Phase 2 Geo-Environmental Site Investigation Report

9 Harper's Lane, Presteigne, LD8 2AN

Mr Alex Dufort

Environmental Management Solutions – EMS Geotech

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SUMMARY REPORT - GENERAL INFORMATION

SUBJECT	COMMENTS
CURRENT USE & DESCRIPTION	Roughly rectangular in plan, the site is relatively flat, orientated northwest to southeast and covers approximately 0.07 hectares. Dominating the northwest third of the site is a two-storey, red brick former Police station building. The remaining external two-thirds is a grass covered rear garden. Brick and stone walls, hedgerows and wood panel fencing delineate the site with a gated access on the southeast boundary. Harpers Lane and Back Lane bound the northwest, northeast and southeast site boundaries. Private houses and a hotel are situated beyond Haper's Lane to the northwest. The former Kaye Presteigne Ltd works complex is situated beyond the lanes to the north- and south-east. A fire station and private house are situated beyond the southwest site boundary.
PROPOSED USE	It is proposed to keep the former police station building as office space and a flat and to construct a two-storey artist's studio in the southern part of the existing garden.
HISTORICAL SUMMARY	The existing former Police Station building, and rear garden have been present on site since 1888, with a well located centrally since around 1890. The Police station was converted to an artist's studio, offices and a flat around 1990. A building to the northeast of the site was used as an electrical works (1920 to 1930), produced die castings and munitions (1941 to 1946), and manufactured die castings for the motor industry from 1946 to 2011. From the 1970s it was expanded into a foundry and engineering works. After the works closed in 2011 the site became disused and on-site buildings demolished in 2013.
PUBLISHED GEOLOGY	It is anticipated that the site is underlain with superficial Till (Diamicton) deposits. The underlying bedrock is mudstone strata belonging to the Wenlock Rocks (Undifferentiated).
COAL MINING AND MINERAL EXTRACTION	The site is not situated within an area of coal mining or mineral extraction.
GROUND STABILITY	The site is unlikely to be affected by ground instability hazards.
ACTUAL GROUND CONDITIONS	The ground conditions encountered generally included Made Ground overlying superficial Till, Diamicton Deposits. The underlying Wenlock Rocks (Undifferentiated) bedrock was not encountered.

HYDROGEOLOGY	The underlying superficial Till (Diamicton) has been classed as a Secondary (Undifferentiated). The underlying Wenlock Rocks bedrock is designated a Secondary B Aquifer. The site is not located within a groundwater Source Protection Zone. Groundwater was recorded at between 0.80m and 1.44m, associated with the Till (Diamicton), following the investigation works.
HYDROLOGY	The closest water feature is a tributary to the River Lugg that flows north-eastwards and is located 72m towards the east. The site is not in an area indicated to be at risk from fluvial flooding but may be impacted by groundwater flooding.
PREVIOUS GROUND REPORTS	EMS have undertaken a Phase I desk Study for this site, which should be read in conjunction with this report and is referenced as: • Phase 1 Geo-Environmental Desk Study Report, '9 Harper's Lane, Presteigne LD8 2AN', EMS, E23890-DS, dated October 2021.

SUMMARY REPORT - GEOTECHNICAL

SUBJECT	COMMENTS
EXCAVATIONS	It should be possible to forward excavations employing normal equipment. Specialist groundwater control will likely be required at this site. It is unlikely that requirements of the Party Wall Act will apply to the development.
SLOPE STABILITY	It is considered that slope stability is unlikely to be a concern at this site.
SUB-SURFACE CONCRETE	Design Sulphate Class of DS-1 and Aggressive Chemical Environment for Concrete class of AC-1 applies.
SOAKAWAYS	Site is unlikely to be suitable for surface water disposal to soakaways or other forms of infiltration device.
PAVEMENT DESIGN	A preliminary design California Bearing Ratio (CBR) of less than 2% has been recommended at this stage for the Made Ground.
FOUNDATIONS	
LIKELY FOUNDATION TYPE	Deep poor strength soils and shallow groundwater at the site will necessitate employing a deep foundation solution such as ground improvement or piles.
VOLUME CHANGE POTENTIAL	The clay rich soils associated with the superficial Till, Devensian – Diamicton have been found to have a medium volume change potential.
ESTIMATED FOUNDATION DEPTHS	Pile lengths to be determined by specialist piling contractor.
HEAVE PROTECTION	Heave protection may be required for the proposed structure.

SUMMARY REPORT – CONTAMINATION ISSUES

SUBJECT	COMMENTS
SOIL RISKS TO HUMAN HEALTH	No unacceptable contamination risks in respect to human health have been identified from this Phase 2 intrusive investigation.
GROUND GAS	No unacceptable ground gas or hydrocarbon risks have been identified for this site.
RADON GAS	The site is not within an area where radon protection measures are required in new dwellings.
RISKS TO THE WATER ENVIRONMENT	No unacceptable contamination risks with respect to controlled water resources have been identified from this Phase 2 intrusive investigation.
RISKS TO BUILDING MATERIALS AND SERVICES	No unacceptable contamination risks to with respect to building materials and services have been identified from this Phase 2 intrusive investigation.
REMEDIATION	No remedial works are considered necessary to facilitate the proposed development at this stage.
ASBESTOS	No asbestos or suspected asbestos containing materials have been detected in the soil samples tested.
WASTE SOIL DISPOSAL	Topsoil should be viewed as a resource and re-used on-site. Made Ground or natural sub-soils for off-site disposal would be classed as 'inert waste'.

SUMMARY REPORT - KEY RECOMMENDATIONS

RECOMMENDATIONS
To aid pile design, it is recommended that a deep cable percussive borehole is undertaken to a minimum 10m in order to confirm deeper ground conditions and soil strengths. A monitoring well should be included in the boreholes and at least one post site-work monitoring visit should be undertaken to record groundwater levels. In-situ Standard Penetration Tests should be conducted during boring and soil samples collected for logging purposes and submitted for appropriate geotechnical laboratory testing. It is recommended that this report is submitted to the planning department of the Local Authority, the organization undertaking the Building Control function and warranty providers to confirm that the investigation completed to date is satisfactory.

1. Introduction

1.1. Contract Information

Environmental Management Solutions Limited (EMS) have been commissioned to undertake a Phase 2 Geo-Environmental Site Investigation for a site located at 9 Harper's Lane, Presteigne, LD8 2AN. Hereafter, referred to as 'the site'. The works have been commissioned directly by the Client.)

It is understood that the site is currently used for residential and commercial purposes and the client intends to extend the site's commercial use.

This report aims to summarise the findings of recent site investigation works undertaken at the site and characterise the underlying ground conditions. The report also provides and assessment of the underlying ground conditions in relation to contamination, to meet likely planning requirements, and geotechnical constraints to aid with foundation design.

A Phase 1 Contamination Desk Study has been undertaken by EMS, which should be read in conjunction with this report and is referenced as:

- Phase 1 Geo-Environmental Desk Study Report, '9 Harper's Lane, Presteigne, LD8 2AN', EMS, E23890-DS, dated October 2021.

1.2. Scope of Work

The agreed work scope for the Phase 2 site Investigation included:

- Producing health and safety documentation and mobilizing to site.
- Undertaking Cable Avoidance Tool (CAT) scans for all exploratory hole positions.
- Drilling shallow boreholes using a dynamic Windowless Sampler rig to a nominal 5m depth, ground conditions permitting. We would estimate undertaking 5 No. shallow windowless samples boreholes per day. Including measurements of in-situ soil strength using Standard Penetration Tests (SPTs). Windowless sample boreholes will facilitate collecting soil samples for logging purposes and laboratory testing and installing groundwater and ground gas monitoring standpipes.
- Hand pits to a nominal 1.20m depth, ground conditions permitting, to expose a larger soil quantity for inspection and facilitate collecting soil samples for logging and laboratory purposes.
- Screening borehole soil samples at 0.50m intervals for volatile hydrocarbons using a Photo-Ionization Detector (PID).
- Installing groundwater and ground gas monitoring standpipes into 3 No. borehole locations.
- Logging, sampling and undertaking investigation works in general accordance with BS5930:2015, BS10175:2011 and BS EN ISO 14688, parts 1 and 2 and BS10175:2011 by a suitably qualified Geo-Environmental Engineer.
- Determining each exploratory hole location using a tape measure or recreational handheld GPS unit.

- Geo-Environmental technician to undertake initially 3 No. once weekly return site monitoring visits to measure standing groundwater levels and ground gas (methane and carbon dioxide) / vapour concentrations. Should significantly elevated ground gas / vapour concentrations be recorded the monitoring scope will be increased to 3 No. once monthly visits.

- Laboratory chemical analysis of soil samples to check for on-site contamination with a budget based on the following schedule:

    - 4 No. EMS Soil Suite 1: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, speciated PAH, Banded TPH (with BTEX and MTBE), total cyanide, phenols, organic matter, Chromium (VI), total sulphate, water soluble sulphate, total sulphur, pH.

    - 3 No. Volatile Organic Compounds (VOCs) / Semi-Volatile Organic Compounds (SVOCs).

    - 4 No. Asbestos in soil. and

    - Asbestos quantification (only where asbestos in soils is encountered).

- Laboratory chemical analysis of groundwater samples to check for volatile hydrocarbons with a budget based on the following schedule:

    - 3 No. Volatile Organic Compounds (VOCs) / Semi-Volatile Organic Compounds (SVOCs).

    - Laboratory chemical analysis of soil gas samples, where required from investigation findings and soil / groundwater analysis, to check for volatile hydrocarbons with a budget based on the following schedule:

    - 3 No. Volatile Organic Compounds (VOCs) / Semi-Volatile Organic Compounds (SVOCs).

- Laboratory geotechnical testing to characterize on-site soils with a budget based on the following testing schedule:

    - 5 No. Moisture Content Determinations.

    - 3 No. Atterberg Limits (Liquid Limit, Plastic Limit & Plasticity Index).

    - 2 No. Particle Size Distribution Tests (using the wet sieve methods).

    - 4 No. BRE SD1 (EMS Suite 3 - pH, water soluble sulphate, total sulphate and total Sulphur).

- Compiling one Phase 2 Site Investigation report in electronic (in pdf format) summarizing Phase 1 desk study information; Detailing the site works undertaken and the ground conditions encountered; Including factual exploratory hole records, hand pit photos, laboratory and monitoring results; Including a revised conceptual site model and Quantitative Contamination risk assessment; Including characterizing encountered ground conditions with respect to their geotechnical properties to aid with foundation design; Providing recommendations for further investigation works and potential Phase 3 remediation options where required.

1.3. Management Limitations

- This report has been prepared under the express instructions and solely for the use of the Client and the Client's agents in performance of EMS's duties under its contract with the Client. Should the Client wish to release this report to a Third Party for that party's reliance, EMS agree to such release provided that EMS assumes no duties, liabilities or obligations to the Third Party, that the Third Party does not acquire any rights whatsoever against EMS, and EMS accepts no responsibility for any loss incurred by the Client through the Client's release of the report to the Third Party.

- Copyright of this report is held by EMS.

- The findings of this report represent the professional opinion of experienced contaminated land consultants. EMS relied on the accuracy of third-party documentary information contained in the consulted and is in no circumstances responsible for the accuracy of such information or data supplied. When considering this report due regard should be given to the terms and conditions of EMS's contract with the Client under which the report was prepared.

- EMS does not provide legal advice and the advice of legal professionals may also be required. All advice, opinions or recommendations within this report should be read and relied upon only in the context of the report as a whole. The advice within the report is based upon the information made available to EMS within the financial and timeframe constraints imposed.

- The assessment and interpretation of contamination risks is based on the scope of works agreed with the Client together with the budgetary and programme constraints imposed. Further investigation, analysis and assessment of contamination may be required by regulators or other third parties with an interest in the site. An ecological risk assessment of contaminated soils is beyond the scope of this report. This report is concerned with assessing those contamination risks which apply to the future use of the site through the proposed development as part of the planning regime. The assessment does not consider the risk to current site users or continued future use of the site in its current state. If development of the site should occur that differs from that proposed, then the findings of the contamination assessment would need to be re-evaluated.

- At the time of writing, detailed information on the proposed structure, such as detailed layout, loadings and serviceability limits, was not available. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules. The scope of this investigation excludes a formal slope stability study and any observations made regarding slopes are for information only.

- All work carried out in preparing this report has utilised and is based upon EMS's current professional knowledge and understanding of current relevant UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect. EMS does not accept responsibility for advising the Client or other interested parties of the facts or implications of any such changes.

- The report is limited to the site boundaries identified by the Client and confirmed within this report. All boundary lines depicted on plans included within this report are approximate only and do not imply legal land ownership.

- The extent of the investigation was designed in-line with the Client's budget, which is considered suitable, and not limiting, for the proposed development.

- The recommendations, interpretations and conclusions within this report are based solely ground conditions found at the exploratory holes. Due to the variability in the nature of ground, conditions between exploratory holes can only be interpreted and not defined. The description of the site and the ground conditions is accurate only for the dates of the field works. In particular, groundwater levels can vary due to seasonal and other effects. Over time, site conditions may alter.

- All observations relating to tree species, asbestos containing materials within structures or invasive weeds, such as Japanese Knotweed, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.

2. Land Use and Site Setting

2.1. Site Location

The site is situated approximately 200m from the centre of and on the eastern outskirts of the town of Presteigne at 9 Harper's Lane, Presteigne, LD8 2AN.

The National Grid Reference (NGR) for the site is E: 331560, N: 264400.

A Site Location Plan is included in Appendix A.

2.2. Site Description

Roughly rectangular in plan, the site is relatively flat, orientated northwest to southeast and covers approximately 0.07 hectares. Dominating the northwest third of the site is a two-storey, red brick building with lean-tos to the rear that is understood to have historically acted as a police station and currently houses an artist's studio, office and flat used by Brixton Pottery Limited. The remaining external two-thirds of the site is grassy lawned with some block paving forming a rear garden that is currently unused.

The wall to the existing building delineates the site along its northwest boundary and wood panel fencing, stone wall and hedgerow is situated along northeast boundary. Harper's Lane bounds the site beyond the northwest and northeast boundaries. A five-bar gate, forming an access to the rear garden, stone wall and hedgerow delineates the southeast boundary with Back Lane beyond and bounding it. Hedgerow atop an earth bund and brick wall delineates the southwest boundary.

Beyond Harper's Lane to the North, are residential properties and a hotel (Judge's Lodging) with associated garden space. To the east of Harper's Lane and south of Back Lane are floor slabs and concrete / asphalt hardstanding associated with cleared historical industrial units. A private house and garden and Presteigne Fire Station bound the site to the west, beyond which are more houses.

The site is situated on elevated ground at approximately 150m Above Ordnance Datum (mAOD) on the southwestern edge of the River Lugg Valley. The ground slopes very gently towards the north and east and the River Lugg at approximately 145m AOD. To the west the ground initially rises very gently before rising rapidly to 316m AOD at the summit of Harley's Hill.

A plan showing the existing site layout is included in Appendix A.

2.3. Site History

The existing former Police Station building, and rear garden have been present on site since 1888, with a well located centrally since around 1890. The Police station was converted to an artist's studio, offices and a flat around 1990.

A building to the northeast of the site was used as an electrical works (1920 to 1930), produced die castings and munitions (1941 to 1946), and manufactured die castings for the motor industry from 1946 to 2011. From the 1970s it was expanded into a foundry and engineering works. After the works closed in 2011 the site became disused with on-site buildings being demolished in 2013.

2.4. Proposed Development

It is proposed to keep the former police station building as office space and a flat and to construct a two-storey artist's studio in the southern part of the existing garden. The proposed development will also include building an extension on the eastern side of the existing former police station building

A plan showing the proposed site layout is included in Appendix A.

2.5. Published Geology

The site is located on elevated ground that slopes very gently towards the northwest. The BGS GeoIndex (www. mapapps2.bgs.ac.uk), shows the site to be underlain with superficial Till, Devensian – Diamicton. These deposits are generally unsorted, unstratified and overconsolidated and were deposited either directly by or beneath a glacier without subsequent reworking by water towards the end of the last (Devensian) Ice Age. The BGS Lexicon generally describes these deposits as 'a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape'. Alluvial Deposits associated with the River Lugg are situated approximately 200m to the north. The underlying bedrock is identified as 'argillaceous, or mudstone strata belonging to the Wenlock Rocks (Undifferentiated) that are Silurian in age.

Whether Made Ground is present on-site is not shown from the geological information. However, given the site history isolated sporadic patches would be expected.

Historic BGS borehole records situated approximately 460m and 540m to the southeast recorded Made Ground or overburden, to between 0.50m and 3.00m depth, overlying interbedded clay rich and granular soils (superficial Till, Diamicton), to between 15m and 26m depth. Probable perched groundwater was encountered at 3.00m depth and groundwater at approximately 21m and 26m depth at or close to the superficial deposit / bedrock boundary.

No faults or other major geological structures are recorded either on-site or within 250m of the site.

2.6. Hydrogeology

The site is situated on the south-western edge of the River Lugg Valley and elevated at approximately 150m AOD with the ground generally sloping from west towards the north and east. Groundwater is anticipated to occur at depth, at or close to the boundary between the overlying Till, Diamicton and the underlying bedrock and flow towards the east. Groundwater is also likely to be in hydraulic continuity with the River Lugg. Perched groundwater is anticipated to occur at shallower depths associated with interbedded granular layers within the superficial Till deposits. An on-site well recorded groundwater (likely to be perched) at 0.60m depth during the winter months and associated with granular layers within the underlying superficial deposits.

Natural Resources Wales have classed the Alluvial Deposits as a Secondary A Aquifer and the Till Diamicton as a Secondary (Undifferentiated) Aquifer. The underlying Wenlock Rocks (Undifferentiated) have been classed as a Secondary B Aquifer. The underlying superficial deposits and bedrock being identified as high vulnerability Secondary Aquifers due to their leaching potential.

The site is not located within a groundwater Source Protection Zone.

2.7. Hydrology

The site is situated on the south-western edge to the River Lugg Valley. The ground slopes towards the north and east with approximately two-thirds grass covered and an existing building dominating the north-western third. Therefore, surface water is anticipated to predominantly percolate directly into the ground with some draining into local drainage networks.

The nearest surface water feature is a small northeast flowing tributary to the River Lugg located approximately 72m towards the east. The River Lugg is situated approximately 215m to the northeast and flows towards the east.

The nearest licensed discharge consents are associated with the former Brockhouse Kaye (Presteigne) works located adjacent to the site and no licensed surface water abstractions are associated with the site.

The site is not located within an area designated as being at risk from fluvial flooding. However, there is potential for groundwater flooding where properties are situated below ground level or at surface.

2.8. Mining and Mineral Extraction

The site is not located within an area expected to be at risk from coal mining and there are no records given for mineral extraction activities within 250m.

2.9. Ground Stability

The potential risk for the site to be impacted by compressible ground or ground dissolution is recorded as no hazard. For collapsible ground, landslides, shrinking or swelling clays and running sands the risk is recorded as very low.

2.10. Radon

The site is situated within a lower probability radon area (where less than 1% of homes are estimated to be at or above the action Level). Therefore, no radon protection measures are required in the construction of new dwellings or extensions.

2.11. Soil Chemistry

The site is situated within an area where elevated natural background concentration of metals has been recorded for chromium (60 – 90 mg/kg) and nickel (15 – 30 mg/kg).

2.12. Landfills and Infilled land

No records for historic landfills, licensed land fill sites, waste treatment and management facilities, or waste transfer sites are given for the site or within 250m.

No entries for potentially infilled land are recorded for the site or within 250m.

2.13. Pollution Incidents

There are ten entries for pollution incidents to controlled waters recorded for the site. The closest being located approximately 26m but considered not to pose a risk to the proposed development.

2.14. Hazardous Substances

There are no entries for registered hazardous sites recorded either on-site or within 250m of the site.

2.15. Contemporary Trade Directory and Fuel Station Entries

A single active contemporary trade directory entry for Artisan Print – Printers, is located 110m to the southwest. Given its distance this entry is not considered to pose a significant risk to the proposed development.

2.16. Unexploded Ordnance

According to the ZeticaUXO website (www.zeticauxo.com), the site is located within an area indicated to be at low risk (15 bombs per 1000 acres or less) from unexploded ordnance.

2.17. Ecologically Sensitive Sites

The site is located within an Environmentally sensitive area, identified as Radnor (decommissioned). The River Lugg is identified as a Site of Special Scientific Interest.

2.18. Previous Investigation Reports

EMS is not aware of formal previous ground investigation works having been undertaken at the site. However, hand and auger pits were undertaken during a preliminary risk assessment in April 2021. The findings were included within a preliminary risk assessment, which should be read in conjunction with this report and is referenced as:

- 'Phase 1: Preliminary Risk Assessment, 9 Harper's Lane, Presteigne LD8 2AN', dated 21st April 2021.

Three pits were undertaken within the garden area and a single one on the soil bund along the south-western boundary.

Across the garden area the encountered soils were described as 'highly compact and stony sandy clay loam', 'dark, friable, well drained loam with fine roots and traces of brick' and 'dark, very stony loam with fine roots'. These soils, or Made Ground, were encountered to between 0.20m and 0.60m depth.

Within the soil bund, soils described as 'dark sandy clay loam, friable, many roots', were recorded to 0.50m depth overlying 'clay loam' to 0.90m depth.

No indication was given as to whether groundwater was encountered within the inspection pits.

No evidence for vegetation die-back, visual asbestos containing materials (ACMs), buried services or structures, coal ash or clinker were recorded in the inspection pits.

2.19. Preliminary Contamination Risk Assessment

The EMS Phase 1 desk study report revealed a potentially low to Moderate risk to human health from potentially contaminated Made Ground on-site. The posed risk towards controlled waters and buildings or buried structures was identified as low to very low, respectively.

With respect to the former Kaye Presteigne Ltd works to the northeast and southeast the posed risk from contaminated soils impacting human health on-site was identified as low. The potential for contaminated Made Ground to pose a risk to controlled waters and buildings or buried structures associated with the proposed development was identified as very low.

However, a potentially moderate to low risk from ground gas and vapours, towards the development site and human health, was identified from Made Ground and potentially leaked hydrocarbon sources associated with the former Kaye Presteigne Ltd works. Ground gas and vapours are likely to pose a low risk to buildings and buried structures associated with the proposed development.

2.20. Preliminary Geotechnical Risk Assessment

Potential geotechnical constraints identified within the EMS Phase 1 Desk Study for the site include an unknown Made Ground depth, volume change potential associated with clay rich soils, soil type variations over small distances and aggressive ground conditions that can deepen and complicate foundation design.

3. Site Investigation and Observations

3.1. Investigation Strategy

The Phase 2 intrusive investigation works included 5 No. Windowless Sample Boreholes (WS01 to WS05) and 6 No. Hand Dug Pits (HP01 to HP06).

Windowless sample boreholes were selected to investigate deep soils, undertake in-situ strength testing, using standard penetration test (SPT) apparatus, and obtain soil samples for geotechnical testing and chemical analysis. Windowless sample boreholes also facilitated the installation of groundwater and gas monitoring standpipes.

Shallow hand dug pits were selected as a relatively quick and easy method of exposing a greater area of soils, for logging purposes, obtaining samples for geotechnical testing and chemical analysis.

No significant constraints to the exploratory hole layout were encountered during the investigation works.

Borehole WS01 and Hand Pit HP06 were undertaken where the extension to the existing building was proposed. Boreholes WS02 to WS05 and Hand Pits HP01 to HP05 were undertaken across the southern half of the garden where the proposed two-storey artist's studio will be located. Boreholes WS01, WS03 and WS04 were also located close to the eastern / southern site boundary to monitor for ground gas and hydrocarbon vapours from the adjacent former factory site.

The ground investigation layout is presented on the Exploratory Hole Location Plan included in Appendix A.

Based on the proposed end use, the sampling and analysis plan was more positively biased towards near surface samples as these represent the soils most likely to be available to future site users.

Laboratory chemical analysis was based on the potential contaminants identified within the Phase 1 Preliminary Conceptual Site Model. Therefore, EMS has scheduled a suite of typically occurring contaminants that tend to be associated with industrial sites. In order to help assess the potential for hydrocarbon vapours to be migrating from the adjacent former factory site, soil and groundwater samples were also analysed for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs).

3.2. Investigation Methodology

EMS undertook the Phase 2 investigation works on 25th November 2021.

Windowless sample boreholes were sunk using dynamic windowless sampling methods to between 1.10m (WS05) and 5.00m (WS01) depth. During drilling, Standard Penetration Tests (SPTs) were undertaken to determine in-situ soil strengths and soil samples were collected for logging purposes and laboratory chemical analysis / geotechnical testing. Groundwater samples were collected from three boreholes (WS01, WS03 and WS04) during the site works for laboratory chemical analysis. Upon completion boreholes WS01 to WS04 were installed with groundwater and gas monitoring standpipes, to 4m depth, and Boreholes WS05 was backfilled with arisings.

Hand dug pits (HP01 to HP06) were undertaken to between 0.20m (HP03) and 1.00m (HP06) depth to collect soil samples for logging purposes and laboratory chemical analysis / geotechnical testing. Each pit was backfilled with arisings on completion.

Groundwater and ground gas / vapour monitoring was undertaken during three visits between 16th December 2021 and 11th January 2022.

All soil arisings were logged in general accordance with British Standard BS5930:2015 by an attending EMS Geo-Environmental Engineer.

Details of the soils encountered, samples taken, in-situ tests and groundwater entries are recorded on the exploratory hole logs included in Appendix B. A photographic record showing the hand pits undertaken is included in Appendix C. Tables summarising the chemical results are included in Appendix D. Groundwater and ground gas monitoring summary tables are included in Appendix E.

3.3. Geotechnical Testing

Soil samples for geotechnical testing were forwarded to GEO Site & Testing Services Ltd (GSTL), at their Llanelli, Carmarthenshire Laboratory. GSTL is UKAS accredited (UKAS number 2788) and part of the Monitoring Certification Scheme (MCERTS). Chemical Analysis for pH and sulphate was undertaken by Envirolab, at their Mottram Road, Hyde Laboratory. Envirolab is a UKAS accredited (Envirolab: UKAS number 1247) and part of the Monitoring Certification Scheme (MCERTS). A full list of determinants analysed along with the UKAS accreditation for each individual testing method are shown on the laboratory test certificates included in Appendix F.

The geotechnical testing undertaken is outlined in the table below:

Test	No. of Samples Analysed
Moisture Content Determination.	5
Atterberg Limits (Liquid Limit, Plastic Limit & Plasticity Index).	5

3.4. Chemical Analysis - Soils

Soil samples for chemical analysis were forwarded to Envirolab, at their Mottram Road, Hyde Laboratory. Envirolab is a UKAS accredited (Envirolab: UKAS number 1247) and part of the Monitoring Certification Scheme (MCERTS). Chemical analysis was undertaken in accordance with in-house methods. A full list of determinants analysed along with the UKAS accreditation for each individual testing method are shown on the laboratory test certificates included in Appendix G.

The chemical analysis undertaken is outlined in the table below:

Chemical Analysis	No. of Samples Analysed
Heavy Metals (arsenic, cadmium, chromium, chromium (VI), copper, lead, mercury, nickel, selenium and zinc).	4
Total Cyanide, Phenols, Organic Matter, Total Sulphate, Water Soluble Sulphate, Total Sulphur & pH.	4
Speciated Polycyclic Aromatic Hydrocarbons (PAH).	4
Banded Total Petroleum Hydrocarbons (TPH).	4
Asbestos in Soil.	4
Asbestos Quantification.	0
VOCs / SVOCs	3

3.5. Chemical Analysis – Groundwater

Groundwater samples taken from windowless sample boreholes WS01, WS03 and WS04 for chemical analysis were forwarded to Envirolab, at their Mottram Road, Hyde Laboratory. A full list of determinants analysed along with the UKAS accreditation for each individual testing method are shown on the laboratory test certificates included in Appendix G.

The chemical analysis undertaken is outlined in the table below:

Chemical Analysis	No. of Samples Analysed
VOCs / SVOCs	3

4. Ground Conditions

4.1. Overview

The ground conditions encountered during the investigation works generally agreed with those anticipated from the published geological information. These generally comprised Made Ground overlying superficial Till, Diamicton Deposits. Bedrock was not encountered during the investigation works.

Details of the various stratigraphic units encountered are presented on the exploratory hole logs, included in Appendix B, and are discussed further in the following sections.

4.2. Artificial Ground

During the intrusive investigation works no surface hardstanding, buried services or structures were encountered in the exploratory holes undertaken.

4.3. Topsoil and Made Ground Topsoil

No Topsoil / Topsoil Made Ground was encountered during the investigation works.

4.4. Made Ground

Made Ground was recorded sitewide in all exploratory holes to between 0.30m (WS03) and 1.10m (WS02) depth. Hand pit HP03 was terminated at 0.20m depth due to the Made ground being too difficult to dig through. The encountered Made Ground was generally described as firm dark brown gravelly clay that included sandstone, brick, concrete and cement. This material also included layers described as dark brown and grey angular to rounded concrete and brick cobbles.

4.5. Superficial Soils – Till, Devensian - Diamicton

Superficial Till deposits were encountered sitewide in all exploratory holes with the exception of hand pit HP03 that terminated in Made Ground. These deposits were generally described as soft brownish grey gravelly silt and thinly laminated grey silt that was encountered to the maximum investigation depth at 5.00m (WS01).

4.6. Bedrock – Wenlock Rocks (Undifferentiated)

The Wenlock Rocks (Undiferentiated) bedrock was not encountered in the exploratory holes during the investigation works.

4.7. Groundwater

During the investigation works, groundwater was encountered in boreholes WS01 to WS04 at between 2.10m (WS01) and 3.20m (WS04) depth, associated with the superficial Till, Devensian – Diamicton Deposits.

During the follow-on monitoring visits, between 16th December 2021 and 11th January 2022, groundwater was recorded at between 0.80m (WS03) and 1.44m (WS01) depth associated with the superficial Till, Devensian – Diamicton Deposits.

Tables summarizing the groundwater monitoring results are included in Appendix E.

5. Geotechnical Properties

5.1. Natural Moisture Content

Natural Moisture Content determinations were undertaken on 5 No. superficial Till, Devensian – Diamicton soil samples between 1.10m (WS05) and 3.80m depth (WS04). The results returned Natural Moisture Contents for these deposits between 22% and 27%.

5.2. Atterberg Limits

The same 5 No. superficial Till, Devensian – Diamicton samples, between 1.10m (WS05) and 3.80m depth (WS04), were subjected to Atterberg Limit measurements for Liquid Limit, Plastic Limit and Plasticity Index.

These deposits returned a Liquid Limit between 44% and 59%, Plastic Limit between 19% and 21% and a Plasticity Index between 23% and 38%. No oversized particles were recorded in these samples giving a Modified Plasticity Index equivalent to the Plasticity Index between 23% and 38%. According to NHBC standards the Modified Plasticity Index corresponds to the superficial Till, Devensian – Diamicton being a clay rich soil with a medium volume change potential.

5.3. Standard Penetration Tests

Standard Penetration Tests (SPTs) were undertaken at 1.00m intervals, between 1.00m and 5.00m depth, in all windowless sample boreholes within the superficial Till, Devensian – Diamicton deposits.

Returned SPT N values generally ranged between 7 and 14 for the full borehole depths and showed no particular trend with depth. A single N value exceeding 50 was recorded in boreholes WS01 at 1.00m depth. However, is it anticipated that this value corresponds to gravel, or a cobble and it is not considered representative for the deposits encountered. The typical N values recorded generally correspond to a clay rich soil with soft to firm consistency.

For clay rich soils such as these Till deposits, an equivalent undrained shear strength to a 100mm diameter triaxial compression test can be determined using industry standard's, such as Stroud's method. The equivalent undrained shear strength (Cu) can be calculated using the average Plasticity Index, to determine a conversion factor (f1), SPT N values and the following formula:

$$Cu = f1N \text{ (Tomlinson 2001)}$$

The average plasticity index for these deposits is 31% and the corresponding f1 value is 4.51.

Therefore, the equivalent undrained shear strengths estimated for these deposits ranges between 27 kPa and 63 kPa, indicating a low to medium strength soil.

5.4. pH and Water Soluble Sulphate

Results for BRE pH and sulphate tests undertaken on samples from the Made Ground and superficial Till, Devensian – Diamicton deposits returned water soluble sulphates values from <10 mg/l to 33 mg/l and pH values between 7.38 and 8.52. Giving a characteristic sulphate value of 100 mg/l, based on the mean of highest two results rounded to nearest 100mg/l. The corresponding characteristic pH value is 7.38, based on the mean of lowest 20% results, in accordance with BRE SD1 (2005).

Groundwater was not tested.

Total potential sulphate not applicable as pyrite unlikely in the samples tested.

6. Geotechnical Assessment

6.1. Introduction

The following advice and recommendations are based on constructing a two-storey studio building and extension to the existing former police station building. A proposed development layout plan is included in Appendix A. From assessment of the nature of the ground conditions and the type of proposed structures, it is considered that the situation falls within EC7 Geotechnical Category 2.

Should the nature of the development be changed then the results of this investigation would need to be reviewed and reassessed.

6.2. Excavations

Made Ground and shallow groundwater were encountered during the site works, which will make excavations prone to sidewall collapse without temporary support to keep them open.

All excavations requiring man entry should be battered back to a safe angle, supported by an appropriate proprietary trench support system or adequately shored to provide safe working conditions. Shoring to all excavations requiring man entry must be designed by a suitably qualified and experienced engineer. All support systems will require regular inspection as detailed in published guidelines to ensure the excavation support is adequate and appropriate for the ground conditions present.

Shallow groundwater will likely result in excavation difficulties and appropriate groundwater control will therefore be required.

It is considered that construction without adequate groundwater control will be problematical and that pumping from sumps alone may not be sufficient. Consultation with groundwater control contractors is recommended as specialist measures such as 'well pointing' may be required. Any groundwater control system should be designed and operated to minimise the loss of fines from the soil matrix as this could adversely affect settlement.

Groundwater levels at the time of construction will have a critical impact on the ease with which the structure can be built. It is recommended that excavation works for foundations are undertaken during drier months when levels are likely to be lower to reduce the groundwater impacts on foundation construction.

Third party structures are present to the north and west of the site. However, the proposed structure will be located within the southeast corner and well away from other third part structures. Therefore, it is considered that the Party Wall Act is unlikely to apply to the proposed development.

6.3. Slope Stability

The site is relatively flat with a gentle regional slope towards the north and east. No significant changes in level as part of the development are anticipated. Therefore, it is considered that slope stability is unlikely to be a concern at this site.

6.4. Concrete Design

The results for pH and sulphate testing indicate that aggressive ground conditions are not present at the site it being classed as brownfield. Therefore, a Design Sulphate Class of DS-1 and Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1 is considered appropriate. The groundwater regime is anticipated to be mobile.

6.5. Drainage Design

Infiltration tests to inform drainage design were not within the scope of these investigation works.

6.6. Pavement Construction

A Made Ground cover was recorded across the site, which it is anticipated pavement construction will sit upon. Therefore, it is recommended that a preliminary design California Bearing Ratio (CBR) of less than 2% is assumed at this stage.

All unsuitable soils, such as topsoil or desiccated soils, should be removed from beneath proposed paved areas. The exposed sub-grade formation should then be proof rolled to reveal any excessively soft or compressible zones and any such features identified also removed by excavation. Where unsuitable materials are removed, the resultant voids should be filled in layers with appropriately compacted suitable granular fill. To reduce the loss of granular construction materials into the sub-grade, consideration should be given to utilizing a geotextile starter layer across the formation level.

6.7. Preliminary Foundation Recommendations

6.7.1. Introduction

The client is proposing to construct a two-storey artist's studio within the southern garden area belonging to the site and adding an extension to the eastern side of the existing former police station building.

Encountered ground conditions recorded during the recent intrusive investigation works included a clay rich Made Ground cover, to between 0.30m and 1.10m depth, overlying superficial Till, Devensian – Diamicton deposits. Encountered to the full investigation depth, at 5.00m, the superficial deposits comprised low to medium strength brownish grey gravelly silt and thinly laminated grey silt. Bedrock was not encountered, and follow-on monitoring has revealed shallow groundwater at between 0.80m and 1.44m depth.

With respect to shallow foundations, Made Ground and low strength soils are not considered as suitable bearing strata due to their potentially variable nature and poor strength. Given the poor strength depths and that shallow groundwater is present, it is considered that traditional shallow footings are not feasible at this site. Therefore, consideration needs to be given to adopting a deep foundation solution employing ground improvement or piles to transfer loads down to a competent bearing stratum.

6.7.2. Floor Slabs

Considering that Made Ground and clay rich soils are present near surface, fully suspended floor slabs designed and constructed in accordance with NHBC Standards are recommended at this development.

With reference to Sections 2.10 and 7.6, the floor construction will not have to incorporate radon/ground gas protection measures.

6.7.3. Ground Improvement

Given the poor strength soil depths present beneath the site, it may be possible for the ground to be improved using vibro-replacement stone or concrete columns. After ground improvement by such techniques, shallow reinforced strip footings could then be employed. Discussions with specialist contractors should be held to confirm that this technique is suitable for the ground conditions at the site.

Ground improvement techniques such as dynamic compaction, excavation and replacement with suitable engineered fill, and surcharging for to allow the use of shallow spread foundations are not generally accepted by construction warranty providers, e.g. NHBC, and are therefore not discussed.

6.7.4. Piling

Deep poor strength soils and shallow groundwater make employing traditional shallow footings unfeasible at this site. Therefore, consideration should be given to employing a deeper foundation solution such as piles to transfer loads to more competent strata at depth.

Shallow groundwater may make traditional bored piles difficult to construct unless they are cased through to the underlying Wenlock Rocks (Undiferentiated) bedrock. Using Continuous Flight Auger (CFA) piling techniques could avoid the need for casing and may be the best method for constructing cast in-situ piles. Alternatively, driven pre-cast concrete piles would be a viable option, however, the proximity to neighbouring structures may make them unsuitable due to noise and vibration considerations.

For pile design purposes, it is recommended that skin friction from the Made Ground is ignored. Working loads should be calculated from a combination of skin friction and end bearing within the underlying superficial Till Deposits and Wenlock Rocks (Undiferentiated) bedrock.

Existing trees may cause soil heave. In the influence zone of trees, pile caps and ground beams will have to be separated from the soil by a suitable void former on the sides and in the case of ground beams, underneath. Piles will have to be designed to withstand the seasonal movements exerted by the remaining and proposed vegetation either by the use of suitable reinforcement or by the provision of sleeving through the swelling zone. Such precautions against heave should be designed and constructed in accordance with NHBC Standards.

It is recommended that consultation with a specialist piling contractor is undertaken in order to evaluate likely pile loads, diameter and depths based upon the ground conditions revealed within the context of the specified technical requirements of the chosen piling method. In any event, positive contractual assurances should be sought from the piling contractor in respect of the performance of their proprietary system.

6.8. Recommendations for Further Intrusive Geotechnical Works

To aid pile design, it is recommended that a deep cable percussive borehole is undertaken to a minimum 10m in order to confirm deeper ground conditions and soil strengths. A monitoring well should be included in the boreholes and at least one post site-work monitoring visit should be undertaken to record groundwater levels. In-situ Standard Penetration Tests should be conducted during boring and soil samples collected for logging purposes and submitted for appropriate geotechnical laboratory testing.

7. Revised Contamination Risk Assessment

7.1. Selection of Generic Assessment Criteria

Information relating to selecting acceptance criteria for human health, controlled waters and building structures and services is contained within the supplementary information section.

The proposed site development is for residential and commercial purposes with associated gardens and parking. The proposed residential site use applies to the existing former police station, which the client is currently using to live in. The proposed design involves converting the existing building into a flat and office space for the client. The proposed commercial site use is for a newly constructed artist's studio located within the southern half of the site. External areas will be either covered with hard landscaping or hardstanding for parking purposes or kept as existing lawn. For comparison purposes, Generic Assessment Criteria (GACs) for a residential use with and without plant uptake have been utilized.

The risk to construction workers from acute (short term) exposure has been initially assessed on a qualitative basis. However, it should be noted that soil contamination considerations and the risks posed to contractors during site works should be covered and included within the construction health and safety documentation.

7.2. Human Health

7.2.1. Soils

Selected Made Ground samples, between 0.10m and 0.60m depth, from hand pits HP01, HP03, HP04 and HP06 were subjected to chemical analysis. Chemicals analysed for included heavy metals, total cyanide, phenols, organic matter content, water soluble sulphate, total sulphate, total sulphur and pH, speciated polycyclic aromatic hydrocarbons (PAH), banded total petroleum hydrocarbons (TPH), BTEX & MTBE and asbestos in soils / quantification (where asbestos was recorded in soils). To help with assessing the potential for hydrocarbon vapours within soils underlying the site, single Made Ground and two natural soil samples were analysed for VOCs and SVOCs.

No significantly elevated heavy metal concentrations, exceeding the GACs for a residential end-use, were recorded for the Made Ground samples taken from hand pits HP01, HP03 and HP06. However, an elevated lead concentration at 216 mg/kg was recorded in a Made Ground sample taken from hand pit HP04 at 0.50m depth. Whilst not exceeding the GAC for a residential use without plant uptake, this concentration slightly exceeds the GAC for residential use with plant uptake at 200 mg/kg.

The location for hand pit HP04 puts it directly beneath the building footprint for the proposed artist studio. During preliminary site clearance and foundation construction works for the studio, it is expected that the Made Ground soils containing the slightly elevated lead will be removed for off-site disposal. Therefore, it is considered that the potential risk from the elevated lead poses a very low risk to the proposed development and future site users.

For non-metallic compounds, PAH, TPH, in soils, no significantly elevated concentrations were recorded and none that exceeded the GACs for a residential end use. No significantly elevated concentrations for VOCs and SVOCs were recorded in soil samples analysed. No asbestos in soils or asbestos containing materials were recorded within the Made Ground samples analysed.

Chemical results are summarised in tables presented in Appendix D and the laboratory test certificates are included in Appendix G|.

7.2.2. Waters

It is not appropriate to consider human health assessment criteria for human health in relation to the risk to the water environment, but currently there are no generic soil assessment criteria in respect of the water environment. In the absence of any groundwater sampling data, the soil results are assessed on the basis of professional judgement.

Contaminant concentrations recorded in the soils at the site are not considered to be at such levels that they would present any significant risk to the underlying water environment.

7.3. Controlled Waters

7.3.1. Surface Waters

There are no surface water features with 250m of the site and no significant contaminative sources or contamination in on-site soils has been identified from laboratory analysis. Therefore, it is considered that the risks posed to surface water features from contamination in on-site soils is very low.

7.3.2. Groundwater

Groundwater samples from 3 No. boreholes (WS01, WS03 and WS04), were analysed for VOCs and SVOCs to help assess the likelihood of hydrocarbon vapours migrating from the adjacent former factory site. No significantly elevated VOC or SVOC concentrations were recorded for the samples analyse.

Generally, no significantly elevated concentrations for heavy metals, non-metallic compounds, PAH or TPH were recorded in the Made Ground samples analysed. A slightly elevated lead concentration was recorded in hand pit HP04 that exceeded the GAC for residential use with plant uptake. However, this location it beneath the proposed building footprint and it is expected that the associated soils will be removed during the preliminary site works. Therefore, given the lack of significant chemical concentrations recorded from the laboratory analysis it is considered that the risk posed to groundwater is very low.

7.4. Buried Concrete and Underground Services

No significantly elevated contaminant concentrations were recorded in soil and groundwater samples analysed for these investigation works. Therefore, it is considered that the potential risk posed to buried concrete and services is very low.

7.5. Undiscovered Contamination

Should any hitherto undiscovered contamination be encountered during construction works the Geo-Environmental Engineer should be informed immediately so that appropriate measures can be taken. The potential for the presence of significant undiscovered contamination to be present at this site is considered to be very low.

7.6. Ground Gas and Hydrocarbon Vapours

The Phase 1 Desk Study report identified a potentially moderate to low risk to human health from ground gas, associated with on-site Made Ground, and hydrocarbon vapours from the adjacent former Kaye Presteigne Ltd works. The potential posed risk towards buildings and buried structures was identified as being low.

CIRIA C665 guidance indicates that ground gases typically require a pressure differential to act as a driving force to enable them to be driven through the ground. Hydrocarbon vapours diffuse along concentration gradients or flow in dissolved form in liquids. Atmospheric pressure, rainfall and frozen ground, wind and ground conditions such as vegetation cover, soil type, groundwater and anthropomorphic influences (shafts, service runs, drains, foundations and piles), will all influence ground gas and vapour migration through the ground. The underlying ground conditions are typically clay rich in nature and contain relatively shallow groundwater. Therefore, it is expected that ground gas and hydrocarbon vapor migration through the ground will be strongly inhibited.

Generally, the Made Ground encountered was not described as containing much plant of putrescible material and the former adjacent factory site ceased operating around 2013. Therefore, it is considered ground gas and hydrocarbon vapour volumes, where produced, are likely to be very low.

During the investigation works, soil headspace analysis was undertaken in all boreholes (WS01 to WS05) at 0.50m intervals using MiniRae 3000 Photoionization Detection (PID) apparatus to check for volatile hydrocarbon vapours. The results recorded in parts per million (ppm) are summarized in the following table:

Well ID / Depth (m)	WS01	WS02	WS03	WS04	WS05
0.50	<0.1	<0.1	<0.1	<0.1	<0.1
1.00	<0.1	<0.1	<0.1	<0.1	<0.1
1.50	<0.1	<0.1	<0.1	<0.1	-
2.00	<0.1	<0.1	<0.1	<0.1	-
2.50	<0.1	<0.1	<0.1	<0.1	-
3.00	<0.1	<0.1	<0.1	<0.1	-
3.50	<0.1	<0.1	<0.1	<0.1	-
4.00	<0.1	<0.1	<0.1	<0.1	-
4.50	<0.1	-	-	-	-
5.00	<0.1	-	-	-	-

Measured PID results recorded during the post-fieldwork monitoring visits, undertaken between 16th December 2021 and 11th January 2022, were between 0.0ppm and 0.2ppm, i.e. very low. No significantly elevated VOC and SVOC concentrations were recorded in the soil or groundwater samples analyzed during the investigation works. Given this and the very low PID results recorded during and after the site works, it is expected that no significant hydrocarbon vapor concentrations are migrating from the adjacent factory site. This is considered to be due to one or more reasons. The underlying ground conditions being clay rich with high groundwater inhibiting lateral vapour migration, or an hydrocarbon absence at source or a combination of both.

During the ground gas monitoring visits, no methane concentrations were recorded and carbon dioxide concentrations ranged between 0.3% and 0.8%. Recorded flow rates ranged from -0.5 l/hr to 0.3 l/hr. The results equating to Gas Screening values of 0.000 l/hr, for methane, and from -0.004 l/hr to 0.001 l/hr, for carbon dioxide. The results indicating a very low ground gas risk classification, which corresponds to a Characteristic Situation of CS1 and an NHBC "Traffic Lights" classification of Green.

Also, recorded ground gas concentrations did not exceed the threshold limits for methane (1%) or carbon dioxide (5%). Therefore, it is considered that the very low ground gas risk classification for the site remains unchanged and the Characteristic Situation remains as CS1 and an NHBC "Traffic Lights" classification as Green.

Therefore, given the very low hydrocarbon vapour and ground gas concentrations recorded, it is considered that gas protection measures are not required with the foundations for the proposed development.

Tables summarizing the ground gas/hydrocarbon vapour monitoring results and identifying the potential ground gas risk are presented in Appendix E along with a calibration certificate for the PID.

8. Risk Evaluation

8.1. Revised Conceptual Site Model

A revised conceptual site model is presented in Appendix A.

8.1.1. Revised Sources

A slightly elevated lead concentration was recorded from the Phase 2 investigation works, associated with shallow soils beneath the proposed building footprint. However, it is expected that these soils will be removed from site during preliminary site clearance operations and will not pose a risk to the proposed development.

No other significant potential on-site or off-site contaminative sources or chemical contamination in on-site soils have been identified from these Phase 2 intrusive investigation works.

8.1.2. Previously Identified Receptors

Potential receptors previously identified form the Phase 1 Desk Study that are most likely to be impacted by the revised contaminative sources include:

- Human Health (end-users and construction workers).
- Groundwater within the underlying Till and Wenlock Rocks (Undifferentiated) bedrock.
- Buildings, buried structures and / or services.

Good hygiene practice, using appropriate PPE, appropriate protection measures and adequate training will help to reduce risks posed to construction workers.

8.1.3. Previously Identified Pathways

Potential pathways previously identified form the Phase 1 Desk Study that are most likely to be impacted by the revised contaminative sources include:

- Inhalation, ingestion and direct contact with contaminated soils and dust.
- Vertical migration to groundwater.
- Ground gas / vapour migration, ingress and accumulation through buried structures / services, voids and defects into buildings and enclosed spaces.

8.1.4. Limitations and Uncertainties

There were no access limitations encountered during the investigation works. A sufficient spread of exploratory positions was completed for contamination assessment purposes.

8.2. Revised Contamination Risk Assessment

The pollutant linkages identified in the revised conceptual site model are evaluated as to their severity below.

Potential Sources and contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
Made Ground (On-site) Heavy metals. Inorganic compounds. Polycyclic Aromatic Hydrocarbons (PAH). Petroleum hydrocarbons (TPH). Asbestos in soils.	Ingestion Inhalation Direct Contact (1)	Site end-users. and Construction Workers.	Human health effects. [Medium]	No significant contamination sources identified from laboratory analysis. Shallow soils likely to be removed during preliminary site clearance. [Unlikely]	Low.
	Vertical migration (2)	Perched Groundwater within superficial Till Deposits / Groundwater within the Wenlock Rocks bedrock.	Secondary (Undifferentiated) / Secondary B Aquifers [Mild]		Very Low.
	Direct Contact (3)	Buildings, Buried Structures and Services	Chemical attack of buried structures and tainted water supplies. [Minor]		Very Low.

Potential Sources and contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
Made Ground (Off-site), associated with the former Kaye Presteigne Ltd works: Heavy metals. Inorganic compounds. Polycyclic Aromatic Hydrocarbons (PAH). Petroleum hydrocarbons (TPH). PCBs. Acids / Alkalis. OCPs and OPPs Asbestos.	Ingestion Inhalation Direct Contact (4)	Site end-users. and Construction Workers.	Human health effects. [Medium]	Works are down topographic gradient of the site and potentially contaminated soils confined beneath existing hardstanding [Unlikely]	Low.
	Vertical migration (5)	Perched Groundwater within granular superficial Till Deposits / Groundwater within the Wenlock Rocks bedrock.	Secondary (Undifferentiated) / Secondary B Aquifers [Mild]	Works are down hydraulic gradient of the site. [Low Likelihood]	Very Low.
	Direct Contact (6)	Buildings, Buried Structures and Services	Chemical attack of buried structures and tainted water supplies. [Minor]	Works are down topographic and hydraulic gradient of the site. [Unlikely]	Very Low.
Ground gas and vapours (Off-site), associated with the former Kaye	Migration, ingress and accumulation. Inhalation. (7)	Site End-users.	Human Health Effects [Medium]	No significant ground gas or hydrocarbon vapour/ VOCs/ SVOCs recorded from laboratory	Low.

Potential Sources and contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
Presteigne Works: Methane. Hydrocarbon Vapours.	Migration, ingress and accumulation. (8)	Buildings.	Risk of structural damage from explosions due to building up ground gas. [Mild]	analysis / monitoring. Underlying soils are clay rich with shallow groundwater. [Unlikely]	Very Low.

The Phase 2 intrusive investigation works have identified no additional contaminative sources or significant contamination in on-site soils that are likely to impact on the proposed development. Therefore, the previously identified contaminative risk towards human health from potentially contaminated on-site Made Ground, the adjacent former Kaye Presteigne Ltd works or ground gases / vapours has been reduced to, or remains as, low.

The potential risk to groundwater and buildings from contamination in on-site/off-site Made Ground or ground gases / vapours remains or has been reduced to low or very low.

8.3. Risk Management

8.3.1. General

Apart from some slightly elevated lead in shallow Made Ground within the proposed building footprint, which will likely be removed during preliminary site works, no significant contaminant or ground gas / hydrocarbon vapour concentrations have been identified from this site investigation.

It is recommended that this report is submitted to the planning department of the Local Authority, the organization undertaking the Building Control function, warranty providers to confirm that the investigation completed to date is satisfactory.

8.3.2. Further Investigation

No further on-site/off-site contaminative sources or significant contamination in shallow Made Ground has been identified from these Phase 2 investigation works. Therefore, it is considered that no further intrusive investigation works to assess contamination constraints are required for this site.

8.3.3. Outline Remediation Option Appraisal

Due to no significant contamination risks being identified from the Phase 2 intrusive works for this site, no remediation works are considered necessary.

8.3.4. Waste Classification

It is anticipated that if and where possible all excavated soils will be re-used on-site during the proposed works.

Topsoil should be viewed as a resource rather than a waste and as it is suitable for residential garden use, the topsoil at the site should be stripped and the surplus reused on other developments. It should be noted that topsoil, even if uncontaminated, is unlikely to constitute 'inert waste' due to its high organic matter content.

It is considered that Made Ground or natural sub-soils for off-site disposal would be classified as 'inert waste'. However, the chemical results should be forwarded to the proposed landfill site and the waste classification confirmed prior to surplus soil disposal off-site. Soils Waste Acceptance Criteria (WAC) testing will be required where surplus soils are being disposed off-site to a landfill permitted to accept inert waste. The waste code from the European Waste Catalogue (EWC) 2002 for the soils would be 17 05 04 'Soil and Stones, not containing dangerous substances'.

9. Health and Safety File Information

9.1. Introduction

The following sections aim to present pertinent Health and Safety information that has arisen from the current investigation/survey works discussed in this report. The purpose being to identify health and safety controls that may be necessary during subsequent maintenance, refurbishment, demolition or construction works.

Where EMS has been appointed as a Principal Contractor, then this information shall form the Health and Safety Files as required by the Construction Design and Management (CDM) Regulations 2015.

Reports are always forwarded to the Client and they shall be responsible for ensuring this safety information is disseminated to those who need it.

9.2. Works Undertaken

Detail on the works undertaken and the information gained about the site are discussed in previous sections of this report.

In summary, EMS's work comprised a single day undertaking windowless sample boreholes, hand pits and follow-on monitoring to investigate potential contaminative and geotechnical constraints associated with the proposed development.

9.3. Identified Hazards

The investigation works have revealed the following hazards:

9.3.1. Contamination

Although no contamination has been identified, as with any construction site, if any anomalous material is encountered during the redevelopment, then expert environmental advice should be sought.

9.3.2. Asbestos

No asbestos in soils or Asbestos Containing Materials (ACMs) have been identified for this site.

9.3.3. Other Issues

No other significant safety hazards were identified on-site during EMS's investigation works.

9.3.4. On-site Structures

The existing former police station building will remain as part of the proposed development,

EMS recommend that a qualified and experienced Building Surveyor or Structural Engineer is consulted for advice relating to existing structures.

9.4. Hazardous Materials Used

EMS did not construct anything with hazardous materials during their investigation works.

Any soils to be imported to the site, in particular topsoil, should be tested to confirm their suitability in the development.

9.5. Identified Utility Services

No previously unidentified utility services were encountered during the EMS works.

References

- ‘‘Phase 1 Contamination Desk Study Report, 9 Harper's Lane, Presteigne, LD8 2AN’, EMS, E23890, dated 1st October 2021.

- ‘Phase 1: Preliminary Risk Assessment, 9 Harper’s Lane, Presteigne LD8 2AN’, dated 21st April 2021.

Supporting Information

GROUND INVESTIGATION

Exploratory holes are logged by an experienced Geo-Environmental Consultant in general accordance with 'Code of practice for site investigations' BS5930:1999 +A2:2010, BSi, August 2010. Soil samples for chemical analysis are taken from the exploratory holes at intervals dictated by the nature of the soils and the objectives of the investigation.

Where stated on exploratory hole logs (where in-situ testing has not been undertaken), the relative density of granular (sand and gravel) soils is tentative only. Such density assessments are based on visual inspection only taking into consideration such factors as drilling rates, stability of pit side walls, appearance and behaviour under excavation.

Where Chalk strata is encountered it is logged and graded in general accordance with CIRIA guidance 'C574 - Engineering in Chalk'. It should be recognised that where percussive drilling methods are employed, the structure of the Chalk is destroyed and therefore the grading stated on such logs is either tentative or absent where it is not possible to assess the grade.

Hand Dug Inspection Pits

Hand tools are used to forward shallow inspection pits as a cost-effective method of describing and sampling near surface soils. The technique is also used where exposure of existing footings is required. The depth reached by such techniques is a function of the nature of the ground and generally does not exceed 1.2m

Trial Pits

Mechanically excavated trial pits allow detailed inspection of near surface ground due to the large volume of soil exposed. A wheeled backhoe loader is the usual machine for digging trial pits that are typically 3 to 4.5m deep, 0.5m wide and 3m long.

Windowless Sampling Boreholes

This type of borehole is formed by a small tracked dynamic percussion drilling rig with samples retrieved in thin plastic liners within the narrow diameter steel sampling tubes. Borehole depths of up to 5m are typical, but in exceptional circumstances up to 15m depth can be achieved. This is the smallest type of rig that is capable of undertaking Standard Penetration Tests (SPTs).

Handheld Window Sampling

Handheld window sampling is a useful method of drilling narrow diameter boreholes particularly where access is difficult. Handheld mechanical percussive hammers are used to drive the sampling tube into the ground. The soil samples are collected within the hollow metal sampling tubes and inspected via the open window along one side. Window sampling boreholes can be forwarded to depths of 3m to 6m depending upon ground conditions.

Cable Percussive Boreholes

This form of drilling involves repetitive dropping of a tube into the soil under its own weight from a tripod support. The sample is obtained from the clay cutter head in fine soils or a bailer for wet granular soils. As the borehole progresses SPTs can be undertaken and relatively undisturbed

samples can be obtained. Typically, these boreholes are 15 to 25m deep, but depths of double that can be achieved in soils, but only thin weak rock layers can be penetrated.

Rotary Boreholes

Where competent rock is required to be drilled then rotary drilling techniques are required. The drilling rigs can vary in size from small tracked units to larger units mounted on four-wheel drive trucks. Rotary open hole drilling techniques break the rock into small fragments and so recovery of any samples is limited. In contrast, rotary coring retrieves excellent samples. Some rigs also allow windowless sampling to be undertaken through soil layers. There are no practical limits to the depths that this drilling method can achieve.

Dynamic Probing

Dynamic probing comprises a sectional rod with a sacrificial cone at the base of slightly larger diameter than the rod. The rod is driven into the ground by a constant mass falling through a set distance. The number of blows required to forward the rod per 100mm is then recorded and presented in a graph of N_{10} values. The standard applicable to dynamic probing is "BS EN ISO 22476-2:2005 Incorporating corrigendum no. 1, Geotechnical investigation and testing — Field testing — Part 2: Dynamic probing" BSi, February 2007.

Dynamic Penetrometer

The Transport Research Laboratory Dynamic Cone Penetrometer (TRL DCP) uses an 8 kg hammer dropping through a height of 575mm to drive a 60° cone of 20mm maximum diameter into the ground. The depth driven either per blow or per several blows is recorded. The strength of each of the soil layer encountered is then calculated by converting the penetration rate (mm per blow) into an approximate California Bearing Ratio (CBR) value employing the correlation proposed by TRL.

Gas Monitoring

Gas monitoring is undertaken with a portable gas monitor for oxygen, Methane, Carbon Dioxide, Hydrogen Sulphide and Carbon Monoxide together with recording of atmospheric pressure and any flow rate.

Vapour Monitoring

Headspace tests and monitoring for Volatile Organic Compounds (VOC) or Semi Volatile Organic Compounds (SVOC) is undertaken using a Photo Ionisation Detector (PID). The MiniRAE models used have a 10.6 eV lamp calibrated for isobutylene. The PID is useful tool to indicate the presence of a wide range of volatile compounds, but only provides semi-quantitative data as different compounds provide a different response and thus the reading is not a true reflection of the actual concentration present.

Low PID readings can be recorded in natural uncontaminated organic soils or even as a result of atmospheric pollution. It is generally accepted by consultants and regulators that recorded values in excess 50 parts per million (ppm) represents the presence of organic compound pollutants and in excess of 100 ppm such contamination may be significant.

The headspace test procedure involves the collection of a sample of suspected contaminated soils and placing within a sample bag. A tight seal to the bag is formed with a similar volume of air trapped to that of the soil and the sample is left for fifteen minutes to allow volatilisation of any

contaminants. The bag is then pierced by, and sealed around, the sample probe of the PID and a reading taken.

Borehole well monitoring is undertaken by connecting the PID directly to the gas tap on the monitoring well installation.

Groundwater Level Monitoring

Groundwater levels are recorded with an electronic dip meter that has a detector end that is lowered into the borehole well. An audible signal is made when water is reached and the depth recorded from the graduated tape used to lower the detector. Where there is potential for a separate Light Non Aqueous Phase Liquid (LNAPL) to be present floating on the groundwater an oil/water interface meter is used in preference to a conventional dip meter so that any such floating product can be detected.

Contamination Sampling

EMS soil contamination sampling methodology determines that samples are taken from the trial pits and placed in glass jars and vials for storage. Jars and vials are stored within a cool box at the first possible opportunity to ensure sample preservation. Containers for volatile analysis were filled so that minimal air space remained prior to sealing. This, in combination with a low storage temperature, reduces the likelihood for volatile compounds, which may have been present within the sample, to volatilise to the headspace prior to analysis.

After brief temporary storage within EMS's sample refrigeration unit samples selected for laboratory analysis are transported in cool boxes via an overnight courier company. On-site inspection for below ground asbestos debris is undertaken as standard at the time of investigation, and soil/debris samples taken if deemed necessary.

Samples are chosen for laboratory analysis based upon visual observations. Disposable nitrile gloves were worn and changed between each sample taken to prevent cross contamination.

CONTAMINATION ASSESSMENT METHODOLOGY

UK Policy

The UK Government's policy in relation to land affected by historic contamination is based on a 'suitable for use' approach. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Contamination risks therefore need to be assessed on a site-by-site basis. The 'suitable for use' approach limits requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to either the current use or future use of the land.

The three main drivers for contamination assessment and remediation are:

- *Voluntary action.*
- *Development as part of the planning regime.*
- *Regulatory action to mitigate unacceptable risks e.g. Part 2A of the Environmental Protection Act 1990.*

Pollutant Linkages

For a contamination risk to exist there must be a 'pollutant linkage' from the contaminant (source) via a pathway (the route from contaminant to receptor) to a receptor (the entity that could be harmed). The absence of a contaminant, pathway or receptor breaks the pollutant linkage and therefore no contamination risk exists.

Contamination is typically present at a site (in the ground and/or in the underlying groundwater) as a result of a historic or current industrial use, usually as a result of leaks, spills or disposal of residues, wastes and excess raw materials from the industrial processes. Contamination may also be present due to:

- *The deliberate application of chemicals e.g. the spraying of herbicide/pesticide.*
- *Migration of pollutants from adjacent land.*

Naturally occurring processes e.g. elevated concentrations of particular heavy metals associated with specific geological strata.

Conceptual Site Model

The conceptual site model can be defined as a textual or graphical representation of the identified pollutant linkages for a given site. The model forms the basis for designing the investigation as the aim will be to target all of the potential pollutant linkages to determine, through the subsequent phases of risk assessment, whether or not they pose an actual risk.

It is important that the conceptual site model is updated with new information as the various investigation, risk assessment and remediation works are completed.

Technical Guidance

The technical and legal framework for contamination assessment is complex. The process adopted through this report for assessing contamination risks is in general accordance with the following guidance, as listed below:

- *'Investigation of Potentially Contaminated Sites - Code of Practice - BS 10175: 2011', BSi, 2011.*
- *'Model Procedures for the management of Land Contamination - CLR Document No. 11', Environment Agency, 2004.*
- *'Guidance for the safe development of housing on land affected by contamination - R&D66: 2008', NHBC/Environment Agency, 2008.*

Risk Assessment Methodology

In line with the technical guidance, the contamination risk assessment follows a series of phased stages for each particular site:

PHASE	DESCRIPTION	RISK ASSESSMENT STAGE
PHASE1	*Generally limited to desk based research and a site walkover survey to develop an initial conceptual site model and identify what risks, if any, are likely to be presented by the site.*	***Hazard Identification and Assessment*** *A preliminary stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site and identifying potential pollutant linkages.*
PHASE 2	*This phase is concerned with establishing whether contamination is present, usually through intrusive ground investigation, and then evaluating the degree and magnitude of the associated risks.*	***Risk Estimation*** *A stage concerned with estimating the likelihood that receptors will suffer adverse effects if they come into contact with, or are otherwise affected by, a hazardous substance or agent under defined conditions.* ***Risk Evaluation*** *A stage of risk assessment concerned with evaluating the acceptability of estimated risks, taking into account the nature and scale of the risk estimates, any uncertainties associated with the assessment and the broad costs and benefits of taking action to mitigate risks.*
PHASE 3	*The appraisal and selection of remediation techniques, their implementation and verification.*	***Risk Management*** *The process whereby decisions are made to accept a known or assessed risk and/or the implementation of action to reduce the consequences or probabilities of occurrence.*

Risk Classification

The objective of risk assessment is to identify the nature and magnitude of the potential risks and should be based on a consideration of both:

- *The likelihood/probability of an event [taking into account both the presence of the hazard and receptor and the integrity of the pathway].*
- *The severity of the potential consequence [taking into account both the potential severity of the hazard and the sensitivity of the receptor].*

There is a need for a logical, transparent and repeatable system in defining the categories of severity of consequence and likelihood as well as for the risk itself and therefore the following risk rating matrix is employed:

		SEVERITY OF CONSEQUENCE			
		SEVERE	**MEDIUM**	**MILD**	**MINOR**
PROBABILITY	**HIGH LIKELIHOOD**	*Very High Risk*	*High Risk*	*Moderate Risk*	*Moderate/Low Risk*
	LIKELY	*High Risk*	*Moderate Risk*	*Moderate/Low Risk*	*Low Risk*
	LOW LIKELIHOOD	*Moderate Risk*	*Moderate/Low Risk*	*Low Risk*	*Negligible Risk*
	UNLIKELY	*Moderate/Low Risk*	*Low Risk*	*Negligible Risk*	*Negligible Risk*

These risk classifications are defined as follows:

- *Very High Risk - There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.*
- *High Risk - Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.*
- *Moderate Risk - It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.*
- *Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.*
- *Negligible Risk - The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.*

This risk assessment matrix and classification system is based on guidance produced by Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in connection with contaminated land assessment.

RISK ESTIMATION - SOILS

Introduction to Soil Human Health Generic Assessment Criteria (GAC)

The Environment Agency (EA) and Department of Environment Food and Rural Affairs (DEFRA) historically issued revised guidance following consultation about the DEFRA publication "Assessing risks from land contamination – a proportionate approach. Soil Guideline Values: the Way Forward". This resulted in a revised version of the Contaminated Land Exposure Model (CLEA) model (version 1.06) and a few of the previously published Soil Guideline Values (SGVs) were revised.

The main legislative driver for dealing with historical land affected by contamination is Part 2A of the Environmental Protection Act 1990. Revised Statutory Guidance to support Part 2A was

published in April 2012. This Guidance introduced a new four-category system for classifying land under Part 2A for cases of a Significant Possibility of Significant Harm to human health,1 where Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is acceptably low. The impact assessment for the new Statutory Guidance stated "The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land". The C4SLs are still derived using the CLEA model but adopt a slightly different approach to toxicological assessment and exposure modelling.

In 2014, "SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Final Project Report" (CL:AIRE) was published. This document covered C4SLs for four metals (arsenic, cadmium, chromium VI and lead), benzene and benzo(a)pyrene (BaP), which were finalised for use in risk assessment undertaken under the planning regime. As yet no C4SLs for other contaminants have been developed.

Due to the limited number of published C4SL values at this time, the Chartered Institute of Environmental health (CIEH) and Land Quality Management Ltd (LQM) produced Generic Assessment Criteria (GAC) known as Suitable for Use Levels (S4ULs), for use in contaminated land human health risk assessment. These S4ULs (2014) have been derived for 89 substances using the current CLEA model and are therefore consistent with current guidance. They also incorporate the revised exposure parameters as adopted by the C4SL programme, but have not adopted the revised toxicological approach adopted by the C4SLs and so remain a more conservative assessment criteria. The substances for which SGVs were previously published have also been revised as new S4ULs in light of the new exposure parameters proposed by the C4SL programme, and therefore effectively replace the existing SGVs.

EMS have adopted for use the revised 'S4UL' (Suitable for Use Levels), published in 2015 by Land Quality Management (LQM) and the Chartered Institute for Environmental Heath (CIEH) for human health risk assessment. The levels have been based on Health Criteria Values and Tolerable Daily Intakes that represent minimal or tolerable levels of risks to health as described in the Environment Agency's SR2 guidance. In the case of lead, the Department for Environment, Food and Rural Affairs' Category 4 Screening Level (C4SL) has been used for comparison purposes.

In December 2009, other GAC for less common substances were produced by the Environmental Industries Commission (EIC), The Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Applications in Real Environments (CL:AIRE) using the CLEA model. These are referred to as the EIC/AGS/CLAIRE GAC.

Where C4SL, S4UL or EIC/AGS/CLAIRE GACs are not available, any concentrations exceeding the laboratory limit of detection are identified and discussed in more detail.

The only exception to this approach is the PAH compound benzo(a)pyrene (BaP) where a C4SL guideline value has been produced, whereas BRD has adopted the S4UL value. The C4SL for BaP relates to its use as a surrogate marker compound representing all of the genotoxic PAH compounds as a mixture, rather than this individual compound. BRD has therefore adopted the compound specific S4UL value as the initial screening value, for consistency with the other PAH compounds before then employing the C4SL is necessary.

It should be noted that unless otherwise stated, all the assessment criteria adopted within this report have been derived based on a sandy loam soil at pH 7 and the values quoted are for a conservative soil organic matter content of 1% where applicable (i.e. organic contaminants).

The risk to contractors from acute (short term) exposure has been initially assessed on a qualitative basis. The risk to controlled waters from concentrations of contaminants in soil samples taken as part of this preliminary investigation has also been assessed on a qualitative basis.

Human Health - Soil Generic Assessment Criteria

The results of the soils analysis have been compared to generic assessment criteria for the default exposure scenarios comprising either residential land with plant uptake, residential land without plant uptake, or commercial/industrial land use. The criteria values selected are listed in the table below and full details on the source are referred to above. Where applicable, the results have also been assessed with reference to the required statistical tests presented within CLAIRE document "Guidance on comparing soil contamination data with a critical concentration".

ANALYSIS	GENERIC ASSESSMENT CRITERIA (mg/kg unless stated)			SOURCE
	RESIDENTIAL WITH PLANT UPTAKE	RESIDENTIAL WITHOUT PLANT UPTAKE	COMMERCIAL / INDUSTRIAL	
Arsenic	37	40	640	S4UL
Cadmium	11	85	190	
Chromium (total)$	910	910	8,600	
Chromium VI	6	6	33	
Lead	200	310	2,330	C4SL
Mercury*	11	15	320	S4UL
Selenium	250	430	12,000	
Nickel	180	180	980	
Copper	2,400	7,100	68,000	
Zinc	3,700	40,000	730,000	
pH	<5 – 10> units			Professional judgement
Naphthalene	2.3	2.3	190	S4UL
Acenaphthylene	170	2,900	83,000	
Acenaphthene	210	3,000	84,000	
Fluorene	170	2,800	63,000	
Phenanthrene	95	1,300	22,000	
Anthracene	2,400	31,000	520,000	
Fluoranthene	280	1,500	23,000	
Pyrene	620	3,700	54,000	
Benzo(a)anthracene	7.2	11	170	
Chrysene	15	30	350	
Benzo(b)fluoranthene	2.6	3.9	44	
Benzo(k)fluoranthene	77	110	1,200	
Benzo(a)pyrene	2.2	3.2	35	
Indeno(1,2,3-cd)pyrene	27	45	500	
Dibenzo(a,h)anthracene	0.24	0.31	3.5	S4UL
Benzo(ghi)perylene	320	360	3,900	
TPH (Banded)				
TPH C5-C6	42	42	3,200 [304]	
TPH C6-C8	100	100	7,800 [144]	
TPH C8-C10	27	27	2,000 [78]	
TPH C10-C12	74	130	9,700 [48]	
TPH C12-C16	140	1,100	36,000 [169]	
TPH C16-C21	260	1,900	28,000	
TPH C21-C40	1,100	1,900	28,000	
TPH (CWG)				
TPH Aliphatic C5-C6	42	42	3,200 [304]	

ANALYSIS	GENERIC ASSESSMENT CRITERIA (mg/kg unless stated)			SOURCE
	RESIDENTIAL WITH PLANT UPTAKE	RESIDENTIAL WITHOUT PLANT UPTAKE	COMMERCIAL / INDUSTRIAL	
TPH Aliphatic C6-C8	100	100	7,800 [144]	
TPH Aliphatic C8-C10	27	27	2,000 [78]	
TPH Aliphatic C10-C12	130 (48)	130 (48)	9,700 [48]	
TPH Aliphatic C12-C16	1,100 [24]	1,100 [24]	59,000 [24]	
TPH Aliphatic C16-C35	65,000 [8.48]	65,000 [8.48]	1,600,000	
TPH Aliphatic C35-C44	65,000 [8.48]	65,000 [8.48]	1,600,000	
TPH Aromatic C5-C7	70	370	26,000 [1220]	
TPH Aromatic C7-C8	130	860	56,000 (869)	
TPH Aromatic C8-C10	34	47	3,500 (613)	
TPH Aromatic C10-C12	74	250	16,000	
TPH Aromatic C12-C16	140	1,800	16,000 [364]	
TPH Aromatic C16-C21	260	1,900	36,000 [169]	
TPH Aromatic C21-C35	1,100	1,900	28,000	
TPH Aromatic C35-C44	1,100	1,900	28,000	
Benzene	0.87	3.3	98	C4SL
Toluene	130	880 (869)	56,000 (869)	S4UL
Ethylbenzene	47	83	5,700 (518)	
Xylene^	56	79	5,900 [576]	
MTBE	49	88	7,900	EIC/AGS/CL:AIRE GAC

Notes:
** The S4UL for methyl mercury has been adopted as the worst-case mercury compound as generally there is no desk study evidence to suggest the potential for elemental mercury on the majority of sites.*
^ The lowest S4UL of either p-xylene, o-xylene or m-xylene has been adopted for each land use as a conservative measure.
$ S4UL for Chromium III adopted, as in the absence of Chromium VI it is likely that all of the chromium will be in this form as these are the two most common and stable forms of chromium in the soil environment.

1. S4ULs for metals are not listed for varying SOM% but are based on 6% SOM. The variability of the S4ULs for metals with SOM% is not considered significant.
2. Value shown exceeds solubility saturation limits if followed by square brackets [] or vapour saturation limits if followed by round brackets (). Brackets contain the saturation limit value.
3. For Banded TPH the lowest GAC value of either aliphatic or aromatic band has been based on a worst case 1% SOM.

Where no GAC is available, any concentrations exceeding the laboratory limit of detection are identified and discussed in more detail.

Water Environment - Soil Generic Assessment Criteria

There are no UK published Generic Assessment Criteria for soil test results in respect of the risk to the water environment. Therefore, risk estimation is based on the professional judgement and experience of EMS to employ values that are a reasonable concentration above which concern for water resources is valid.

The Total PAH GAC employed is the sum of the 16No. priority PAH compounds regularly tested for in contaminated land analysis (i.e. US EPA 16PAHs). EMS employ a soil screening based upon the total PAH limit for 'inert waste' of 100mg/kg. The rationale is based on PAHs are recognised to be generally of low solubility and the risk to the water environment is correspondingly low.

In respect of Total Petroleum Hydrocarbons, EMS employ a value of 500 mg/kg as a screening value in comparison to the sum of the component aliphatic and aromatic TPH carbon bands. The employed soil screening value is based upon:

- *In common with some other consultants, the professional judgement and experience of EMS suggests that this value is a reasonable concentration above which concern for water resources is valid. The rationale is based on the fact that lower concentrations of fuel-based contaminants are more likely to naturally degrade than migrate any great distance.*

- *EMS is aware of regional Environment Agency groundwater and contaminated land teams that employ 500 mg/kg as a screening value for considering whether or not TPH could represent a risk to water resources.*

- *The value mirrors the mineral oil Waste Acceptance Criteria limits for what is considered 'inert waste'.*

Should elevated contaminants that pose a potential risk to the water environment be identified then site-specific assessment criteria should be developed.

Building Materials and Services – Soil Generic Assessment Criteria

Some hydrocarbon compounds are known to both attack and permeate through certain plastic pipe materials, with the primary concern being the degradation and tainting of water supplies. The UK Water Industry Research (UKWIR) has therefore produced a document 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' (ref. 10/WM/03/21) that specifies threshold criteria for the adoption of 'standard' polythene (PE) or PVC pipes, protective barrier pipe and ductile iron/steel/copper pipes.

The UKWIR threshold assessment criteria from Table 3.1 of this document for standard PE pipes have been employed. It should be noted that the approach taken by UKWIR is very conservative, and both the document and research are flawed. However, it is these values that are being using to specify water pipe materials and therefore it is appropriate to consider them.

The UKWIR guidance is particularly flawed in respect of the chemical analysis it expects as it seeks a limit of detection that is generally below limits that are reasonable or commonly employed in contaminated land assessment. The UKWIR seeks that where a substance is below the limit of detection it should be taken as being present at half this concentration. For the larger suite of chemicals where the limit is against a sum of compounds, this approach would mean that a sample of virgin sub-soil from a greenfield site with absolutely no contamination would actually fail the criteria for using standard PE pipes. To avoid this situation, EMS have adopted the approach of summing only those compounds detected above their respective limits of detection.

In terms of building materials, the primary concern is in respect of concrete as certain commonly occurring natural ground conditions can adversely impact on buried concrete as discussed in 'Special digest 1:2005 Concrete in aggressive ground', BRE, 2005.

ANALYSIS	***GENERIC ASSESSMENT CRITERIA***	***SOURCE***
pH	*<5.5*	*BRE Special Digest 1:2005*
Sulphate (w/s)	*500 mg/l*	*BRE Special Digest 1:2005*
Sum of any VOC above detection limits	*0.5 mg/kg*	*Relevant compounds adapted from UKWIR Table 3.1*
Sum of SVOC + Aliphatic TPH >C5-C10 + Aromatic TPH >C5-C10 above detection limits	*2 mg/kg*	

ANALYSIS	GENERIC ASSESSMENT CRITERIA	SOURCE
Sum of Aliphatic TPH >C10-C21 + Aromatic TPH >C10-C21 above detection limits	*10 mg/kg*	
Sum of Aliphatic TPH >C21-C34 + Aromatic TPH >C10-C35 above detection limits	*500 mg/kg*	
Sum of BTEX + MTBE above detection limits	*0.1 mg/kg*	
Phenols	*2 mg/kg*	
Cresols and chlorinated phenols	*2 mg/kg*	
Naphthalene	*0.5 mg/kg*	
Benzo(a)pyrene	*0.5 mg/kg*	

RISK ESTIMATION – GROUNDWATER

The initial assessment of the contamination risk to groundwater is by comparing dissolved groundwater concentrations with screening values that are protective of groundwater resources.

The reference source for the target concentrations is generally the EA's Environmental Quality Standards (EQS), the Water Supply (Water Quality) Regulations (WSR) 2018 and the UK Drinking Water Standards (DW1/DW2) criteria from the Surface Water (Abstraction for drinking water) (classification) Regulations 1996. The target concentrations are outlined in the table overleaf.

ANALYSIS	GENERIC ASSESSMENT CRITERIA	SOURCE
Arsenic	*50 µg/l*	*EQS*
	10 µg/l	*DW1 / WSR*
Cadmium	*5 µg/l*	*DW1 / EQS*
Chromium (total)	*50 µg/l*	*DW1*
Copper	*50 µg/l*	*DW1*
	2,000 µg/l	*WSR*
Nickel	*20 µg/l*	*WSR*
Lead	*10 µg/l*	*WSR*
	50 µg/l	*DW1*
Mercury	*1 µg/l*	*EQS*
Selenium	*10 µg/l*	*WSR*
Zinc	*5 mg/l*	*DW2*
Cyanide	*50 µg/l*	*WSR*
pH	*6 to 9 units*	*EQS*
Benzene	*30 µg/l*	*EQS*
Toluene	*50 µg/l*	*EQS*
Ethylbenzene	*30 µg/l*	*EQS for benzene as a guide*
Xylene	*30 µg/l*	*EQS for benzene as a guide*
Naphthalene	*2.4 µg/l*	*EQS*
Benzo(a)pyrene	*0.05 µg/l*	*EQS*
Phenols	*10 µg/l*	*DW1*
Total PAH	*0.2 µg/l*	*DW1*
TPH (dissolved or emulsified hydrocarbons)	*50 µg/l*	*DW1*

There are no available generic assessment criteria for some of the analytical parameters which have been scheduled, for example hexavalent chromium, and individual TPH and PAH and some VOC compounds. These parameters will be assessed based on professional judgement should they exceed the limit of detection.

RISK ESTIMATION - GROUND GAS

Introduction

A variety of potentially hazardous gases occur in naturally in the ground environment. Microbial decay of organic matter under anaerobic conditions and geological processes can lead to the generation of Methane and Carbon Dioxide, but can also include traces gases such as Hydrogen sulphide and Carbon monoxide.

Methane is a colourless and odourless gas that has the hazardous properties of being flammable and, at certain air/Methane mixtures, explosive. Methane has a low toxicity, but can be a simple asphyxiant due to the displacement of oxygen.

Carbon Dioxide is a colourless, odourless and non-combustible gas that has the hazardous property of being a highly toxic chemical. At concentrations of 3% by volume, shortness of breath and headaches will occur becoming acute by 6%. At levels of above 10% by volume headache, visual distortion, tremors and rapid loss of consciousness occur. Concentrations of Carbon Dioxide above 22% by volume are likely to be fatal. The effects of Carbon Dioxide poisoning are made more severe if there is accompanying reduction in oxygen concentrations.

Hydrogen sulphide is a colourless and flammable gas that has an odour of rotten eggs. It is important to that the sense of smell is overpowered at higher concentrations. The gas is toxic and can be an asphyxiant.

Carbon monoxide is a colourless, odourless and explosive gas in air mixtures that has the hazardous property of being a highly toxic chemical.

Radon is a naturally occurring colourless and odourless gas that is radioactive. It is formed by the radioactive decay of radium which in turn is derived from the radioactive decay of uranium, both of which are minerals that can be found in many soil types. Whilst it is recognised that the air inside every house contains radon, some houses built in certain defined areas of the country might have unacceptably high concentrations and require special precautions to be taken. The maps contained within BRE211:2007 'Radon: guidance on protective measures for new buildings' identify areas where no radon protection measures are necessary or where higher concentrations are present that either basic or full radon protection measures are required to be fitted to all new dwellings.

Basis of Gas Assessment

In order to classify the level of risk and need, if any, for gas protection measures at a site with the potential for a gas problem, consideration of each of the following is necessary:

- *The source of the gas.*
- *The generation potential of the gas.*
- *The location of the source and the geological setting.*
- *Boreholes flow rate and estimated surface emission rate.*
- *The nature of the proposed development.*
- *Confidence in the knowledge of the gas regime.*

The gas assessment is made with reference to 'C665 - Assessing risks posed by hazardous ground gases to buildings', Construction Industry Research and Information Association (CIRIA), 2007.

Gas Screening Value

The method within CIRIA C665 uses both the gas concentrations and borehole flow rates to define a characteristic situation for a site based on the limiting borehole gas volume flow for Methane and Carbon Dioxide. This limiting borehole gas volume flow is called the Gas Screening Value (GSV) and is expressed below:

Gas Screening Value (l /hr) = borehole flow rate (l/hr) x gas concentration (fraction)

The calculation of GSV is completed for both Methane and Carbon Dioxide and then the 'worse case' maximum values are used in the assessment. The assessment is to determine the gas regime at the site is dependent upon the nature of the development.

Situation A – All development types except low rise housing with gardens.

The characteristic situation for many sites is determined from evaluation of the Gas Screening Value derived against the criteria in the following table.

Characteristic situation	Risk classification	Gas Screening Value (CH4 or CO2 l/hr)	Additional factors	Typical sources of generation
1	Very low risk	<0.07	Typically, Methane ≤1% and/or Carbon Dioxide ≤5%. Otherwise consider an increase to characteristic situation 2.	Natural soils with low organic matter content and 'typical' made ground.
2	Low risk	<0.7	Borehole air flow rate not to exceed 70 l/hr. Otherwise consider an increase to characteristic situation 3.	Natural soil with high organic peat/organic content and 'typical' made ground.
3	Moderate risk	<3.5		Old landfill, inert waste and flooded mine working.
4	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protection measures.	Mine working susceptible to flooding and landfill completed to WMP 26B criteria.
5	High risk	<70		Mine working unflooded inactive with shallow workings near surface.
6	Very high risk	>70		Recent landfill site.

Situation B – Low rise housing with gardens – NHBC 'Traffic Lights'

The NHBC model for low rise housing development considered a typical residential house with a ground floor area of 64m^2, suspended floor and ventilated sub-floor void of height 150mm. Where the proposed development of a site is consistent with this model, the NHBC traffic light situation of the site is determined from evaluation of the Gas Screening Value against the criteria in the following table.

Traffic Lights	Methane		Carbon Dioxide	
	Typical maximum concentrations (%)	Gas Screening Value (l/hr)	Typical maximum concentrations (%)	Gas Screening Value (l/hr)
Green	≤1	≤0.16	≤5	≤0.78
Amber 1	1> to ≤5	>0.16 to ≤0.63	>5 to ≤10	>0.78 to ≤1.56
Amber 2	5> to ≤20	>0.63 to ≤1.56	>10 to ≤30	>1.56 to ≤3.13
Red	>20	>1.56	>30	>3.13

Appendices

A. Site Plans and Drawings

B. Exploratory Hole Logs – Windowless Sample Boreholes and Hand Pits

C. Photographic Record – Hand Pit Photos

D. Chemical Analysis Summary Tables

E. Groundwater and Ground Gas / Vapour Summary Tables

F. Laboratory Results – Geotechnical Testing

G. Laboratory Results – Chemical Analysis

Appendix A – Site Plans and Drawings

KEY:

Site Location

0 m 500

Approximate Scale:

ENVIRONMENTAL MANAGEMENT SOLUTIONS
EMSasbestos EMSgeotech EMSwater

Project Number:	E23890
Site:	9 Harper's Lane, Presteigne, LD8 2AN.
Drawing Title:	Site Location Plan

Key:

Proposed Development Boundary.

9 Harper's Lane Site Boundary.

Former Kaye Presteigne Works

0 20m

Approximate Scale:

Extract taken David Colwell Design Drawing: AD 3, dated 6th December 2019.

ENVIRONMENTAL MANAGEMENT SOLUTIONS EMSasbestos EMSgeotech EMSwater	Project Number:	E23890
	Site:	9 Harper's Lane, Presteigne, LD8 2AN.
	Drawing Title:	Existing Site Layout Plan

Key:

Proposed Development Boundary.

9 Harper's Lane Site Boundary.

Former Kaye Presteigne Works

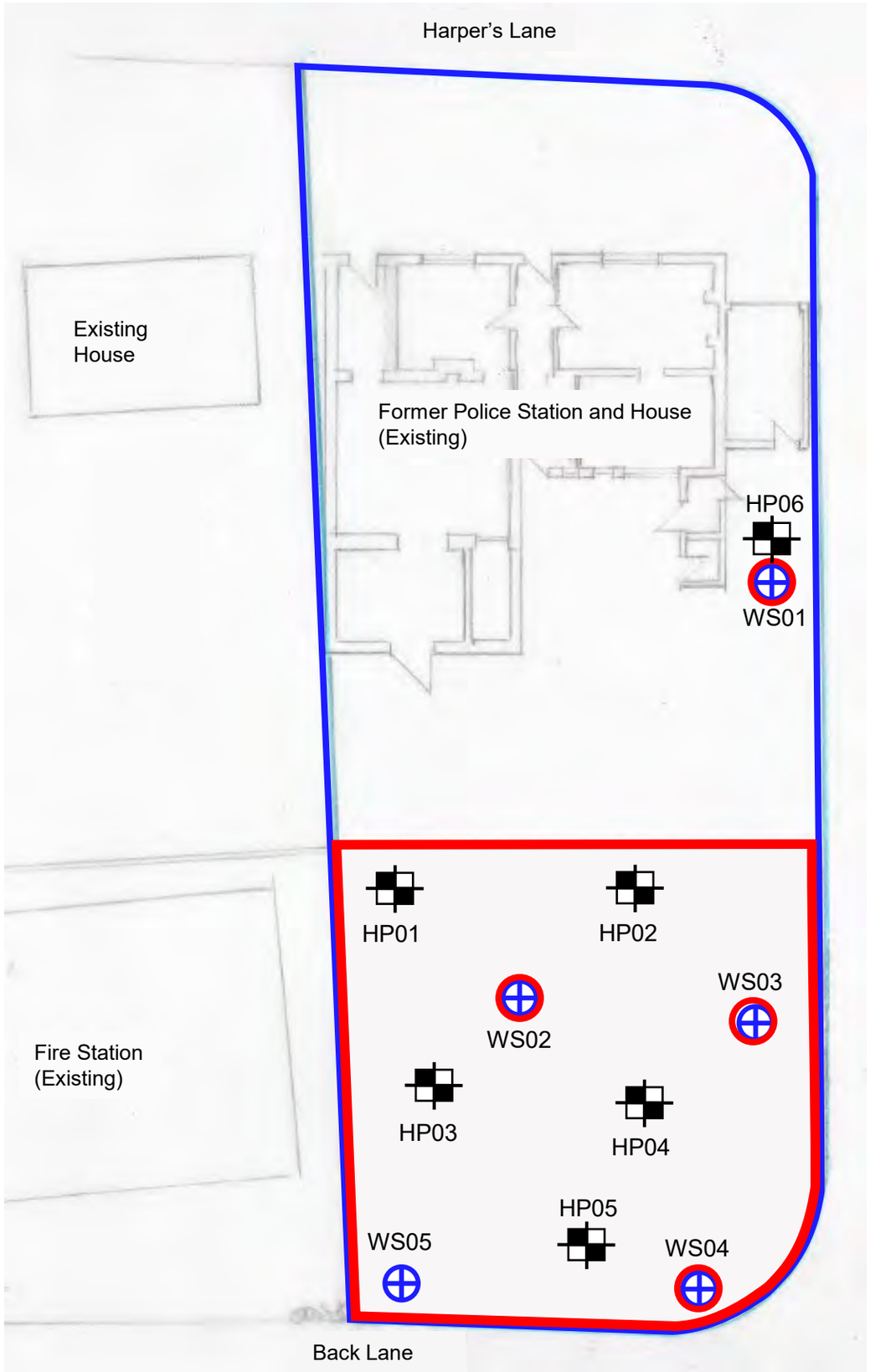
0 20m

Approximate Scale:

Extract taken David Colwell Design Drawing: AD 3, dated 6th December 2019.

ENVIRONMENTAL MANAGEMENT SOLUTIONS
EMSasbestos EMSgeotech EMSwater

Project Number:	E23890
Site:	9 Harper's Lane, Presteigne, LD8 2AN.
Drawing Title:	Proposed Site Layout Plan



Key:

- Proposed Development Boundary.
- 9 Harper's Lane Site Boundary.
- Windowless Sample Borehole (WS01 to WS05) Locations.
- Installed Windowless Sample Boreholes.
- Hand Pit (HP01 to HP06) Locations.

Former Kaye
Presteigne Works

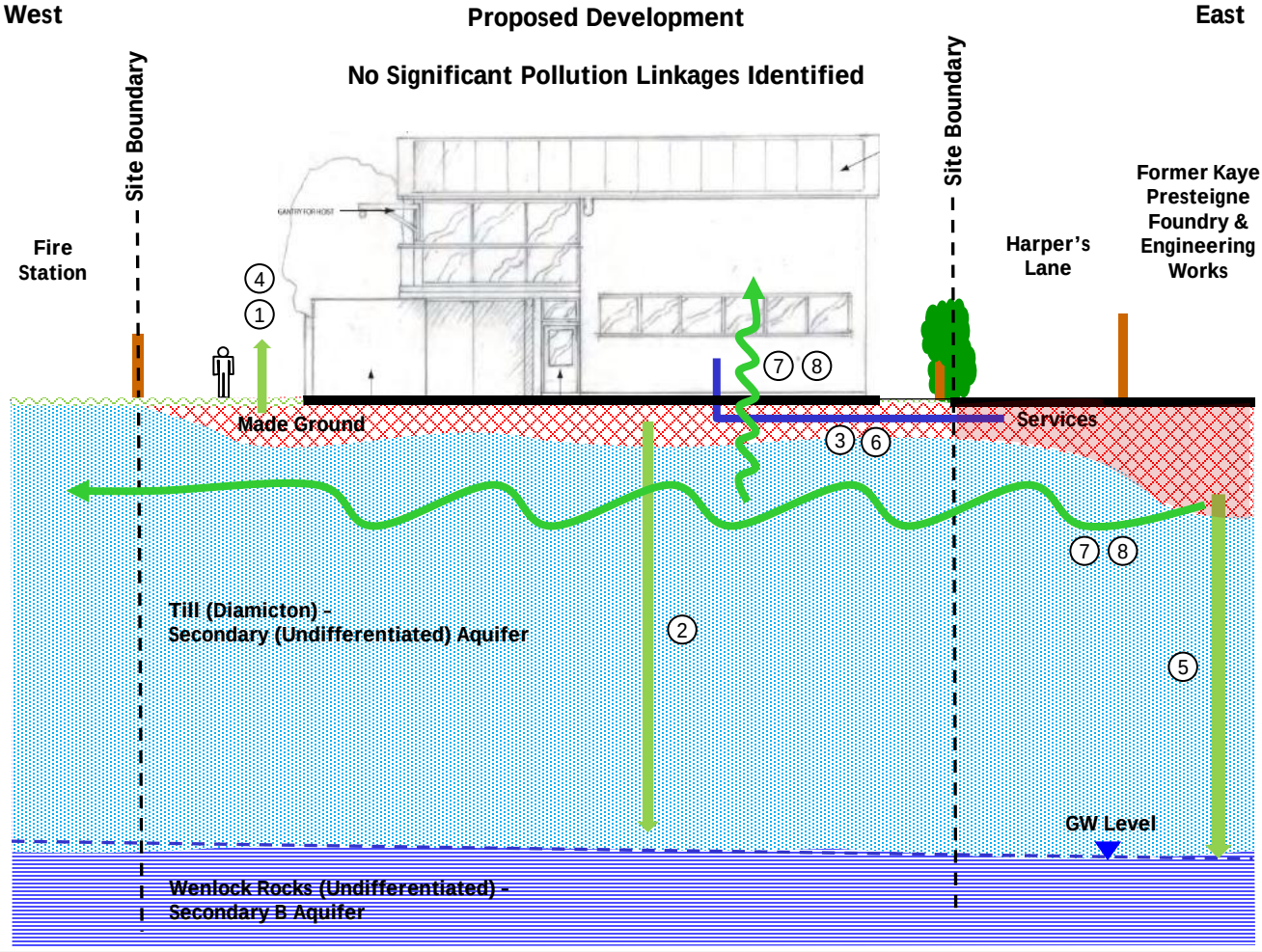
0 20m

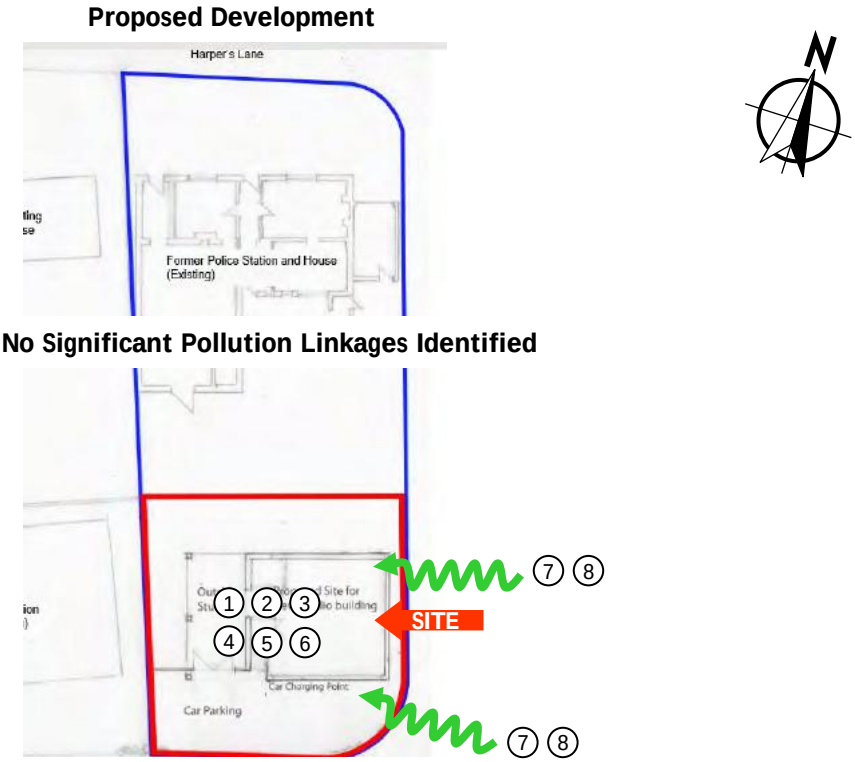
Approximate Scale:

Extract taken David Colwell Design Drawing: AD 3, dated 6th December 2019.

ENVIRONMENTAL MANAGEMENT SOLUTIONS
EMSasbestos EMSgeotech EMSwater

Project Number:	E23890
Site:	9 Harper's Lane, Presteigne, LD8 2AN.
Drawing Title:	Exploratory Hole Location Plan.





Job Title:	9 Harper's Lane, Presteigne, LD8 2AN
Job Number:	E23890
Drawing Title:	Revised Conceptual Site Model

ENVIRONMENTAL MANAGEMENT SOLUTIONS
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Appendix B – Exploratory Hole Logs – Windowless Sample Boreholes and Hand Pits

Trial Pit Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331563.00 N264393.00
Project No. : E23890	Crew Name:	Equipment: Hand Tools

Location Number	Location Type	Level	Logged By	Scale	Page Number
HP01	TP	145.00m AoD	OSB	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES					MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, concrete and cement.
					0.85	145.00		
					0.90	144.15		Soft brownish grey gravelly SILT. Gravel is angular medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
								End of Borehole at 0.900m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.20	Stable	None Used				

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Pit terminated at 0.90m in Devensian Till
Backfilled with arisings on completion.

Trial Pit Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331566.00 N264397.00
Project No. : E23890	Crew Name:	Equipment: Hand Tools

Location Number	Location Type	Level	Logged By	Scale	Page Number
HP02	TP	145.00m AoD	OSB	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, concrete and cement.
					0.85	145.00		
					0.90	144.15		Soft brownish grey gravelly SILT. Gravel is angular medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
								End of Borehole at 0.900m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.20	Stable	None Used				

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Pit terminated at 0.90m in Devensian Till
Backfilled with arisings on completion.

Trial Pit Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331566.00 N264388.00
Project No. : E23890	Crew Name:	Equipment: Hand Tools

Location Number	Location Type	Level	Logged By	Scale	Page Number
HP03	TP	145.00m AoD	OSB	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.15 0.20	145.00 144.85		MADE GROUND: Firm dark brown very gravelly clay. Gravel is angular fine to coarse brick, concrete and cement. MADE GROUND: Dark brown and grey angular to subrounded cobbles of concrete and brick. End of Borehole at 0.200m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.20	Stable	None Used				

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Unable to advance pit beyond 0.20m in Made Ground.
Backfilled with arisings on completion.

Trial Pit Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331569.00 N264392.00
Project No. : E23890	Crew Name:	Equipment: Hand Tools

Location Number	Location Type	Level	Logged By	Scale	Page Number
HP04	TP	145.00m AoD	OSB	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES					MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, concrete and cement.
					0.80	145.00		
					0.85	144.20		Soft brownish grey gravelly SILT. Gravel is angular medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
								End of Borehole at 0.850m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.20	Stable	None Used				

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Pit terminated at 0.85m in Devensian Till
Backfilled with arisings on completion.

Trial Pit Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331575.00 N264389.00
Project No. : E23890	Crew Name:	Equipment: Hand Tools

Location Number	Location Type	Level	Logged By	Scale	Page Number
HP05	TP	145.00m AoD	OSB	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, concrete and cement.
					0.70	145.00		
					0.80	144.30		Soft brownish grey gravelly SILT. Gravel is angular medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
								End of Borehole at 0.800m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.20	Stable	None Used				

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Pit terminated at 0.80m in Devensian Till
Backfilled with arisings on completion.

Trial Pit Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331568.00 N264412.00
Project No. : E23890	Crew Name:	Equipment: Hand Tools

Location Number	Location Type	Level	Logged By	Scale	Page Number
HP06	TP	145.00m AoD	OSB	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.60	ES					MADE GROUND: Dark brown and grey angular to subrounded cobbles of concrete and brick.
					0.80	145.00		Soft brownish grey gravelly SILT. Gravel is angular medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
					1.00	144.20		End of Borehole at 1.000m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.20	Stable	None Used				

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Pit terminated at 1.00m in Devensian Till
Backfilled with arisings on completion.

Percussion Drilling Log

EMSgeotech

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331569.00 N264410.00
Project No. : E23890	Crew Name:	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS01	WS	145.00m AoD	EY	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.85	144.15		MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, sandstone and cement.
		1.00	SPT	N=11 (3,3/2,3,3,3)				Soft brownish grey gravelly SILT. Gravel is angular to rounded medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
		1.70	D		1.80	143.20		
	▼	2.00	D					Soft thinly laminated grey SILT. [TILL, DEVENSIAN - DIAMICTON]
		2.00	SPT	N=8 (2,2/2,2,2,2)				
		2.10	EW					
		3.00	SPT	N=8 (1,2/2,2,2,2)				
		4.00	SPT	N=9 (2,2/2,2,2,3)				
		5.00	SPT	N=11 (2,3/2,3,4,2)	5.00	140.00		End of Borehole at 5.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater encountered at 2.10m.
Headspace analysis undertaken at 0.50m intervals.
Borehole terminated at 5.00m in Devensian Till.
Borehole collapsed to 4.00m. Borehole installed to 4.00m on completion.

ENVIRONMENTAL MANAGEMENT SOLUTIONS
EMSasbestos EMSgeotech EMSwater

Percussion Drilling Log

EMSgeotech

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331565.00 N264396.00
Project No. : E23890	Crew Name:	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS02	WS	145.00m AoD	EY	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, sandstone and cement.
		1.00	SPT	N=14 (2,2/3,2,4,5)	1.10	143.90		
		1.70	D					Soft brownish grey gravelly SILT. Gravel is angular to rounded medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
		2.00	SPT	N=14 (3,3/3,3,4,4)				
		2.30	D					
	▼				2.80	142.20		
		3.00	SPT	N=10 (1,2/1,2,3,4)				Soft thinly laminated grey SILT. [TILL, DEVENSIAN - DIAMICTON]
		4.00	SPT	N=14 (2,2/2,4,3,5)	4.00	141.00		End of Borehole at 4.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater encountered at 2.90m.
Headspace analysis undertaken at 0.50m intervals.
Borehole terminated at 4.00m in Devensian Till.
Borehole installed to 4.00m on completion.

ENVIRONMENTAL MANAGEMENT SOLUTIONS
EMSasbestos EMSgeotech EMSwater

Percussion Drilling Log

EMSgeotech

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331574.00 N264397.00
Project No. : E23890	Crew Name:	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS03	WS	145.00m AoD	EY	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.60	144.40		MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, sandstone and cement.
					0.60	144.40		Soft brownish grey gravelly SILT. Gravel is angular to rounded medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
		1.00	SPT	N=10 (2,2/2,3,3,2)				Soft thinly laminated grey SILT. [TILL, DEVENSIAN - DIAMICTON]
		2.00	SPT	N=7 (1,2/2,1,2,2)				
	▼	2.50	D					
		3.00	D					
		3.00	SPT	N=8 (2,1/2,2,2,2)				
		3.20	EW					
		4.00	SPT	N=8 (2,1/2,2,2,2)	4.00	141.00		End of Borehole at 4.000m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater encountered at 2.70m.
Headspace analysis undertaken at 0.50m intervals.
Borehole terminated at 4.00m in Devensian Till.
Borehole installed to 4.00m on completion.

ENVIRONMENTAL MANAGEMENT SOLUTIONS
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Percussion Drilling Log

EMSgeotech

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331578.00 N264387.00
Project No. : E23890	Crew Name:	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS04	WS	145.00m AoD	EY	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40	144.60		MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, sandstone and cement.
		1.00	SPT	N=11 (5,4/3,2,3,3)				Soft brownish grey gravelly SILT. Gravel is angular to rounded medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
					1.40	143.60		Soft thinly laminated grey SILT. [TILL, DEVENSIAN - DIAMICTON]
		2.00	SPT	N=6 (2,1/1,2,1,2)				
		2.40	D					
		2.70	EW					
	▼	3.00	SPT	N=6 (2,2/1,2,1,2)				
		3.80	D					
		4.00	SPT	N=8 (3,2/2,2,2,2)	4.00	141.00		End of Borehole at 4.000m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater encountered at 3.20m.
Headspace analysis undertaken at 0.50m intervals.
Borehole terminated at 4.00m in Devensian Till.
Borehole installed to 4.00m on completion.

ENVIRONMENTAL MANAGEMENT SOLUTIONS
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Percussion Drilling Log

Project Name: 9 Harper's Lane	Client: Alex Dufort	Date: 25/11/2021
Location: Presteigne	Contractor: GSS	Co-ords: E331568.00 N264385.00
Project No. : E23890	Crew Name:	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS05	WS	145.00m AoD	EY	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00	SPT	50 (2,2/50 for 180mm)	1.05	143.95		MADE GROUND: Firm dark brown gravelly clay. Gravel is angular fine to coarse brick, sandstone and cement.
		1.10	D		1.20	143.80		Soft brownish grey gravelly SILT. Gravel is angular to rounded medium and coarse sandstone. [TILL, DEVENSIAN - DIAMICTON]
								End of Borehole at 1.200m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater not encountered.
Headspace analysis undertaken at 0.50m intervals.
Borehole refused at 1.20m in Devensian Till.
Borehole backfilled with arisings on completion.

Appendix C – Photographic Record – Hand Pit Photos

Photo 1: Hand Pit HP01

Photo 2: Hand Pit HP01 Spoil

Photo 3: Hand Pit HP02

Photo 4: Hand Pit HP02 Spoil

Photo 5: Hand Pit HP03

Photo 6: Hand Pit Spoil

Photo 7: Hand Pit HP04

Photo 8: Hand Pit HP04 Spoil

Photo 9: Hand Pit HP05

Photo 10: Hand Pit HP05 Spoil

Photo 11: Hand Pit HP06

Photo 12: Hand Pit HP06 Spoil

Appendix D - Chemical Analysis Summary Tables

Chemical Summary Tables - Metals and Non-Metallic Compounds (Soils)

Exploratory Hole ID	Units	Limits of Detection	GACs*		WS01	WS03	WS02	WS04	HP01	HP03	HP04	HP06
Sample ID			With Plant Uptake	Without Plant Uptake	ES1	ES2	ES2	ES1	ES1	ES1	ES1	ES1
Sample Depth (m)					1.70	2.50	2.30	2.40	0.40	0.10	0.50	0.60
Soil Type					TILL	TILL	TILL	TILL	MG	MG	MG	MG
% Stones >10mm	% w/w	0.1	-	-	<0.1	<0.1	<0.1	<0.1	35.5	17.8	12.8	6.9
pH	pH	0.01	<5-10>		7.74	8.52	7.68	7.4	7.38	7.38	7.52	7.51
Sulphate BRE (water sol 2:1)	mg/l	10	-	-	<10	12	<10	<10	33	<10	<10	19
Sulphate BRE (acid sol)	% w/w	0.02	-	-	<0.02	<0.02	<0.02	<0.02	0.03	0.02	0.04	0.04
Sulphur BRE (total)	% w/w	0.01	-	-	<0.01	0.05	<0.01	<0.01	0.02	0.02	0.03	0.03
Cyanide (total)	mg/kg	1	-	-					<1	<1	<1	<1
Phenols - Total by HPLC	mg/kg	0.2	-	-					<0.2	<0.2	<0.2	<0.2
Organic matter	% w/w	0.1	-	-					1.6	2.9	3.5	7.2
Arsenic	mg/kg	1	37	40					<1	<1	3	4
Cadmium	mg/kg	0.5	11	85					0.6	1.2	1	1.3
Copper	mg/kg	1	2,400	7,100					27	40	65	100
Chromium	mg/kg	1	910	910					21	32	35	26
Chromium (hexavalent)	mg/kg	1	6	6					<1	<1	<1	<1
Lead	mg/kg	1	200	310					137	40	216	171
Mercury	mg/kg	0.17	11	15					0.19	<0.17	0.4	0.85
Nickel	mg/kg	1	180	180					20	24	32	36
Selenium	mg/kg	1	250	430					<1	<1	<1	<1
Zinc	mg/kg	5	3,700	40,000					75	192	201	208
Asbestos in Soil (inc. matrix) ^		Presence		-					NAD	NAD	NAD	NAD
Asbestos in soil	% w/w	Presence		-					N/A	N/A	N/A	N/A

* GACs for a residential land use.

Concentrations exceeding GACs for residential use with plant uptake.

Concentrations exceeding GACs for residential use without plant uptake.

Soil Type
MG - Made Ground
TILL - Till, Devensian - Diamicton

Chemical Summary Tables - Polycyclic Aromatic Hydrocarbons (PAHs) (Soils)

Exploratory Hole ID	Units	Limits of Detection	GACs*		HP01	HP03	HP04	HP06
Sample ID			With Plant Uptake	Without Plant Uptake	ES1	ES1	ES1	ES1
Sample Depth (m)					0.40	0.10	0.50	0.60
Soil Type					MG	MG	MG	MG
PAH-16MS								
Acenaphthene	mg/kg	0.01	210	3000	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	0.01	170	2900	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	0.02	2,400	31000	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	mg/kg	0.04	7.2	11	<0.04	<0.04	<0.04	<0.04
Benzo(a)pyrene	mg/kg	0.04	2.2	3.2	<0.04	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	mg/kg	0.05	2.6	3.9	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg	0.05	320	360	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	0.07	77	110	<0.07	<0.07	<0.07	<0.07
Chrysene	mg/kg	0.06	15	30	<0.06	<0.06	<0.06	<0.06
Dibenzo(ah)anthracene	mg/kg	0.04	0.24	0.31	<0.04	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	0.08	280	1500	<0.08	<0.08	<0.08	<0.08
Fluorene	mg/kg	0.01	170	2800	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)pyrene	mg/kg	0.03	27	45	<0.03	<0.03	<0.03	<0.03
Naphthalene	mg/kg	0.03	2.3	2.3	<0.03	<0.03	<0.03	<0.03
Phenanthrene	mg/kg	0.03	95	1300	<0.03	<0.03	<0.03	<0.03
Pyrene	mg/kg	0.07	620	3700	<0.07	<0.07	<0.07	<0.07
Total PAH-16MS	mg/kg	0.01	-	-	<0.08	<0.08	<0.08	<0.08

* GACs for a residential land use.

Concentrations exceeding GACs for residential use with plant uptake.

Concentrations exceeding GACs for residential use without plant uptake.

Soil Type
MG - Made Ground
TILL - Till, Devensian - Diamicton

Chemical Summary Tables - Total Petroleum Hydrocarbons (TPHs) (Soils)

Exploratory Hole ID	Units	Limits of Detection	GACs*		HP01	HP03	HP04	HP06
Sample ID			With Plant Uptake	Without Plant Uptake	ES1	ES1	ES1	ES1
Sample Depth (m)					0.40	0.10	0.50	0.60
Soil Type					MG	MG	MG	MG
TPH Banded								
>C6-C8	mg/kg	5	100	100	<5	<5	<5	<5
>C8-C10	mg/kg	1	27	27	<1	<1	<1	<1
>C10-C12	mg/kg	1	74	130	<1	<1	<1	<1
>C12-C16	mg/kg	2	140	1100	<2	<2	<2	<2
>C16-C21	mg/kg	2	260	1900	<2	5	3	4
>C21-C40	mg/kg	5	1100	1900	<5	21	75	13
Total TPH	mg/kg	5		-	<5	26	78	17

* GACs for a residential land use.
For Banded TPH the lowest value for either the aliphatic or aromatic band has been used based on a worst case 1% SOM.
Value shown exceeds solubility saturation limits if followed by square brackets [] or vapour saturation limits if followed by round brackets (). Brackets contain the saturation limit value.
Concentrations exceeding GACs for residential use with plant uptake.
Concentrations exceeding GACs for residential use without plant uptake.

Soil Type
MG - Made Ground
TILL - Till, Devensian - Diamicton

Chemical Summary Tables - Volatile Organic Compounds (VOCs) (Soils)

Exploratory Hole ID	Units	Limits of Detection	GACs*	WS01	WS03	HP04
Sample ID				ES1	ES2	ES1
Sample Depth (m)				1.70	2.50	0.50
Soil Type				TILL	TILL	MG
VOC						
Dichlorodifluoromethane	µg/kg	1	-	<1	<1	<1
Chloromethane	µg/kg	10	-	<10	<10	<10
Vinyl Chloride (Chloroethene)	µg/kg	1	-	<1	<1	<1
Bromomethane	µg/kg	1	-	<1	<1	<1
Chloroethane	µg/kg	1	-	<1	<1	<1
Trichlorofluoromethane	µg/kg	1	-	<1	<1	<1
1,1-Dichloroethene	µg/kg	1	-	<1	<1	<1
Carbon Disulphide	µg/kg	1	-	<1	<1	<1
Dichloromethane	µg/kg	5	-	<5	<5	<5
trans 1,2-Dichloroethene	µg/kg	1	-	<1	<1	<1
1,1-Dichloroethane	µg/kg	1	-	<1	<1	<1
cis 1,2-Dichloroethene	µg/kg	1	-	<1	<1	<1
2,2-Dichloropropane	µg/kg	1	-	<1	<1	<1
Bromochloromethane	µg/kg	5	-	<5	<5	<5
Chloroform	µg/kg	1	-	<1	<1	<1
1,1,1-Trichloroethane	µg/kg	1	-	<1	<1	<1
1,1-Dichloropropene	µg/kg	1	-	<1	<1	<1
Carbon Tetrachloride	µg/kg	1	-	<1	<1	<1
1,2-Dichloroethane	µg/kg	2	-	<2	<2	<2
Benzene	µg/kg	1	-	<1	<1	<1
Trichloroethene	µg/kg	1	-	<1	<1	<1
1,2-Dichloropropane	µg/kg	1	-	<1	<1	<1
Dibromomethane	µg/kg	1	-	<1	<1	<1
Bromodichloromethane	µg/kg	10	-	<10	<10	<10
cis 1,3-Dichloropropene	µg/kg	1	-	<1	<1	<1
Toluene	µg/kg	1	-	<1	<1	<1
trans 1,3-Dichloropropene	µg/kg	1	-	<1	<1	<1
1,1,2-Trichloroethane	µg/kg	1	-	<1	<1	<1
1,3-Dichloropropane	µg/kg	1	-	<1	<1	<1
Tetrachloroethene	µg/kg	1	-	<1	<1	<1
Dibromochloromethane	µg/kg	3	-	<3	<3	<3
1,2-Dibromoethane	µg/kg	1	-	<1	<1	<1
Chlorobenzene	µg/kg	1	-	<1	<1	<1
1,1,1,2-Tetrachloroethane	µg/kg	1	-	<1	<1	<1
Ethylbenzene	µg/kg	1	-	<1	<1	<1
m & p Xylene	µg/kg	1	-	<1	<1	<1
o-Xylene	µg/kg	1	-	<1	<1	<1
Styrene	µg/kg	1	-	<1	<1	<1
Bromoform	µg/kg	1	-	<1	<1	<1
Isopropylbenzene	µg/kg	1	-	<1	<1	<1
1,1,2,2-Tetrachloroethane	µg/kg	1	-	<1	<1	<1
1,2,3-Trichloropropane	µg/kg	1	-	<1	<1	<1
Bromobenzene	µg/kg	1	-	<1	<1	<1
n-Propylbenzene	µg/kg	1	-	<1	<1	<1
2-Chlorotoluene	µg/kg	1	-	<1	<1	<1
1,3,5-Trimethylbenzene	µg/kg	1	-	<1	<1	<1
4-Chlorotoluene	µg/kg	1	-	<1	<1	<1
tert-Butylbenzene	µg/kg	2	-	<2	<2	<2
1,2,4-Trimethylbenzene	µg/kg	1	-	<1	<1	<1
sec-Butylbenzene	µg/kg	1	-	<1	<1	<1
4-Isopropyltoluene	µg/kg	1	-	<1	<1	<1
1,3-Dichlorobenzene	µg/kg	1	-	<1	<1	<1
1,4-Dichlorobenzene	µg/kg	1	-	<1	<1	<1
n-Butylbenzene	µg/kg	1	-	<1	<1	<1
1,2-Dichlorobenzene	µg/kg	1	-	<1	<1	<1
1,2-Dibromo-3-chloropropane (DCBP)	µg/kg	2	-	<2	<2	<2
1,2,4-Trichlorobenzene	µg/kg	3	-	<3	<3	<3
Hexachlorobutadiene	µg/kg	1	-	<1	<1	<1
1,2,3-Trichlorobenzene	µg/kg	3	-	<3	<3	<3

* GACs - Equivalent to Limits of Detection.
Concentrations Exceeding the Limit of Detection.

Soil Type
MG - Made Ground
TILL - Till, Devensian - Diamicton

Chemical Summary Tables - Semi-Volatile Organic Compounds (SVOCs) (Soils)

Exploratory Hole ID	Units	Limits of Detection	GACs*	WS01	WS03	HP04
Sample ID				ES1	ES2	ES1
Sample Depth (m)				1.70	2.50	0.50
Soil Type				TILL	TILL	MG
SVOC						
4-Bromophenyl phenyl ether	µg/kg	100	-	<100	<100	<100
Hexachlorobenzene	µg/kg	100	-	<100	<100	<100
Diethyl phthalate	µg/kg	100	-	<100	<100	<100
Dimethyl phthalate	µg/kg	100	-	<100	<100	<100
Dibenzofuran	µg/kg	100	-	<100	<100	<100
Carbazole	µg/kg	100	-	<100	<100	<100
Butylbenzyl phthalate	µg/kg	100	-	<100	<100	<100
Bis(2-ethylhexyl)phthalate	µg/kg	500	-	<500	<500	<500
Bis(2-chloroethoxy)methane	µg/kg	100	-	<100	<100	<100
Bis(2-chloroethyl)ether	µg/kg	100	-	<100	<100	<100
4-Nitrophenol	µg/kg	100	-	<100	<100	<100
3+4-Methylphenol	µg/kg	100	-	<100	<100	<100
4-Chloro-3-methylphenol	µg/kg	100	-	<100	<100	<100
2-Nitrophenol	µg/kg	100	-	<100	<100	<100
2-Methylphenol	µg/kg	100	-	<100	<100	<100
2-Chlorophenol	µg/kg	100	-	<100	<100	<100
2,6-Dinitrotoluene	µg/kg	100	-	<100	<100	<100
2,4-Dinitrotoluene	µg/kg	100	-	<100	<100	<100
2,4-Dimethylphenol	µg/kg	100	-	<100	<100	<100
2,4-Dichlorophenol	µg/kg	100	-	<100	<100	<100
2,4,6-Trichlorophenol	µg/kg	100	-	<100	<100	<100
2,4,5-Trichlorophenol	µg/kg	100	-	<100	<100	<100
2-Chloronaphthalene	µg/kg	100	-	<100	<100	<100
2-Methylnaphthalene	µg/kg	100	-	<100	<100	<100
Acenaphthylene	µg/kg	100	-	<100	<100	-
Acenaphthene	µg/kg	100	-	<100	<100	-
Anthracene	µg/kg	100	-	<100	<100	-
Benzo(a)anthracene	µg/kg	100	-	<100	<100	-
Benzo(b)fluoranthene	µg/kg	100	-	<100	<100	-
Benzo(k)fluoranthene	µg/kg	100	-	<100	<100	-
Benzo(a)pyrene	µg/kg	100	-	<100	<100	-
Benzo(ghi)perylene	µg/kg	100	-	<100	<100	-
Chrysene	µg/kg	100	-	<100	<100	-
Fluoranthene	µg/kg	100	-	<100	<100	-
Fluorene	µg/kg	100	-	<100	<100	-
Indeno(1,2,3-cd)pyrene	µg/kg	100	-	<100	<100	-
Phenanthrene	µg/kg	100	-	<100	<100	-
Pyrene	µg/kg	100	-	<100	<100	-
Naphthalene	µg/kg	100	-	<100	<100	-
Dibenzo(ah)anthracene	µg/kg	100	-	<100	<100	-
Bis(2-chloroisopropyl)ether	µg/kg	100	-	<100	<100	<100
Phenol	µg/kg	100	-	<100	<100	<100
Pentachlorophenol (SVOC)	µg/kg	100	-	<100	<100	<100
n-Nitroso-n-dipropylamine	µg/kg	100	-	<100	<100	<100
n-Dioctylphthalate	µg/kg	500	-	<500	<500	<500
n-Dibutylphthalate	µg/kg	100	-	<200	<200	<200
Nitrobenzene	µg/kg	100	-	<100	<100	<100
Isophorone	µg/kg	100	-	<100	<100	<100
Hexachloroethane	µg/kg	100	-	<100	<100	<100
Hexachlorocyclopentadiene	µg/kg	100	-	<100	<100	<100
Perylene	µg/kg	100	-	<100	<100	<100

* GACs - Equivalent to Limits of Detection.
Concentrations Exceeding the Limit of Detection.

Soil Type
MG - Made Ground
TILL - Till, Devensian - Diamicton

Chemical Summary Tables - Volatile Organic Compounds (VOCs) (Groundwater)

Sample ID	Units	LOD	EQS	DWS	WSR	WS01	WS03	WS04
Sample Type						Water	Water	Water
VOCs								
Dichlorodifluoromethane	ug/l	1		LOD		<1	<1	<1
Chloromethane	ug/l	1		LOD		<10	<10	<10
Vinyl Chloride	ug/l	1		LOD		<1	<1	<1
Bromomethane	ug/l	1		LOD		<1	<1	<1
Chloroethane	ug/l	1		LOD		<1	<1	<1
Trichlorofluoromethane	ug/l	1		LOD		<1	<1	<1
1,1-dichloroethylene	ug/l	1		LOD		<1	<1	<1
Methylene Chloride	ug/l	27		LOD		<5	<5	<5
Trans-1,2-dichloroethylene	ug/l	1		LOD		<1	<1	<1
1,1-dichloroethane	ug/l	1		LOD		<1	<1	<1
Cis-1,2-dichloroethylene	ug/l	1		LOD		<1	<1	<1
2,2-dichloropropane	ug/l	2		LOD		<1	<1	<1
Bromochloromethane	ug/l	4		LOD		<5	<5	<5
Chloroform	ug/l	1		LOD		<1	<1	<1
1,1,1-trichloroethane	ug/l	1		LOD		<1	<1	<1
1,1-dichloropropene	ug/l	1		LOD		<2	<2	<2
Carbon tetrachloride	ug/l	1		LOD		<1	<1	<1
Benzene	ug/l	1		LOD		<1	<1	<1
1,2-dichloroethane	ug/l	1		LOD		<1	<1	<1
Trichloroethylene	ug/l	1		LOD		<1	<1	<1
1,2-dichloropropane	ug/l	1		LOD		<1	<1	<1
Dibromomethane	ug/l	1		LOD		<1	<1	<1
Bromodichloromethane	ug/l	4		LOD		<10	<10	<10
cis-1,3-dichloropropene	ug/l	1		LOD		<1	<1	<1
Toluene	ug/l	1		LOD		<1	<1	<1
trans-1,3-dichloropropene	ug/l	1		LOD		<1	<1	<1
1,1,2-trichloroethane	ug/l	1		LOD		<1	<1	<1
Tetrachloroethylene	ug/l	1		LOD		1	<1	<1
1,3-dichloropropane	ug/l	1		LOD		<1	<1	<1
Dibromochloromethane	ug/l	1		LOD		<3	<3	<3
1,2-dibromoethane	ug/l	1		LOD		<1	<1	<1
Chlorobenzene	ug/l	1		LOD		<1	<1	<1
1,1,1,2-tetrachloroethane	ug/l	1		LOD		<1	<1	<1
Ethylbenzene	ug/l	1		LOD		<1	<1	<1
m+p-Xylene	ug/l	2		LOD		<1	<1	<1
o-Xylene	ug/l	1		LOD		<1	<1	<1
Styrene	ug/l	1		LOD		<1	<1	<1
Bromoform	ug/l	1		LOD		<1	<1	<1
Isopropylbenzene	ug/l	1		LOD		<1	<1	<1
1,1,2,2-tetrachloroethane	ug/l	1		LOD		<1	<1	<1
Bromobenzene	ug/l	1		LOD		<1	<1	<1
1,2,3-trichloropropane	ug/l	1		LOD		<1	<1	<1
n-propylbenzene	ug/l	1		LOD		<1	<1	<1
2-chlorotoluene	ug/l	1		LOD		<1	<1	<1
1,3,5-trimethylbenzene	ug/l	1		LOD		<1	<1	<1
4-chlorotoluene	ug/l	1		LOD		<1	<1	<1
Tert-butylbenzene	ug/l	1		LOD		<1	<1	<1
1,2,4-trimethylbenzene	ug/l	1		LOD		<1	<1	<1
sec-butylbenzene	ug/l	1		LOD		<1	<1	<1
p-isopropyltoluene	ug/l	1		LOD		<1	<1	<1
1,3-dichlorobenzene	ug/l	2		LOD		<1	<1	<1
1,4-dichlorobenzene	ug/l	1		LOD		<1	<1	<1
n-butylbenzene	ug/l	1		LOD		<2	<2	<2
1,2-dichlorobenzene	ug/l	1		LOD		<1	<1	<1
1,2-dibromo-3-chloropropane	ug/l	1		LOD		<1	<1	<1
1,2,4-trichlorobenzene	ug/l	1		LOD		<2	<2	<2
Hexachlorobutadiene	ug/l	1		LOD		<3	<3	<3
1,2,3-trichlorobenzene	ug/l	1		LOD		<3	<3	<3
MTBE	ug/l	1		LOD		<1	<1	<1

LOD - Limit of Detection
EQS - EA's Environmental Quality Standard
DWS - Drinking Water Standards
WRS - Water Supply (Water Quality) Regulations

Exceeds the EQS / DWS / WSR
At or elevated above the Limit of Detection

Chemical Summary Tables - Semi-Volatile Organic Compounds (SVOCs) (Groundwater)

Sample ID / Sample Type	Units	LOD	EQS	DWS	WSR	WS01 Water	WS03 Water	WS04 Water
SVOC (w)								
2,4,5-Trichlorophenol	ug/l	1		LOD		<1	<1	<1
2,4,6-Trichlorophenol (w)	ug/l	1		LOD		<1	<1	<1
2,4-Dichlorophenol	ug/l	1		LOD		<1	<1	<1
2,4-Dimethylphenol	ug/l	1		LOD		<1	<1	<1
2,4-Dinitrotoluene	ug/l	1		LOD		<1	<1	<1
2,6-Dinitrotoluene	ug/l	1		LOD		<1	<1	<1
2-Chloronaphthalene	ug/l	1		LOD		<1	<1	<1
2-Chlorophenol	ug/l	1		LOD		<1	<1	<1
2-Methylnaphthalene	ug/l	1		LOD		<1	<1	<1
2-Methylphenol	ug/l	1		LOD		<1	<1	<1
2-Nitrophenol	ug/l	1		LOD		<1	<1	<1
4-Bromophenyl phenyl ether	ug/l	1		LOD		<1	<1	<1
4-Chloro-3-methylphenol	ug/l	1		LOD		<1	<1	<1
Bis(2-chloroisopropyl)ether	ug/l	1		LOD		<1	<1	<1
3+4-Methylphenol	ug/l	1		LOD		<1	<1	<1
4-Nitrophenol	ug/l	1		LOD		<1	<1	<1
Acenaphthene	ug/l	1		LOD		<1	<1	<1
Acenaphthylene	ug/l	1		LOD		<1	<1	<1
Anthracene	ug/l	1		LOD		<1	<1	<1
Bis(2-chloroethyl)ether	ug/l	1		LOD		<1	<1	<1
Bis(2-chloroethoxy)methane	ug/l	1		LOD		<1	<1	<1
Bis(2-ethylhexyl)phthalate	ug/l	10		LOD		<10	<10	<10
Benzo(a)anthracene	ug/l	1		LOD		<1	<1	<1
Butylbenzyl phthalate	ug/l	1		LOD		<1	<1	<1
Benzo(b)fluoranthene	ug/l	1		LOD		<1	<1	<1
Benzo(k)fluoranthene	ug/l	1		LOD		<1	<1	<1
Benzo(a)pyrene	ug/l	1		LOD		<1	<1	<1
Benzo(ghi)perylene	ug/l	1		LOD		<1	<1	<1
Carbazole	ug/l	1		LOD		<1	<1	<1
Chrysene	ug/l	1		LOD		<1	<1	<1
Dibenzofuran	ug/l	1		LOD		<1	<1	<1
n-Dibutylphthalate	ug/l	1		LOD		<1		<1
n-Dioctylphthalate	ug/l	10		LOD		<10	<10	<10
n-Nitroso-n-dipropylamine	ug/l	1		LOD		<1	<1	<1
Diethyl phthalate	ug/l	1		LOD		40	30	46
Dimethyl phthalate	ug/l	1		LOD		<1	<1	<1
Dibenzo(ah)anthracene	ug/l	1		LOD		<1	<1	<1
Fluorene	ug/l	1		LOD		<1	<1	<1
Fluoranthene	ug/l	1		LOD		<1	<1	<1
Hexachlorobenzene	ug/l	1		LOD		<1	<1	<1
Pentachlorophenol (SVOC)	ug/l	1		LOD		<1	<1	<1
Phenol	ug/l	1		LOD		1	<1	<1
Hexachloroethane	ug/l	1		LOD		<1	<1	<1
Nitrobenzene	ug/l	1		LOD		<1	<1	<1
Naphthalene	ug/l	1		LOD		<1	<1	<1
Isophorone	ug/l	1		LOD		<1	<1	<1
Hexachlorocyclopentadiene	ug/l	1		LOD		<1	<1	<1
Phenanthrene	ug/l	1		LOD		<1	<1	<1
Pyrene	ug/l	1		LOD		<1	<1	<1

LOD - Limit of Detection
EQS - EA's Environmental Quality Standard
DWS - Drinking Water Standards
WRS - Water Supply (Water Quality) Regulations

Exceeds the EQS / DWS / WSR
At or elevated above the Limit of Detection

Appendix E – Groundwater and Ground Gas / Vapour Summary Tables

Ground Water and Gas Monitoring Data

		GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA		
Monitoring Point	Date	Methane (%v/v)		%LEL		Carbon Dioxide (%v/v)		Carbon Monoxide (ppmv)		Hydrogen Sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	Comments
		Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
WS01	16/12/2021	0.0	0.0	-	-	0.3	0.3	0.0	1.0	1.0	1.0	20.8	20.8	0.1	-	-0.3	-0.3	0.0	-	1.30	3.00	
WS01	23/12/2021	0.0	0.0	-	-	0.3	0.3	0.0	0.0	1.0	1.0	21.1	21.1	0.0	-	0.0	0.0	0.0	-	1.44	3.00	
WS01	11/01/2022	0.0	0.0	-	-	0.3	0.3	0.0	0.0	0.0	0.0	20.5	20.5	0.0	-	0.3	0.3	0.0	-	1.36	3.00	
WS02	16/12/2021	0.0	0.0	-	-	0.7	0.7	0.0	1.0	2.0	1.0	20.3	20.3	0.1	-	-0.3	-0.3	0.0	-	1.21	3.11	
WS02	23/12/2021	0.0	0.0	-	-	0.6	0.6	1.0	0.0	2.0	1.0	20.3	20.3	0.0	-	-0.4	-0.4	0.0	-	1.43	3.11	
WS02	11/01/2022	0.0	0.0	-	-	0.6	0.6	0.0	0.0	0.0	0.0	19.9	19.9	0.1	-	0.1	0.1	0.0	-	1.18	3.12	
WS03	16/12/2021	0.0	0.0	-	-	0.8	0.8	1.0	1.0	1.0	1.0	19.3	19.3	0.1	-	-0.3	-0.3	0.0	-	0.80	2.35	
WS03	23/12/2021	0.0	0.0	-	-	0.5	0.5	1.0	0.0	1.0	1.0	19.9	19.9	0.0	-	-0.5	-0.5	0.0	-	1.08	2.35	
WS03	11/01/2022	0.0	0.0	-	-	0.3	0.3	0.0	0.0	0.0	0.0	19.9	19.9	0.2	-	0.0	0.0	0.0	-	0.86	2.29	
WS04	16/12/2021	0.0	0.0	-	-	0.6	0.6	0.0	1.0	1.0	1.0	20.2	20.2	0.1	-	-0.3	-0.3	0.0	-	1.2	2.6	
WS04	23/12/2021	0.0	0.0	-	-	0.7	0.7	0.0	0.0	2.0	1.0	20.3	20.3	0.0	-	-0.5	-0.5	0.0	-	1.40	2.60	
WS04	11/01/2022	0.0	0.0	-	-	0.6	0.6	0.0	0.0	0.0	0.0	19.9	19.9	0.1	-	-0.1	-0.1	0.0	-	1.15	2.46	

Ground Water and Gas Monitoring Data

Monitoring Point	Date	GAS CONCENTRATIONS								FLOW DATA				WEATHER		Gas Screening Value (l/hr)		Is CH4 typically <1%?	Is CO2 typically <5%?	Characteristic Gas Situation (CS)	Traffic Lights
		Methane (%v/v)		%LEL		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Flow rate (l/hr)		Differential borehole Pressure (Pa)	flow to equalise (secs)	Air Temperature (°C)	Barometric Pressure (mb)	Methane	Carbon Dioxide				
		Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady	Peak	Steady							Y/N	Y/N		
WS01	16/12/2021	0.0	0.0	-	-	0.3	0.3	20.8	20.8	-0.3	-0.3	0.0	-	-	1023	0.000	-0.001	Y	Y	CS1	Green
WS01	23/12/2021	0.0	0.0	-	-	0.3	0.3	21.1	21.1	0.0	0.0	0.0	-	-	990	0.000	0.000	Y	Y	CS1	Green
WS01	11/01/2022	0.0	0.0	-	-	0.3	0.3	20.5	20.5	0.3	0.3	0.0	-	-	1005	0.000	0.001	Y	Y	CS1	Green
WS02	16/12/2021	0.0	0.0	-	-	0.7	0.7	20.3	20.3	-0.3	-0.3	0.0	-	-	1023	0.000	-0.002	Y	Y	CS1	Green
WS02	23/12/2021	0.0	0.0	-	-	0.6	0.6	20.3	20.3	-0.4	-0.4	0.0	-	-	990	0.000	-0.002	Y	Y	CS1	Green
WS02	11/01/2022	0.0	0.0	-	-	0.6	0.6	19.9	19.9	0.1	0.1	0.0	-	-	1005	0.000	0.001	Y	Y	CS1	Green
WS03	16/12/2021	0.0	0.0	-	-	0.8	0.8	19.3	19.3	-0.3	-0.3	0.0	-	-	1023	0.000	-0.002	Y	Y	CS1	Green
WS03	23/12/2021	0.0	0.0	-	-	0.5	0.5	19.9	19.9	-0.5	-0.5	0.0	-	-	990	0.000	-0.003	Y	Y	CS1	Green
WS03	11/01/2022	0.0	0.0	-	-	0.3	0.3	19.9	19.9	0.0	0.0	0.0	-	-	1005	0.000	0.000	Y	Y	CS1	Green
WS04	16/12/2021	0.0	0.0	-	-	0.6	0.6	20.2	20.2	-0.3	-0.3	0.0	-	-	1023	0.000	-0.002	Y	Y	CS1	Green
WS04	23/12/2021	0.0	0.0	-	-	0.7	0.7	20.3	20.3	-0.5	-0.5	0.0	-	-	990	0.000	-0.004	Y	Y	CS1	Green
WS04	11/01/2022	0.0	0.0	-	-	0.6	0.6	19.9	19.9	-0.1	-0.1	0.0	-	-	1005	0.000	-0.001	Y	Y	CS1	Green

Situation 1 - CIRRIA C665: For all development types except for low-rise houses and gardens:

Characteristic situation	Risk classification	Gas Screening Value (CH4 or	Additional factors	Typical sources of generation
1	Very low	<0.07	Typically Methane ≤1% and/or Carbon Dioxide ≤5%. Otherwise consider an increase to characteristic situation 2.	Natural soils with low organic matter content and 'typical' made ground.
2	Low	<0.7	Borehole air flow rate not to exceed 70 l/hr. Otherwise consider an increase to characteristic situation 3.	Natural soil with high organic peat/organic content and 'typical' made ground.
3	Moderate	<3.5		Old landfill, inert waste and flooded mine working.
4	Moderate to high	<15	Quantitative risk assessment required to evaluate scope of protection measures.	Mine working susceptible to flooding and landfill completed to WMP 26B criteria.
5	High	<70		Mine working unflooded inactive with shallow workings near surface.
6	Very high	>70		Recent landfill site.

Situation 2 - NHBC 'Traffic Lights': For low rise houses with gardens

	Methane		Carbon Dioxide	
Traffic Lights	Typical maximum concentrations (%)	Gas Screening Value (l/hr)	Typical maximum concentrations (%)	Gas Screening Value (l/hr)
Green	≤1	≤0.16	≤5	≤0.78
Amber 1	1> to ≤5	>0.16 to ≤0.63	>5 to ≤10	>0.78 to ≤1.56
Amber 2	5> to ≤20	>0.63 to ≤1.56	>10 to ≤30	>1.56 to ≤3.13
Red	>20	>1.56	>30	>3.13

Ribble Enviro Ltd
www.ribble-enviro.co.uk

...everything gas detection

Certificate of Calibration

Customer:	*RIBBLE ENVIRO HIRE FLEET*
Instrument:	MiniRAE 3000
Job:	Pre-Hire Service, Test & Calibration
Serial number:	592-933553
Fleet Number:	R40053
Certificate no:	933553 / 221121
Next calibration due date:	22 Nov 2022
Tested on:	22 Nov 2021
Calibrated for:	Isobutylene

Applied Gas Concentration:	Cylinder Reference:	Initial Sensor Reading	Final Sensor Reading	Accuracy Limits
Isobutylene: 100 ppm	1055 / 3021	96.5 ppm	99.9 ppm	± 10%

The instrument has been calibrated after re-zeroing and introducing span calibration gas, using gas that is traceable to national standards and has been prepared in [redacted]

[redacted]

[redacted] 01200 445 804 **Fax:** 01200 445 809 **Email:** info@ribble-enviro.co.uk

Appendix F - Laboratory Results – Geotechnical Testing

Laboratory Report

GEO Site & Testing Services Ltd

Contract Number: 57085

Client Ref: **E23890**
Client PO: **0988**

Report Date: **16-12-2021**

Client **Environmental Management Solutions Ltd (EMS)**
Sigeric Business Park
Holme Lacy Road
Rotherwas
Hereford
HR2 6BQ

Contract Title: **9 Harpers Lane**
For the attention of: **Olivia Benbow**

Date Received: **02-12-2021**
Date Completed: **16-12-2021**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	5
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	5
Samples Received - @ Non Accredited Test	5
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Emma Sharp (Business Support Manager) - Paul Evans (Director) - Richard John (Quality/Technical Manager)
Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (Quality Assistant / Administrator / Health and Safety Coordinator)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)	
Contract Number	57085	
Site Name	9 Harpers Lane	
Date Tested	13/12/2021	
	DESCRIPTIONS	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
WS01	2	D	2.00	-	3.00	Greyish brown silty CLAY.
WS02	1	D	1.70	-	1.80	Greyish brown silty CLAY.
WS03	1	D	3.00	-	4.00	Greyish brown silty CLAY.
WS04	2	D	3.80	-	3.90	Greyish brown silty CLAY.
WS05	1	D	1.10	-	1.20	Greyish brown silty CLAY.
				-		
				-		
				-		
				-		
				-		
				-		
				-		
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				-		
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				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		

Operators	Checked	16/12/2021	Richard John (Advanced Testing Manager)
Conor Davison	Approved	16/12/2021	Paul Evans (Quality/Technical Manager)

UKAS TESTING
2788

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)
Contract Number	57085
Project Location	9 Harpers Lane
Date Tested	13/12/2021

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
WS01	2	D	2.00	-	3.00	27	59	21	38	100	CH High Plasticity
WS02	1	D	1.70	-	1.80	22	52	19	33	100	CH High Plasticity
WS03	1	D	3.00	-	4.00	27	55	21	34	100	CH High Plasticity
WS04	2	D	3.80	-	3.90	23	48	19	29	100	CI Intermediate Plasticity
WS05	1	D	1.10	-	1.20	23	44	21	23	100	CI Intermediate Plasticity
				-							
				-							
				-							
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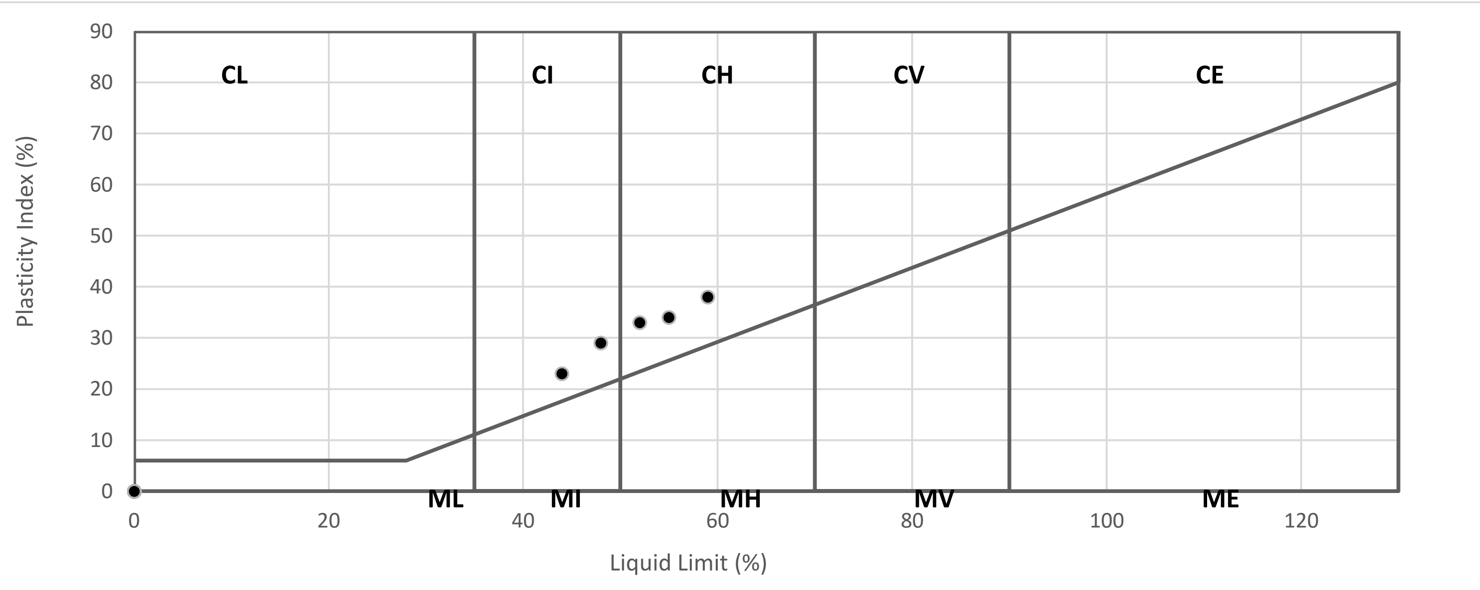
Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	16/12/2021	Richard John (Advanced Testing Manager)
Conor Davison	Approved	16/12/2021	Paul Evans (Quality/Technical Manager)

UKAS TESTING 2788

Appendix G – Laboratory Results – Chemical Analysis

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/12967
Issue Number: 1 **Date:** 14 December, 2021

Client: Environmental Management Solutions Ltd
The Old Surgery,
22a King Street,
Hereford,
UK
HR4 9DA

Project Manager: Olivia Benbow
Project Name: 9 Harpers Lane
Project Ref: E23890
Order No: 0987
Date Samples Received: 29/11/21
Date Instructions Received: 01/12/21
Date Analysis Completed: 14/12/21

Approved by:

[redacted]

Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	6.9	35.5	17.8	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	-	-	-	-	7.51	7.38	7.38	pH	0.01	A-T-031s
pH BRE$_D$$^{M\#}$	7.74	8.52	7.68	7.40	-	-	-	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	12	<10	<10	19	33	<10	mg/l	10	A-T-026s
Sulphate BRE (acid sol)$_D$$^{M\#}$	<0.02	<0.02	<0.02	<0.02	0.04	0.03	0.02	% w/w	0.02	A-T-028s
Sulphur BRE (total)$_D$	<0.01	0.05	<0.01	<0.01	0.03	0.02	0.02	% w/w	0.01	A-T-024s
Cyanide (total)$_A$$^{M\#}$	-	-	-	-	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	-	-	-	-	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic matter$_D$$^{M\#}$	-	-	-	-	7.2	1.6	2.9	% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	-	-	-	-	4	<1	<1	mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	-	-	-	-	1.3	0.6	1.2	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	-	-	-	-	100	27	40	mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	-	-	-	-	26	21	32	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	-	-	-	-	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	-	-	-	-	171	137	40	mg/kg	1	A-T-024s
Mercury$_D$	-	-	-	-	0.85	0.19	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	-	-	-	-	36	20	24	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	-	-	-	-	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	-	-	-	-	208	75	192	mg/kg	5	A-T-024s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil$_{D}^{\#}$	-	-	-	-	NAD	NAD	NAD			A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	-	-	-	-	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
PAH-16MS										
Acenaphthene$_A^{M\#}$	-	-	-	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	-	-	-	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	-	-	-	-	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	-	-	-	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	-	-	-	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	-	-	-	-	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	-	-	-	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	-	-	-	-	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	-	-	-	-	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	-	-	-	-	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	-	-	-	-	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	-	-	-	-	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	-	-	-	-	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	-	-	-	-	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	-	-	-	-	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	-	-	-	-	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	-	-	-	-	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s
TPH Banded 1										
>C6-C8$_A^{M\#}$	-	-	-	-	<5	<5	<5	mg/kg	5	A-T-007s
>C8-C10$_A^{M\#}$	-	-	-	-	<1	<1	<1	mg/kg	1	A-T-007s
>C10-C12$_A^{M\#}$	-	-	-	-	<1	<1	<1	mg/kg	1	A-T-007s
>C12-C16$_A^{M\#}$	-	-	-	-	<2	<2	<2	mg/kg	2	A-T-007s
>C16-C21$_A^{M\#}$	-	-	-	-	4	<2	5	mg/kg	2	A-T-007s
>C21-C40$_A^{M\#}$	-	-	-	-	13	<5	21	mg/kg	5	A-T-007s
Total TPH Banded 1$_A^{M\#}$	-	-	-	-	17	<5	26	mg/kg	5	A-T-007s

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
SVOC										
4-Bromophenyl phenyl ether$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Diethyl phthalate$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Dibenzofuran$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Carbazole$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	<500	<500	-	-	-	-	-	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
4-Nitrophenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2-Nitrophenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2-Methylphenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2-Chlorophenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Acenaphthylene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Acenaphthene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Anthracene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(a)anthracene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(b)fluoranthene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(k)fluoranthene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(a)pyrene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(ghi)perylene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
Chrysene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Fluoranthene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Fluorene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Indeno(1,2,3-cd)pyrene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Phenanthrene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Pyrene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Naphthalene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Dibenzo(ah)anthracene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Phenol$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Pentachlorophenol (SVOC)$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	<500	<500	-	-	-	-	-	µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	<200	<200	-	-	-	-	-	µg/kg	100	A-T-052s
Nitrobenzene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Isophorone$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachloroethane$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachlorocyclopentadiene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s
Perylene$_A$	<100	<100	-	-	-	-	-	µg/kg	100	A-T-052s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
VOC										
Dichlorodifluoromethane$_{A}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Chloromethane$_{A}$	<10	<10	-	-	-	-	-	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Dichloromethane$_{A}$	<5	<5	-	-	-	-	-	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	<5	<5	-	-	-	-	-	µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	<2	<2	-	-	-	-	-	µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	<10	<10	-	-	-	-	-	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	<3	<3	-	-	-	-	-	µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s

Envirolab Job Number: 21/12967 **Client Project Name: 9 Harpers Lane**

Client Project Ref: E23890

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	Units	Limit of Detection	Method ref
Client Sample No	1	2	2	1	1	1	1			
Client Sample ID	WS01	WS03	WS02	WS04	HP06	HP01	HP03			
Depth to Top	1.70	2.50	2.30	2.40	0.60	0.40	0.10			
Depth To Bottom	1.80	2.60	2.40	2.50						
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21	25-Nov-21			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code	3A	3	3	3	6AE	6AE	6AE			
Chlorobenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_A$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Ethylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
m & p Xylene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
o-Xylene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Styrene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromoform$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Isopropylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_A$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromobenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
n-Propylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
2-Chlorotoluene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
4-Chlorotoluene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
tert-Butylbenzene$_A^\#$	<2	<2	-	-	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
sec-Butylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
4-Isopropyltoluene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_A$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
n-Butylbenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_A$	<2	<2	-	-	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_A$	<3	<3	-	-	-	-	-	µg/kg	3	A-T-006s
Hexachlorobutadiene$_A^\#$	<1	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_A$	<3	<3	-	-	-	-	-	µg/kg	3	A-T-006s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/8							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	HP04									
Depth to Top	0.50									
Depth To Bottom										
Date Sampled	25-Nov-21									
Sample Type	Soil - D									
Sample Matrix Code	6AE									
% Stones >10mm$_A$	12.8							% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.52							pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10							mg/l	10	A-T-026s
Sulphate BRE (acid sol)$_D$$^{M\#}$	0.04							% w/w	0.02	A-T-028s
Sulphur BRE (total)$_D$	0.03							% w/w	0.01	A-T-024s
Cyanide (total)$_A$$^{M\#}$	<1							mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2							mg/kg	0.2	A-T-050s
Organic matter$_D$$^{M\#}$	3.5							% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	3							mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	1.0							mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	65							mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	35							mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1							mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	216							mg/kg	1	A-T-024s
Mercury$_D$	0.40							mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	32							mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1							mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	201							mg/kg	5	A-T-024s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/8							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	HP04									
Depth to Top	0.50									
Depth To Bottom										
Date Sampled	25-Nov-21									
Sample Type	Soil - D									
Sample Matrix Code	6AE									
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil$_{D}^{\#}$	NAD									A-T-045
Asbestos Matrix (visual)$_{D}$	-									A-T-045
Asbestos Matrix (microscope)$_{D}$	-									A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A									A-T-045

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/8							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	HP04									
Depth to Top	0.50									
Depth To Bottom										
Date Sampled	25-Nov-21									
Sample Type	Soil - D									
Sample Matrix Code	6AE									
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02							mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04							mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07							mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04							mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08							mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07							mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08							mg/kg	0.01	A-T-019s
TPH Banded 1										
>C6-C8$_A^{M\#}$	<5							mg/kg	5	A-T-007s
>C8-C10$_A^{M\#}$	<1							mg/kg	1	A-T-007s
>C10-C12$_A^{M\#}$	<1							mg/kg	1	A-T-007s
>C12-C16$_A^{M\#}$	<2							mg/kg	2	A-T-007s
>C16-C21$_A^{M\#}$	3							mg/kg	2	A-T-007s
>C21-C40$_A^{M\#}$	75							mg/kg	5	A-T-007s
Total TPH Banded 1$_A^{M\#}$	78							mg/kg	5	A-T-007s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/8							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	HP04									
Depth to Top	0.50									
Depth To Bottom										
Date Sampled	25-Nov-21									
Sample Type	Soil - D									
Sample Matrix Code	6AE									
SVOC										
4-Bromophenyl phenyl ether$_A$	<100							µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	<100							µg/kg	100	A-T-052s
Diethyl phthalate$_A$	<100							µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	<100							µg/kg	100	A-T-052s
Dibenzofuran$_A$	<100							µg/kg	100	A-T-052s
Carbazole$_A$	<100							µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	<100							µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	<500							µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	<100							µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	<100							µg/kg	100	A-T-052s
4-Nitrophenol$_A$	<100							µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	<100							µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	<100							µg/kg	100	A-T-052s
2-Nitrophenol$_A$	<100							µg/kg	100	A-T-052s
2-Methylphenol$_A$	<100							µg/kg	100	A-T-052s
2-Chlorophenol$_A$	<100							µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	<100							µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	<100							µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	<100							µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	<100							µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	<100							µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	<100							µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	<100							µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	<100							µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	<100							µg/kg	100	A-T-052s
Phenol$_A$	<100							µg/kg	100	A-T-052s
Pentachlorophenol (SVOC)$_A$	<100							µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	<100							µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	<500							µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	<200							µg/kg	100	A-T-052s
Nitrobenzene$_A$	<100							µg/kg	100	A-T-052s
Isophorone$_A$	<100							µg/kg	100	A-T-052s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	**21/12967/8**							**Units**	**Limit of Detection**	**Method ref**
Client Sample No	**1**									
Client Sample ID	**HP04**									
Depth to Top	**0.50**									
Depth To Bottom										
Date Sampled	**25-Nov-21**									
Sample Type	**Soil - D**									
Sample Matrix Code	**6AE**									
Hexachloroethane$_A$	**<100**							**µg/kg**	**100**	**A-T-052s**
Hexachlorocyclopentadiene$_A$	**<100**							**µg/kg**	**100**	**A-T-052s**
Perylene$_A$	**<100**							**µg/kg**	**100**	**A-T-052s**

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/8							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	HP04									
Depth to Top	0.50									
Depth To Bottom										
Date Sampled	25-Nov-21									
Sample Type	Soil - D									
Sample Matrix Code	6AE									
VOC										
Dichlorodifluoromethane$_A$	<1							µg/kg	1	A-T-006s
Chloromethane$_A$	<10							µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_A^\#$	<1							µg/kg	1	A-T-006s
Bromomethane$_A^\#$	<1							µg/kg	1	A-T-006s
Chloroethane$_A^\#$	<1							µg/kg	1	A-T-006s
Trichlorofluoromethane$_A^\#$	<1							µg/kg	1	A-T-006s
1,1-Dichloroethene$_A^\#$	<1							µg/kg	1	A-T-006s
Carbon Disulphide$_A^\#$	<1							µg/kg	1	A-T-006s
Dichloromethane$_A$	<5							µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_A^\#$	<1							µg/kg	1	A-T-006s
1,1-Dichloroethane$_A^\#$	<1							µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_A^\#$	<1							µg/kg	1	A-T-006s
2,2-Dichloropropane$_A^\#$	<1							µg/kg	1	A-T-006s
Bromochloromethane$_A^\#$	<5							µg/kg	5	A-T-006s
Chloroform$_A^\#$	<1							µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_A^\#$	<1							µg/kg	1	A-T-006s
1,1-Dichloropropene$_A^\#$	<1							µg/kg	1	A-T-006s
Carbon Tetrachloride$_A^\#$	<1							µg/kg	1	A-T-006s
1,2-Dichloroethane$_A^\#$	<2							µg/kg	2	A-T-006s
Benzene$_A^\#$	<1							µg/kg	1	A-T-006s
Trichloroethene$_A^\#$	<1							µg/kg	1	A-T-006s
1,2-Dichloropropane$_A^\#$	<1							µg/kg	1	A-T-006s
Dibromomethane$_A^\#$	<1							µg/kg	1	A-T-006s
Bromodichloromethane$_A^\#$	<10							µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_A^\#$	<1							µg/kg	1	A-T-006s
Toluene$_A^\#$	<1							µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_A^\#$	<1							µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_A^\#$	<1							µg/kg	1	A-T-006s
1,3-Dichloropropane$_A^\#$	<1							µg/kg	1	A-T-006s
Tetrachloroethene$_A^\#$	<1							µg/kg	1	A-T-006s
Dibromochloromethane$_A^\#$	<3							µg/kg	3	A-T-006s
1,2-Dibromoethane$_A^\#$	<1							µg/kg	1	A-T-006s

Envirolab Job Number: 21/12967

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12967/8							Units	Limit of Detection	Method ref
Client Sample No	1									
Client Sample ID	HP04									
Depth to Top	0.50									
Depth To Bottom										
Date Sampled	25-Nov-21									
Sample Type	Soil - D									
Sample Matrix Code	6AE									
Chlorobenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	<1							µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	<1							µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	<2							µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	<1							µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	<2							µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	<3							µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	<1							µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	<3							µg/kg	3	A-T-006s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

v1

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Environmental Management Solutions Ltd, The Old Surgery,, 22a King Street, Hereford, UK, HR4 9DA

Project: 9 Harpers Lane

Clients Project No: E23890

Project No: 21/12967

Date Received: 01/12/2021 (am)

Cool Box Temperatures (°C): 6.9, 6.3

Lab Sample ID	21/12967/1	21/12967/2
Client Sample No	1	2
Client Sample ID/Depth	WS01 1.70-1.80m	WS03 2.50-2.60m
Date Sampled	25/11/21	25/11/21
Deviation Code		
D (no glass)	✓	✓

Key
D (no glass) *Glass container not provided for extractable organics analysis*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/12967/1	21/12967/2	21/12967/3	21/12967/4	21/12967/5	21/12967/6	21/12967/7	21/12967/8
Client Sample No	1	2	2	1	1	1	1	1
Client Sample ID/Depth	WS01 1.70-1.80m	WS03 2.50-2.60m	WS02 2.30-2.40m	WS04 2.40-2.50m	HP06 0.60m	HP01 0.40m	HP03 0.10m	HP04
Date Sampled	25/11/21	25/11/21	25/11/21	25/11/21	25/11/21	25/11/21	25/11/21	25/11/21
A-T-006s	06/12/2021	06/12/2021						06/12/2021
A-T-007s					07/12/2021	07/12/2021	07/12/2021	07/12/2021
A-T-019s					07/12/2021	07/12/2021	07/12/2021	07/12/2021
A-T-024s	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021
A-T-026s	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021	13/12/2021
A-T-028s	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021
A-T-031s	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021	14/12/2021
A-T-032 OM					13/12/2021	13/12/2021	13/12/2021	13/12/2021
A-T-040s					13/12/2021	13/12/2021	13/12/2021	13/12/2021
A-T-042sTCN					06/12/2021	06/12/2021	06/12/2021	06/12/2021
A-T-044	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021
A-T-045					08/12/2021	08/12/2021	08/12/2021	08/12/2021
A-T-050s					06/12/2021	06/12/2021	06/12/2021	06/12/2021
A-T-052s	09/12/2021	09/12/2021						09/12/2021

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/12978
Issue Number: 1 **Date:** 13 December, 2021

Client: Environmental Management Solutions Ltd
The Old Surgery,
22a King Street,
Hereford,
UK
HR4 9DA

Project Manager: Olivia Benbow
Project Name: 9 Harpers Lane
Project Ref: E23890
Order No: 0987
Date Samples Received: 29/11/21
Date Instructions Received: 01/12/21
Date Analysis Completed: 13/12/21

Approved by:

[redacted]
Holly Neary-King
Client Services Supervisor

UKAS TESTING
1247

Envirolab Job Number: 21/12978

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12978/1	21/12978/2	21/12978/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS04							
Depth to Top	2.10	2.70	3.20							
Depth To Bottom	3.60	3.70	3.70							
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
SVOC (w)										
2,4,5-Trichlorophenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
2,4,6-Trichlorophenol (w)$_A$	<1	<1	<1					µg/l	1	A-T-052w
2,4-Dichlorophenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
2,4-Dimethylphenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
2,4-Dinitrotoluene$_A$	<1	<1	<1					µg/l	1	A-T-052w
2,6-Dinitrotoluene$_A$	<1	<1	<1					µg/l	1	A-T-052w
2-Chloronaphthalene$_A$	<1	<1	<1					µg/l	1	A-T-052w
2-Chlorophenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
2-Methylnaphthalene$_A$	<1	<1	<1					µg/l	1	A-T-052w
2-Methylphenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
2-Nitrophenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
4-Bromophenyl phenyl ether$_A$	<1	<1	<1					µg/l	1	A-T-052w
4-Chloro-3-methylphenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
Bis(2-chloroisopropyl)ether$_A$	<1	<1	<1					µg/l	1	A-T-052w
3+4-Methylphenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
4-Nitrophenol$_A$	<1	<1	<1					µg/l	1	A-T-052w
Acenaphthene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Acenaphthylene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Anthracene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Bis(2-chloroethyl)ether$_A$	<1	<1	<1					µg/l	1	A-T-052w
Bis(2-chloroethoxy)methane$_A$	<1	<1	<1					µg/l	1	A-T-052w
Bis(2-ethylhexyl)phthalate$_A$	<10	<10	<10					µg/l	10	A-T-052w
Benzo(a)anthracene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Butylbenzyl phthalate$_A$	<1	<1	<1					µg/l	1	A-T-052w
Benzo(b)fluoranthene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Benzo(k)fluoranthene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Benzo(a)pyrene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Benzo(ghi)perylene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Carbazole$_A$	<1	<1	<1					µg/l	1	A-T-052w
Chrysene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Dibenzofuran$_A$	<1	<1	<1					µg/l	1	A-T-052w
n-Dibutylphthalate$_A$	<1	<1	<1					µg/l	1	A-T-052w

Envirolab Job Number: 21/12978

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12978/1	21/12978/2	21/12978/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS04							
Depth to Top	2.10	2.70	3.20							
Depth To Bottom	3.60	3.70	3.70							
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
n-Dioctylphthalate$_A$	<10	<10	<10					µg/l	10	A-T-052w
n-Nitroso-n-dipropylamine$_A$	<1	<1	<1					µg/l	1	A-T-052w
Diethyl phthalate$_A$	40	30	46					µg/l	1	A-T-052w
Dimethyl phthalate$_A$	<1	<1	<1					µg/l	1	A-T-052w
Dibenzo(ah)anthracene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Fluorene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Fluoranthene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Hexachlorobenzene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Pentachlorophenol (SVOC)$_A$	<1	<1	<1					µg/l	1	A-T-052w
Phenol$_A$	1	<1	<1					µg/l	1	A-T-052w
Hexachloroethane$_A$	<1	<1	<1					µg/l	1	A-T-052w
Nitrobenzene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Naphthalene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Isophorone$_A$	<1	<1	<1					µg/l	1	A-T-052w
Hexachlorocyclopentadiene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Phenanthrene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Pyrene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Indeno(1,2,3-cd)pyrene$_A$	<1	<1	<1					µg/l	1	A-T-052w
Perylene$_A$	<1	<1	<1					µg/l	1	A-T-052w

Envirolab Job Number: 21/12978

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12978/1	21/12978/2	21/12978/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS04							
Depth to Top	2.10	2.70	3.20							
Depth To Bottom	3.60	3.70	3.70							
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
VOC (w)										
Dichlorodifluoromethane$_A$	<1	<1	<1					µg/l	1	A-T-006w
Chloromethane$_A$	<10	<10	<10					µg/l	10	A-T-006w
Vinyl Chloride$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Bromomethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Chloroethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Trichlorofluoromethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
trans 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Dichloromethane$_A$	<5	<5	<5					µg/l	5	A-T-006w
Carbon Disulphide$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
1,1-Dichloroethene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
1,1-Dichloroethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
cis 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Bromochloromethane$_A^{\#}$	<5	<5	<5					µg/l	5	A-T-006w
Chloroform$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
2,2-Dichloropropane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
1,2-Dichloroethane$_A^{\#}$	<2	<2	<2					µg/l	2	A-T-006w
1,1,1-Trichloroethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
1,1-Dichloropropene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Benzene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Carbon Tetrachloride$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Dibromomethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
1,2-Dichloropropane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Bromodichloromethane$_A^{\#}$	<10	<10	<10					µg/l	10	A-T-006w
Trichloroethene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
cis 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
trans 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
1,1,2-Trichloroethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Toluene$_A^{\#}$	1	<1	<1					µg/l	1	A-T-006w
1,3-Dichloropropane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Dibromochloromethane$_A^{\#}$	<3	<3	<3					µg/l	3	A-T-006w
1,2-Dibromoethane$_A^{\#}$	<1	<1	<1					µg/l	1	A-T-006w
Tetrachloroethene$_A$	<1	<1	<1					µg/l	1	A-T-006w

Envirolab Job Number: 21/12978

Client Project Name: 9 Harpers Lane

Client Project Ref: E23890

Lab Sample ID	21/12978/1	21/12978/2	21/12978/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS04							
Depth to Top	2.10	2.70	3.20							
Depth To Bottom	3.60	3.70	3.70							
Date Sampled	25-Nov-21	25-Nov-21	25-Nov-21							
Sample Type	Water - EW	Water - EW	Water - EW							
Sample Matrix Code	N/A	N/A	N/A							
1,1,1,2-Tetrachloroethane$_A$	<1	<1	<1					µg/l	1	A-T-006w
Chlorobenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
Ethylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
m & p Xylene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
Bromoform$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
Styrene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,1,2,2-Tetrachloroethane$_A$	<1	<1	<1					µg/l	1	A-T-006w
o-Xylene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,2,3-Trichloropropane$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
Isopropylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
Bromobenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
2-Chlorotoluene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
n-propylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
4-Chlorotoluene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,2,4-Trimethylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
4-Isopropyltoluene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,3,5-Trimethylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,2-Dichlorobenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,4-Dichlorobenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
sec-Butylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
tert-Butylbenzene$_A^\#$	<2	<2	<2					µg/l	2	A-T-006w
1,3-Dichlorobenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
n-butylbenzene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w
1,2-Dibromo-3-chloropropane$_A^\#$	<2	<2	<2					µg/l	2	A-T-006w
1,2,4-Trichlorobenzene$_A^\#$	<3	<3	<3					µg/l	3	A-T-006w
1,2,3-Trichlorobenzene$_A^\#$	<3	<3	<3					µg/l	3	A-T-006w
Hexachlorobutadiene$_A^\#$	<1	<1	<1					µg/l	1	A-T-006w

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

v1

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Environmental Management Solutions Ltd, The Old Surgery,, 22a King Street, Hereford, UK, HR4 9DA

Project: 9 Harpers Lane

Clients Project No: E23890

Project No: 21/12978

Date Received: 01/12/2021 (am)

Cool Box Temperatures (°C): 6.9

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/12978/1	21/12978/2	21/12978/3
Client Sample No			
Client Sample ID/Depth	WS01 2.10-3.60m	WS03 2.70-3.70m	WS04 3.20-3.70m
Date Sampled	25/11/21	25/11/21	25/11/21
A-T-006w	09/12/2021	09/12/2021	09/12/2021
A-T-052w	13/12/2021	13/12/2021	13/12/2021

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Environmental Management Solutions Ltd.
The Old Surgery,
22a King Street,
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HR4 9DA

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