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PHASE 2 GEO-ENVIRONMENTAL REPORT

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site address	Frontier Business Park, 260 Bradford Road, Batley, WF17 6JD		
written by	S. Alexander	checked by	R. Palmer
issued by	S. Alexander		



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Report on a Phase 2 Geo-environmental Investigation

Location:	Frontier Business Park Bradford Road, Batley, WF17 6JD	
For:	Redbrick Yorkshire Limited	
Report No.	C5904/26/E/9153	Report date: May 2026

For and on behalf of **Rogers Geotechnical Services Ltd**

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Report Summary¹

Item	Comments	Section
Development	Construction of a new commercial unit.	1.
Geology	Artificial Geology – Made Ground. Superficial geology – Alluvium. Solid geology – Pennine Lower Coal Measures Formation.	5.
Strata Conditions	Granular made ground proven to refusal at 2.70m.	6.
Groundwater	None encountered during investigation.	6.2
Foundation Design	Piled foundation solution. Further investigation required to enable a suitable design.	10.1
Effect of Sulphates	DS-2 concrete.	10.5
Contamination	Asbestos fibres in WS01.	11.

¹ This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

It is understood that the land at Frontier Business Park, Bradford Road, Batley, WF17 6JD is to be developed by the construction of a new commercial unit. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This investigation also takes into consideration the risk of any contamination present. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Desk Study

A Phase 1 Desk Study has been undertaken by Brownfield Solutions and the results were presented as report number TH/C4575/14464 in September 2025. This report has been used extensively during the current intrusive investigation.

4. Fieldworks

The fieldworks were undertaken on the 7th April 2026 and included the following:

- Three windowless sample boreholes.
- Standard penetration tests.
- Three gas monitoring standpipes.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

4.1 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 87mm for the first 1m through 77mm, and 67mm for

subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015 +A1: 2020 and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

4.2 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within windowless sample boreholes. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 750mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

4.3 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 3.

4.4 Gas Monitoring Standpipes

Gas monitoring standpipes were installed between 1.80m and 2.50m depth in all of the boreholes and the installation details are shown on the appropriate borehole records. In all cases, the monitoring standpipe consisted of a perforated pipe from the base of the borehole to 1.0m below surface, with a non-perforated pipe to ground level. The response zone was filled with pea gravel, with a bentonite seal at the base and above, and the installation was capped with a stop box cover in a concrete surround.

5. Geology

The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site			
Strata Type	Strata Name ²	Parent Name ³	Description ³
Artificial Geology	Made Ground	-	Made Ground is an area where the pre-existing (natural or artificial) land surface is raised by artificial deposits. The purpose of the made ground is unspecified.
Superficial Geology	Alluvium	-	Soft to firm normally consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.
Solid Geology	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile			
Depth m below ground level to underside of layer	Strata Type	Positions Encountered	Groundwater Strikes m below ground level
0.20	Asphalt Surface	ALL	None
2.70	MADE GROUND (Granular)	ALL	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated

6.1 General Strata

All the boreholes drilled encountered made ground deposits comprising dark brown sandy gravel, thought to represent subbase, underlain by dark brown very gravelly sand in a variable in situ condition. In all cases the boreholes terminated abruptly at 2.70m below the existing ground level. It is not clear from the recovered materials what the boreholes have refused upon.

² Sources: British Geological Survey (NERC) Map Sheet 77; Huddersfield; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

³ Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]

6.2 Groundwater

No groundwater strikes were observed during the site investigation. However, it should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike, moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.

7. Insitu Testing

7.1 Standard Penetration Tests

The standard penetration tests carried out in boreholes are summarised in the following table:

Table 3: Summary of Standard Penetration Tests				
Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
Made Ground	1.00 to 2.00	5 to 31	-	SPT's indicate a variable insitu condition between loose to dense with refusal met in all cases at 2.70m
	2.70	50+		

7.2 Dynamic Probe Tests

Dynamic penetration tests were undertaken adjacent to the windowless sample borehole positions. A summary of the results is presented below:

Table 4: Summary of Dynamic Penetration Tests					
Position	Blows/100mm			Refusal type (Effective/ Abrupt) ⁴	Comments
	0 - 2	3 - 10	10+		
	Depth to which blow count range was observed (m)				
DP1	2.7	1.3	0.6	Abrupt	Initial high results reducing with depth with variably low results until abrupt refusal at 2.7m
DP2	2.4	1.4 2.7	0.6	Abrupt	Initial high results reducing with depth with variably low results until abrupt refusal at 2.7m
DP3	1.6 2.5	0.9 2.0 2.7	0.6	Abrupt	Initial high results reducing with depth with variably low results until abrupt refusal at 2.7m

It is noted that the dynamic probes have refused at a similar depth to the windowless sample boreholes.

⁴ Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.

7.3 Gas and Water Level Monitoring

The standpipes were monitored between the 2nd April the 22nd April 2016. The results of the gas monitoring undertaken to date are tabulated below and full results are presented in Appendix 4.

Table 5: Gas Monitoring

Location	Date	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/h)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS01	02.04.26	0.1	0.5	20.8	0.1	1016↔	DRY	1.88
	10.04.26	0.1	0.5	21.3	0.0	1014↑	DRY	
	18.04.26	0.1	0.4	20.7	0.0	1011↓	DRY	
	22.04.26	0.1	0.5	20.2	0.1	1024↔	DRY	
WS02	02.04.26	0.0	1.3	19.7	0.1	1016↔	DRY	2.42
	10.04.26	0.1	1.4	20.3	0.1	1014↑	DRY	
	18.04.26	0.0	1.3	19.7	0.0	1011↓	DRY	
	22.04.26	0.1	1.4	19.6	0.1	1024↔	DRY	
WS03	02.04.26	0.0	0.3	20.4	0.0	1016↔	DRY	2.53
	10.04.26	0.1	0.3	21.3	0.0	1014↑	DRY	
	18.04.26	0.0	0.6	19.9	0.1	1011↓	DRY	
	22.04.26	0.1	0.4	20.7	0.1	1024↔	DRY	

↑ - rising pressure ↓ - falling pressure ↔ -steady pressure

This work was undertaken using a Geotechnical Instruments (UK) Ltd. GA5000 (serial No G504785) which was last calibrated on the 19th February 2026.

8. Laboratory Testing - Geotechnical

No appropriate samples were recovered which could be subjected to geotechnical testing.

9. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr^{VI}, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻ and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO₄²⁻.
- Asbestos.

This testing was undertaken by i2 Analytical Ltd and the results of all of the chemical testing are presented in Appendix 5 of this report.

10. Discussion of Ground Conditions - Geotechnical

10.1 Foundations

It is understood that the current development proposals comprise the construction of a new commercial unit. At present it is not recommended that shallow foundations be employed. Based on the historical data the area has been previously occupied by a sewage works with reservoirs or filter beds present on the footprint of the proposed building. It appears that the ground conditions encountered represent a filled former reservoir or filter bed with refusal in all three locations. These deposits could represent the base of the features, or could represent bedrock; given the abrupt and consistent refusal, it is anticipated to be the former.

Whilst a form of ground improvement and the installation of a raft foundation could be considered, it is anticipated that insufficient land take shall be present in order to allow such a solution. Moreover, given the active commercial setting, the disturbance caused by the removal and transportation of soil would also be unsuitable. If deemed feasible, the existing soils would need to be excavated and recompacted in a suitable engineered manner, or excavated and replaced by a bulk granular fill if the existing soils are deemed inappropriate for recompaction.

If alternative solutions need to be adopted, then further investigation will be required to confirm the deposits underneath the obstructions and will likely require a form of rotary drilling to prove the deposits at depth on which refusal was proven. Should the refusal prove to be rock it is likely that the most suitable foundations will be piles, although ground improvement via resin or grout injection may also be viable.

10.2 General Comments for Excavations

The stability of excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary. Under no circumstances should operatives be allowed to enter unsupported excavations. Prior to any excavation, the potential impacts of soil removal on nearby structures and infrastructure would need to be considered.

Should the excavations be required to stand open, it is considered that a blinding layer of lean-mixed concrete be placed over the sub-grade. This expedient will reduce loosening or softening of the underling soil due to both physical disturbance and the ingress of surface water.

Should seepage of groundwater be encountered it is considered that it could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

10.3 Ground-floors

In light of the made ground and weak near surface soils, which were revealed to depths of up to 2.70m, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

10.4 Hard-standing Areas

It is considered that any hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of <2% could be employed in the pavement design⁵. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

10.5 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2⁶, which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-2 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1⁷, which can be found in Part D, *Specifying concrete for general cast-in-situ use*, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

11. Discussion of Ground Conditions - Environmental

11.1 Discussion of Test Results

It is understood that the site is to be developed by the erection of a new commercial building. Consequently, the site may be classified as commercial end use.

11.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 4.5% and 5.8%. On this basis, it is considered that the screening values associated with 1% SOM should be adopted. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website⁸ and these include many local authorities.

⁵ Table 11.1, *Reproduction of TRRL Report LR1132 (1984)*, Smith (2006), Smith's Elements of Soil Mechanics, 8th ed.

⁶ Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*

⁷ Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

⁸ <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>

A comparison of the results of the testing, together with the data given above, can be found within Appendix 5. These results indicate the following:

Table 8: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Commercial)
WS01	0.60	Asbestos: Loose fibres, and asbestos cement Chrysotile. PAHs: Benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3 c-d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)anthracene TPHs: Aromatic (>C12-C16)
WS02	1.60	PAHs: Benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3 c-d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)anthracene TPHs: Aromatic (>C12-C16)
WS03	0.50	PAHs: Benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3 c-d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)anthracene TPHs: Aromatic (>C12-C16)

Concentrations of chromium^{VI}, free cyanide, phenols (total) and total petroleum hydrocarbons (aliphatic C5 to C10; aromatic C5 to C10) were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated At Risk Soil Screening Values. Chrysotile fibres and asbestos cement was recorded in WS01.

It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion⁹. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

Table 9: Summary of Areas Contaminated by PAHs & TPHs

Location	Depth (m)	Contaminants found to be exceeding SSVs (Commercial)
WS01	0.60	None
WS02	1.60	None
WS03	0.50	None

On the basis of the above testing, apart from the trace fibres of asbestos found in the soils at WS01, the site is generally uncontaminated with respect to the proposed commercial end use.

⁹ Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 1% SOM, Commercial land use, 23.06.17.

11.1.2 Gas Concentrations

With respect to ground gas, the results of the monitoring visits indicated a maximum concentration of 0.1% methane, with concentrations of carbon dioxide ranging between 0.3% and 1.4%, in association with oxygen levels of between 19.7% and 21.3%. It should be appreciated that on non-contaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 0.1 litres per hour was recorded and will be employed in the following calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 1011mb and 1024mb during periods of rising, steady and falling pressure trends.

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0.1% (0.001) methane was recorded along with 1.4% (0.014) carbon dioxide, in association with a maximum flow rate of 0.1 l/hr. This results in a GSV of 0.0001 l/hr for methane and a GSV of 0.0014 l/hr for carbon dioxide.

In accordance with Table 2 of BS8485: 2015, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, the site may be characterised as *Characteristic Situation Level 1*. It is therefore considered that there is a very low risk of harm to end users and site operatives and no special precautionary measures are required in accordance to Table 8.6, *Typical scope of gas protection measures*, of CIRIA report C665.

In this case, a total of 4 monitoring visits were undertaken over a 1 month time period and for the purpose of this assessment, it is considered that the site can be classified as Characteristic Situation Level 1.

The client should be aware the site is also located in a 5% to 10% radon risk area and basic radon protection measures will be required. The original desk study stated the site was in a low risk area where <1% of properties were at or below the action level, however on review of the published data on UK Radon it was discovered the radon level was in fact between 5% and 10%.

11.2 Site Specific Risk Assessment

11.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency¹⁰ advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.¹¹ This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause

¹⁰ R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.

¹¹ The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'¹²

11.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 10. Sources of contamination include the following:

On-site – Made Ground (Asbestos).

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

N/A -	A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.
Low -	A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.
Moderate -	The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary
High -	The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.

The results of the risk assessment are presented in Table 10.

¹² See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.

Table 10: Conceptual Site Model and Site-Specific Risk Assessment

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Actions Required
Direct contact/dermal absorption/soil ingestion	Operative	Yes – trace levels of PAHs and TPHs found in soils but below screening values. Workers will come into direct contact with soils.	Low	Precautionary measures will be required during the construction phase to protect workers. Final development will sever pathways.
	End User	Yes – contamination found to be present at the site and site to be developed into commercial end use. Soils but below screening values. Site likely to be completely covered with hardstanding therefore pathway will be severed.	Low	
	Neighbours	Yes – contamination found to be present at the site and a commercial area surrounds the site. Site completely covered with hardstanding which will sever the pathway.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from soils. Asbestos fibres encountered in WS01 which may be released during site activity. In addition, trace levels of TPHs may produce volatiles	Moderate	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Measures will be required to prevent offsite migration of dust or asbestos fibres.
	End User	Yes – Asbestos fibres encountered in WS01. Site likely to be completely covered with hardstanding therefore pathway will be severed.	Low	
	Neighbours	Yes – contamination found to be present at the site and a commercial area surrounds the site. Site completely covered with hardstanding which will sever the pathway. Asbestos fibres encountered in WS01 which may be released during site activity.	Moderate	
Ingestion of fruit/vegetables and/or waters	Operative	No – Site is located in a commercial area with no soft landscaping.	N/A	No action required.
	End User			
	Neighbours			
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – low concentrations of methane and carbon dioxide have been found to be present at the site (<i>Characteristic Situation Level 1</i>).	Low	Low concentrations of harmful gases (methane and carbon dioxide) were detected at the site. If ground gas conditions remain the same, no special precautionary measures are deemed to be required. However, local presence of TPHs may require vapour barrier and precautionary measures during construction.
	End User		Low	

	Neighbours	No – whilst concentrations of ground gas have been found to be present at the site (<i>Characteristic Situation Level 1</i>), no structures directly adjoin the site, therefore gases migrating from the site would vent to atmosphere before reaching neighbouring structures.	N/A	
Spillage/loss/run off direct to receiving water	Controlled Waters	Yes – a surface water course is present adjacent to the east of the site. Trace levels of PAHs and TPHs recorded in soils which do not exceed screening values.	Moderate	Soils below screening values, however at levels which may pose a risk to water environment.
Migration via permeable unsaturated strata	Controlled Waters	Yes – Predominantly granular made ground present on site. Site underlain by secondary A aquifer Trace levels of PAHs and TPHs recorded in soils which do not exceed screening values. However, mobility of light PAH and TPH fractions may pose a risk to groundwater and the adjacent water course.	Moderate	Measures required to endure that no direct surface run-off can enter into adjacent water course. Any perched waters encountered will need to be pumped, tanked and removed from site.
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. Trace levels of PAHs and TPHs recorded in soils which do not exceed screening values. However, mobility of light PAH and TPH fractions may pose a risk to groundwater and the adjacent water course.	Moderate	
Direct contact with contaminated soils	Plants	No – Site proposed to be commercial end use with no soft landscaping. Soils below screening levels.	N/A	No action required. .
Uptake via root system			N/A	
Direct contact with contaminated soils	Building Materials	Yes – TPH and PAH contamination revealed at the site may represent a significant risk to building materials or plastic water pipes Preclude use of PE pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is DS-2 AC-1s.	High (plastic services)	Please see section 11.3 for information on good building practice.
Direct contact with contaminated groundwater			Moderate (buried concrete)	
Exposure to Radon	Operative	Yes – Site is located in a radon risk area where between 5% and 10% of properties are at or above the action limit.	High	Basic radon protection measures required.
	End User			

11.3 Indicative Remediation Strategy

In view of the site specific risk assessment it is considered that it will not be necessary to undertake any specific remediation at this site. It should be appreciated, however, that careful inspection of the subgrade should be made during the groundworks. Should areas of contamination be detected then further testing may become necessary.

11.3.1 General Approach to Construction

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore, the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the fundamental principles of identifying potentially contaminated soils and the hazards of working with such soils not identified by the ground investigation.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use at all times.
- Where vehicles are transferring soil to landfill site they should be covered to prevent any potential contamination of the surrounding area by dust.
- Any stockpiles of soil should be sheeted over to prevent excessive amounts of airborne dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer any potential contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the development the following items are required to protect the structure from the potential contaminants revealed at this site.

- Beneath, pavements and hard-standings clean inert granular sub-base should be employed.
- Levels of TPHs and PAHs preclude use of PE pipes.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-2.

10.4 Fill Materials

It should also be appreciated that any fill material, either site-won or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.

Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3882 (2015).
- It is free from obvious contamination i.e. visual or olfactory evidence.
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing.
- It is not a statutory nuisance, such as being odorous.
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG¹³ documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 11: Validation Sampling and Testing		
Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m ³ and 1 per 250m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m ³ and 1 per 100m ³	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

¹³ YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V11.2 Appendix 1a, June 2020.

Table 12: Fill Screening Values

Contaminant	Screening Value (Commercial) (mg/kg)		Reference
	1% SOM	6% SOM	
As	635	635	Atrisk ^{SOIL} SSVs
Cd	410	410	Atrisk ^{SOIL} SSVs
Cr(VI)	49.1	49.1	Atrisk ^{SOIL} SSVs
Cu	106000	106000	Atrisk ^{SOIL} SSVs
Hg	350	405	Atrisk ^{SOIL} SSVs
Ni	1770	1770	Atrisk ^{SOIL} SSVs
Pb	2310	2310	Atrisk ^{SOIL} SSVs
V	7490	7490	Atrisk ^{SOIL} SSVs
Zn	1100000	1100000	Atrisk ^{SOIL} SSVs

Please see summary sheet within Appendix 6 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

11.5 Verification Report

It is not anticipated that it will be necessary to produce a verification report for submission to any statutory authorities. However should any unexpected contamination such as grossly contaminated or free product be observed then works should cease and further testing undertaken.

12. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Detailed design of the sub-structure Completion of additional fieldworks by means of rotary boreholes to aid in foundation design.
- Discussions with a groundworks contractors to assess whether ground improvement and subsequent raft solution is feasible.
- Discussions with piling contractors regarding their method for installing piles.
- Discussions with ground work contractors in relation to the requirement for testing of materials to be disposed off-site (Waste Acceptance Criteria) and the suitability of imported materials.
- Discussions with service providers regarding suitable materials for pipe work given the nature of chemical determinands found within the soils on site.
- Discussions with contractors for requirements for radon barrier gas membrane.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.

13. References

- British Geological Survey (NERC) (2026), BGS, Keyworth.
 - Geology of Britain Viewer:
(http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)
 - Lexicon of Named Rock Units:
(<http://www.bgs.ac.uk/lexicon/>)
- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-2: *Geotechnical investigation and testing – Field testing, Part 2: Dynamic Probing*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-3: *Geotechnical investigation and testing – Field testing, Part 3: Standard penetration test*, B.S.I., London.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- British Standards Institution (2011), BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.
- British Standards Institution (2015 +A1:2019) BS8485: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, B.S.I., London.
- British Standards Institution (2013), BS 8576 *Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds*.
- British Standards Institution (2017) BS EN ISO 14688: *Geotechnical investigation and testing – Identification and classification of soil*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: *Concrete in aggressive ground*, BRE Press, Garston.
 - Part C: *Assessing the aggressive chemical environment*.
 - Part D: *Specifying concrete for general cast-in-situ use*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.
- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings*, CIRIA Report C665.

Appendix 1

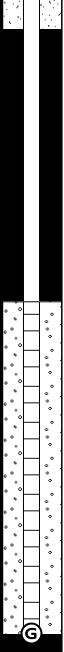
Site Plan



Appendix 2

Borehole Records

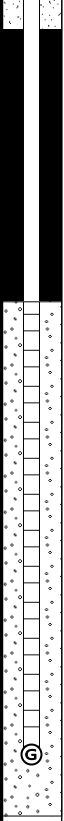
							Borehole Log			Borehole No. WS01 Sheet 1 of 1	
Project Name: Frontier Business Park				Project No. C5904/26//E/9158		Co-ords:			Hole Type WLS		
Location: 260 Bradford Road, Batley						Level:			Scale 1:25		
Client: Joe Batty						Dates: 07/04/2026			Logged By IMY		

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.10								ASPHALT.	
		0.15								MADE GROUND (Creamish brown sandy, sub-angular to sub-angular to sub-rounded, fine to medium of limestone). [SUBBASE]	
		0.60	ES	87	100					MADE GROUND (Medium dense dark brown silty very gravelly SAND. Gravel is sub-angular to sub-rounded, fine to medium of clinker, brick, mortar and sandstone. Occasional timber fragments).	
		1.00	SPT			N=23 (4,3/2,4,12,5)				MADE GROUND (Light brown and brown silty very gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to medium and occasional coarse of sandstone, brick and mortar). <u>1.0m - 1.45m: Poor recovery.</u>	1
				77	45						
		1.45								MADE GROUND (Loose dark brown silty very gravelly fine to medium SAND. Locally slightly clayey. Gravel is sub-angular to sub-rounded, fine to medium of brick, mortar, concrete and sandstone).	2
		2.00	SPT			N=5 (1,1/1,1,2,1)					
				67	60						
		2.70	SPT			50 (50 for 10mm/50 for 10mm)				End of Borehole at 2.70m	3
											4
											5

Remarks
 CAT and Genny survey.



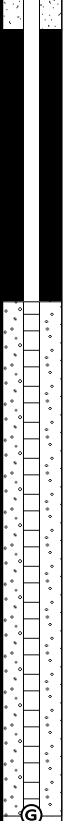
							Borehole Log			Borehole No. WS02 Sheet 1 of 1	
Project Name: Frontier Business Park					Project No. C5904/26//E/9158		Co-ords:		Hole Type WLS		
Location: 260 Bradford Road, Batley							Level:		Scale 1:25		
Client: Joe Batty							Dates: 07/04/2026		Logged By IMY		

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
									ASPHALT.	
									MADE GROUND (Reddish brown sandy, sub-angular to sub-rounded, fine to coarse GRAVEL of brick). [SUBBASE]	
									MADE GROUND (Medium dense becoming loose dark brown silty very gravelly fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to medium and occasional coarse of brick, mortar, ash, clinker and occasional sandstone).	1
									MADE GROUND (Loose dark brown silty gravelly fine to coarse SAND. Sand is ash. Gravel is sub-angular to sub-rounded, fine to medium of ash, clinker, occasional brick, sandstone and concrete).	2
									End of Borehole at 2.70m	3
		1.00	SPT	87	100	N=5 (1,2/1,1,1,2)	0.20			
		1.60	ES	77	70		0.60			
		2.00	SPT	67	40	N=31 (2,2/11,10,6,4)	1.45			
		2.70	SPT			50 (50 for 10mm/50 for 16mm)	2.70			4
										5

Remarks
 CAT and Genny survey.



						Borehole Log				Borehole No. WS03 Sheet 1 of 1	
Project Name: Frontier Business Park						Project No. C5904/26//E/9158		Co-ords:		Hole Type WLS	
Location: 260 Bradford Road, Batley						Level:		Scale 1:25		Logged By IMY	
Client: Joe Battye						Dates: 07/04/2026					

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.05								ASPHALT.	
		0.50	ES	87	100					MADE GROUND (Medium dense dark brown silty very gravelly fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to medium of clinker, brick, mortar and sandstone. Occasional coarse brick).	
		1.00	SPT			N=9 (2,7/3,2,1,3)	1.00			MADE GROUND (Medium dense becoming loose dark brown silty very gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to medium and occasional coarse of brick, mortar, ash, clinker and occasional sandstone).	1
				77	50		1.30			MADE GROUND (Loose dark brown silty gravelly fine to medium SAND. Sand is ash. Gravel is sub-angular to sub-rounded, fine to medium of ash, clinker, occasional brick, sandstone and concrete).	
		2.00	SPT			N=11 (2,2/3,2,2,4)					2
		2.70	SPT			50 (50 for 60mm/50 for 60mm)	2.70			End of Borehole at 2.70m	3
											4
											5

Remarks CAT and Genny survey.											
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Appendix 3

Dynamic Probing Records



Probe Log

Probe No.

WS01

Sheet 1 of 1

Project Name: Frontier Business Park

Project No.
C5904/26//E/9158

Co-ords:

Hole Type
WLS

Location: 260 Bradford Road, Batley

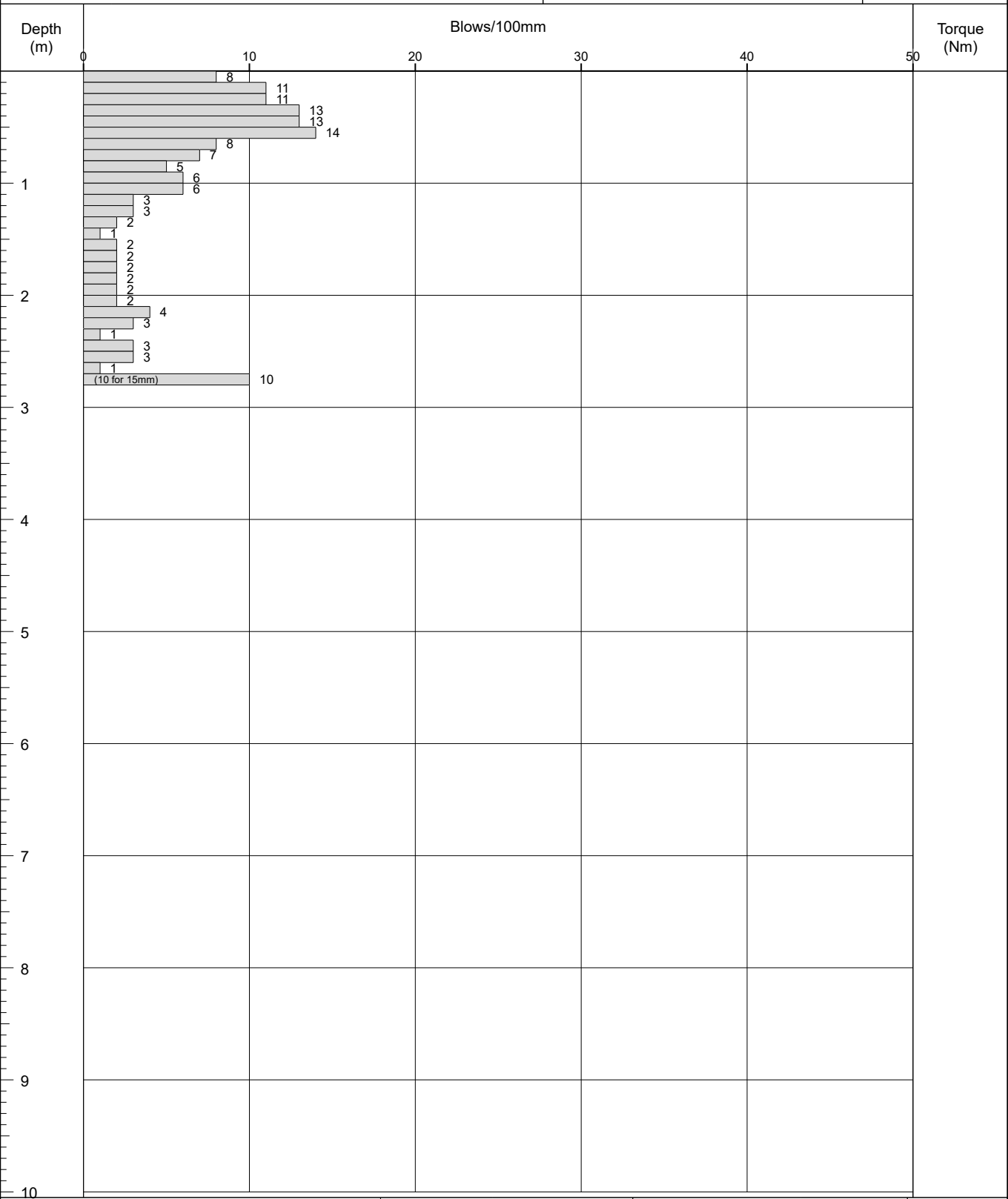
Level:

Scale
1:50

Client: Joe Battye

Dates: 07/04/2026

Logged By
IMY



Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 2.7m

Probe Type DPSH-B





Environmental
Geotechnical
Specialists

Probe Log

Probe No.

WS02

Sheet 1 of 1

Project Name: Frontier Business Park

Project No.
C5904/26//E/9158

Co-ords:

Hole Type
WLS

Location: 260 Bradford Road, Batley

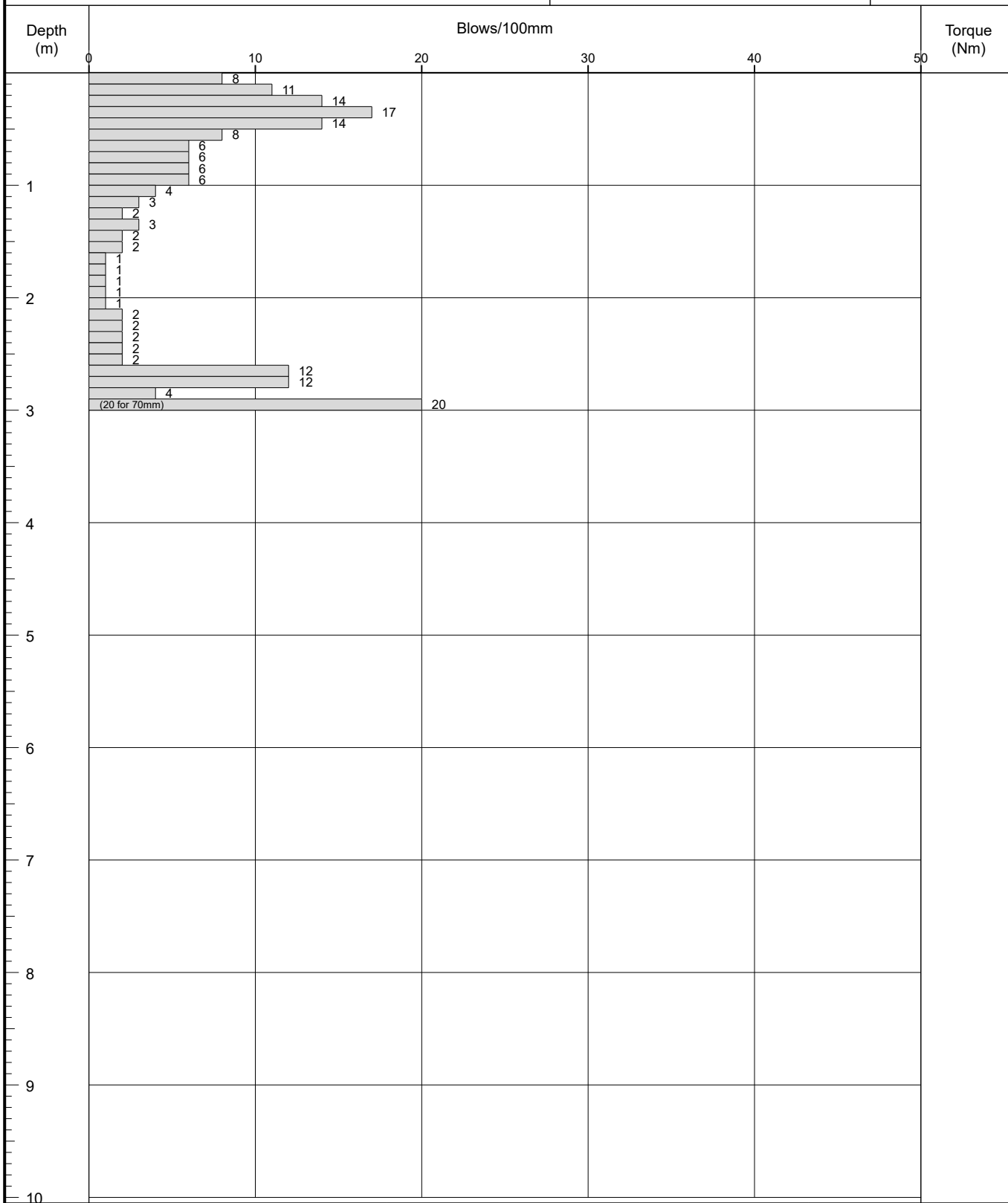
Level:

Scale
1:50

Client: Joe Battye

Dates: 07/04/2026

Logged By
IMY



Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 2.7m

Probe Type DPSH-B





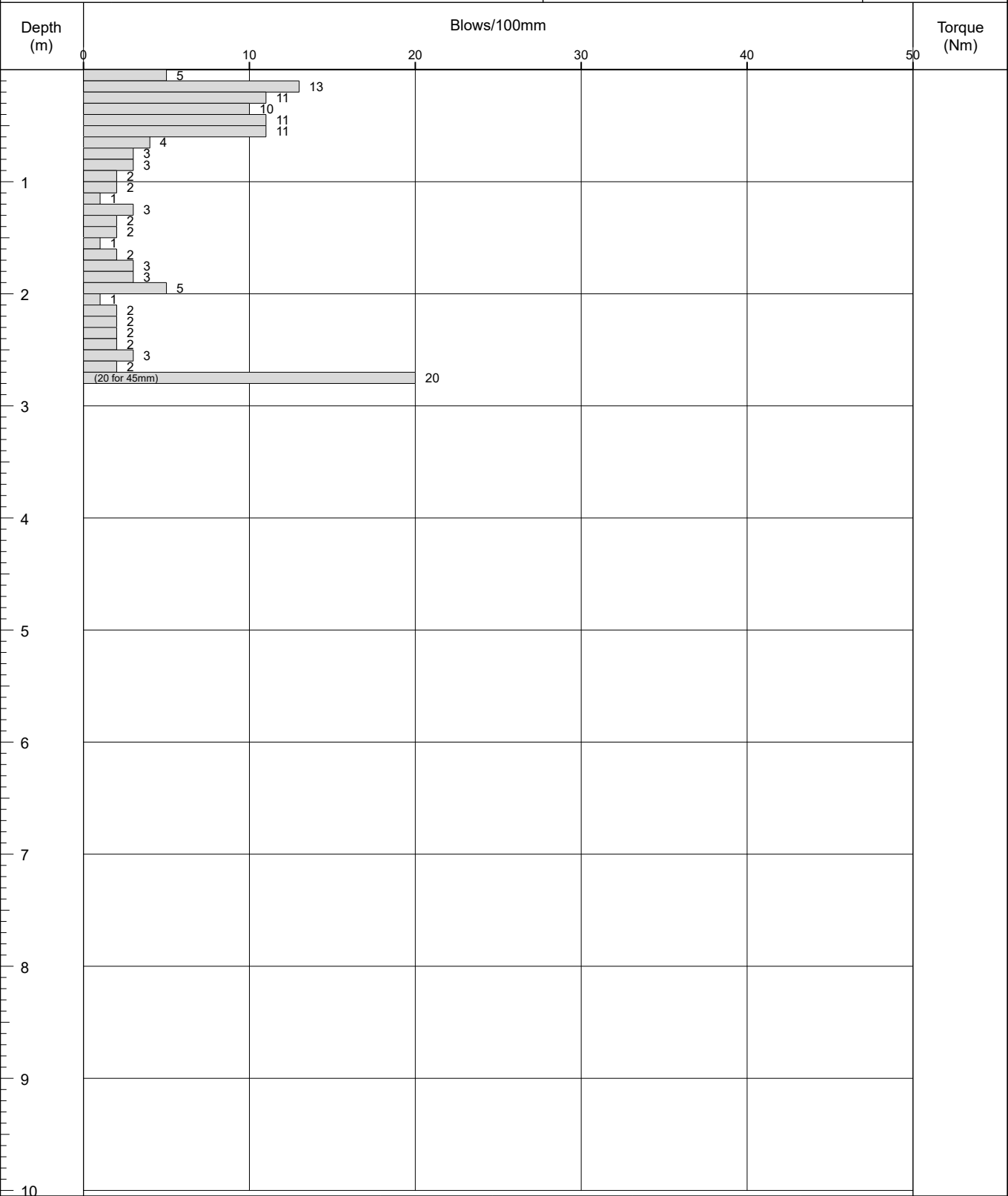
Probe Log

Probe No.

WS03

Sheet 1 of 1

Project Name: Frontier Business Park	Project No. C5904/26//E/9158	Co-ords:	Hole Type WLS
Location: 260 Bradford Road, Batley		Level:	Scale 1:50
Client: Joe Battye		Dates: 07/04/2026	Logged By IMY



Remarks:	Fall Height	750mm	Cone Base Diameter	50.5mm
	Hammer Wt	63.5kg	Final Depth	2.7m
	Probe Type	DPSH-B		



Appendix 4

Gas Monitoring Sheets

Post Fieldworks Discrete Well Monitoring Site Record																																																																																																																																																	
Job No:	C/5904/26/E/9158					Client:	Joe Battye					Visit:	1	Of	4	 Rogers Geotechnical Services Ltd , Offices 1 & 2 Barncliffe Business Park, Shelley, Huddersfield, HD8 8LU Tel: 01484 604 354 enquiries@rogersgeotech.co.uk																																																																																																																																	
Site:	Front.Bus.Park260Brad.RdBatleyWF176JD					Date:	02.04.2026																																																																																																																																										
Location ID	Methane (%)		Carbon Dioxide (%)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		Oxygen (%)		VOCs (ppm)		Flowrate (l/hr)		Water Depth (m)		Well Depth (m)	Installed Depth (m)	Comments																																																																																																																														
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Appendix 5

Laboratory Testing

Rogers Geotechnical Services Ltd
Offices 1&2 Barncliffe Business Pk
Near Bank, Shelley
Huddersfield
West Yorkshire
HD8 8LU

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i2 Analytical Ltd.
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Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: info-i2analytical@normecgroup.com

Analytical Report Number : 26-018333

Project / Site name:	Frontier Bussiness Park, Batley	Samples received on:	04/04/2026
Your job number:	C5904 26 E 9158	Samples instructed on/ Analysis started on:	09/04/2026
Your order number:	PO 3776	Analysis completed by:	16/04/2026
Report Issue Number:	1	Report issued on:	17/04/2026
Samples Analysed:	3 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
air	- once the analysis is complete

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

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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: 26-018333

Project / Site name: Frontier Bussiness Park, Batley

Your Order No: PO 3776

Lab Sample Number	884021	884022	884023
Sample Reference	WS01	WS02	WS03
Sample Number	None Supplied	None Supplied	None Supplied
Water Matrix	N/A	N/A	N/A
Depth (m)	0.60	1.60	0.50
Date Sampled	31/03/2026	31/03/2026	31/03/2026
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status

Mass of stone >10mm	%	0.1	NONE	72.8	< 0.1	11.7
Moisture Content	%	0.01	NONE	11	15	17
Total mass of sample received	kg	0.1	NONE	0.8	0.7	0.8
Whole Sample Crushed	N/A	N/A	NONE	Crushed	-	-

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WIK	WIK	WIK
Analysis completed	N/A	N/A	N/A	16/04/2026	16/04/2026	16/04/2026
Actinolite detected	Type	N/A	ISO 17025	Not-detected	-	-
Amosite detected	Type	N/A	ISO 17025	Not-detected	-	-
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected	-	-
Chrysotile detected	Type	N/A	ISO 17025	Detected	-	-
Crocidolite detected	Type	N/A	ISO 17025	Not-detected	-	-
Tremolite detected	Type	N/A	ISO 17025	Not-detected	-	-

Asbestos % by hand picking/weighing	%	0.001	ISO 17025	0.001	-	-
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Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Loose Fibres, Asbestos Cement	-	-
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General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8	8	7.8
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	0.354	0.415	0.19
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1600	510	800
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	785	253	398
Organic Matter (automated)	%	0.1	MCERTS	5.1	4.5	5.8

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
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Analytical Report Number: 26-018333

Project / Site name: Frontier Bussiness Park, Batley

Your Order No: PO 3776

Lab Sample Number	884021	884022	884023
Sample Reference	WS01	WS02	WS03
Sample Number	None Supplied	None Supplied	None Supplied
Water Matrix	N/A	N/A	N/A
Depth (m)	0.60	1.60	0.50
Date Sampled	31/03/2026	31/03/2026	31/03/2026
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	14	15	17
Acenaphthylene	mg/kg	0.05	MCERTS	0.77	0.21	0.98
Acenaphthene	mg/kg	0.05	MCERTS	9.2	7.1	18
Fluorene	mg/kg	0.05	MCERTS	7.5	5.7	16
Phenanthrene	mg/kg	0.05	MCERTS	44	49	94
Anthracene	mg/kg	0.05	MCERTS	8.7	14	19
Fluoranthene	mg/kg	0.05	MCERTS	47	61	100
Pyrene	mg/kg	0.05	MCERTS	41	48	87
Benzo(a)anthracene	mg/kg	0.05	MCERTS	19	26	42
Chrysene	mg/kg	0.05	MCERTS	19	20	40
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	21	24	37
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	8.4	9.7	17
Benzo(a)pyrene	mg/kg	0.05	MCERTS	17	21	31
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	8.4	9.4	13
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	2.7	2.3	4.3
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	9.1	10	15

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	277	322	551
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	45	190	67
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.6	0.6
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	210	32	34
Copper (aqua regia extractable)	mg/kg	1	MCERTS	150	130	170
Lead (aqua regia extractable)	mg/kg	1	MCERTS	210	140	280
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	1.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	36	69	45
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	6.2	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	180	110	58
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	250	110	230

Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	1.4
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	3.1	< 2.0	5.8
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	38	< 8.0	8
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	260	8.7	35
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	300	< 10	50

Analytical Report Number: 26-018333

Project / Site name: Frontier Bussiness Park, Batley

Your Order No: PO 3776

Lab Sample Number	884021	884022	884023
Sample Reference	WS01	WS02	WS03
Sample Number	None Supplied	None Supplied	None Supplied
Water Matrix	N/A	N/A	N/A
Depth (m)	0.60	1.60	0.50
Date Sampled	31/03/2026	31/03/2026	31/03/2026
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.02	MCERTS	< 0.020	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	5.9	17	23
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	36	36	100
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	160	150	380
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	360	270	540
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	570	470	1000

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
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	8	MCERTS	< 8.0	< 8.0	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0

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



4041



Analytical Report Number: **26-018333**
Project / Site name: **Frontier Bussiness Park, Batley**
Your Order No: **PO 3776**

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

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

Quantitative Analysis

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

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

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

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample	Analysis completed	Analyst ID
884021	WS01	0.6	159	Loose Fibres, Asbestos Cement	Chrysotile	0.001	0.001	16/04/2026	WIK

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

Analytical Report Number : 26-018333

Project / Site name: Frontier Bussiness Park, Batley

* 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 *
884021	WS01	None Supplied	0.6	Brown sand with gravel and stones
884022	WS02	None Supplied	1.6	Brown sand with gravel and brick
884023	WS03	None Supplied	0.5	Brown clay and gravel with stones

Analytical Report Number : 26-018333

Project / Site name: Frontier Bussiness Park, Batley

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)

Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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, 2021	A001B	D	ISO 17025
Whole Sample Crushed	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis	In house method, applicable to dry samples only	L019B	D	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references	HSE Report No: 83/1996, HSG 248 (2021), HSG 264 (2012) & SCA Blue Book (draft)	A006B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content (Wet Weight)	Moisture content (% wet weight), determined gravimetrically (up to 30°C)	In-house-procedure based on BS EN 12880:2000	L019B	W	NONE
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.	L019B	D	NONE
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	L038B	D	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID with carbon banding aliphatic and aromatic	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
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
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
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	L080-PL	W	MCERTS

Analytical Report Number : 26-018333

Project / Site name: Frontier Bussiness Park, Batley

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)

Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS with carbon banding aliphatic and aromatic	In-house method	L088-PL	W	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
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution

Analytical Report Number : 26-018333

Project / Site name: Frontier Bussiness Park, Batley

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container/Insufficient material provided c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS01	N/A	S	884021	c	BTEX and/or Volatile organic compounds in soil	L073B	c
WS01	N/A	S	884021	c	Free cyanide in soil	L080-PL	c
WS01	N/A	S	884021	c	Monohydric phenols in soil	L080-PL	c
WS01	N/A	S	884021	c	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	c
WS01	N/A	S	884021	c	Total petroleum hydrocarbons with carbon banding by GC-FID in soil	L076B	c
WS01	N/A	S	884021	c	Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	L088-PL	c
WS02	N/A	S	884022	c	BTEX and/or Volatile organic compounds in soil	L073B	c
WS02	N/A	S	884022	c	Free cyanide in soil	L080-PL	c
WS02	N/A	S	884022	c	Monohydric phenols in soil	L080-PL	c
WS02	N/A	S	884022	c	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	c
WS02	N/A	S	884022	c	Total petroleum hydrocarbons with carbon banding by GC-FID in soil	L076B	c
WS02	N/A	S	884022	c	Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	L088-PL	c
WS03	N/A	S	884023	c	BTEX and/or Volatile organic compounds in soil	L073B	c
WS03	N/A	S	884023	c	Free cyanide in soil	L080-PL	c
WS03	N/A	S	884023	c	Monohydric phenols in soil	L080-PL	c
WS03	N/A	S	884023	c	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	c
WS03	N/A	S	884023	c	Total petroleum hydrocarbons with carbon banding by GC-FID in soil	L076B	c
WS03	N/A	S	884023	c	Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	L088-PL	c



Rogers Geotechnical Services: Soil Screening Values Comparison Sheet



Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet														
Job Number	C5904/26/E/9158				A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than i2's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.									
Job Name	Frontier Business Park, Batley				KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)									
Date	07/05/2026				Sample Location	WS01	WS02	WS03						
Client	Redbrick Yorkshire Limited				Depth Top	0.60	1.60	0.50						
					Depth Base									
Determinand	Units	Ref	LOD	Commercial 1%										
				Atrisk 2015 (No Free Product)	Atrisk 2017									
Cadmium	mg/kg	C	0.2		410	0.6	0.6	0.6						
Chromium (Hexavalent)	mg/kg	B/C	1.8	49.1	19.7	< 1.8	< 1.8	< 1.8						
Copper	mg/kg	A+	1.0		106000	150	130	170						
Mercury	mg/kg	A/D	0.3		350	< 0.3	< 0.3	1.7						
Nickel	mg/kg	A+	1.0		1770	36	69	45						
Lead	mg/kg	C	1.0		2310	210	140	280						
Zinc	mg/kg	A+	1.0		1100000	250	110	230						
Vanadium	mg/kg	A+	1.0		7490	180	110	58						
Arsenic	mg/kg	C	1.0		635	45	190	67						
Selenium	mg/kg	A	1.0		13000	6.2	< 1.0	< 1.0						
Cyanide (Free)	mg/kg	A	1.0		373	< 1.0	< 1.0	< 1.0						
Total Phenols	mg/kg	A	1.0		685	< 1.0	< 1.0	< 1.0						
Naphthalene	mg/kg	A+	0.05	90.1	75	14	15	17						
Acenaphthylene	mg/kg		0.05			0.77	0.21	0.98						
Acenaphthene	mg/kg	A+	0.05	83600	156.8	9.2	7.1	18						
Fluorene	mg/kg	A+	0.05		66500	7.5	5.7	16						
Phenanthrene	mg/kg		0.05			44	49	94						
Anthracene	mg/kg	A+	0.05		535000	8.7	14	19						
Fluoranthene	mg/kg	A+	0.05		72200	47	61	100						
Pyrene	mg/kg	A+	0.05		54100	41	48	87						
Benzo[a]anthracene	mg/kg	A	0.05	131	1.71	19	26	42						
Chrysene	mg/kg	A	0.05	14000	0.44	19	20	40						
Benzo[b]fluoranthene	mg/kg	A	0.05	142	1.22	21	24	37						
Benzo[k]fluoranthene	mg/kg	A	0.05	1430	0.686	8.4	9.7	17						
Benzo[a]pyrene	mg/kg	B/C	0.05	76.3	26.1	17	21	31						
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.05	142	0.0614	8.4	9.4	13						
Dibenz(a,h)Anthracene	mg/kg	A	0.05	14.3	0.00393	2.7	2.3	4.3						
Benzo[g,h,i]perylene	mg/kg	A	0.05	1440	0.0187	9.1	10	15						
Total Of 16 PAH's	mg/kg		0.8			277	322	551						
Aliphatic TPH >C5-C6	mg/kg	A+	0.01	4490	327	< 0.010	< 0.010	< 0.010						
Aliphatic TPH >C6-C8	mg/kg	A+	0.01	10400	157	< 0.010	< 0.010	< 0.010						
Aliphatic TPH >C8-C10	mg/kg	A+	0.01	1370	82.4	< 0.010	< 0.010	< 0.010						
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	7900	49.9	< 1.0	< 1.0	1.4						
Aliphatic TPH >C12-C16	mg/kg	A+	2.0	34000	20.9	3.1	< 2.0	5.8						
Aliphatic TPH >C16-C21	mg/kg	A+	8.0		3620000	38	< 8.0	8						
Aliphatic TPH >C21-C35	mg/kg	A+	8.0		3620000	260	8.7	35						
Aliphatic TPH >C35-C44	mg/kg		10.0											
Total Aliphatic Hydrocarbons	mg/kg		10.0			300	< 10	50						
Aromatic TPH >C5-C7	mg/kg	A+	0.01		12.5	< 0.010	< 0.010	< 0.010						
Aromatic TPH >C7-C8	mg/kg	A+	0.01	27900	834	< 0.010	< 0.010	< 0.010						
Aromatic TPH >C8-C10	mg/kg	A+	0.02	2210	613	< 0.020	< 0.020	< 0.020						



Rogers Geotechnical Services: Soil Screening Values Comparison Sheet



Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet														
Job Number	C5904/26/E/9158			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than i2's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.										
Job Name	Frontier Business Park, Batley			KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD) 										
Date	07/05/2026			Sample Location	WS01	WS02	WS03							
Client	Redbrick Yorkshire Limited			Depth Top	0.60	1.60	0.50							
				Depth Base										
Determinand	Units	Ref	LOD	Commercial 1%										
Aromatic TPH >C10-C12	mg/kg	A+	1.0	12300	369	5.9	17	23						
Aromatic TPH >C12-C16	mg/kg	A+	2.0	41300	155	36	36	100						
Aromatic TPH >C16-C21	mg/kg	A+	10.0		28400	160	150	380						
Aromatic TPH >C21-C35	mg/kg	A+	10.0		28400	360	270	540						
Aromatic TPH >C35-C44	mg/kg		10.0											
Total Aromatic Hydrocarbons	mg/kg		10.0			570	470	1000						
Total Petroleum Hydrocarbons	mg/kg		10.0											
pH			N/A			8	8	7.8						
Sulphate (2:1 Water Soluble) as SO4	mg/l		1.25			785	253	398						
ACM Type			N/A			Loose Fibres, Asbestos Cement	-	-						
Asbestos Identification	%					0.001	-	-						
ACM Detection Stage			N/A			Detected	Not-detected	Not-detected						
Moisture	%		0.01			11	15	17						
Soil Colour			N/A											
Other Material			N/A											
Soil Texture			N/A											
Sulphate (Total)	%		0.005			0.354	0.415	0.19						
Organic Matter	%		0.1			5.1	4.5	5.8						

Appendix 6

Fill Screening Values

Atkins ATRISK Soil Screening Values (SSVs) - Commercial Landuse

A = WS ATKINS PLC, ATRISK SOIL SCREENING VALUES BASED ON 1% SOIL ORGANIC MATTER
A+ = Values updated June 2017.
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.
B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report.
C = Category 4 Screening Levels (C4SLs) based on 1% soil organic matter.
D - Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 7.95 should be used.