date Sampled				20/11/2023	20/11/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.1	6.4
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	29
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	0.58
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	56	17
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	8.1	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	20
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	71	62

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	< 10
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	< 10
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	NONE	< 10	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	NONE	< 10	< 10

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

Analytical Report Number : 23-70333

Project / Site name: The Rock, Bury

* 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 *
2886498	HP101	None Supplied	0.5	Brown sandy clay with gravel.
2886499	HP102	None Supplied	0.1	Brown clay and sand with gravel.
2886500	HP103	None Supplied	0.2	Brown clay and sand with gravel.
2886501	HP103	None Supplied	0.7	Brown sandy clay with gravel.
2886502	HP104	None Supplied	0.2	Brown sand with gravel.
2886503	HP104	None Supplied	0.9	Brown sandy clay.
2886504	HP105	None Supplied	1	Brown sandy clay.

Analytical Report Number : 23-70333

Project / Site name: The Rock, Bury

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 °C)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
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
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
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

Analytical Report Number : 23-70333
Project / Site name: The Rock, Bury

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
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK 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 30°C.

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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