

CONTAMINATED LAND RISK ASSESSMENT

Phase 2 Environmental Site Investigation Report

Site

10 Church End
Markyate
St Albans
AL3 8PY

Client

Gleneden Plant Sales Ltd

Report Reference

PH2-2023-000036

Prepared by

STM Environmental Consultants Ltd

Date

31/10/2023



**CONSULTING GEO-ENVIRONMENTAL
ENGINEERS AND SCIENTISTS**

Phase 1 Contaminated Land Desk Studies, Geo-Environmental Site Investigations, Environmental Due Diligence, Flood Risk Assessments, Surface Water Management Strategies (SuDS), Ecology, Noise and Air Quality Assessments, Environmental Management Systems, GIS & Data Management Systems

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1 DOCUMENT CONTROL



CONTAMINATED LAND RISK ASSESSMENT PHASE 2 ENVIRONMENTAL SITE INVESTIGATION REPORT



Site Address:	10 Church End Markyate St Albans AL3 8PY
Site Coordinates:	505968, 216797
Prepared for:	Gleneden Plant Sales Ltd
Report Reference:	PH2-2023-000036
Version No:	1.0
Date:	31/10/2023
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2 DISCLAIMERS

This report and any information or advice which it contains, is provided by STM Environmental Consultants Ltd (STM) and can only be used and relied upon by Gleneden Plant Sales Ltd (Client). Any party other than the Client using or placing reliance upon any information contained in this report, do so at their own risk.

STM has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. However, STM gives no warranty, representation or assurance as to the accuracy or completeness of any information, assessments or evaluations presented within this report.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

It should be noted that this report has been produced for environmental purposes only. It should not in any way be construed to be or used to replace a geotechnical survey, structural survey, asbestos survey, buried services survey, unexploded ordnance survey or invasive plant survey.

All coordinates and ground levels stated within the report are approximated based on OS mapping and LIDAR data. It is recommended that a topographic survey is undertaken if more accurate estimates are required.

3 EXECUTIVE SUMMARY

SECTION	SUMMARY
Site Location and Description	The site is located at 10 Church End, Markyate, St Albans, AL3 8PY and is centred at national grid reference 505968, 216797. The site has an area of approximately 0.01ha.
Proposed Development	The development proposal is for the ' <i>Conversion of existing former commercial building (E1) to dwelling house (C3) and construction of part first, part 1.5 storey side extension with soft and hard landscaping</i> '. It is understood that private gardens are included in the proposed development.
Summary of Phase 1 Desk Study	<p>A Phase 1 Desk Study was carried out by STM in October 2023 which indicated that the site has been subject to past Potentially Contaminative Land Uses (PCLUs) including Engineering Works and Fly-Tipping. Off site PCLUs identified included a Works/Factory (adjacent W) and Cemetery (170m SW). A conceptual risk site model was constructed and a qualitative risk assessment carried out. This identified potentially significant Potential Pollutant Linkages with respect to human health, groundwater, and property receptors.</p> <p>The Desk Study recommended that an intrusive site investigation be carried out with the objective of determining the presence and extent of any soil and gaseous contamination at the site.</p>
Summary of Site Investigation	<p>Site investigation works were carried out on the 31st August 2023. A total of 3no. boreholes (BH01 – BH03) were excavated to a maximum depth of 3 mbgl using a hand auger.</p> <p>A total of 6no. soil samples were collected from depths ranging between 0.3m – 1.2mbgl and submitted to a UKAS/MCERTS accredited laboratory for analysis of Heavy Metals, TPH, BTEX, PAHs, SVOCs and Asbestos.</p> <p>All of the boreholes (BH01 – BH03) were installed as groundwater, ground gas and vapour monitoring wells to depths up to 3mbgl. 3no. rounds of ground gas monitoring were undertaken over 4 weeks.</p>
Updated Contamination Assessment	<p>Reinforced concrete was encountered to a maximum depth of 0.2mbgl, underlain by Made Ground comprising clayey SILT and gravelly silty CLAY to a maximum depth of 1.6mbgl. This was underlain by gravelly chalky CLAY to a maximum depth of 2.5mbgl, underlain by CHALK to 3mbgl, the maximum depth of the boreholes.</p> <p>Visual indications of contamination of the Made Ground were observed (i.e. fragments of brick, concrete, plastic, and occasional flaky white unidentified fragments) generally across the site. No significant odours or PID readings were recorded during the investigation.</p>

SECTION	SUMMARY
	<p>A Generic Quantitative Risk Assessment was carried out where the results of the soil sample analysis were compared to Generic Assessment Criteria (GAC) for a residential housing with home-grown produce land use scenario.</p> <p>Results of the soil sample analyses identified concentrations above the chosen GAC for Lead as well as PAHs (Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(ah)anthracene) in soils from all of the borehole locations. Asbestos was not identified in any of the samples screened.</p> <p>A Gas Screening Value (GSV) of 0.023l/hr was calculated using the results of the ground gas monitoring. The GSV indicates that the site should be classified as “Characteristic Situation 1 (CS1) – Very Low Gas Risk” meaning that no standard gas protection measures are considered to be required.</p> <p>The Conceptual Risk Model for the site was reassessed incorporating the results of the site investigation.</p> <p>Potentially Significant Potential Pollutant Linkages were considered to exist with respect to human health and property receptors. These are concerned with the risk of human health receptors (future occupiers) being exposed to the identified contamination while undertaking recreational activities in gardens.</p>
<p>Conclusions and Recommendations</p>	<p>Given the findings of the site investigation, it is recommended that remedial measures are undertaken in order to break the Potential Pollutant Linkages identified so as to render the site suitable for the proposed residential end use.</p> <p>A formal remediation strategy will likely need to be submitted to the Local Planning Authority for approval. Once completed, the remedial works will need to be validated and a remediation verification report submitted to the Local Planning Authority for approval prior to occupation of the development.</p> <p>It is recommended that a “watching brief” is kept at all times during the development. Should any unexpected contamination be encountered then the discovery strategy outlined in this document should be followed.</p>

4 INTRODUCTION

STM Environmental Consultants Limited were commissioned by Gleneden Plant Sales Ltd to undertake a preliminary risk assessment at 10 Church End, Markyate, St Albans, AL3 8PY (the site).

4.1 Development Proposal

The report was produced to support the discharge of Condition 6(ii) attached to planning permission 21/04038/FUL for the 'Conversion of existing former commercial building (E1) to dwelling house (C3) and construction of part first, part 1.5 storey side extension with soft and hard landscaping'.

The condition states the following:

(ii) **A Phase II Report** consists of an intrusive site investigation and risk assessment. The report should make recommendations for further investigation and assessment where required.

It is understood that there are proposals to include private gardens in the development. The decision notice and proposed development plans are available in [Appendix 1](#).

4.2 Report Objectives

The main objectives of the study were to:

- Provide information for a generic quantitative risk assessment (GQRA) to be undertaken;
- Refine the Conceptual Site Risk Model using the findings of the GQRA;
- Inform the need for and scope of any remedial works that may be required.

A summary of the findings of the site investigation and GQRA are detailed within this report.

This report should be read in conjunction with the Desk Study Report (Ref: PH1-2023-000075) produced for the site by STM Environmental Consultants in October 2023 which is summarised below.

5 SUMMARY OF DESK STUDY FINDINGS

5.1 Site Location

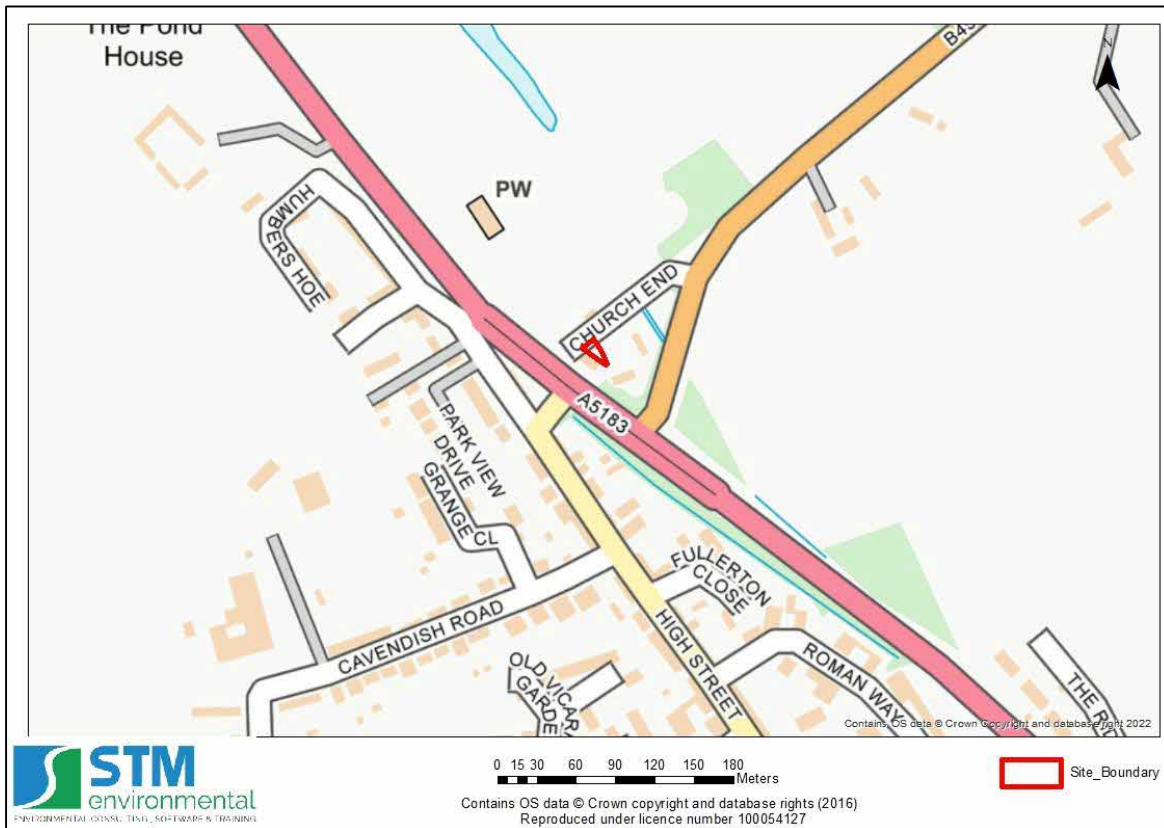
The site is located at 10 Church End, Markyate, St Albans, AL3 8PY and is centred at national grid reference 505968, 216797. The site has an area of approximately 0.01ha.

The site lies within the jurisdiction of Dacorum Borough Council in terms of the planning process. Maps showing the location of the site are shown in the figure below.

5.2 Current Site and Surrounding Land Uses

The site currently comprises a disused two-storey commercial building with a single storey side structure which was previously a Storeroom/Workshop. There is evidence of Fly Tipping to the rear of the property. The main current uses in the immediate surrounding area include Industrial, commercial and potentially Agricultural uses.

Figure 1: Site Location and Aerial Map



5.3 Site History

Examination of Ordnance Survey historic maps revealed that the site was undeveloped land until c. 1920-22, when 1no. unspecified building was developed. By c.1970-71, the site was redeveloped as 2no. buildings labelled 'Engineering Works'. Maps from c.1991-92 show the site relabelled as 'Works', and 1no. building constructed in the west of the site. The surrounding area has been Industrial and commercial uses.

The Phase 1 Desktop Study indicated that the site and immediate surrounding area had been subject to past potentially contaminative uses including Engineering Works and Fly-Tipping while off site PCLUs include a Works/Factory (adjacent W) and Cemetery (170m SW).

5.4 Previous Site Investigations

A search of relevant information on Dacorum Borough Council's planning portal did not identify any records of previous contaminated land site investigations undertaken at or in the vicinity of the site.

5.5 Qualitative Risk Assessment

A qualitative risk assessment was undertaken in order to assess the magnitude of the potential risks identified in the Phase 1 Report.

5.5.1 Potential Sources

Any Potentially Contaminative Land Uses (PCLUs) within a 50m radius of the site as well as any PCLUs with high pollution migration potential within 250m of the site were considered to be of concern and were included within the assessment.

A summary is provided in the table below.

Table 1: Summary of potential contamination sources, period of operation and distance from site.

Site Name/ Description	Industrial Profile	Approx. Year Use Established	Approx. Year Use Ended	Direction	Approx. Distance from Site (m)
Potential Made Ground	-	Unknown	Current (2023)	Onsite	0
Engineering Works	Engineering Works	c.1970-71	Unknown	Onsite	0
Storeroom/Workshop	-	Unknown	Current (2023)	Onsite	0
Fly-Tipping	-	Unknown	Current (2023)	Onsite	0
Works/ Factory*	Factory or Works – Use Not Specified	c.1970-71	Unknown	Adjacent	W
Cemetery	Cemetery or Graveyard	c.1920-22	Current (2023)	SW	170

5.5.2 Potential Receptors

Potential human health receptors were considered to include future site users, construction workers and neighbours. Property receptors were considered to include onsite buildings and services.

Data from the BGS indicates that the site is underlain by superficial deposits consisting of Alluvium (Clay, Silt, Sand and Gravel) which are classified as a Secondary A Aquifer. The bedrock consists of Holywell Nodular Chalk Formation and New Pit Chalk Formation (Undifferentiated – Chalk) and is classified as a Principal Aquifer. The site does lie within Source Protection Zone 2 and there are no recorded water abstractions within 2000m of the site.

The nearest surface water receptor is the River Ver which is located approximately 35m east at its nearest point to the site.

No designated ecological receptors were identified onsite or within 250m of the site.

5.5.3 Conceptual Site Risk Model

A preliminary conceptual site risk model (CSM) was constructed in order to assess potential pollutant linkages.

Potentially significant potential pollutant linkages (PPLs) were identified with respect to:

- Human health receptors (PPL1a and PPL1b)
- Groundwater (PPL3)
- Property (PPL6a and PPL6b)

The desk study recommended that an intrusive site investigation be carried out to determine the presence and extent of any soil and gaseous contamination at the site.

6 SITE INVESTIGATION

The site investigation works were carried out on the 31st August 2023 and were undertaken in general accordance with the following guidance:

- Land contamination risk management (LCRM) guidance - DEFRA;
- BS 10175 - Code of practice for the Investigation of potentially contaminated sites British Standard Institution;
- BS 10176:2020 - Taking soil samples for determination of volatile organic compounds (VOCs);
- BS5930:2015 Code of Practice for Ground Investigation
- BS 8485: 2015 - Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution;
- BS8576:2013, Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs);
- C665, 2007 - Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA.

6.1.1 Sampling Strategy

A total of 3no. sampling locations (BH01 – BH3) were excavated to 3mbgl for contamination assessment purposes. A semi-targeted sampling strategy was used to select the locations of the exploratory positions, with boreholes being generally equally spaced out across the site, with efforts being made to ensure that samples were collected from the most sensitive areas (i.e. gardens) of the proposed development.

As the investigation was primarily focused on assessing the quality of near surface soils, samples were collected at depths between 0.4 – 1.2mbgl.

A map showing the locations of boreholes and the borehole logs are available in [Appendix 2](#) and [Appendix 3](#) respectively.

6.1.2 On-site Screening of Volatile Organic Compounds

Soil from each borehole was screened on site for Volatile Organic Compounds (VOCs) using a hand held Minirae Photo-Ionisation Detector (PID) which has a detection limit of 0.1 parts per billion (ppb). The PID was calibrated in the field prior to use using a gas of known concentration (isobutylene gas – 100ppm).

Soil vapour readings were taken using the headspace method, which involved placing the soil sample into a sealed plastic bag and then taking a reading by placing the PID filter into the bag.

6.1.3 Sample Collection and Transport

All samples were put into sample containers (jars and tubs) that were tightly sealed with minimal headspace. The sample containers were put into a cooler box immediately on collection and kept cool until analysis was undertaken at the laboratory.

6.1.4 Laboratory Analysis

A total of 6no. soil samples were submitted to a UKAS/MCERTS accredited laboratory for analysis of the following:

- Heavy Metals – Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc;
- Petroleum Hydrocarbons (TPHCWG);
- Total Phenols - Total Phenols (Monohydric);
- Monoaromatics – Benzene, Toluene, Ethylbenzene, p & m-xylene, o-xylene, MTBE (Methyl Tertiary Butyl Ether);
- Speciated PAHs – Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene;
- Total PAHs - Speciated Total EPA-16 PAHs;
- Asbestos Screening and Quantification;
- Inorganics - pH – Automated, Total Cyanide, Water Soluble Sulphate, Sulphide, Total Organic Carbon (TOC);
- SVOCs.

6.1.5 Groundwater, Ground Gas and Vapour Monitoring

All of the boreholes (BH01- BH03) were installed with standpipes equipped with monitoring apparatus to a maximum depth of 3mbgl in order to allow for the measurement of groundwater levels and the estimation of Gas Screening Values (GSVs) as per CIRIA 665 and BS8485 guidance.

The wells were constructed using 63mm HDPE plain pipe in a bentonite seal from existing ground level to 1.0 mbgl and 63mm HDPE slotted pipe in a gravel surround to the base of the borehole. The wells were fitted with a gas tap assembly and a lockable cover at ground level to provide protection.

The frequency of ground gas monitoring on site was decided in line with recommendations by CIRIA to provide monitoring data sufficient to allow the prediction of worst-case conditions. Based on the gas generation potential of the site and the sensitivity of the proposed development, 3no. monitoring visits were considered appropriate.

6.2 Site Investigation Findings

6.2.1 Ground Conditions

Reinforced concrete was encountered to a maximum depth of 0.2mbgl, underlain by Made Ground comprising clayey SILT and gravelly silty CLAY to a maximum depth of 1.6mbgl. This was underlain by gravelly chalky CLAY to a maximum depth of 2.5mbgl, underlain by CHALK to 3mbgl, the maximum depth of the boreholes.

The borehole logs are shown in [Appendix 3](#) and photographs from some of the soils extracted from the boreholes are presented in [Appendix 4](#).

6.2.2 Groundwater

Groundwater was not encountered during the site investigation or subsequent monitoring rounds.

6.2.3 Visual and Olfactory Signs of Contamination

Visual indications of contamination of the Made Ground were observed (i.e. fragments of brick, concrete, plastic, and occasional flaky white unidentified fragments) generally across the site. No significant odours or PID readings were recorded during the investigation. The PID readings can be seen in the borehole logs shown in [Appendix 3](#).

6.3 Laboratory Sample Analysis Results

A total of 6no. soil samples were submitted for analysis. The full results of the laboratory sample analysis can be seen in [Appendix 5](#).

7 RISK ASSESSMENT

7.1 Generic Quantitative Risk Assessment (Human Health)

A Generic Quantitative Risk Assessment (GQRA) was conducted using the soil analytical results in order to further evaluate the significance of the potential pollutant linkages identified in the Preliminary Risk Assessment in the Desk Study.

7.1.1 Generic Assessment Criteria for Soils

The GAC used for the screening of the soils and their sources are outlined in the table in [Appendix 6](#). The GAC used are a combination of the DEFRA's Category 4 Screening Levels and the CIEH\LQM GAC for residential with homegrown produce land use scenario as the proposed development involves private gardens.

7.1.2 Soil Organic Matter Content

Sample results indicated that soils on the site have an average Total Organic Carbon (TOC) content of 1.61%, which based on a conversion factor of 1.72, indicates a Soil Organic Matter (SOM) of around 2.77%. Therefore, a soil organic matter content of 2.5% was assumed.

7.1.3 Contaminants Exceeding Generic Assessment Criteria

A summary of contaminants that were found to be present in concentrations that exceeded the GAC is shown Table 2 below.

Table 2: Contaminants Exceeding GAC

Contaminant	GAC (mg/kg)	No. of Exceedances	Measured Concentrations (mg/kg)		Exceedance Borehole Locations
			Mean	Maximum	
Benzo(a)anthracene	11	2	6.31	20.2	BH01/3*, BH02/1
Benzo(a)pyrene	2.4	3	4.06	11.7	BH01/3*, BH02/1, BH02/2
Benzo(b)fluoranthene	3.3	2	4.13	12.1	BH01/3*, BH02/1
Dibenzo(ah)anthracene	0.28	3	0.66	1.91	BH01/3*, BH02/1, BH02/2
Lead	200	3	613.47	1978	BH02/2, BH03/1, BH03/3*

*Maximum value location

7.1.4 Statistical Analysis

The results of statistical analysis are presented in [Appendix 7](#). All of the contaminants that exhibited exceedances of the GAC (i.e. listed in the table above) had normal distributions and failed the Mean Value test.

7.2 Asbestos

Asbestos was not detected in any of the samples analysed.

7.3 Ground Gas Risk Assessment

A summary of the gas monitoring results is presented in Table 3 below. The full results are available in [Appendix 8](#). The readings include measurements during rising and falling atmospheric pressure conditions.

Table 3: Summary of ground gas monitoring results

Borehole	Barometric Pressure	Flow l/hr	CH ₄ %	CO ₂ %	O ₂ %	H ₂ S ppm	CO ppm	VOCs ppm
BH01	1000 - 1003	0.2-1.0	0.0-0.1	1.8-2.3	18.4-19.2	0	0.0-1.0	0.0
BH02	1000 - 1003	0.2-1.0	0.0	1.8-2.0	18.2-19.2	0	0.0-1.0	0.0
BH03	1000 - 1003	0.2-1.0	0.0	1.8-2.1	17.9-19.1	0	0.0-1.0	0.0

A maximum Methane concentration of 0.1% by volume in air (v/v), a maximum Carbon Dioxide concentration of 2.3% v/v and maximum flow rate of l/hr were recorded. A maximum PID reading of 0ppm was observed.

In accordance with CIRIA C665, the Gas Screening Value (GSV) for Carbon Dioxide was calculated as follows:

$$GSV = 0.023 * 1.0 = 0.023\text{/hr}$$

A GSV of 0.023l/hr indicates that the site should be classified as Wilson and Card “Characteristic Situation 1 (CS1) – Very Low Gas Risk” meaning that standard gas protection measures are not required.

Based on the typical maximum concentration of Carbon Dioxide being less than 5% v/v, the site is considered to be Green (i.e. ground gas protection measures are not required) under the [NHBC classification system](#).

8 RE-ASSESSMENT OF POTENTIAL POLLUTANT LINKAGES

The Potential Pollutant Linkages (PPLs) identified as being plausible in the Desk Study are concerned with the following risks:

- Risk of direct contact (ingestion and absorption) with and inhalation of contaminants to on-site human health receptors (PPL1a – Future Occupiers and PPL1c – Construction Workers);
- Risk of injury/death of on-site human health receptors as a result of explosion due to accumulation of ground gas from on and off-site sources in confined spaces within on-site dwellings. (PPL1b- – Future Occupiers and PPL1d - Construction Workers);
- Risk of direct contact with (ingestion and absorption) and inhalation of contaminants to off-site human health receptors as a result of on-site contaminants migrating off-site (PPL2a);
- Risk of injury/death to off-site human health receptors as a result of explosion due to migration of on-site ground gas and subsequent accumulation in confined spaces in off-site buildings. (PPL2b);
- Risk of deterioration of groundwater quality resulting from the migration of on-site contaminants into the underlying aquifer (PPL3);
- Risk of deterioration of surface water quality resulting from the migration and entry of on-site contaminants into the surface water receptor (PPL4);
- Risk of deterioration of ecological quality resulting from the migration and entry of on-site contaminants to the ecological receptor during development and after completion (PPL5);
- Risk of damage to buildings and services from on and off-site contaminants (PPL6a);
- Risk of damage to property as a result of explosion due to accumulation of ground gas from on and off-site sources in confined spaces within buildings (PPL6b).

The Desk Study concluded that PPL1a, PPL1b, PPL3, PPL6a and PPL6b had the potential to be significant. All of the PPLs were re-assessed considering the soil analytical results obtained from site investigation. The table below presents the results of the re-assessment.

A detailed explanation of the risk assessment methodology is available in [Appendix 9](#).

Table 4: Results of Qualitative Risk Assessment.

CRITERIA	POTENTIAL POLLUTANT LINKAGES										
	PPL1a	PPL1b	PPL1c	PPL1d	PPL2a	PPL2b	PPL3	PPL4	PPL5	PPL6a	PPL6b
POTENTIAL PATHWAY/ RECEPTOR	Contact/ Inhalation - Human Health (Future Occupiers)	Explosion - Human Health (Future Occupiers)	Contact/ Inhalation - Human Health (Construction Workers)	Explosion - Human Health (Construction Workers)	Contact/ Inhalation - Offsite Human Health Receptors	Explosion - Human Health Receptors	Contact - Groundwater	Contact - Surface Water	Contact - Ecology	Contact - On & Off-Site Property	Explosion - On & Off-Site Property
SEVERITY	Major (4)	Major (4)	Major (4)	Major (4)	Major (4)	Major (4)	Moderate (3)	Moderate (3)	Moderate (3)	Moderate (3)	Moderate (3)
LIKELIHOOD	Possible (3)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Possible (3)	Improbable (1)
RISK	Moderate (12)	Low (4)	Low (4)	Low (4)	Low (4)	Low (4)	Very Low (3)	Very Low (3)	Very Low (3)	Low to Moderate (9)	Very Low (3)
POTENTIALLY SIGNIFICANT?	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO

8.1 Potential Risks to On-Site Human Health

PPL1a and PPL1c are concerned with the risk of direct contact (ingestion and dermal absorption) with and inhalation of on and off-site contaminants by on site human health receptors. PPL1a is considered to have the potential to be significant given the Lead and PAH contamination identified. As the proposal is to introduce a residential dwelling with private gardens, it is possible that human health receptors (i.e. future occupiers of the dwellings) could be exposed to contamination while undertaking recreational activities in the gardens.

PPL1c is considered unlikely to be significant as it is considered that any potential risks to groundworkers can be adequately dealt with by ensuring that standard health and safety measures are implemented during the construction phase.

PPL1b and PPL1d are concerned with the risk of injury/death of on-site human health receptors as a result of explosion due to the potential accumulation of ground gases and vapours from on and off-site sources. These PPLs are considered unlikely to have the potential to be significant as no significant concentrations of ground gases or vapours were identified during the ground gas monitoring.

8.2 Potential Risks to Off-Site Human Health

PPL2a is concerned with the risk of direct contact and inhalation of contaminants originating from the site by off-site human health receptors. PPL2a is considered unlikely to have the potential to be significant. Although PAH and Heavy Metal contamination was identified, given their immobility, the concentrations encountered are not considered sufficient to impact offsite human health receptors.

PPL2b is concerned with the risk of injury/death of on-site human health receptors as a result of explosion due to accumulation of ground gases from on-site sources. PPL2b is considered unlikely to be significant for the same reasons as PPL1b.

8.3 Potential Risks to Groundwater Receptors

PPL3 is concerned with the risk of deterioration of groundwater quality resulting from the migration of on-site contaminants into the underlying aquifer. PPL3 is assessed as unlikely to have the potential to be significant as the contamination (i.e. Lead and PAHs) identified at the site is considered to be of insufficient mobility to impact the groundwater receptor. Additionally, no groundwater was encountered during the intrusive investigation or subsequent monitoring rounds, and there are no recorded water abstractions within 2000m of the site.

8.4 Potential Risks to Surface Water Receptors

PPL4 is concerned with the risk of negative impacts on surface water quality resulting from the migration and entry of on-site contaminants into surface water receptors. Although the nearest water course is the River Ver located 35m from the site, it is considered that the identified PAHs and Lead contamination present at the site is of insufficient magnitude and mobility to significantly impact the water body.

8.5 Potential Risks to Ecological Receptors

PPL5 is concerned with the risk of negative ecological impacts resulting from potential on-site contaminants. PPL5 is considered unlikely to have the potential to be significant given that no designated ecological receptors were identified onsite or within 250m of the site.

8.6 Potential Risks to Property Receptors

PPL6a is concerned with the risk of damage to on site buildings and services from on and off-site contaminants. If contaminated, the soil may contain aggressive chemicals (i.e. Sulphates, VOCs) that can attack building materials and services. PPL6a is considered to have the potential to be significant. Given the elevated concentrations of aggressive contaminants (i.e. PAHs) identified in the soils tested, they could impact upon the buildings present on the site. Therefore, it is recommended that the statutory water undertaker should be consulted to confirm their requirements for any water supply services to be installed at the site.

PPL6b is concerned with the risk of damage to property as a result of explosion due to migration of on and off-site ground gases and vapours and their subsequent accumulation in confined spaces in on-site buildings. PPL6b is considered unlikely to be significant for the same reasons as PPL1b.

9 CONCLUSIONS

In response to the findings of the Desk Study carried out for the site by STM Environmental Consultants, an environmental site investigation was carried out on the 31st August 2023. The objective of the investigation was to determine the presence and extent of potential contamination at the site in order to further inform the risk assessment process.

A total of 3no. boreholes were advanced to a maximum depth of 3mbgl for the purposes of environmental soil sampling. 6no. soil samples were taken from depths ranging from 0.4 – 1.2mbgl. The samples were submitted to a UKAS/MCERTS accredited laboratory for analysis of Heavy Metals, TPH, BTEX, PAHs, SVOCs and Asbestos.

3no. of the boreholes (BH01 – BH03) were excavated and installed as ground gas, vapour and groundwater monitoring wells. 3no. rounds of ground gas, groundwater and vapour monitoring were undertaken over a period of 4 weeks.

A Generic Quantitative Risk Assessment was carried out where the results of the soil sample analysis were compared to Generic Assessment Criteria (GAC) for a residential with homegrown produce land use scenario.

Results of the soil sample analysis indicate that concentrations of Lead as well as PAHs (Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(ah)anthracene) in soils from all of the borehole locations. Asbestos was not identified in any of the samples screened.

Ground gas monitoring did not identify any significant concentrations of Methane or Carbon Dioxide. A GSV of 0.023l/hr was calculated using the results of the monitoring which indicates that the site should be classified as Wilson and Card "Characteristic Situation 1 (CS1 – Very Low Gas Risk) meaning that gas protection measures are not required.

The Conceptual Risk Model for the site was reassessed incorporating the results of the site investigation. Potentially Significant Potential Pollutant linkages were considered to exist with respect to human health and property receptors. These are concerned with the risk of human health receptors (future occupiers) being exposed to the contamination identified while undertaking recreational activities in gardens.

The revised conceptual site risk model is summarised in

Table 5 below.

Table 5: Summary of revised conceptual site risk model

Potential Receptor	Potential Pathway	Potential Hazard	PSPPL?	Risk
On-Site Human Health (Future Occupiers & Groundworkers)	Ingestion/Absorption Inhalation	Adverse health Injury/Death	Yes	Moderate
	Build-up of Methane/ VOCs in confined spaces	Explosion/ Fire Injury/Death	No	Low
Off-Site Human Health	Ingestion/Absorption Inhalation	Adverse health Injury/Death	No	Low
	Build-up of Methane/ VOCs in confined spaces	Explosion/ Fire Injury/Death	No	Low
Groundwater	Percolation/Leaching	Adverse groundwater quality	No	Very Low
Surface Water	Lateral Migration Groundwater baseflow	Adverse Surface water quality	No	Very Low
Ecology	Ingestion/Absorption	Adverse health Injury/Death	No	Very Low
Property	Physical Contact/Absorption	Damage to building and services	Yes	Low to Moderate
	Build-up of Methane/ VOCs in confined spaces	Explosion/ Fire Damage to building	No	Very Low

10 RECOMMENDATIONS

10.1 Remedial Action



Given the findings of the site investigation, it is recommended that remedial measures are undertaken in order to break the Potential Pollutant Linkages identified so as to render the site suitable for the proposed residential end use.

Remedial measures will likely comprise the excavation of Made Ground and replacement with clean certified fill across areas of the site that are intended for use as gardens.

A formal remediation strategy will need to be submitted to the Local Planning Authority for approval. Once completed, the remedial works will need to be validated by a qualified Environmental Consultant and a remediation verification report submitted to the Local Planning Authority for approval prior to occupation of the development.

10.2 Watching Brief and Discovery Strategy

It is recommended that a “watching brief” is kept at all times during the development. Should any unexpected contamination be encountered then the discovery strategy outlined below should be followed.

-  Works should be halted if any suspicious ground conditions are identified by groundworkers;
-  The Contractor should assess the need for any immediate health and safety or environmental management control measures. If control measures are considered to be required, they should be implemented;

- The Contractor should notify the Client's Environmental Consultant and the Local Planning Authority;
- The Environmental Consultant should attend the site to record the extent of 'contamination' and if necessary, to collect samples;
- If remedial action is considered necessary then the proposed works should be agreed with the Local Planning Authority prior to implementation;
- Once remediation is complete, the Environmental Consultant should collate evidence of work carried out for inclusion in a Remediation Verification Report which should be submitted to the Local Planning Authority.

10.3 Health and Safety

Given that contaminants were identified on the site, measures will be necessary to protect the health and safety of site workers during the site works. The following measures are suggested to provide a minimum level of protection.

- Provision of appropriate Personal Protective Equipment (PPE) including protective clothing, footwear, gloves and dust masks to all groundworkers on-site. These should not be removed from site, and advice should be given on when and how they are to be used;
- Great care should be taken to minimise the amount of dust and mud generated on-site;
- Good practices relating to personal hygiene (i.e. washing and changing procedures) should be adhered to on-site, i.e. food and drink should only be consumed within designated areas on the site and smoking should be prohibited in all working areas;
- Availability of site welfare;
- Daily safety briefings.

All site works should be carried out in accordance with Health and Safety Executive regulations and guidelines and the Contractor's Construction Health and Safety Plan. Particular should be made to the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Development of Contaminated Land".

10.4 Waste Disposal

Groundworks at the site are likely to give rise to waste soils. These may require classification before removal from site to an appropriately licensed facility for treatment or final disposal. The Environment Agency's Hazardous Waste Technical Guidance document (WM3) outlines the methodology for classifying wastes.

The contractor will need to keep a full documentary record of the waste disposal works in line with Duty of Care requirements. The record will include waste transfer notes and details of the receiving site. Copies of all relevant documents should be provided to the Client's Environmental Consultant for inclusion in the remediation verification report.

10.5 Services

The Statutory Water Undertaker for the area should be contacted in relation to new services that are to be installed as part of the proposed development in order to determine their specification for the type of pipework/conduits that should be used on this site.

It is recommended that all services, and in particular potable water, should be supplied using materials that are resistant to attack and degradation to chemical attack. Reference should be made to the document '*Selection of Water Supply Pipes to be used in Brownfield Sites*', issued in January 2011 by the UK Water Industry Research.

11 INFORMATION GAPS AND UNCERTAINTIES

Assumptions have been made regarding the nature and scale of the activities that took place on the site and the types of potential contaminants that may have resulted. There are therefore a number of uncertainties associated with the investigation which include, but are not limited to, the following:

- This report is based on data obtained from the chosen sampling locations only. Although efforts have been made to ensure adequate coverage of the site when designing the investigation, it is nonetheless possible that (as with any site investigation) there may be locations which were not sampled where localised pockets of contamination exist.
- The site investigation and risk assessment were designed to investigate only the most likely contaminants associated with the potential sources of contamination identified in the Desk Study. The presence of additional unknown contaminants cannot be discounted.

These uncertainties will need to be reviewed along with the Conceptual Site Risk Model should further information come to light in the future.

12 APPENDICES

12.1 Appendix 1 – Proposed Development Plans

Dacorum Borough Council Planning and Regeneration

The Forum
Marlowes
Hemel Hempstead
Herts
HP1 1DN



Mr David Or Martin Lomas Or Crook
MSC Planning Associates Ltd
The Old Registry
20 Amersham Hill
High Wycombe
HP13 6NZ

Switchboard
01442 228 000
Website
www.dacorum.gov.uk
D/deaf callers, Text Relay:
18001 + 01442 228 000

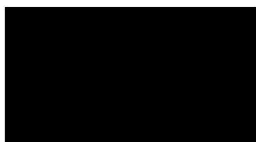
DECISION NOTICE

Application (full) for planning permission.

Town and Country Planning Act 1990

Reference:	21/04038/FUL
Proposal:	Conversion of existing former commercial building (E1) to dwelling house (C3) and construction of part first, part 1.5 storey side extension with soft and hard landscaping.
Address:	10 Church End Markyate St Albans Hertfordshire AL3 8PY

Your application received 22nd October 2021 and registered on 28th October 2021 has been **GRANTED** subject to the conditions overleaf.



Head of Development Management
Dacorum Borough Council

Condition(s) and Reason(s):

1. The development hereby permitted shall begin before the expiration of three years from the date of this permission.

Reason: To comply with the requirements of Section 91 (1) of the Town and Country Planning Act 1990, as amended by Section 51 (1) of the Planning and Compulsory Purchase Act 2004.

2. The development hereby permitted shall be carried out in accordance with the following approved plans/documents:

21.058 2A, 21 058 1A, K0422-E-S1

Reason: For the avoidance of doubt and in the interests of proper planning.

3. The parking space shown on the approved plan shall be kept available at all times for the parking of motor vehicles by the occupants of the dwelling[s] and their visitors and for no other purpose.

Reason: In accordance with Policy CS12 of the Dacorum Borough Core Strategy (2013) and Section 9 of the National Planning Policy Framework (2021).

4. Notwithstanding the provisions of the Town and Country Planning (General Permitted Development) Order 2015 (as amended) (or any Order amending or re-enacting that Order with or without modification) no development falling within the following classes of the Order shall be carried out without the prior written approval of the Local Planning Authority:

Schedule 2 Part 1 Classes A, B, C, E.

Reason: To enable the Local Planning Authority to retain control over the development in the interests of safeguarding the residential and visual amenity of the locality in accordance with Policy CS12 of the Dacorum Borough Core Strategy (2013) and Paragraph 130 of the National Planning Policy Framework (2021).

5. No development (excluding demolition/ground investigations) shall take place until details of the materials to be used in the construction of the external surfaces of the development hereby permitted have been submitted and approved in writing by the Local Planning Authority. Development shall be carried out in accordance with the approved details. Please do not send materials to the Council offices. Materials should be kept on site and arrangements made with the Planning Officer for inspection.

Reason: To ensure satisfactory appearance to the development and to safeguard the visual character of the area in accordance with Policies CS11 and CS12 of the Dacorum Borough Core Strategy (2013).

6. No development, shall take place until a Phase I Report to assess the actual or potential contamination at the site has been submitted to and approved in writing by the Local Planning Authority. If actual or potential contamination and/or ground gas risks are identified, further investigation shall be carried out and a Phase II report shall be submitted to and approved in writing by the Local Planning Authority prior to the commencement of the development. If the Phase II report establishes that remediation or protection measures are necessary, a Remediation Statement shall be submitted to and approved in writing by the Local Planning Authority.

For the purposes of this condition:

(i) A Phase I Report consists of a desk study, site walkover, conceptual model and a preliminary risk assessment. The desk study comprises a search of available information and historical maps which can be used to identify the likelihood of contamination. A simple walkover survey of the site is conducted to identify pollution linkages not obvious from desk studies. Using the information gathered, a 'conceptual model' of the site is constructed and a preliminary risk assessment is carried out.

(ii) A Phase II Report consists of an intrusive site investigation and risk assessment. The report should make recommendations for further investigation and assessment where required.

(iii) A Remediation Statement details actions to be carried out and timescales so that contamination no longer presents a risk to site users, property, the environment or ecological systems.

Reason: To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other off-site receptors in accordance with Policy CS32 of the Dacorum Borough Core Strategy (2013) and Paragraphs 183 and 185 of the National Planning Policy Framework (2021).

7. All remediation or protection measures identified in the Remediation Statement referred to in Condition above shall be fully implemented within the timescales and by the deadlines as set out in the Remediation Statement and a Site Completion Report shall be submitted to and approved in writing by the Local Planning Authority prior to the first occupation of any part of the development hereby permitted.

For the purposes of this condition: a Site Completion Report shall record all the investigation and remedial or protection actions carried out. It shall detail all conclusions and actions taken at each stage of the works including validation work. It shall contain quality assurance and validation results providing evidence that the site has been remediated to a standard suitable for the approved use.

Reason: To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to

controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other off-site receptors in accordance with Policy CS32 of the Dacorum Borough Core Strategy (2013) and Paragraphs 183 and 185 of the National Planning Policy Framework (2021).

8. No development shall take place until a detailed BS4142: 2014 Noise Impact Assessment has been undertaken and submitted to the Local Planning Authority for approval. The report shall detail noise emissions and appropriate mitigation to protect residents against such industrial noise sources, including but not limited to, mechanical plant (fans, generators a/c, air handling unit, local exhaust ventilation, reversing beepers, crates, deliveries, metal cage/pallet deliveries, forklift trucks, rubbish collections, glass breakage, radio's etc.). The rating level of the noise emitted from the commercial site shall not exceed the existing typical background (LA90,1hr daytime) and (LA90,15 min) night-time. The noise levels shall be determined at the nearest noise sensitive receptor or known proposed residential dwellings. Development shall be carried out in accordance with the approved measures.

Reason: To protect the residential amenities of the locality, having regard to Policies CS12 and CS32 of the Dacorum Borough Core Strategy (2013) and Paragraph 130 (f) of the National Planning Policy Framework (2021).

Informatives:

1. Planning permission has been granted for this proposal. The Council acted pro-actively through positive engagement with the applicant during the determination process which led to improvements to the scheme. The Council has therefore acted pro-actively in line with the requirements of the Framework (paragraph 38) and in accordance with the Town and Country Planning (Development Management Procedure) (England) (Amendment No. 2) Order 2015.
2. Highway Informatives
HCC as Highway Authority recommends inclusion of the following Advisory Note (AN) / highway informative to ensure that any works within the highway are carried out in accordance with the provisions of the Highway Act 1980:

AN 1) Storage of materials: The applicant is advised that the storage of materials associated with the construction of this development should be provided within the site on land which is not public highway, and the use of such areas must not interfere with the public highway. If this is not possible, authorisation should be sought from the Highway Authority before construction works commence. Further information is available via the County Council website at:

<https://www.hertfordshire.gov.uk/services/highways-roads-and-pavements/business-and-developer-information/business-licences/business-licences.aspx> or by telephoning 0300 1234047.

AN 2) Obstruction of highway: It is an offence under section 137 of the Highways Act 1980 for any person, without lawful authority or excuse, in any way to wilfully obstruct the free passage along a highway or public right of way. If this development is likely to result in the public highway or public right of way network becoming routinely blocked (fully or partly) the applicant must contact the Highway Authority to obtain their permission and requirements before construction works commence. Further information is available via the County Council website at:

<https://www.hertfordshire.gov.uk/services/highways-roads-and-pavements/business-and-developer-information/business-licences/business-licences.aspx> or by telephoning 0300 1234047.

AN 3) Debris and deposits on the highway: It is an offence under section 148 of the Highways Act 1980 to deposit compost, dung or other material for dressing land, or any rubbish on a made up carriageway, or any or other debris on a highway to the interruption of any highway user. Section 149 of the same Act gives the Highway Authority powers to remove such material at the expense of the party responsible. Therefore, best practical means shall be taken at all times to ensure that all vehicles leaving the site during construction of the development and use thereafter are in a condition such as not to emit dust or deposit mud, slurry or other debris on the highway. Further information is available by telephoning 0300 1234047.

3. Working Hours Informative

Contractors and sub-contractors must have regard to BS 5228-2:2009 "Code of Practice for Noise Control on Construction and Open Sites" and the Control of Pollution Act 1974.

As a guideline, the following hours for noisy works and/or deliveries should be observed: Monday to Friday, 7.30am to 5:30pm, Saturday, 8am to 1pm, Sunday and bank holidays - no noisy work allowed.

Where permission is sought for works to be carried out outside the hours stated, applications in writing must be made with at least seven days' notice to Environmental and Community Protection Team ecp@dacorum.gov.uk or The Forum, Marlowes, Hemel Hempstead, HP1 1DN. Local residents that may be affected by the work shall also be notified in writing, after approval is received from the LPA or Environmental Health.

Works audible at the site boundary outside these hours may result in the service of a Notice restricting the hours as above. Breach of the notice may result in prosecution and an unlimited fine and/or six months imprisonment.

Waste Management Informative

Under no circumstances should waste produced from the development be incinerated on site. This includes but is not limited to pallet stretch wrap, used bulk bags, building materials, product of demolition and so on. Suitable waste management should be in place to reduce, reuse, recover or recycle waste product on site, or dispose of appropriately.

Air Quality Informative.

As an authority we are looking for all development to support sustainable travel and air quality improvements as required by the NPPF. We are looking to minimise the cumulative impact on local air quality that ongoing development has, rather than looking at significance. This is also being encouraged by DEFRA.

As a result as part of the planning application I would recommend that the applicant be asked to propose what measures they can take as part of this new development, to support sustainable travel and air quality improvements. These measures may be conditioned through the planning consent if the proposals are acceptable.

A key theme of the NPPF is that developments should enable future occupiers to make "green" vehicle choices and (paragraph 35) "incorporates facilities for charging plug-in and other ultra-low emission vehicles". Therefore an electric vehicle recharging provision rate of 1 vehicle charging point per 10 spaces (unallocated parking) is expected. To prepare for increased demand in future years, appropriate cable provision should be included in the scheme design and development, in agreement with the local authority.

Please note that with regard to EV charging for residential units with dedicated parking, we are not talking about physical charging points in all units but the capacity to install one. The cost of installing appropriate trunking/ducting and a dedicated fuse at the point of build is miniscule, compared to the cost of retrofitting an EV charging unit after the fact, without the relevant base work in place.

In addition, mitigation in regards to NOx emissions should be addressed in that all gas fired boilers to meet a minimum standard of 40 mg NOx/Kwh or consideration of alternative heat sources.

Invasive and Injurious Weeds - Informative

Weeds such as Japanese Knotweed, Giant Hogweed and Ragwort are having a detrimental impact on our environment and may injure livestock. Land owners must not plant or otherwise cause to grow in the wild any plant listed on schedule 9 of the Wildlife and Countryside Act 1981. Developers and land owners should therefore undertake an invasive weeds survey before development commences and take the steps necessary to avoid weed spread. Further advice can be obtained from the Environment Agency website at <https://www.gov.uk/japanese-knotweed-giant-hogweed-and-other-invasive-plants> .

This application was supported by the following documents:

- 21-058-3 (Existing Floor Plans)
 - (Site Location Plan)
 - (Flood Risk Assessment)
 - (Heritage Statement)
- 21-058-2 (Proposed Floor plans)
- 21-058-1 (Proposed Elevations)
- F0121-F (Site plans)

(Planning Statement)

Notes:

Appeal to the Planning Inspectorate

If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.

Before making any appeal you should first consider re-engaging with the local planning authority to discuss whether any changes to the proposal would make it more acceptable and likely to gain planning permission. A revised planning application could then be submitted.

Applicants should give consideration to the merits of the case, and whether there are strong grounds to contest the conditions or reasons for refusal of planning permission before submitting an appeal. Parties who pursue an appeal unreasonably without sound grounds for appeal may have an award of costs made against them.

Most planning appeals must be received within six months of the date on the decision notice. Where the appeal relates to an application for householder planning consent, and is to be determined via the fast track Householder Appeals Service, there are only 12 weeks to make the appeal. Appeals related to shop fronts must also be submitted within 12 weeks. Advertisement consent appeals must be submitted within 8 weeks. If an appeal on an application for planning permission is linked to enforcement action, there are only 28 days to make the appeal.

Appeals can be made online at: <https://www.gov.uk/planning-inspectorate>. If you are unable to access the online appeal form, please contact the Planning Inspectorate to obtain a paper copy of the appeal form on telephone: 0303 444 5000.

Compensation

In certain circumstances, compensation may be claimed for the Borough Council if permission is refused, or granted subject to conditions, by the Secretary of State on appeal or on reference of an application to him. These circumstances are set out in Parts VI and VIII and related provisions of the Town and Country Planning Act 1990 and Part 1 Chapter III of the Planning (Listed Buildings and Conservation Areas) Act 1990.

Purchase Notices

If either the Local Planning Authority or the Secretary of State refuses permission/consent to develop land, or grants it subject to conditions, the owner may claim that he can neither put the land to a reasonably beneficial use in its existing state, nor render the land capable of a reasonably beneficial use, by the carrying out of any development or works that have been or would be permitted.

In these circumstances, the owner may serve a purchase notice on the Borough Council. This notice will require the Council to purchase his interest in the land in accordance with the provisions of Part VI, Chapter I of the Town and Country Planning Act 1990 and Part I, Chapter III of the Planning (Listed Buildings and Conservation Areas) Act 1990.

Community Infrastructure Levy (CIL)

Dacorum Borough Council is a Charging Authority for Community Infrastructure Levy (CIL). It is your responsibility to clarify the CIL liability on your development. The Council will make every effort to ensure that notices for liable developments are dispatched as soon as possible following planning permission or consent being granted. If you do not receive a liability notice please contact the Council. It is important that all CIL matters be in place before any works begin on site – including any demolition. Further information regarding CIL, including FAQs, access to all CIL forms and information on appeals can be found on our website at www.dacorum.gov.uk/cil or you can contact us at CIL@dacorum.gov.uk.

Building Regulations

The proposed works may require building regulations approval. Please contact Hertfordshire Building Control who can help you through the process. They can be contacted via telephone (01438 879990) or email (buildingcontrol@hertfordshirebc.co.uk).

Creating New Addresses

If you are creating a new commercial or residential postal address, you must notify the Council's Address Management Team when works are commenced. This can be done [online](#) or by emailing address.management@dacorum.gov.uk.

Pollution Act

When arranging building works both the employer and the builder are responsible for works being undertaken within the hours of construction of the Control of Pollution Act 1974. Further information can be found on our [website](#).

Southern Gas Network Overbuild Advisory Note

There are a number of risks created by built over gas mains and services; these are:

- Pipework loading – pipes are at risk from loads applied by the new structure and are more susceptible to interference damage.
- Gas entry into buildings – pipework proximity increases risk of gas entry in buildings. Leaks arising from previous external pipework able to track directly into main building from unsealed entry.
- Occupier safety – lack or no fire resistance of pipework, fittings, or meter installation. Means of escape could be impeded by an enclosed meter.

Please note therefore, if you plan to dig, or carry out building work to a property, site, or public highway within Southern Gas Network's gas network, you must:

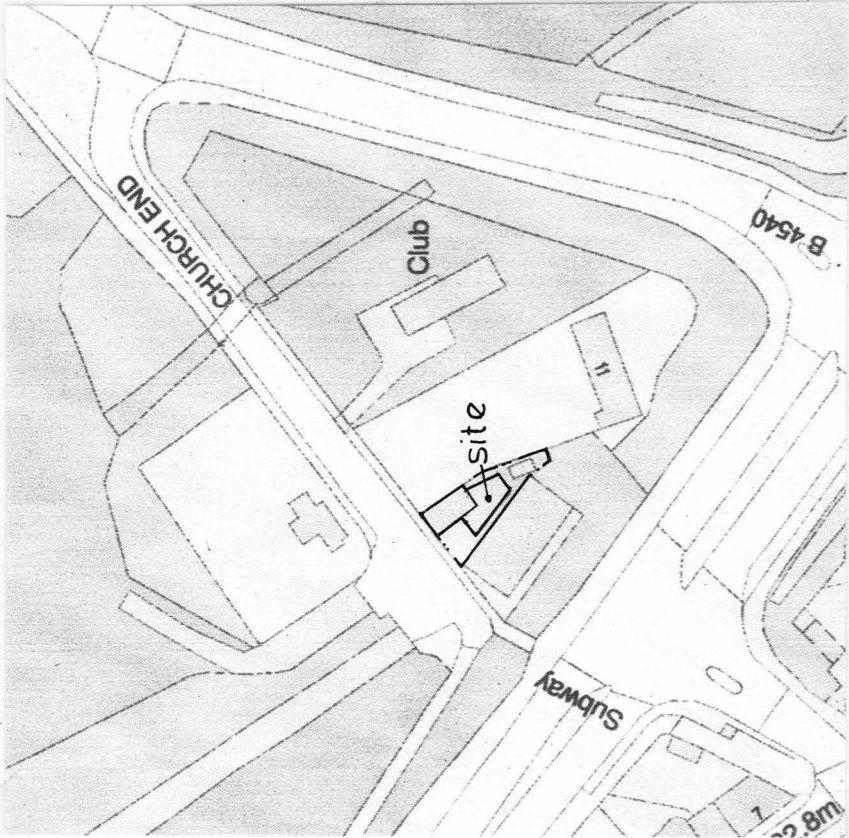
1. Check your proposals against the information held at <https://www.linesearchbeforeudig.co.uk/> to assess any risk associated with your development and
2. Contact their Plant Protection team to let them know. Plant location enquiries must be made via email, but you can phone us with general plant protection queries. See contact details below:

Phone 0800 912 1722 / Email plantlocation@sgn.co.uk

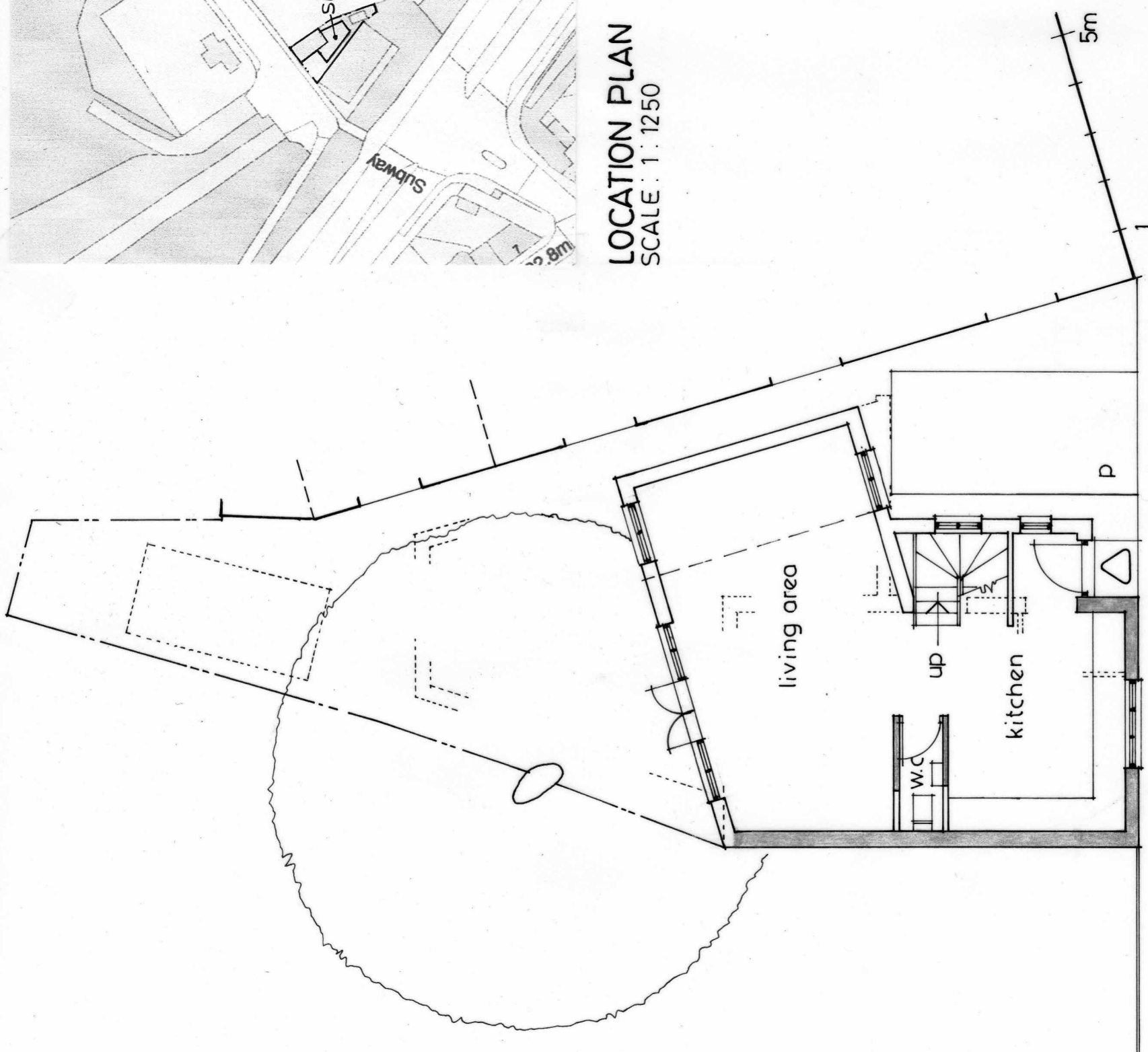
In the event of an overbuild on our gas network, the pipework must be altered, you may be temporarily disconnected, and your insurance may be invalidated.

Further information on safe digging practices can be found here:

- Our free Damage Prevention e-Learning only takes 10-15 minutes to complete and highlights the importance of working safely near gas pipelines, giving clear guidance on what to do and who to contact before starting any work <https://www.sgn.co.uk/damage-prevention>
- Further information can also be found here <https://www.sgn.co.uk/help-and-advice/digging-safely>

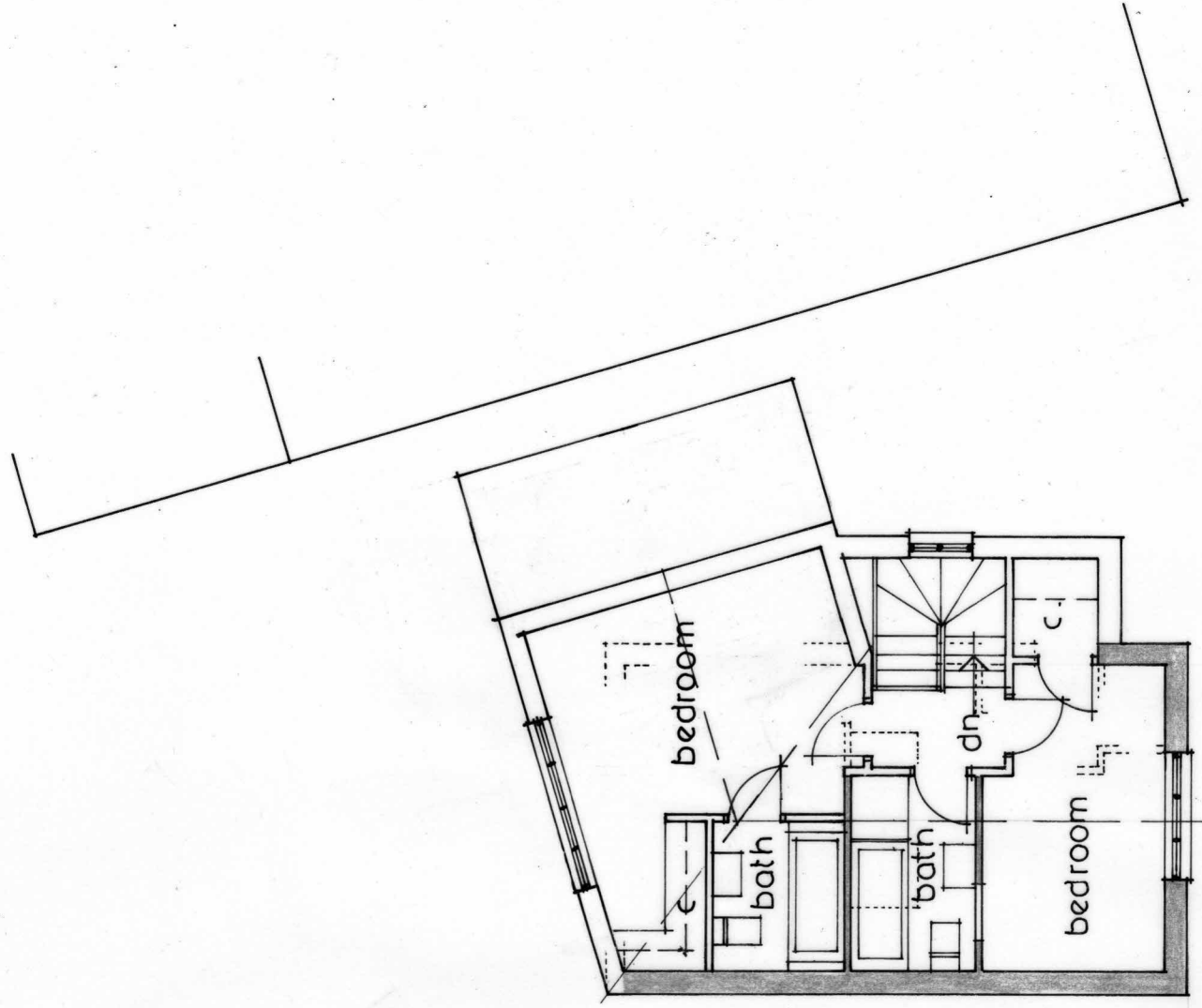
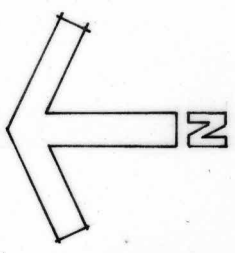


LOCATION PLAN
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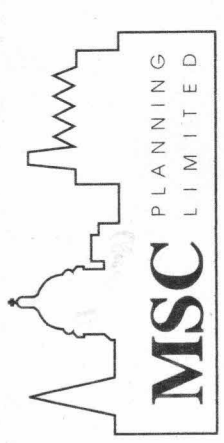


GROUND FLOOR PLAN
SCALE: 1:100

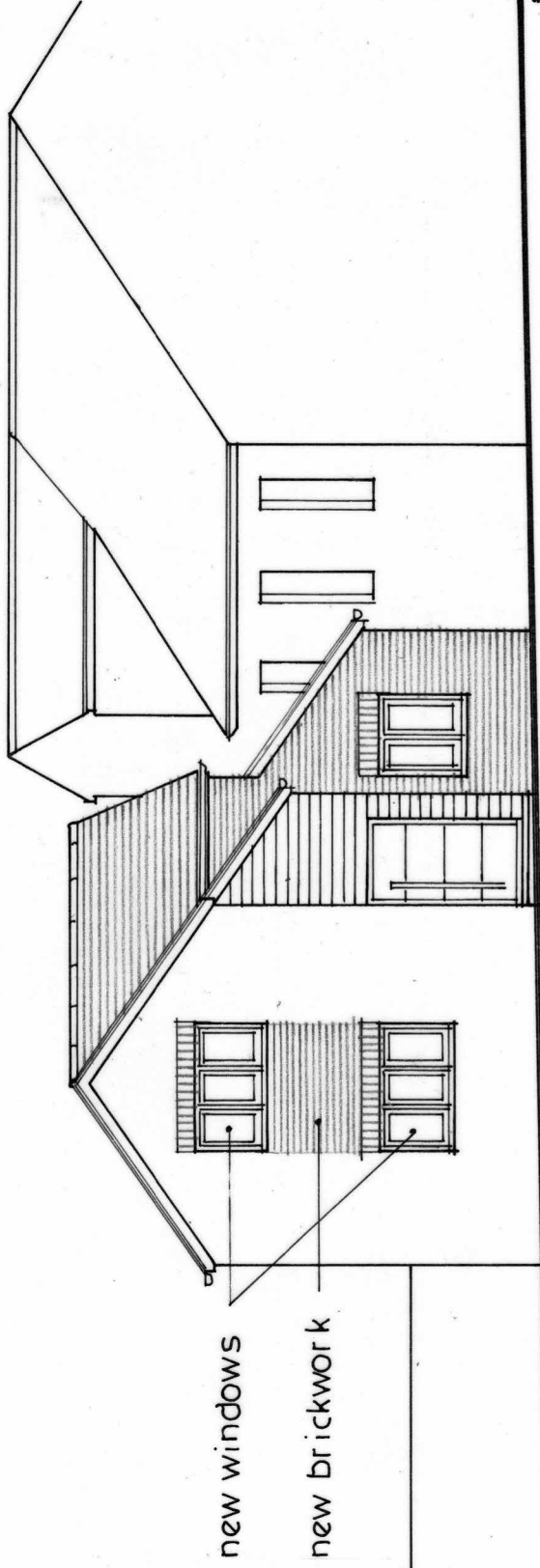
PROPOSED DEVELOPMENT AT 10 CHURCH END · MARKYATE · HERTS ·
REF: 21-058-2A



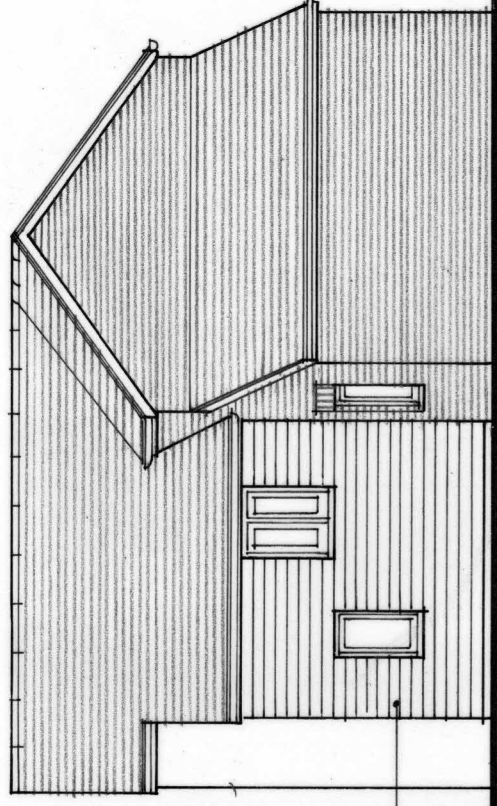
FIRST FLOOR PLAN



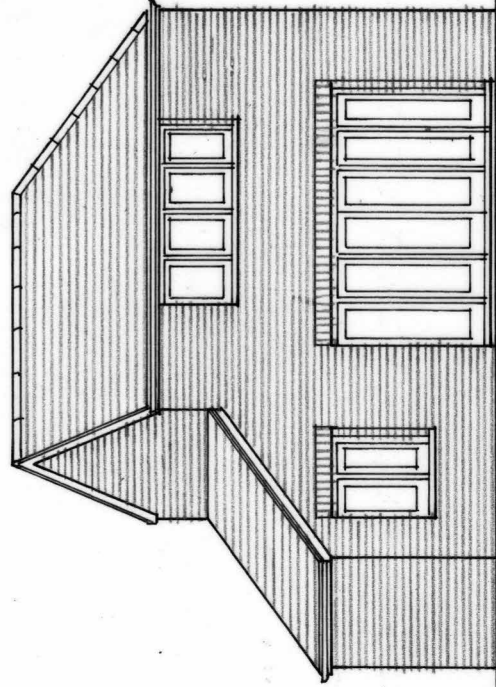
Chartered Town Planning & Development Consultants
Beech House, 259 Amersham Road,
Hazlemere, Buckinghamshire HP15 7GW.
Tel: 01494 511108 Fax: 01494 534351



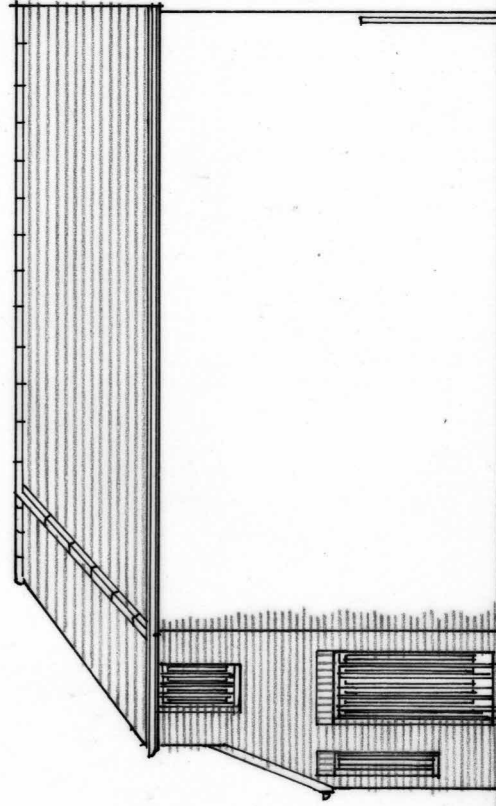
NORTH WEST ELEVATION



SOUTH WEST ELEVATION



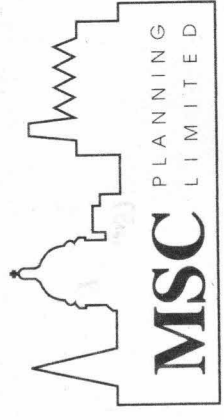
SOUTH EAST ELEVATION



NORTH EAST ELEVATION

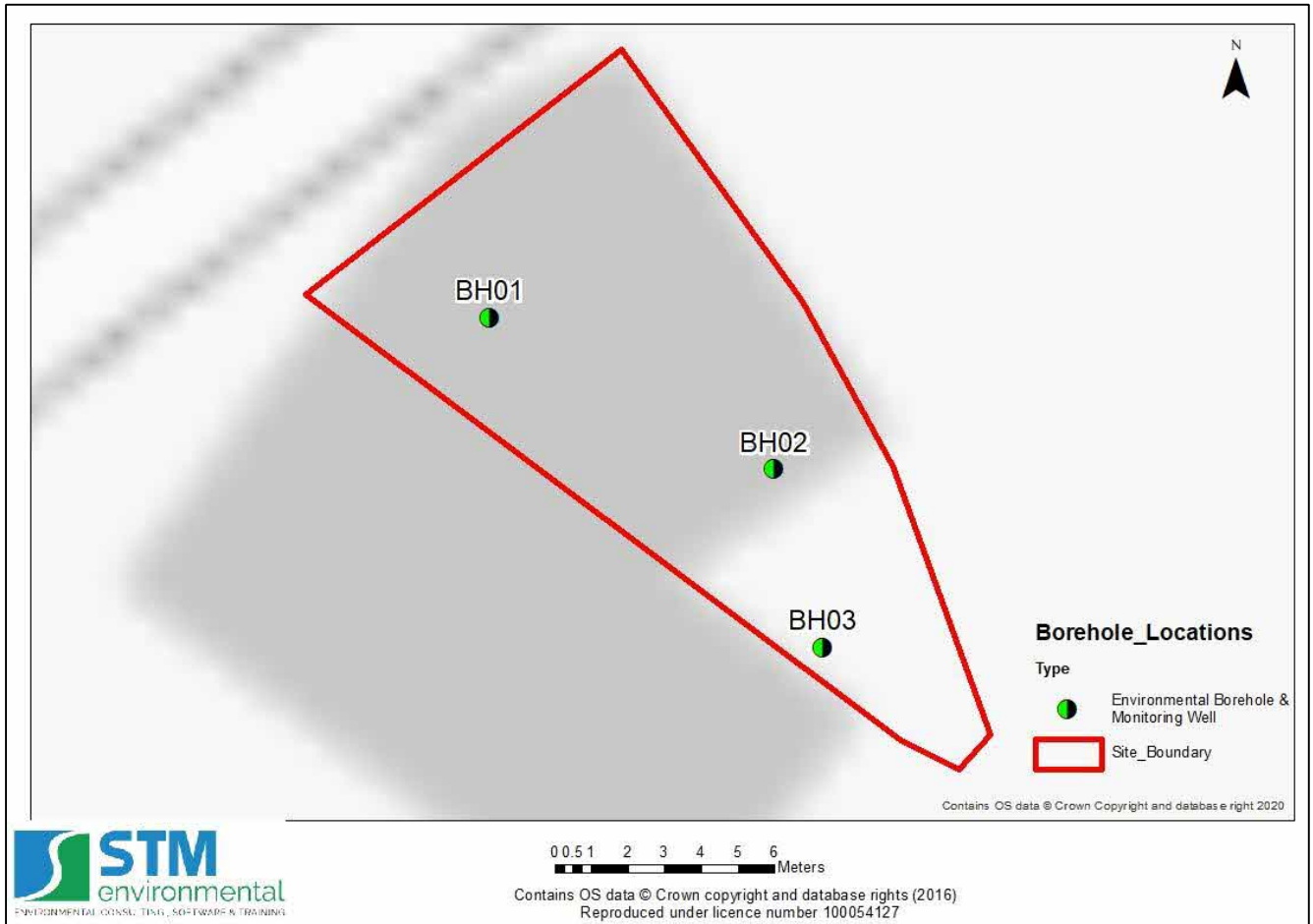
5m

PROPOSED DEVELOPMENT AT 10 CHURCH END · MARKYATE · HERTS ·
 REF: 21-058-1A



Chartered Town Planning & Development Consultants
 Beech House, 259, Amersham Road,
 Hazlemere, Buckinghamshire HP15 7QW.
 Tel: 01494 511108 Fax: 01494 534351

12.2 Appendix 2 - Borehole Location Plan



12.3 Appendix 3 - Borehole Logs

12.4 Appendix 4 - Photographs



General overview of the site





General overview of the site and the soils encountered in BH01





Soils encountered in BH02 and BH03



12.5 Appendix 5 – Laboratory Certification



Environmental
Chemistry

Certificate of Analysis

Client: STM ENVIRONMENTAL

Project: 23090494

Quote: BEC230228809 V2.1

Project Ref: 10 Church End, Markyate, St Al

Site: 10 Church End, Markyate, St Albans

Contact: Parminder Bhatia

Address: Unit 6, Crane Mews
32 Gould Road
Twickenham
London
TW2 6RS

E-Mail: Parminder@stmenvironmental.co.uk

Phone: 07760469516

No. Samples Received: 6


Date Received: 06/09/2023

Analysis Date: 15/09/2023

Date Issued: 15/09/2023

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory



Reported by Customer Service Lead
Martin Elliott-Palmer
01283 554137



Client: STM ENVIRONMENTAL
Project Name: 10 Church End, Markyate, St Al-10 Church End, Markyate, St Albans
Project No: 23090494
Date Issued: 15/09/2023

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
23090494-001	BH01/1-0-ES-0.40	31/08/2023 10:00:00	SOLID	Soil Sample
23090494-002	BH01/3-0-ES-1.20	31/08/2023 10:00:00	SOLID	Soil Sample
23090494-003	BH02/1-0-ES-0.30	31/08/2023 10:00:00	SOLID	Soil Sample
23090494-004	BH02/2-0-ES-0.70	31/08/2023 10:00:00	SOLID	Soil Sample
23090494-005	BH03/1-0-ES-0.40	31/08/2023 10:00:00	SOLID	Soil Sample
23090494-006	BH03/3-0-ES-1.10	31/08/2023 10:00:00	SOLID	Soil Sample



Client: STM ENVIRONMENTAL
 Project Name: 10 Church End, Markyate, St Al-10 Church End, Markyate, St Albans
 Project No: 23090494
 Date Issued: 15/09/2023



Analysis Results

					Sample ID	001	002	003	004	005	006
					Customer ID	BH01/1-0-ES-0.40	BH01/3-0-ES-1.20	BH02/1-0-ES-0.30	BH02/2-0-ES-0.70	BH03/1-0-ES-0.40	BH03/3-0-ES-1.10
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023
Analysis	Method Code	MDL	Units	Accred.							
>C6-C8 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.226		<0.217		<0.262		
>C7-C8 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.01	mg/kg^	UM	<0.011		<0.011		<0.013		
>C8-C10 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.226		<0.217		<0.262		
>C8-C10 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.04	mg/kg^	UM	<0.045		<0.044		<0.052		
C5-C6 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.226		<0.217		<0.262		
C5-C7 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.01	mg/kg^	UM	<0.011		<0.011		<0.013		
Total GRO C5-C10 HS_1D_Total	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.226		<0.217		<0.262		
pH (2.5:1 extraction)	PHSOIL	1	pH units	UM	8.3	10.0	9.5	8.5	8.1	8.0	
Phenol Index	SFAPI	0.5	mg/kg^	U	<0.6	<0.6	<0.5	<0.6	<0.7	<0.6	
Sulphide as S	SFAPI	0.5	mg/kg^	N	<0.6	<0.6	<0.5	<0.6	<0.7	<0.6	
Total Cyanide	SFAPI	0.5	mg/kg^	UM	<0.6	<0.6	<0.5	<0.6	<0.7	<0.6	
Total Organic Carbon	WSLM59	0.02	% m/m^	U	0.91	0.40	2.72	2.20	2.97	0.45	
Arsenic as As	ICPMSS	0.3	mg/kg^	UM	11.6	9.4	11.8	13.3	14.9	16.0	
Cadmium as Cd	ICPMSS	0.2	mg/kg^	UM	<0.2	0.4	0.3	0.3	0.4	0.6	
Copper as Cu	ICPMSS	1.6	mg/kg^	UM	18.0	94.6	15.9	31.4	69.0	287.6	
Lead as Pb	ICPMSS	0.7	mg/kg^	UM	12.3	163.1	19.8	307.6	1200	1978	
Mercury as Hg	ICPMSS	0.5	mg/kg^	UM	<0.5	<0.5	<0.5	<0.5	1.2	1.2	
Nickel as Ni	ICPMSS	2	mg/kg^	UM	38.7	19.7	25.2	22.8	27.4	29.2	
Selenium as Se	ICPMSS	0.5	mg/kg^	UM	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	BH01/1-0-ES-0.40	BH01/3-0-ES-1.20	BH02/1-0-ES-0.30	BH02/2-0-ES-0.70	BH03/1-0-ES-0.40	BH03/3-0-ES-1.10
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023
Total Chromium as Cr	ICPMSS	1.2	mg/kg [^]	UM		36.4	24.3	31.7	18.4	18.5	22.7
Zinc as Zn	ICPMSS	16	mg/kg [^]	UM		56.0	97.0	46.9	76.1	121.4	248.8
Boron as B	ICPBOR	0.5	mg/kg [^]	UM		0.7	1.6	0.8	2.3	1.3	0.7
Acid Soluble Sulphate as SO4	ICPACIDS	20	mg/kg [^]	UM		1630	168	4500	1210	1690	387
Benzene HS_ID_AR	BTEXHSA	10	µg/kg [^]	UM		<11		<11		<13	
Ethylbenzene HS_ID_AR	BTEXHSA	10	µg/kg [^]	UM		<11		<11		<13	
m/p-Xylene HS_ID_AR	BTEXHSA	20	µg/kg [^]	UM		<23		<22		<26	
o-Xylene HS_ID_AR	BTEXHSA	10	µg/kg [^]	UM		<11		<11		<13	
Toluene HS_ID_AR	BTEXHSA	10	µg/kg [^]	UM		<11		<11		<13	
Acenaphthene	PAHMSUS	0.08	mg/kg [^]	UM		<0.09	0.25	<0.09	<0.09	<0.11	<0.10
Acenaphthylene	PAHMSUS	0.08	mg/kg [^]	U		<0.09	2.55	1.98	0.69	0.16	<0.10
Anthracene	PAHMSUS	0.08	mg/kg [^]	U		0.10	7.01	2.50	1.07	0.32	<0.10
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg [^]	UM		0.28	20.2	12.8	3.93	0.64	<0.10
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg [^]	UM		0.36	11.7	8.84	2.73	0.72	<0.10
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg [^]	UM		0.36	12.1	8.66	2.77	0.90	<0.10
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg [^]	UM		0.26	3.60	2.77	0.90	0.43	<0.10
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg [^]	UM		0.23	5.78	4.09	1.43	0.43	<0.10
Chrysene	PAHMSUS	0.08	mg/kg [^]	UM		0.30	15.0	9.23	2.89	0.62	<0.10
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg [^]	UM		<0.09	1.91	1.50	0.44	0.12	<0.10

Analysis Results

					Sample ID	001	002	003	004	005	006
					Customer ID	BH01/1-0-ES-0.40	BH01/3-0-ES-1.20	BH02/1-0-ES-0.30	BH02/2-0-ES-0.70	BH03/1-0-ES-0.40	BH03/3-0-ES-1.10
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023
Analysis	Method Code	MDL	Units	Accred.							
Fluoranthene	PAHMSUS	0.08	mg/kg [^]	UM	0.67	24.8	12.3	5.30	1.74	<0.10	
Fluorene	PAHMSUS	0.08	mg/kg [^]	UM	<0.09	1.23	0.50	0.18	<0.11	<0.10	
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg [^]	UM	0.21	3.64	2.70	0.83	0.37	<0.10	
Naphthalene	PAHMSUS	0.08	mg/kg [^]	UM	<0.09	0.54	0.53	0.27	<0.11	<0.10	
Phenanthrene	PAHMSUS	0.08	mg/kg [^]	UM	0.20	13.3	2.59	1.05	0.59	<0.10	
Pyrene	PAHMSUS	0.08	mg/kg [^]	UM	0.69	23.0	14.4	5.73	1.50	<0.10	
Total PAH 16	PAHMSUS	1.28	mg/kg [^]	U	4.10	147	85.4	30.3	8.84	<1.55	
>C10-C40 EH_1D_Total	TPHFIDUS	10	mg/kg [^]	U		1960		507		<12.1	
>C10-C12 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U	<4.51		<4.34		<5.24		
>C12-C16 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U	<4.51		20.3		<5.24		
>C16-C21 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U	<4.51* _B		28.6* _B		<5.24* _B		
>C21-C35 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	10	mg/kg [^]	U	<11.3* _B		71.9* _B		<13.1* _B		
>C35-C44 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	6	mg/kg [^]	N	<6.77		24.8		<7.86		
Total TPH >C8-C40 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	20	mg/kg [^]	U	<22.6		143		<26.2		
>C10-C12 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	4	mg/kg [^]	U	<4.51		<4.34		<5.24		
>C12-C16 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	4	mg/kg [^]	U	<4.51		20.8		6.56		
>C16-C21 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	4	mg/kg [^]	U	6.81		154		16.9		
>C21-C35 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	10	mg/kg [^]	U	32.7* _B		963* _B		70.1* _B		
>C35-C44 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	6	mg/kg [^]	N	<6.77		341		16.2		



Client: STM ENVIRONMENTAL
 Project Name: 10 Church End, Markyate, St Al-10 Church End, Markyate, St Albans
 Project No: 23090494
 Date Issued: 15/09/2023



Analysis Results

					Sample ID	001	002	003	004	005	006
					Customer ID	BH01/1-0-ES-0.40	BH01/3-0-ES-1.20	BH02/1-0-ES-0.30	BH02/2-0-ES-0.70	BH03/1-0-ES-0.40	BH03/3-0-ES-1.10
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023	31/08/2023
Analysis	Method Code	MDL	Units	Accred.							
Total TPH >C8-C40 (Aromatic) EH_CU_ID_AR	TPHFIDUS (Aromatic)	20	mg/kg^	U	47.1			1350		111	
Total Moisture at 35°C	CLANDPREP	0.1	%	N	11.4	15.6	7.8	15.3	23.7	17.6	
Colour of Material	CLANDPREP		-	N	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Major Constituents	CLANDPREP		-	N	SILT	CLAY	SILT	SILT	CLAY	CLAY	
Minor Constituents	CLANDPREP		-	N	Made Ground	Silt	Gravel	Gravel	Gravel	Gravel	
Miscellaneous Constituents	CLANDPREP		-	N	Clay	Gravel	Made Ground	na	Silt	Silt	
Asbestos Identification	SUB020		-	N	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: SOCOTEC UK Ltd
 Environmental Chemistry
 PO Box 100
 Burton upon Trent
 Staffordshire
 DE15 0XD

CONTRACT NO: S35730-1

DATE OF ISSUE: 15.09.23

DATE SAMPLES RECEIVED: 08.09.23

DATE ANALYSIS COMPLETED: 15.09.23

DESCRIPTION: Six soil/loose aggregate samples each weighing approximately 0.1-1.4kg.

ANALYSIS REQUESTED: Qualitative and quantitative analysis of soil/loose aggregate samples for mass determination of asbestos.

METHODS:

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

Quantitative - The analysis was carried out using our documented in-house method based on HSE Contract Research Report No. 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies *et al*, 1996) and HSG 248. Our method includes initial examination of the entire sample, detailed analysis of a representative sub-sample and quantification by hand picking/weighing and/or fibre counting/sizing as appropriate.

RESULTS:

Initial Screening

No asbestos was detected in any of the soil samples by stereo-binocular and polarised light microscopy.

A summary of the results is given in Table 1.



CONTRACT NO: S35730-1
DATE OF ISSUE: 15.09.23

RESULTS: (cont.)

Table 1: Qualitative Results

SOCOTEC Job I.D: 23090494

IOM sample number	SOCOTEC Sample ID	Client Sample ID	ACM type detected	PLM result
S35730-1	23090494-001	BH01/1-0-ES-0.40	-	No Asbestos Detected
S35730-2	23090494-002	BH01/3-0-ES-1.20	-	No Asbestos Detected
S35730-3	23090494-003	BH02/1-0-ES-0.30	-	No Asbestos Detected
S35730-4	23090494-004	BH02/2-0-ES-0.70	-	No Asbestos Detected
S35730-5	23090494-005	BH03/1-0-ES-0.40	-	No Asbestos Detected
S35730-6	23090494-006	BH03/3-0-ES-1.10	-	No Asbestos Detected

Our detection limit for this method is 0.001%.

COMMENTS:

IOM Consulting cannot accept responsibility for samples that have been incorrectly collected or despatched by external clients.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

AUTHORISED BY: 

J Simpson
Senior Laboratory Analyst



Client: STM ENVIRONMENTAL
 Project Name: 10 Church End, Markyate, St Al-10 Church End, Markyate, St Albans
 Project No: 23090494
 Date Issued: 15/09/2023

Deviating Sample Report

All samples received in an appropriate condition with no deviancies noted with the samples.

Analysis Method

<u>Method Code</u>	<u>Method Description</u>	<u>Analysis Method</u>
BTEXHSA	BTEX by GCFID	As Received
CLANDPREP	DW35 - CLand Prep and Dry Weight Correction to 35°C	As Received
CLANDPREP	Solid Material Description	As Received
GROHSA/BTEXHSA	GRO CWG UK (C5-C10) Ali/Aro Split	As Received
ICPACIDS	Sulphate as SO4 (Acid Soluble)	Air Dried & Ground
ICPBOR	Boron (Water Soluble) by ICPOES	Air Dried & Ground
ICPMSS	Arsenic in Solids by ICPMS	Air Dried & Ground
ICPMSS	Cadmium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Chromium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Copper in Solids by ICPMS	Air Dried & Ground
ICPMSS	Lead in Solids by ICPMS	Air Dried & Ground
ICPMSS	Mercury in Solids by ICPMS	Air Dried & Ground
ICPMSS	Nickel in Solids by ICPMS	Air Dried & Ground
ICPMSS	Selenium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Zinc in Solids by ICPMS	Air Dried & Ground
PAHMSUS	16 PAHs by GCMS	As Received
PHSOIL	pH (2.5:1)	As Received
SFAPI	Cyanide (Total) by SFA	As Received
SFAPI	Phenol Index (Total) by SFA	As Received
SFAPI	Sulphide by SFA	As Received
SUB002	Asbestos Stage 1 (with Stage 2 Trigger)	
SUB020	Asbestos Stage 1 (with Stage 2 Trigger)	
TPHFIDUS	TPH (>C10-C40) Total	As Received
TPHFIDUS (Aliphatic)	TPH (CWG UK) Aliphatic Split with Carbon Banding	As Received
TPHFIDUS (Aromatic)	TPH (CWG UK) Aromatic Split with Carbon Banding	As Received
WSLM59	TOC: Total Organic Carbon	Air Dried & Ground



Client: STM ENVIRONMENTAL
Project Name: 10 Church End, Markyate, St Al-10 Church End, Markyate, St Albans
Project No: 23090494
Date Issued: 15/09/2023

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are as follows:

<u>Letter</u>	<u>Note</u>
---------------	-------------

- | | |
|---|--|
| A | Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data. |
| B | The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised. |
| C | Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data. |
| D | A non-standard volume or mass has been used for this test which has resulted in a raised detection limit. |
| E | Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only. |
| F | Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only. |
| G | The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only. |

HWOL Acronym Key

<u>Acronym</u>	<u>Description</u>
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total



Client: STM ENVIRONMENTAL
Project Name: 10 Church End, Markyate, St Al-10 Church End, Markyate, St Albans
Project No: 23090494
Date Issued: 15/09/2023

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

- U = UKAS accredited analysis
- M = MCERT accredited analysis
- N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 35 ° C.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35 ° C.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

- IS = Insufficient Sample to complete analysis
- NA = Sample is not amenable for the required analysis
- ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis

12.6 Appendix 6 – Chosen Generic Assessment Criteria

12.6.1 Soils Criteria

Residential With Home-grown Produce (RWHP) - 2.5% Organic Matter		
Contaminant	Concentration (mg/kg)	Source
Heavy Metals		
Arsenic	37	CAT4
Cadmium	11	LQM SULs RWHP 2.5%
Chromium	910	LQM SULs RWHP 2.5%
Chromium - Hexavalent	6	LQM SULs RWHP 2.5%
Copper	2400	LQM SULs RWHP 2.5%
Lead	200	LQM SULs RWHP 2.5%
Mercury	40	LQM SULs RWHP 2.5%
Nickel	180	LQM SULs RWHP 2.5%
Selenium	250	LQM SULs RWHP 2.5%
Zinc	3700	LQM SULs RWHP 2.5%
VOCs		
Toluene	290	LQM SULs RWHP 2.5%
Benzene	0.17	LQM SULs RWHP 2.5%
Ethylbenzene	110	LQM SULs RWHP 2.5%
m,p xylenes	130	LQM SULs RWHP 2.5%
PAHs		
Acenaphthylene	420	LQM SULs RWHP 2.5%
Acenaphthene	510	LQM SULs RWHP 2.5%
Fluorene	400	LQM SULs RWHP 2.5%
Phenanthrene	220	LQM SULs RWHP 2.5%
Anthracene	5400	LQM SULs RWHP 2.5%
Fluoranthene	560	LQM SULs RWHP 2.5%
Pyrene	1200	LQM SULs RWHP 2.5%
Benzo(a)anthracene	11	LQM SULs RWHP 2.5%
Chrysene	22	LQM SULs RWHP 2.5%
Benzo (b) fluoranthene	3.3	LQM SULs RWHP 2.5%
Benzo(k)fluoranthene	93	LQM SULs RWHP 2.5%
Benzo(a)pyrene	2.4	CAT4
Dibenz-a-h-anthracene	0.28	LQM SULs RWHP 2.5%
Indeno(1,2,3-cd)pyrene	36	LQM SULs RWHP 2.5%
Benzo (g,h,i) perylene	340	LQM SULs RWHP 2.5%
Napthalene	5.6	LQM SULs RWHP 2.5%
Petroleum Hydrocarbons - TPH (CWG)		
Aliphatics >C5-6	78	LQM SULs RWHP 2.5%
Aliphatics >C6-8	230	LQM SULs RWHP 2.5%

Residential With Home-grown Produce (RWHP) - 2.5% Organic Matter		
Contaminant	Concentration (mg/kg)	Source
Aliphatics >C8-10	65	LQM SULs RWHP 2.5%
Aliphatics >C10-12	330	LQM SULs RWHP 2.5%
Aliphatics >C12-16	2400	LQM SULs RWHP 2.5%
Aliphatics >C16-C35	92000	LQM SULs RWHP 2.5%
Aliphatics >C21-35	1500	LQM SULs RWHP 2.5%
Aliphatics >C35-44	92000	LQM SULs RWHP 2.5%
Aromatics >C5-7	140	LQM SULs RWHP 2.5%
Aromatics >C8-10	83	LQM SULs RWHP 2.5%
Aromatics >C10-12	180	LQM SULs RWHP 2.5%
Aromatics >C12-16	330	LQM SULs RWHP 2.5%
Aromatics >C16-21	540	LQM SULs RWHP 2.5%
Aromatics >C16-21	1500	LQM SULs RWHP 2.5%
Aromatics >C35-44	1500	LQM SULs RWHP 2.5%

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LQM SULs RWHP 2.5% - LQM Suitable for Use Levels - Residential With Home-grown Produce (RWHP) – 2.5% Organic Matter) CAT4 – Category 4 Screening Levels

12.7 Appendix 7 – Exceedances and Statistical Analysis Summary

Contaminant	Sample ID	Sample Depth (mbgl)	Measured Concentration (mg/kg)	GAC Value (mg/kg)	GAC
Benzo(a)anthracene	BH01/3	1.2	20.2	11	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Benzo(a)pyrene	BH01/3	1.2	11.7	2.4	Category 4 Screening Levels - Residential (with homegrown produce)
Benzo(b)fluoranthene	BH01/3	1.2	12.1	3.3	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Dibenz-a-h-anthracene	BH01/3	1.2	1.91	0.28	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Benzo(a)anthracene	BH02/1	0.3	12.8	11	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Benzo(a)pyrene	BH02/1	0.3	8.84	2.4	Category 4 Screening Levels - Residential (with homegrown produce)
Benzo(b)fluoranthene	BH02/1	0.3	8.66	3.3	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Dibenz-a-h-anthracene	BH02/1	0.3	1.5	0.28	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Lead	BH02/2	0.7	307.6	200	LQM Suitable for Use Levels - Residential (With Plant Uptake)
Benzo(a)pyrene	BH02/2	0.7	2.73	2.4	Category 4 Screening Levels - Residential (with homegrown produce)
Dibenz-a-h-anthracene	BH02/2	0.7	0.44	0.28	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)
Lead	BH03/1	0.4	1200	200	LQM Suitable for Use Levels - Residential (With Plant Uptake)
Lead	BH03/3	1.1	1978	200	LQM Suitable for Use Levels - Residential (With Plant Uptake)





Parameter	GAC	GAC Source	No. Samples	Mean	Maximum	Outliers Excluded	Max. Value Location	Mean Exceedance	Std Deviation	Non-Detects	W_Sigma/Walk	W_Critical	Distribution	T Statistic	Upper 95th Percentile (95%)	Mean Value Test Result	Max Value Test Result	One Sample T Test - T0	One Sample T Test - Tn	One Sample T Test - Result	One Sample T Test - Level (%)	Evidence Level (%)	Krill-Chebyshev	UCL95-Chebyshev	KD-Chebyshev	Chebyshev Test Result	Chebyshev - Evidence Level (%)	Sample Exceeding GAC
Aliphatics <C-8	230	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.9277	0.767	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-12.43354134	Reject HO (90 - kcrit)	99	None	
Aliphatics <C-10	65	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.9277	0.767	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-12.43354134	Reject HO (90 - kcrit)	99	None	
Aromatics <C-10	83	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.9277	0.767	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-12.43354134	Reject HO (90 - kcrit)	99	None	
Aliphatics <C-6	78	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.9277	0.767	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-12.43354134	Reject HO (90 - kcrit)	99	None	
Aromatics <C-7	140	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.9277	0.767	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-12.43354134	Reject HO (90 - kcrit)	99	None	
Arsenic	37	Category 4 Screening Levels - Residential (with homegrown produce)	6	12.83	16	0	BH03/J	No	2.4	0	0.9733	0.788	Normal	2.015	14.8108	FAILED	Max Value NOT Outlier	-24.625	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	17.11215992	-24.62513132	Reject HO (90 - kcrit)	99	None	
Cadmium	11	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	0.33	0.6	0	BH03/J	No	0.2	1	0.9242	0.788	Normal	2.015	0.4951	FAILED	Max Value NOT Outlier	-132.873	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	0.683342349	-132.8727618	Reject HO (90 - kcrit)	99	None	
Copper	2400	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	86.08	287.6	0	BH03/J	No	103.66	0	0.7439	0.788	Non-Normal	2.015	171.1954	FAILED	Max Value is Outlier	-54.781	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	270.2464997	-54.78118599	Reject HO (90 - kcrit)	99	None	
Lead	200	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	613.47	1978	0	BH03/J	YES	802.02	0	0.8042	0.788	Normal	2.015	1273.2265	FAILED	Max Value NOT Outlier	1.263	-1.943	DO NOT Reject HO ID - (1p-1, 0.95)	51	4.36	2041.0326265	1.262785834	DO NOT Reject HO (90 - kcrit)	0	BH02/J, BH03/J, BH02/J	
Mercury	40	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	0.4	1.2	0	BH03/J	No	0.62	4	0.6403	0.788	Non-Normal	2.015	0.9098	FAILED	Max Value NOT Outlier	-156.533	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	1.503002448	-156.5327442	Reject HO (90 - kcrit)	99	None	
Nickel	130	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	27.17	38.7	0	BH01/J	No	6.57	0	0.9352	0.788	Normal	2.015	32.5721	FAILED	Max Value is Outlier	-38.333	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	38.8628853	-38.33318677	Reject HO (90 - kcrit)	99	None	
Selenium	250	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	0	0	0	N/A	No	0	6	0.9352	0.788	N/A	2.015	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-38.33318677	Reject HO (90 - kcrit)	99	None	
Chromium	910	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	25.33	36.4	0	BH01/J	No	7.29	0	0.8951	0.788	Normal	2.015	31.3308	FAILED	Max Value NOT Outlier	-297.224	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	38.31055024	-297.2244493	Reject HO (90 - kcrit)	99	None	
Zinc	3700	LQM Suitable for Use Levels - Residential (With Plant Uptake)	6	107.7	248.8	0	BH03/J	No	74.27	0	0.8162	0.788	Normal	2.015	168.7953	FAILED	Max Value is Outlier	-118.479	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	239.8961778	-118.4786751	Reject HO (90 - kcrit)	99	None	
Benzene	0.17	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.8407	0.788	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-118.4786751	Reject HO (90 - kcrit)	99	None	
Ethylbenzene	110	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.8407	0.788	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-118.4786751	Reject HO (90 - kcrit)	99	None	
m,p xylenes	130	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.8407	0.788	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-118.4786751	Reject HO (90 - kcrit)	99	None	
Toluene	290	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.8407	0.788	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-118.4786751	Reject HO (90 - kcrit)	99	None	
Acenaphthene	510	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	0.04	0.25	0	BH01/J	No	0.1	5	0.4961	0.788	Non-Normal	2.015	0.1256	FAILED	Max Value is Outlier	-12239	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	0.22333333	-12239	Reject HO (90 - kcrit)	99	None	
Acenaphthylene	420	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	0.9	2.55	0	BH01/J	No	1.1	2	0.8244	0.788	Normal	2.015	1.8053	FAILED	Max Value NOT Outlier	-629.39	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	2.862785504	-629.389468	Reject HO (90 - kcrit)	99	None	
Anthracene	5400	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	1.83	7.01	0	BH01/J	No	2.7	1	0.7549	0.788	Non-Normal	2.015	4.0553	FAILED	Max Value is Outlier	-4895.253	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	6.641257863	-4895.252936	Reject HO (90 - kcrit)	99	None	
Benz[a]anthracene	11	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	6.31	20.2	0	BH01/J	No	8.36	1	0.8083	0.788	Normal	2.015	13.1814	FAILED	Max Value NOT Outlier	-1.375	-1.943	DO NOT Reject HO ID - (1p-1, 0.95)	90	4.36	21.18018349	-1.37546211	DO NOT Reject HO (90 - kcrit)	66	BH01/J, BH02/J	
Benz[b]pyrene	2.4	Category 4 Screening Levels - Residential (with homegrown produce)	6	4.06	11.7	0	BH01/J	YES	4.99	1	0.8178	0.788	Normal	2.015	8.1602	FAILED	Max Value NOT Outlier	0.815	-1.943	DO NOT Reject HO ID - (1p-1, 0.95)	51	4.36	12.93276575	0.814646754	DO NOT Reject HO (90 - kcrit)	0	BH01/J, BH02/J, BH02/J	
Benzofluoranthene	3.3	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	4.13	12.1	0	BH01/J	YES	5.05	1	0.8278	0.788	Normal	2.015	8.2872	FAILED	Max Value NOT Outlier	0.403	-1.943	DO NOT Reject HO ID - (1p-1, 0.95)	51	4.36	13.1215242	0.40326829	DO NOT Reject HO (90 - kcrit)	0	BH01/J, BH02/J	
Benz[e]h,h]perylene	340	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	1.33	3.6	0	BH01/J	No	1.49	1	0.8417	0.788	Normal	2.015	2.5543	FAILED	Max Value NOT Outlier	-555.896	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	3.982944957	-555.894732	Reject HO (90 - kcrit)	99	None	
Benzofluoranthene	93	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	1.99	5.78	0	BH01/J	No	2.39	1	0.8364	0.788	Normal	2.015	3.96	FAILED	Max Value NOT Outlier	-93.242	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	6.248816428	-93.24183831	Reject HO (90 - kcrit)	99	None	
Chrysenes	22	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	4.67	15	0	BH01/J	No	6.13	1	0.8119	0.788	Normal	2.015	9.7173	FAILED	Max Value NOT Outlier	-4.922	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	15.58725126	-4.921828366	Reject HO (90 - kcrit)	98	None	
Dibenz[a,h]anthracene	0.28	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	0.66	1.91	0	BH01/J	YES	0.83	2	0.8091	0.788	Normal	2.015	1.3479	FAILED	Max Value NOT Outlier	1.121	-1.943	DO NOT Reject HO ID - (1p-1, 0.95)	51	4.36	2.146476244	1.120727325	DO NOT Reject HO (90 - kcrit)	0	BH01/J, BH02/J, BH02/J	
Fluoranthene	560	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	7.47	24.8	0	BH01/J	No	9.63	1	0.8232	0.788	Normal	2.015	15.3864	FAILED	Max Value is Outlier	-140.609	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	24.6011637	-140.6094624	Reject HO (90 - kcrit)	99	None	
Fluorene	400	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	0.32	1.23	0	BH01/J	No	0.49	3	0.7557	0.788	Non-Normal	2.015	0.7192	FAILED	Max Value is Outlier	-2009.082	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	1.185700638	-2009.082031	Reject HO (90 - kcrit)	99	None	
Indeno[1,2,3-cd]pyrene	36	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	1.29	3.64	0	BH01/J	No	1.51	1	0.8326	0.788	Normal	2.015	2.5337	FAILED	Max Value NOT Outlier	-56.307	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	3.979243112	-56.30661542	Reject HO (90 - kcrit)	99	None	
Naphthalene	5.6	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	0.22	0.54	0	BH01/J	No	0.26	3	0.7809	0.788	Non-Normal	2.015	0.4398	FAILED	Max Value NOT Outlier	-50.056	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	0.691458584	-50.0552579	Reject HO (90 - kcrit)	99	None	
Phenanthrene	220	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	2.96	13.3	0	BH01/J	No	5.15	1	0.8447	0.788	Non-Normal	2.015	7.1928	FAILED	Max Value is Outlier	-103.2	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	12.12473142	-103.2002138	Reject HO (90 - kcrit)	99	None	
Pyrene	1200	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	6	7.55	23	0	BH01/J	No	9.27	1	0.8415	0.788	Normal	2.015	15.1785	FAILED	Max Value NOT Outlier	-315.113	-1.943	Reject HO ID - (1p-1, 0.95)	99.5	4.36	24.05238473	-315.1131141	Reject HO (90 - kcrit)	99	None	
Aliphatics <C10-12	330	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.8243	0.788	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-315.1131141	Reject HO (90 - kcrit)	99	None	
Aliphatics <C12-16	2400	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	6.77	20.3	0	BH02/J	No	11.72	2	0.7498	0.767	Non-Normal	2.92	26.5253	FAILED	Max Value is Outlier	-353.68	-2.353	Reject HO ID - (1p-1, 0.95)	99.5	4.36	35.26933333	-353.679803	Reject HO (90 - kcrit)	99	None	
Aliphatics <C21-35	1500	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	23.97	71.9	0	BH02/J	No	41.51	2	0.7498	0.767	Non-Normal	2.92	93.9493	FAILED	Max Value is Outlier	-61.587	-2.353	Reject HO ID - (1p-1, 0.95)	99.5	4.36	128.613333	-61.58692459	Reject HO (90 - kcrit)	99	None	
Aliphatics <C35-44	92000	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	8.27	24.8	0	BH02/J	No	14.32	2	0.7498	0.767	Non-Normal	2.92	32.4053	FAILED	Max Value is Outlier	-1128.032	-2.353	Reject HO ID - (1p-1, 0.95)	99.5	4.36	44.30933333	-1128.03226	Reject HO (90 - kcrit)	99	None	
Aromatics <C10-12	180	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	0	0	0	N/A	No	0	3	0.7498	0.767	N/A	2.92	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-1128.03226	Reject HO (90 - kcrit)	99	None	
Aromatics <C12-16	330	LQM Suitable for Use Levels - Residential (With Plant Uptake - 2.5% Organic Matter)	3	9.12	20.8	0	BH02/J	No	10.63	1	0.9662	0.767	Normal	2.92	27.0469	FAILED	Max Value is Outlier</											

12.8 Appendix 8 – Ground Gas Monitoring Results

10 Church End

Date	Monitoring Undertaken By	Borehole Reference	Flow	Methane	Carbon Dioxide	Oxygen	Hydrogen Sulphide	Carbon Monoxide	PID VOCs	Water Level	Well Depth	Bal.	Rel.	Comments	Weather	Barometric pressure
dd/mm/yy	Name	BH#	l/hr	%	%	%	ppm	ppm	ppm	mbgl	mbgl	%	%			
08/09/2023	S.Sapsed	BH01	1.00	0.00	2.30	18.40	0.00	1.00	0.00	NGW	3	79.3	4.20	Rising Pressure	Sunny	1003
		BH02	1.00	0.00	1.80	19.00	0.00	1.00	0.00	NGW	2	79.2	3.40			
		BH03	1.00	0.00	1.80	19.10	0.00	1.00	0.00	NGW	2	79.1	12.74			
15/09/2023	S.Sapsed	BH01	1.00	0.10	1.80	19.20	0.00	0.00	0.00	NGW	3	78.9	-0.14	Falling Pressure	Passing Clouds	1002
		BH02	1.00	0.00	2.00	18.20	0.00	0.00	0.00	NGW	2	79.8	-0.10			
		BH03	1.00	0.00	2.00	18.50	0.00	0.00	0.00	NGW	2	79.5	-0.10			
29/09/2023	S.Sapsed	BH01	0.20	0.00	2.30	18.60	0.00	0.00	0.00	NGW	3	79.1	0.03	Rising Pressure	Passing Clouds	1000
		BH02	0.20	0.00	1.80	19.20	0.00	0.00	0.00	NGW	2	79	-0.02			
		BH03	0.20	0.00	2.10	17.90	0.00	0.00	0.00	NGW	2	80	-0.26			

12.9 Appendix 9 - Assessment Methodology

-  Severity considers the potential impact of the linkage on the receptors if the linkage was active. Categories range from slight/superficial to fatal.
-  Likelihood considers the chances of the linkage occurring and is classified into categories from improbable to frequent.

By assigning scores with each of the above categories, the risk assessment can be undertaken using the formula:

$$\text{RISK} = \text{LIKELIHOOD} \times \text{SEVERITY}$$

The matrix given in Table 6 provides a means of calculating the overall risk; while Table 7 provides the qualitative assessment based on the risk score.

Table 6: Contamination Risk Matrix

		Potential Severity				
		Fatal 5	Major 4	Moderate 3	Minor 2	Slight 1
Probable Likelihood	Frequent 5	Very High	High	Moderate	Low - Moderate	Low
	Probable 4	High	High	Moderate	Low - Moderate	Low
	Possible 3	Moderate	Moderate	Low - Moderate	Low - Moderate	Very Low
	Remote 2	Low - Moderate	Low - Moderate	Low - Moderate	Low	Very Low
	Improbable 1	Low	Low	Very Low	Very Low	Very Low

Table 7: Assessment description for risk scores

Risk Score	Risk Assessment
1-3	Very Low
4-5	Low
6-10	Low to Moderate
11-15	Moderate
16-20	High
21-25	Very High

Table 8: Risk Classification System

Risk Term	Description
Very Low	The presence of an identified hazard does not give rise to the potential to cause significant harm to groundwater, surface water, ecological and/or property receptors. In the event of such harm being realized, it is not likely to be Severe.
Low	The presence of an identified hazard does not give rise to the potential to cause significant harm to human health receptors. In the event of such harm being realized, it is not likely to be Severe.
Low to Moderate	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realized, would at worst normally be mild.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action. Investigation is required and remedial works may be necessary in the short term and are likely over the longer term.
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is an evidence that severe harm to a designated receptor is currently happening. Urgent investigation and remediation are likely to be required.

13 ABBREVIATIONS

Abbreviation	Description
BTEX	Benzene, Tolulene, Ethylene and Xylene
c.	Circa
CLRA	Contaminated Land Risk Assessment
CSM	Conceptual Site Risk Model
EA	Environment Agency
GAC	Generic Assessment Criteria
IPC	Integrated Pollution Control
LAPC	Local Authority Pollution Control
LQM S4ULs	Land Quality Management Suitable for Use Levels
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PAHs	Polycyclic aromatic hydrocarbons
Part IIA	Part IIA of the Environmental Protection. Act 1990
PID	Photoionization Detector
PCB	Polychlorinated Biphenyl
PCLU	Potentially Contaminative Land Use
PPL	Potential Pollutant Linkage
PRA	Preliminary Risk Assessment
PSPPL	Potentially Significant Potential Pollutant Linkage
RWHP	Residential with Home-grown Produce
SI	Site Investigation
SOM	Soil Organic Matter
SPOSH	Significant Possibility of Significant Harm
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
UXO	Unexploded Ordnance

14 REFERENCES

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