



Land at Manor Street, Huddersfield

Phase 2 Site Investigation Report

May 2023

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Phase 2 Site Investigation Report

Report Name	Land at Manor Street, Huddersfield Phase 2 Site Investigation Report	Site Address	Land at Manor Street, Huddersfield, HG4 6NW National Grid Reference, 41482 ,415700
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1.0 INTRODUCTION

Chevin Geoenviron Associates Ltd (CGA) were commissioned by Ramm Construction to carry out a Phase 2 ground investigation of the land at Manor Street, Huddersfield, HG4 6NW.

The purpose of this report is to provide factual and interpretative information required to comply with the requirements of a Phase 2 Site Investigation to assess contamination issues as required by the planning regime. The scope of the study is as follows:

- To provide general information on the site such as location and description;
- To summarise the geological setting of the site and previous assessments;
- To form exploratory holes;
- Provide factual information and descriptions of ground conditions;
- To provide a quantitative risk assessment for the proposed end use of the site; and
- To provide recommendations for further works where necessary.

1.1 Terms and Conditions

This report has been prepared for Ramm Construction in order to provide interpretative information on the ground conditions, to assist with the development of a residential property. It should be noted that the investigation data on which this report is based is only indicative of the actual ground conditions that exist at the locations of the exploratory holes and may not be representative of the conditions that exist on the site as a whole.

Chevin Geoenviron Associates Ltd (CGA) accepts no liability for any adverse environmental impacts on the proposed development that result from ground not investigated as part of this project. Similarly, CGA is not liable for any adverse effects that arise as a result of conditions that exist on land adjacent to the subject site.

Commentary on geotechnical risks from shallow coal seams which may have been historically worked are not within the scope of this report.

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2.0 SITE DETAILS

2.1 Site Location

The site is located approximately 1.00km south of the centre of Huddersfield. It is approximately 0.04 Ha in size and centred on National Grid Reference 414821, 415700. The site is on the corner of Bell Street and Manor Street.

A Site Location Plan is presented as Drawing No. C0564-01 in Appendix A.

2.2 Site Description

The site is rectangular in shape. On the day of the investigation the site had been largely stripped of topsoil, and levels had been reduced. A retaining wall was being constructed in the south and east of the site, and there were stockpiles of arisings along the southern and eastern site boundaries.

The site is bounded to the south by Bell Street, east by Manor Street, north by an adjacent property and gardens and west by a concrete track leading to the rear of Elm Street and Bell Street. Site boundaries were defined by heras fencing.

A Site Location Plan is presented as Drawing No. C0564-01 in Appendix A.

2.3 Proposed Future Use

The proposed development consists of the construction of a single detached dwelling. The proposed site layout plan is presented as Drawing No. C0564-02 in Appendix A. Areas at the top of the retaining wall are proposed to be kept as soft landscape, though not as private gardens.

2.4 Summary of Previous Studies

Tier Environmental produced a phase 1 report for the site, dated July 2016. This concluded that the site had not previously been developed, but had remained as a public open space.

The report concluded that there was potential for made ground on the site, which may present a risk to future land users. A low risk to controlled waters was estimated, and gas protection measures may be required due to made ground and coal measures.

3.0 GEOLOGY HYDROLOGY AND HYDROGEOLOGY

3.1 Superficial & Solid Geology

The phase 1 report indicates that there are no superficial deposits located on or near to the site. With regard to solid geology, the site is underlain by sandstone, siltstone, mudstone and coal seams of the Pennine Lower Coal Measures Formation.

The Middle Band Coal is inferred to be present below the site, beneath which would be the Soft Bed Coal.

3.2 Hydrology and Hydrogeology

Bedrock geology of the Pennine Lower Coal Measures Formation underlying site is classified as a Secondary A Aquifer.

The nearest surface water is the River Colne 140m north of the site. There are no potable groundwater or surface water abstractions within 1km of the site.

4.0 FIELDWORK

4.1 Scope of Fieldwork

The fieldwork was carried out on the 10th February 2023 with the scope of the fieldwork being specified by Chevin Geoenviron Associates Ltd (CGA) and undertaken in general accordance with BS 5930 and BS 10175. Soil logging was undertaken in accordance with the relevant European Standards. CGA had responsibility for ensuring the correct setting out of exploratory holes and for determining the sampling regime.

4.2 Trial Pits

A total of four trial pits designated TP01 to TP04 were logged. TP01 was excavated in the side of a stockpile of arisings through to the natural strata beneath, while TP02 to TP04 were logged from the face of the retaining wall cutting. All were located in areas of proposed soft landscape. Between 0.70m and 1.70m of soil was logged by a qualified CGA engineer. Locations are shown on Drawing No. C0564-03 Exploratory Hole Location Plan.

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Geoenvironmental samples were recovered from the pits for laboratory testing. The depths of the samples recovered are shown on the exploratory hole logs presented in Appendix B of this report.

4.3 Gas Monitoring Installations

Three ground gas and groundwater monitoring wells were installed during rotary drilling by Cape Drilling Ltd. Wells were designated RO01, RO02 and RO03. The response zones for the wells were sealed in the natural soil and bedrock from depths of 2.80m to 3.50m.

5.0 LABORATORY TESTING

5.1 Scope of Testing

All contamination testing was scheduled by CGA and was intended to provide data for the specific areas sampled. The scope of the testing was designed to enable comments regarding suitability of the site for a residential development.

5.2 Contamination Laboratory Testing

A total of four soil samples were sent to UKAS/MCERTS accredited laboratory, i2 Analytical in Watford, for testing for a standard suite of determinands.

Testing was carried out in accordance with a combination of the 'Methods for Examination of Water and Associated Materials' (the 'Blue Book') published by H.M.S.O., documented in-house methods and other published methods, to determine the presence of the analytes listed in Table 1.1.

Table 1.1 Chemical Analysis Summary Table

Analysis	Total No. Samples
SOILS	SOILS
9 Metals	4
SOM (Soil Organic Matter) & pH	4
Total Cyanide	4
Speciated PAH	4
Phenols	4
Total TPH	4
Asbestos ID	4

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The results of the contamination testing are presented in Appendix C of this report.

6.0 INVESTIGATION FINDINGS

6.1 Ground conditions

The following sections provide a summary of the ground conditions encountered during this investigation. The logs presented in Appendix B provide a detailed description of all of the strata observed.

6.2 Made Ground Topsoil

Topsoil was encountered in TP01 between 0.30m and 0.50m; in TP02 between the surface and 0.30m; in TP03 from the surface to 0.40m, and; in TP04 between 0.40m and 1.00m depth.

Topsoil was described as sandy and clayey with gravel sized fragments of sandstone, mudstone, concrete and brick. Fragments of clinker, glass, pipe and beer cans were less commonly encountered.

At TP01 and TP04, the topsoil was buried beneath excavated subsoil.

6.3 Made Ground

Made ground at TP01 to 0.30m; at TP02 between 0.50m and 0.80m; between 0.40m and 0.60m in TP03 and between the surface and 0.40m in TP04 was slightly sandy clay with gravel sized fragments of sandstone and mudstone, with building materials such as concrete, brick or rebar, and less common fragments of glass and coal. This resembled subsoil mixed with topsoil and domestic / construction waste.

At TP02 made ground between 0.30m and 0.50m was grey and red brown sandy gravel sized fragments of clinker, coal, brick, burned mudstone and glass, with ash. This resembled a layer of burnt poor-quality coal and wood, and domestic waste, possibly originating from a bonfire or waste from a residential fire which had been tipped onto the site.

6.4 Residual Bedrock Soils

Residual soils of bedrock were encountered at varying depths over the site, and were present at the ground level where levels had been reduced i.e. over the building footprint. The residual soils comprised

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soft to firm orange brown mottled slightly gravelly slightly sandy clay with fine to coarse, angular and subangular gravel of sandstone.

6.5 Groundwater

No groundwater seepages were observed in the cuttings or hand pits.

7.0 ENVIRONMENTAL ASSESSMENT OF GROUND

7.1 Scope of Sampling, Testing and Commentary

The following assessment was performed in the context of the planning regime and considering Part 2A of the Environmental Protection Act (1990) to determine if unacceptable risks to humans, vegetation or to specific parts of the wider environment are present on the site. The risk assessment follows the source, pathway, receptor methodology, as described in www.gov.uk/guidance/land-contamination-how-to-manage-the-risks, which is used to build a conceptual site model to determine the presence of any pollutant linkages at the site. Should any potentially significant pollutant linkages exist at the site it is deemed necessary to further develop the risk assessment by comparing contamination test results with generic or site-specific assessment criteria in order to determine if an unacceptable level of risk is present at the site. If legislation or guidance changes, or the proposed end use is modified, then it will be necessary to reassess the risks which may require further sampling and testing.

We understand our brief to comprise the following items related to the contamination aspects of this investigation.

- Compare laboratory test results with generic assessment criteria,
- Determine a conceptual site model and identify any pollutant linkages at the site,
- Determine the level of risk posed by environmental hazards on site to human health, vegetation, controlled waters and structures,
- Make recommendations for further work or remediation strategies.

Soil samples were recovered in accordance with current industry practice and were sent to i2 Laboratories to be analysed for the determinants listed in Section 5.0 of the factual part of this report.

The results of these analyses are included in Appendix C of this report.

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7.2 Human Health Assessment

UK guidance recommends that a risk-based approach is taken for the assessment of contaminated land and as such, DEFRA have introduced the CLEA methodology, SGV's and Category 4 Screening Values (C4SL). The CLEA methodology is a deterministic risk assessment model that estimates the long-term exposure to contaminants in the soil for children and adults and predicts the amount of contaminant to which a person might be exposed based on a given soil concentration. By comparison with relevant health criteria on tolerable or acceptable intakes of various contaminants the model was used by DEFRA and the Environment Agency to generate SGV's and C4SL's.

At the time of writing this report the DEFRA and Environment Agency has not published SGV's/C4SL using the CLEA 1.071 software for all anthropogenic toxic substances with C4SL's for further contaminants due to be produced at some point in the future. As such, it was necessary to use other methods to generate target concentrations for contaminants of concern on site.

In order to generate generic assessment criteria which are protective of human health, for use in human health risk assessment, where CLEA SGV's and C4SL's are not available the Environment Agency recommends the use of the CLEA 1.071 software in conjunction with advice found on the GOV.UK CLEA web pages. Accordingly, the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management (LQM) derived a set of Generic Assessment Criteria Values following the approach set out in the DEFRA research project SP1010, C4SL. The GAC for missing contaminants of concern were calculated using the CLEA 1.06 software released in July 2009 and termed Suitable 4 Use Levels (S4UL's). The input parameters used for calculating each S4UL value are listed in the substance specific chapters of the reference document associated with the S4UL's, namely 'The LQM/CIEH S4ULs for Human Health Risk Assessment (Land Quality Press, 2015).

The current view of the Environment Agency is that the C4SL's are considered to be a trigger value at which an exceedance may cause concern for human health and generally requiring further investigation and/or assessment. This report has utilised the C4SL's and CIEH/LQM S4UL's derived using the UK technical documents referenced in this report.

The DEFRA C4SL and LQM/CIEH S4UL's for a residential without home grown produce land use has been selected to assess the proposed end use of the site as this closely matches the development proposals.

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7.3 Vegetation Assessment

As the CLEA methodology only takes account of the risks to human health, a different approach is required to determine the risks to vegetation. In order to determine if levels of phyto-toxic contaminants in soil, not normally considered to be harmful to humans, are suitable to maintain growth of vegetation the published reference values produced by the Ministry of Agriculture, Fisheries and Food (MAFF) have been used in the following assessment.

7.4 Controlled Waters Assessment

An updated qualitative assessment of controlled waters risks will be carried out with reference to the ground conditions encountered during fieldwork and any likely remediation activities.

7.5 Gas Risk Assessment for Structures

A qualitative assessment of ground gas risks will be carried out with reference to the ground conditions and monitoring data recorded during this investigation. Risks will be assessed using BS8485 & NHBC methods for calculating the worst case scenario.

7.6 Statistical Analysis

Best practice guidance published by CL:AIRE/CIEH for statistical analysis of contaminated soils recommends the use of two statistical tests for normally distributed and skewed data sets. These tests are the one sample t-test as used in the CLR7 statistical guidance document for normally distributed data and a method based on the one-sided Chebychev Theorem for skewed data. The outcome of the appropriate test is then applied to the Null Hypothesis or the Alternative Hypothesis.

Null Hypothesis:

“Is the level of contamination in the natural soils above 1.00m the same as or higher than the level of the screening values. “

Alternative Hypothesis:

“The level of contamination in the natural soils above 1.0m is lower than the screening values.”

It should be noted that the guidance document points out that statistical analysis of samples collected using a targeted or judgmental sampling strategy should avoid being used to infer about conditions in un-

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sampled locations. The sampling strategy for this site investigation has been based on the most appropriate sampling design required to gather geoenvironmental information.

Statistical analysis of the laboratory data was not carried out in this case due to the overall low sample number for any one soil type.

8.0 DISCUSSION OF RESULTS

8.1 Human Health Hazards

The laboratory testing recorded that in three of the samples the concentrations of metals exceeded the residential screening criteria. These included the reworked natural made ground and made ground topsoil. A sample of the clinker and glass was not tested from TP02 due to its low volume and poor texture, which had already ruled it out for retention.

Table 1.3 Comparison of Soil Test Results for a Residential with Home Grown Produce End Use

Determinant	Assessment Criteria (mg/kg)		Recorded Concentrations Across the Site (mg/kg)	
	C4SL Screening Levels	S4UL Generic Assessment Criteria	Highest Recorded Value	Location(s) of Samples Exceeding GAC
Metals, semi-metals and non-metals				
Arsenic	40	40	80	TP01, TP03
Cadmium	150	85	< 0.2	n/a
Chromium Total	-	910	37	n/a
Copper	NC	7100	180	n/a
Lead	130-330	310	540	TP01
Mercury (elemental)	NC	1.2	< 0.3	n/a
Nickel	NC	180	47	n/a
Selenium	NC	430	< 1.0	n/a
Zinc	NC	40000	380	n/a
Organics				
Phenol (total mono)	NC	1100	< 1.0	n/a
PAH (total)	NC	NC	248	n/a
TPH (total)	NC	NC	240	n/a
Naphthalene	NC	13	7.4	n/a
Benzo(a)pyrene	3.4	3.2	17	TP01, TP03, TP04
Others				
pH	NC	NC	6.1 – 8.2	n/a
SOM (%)	NC	NC	4.5 – 8.2	n/a
Phenols	NC	1100	< 1.0	n/a
Cyanide (total)	NC	NC	< 1.0	n/a
Asbestos ID	<0.001% fibres		NAD	n/a
(1) C4SL/LQM S4UL 2015 for Residential without home grown produce land use scenario at 6% organic matter content (2) NC = No Criterion. (3) ND = None Detected				

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As the site has had no obvious historical land use the possibility of encountering the more toxic chromium IV is very unlikely. As such the screening value for chromium III was selected to assess total chromium.

The only elevated concentrations of metals identified were in TP01 (arsenic at 80mg/kg and lead at 540mg/kg) and TP03 (arsenic at 42mg/kg).

The LQM PAH profiling tool demonstrated that the benzo(a)pyrene surrogate marker approach was suitable for assessing the PAH compound concentrations. Therefore, only the value for the PAH compound benzo(a)pyrene is shown below.

Concentrations of benzo(a)pyrene in the made ground samples from TP01, TP03 and TP04 were in excess of the screening value at 17mg/kg, 5.8mg/kg and 5.1mg/kg respectively.

Whilst total PAH concentrations were generally low, in TP01 there was a peak of 248mg/kg.

8.2 Vegetation Hazards

Testing found concentrations of arsenic, lead and zinc to be in excess of the MAFF criteria. Due to risks to human health, these soils would not be expected to be retained on the site.

Table 1.4 Soil Test Results Vs Phyto - Toxic Chemical Assessment Criteria

Determinant	MAFF Reference Value (mg/kg)		Recorded Concentrations Across Sampled Area (mg/kg)	
	Maximum Permissible Concentration		Highest Recorded Value	Locations of sample(s) exceeding reference value
	pH 5.0-5.5	pH >7		
Metals and semi- metals				
Arsenic	50	NL	80	TP01
Cadmium	3	NL	< 0.2	n/a
Copper	80	200	180	n/a
Lead	300	NL	540	TP01
Nickel	50	110	47	n/a
Selenium	3	NL	< 1.0	n/a
Zinc	200	300	380	TP01

NOTES: (1) NL = indicates that no level has been set

8.3 Ground Gas Assessment

There was no olfactory evidence of ground gas or vapours during the site works.

Following the completion of the six gas monitoring rounds, maximum carbon dioxide concentrations of 2.2%, maximum methane concentrations of 0.8% and minimum oxygen concentrations of 12.5% were

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encountered. Carbon monoxide and hydrogen sulphide concentrations were at the limit of detection. Gas flow rates recorded during the monitoring were also at the limit of detection at 0.2 litres per hour (l/hr).

The worst-case gas values for carbon dioxide (2.2%) and methane (0.8%) and flow rates (0.2l/hr) recorded in the monitoring wells have been used to calculate a Gas Screening Value (GSV) of 0.0044l/hr for carbon dioxide and 0.0016l/hr for methane.

A comparison of the calculated GSV with Table 14.1 of NHBC March 2007, 'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present' and BS8485 guidance shows that the site is classified as being within Characteristic Situation CS1 (NHBC Green) conditions. No gas protection measures are required where gas risks are classified as CS1 or NHBC Green.

9.0 CONCEPTUAL SITE MODEL

9.1 Introduction

The information within this investigation has been collated and evaluated to develop a refined Conceptual Model for the site.

The site has been assessed in line with current UK guidelines, namely the Contaminated Land (England) Regulations 2000 and Part IIA of the Environmental Protection Act 1990 and follows the procedures set out in the www.gov.uk/guidance/land-contamination-how-to-manage-the-risks June 2019 guidance.

This guidance provides the technical framework for structured decision making about land contamination and builds on the Environmental Agency 'Model Procedures for the Management of Land Contamination – Contamination Land Report (CLR).11. This guidance defines the three essential elements to any risk:

- A contaminant **source** - a substance that is in, on or under land and has the potential to cause harm or to cause pollution of controlled waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property or a water body.
- A **pathway** - a route or means by which a receptor can be exposed to or affected by a contaminant.

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Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of source-pathway-receptor is described as a **pollutant linkage**.

This report presents a Phase 2 Conceptual Model and Quantitative Risk Assessments for the site, based on the proposed residential with home grown produce land use scenario.

9.2 Hazard Identification

9.2.1 Potential Contamination Sources

A summary of potentially significant sources of contamination identified during this study are presented in Table 1.5.

Made ground in three locations was found to be contaminated and not suitable for use on residential sites. Some made ground additionally contained ash, clinker and glass and should not be retained.

Following the completion of six monitoring visits very low concentrations of ground gas and flow rates were recorded.

Table 1.5 Summary of Contaminant Sources & Contaminants

Structure / Process	Contaminants Present
On-site	
Made Ground at TP01, TP03 and TP04 (S1)	Arsenic (TP01, TP03), Lead (TP01), PAH (TP01, TP03, TP04), Sharps (TP02)
Potential Mine Workings (S2)	Carbon Dioxide, Methane
Off-site	
Potential Made Ground (S3)	Carbon Dioxide, Methane

9.2.2 Potential Receptors

The following are considered as potential receptors in relation to the current and proposed use of the site.

- **Future Residential Users** – Female child aged 0 - 6 years;

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- **Utility / Construction / Demolition / Site Investigation workers** – Workers undertaking routine / non-routine work involving ground disturbance works and maintenance of below ground services (assuming workers are only wearing standard construction / utility worker PPE);
- **Secondary A Aquifer** – Pennine Lower Coal Measures;
- **Surface Water** –River Colne 140m North;
- **New Potable Water Supply Pipes** – Ingress of PAH into drinking water;
- **Structures** – Ingress of ground gas.

9.2.3 Potential Contamination Pathways

The following are considered plausible contamination pathways given the nature of the site and the potential contaminative sources identified, and assuming a continued current use.

- Dermal contact and ingestions of soils;
- Ingestion of home grown produce;
- Inhalation of dust/fibres and vapours;
- Migration of leachable contaminants;
- Migration of gas /vapours via granular soils;
- Ingress of PAH into drinking water supply or aquifer.

9.2.4 Quantitative Risk Assessment

By considering the sources, pathways and receptors, an assessment of the environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of major or minor significance.

An initial conceptual model of the source-pathway-receptor linkages has been developed based on the information derived from the CGA desk study and this study. The Conceptual Site Model has been used to identify Relevant Pollutant Linkages for the current and proposed end uses which have been assessed quantitatively and qualitatively using CIRIA 552 guidance, as described below in Table 1.6 and Table 1.7.

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Table 1.6 Methodology for Assessing Consequence of Harm

Consequence	Criteria
Severe	Short term (acute) risk to Human Health likely to result in “significant harm” as defined by the Environmental Protection Act 1990, Part IIa. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings / property
Moderate	Chronic damage to Human Health likely, over a long term, to result in “significant harm” as defined by the Environmental Protection Act 1990, Part IIa. Pollution of sensitive water resources
Mild	Health effects to Human Health that are unlikely to result in “significant harm” as defined by the Environmental Protection Act 1990, Part IIa. Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings / structures / services or the environment
Negligible	Non-permanent health effects to Human Health that are unlikely to result in “significant harm” as defined by the Environmental Protection Act 1990, Part IIa. Those that are easily prevented by means such as personal protective clothing. Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve

Table 1.7 Methodology for Assessing Likelihood of Consequence Occurring

Probability	Criteria
Almost Certain	Circumstances are such that an event either appears very likely in the short term and almost inevitable over the long term or there is evidence of currently harm occurring
Likely	Circumstances are such that an event, whilst not inevitable, is possible in the short term and is likely to occur over the long term
Unlikely	Circumstances are such that it is possible an event could occur but it is by no means certain to occur even over a longer period, and it is less likely in the shorter term
Very Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable even in the medium to long term
Extremely Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are highly improbable even in the long term

The risk assessment table and apportioned scores presented in Table 1.8 are in general accordance with CIRIA 552. The main exception is that irreversible risks to human health are considered to have a severe consequence irrespective of whether the effects are chronic or acute in nature. The risks are scored from 0 to 48 with increasing significance with increasing scores.

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Table 1.8 Summary of Risk Scoring

Consequence Probability	Severe (4)	Moderate (3)	Mild (2)	Negligible (1)
Almost Certain (12)	Very High Risk (48)	High Risk (36)	Moderate Risk (24)	Low Risk (12)
Likely (9)	High Risk (36)	Moderate Risk (27)	Moderate/ Low Risk (18)	Low Risk (9)
Unlikely (6)	Moderate Risk (24)	Moderate/ Low Risk (18)	Low Risk (12)	Very Low Risk (6)
Very Unlikely (3)	Low Risk (12)	Low Risk (9)	Very Low Risk (6)	Very Low Risk (3)
Extremely Unlikely (0)	Very Low Risk (0)	Very Low Risk (0)	Very Low Risk (0)	Very Low Risk (0)

The categories of risk are defined as follows:

Very High Risk: There is a probability that severe harm is almost certain to arise to a designated receptor from an identified source, or there is evidence that severe harm to a designated receptor is currently occurring.

High Risk: There is a probability that severe harm is likely to arise to a designated receptor from an identified source, or there is a probability that moderate harm is almost certain to arise.

Low Risk: There is a possibility that harm could arise to a designated receptor from an identified source, but it is likely that this harm, if realised, would be mild at worst.

Very Low Risk: There is a very low possibility that harm could arise to the receptor, but it is likely that this harm, if realised, would be mild at worst.

In accordance with UK technical guidance, professional judgement has been employed to evaluate the risk on a quantitative and where necessary qualitative basis using available information.

A summary of the pollution linkages is provided in Table 1.9.

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Table 1.9 Phase 2 Conceptual Site Model

Area / Structure	Pollutants (Chemicals of Concern)	Critical Receptor	Pathway(s)	Potential Consequence of Complete S-P-R Linkage	Potential Likelihood of Complete S-P-R Linkage	Risk Score and Equivalent CIRIA Risk Classification	Remedial Option(s) / Next steps	Comments
Made Ground at TP01, TP03 and TP04 (S1)	Arsenic, Lead, PAH, Glass & Clinker.	Future child site user	Direct contact / Dust inhalation / Ingestion of home grown produce.	Moderate	Unlikely	Moderate/ Low Risk (18)	Remediation	Made ground in garden areas contains high concentrations of contaminants. Remediation or adaptation of design required.
		Current site users		Mild	Unlikely	Low Risk (12)	No Further Assessment Required	Shallow made ground / topsoil exposed on site contains high concentrations of contaminants. Site is fenced off and soils not available to local residents.
		Ground disturbance workers		Mild	Unlikely	Low Risk (12)	No Further Assessment Required	Contaminated made ground / topsoils known to be present. Standard PPE and site hygiene rules will be sufficient to reduce the risks.
Potential Mine Workings (S2)		New potable water supply pipes	Penetration of pipes	Moderate	Unlikely	Moderate/ Low Risk (18)	Consultation Recommended	Elevated concentrations of PAH compounds identified in made ground. Consultation with Statutory Water supplier recommended.
Off-site Potential Made Ground (S3)		Secondary A aquifer	Leaching / dissolution from contaminated soil followed by migration	Mild	Very Unlikely	Very Low Risk (6)	No Further Assessment Required	Low permeability clay beneath contaminated soils will prevent migration to the aquifer.
		Surface water 140m north	Leaching / dissolution from contaminated soil followed by migration	Mild	Very Unlikely	Very Low Risk (6)	No Further Assessment Required	Surface water 140m south of the site. Site runoff more likely to enter road drainage with significant dilution than reach controlled waters.
	Methane, Carbon Dioxide.	Structures	Ingress of ground gas or vapours into structures	Mild	Very Unlikely	Very Low Risk (6)	No Further Assessment Required	Ground gasses are unlikely to migrate to site structures due to thick clay beneath the site. Very low concentrations of gas have been identified. Site classified as CS1/NHBC Green.

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Phase 2 Site Investigation Report

9.3 Discussion of Risks

The risk assessment presented in the above sections and summarised within the CSM presented Table 1.9 above has shown that theoretical Contaminant Linkages were identified to be present at the site. The following sections provide a discussion of the environmental risks based on the site investigation and laboratory data as well as the desk study information.

9.3.1 Human Health

Proposed Residential Site Users

Shallow made ground in proposed soft landscape areas was found to contain lead, arsenic, PAH and man-made sharps. A **MODERATE TO LOW** level of risk is considered to apply, with remediation or amendment of the design recommended.

Current Site Users

Shallow made ground soils have been found to be contaminated with various determinands. However, the soils are currently fenced off and there is no public throughfare. The risk to human health of current site users has been assessed to be **LOW**.

Ground Workers

The probability of contact with contaminated soils increases for workers involved with ground excavation (e.g. during development, site investigation or maintenance works). It is recommended that the Construction Design & Management Regulations, 2015 (CDM) health and safety plan for the development considers the general risks to works from exposure to contamination. However, standard mitigation measures and PPE should be sufficient to protect site operatives in most circumstances, and the risk is considered to be **LOW**.

9.3.2 Controlled Waters

It is unlikely that levels of leachable contaminants from the made ground would penetrate the underlying clay soils and adversely affect the underlying secondary A aquifer at significant concentrations. The risk has therefore been assessed to be **VERY LOW**.

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Phase 2 Site Investigation Report

The nearest surface water feature is the River Colne 140m to the north, and downgradient from the site. It is considered unlikely that leachable contaminants could migrate to this feature and would be more likely to enter the municipal drains along the adjacent highways. Therefore, the risk to surface waters are considered to be **LOW**.

9.3.3 Potable Water Supply Pipes

Elevated concentrations of PAH contamination were encountered in the made ground, at concentrations which may be capable of affecting new potable water supply pipes. The risk to new potable water pipes laid within made ground on site is therefore considered to be **MODERATE TO LOW**. It is recommended to consult with the statutory water supplier in order to ascertain their requirements prior to installing new water supply pipes.

9.3.4 Ground Gas / Vapour

The site is within a coal mining area, with possible shallow coal workings, although none were recorded beneath the site. The desk study also mentioned a possibility of deep made ground local to the site. Due to the presence of thick deposits of low permeability clay, migration of ground gas to the site is unlikely. The completed gas monitoring of six visits over 12 weeks recorded very low concentrations of ground gas with low flow rates. These results characterise the site as BS8485 CS1 or NHBC Green with a **VERY LOW** level of risk from ground gases affecting structures on site. No ground gas protection measures are required.

10.0 PRELIMINARY WASTE ASSESSMENT

The waste classification of the made ground has been determined through the laboratory testing of samples collected from made ground across the site.

The waste classification for made ground within the western half of the site has been determined to be Hazardous Waste due to the high levels of PAH recorded at the location of TP01. The following waste code can be applied to made ground;

Made ground at the location of TP01; 17 05 03* Soil and Stones Containing Hazardous Substances

Made Ground for the remainder of the site; 17 05 03 Soil and stone other than those describe in 17 05 03*

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Made ground from the location of TP01 is recommended to be segregated for disposal. Due to the variability in the made ground a visual check and segregation of similar made ground to that recorded in TP01 is recommended.

All segregated stockpiles are recommended to be retested for a suite of contamination testing prior to disposal at a landfill site. Any material being sent directly to a landfill site will require a Waste Acceptance Criteria (WAC) test prior to the receiving landfill site accepting the waste soil. We recommend the laboratory testing results be forward to the receiving landfill for confirmation of this assessment.

11.0 CONCLUSIONS

Trial pits confirmed the presence of topsoil and made ground overlying clay soils associated with weathered Lower Coal Measures. The made ground was found to contain concentrations of metals (arsenic and lead) and PAH in excess of the screening values for garden soils. Additionally some soils were texturally unsuitable for retention due to glass and clinker content.

Risk to future site users was established to be Moderate to Low, with remediation or amendment of the proposed development recommended. Currently the soils are fenced off to local residents and so a Low level of risk to current site users applies. Standard PPE and site hygiene practices are considered to be sufficient to protect ground disturbance workers, and a Low level of risk is estimated also. Controlled waters were not considered to be vulnerable and migration was not considered to be likely due to the local geology and urban geography, and so a Very Low level of risk applies. Made ground soils could feasibly impact potable water pipes however, and so a low Moderate to Low level of risk applies where they are installed in the made ground soils.

Ground gas monitoring found very low concentrations of ground gas and low flow rates. The site has been characterised as CS1/NHBC Green with a Very Low level of risk from ground gases affecting structures on site. No ground gas protection measures are required.

With regard to human health of the proposed future residents, the risks from site soils have been assessed to be **MODERATE to LOW**, with remediation or adjustment of the proposed development plan being recommended.

12.0 RECOMMENDATIONS

Remediation options for the site include the removal of the contaminated materials and the provision of a verified clean imported cover layer to provide a growing medium for future vegetation. At TPO1 the soils were identified to have elevated concentrations of total PAH, and will require specialist disposal as hazardous waste.

Commission of a remediation strategy which includes recommendations for importing soils, any additional testing and disposal, is recommended.

It is recommended to consult with the statutory water supplier in order to ascertain their requirements prior to installing new water supply pipes.

13.0 REFERENCES

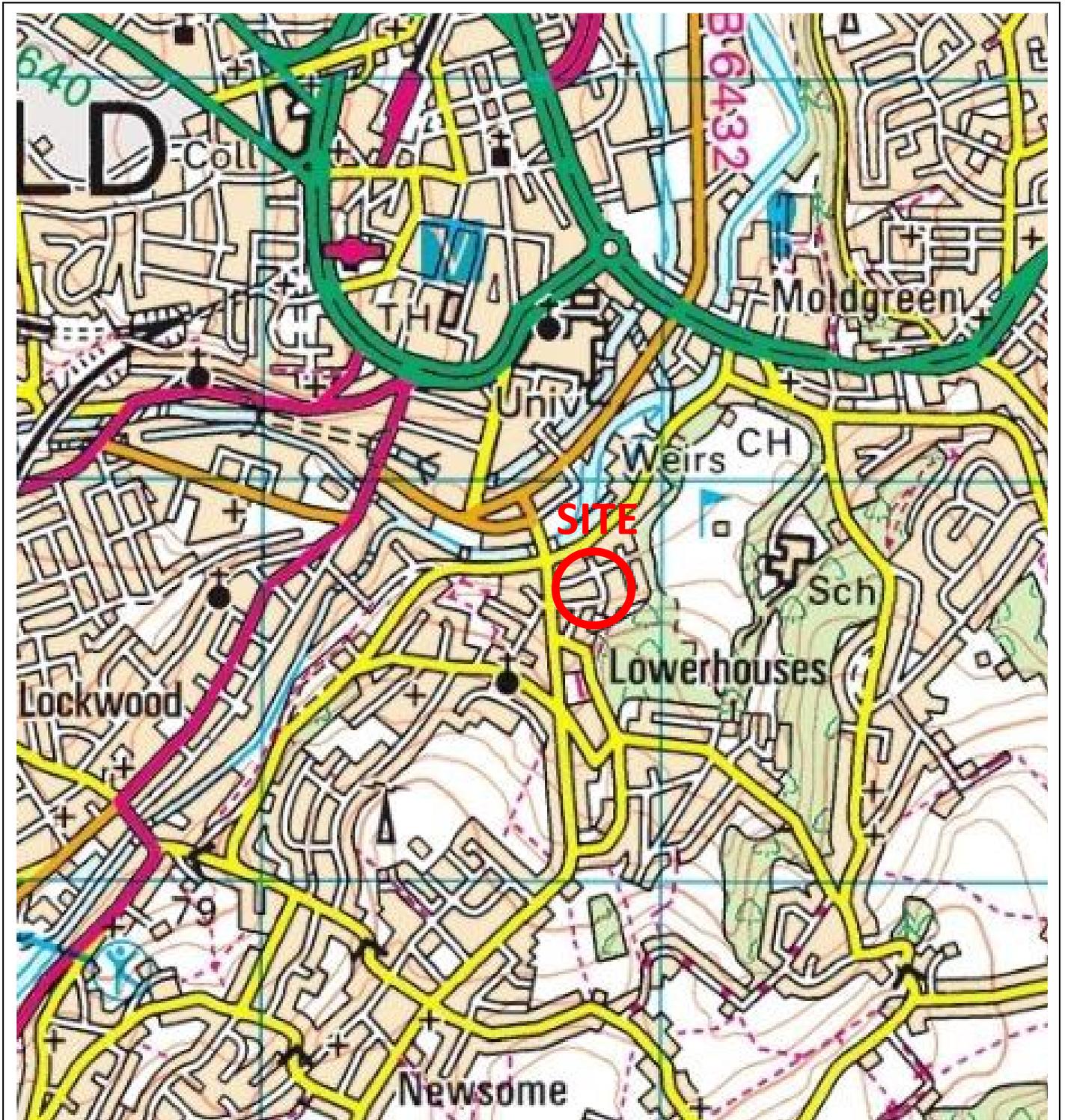
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- BS 10175: (2011)+A2 2017: Code of Practice for the Investigation of Potentially Contaminated Sites. British Standards Institution
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- Nathaniel, C.P., McCafferey, C., Gillett, A., Ogden, R.C., and Nathanail, J.F. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
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Appendices

Figures and Drawings

Appendix A – Site Location Plan



Chevin Geoenviron Associates LTD

Tel: 01943 470363

E-mail info@chevin-ltd.co.uk

Geo-environmental Consultancy
Ground Technologies & Investigation & Remediation

Project: Manor Street, Newsome, Huddersfield

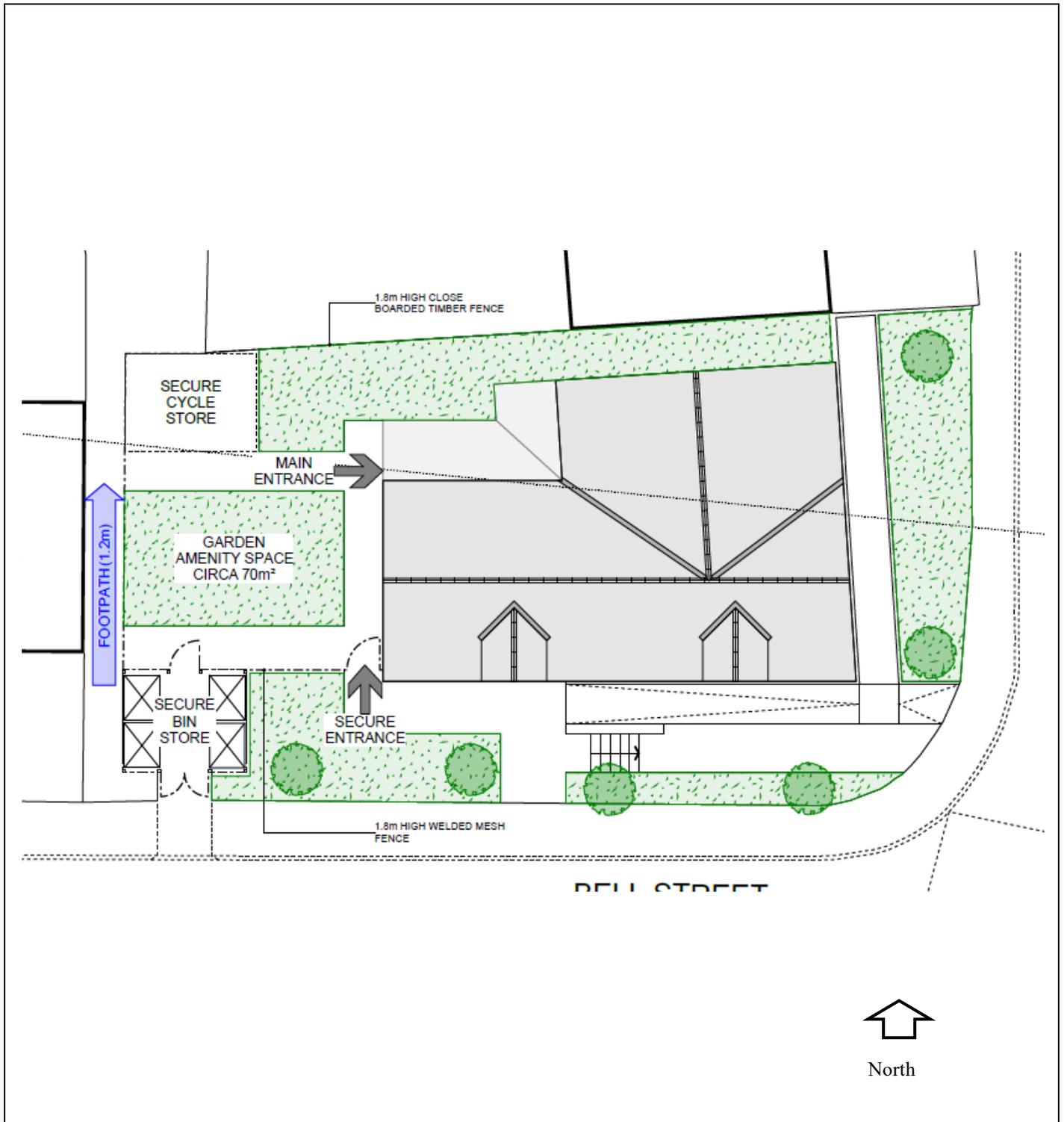
Client: Ramm Construction Ltd

Project No. C0564

Date 13/02/2023

Manor Street, Huddersfield
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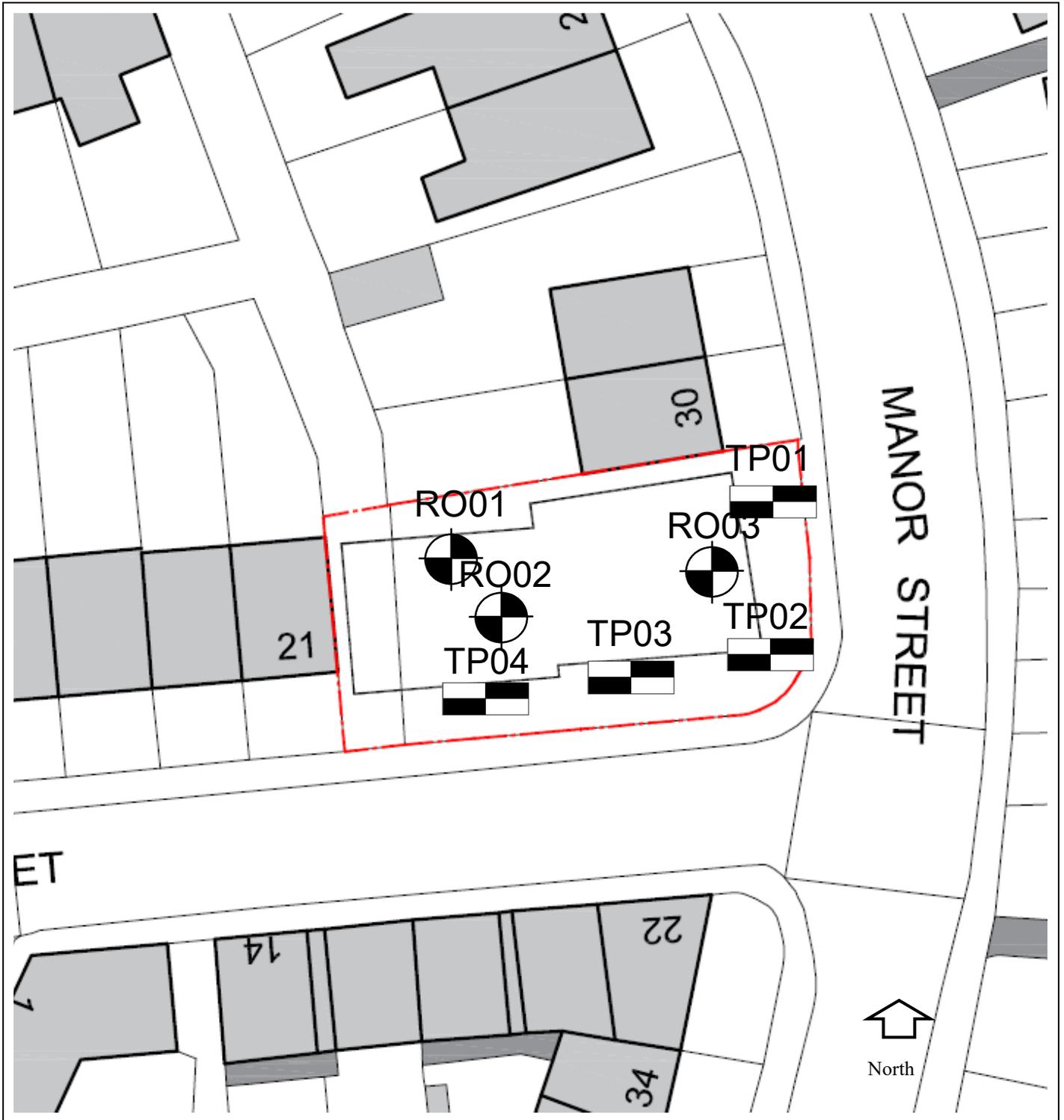
Appendix A – Proposed Site Layout



Chevin Geoenviron Associates LTD	Project: Manor Street, Newsome, Huddersfield	
	Client: Ramm Construction	
Tel: 01943 470363	Project No. C0564	Date: 12/05/2023
E-mail info@chevin-ltd.co.uk		
Geo-environmental Consultancy Ground Technologies & Investigation & Remediation		

Manor Street, Huddersfield
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Appendix A – Exploratory Hole Location Plan



Chevin Geoenviron Associates LTD Tel: 01943 470363 E-mail info@chevin-ltd.co.uk Geo-environmental Consultancy Ground Technologies & Investigation & Remediation	Project: Manor Street, Newsome, Huddersfield	
	Client: Ramm Construction	
	Project No. C0564	Date: 13/02/2023

Manor Street, Huddersfield
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Appendix B – Engineering Logs

Trial Pit Log

Project Name: Manor Street, Huddersfield	Project No. C0564	Co-ords: - Level:	Date 10/02/2023
Location: Manor Street, Newsome, Huddersfield		Dimensions (m): Depth 1.70	Scale 1:10 Logged TR
Client: Ramm Construction Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.60	CBR		0.30			MADE GROUND: Dark grey slightly gravelly sandy clay topsoil. Gravel sized fragments of sandstone, mudstone, concrete, brick, plastic pipe and rare glass.
				0.50			MADE GROUND: Grey and red brown slightly clayey sandy gravel sized fragments of clinker, coal, brick, burned mudstone and glass with high ash content.
				0.80			MADE GROUND: Grey brown slightly sandy slightly gravelly clay. Gravel sized fragments of sandstone, mudstone, coal and concrete. Rare whole house bricks and fragments of glass.
				1.70			Soft to firm orange brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, angular and subrounded of sandstone. Rare angular cobbles or boulders of sandstone.
							End of pit at 1.70 m

Remarks: Log of cutting for retaining wall.
No groundwater entries.

Stability: Cutting face stable.



Trial Pit Log

Project Name: Manor Street, Huddersfield	Project No. C0564	Co-ords: - Level:	Date 10/02/2023
Location: Manor Street, Newsome, Huddersfield		Dimensions (m): Depth 1.50	Scale 1:10 Logged TR
Client: Ramm Construction Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	ES					MADE GROUND: Dark grey slightly gravelly sandy clay topsoil. Gravel sized fragments of sandstone, mudstone, concrete, brick and clinker.
				0.40			MADE GROUND: Grey brown slightly sandy slightly gravelly clay. Gravel sized fragments of sandstone, mudstone, coal and concrete.
				0.60			Soft to firm orange brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, angular and subrounded of sandstone. Rare angular cobbles or boulders of sandstone.
				1.50			End of pit at 1.50 m

Remarks: Log of cutting for retaining wall.
No groundwater entries.

Stability: Cutting face stable.



Trial Pit Log

Project Name: Manor Street, Huddersfield	Project No. C0564	Co-ords: - Level:	Date 10/02/2023
Location: Manor Street, Newsome, Huddersfield		Dimensions (m): Depth 1.10	Scale 1:10 Logged TR
Client: Ramm Construction Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.40			MADE GROUND: Grey and orange brown slightly sandy clay. Gravel sized fragments of sandstone, concrete and brick.
				1.00			MADE GROUND: Dark grey slightly gravelly clayey sandy topsoil. Gravel sized fragments of sandstone, mudstone, concrete, brick and clinker.
				1.10			Soft to firm orange brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, angular and subrounded of sandstone. Rare angular cobbles or boulders of sandstone. End of pit at 1.10 m

Remarks: Log of cutting for retaining wall.
No groundwater entries.

Stability: Cutting face stable.



Client: Holda Ltd	Site: Land Adjacent to 19 Bell Street Huddersfield HD4 6NN	Cape Site Services unit 2, rear of Castle Buildings Carlton Road, Barnsley, S71 3HX	
Date: 10/02/2023	Method: water flush	Permit No: 26270	
Driller: Ian Wiles		Driller Assistant: Richard Hawkins, Simon Fish	
Drillers Signature:		Page No: 1	

Measurements In Meters

BH No:	FROM	TO	THICKNESS	DESCRIPTION
1				
	0	0.5	0.5	Fill
	0.5	3	2.5	Clay brown soft
	3	3.7	0.7	Mudstone black silty soft
	3.7	4.1	0.4	Coal
	4.1	7	2.9	Sandstone grey brown
	7	25	18	Mudstone silty dark grey with sandstone bands hard
Gas well installation to 3m with 2m slotted and 1m plain				
2				
	0	0.4	0.4	Fill
	0.4	2	1.6	Clay brown soft
	2	3.2	1.2	Mudstone black silty soft
	3.2	3.7	0.5	Coal
	3.7	6.7	3	Sandstone grey brown
	6.7	25	18.3	Mudstone silty dark grey with sandstone bands hard
Gas well installation to 3m with 2m slotted and 1m plain				
3				
	0	0.3	0.3	Fill
	0.3	2.7	2.4	Clay brown soft
	2.7	3.3	0.6	Clay grey brown wet soft
	3.3	4.2	0.9	Mudstone black silty soft
	4.2	4.7	0.5	Coal
	4.7	7.7	3	Sandstone grey brown
	7.7	25	17.3	Mudstone silty dark grey with sandstone bands hard
Gas well installation to 3m with 2m slotted and 1m plain				

Manor Street, Huddersfield
Phase 2 Site Investigation Report

Appendix C – Laboratory Test Results



Info

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77 High Street
Yeadon
LS19 7SP

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7 Woodshots Meadow,
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e: reception@i2analytical.com

Analytical Report Number : 23-17283-2

Replaces Analytical Report Number: 23-17283, issue no. 1
Client sampling date amended.

Project / Site name:	Manor Street Hudds	Samples received on:	13/02/2023
Your job number:		Samples instructed on/ Analysis started on:	13/02/2023
Your order number:		Analysis completed by:	27/02/2023
Report Issue Number:	2	Report issued on:	27/02/2023
Samples Analysed:	4 soil samples		

Signed: _____

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 23-17283
Project / Site name: Manor Street Hudds

Lab Sample Number	2583282	2583283	2583284	2583285			
Sample Reference	TP01	TP02	TP03	TP04			
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied			
Depth (m)	0.40	0.60	0.30	0.20			
Date Sampled	10/02/2023	10/02/2023	10/02/2023	10/02/2023			
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	18	9.7	18
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	0.3

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.1	7.8	8.2	7.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Organic Matter (automated)	%	0.1	MCERTS	8.2	4.5	6.5	4.5

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	7.4	< 0.05	0.5	0.41
Acenaphthylene	mg/kg	0.05	MCERTS	0.2	< 0.05	0.1	0.12
Acenaphthene	mg/kg	0.05	MCERTS	6.2	< 0.05	0.66	0.74
Fluorene	mg/kg	0.05	MCERTS	4.6	< 0.05	0.5	0.57
Phenanthrene	mg/kg	0.05	MCERTS	41	0.44	6.2	6.9
Anthracene	mg/kg	0.05	MCERTS	8.2	0.1	1.2	1.5
Fluoranthene	mg/kg	0.05	MCERTS	43	0.71	12	12
Pyrene	mg/kg	0.05	MCERTS	39	0.65	10	10
Benzo(a)anthracene	mg/kg	0.05	MCERTS	21	0.43	6.2	5.8
Chrysene	mg/kg	0.05	MCERTS	18	0.36	4.8	4.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	0.43	6.5	5.6
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	0.23	2.5	2.1
Benzo(b)fluoranthene & Benzo(k)fluoranthene	mg/kg	0.1	ISO 17025	27.8	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	17	0.32	5.8	5.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	6.4	< 0.05	3.3	3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.6	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	7.4	< 0.05	3.6	3.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	248	3.67	64	61.2

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	80	34	42	28
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37	28	24	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	180	98	130	81
Lead (aqua regia extractable)	mg/kg	1	MCERTS	540	86	300	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	47	34	29	27
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	380	250	190	140

Petroleum Hydrocarbons

TPH C10 - C40 EH_CU_ID_TOTAL	mg/kg	10	MCERTS	240	12	79	91

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

Analytical Report Number : 23-17283
Project / Site name: Manor Street Hudds

* 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 *
2583282	TP01	None Supplied	0.4	Black loam with vegetation.
2583283	TP02	None Supplied	0.6	Black loam and clay.
2583284	TP03	None Supplied	0.3	Black loam and clay with metal.
2583285	TP04	None Supplied	0.2	Brown loam and clay with vegetation.

Analytical Report Number : 23-17283
Project / Site name: Manor Street Hudds

Water matrix abbreviations:

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Organic matter (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

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

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

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

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

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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



Analytical Report Number : 23-17283
Project / Site name: Manor Street Hudds

Water matrix abbreviations:

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

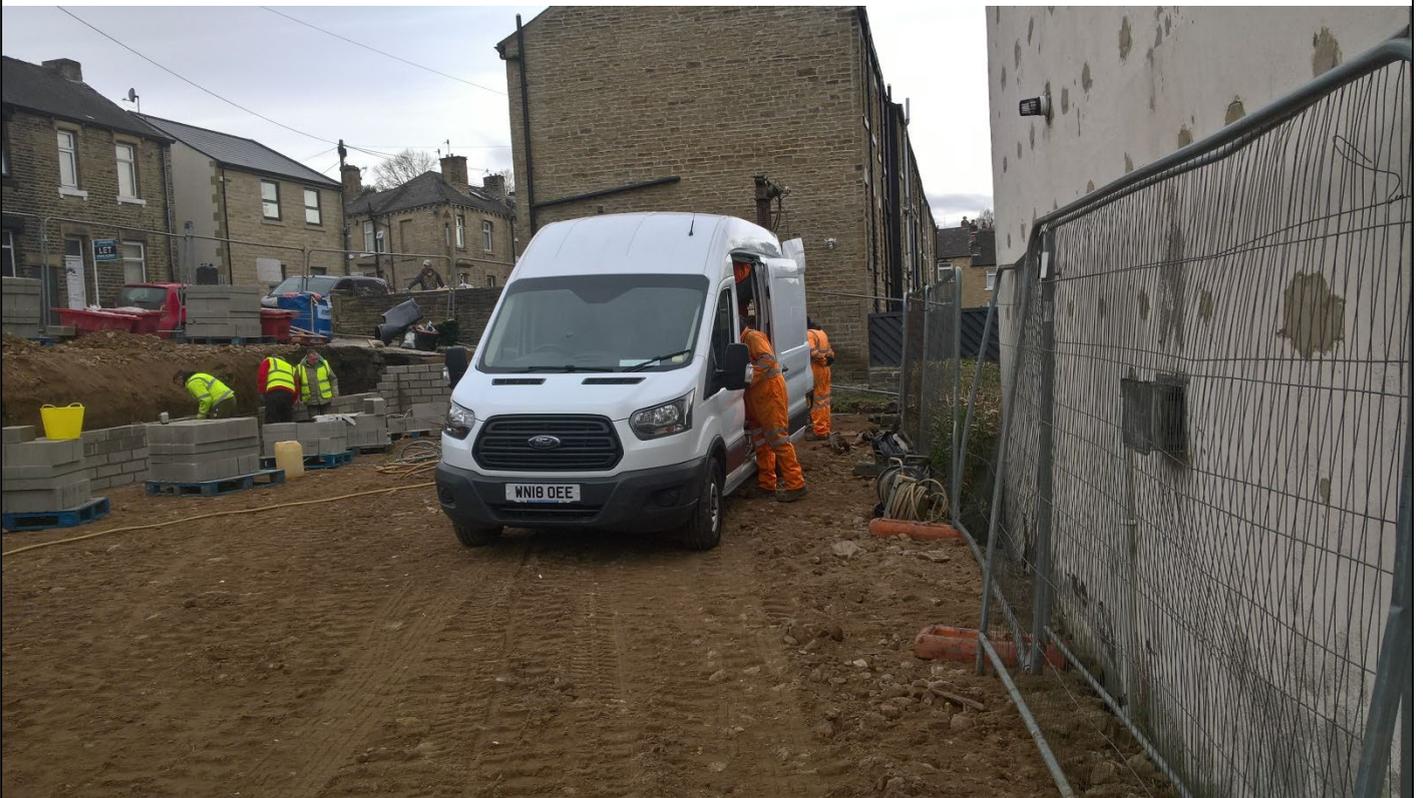
Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
-	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				

Manor Street, Huddersfield
Phase 2 Site Investigation Report

Appendix D – Trial Pit Photographs



Photograph No.1: View south of cutting on site from site entrance in north east.



Photograph No.2: View west of site from entrance.

Chevin Geoenviron Associates LTD

Tel: 01943 470363

**E-mail info@chevin-ltd.co.uk
Geo-environmental Consultancy
Ground Technologies & Investigation & Remediation**

Project: Manor Street, Newsome, Huddersfield

Client: Ramm Construction

Project No. C0564

Date: 13/02/2023



Photograph No.3: TP01 hand pit in north east of site.



Photograph No.4: Location of TP01.

Chevin Geoenviron Associates LTD

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Geo-environmental Consultancy
Ground Technologies & Investigation & Remediation**

Project: Manor Street, Newsome, Huddersfield

Client: Ramm Construction

Project No. C0564

Date: 13/02/2023



Photograph No.5: TP02 section.

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Project: Manor Street, Newsome, Huddersfield

Client: Ramm Construction

Project No. C0564

Date: 13/02/2023



Photograph No.6: TP03 section.

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Ground Technologies & Investigation & Remediation**

Project: Manor Street, Newsome, Huddersfield

Client: Ramm Construction

Project No. C0564

Date: 13/02/2023



Photograph No.7: TP04 section.

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Ground Technologies & Investigation & Remediation**

Project: Manor Street, Newsome, Huddersfield

Client: Ramm Construction

Project No. C0564

Date: 13/02/2023

Manor Street, Huddersfield
Phase 2 Site Investigation Report

Appendix E – Ground Gas Monitoring Data



Hole ID: RO01

Project Name: Manor Street, Huddersfield
Project Number: C0564

Ground Gas Monitoring Results

NOTES:

Measured Parameter	Units	Detection						
Monitoring round no.	N/A	N/A	1	2	3	4	5	6
Date	dd/mm/yyyy	N/A	20/02/2023	01/03/2023	13/03/2023	26/03/2023	06/04/2023	11/05/2023
Atmospheric pressure	mb		1009	1005	970	1000	1007	998 falling
Relative pressure	mb		0.09	0.07	0.19	0.1	0.03	0.02
Water Level	m		DRY	DRY	DRY	2	DRY	DRY
Base depth of installation	m		2.8	2.8	2.8	2.8	2.8	2.8
Time of Initial readings	hh:mm:ss		10.21	13.58	10.29	11.54	13.58	11.09
Time of Peak readings	hh:mm:ss		10.22	13.59	10.32	11.56	13.59	11.10
Time of Steady readings	hh:mm:ss		10.23	14.01	10.33	11.57	14.01	11.11
CH4: (LEL) Peak	%		0	0	0	0	0	0
CH4: (LEL) Steady State	%		0	0	0	0	0	0
CH4: Peak	% v/v		0.1	0.1	0.7	0.7	0.8	0.8
CH4: Steady State	% v/v		0.1	0.1	0.7	0.7	0.8	0.8
CO2: Peak	% v/v		1.1	1.3	1.7	2.2	0.3	0.1
CO2: Steady State	% v/v		1.1	1.3	1.6	2.2	0.3	0.1
O2: Minimum	% v/v		20.1	20.2	20.2	19.2	20.1	20.6
O2: Steady State	% v/v		20.1	20.2	20.2	20.2	20.1	20.6
CO: Peak	ppm		0	0	0	0	0	0
CO: Steady State	ppm		0	0	0	0	0	0
H2S: Peak	ppm		0	0	0	0	0	0
H2S: Steady State	ppm		0	0	0	0	0	0
Flow Rate	l/hr		0.1	0.1	0.2	0.2	0.2	0.2
Weather Conditions:			Wet Drizel	Light Rain	Cloudy	Cloudy	Sunny	Heavy Rain
Equipment Type			GA5000	GA5000	GA5000	GA5000	GA5000	GA5000
Equipment Serial Number			G504574	G504574	G504574	G504574	G504574	G504574
Equipment Last Calibrated			25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022
Monitored By			TR	TR	CW	CW	CW	CW



Hole ID: RO02

Project Name: Manor Street, Huddersfield
Project Number: C0564

Ground Gas Monitoring Results

NOTES:

Measured Parameter	Units	Detection						
Monitoring round no.	N/A	N/A	1	2	3	4	5	6
Date	dd/mm/yyyy	N/A	20/02/2023	01/03/2023	13/03/2023	26/03/2023	06/04/2023	11/05/2023
Atmospheric pressure	mb		1009	1005	997	1000	1007	998 falling
Relative pressure	mb		0.09	0.07	0.19	0	0.03	0.09
Water Level	m		DRY	DRY			DRY	DRY
Base depth of installation	m		3	3			3	3
Time of Initial readings	hh:mm:ss		10.30	14.05			14.10	11.15
Time of Peak readings	hh:mm:ss		10.31	14.06			14.11	11.16
Time of Steady readings	hh:mm:ss		10.33	14.08			14.12	11.17
CH4: (LEL) Peak	%		0	0			0	0
CH4: (LEL) Steady State	%		0	0			0	0
CH4: Peak	% v/v		0.1	0.1			0.2	0.8
CH4: Steady State	% v/v		0.1	0.1			0.2	0.8
CO2: Peak	% v/v		0.1	0.1			0.3	0.2
CO2: Steady State	% v/v		0.1	0.1			0.3	0.2
O2: Minimum	% v/v		20.5	20.5			20.4	20.4
O2: Steady State	% v/v		20.5	20.5			20.4	20.4
CO: Peak	ppm		0	0			0	0
CO: Steady State	ppm		0	0			0	0
H2S: Peak	ppm		0	0			0	0
H2S: Steady State	ppm		0	0			0	0
Flow Rate	l/hr		0.1	0.1			0.2	0.2
Weather Conditions:			Wet Drizel	Light Rain	Cloudy	Cloudy	Sunny	Heavy Rain
Equipment Type			GA5000	GA5000	GA5000	GA5000	GA5000	GA5000
Equipment Serial Number			G504574	G504574	G504574	G504574	G504574	G504574
Equipment Last Calibrated			25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022
Monitored By			TR	TR	CW	CW	CW	CW

RH02 covered by dirt on 13/03 & 26/03

Form Number: 03-2019



Hole ID: RO03

Project Name: Manor Street, Huddersfield
Project Number: C0564

Ground Gas Monitoring Results

NOTES:

Measured Parameter	Units	Detection						
Monitoring round no.	N/A	N/A	1	2	3	4	5	6
Date	dd/mm/yyyy	N/A	20/02/2023	01/03/2023	13/03/2023	26/03/2023	06/04/2023	11/05/2023
Atmospheric pressure	mb		1009	1005	997	1000	1007	998 falling
Relative pressure	mb		0.09	0.05	0.19	0.1		0.02
Water Level	m		DRY	DRY	Flooded	3.20	Flooded	DRY
Base depth of installation	m		3.50	3.50	3.50	3.50	3.50	3.50
Time of Initial readings	hh:mm:ss		10.42	14.10		12.16		11.26
Time of Peak readings	hh:mm:ss		10.43	14.11		12.18		11.27
Time of Steady readings	hh:mm:ss		10.44	14.13		12.21		11.28
CH4: (LEL) Peak	%		-	-		0		0
CH4: (LEL) Steady State	%		-	-		0		0
CH4: Peak	% v/v		0.1	0.2		0.7		0.1
CH4: Steady State	% v/v		0.1	0.2		0.7		0.1
CO2: Peak	% v/v		0.5	0.7		1.3		1.6
CO2: Steady State	% v/v		0.5	0.7		0.3		0.6
O2: Minimum	% v/v		19.7	19.9		12.5		18.4
O2: Steady State	% v/v		19.7	19.9		19.2		20.1
CO: Peak	ppm		2	2		3		2
CO: Steady State	ppm		1	2		3		2
H2S: Peak	ppm		0	0		0		0
H2S: Steady State	ppm		0	0		0		0
Flow Rate	l/hr		0.1	0.1		0.1		0.2
Weather Conditions:			Wet Drizel	Light Rain	Cloudy	Cloudy	Sunny	Heavey Rain
Equipment Type			GA5000	GA5000	GA5000	GA5000	GA5000	GA5000
Equipment Serial Number			G504574	G504574	G504574	G504574	G504574	G504574
Equipment Last Calibrated			25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022
Monitored By			TR	TR	CW	CW	CW	CW

13/03, 06/04, borehole flooded by ponding of surface water.

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Form Number: 03-2019