

A CONTAMINATION ASSESSMENT FOR A PROPOSED COMMERCIAL DEVELOPMENT AT:

**HORNBEAM BUSINESS PARK PHASE 4, HORNBEAM ROAD,  
NORTH WALSHAM, NORFOLK, NR28 0FQ**



CLIENT:	Birchwood Building Limited
REFERENCE:	JAH/21.008/CA/Phase4
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## 1. INTRODUCTION

A F Howland Associates Limited was instructed by Birchwood Building Limited (the “Client”) to carry out a ground investigation of a plot of land at Hornbeam Business Park Phase 4, Hornbeam Road, North Walsham, Norfolk, NR28 0FQ (Drawing 21.008/CA/01).

It is proposed to develop the site for commercial use. An indicative scheme layout is shown on the Birchwood Building Limited drawing presented in Appendix D.

The report has been carried out in general accordance with accepted best practice and methodologies (BSI, 2017; EA, 2020; DCLG, 2013) and was prepared for the sole and exclusive use of the Client and its advisors. It provides the factual details of the fieldwork and laboratory testing undertaken during the investigation and discusses the findings with respect to the proposed development. Other parties using the contained information do so at their own risk and any duty of care to those parties is specifically excluded subject to copyright as detailed below.

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## 2. BACKGROUND INFORMATION

### 2.1 SITE LOCATION AND DESCRIPTION

The site is located within the town of North Walsham, and is situated adjacent to North Walsham railway station.

The site is a stripped area of land, located on the outskirts of a residential development. It is located at an approximate elevation of 41 to 42 m aOD (above Ordnance Datum), and centred at National Grid reference 628236 E and 329457 N.

### 2.2 GEOLOGY

The regional geology as mapped for the area by the British Geological Survey (BGS) indicates bedrock of the Crag Group overlain by superficial deposits of the Briton's Lane Sand and Gravel Member (BGS, 2022).

### 2.3 HYDROLOGY

The Crag Group is designated a principal aquifer status whilst the Briton's Lane Sand and Gravel Member is designated secondary B aquifer status (DEFRA, 2022).

The closest surface water feature to the site was a tributary to the North Walsham and Dilham Canal approximately 1.4 km to the east.

### 2.4 ADDITIONAL INFORMATION

The site was formerly located in the footprint of a canning factory, which was demolished in stages (Harrison Group Environmental Limited, 2013). Anecdotal evidence suggested that the factory included asbestos containing materials (ACMs) within the building fabric. It is unclear whether any ACMs had been removed from the site before demolition took place.

The site is located within an area that has been subject to a site investigation carried out by Harrison Group Environmental Limited (2013)<sup>1</sup>, the pertinent findings of which are summarised below.

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<sup>1</sup> Sourced via North Norfolk planning application ref. PF/17/0127



The investigation included a single trial pit, referenced TP1110, within the development site, and a mixture of window samples and other trial pits in close proximity, referenced TP108, TP109, WS105, and WS110.

TP110 recorded made ground down to a depth of 0.50 m, with chrysotile fibre containing cement board fragments between 0.35 and 0.50 m. Beneath this made ground, natural soil was recorded to the base of the trial pit and comprised a slightly clayey slightly gravelly sand grading to a silty clayey gravelly sand.

The remaining nearby positions recorded varying thicknesses of made ground, between 0.20 and 1.25 m, all overlying natural soil of silty gravelly sand.

Monitoring standpipes were installed within WS105 and WS110. The response zones targeted the natural soil underlying the initial made ground. Six return monitoring visits for ground gases were carried out between 14 March 2013 and 12 April 2013, across a range of barometric pressures (between 990 and 1016 mb). The standpipes were reported as dry during each visit. A summary of the monitoring results is provided in Table 1, below.

Monitoring results summary	WS105	WS110
Carbon Dioxide (%) [maximum concentration]	0.7	1.6
Methane (%) [maximum concentration]	0.0	0.0
Oxygen (%) [minimum concentration]	17.8	19.4
Carbon Monoxide (ppm) [maximum concentration]	1	2
Hydrogen Sulphide (ppm) [maximum concentration]	1	1
Flow (l/hr) [range]	-0.4 to 0.2	-0.2 to 0.3

Table 1: Summary of monitoring results for WS105 and WS110 (Harrison Group Environmental Limited, 2013)

Harrison Group Environmental Limited concluded a classification of 'Amber 1' for the wider development following the guidance in CIRIA C665 (Wilson et al. 2007). A re-assessment of the data pertinent to the site has been provided in Section 4.6.

The BR211 report (BRE, 2015) indicates that the site is not within an area where specific protection from radon gas is required.



### 3. INTRUSIVE INVESTIGATION

#### 3.1 FIELDWORK

Fieldwork was carried out on 14 December 2021 and comprised seven machine excavated trial pits.

The trial pit positions were set out by A F Howland Associates using a Hemisphere S320 VRS GPS, to National Grid and Ordnance Datum. The locations are shown on Drawing 21.008/CA/Phase4/02, appended. A cable avoidance tool (CAT) was used to sweep the trial pit positions and surrounding areas to locate any services or buried obstructions.

The trial pits, referenced TP101 to TP107, were carried out using a 3 tonne tracked excavator and extended to 2.40 m below ground level (bgl). Soil was logged at surface and representative disturbed samples, together with specialist environmental samples, were collected for subsequent laboratory analysis.

Sampling and soil descriptions were carried out in general accordance with BS EN 1997-2:2007 Eurocode 7 and its UK National Annex supported by BS 5930:2015+A2:2010.

#### 3.2 GROUND CONDITIONS

##### 3.2.1 General

The geology across the site broadly comprised a layer of made ground overlying a natural soil of slightly silty variably gravelly sand. The natural soil was considered representative of the Briton's Lane Sand and Gravel Member.

The underlying bedrock of the Crag Group was not encountered within any of the exploratory holes.

##### 3.2.2 Made Ground

In general, made ground was encountered within all of the trial pits to base depths between 0.30 and 1.90 m.

The made ground was noted to be a silty gravelly sand with various fragments of anthropogenic material. The gravel was angular to subrounded fine to coarse flint. The



anthropogenic constituents within the made ground included fragments of brick, ceramics, clinker, concrete, metal, plastic, and slate. Occasional large fragments of concrete were also encountered.

Fragments of cement board (suspected ACM) were recorded within the made ground of TP101, TP102, and TP107. A fragment of fibrous concrete was also recorded within the made ground of TP107.

### 3.2.3 Briton's Lane Sand and Gravel Member

Beneath the made ground an orange brown variably silty gravelly fine to coarse sand was encountered within the trial pits. The gravel was subangular to subrounded fine to coarse flint and quartzite. Clay lenses were noted in the stratum as were occasional flint cobbles.

### 3.2.4 Groundwater

No groundwater was encountered during the fieldwork.

However, the general procedures used do not allow precise measurements of the groundwater conditions, but give only a general guide to the overall situation. Fluctuations in any groundwater table will also occur as a result of seasonal or climatic effects, as well as other outside influences.



## 4. QUANTITATIVE CONTAMINATION RISK ASSESSMENT

### 4.1 PROPOSALS

It is proposed to construct six commercial units, referenced Unit H to Unit M, across four steel framed buildings and associated areas of hardstanding for car parking and soft landscaping. An indicative scheme layout is shown on the Birchwood Building Limited drawing, presented in Appendix D.

The quantitative risk assessments presented below is intended to establish the potential risk to human end-users from contamination in the ground. This is based on long-term chronic exposure pathways, and is not directly applicable to short-term contact such as that experienced by construction workers. Nevertheless, without any current UK guidelines that allow an assessment of the potential risk to workers from contaminated soils the approaches used provide an applicable assessment criteria.

### 4.2 LABORATORY TESTING

The testing programme included analysis on samples of shallow soils for a suite of generic contaminants. In summary, the samples were tested for the following determinands;

- heavy metals/metalloids (antimony, arsenic, beryllium, cadmium, chromium (III and VI), copper, lead, mercury, nickel, selenium, vanadium, and zinc);
- cyanide (total, complex, and free), thiocyanate (as SCN), and phenol (total - monohydric);
- total and speciated polycyclic aromatic hydrocarbons (PAHs) (USEPA-16 and coronene);
- organic matter content;
- BTEX<sup>2</sup>, MTBE<sup>3</sup>, and petroleum hydrocarbons; and,
- asbestos fibres and bulk asbestos containing material (ACM) screening and identification.

One sample of the natural soil was also subjected to leachate analysis for a similar suite of potential contaminants at the location and depth of the proposed soakaway invert level.

<sup>2</sup> Benzene, Toluene, Ethylbenzene, and xylene (p-, m-, o- isomers)

<sup>3</sup> Methyl Tertiary Butyl Ether





## 4.3 HUMAN HEALTH RISK ASSESSMENT

### 4.3.1 Assessment Methodology

The results for the analysis are presented in the analytical report referenced 21-14822. The report is presented in Appendix C and the moisture content is provided, where applicable.

The results of the chemical analysis have been assessed against human health guideline values produced by Land Quality Management Limited in association with the Chartered Institute of Environmental Health (LQM, 2015) and which are referred to as 'suitable for use levels' (S4ULs). The S4ULs provide generic assessment criteria (GAC) values from a risk based approach to human exposure through the pathways of inhalation, ingestion and dermal contact which have been derived using the CLEA software version 1.06 and Environment Agency guidance (Environment Agency, 2009). The S4UL 'commercial' scenario and a soil organic matter content (SOM) of 1.0 % have been used for the assessment<sup>4</sup>.

When relevant S4ULs were unavailable, such as in the case of antimony, lead, and cyanide, the results were compared to alternative 'soil screening values' (SSVs). For antimony and cyanide, the SSV was derived by WS Atkins Consultants Limited (W S Atkins, 2017), using the ATRISKsoil programme. For lead, 'category 4 screening levels' (C4SLs) were used which have been developed by Contaminated Land: Applications in Real Environments (DEFRA, 2014) using a modified version of the CLEA model. The derivation of C4SLs uses the concept of a low level of toxicological concern (LLTC), which represents the estimated concentration of a contaminant that would pose an 'acceptably low' risk to human health. These allow a higher (though still 'acceptably low') level of risk while maintaining the precautionary approach. A 'commercial' scenario and a SOM of 1.0 % has been used for the assessment of these determinands<sup>4</sup>.

The risk from the release of asbestos fibres from asbestos containing soil (ACS)<sup>5</sup> has been considered in general accordance with CIRIA C733 (2014).

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<sup>4</sup> Average SOM of 1.9% across all 7 samples of made ground analysed

<sup>5</sup> Asbestos containing soil (ACS) is any soil found to contain asbestos fibres and/or bulk asbestos containing material (ACM)



#### 4.3.2 Results

##### Chemical contaminants

No chemical contaminants were recorded in excess (or equal to) their respective adopted screening criteria.

##### Asbestos

Of the four samples of suspected asbestos containing material (ACM) that were encountered during the fieldwork, only the ACM from both TP101 and TP102 was confirmed to contain chrysotile fibres, with neither of the suspected ACMs from TP107 containing any asbestos fibres. No loose fibres were detected within any of the samples of made ground analysed, including the samples that were of the soil matrix around each of the samples of suspected ACM.

#### 4.3.3 Discussion

Based on the results of the chemical analysis, there is a negligible to low risk to human end users of the proposed commercial development.

ACM has been recorded within the made ground on site, although laboratory analysis indicates that these materials have not degraded as no loose fibres were present in the surrounding soil matrix. TP102, where ACM was identified, is in an area of proposed soft landscaping. Given the sporadic nature of ACM within the made ground across the wider Hornbeam Business Park (AFHA, 2019; 2021), and the potential for other ACM and/or loose asbestos fibres to be present elsewhere on site there is a moderate risk to the human end-users of the development, which will require mitigation. Possible remedial measures are outlined in section 5.

#### 4.4 CONTROLLED WATER RISK ASSESSMENT

The site overlies secondary B and principal aquifers, which are considered to be sensitive receptors. The closest surface water feature to the site was noted to be a considerable distance away, so is unlikely to be impacted by any potential soil contamination on site.

No significant concentrations of potentially mobile contaminants, such as hydrocarbons, have been detected within the made ground on site.

A sample of the soil was taken from TP106 at the proposed location of a soakaway. This was subject to a leachate analysis for a broad range of contaminants including, metals,



PAHs (USEPA-16 and coronene), phenol (total - monohydric), TPH (CWG banding), cyanide (total), BTEX<sup>2</sup>, and MTBE<sup>3</sup>. The leachate results should be representative of that which might be present in the groundwater (depth not confirmed), ignoring the potentially beneficial effects of dilution and attenuation in the unsaturated zone, and also could be considered representative of that which might be mobilised if a soakaway was constructed at the location.

The results of the leachate analysis are presented in analytical report referenced 21-14822 in appendix C.

The results were compared to the Water Framework Directive compliant Environmental Quality Standards (EQSs) (DEFRA, 2015). In the absence of EQSs for TPH, the WHO drinking water standards (2008) have been adopted as a screening criteria as discussed in CL:AIRE guidance (2017).

Results of this assessment indicate that the tested determinands were present at concentrations below limits of detection, EQS values, or other adopted screening criteria.

#### 4.5 WATER SUPPLY PIPE ASSESSMENT

An assessment of the laboratory results with respect to UKWIR guidance (2010) suggests concentrations of the tested organic contaminants are present below screening levels for polyethylene pipes across the site. The results are presented in analytical report referenced 21-14822 in appendix C.

Based on the results, polyethylene, polyvinyl chloride, or barrier pipework should be suitable. The specification of any buried pipework should be agreed with the local water utility prior to installation.

#### 4.6 GROUND GAS RISK ASSESSMENT

The results of the ground gas monitoring carried out by Harrison Group Environmental Limited (2013) have been assessed in general accordance with BS 8485:2015:A1:2019 and CIRIA C665 (Wilson et al, 2007). These describe a characterisation system and provide a risk based approach designed to allow gas protection measures to be selected appropriately.



The results correspond to a characteristic gas situation of CS1 for the natural soil underlying the made ground.

Made ground was also encountered on site, albeit not at any considerable thicknesses. In order to assess the risk from ground gas generation, in the absence of any significant off-site sources of ground gas, a lines of evidence approach and empirical assessment has been carried out to determine a characteristic gas situation. The empirical assessment uses the organic content of the made ground following the approach provided in CL:AIRE Research Bulletin 17 (CL:AIRE, 2012) and as subsequently adopted by BS 8485:2015+A1:2019.

Forensic description of the soils during fieldwork identified that the made ground across the site included constituents including ACM, brick, ceramics, clinker, concrete, glass, metal, and plastic, with putrescible/degradable material generally absent. Subsequent laboratory analysis has recorded the total organic carbon (TOC) content of the made ground to range between 0.5 and 1.7%<sup>6</sup>.

Following the approach provided in CL:AIRE (2012) and BS 8485+A1:2019, this would be consistent with a characteristic ground gas situation of CS2 for the made ground as a potential source of ground gases.

However, no groundwater was encountered and the made ground would therefore be unsaturated and aerobic, resulting in a low potential for methanogenesis to occur. The granular nature of the majority of the made ground also means that atmospheric ventilation is likely to occur, as opposed to lateral migration and accumulation into the subfloor of the commercial building. The slightly elevated TOC concentrations recorded within the made ground are likely due to the presence of clinker, which is non-degradable and therefore not a viable source of ground gases. This in combination within the relative shallow thickness of made ground across the site, and that the development of the site will require the removal of large parts of the made ground, as this will not be a suitable founding strata for any of the proposed buildings, the overall risks posed by potential ground gases is considered to be very low, and as such a characteristic ground gas situation of CS1 should be applied across the development site.

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<sup>6</sup> Based on a relationship between SOM and TOC (CL:AIRE, 2011)



## 4.7 CONCEPTUAL MODEL

Following assessment of the laboratory analysis the conceptual model presented in the desk study has been revised and updated. This is presented in Table 2 below. Risk management and remediation measures are discussed in section 5, where appropriate. Risk assessment classification is presented in Appendix E.



Source of Contamination	Pathway	Receptor	Probability and Reasoning	Consequence and Reasoning	Risk Classification
Potentially contaminated soils from former land uses on site	Direct contact, inhalation, ingestion	Human end-users	Likely – Laboratory analysis reported no elevated concentrations of determinands within the samples analysed. However, bulk ACMs have been recorded on site.	Medium – Commercial end-use proposed with soft landscaping	Moderate Risk
		Construction workers		Mild – Short term exposure but can be controlled by use of PPE and suitable hygiene practices	Low/Moderate Risk
	Percolation of leachate / mobile contaminants	Groundwater	Low likelihood –laboratory analysis reported low concentration of the tested contaminants. Leachable contamination is unlikely.	Mild – The site is underlain by principal and secondary A aquifers. Groundwater is anticipated to be encountered at depth	Low Risk
		Surface water		Minor – The closest surface water feature is located 1.5 km away from the site	Very Low Risk
	Permeation through water supply pipes	Human end-users	Unlikely – No elevated concentrations of contaminants that can permeate plastic pipework were recorded on site.	Medium – Chronic damage to human health	Low Risk
	Inhalation	Off site receptors	Likely – Asbestos has been recorded on site as loose fibres.	Medium - Controls, such as dust suppression, should be put in place during construction, to reduce the risk of exposure	Moderate Risk
Potentially infilled land on and off site	Gas migration and accumulation in structures	Human end-users	Deep made ground was not recorded on site, and no potential on or off site sources of ground gases have been identified. The made ground on site had a relatively low organic content. The site has been classified as very low risk (CS1).		
		Structures			
Radon Gas		Human end-users	Unlikely – Site outside of radon affected area	Medium - chronic risk to human end users	Low Risk

Table 2: Conceptual model and risk classification



## 5. RISK MANAGEMENT AND MITIGATION MEASURES

### 5.1 INTRODUCTION

The review of risk and assessment of appropriate management or remediation is based on the presence of a “source-pathway-receptor”. In the absence of the linkage, the risk is eliminated. The discussion below is based on the findings of the investigation and is therefore limited to these areas. If any suspected contamination is encountered during the construction phase then this should be evaluated and appropriate action taken.

### 5.2 CHEMICAL CONTAMINATION – HUMAN END-USERS

Asbestos was recorded on site in the form of ACM fragments, which may degrade producing loose fibres. There is a potential risk to human end-users from exposure to potentially respirable asbestos fibres, particularly in high exposure areas such as areas of proposed soft landscaping. Therefore, remediation will be required.

Given that the receptor cannot be removed and the potentially widespread nature of the contamination restricting the practicality to remove the source, mitigation measures to restrict the potential pathway should be put in place. Different measures are proposed for the hard surfaced and soft landscaped areas.

For the proposed areas of soft landscaping, it is proposed to cover any made ground that is to remain in situ with a brightly coloured geotextile membrane, to prevent soil mixing, overlain with a nominal thickness of imported soil (minimum 150 mm thickness). This will mitigate the risk to human-end users exposed in these areas. Any imported soil should be verified as suitable for use within a commercial setting.

The areas of hard surfacing, the proposed building foundations and/or the hardstanding of the proposed car park/access route will act as physical barrier with respect to respirable asbestos fibres, thereby mitigating the risk to human end-users on site.

There is a potential risk to human users off-site during development, due to the potential generation of loose asbestos fibres on site. As such it is proposed that dust suppression techniques are adopted throughout the groundworks, which should mitigate this risk. Once groundworks have been completed, there should be no viable pathway by which



loose fibres would be able to migrate and impact upon any off-site receptors, and as such any residual risks will have been mitigated.

### 5.3 CHEMICAL CONTAMINATION – CONSTRUCTION WORKERS

Asbestos has been recorded on site, which may pose a risk to construction workers via the inhalation of respirable fibres.

It is recommended that dust suppression methods are used throughout construction, and that all construction workers are informed of the potential presence of asbestos containing materials and soils.

Any residual risks can be addressed by usual hygiene precautions (such as washing hands before eating) and standard personal protective equipment (including gloves, when handling soil).

If any suspected ACMs are reported on site during the construction, they should be appropriately managed, including potential removal and disposal off site. In accordance with the Control of Asbestos Regulations 2012 (as discussed in CL:AIRE, 2016), a duty is placed on the employer or Principal Contractor to prevent the exposure of their employees and members of the public to asbestos fibres, so far as is reasonably practicable, and this should be the first consideration.

### 5.4 CHEMICAL CONTAMINATION – CONTROLLED WATERS

No surface water features were noted on site or within the immediate vicinity. The site was noted to overlie principal and secondary B aquifers.

No evidence of mobile contamination or significant concentrations of potential contaminants was identified on site. Leachate analysis of the natural soil underlying the made ground confirmed the absence of any significant contamination. As such a low to very low risk to controlled waters is concluded.

### 5.5 CHEMICAL CONTAMINATION – WATER SUPPLY PIPES

A low risk from permeation of contaminants into water supply pipes is concluded, based on the recorded concentrations of potential contaminants within the made





ground/natural soil. As such polyethylene, polyvinyl chloride, or barrier pipework should be sufficient.

The specification of any buried pipework should be agreed with the local water utility prior to installation.

## 5.6 GROUND GAS

The ground gas regime of the site has been assessed as best conforming to characteristic gas situation CS1, a site of very low risk. The site is not within an area affected by radon gas. Therefore, no specific gas protection measures are considered necessary.



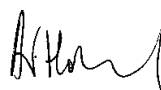
## 6. SUMMARY

1. A contamination assessment was carried out to establish the presence of contaminated soils at Hornbeam Business Park Phase 4, Hornbeam Road, North Walsham, Norfolk, NR28 0FQ prior to development for commercial purposes.
2. The investigation broadly confirmed that made ground was present overlying a granular natural soil with depth. Groundwater was not encountered across the site.
3. Chemical analysis revealed no elevated concentrations of potential chemical contaminants within the made ground. Two bulk ACM fragments were encountered, however no loose fibres were recorded within any samples of the made ground analysed.
4. A moderate risk to human end users from soil contamination by inhalation of asbestos fibres is concluded and remediation will be required. Remediation should comprise the covering of any made ground left in situ in the proposed soft landscaping areas with a brightly coloured geotextile membrane, and a nominal thickness of suitable for use soil laid on top (minimum 150 mm). Any risks to off-site receptors during development can be mitigated by the adoption of dust suppression techniques throughout construction to reduce the risk of exposure to respirable asbestos fibres.
5. The risks to construction workers were considered to be low/moderate due to the asbestos. As such it is recommended that dust suppression techniques are adopted during the groundworks, toolbox talks are carried out to notify operatives of the possible risks, and good hygiene practices, and standard PPE are adopted throughout construction.
6. There is considered to be a low to very low risk to groundwater and surface water respectively given the lack of significant mobile or leachable contamination, and the distance to any surface water features.
7. No elevated concentrations of contaminants that could permeate water supply pipes were recorded and polyethylene should be a suitable material for buried pipework. The specification of any buried pipework should be agreed with the local water utility prior to installation.
8. The ground gas regime of the site has been assessed as characteristic gas situation CS1, a site of very low risk. The site is not within an area affected by radon gas. Therefore, no specific gas protection measures are considered necessary.
9. The detail of any remediation should be submitted as a remediation method statement to the local authority for approval prior to implementation.



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## APPENDIX A: REFERENCES

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## APPENDIX B: TRIAL PIT RECORDS

### KEY



D	Small disturbed sample
ES	Environmental sample
A	Sample of suspected asbestos containing material (ACM)



Each sample type is numbered sequentially with depth and relates to the depth range quoted

All depths and measurements are given in metres, except as noted

Strata descriptions compiled by visual examination of liner samples obtained after BS EN1997-2:2007 Eurocode 7 and its UK National Annex supported by BS 5930:2015 and modified in accordance with laboratory test results where applicable



 <b>A F Howland Associates</b> <b>Geotechnical Engineers</b>					<b>Site</b> Hornbeam Business Park, Hornbeam Road, North Walsham, Norfolk		<b>Trial Pit Number</b> <b>TP101</b>
<b>Excavation Method</b> Machine excavated trial pit		<b>Dimensions</b> L 1.4 x W 0.6 x D 1.8 m		<b>Ground Level (mOD)</b> 41.37	<b>Client</b> Birchwood Building Limited		<b>Job Number</b> 21.008
		<b>Location</b> 628240 E 329495 N		<b>Dates</b> 14/12/2021	<b>Engineer</b>		<b>Sheet</b> 1/1
<b>Depth (m)</b>	<b>Sample / Tests</b>	<b>Water Depth (m)</b>	<b>Field Records</b>	<b>Level (mOD)</b>	<b>Depth (m) (Thickness)</b>	<b>Description</b>	<b>Legend</b>
0.20 0.20 0.20	A1 D1 ES1				(0.50)	MADE GROUND (Brown clayey gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse brick, flint and concrete. 1 no. cement board fragment at 0.2m [A1]) over plastic membrane	
0.80 0.80	D2 ES2			40.87	0.50	MADE GROUND (Grey clayey slightly gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse flint, brick and clinker. Slight organic odour)	
					(1.00)		
1.60	D3			39.87	1.50	Orange brown very gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint. With occasional flint cobbles	
			14/12/2022:DRY	39.57	1.80	Complete at 1.80m	
					<b>Remarks</b>  1. Location CAT scanned prior to excavation 2. No groundwater encountered 3. Trial pit remained open and sidewalls stable during excavation. 4. Trial pit backfilled with arisings upon completion. 5. Sample A1 was confirmed, via laboratory analysis, to be an asbestos containing material (ACM)		
					Logged in accordance BS5930:1999 A2		
					<b>Scale (approx)</b> 1:20	<b>Logged By</b> DJM	<b>Figure No.</b> 21.008.TP101

 <b>A F Howland Associates</b> <b>Geotechnical Engineers</b>					<b>Site</b> Hornbeam Business Park, Hornbeam Road, North Walsham, Norfolk		<b>Trial Pit Number</b> <b>TP102</b>
<b>Excavation Method</b> Machine excavated trial pit		<b>Dimensions</b> L 1.6 x W 0.8 x D 1.9 m		<b>Ground Level (mOD)</b> 41.66	<b>Client</b> Birchwood Building Limited		<b>Job Number</b> 21.008
		<b>Location</b> 628225 E 329480 N		<b>Dates</b> 14/12/2021	<b>Engineer</b>		<b>Sheet</b> 1/1
<b>Depth (m)</b>	<b>Sample / Tests</b>	<b>Water Depth (m)</b>	<b>Field Records</b>	<b>Level (mOD)</b>	<b>Depth (m) (Thickness)</b>	<b>Description</b>	<b>Legend</b>
0.10	ES1			41.46	(0.20) 0.20	MADE GROUND (Brown silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse brick, flint, chalk and concrete) ...orange membrane at the base of strata	
0.30 0.30 0.30	A1 D1 ES2			41.06	(0.40) 0.60	MADE GROUND (Brown silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse brick and flint. 1No. kerb-stone. 2No. fragments of corrugated cement board [A1]) over plastic membrane	
1.00 1.00	D2 ES3			40.06	(1.00) 1.60	MADE GROUND (Brown mottled orange brown and grey slightly silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse flint and brick)	
1.80 1.80	D3 ES4		14/12/2022:DRY	39.76	(0.30) 1.90	Orange brown slightly silty gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint	
						Complete at 1.90m	
					<b>Remarks</b>  1. Location CAT scanned prior to excavation 2. No groundwater encountered 3. Trial pit sidewalls unstable from surface to 1.6m 4. Trial pit backfilled with arisings upon completion. 5. Sample A1 was confirmed, via laboratory analysis, to be an asbestos containing material (ACM)		
					Logged in accordance BS5930:1999 A2		
					<b>Scale (approx)</b> 1:20	<b>Logged By</b> DJM	<b>Figure No.</b> 21.008.TP102



# A F Howland Associates Geotechnical Engineers

## Site

Hornbeam Business Park, Hornbeam Road, North  
Walsham, Norfolk

**Trial Pit  
Number**  
**TP103**

<b>Excavation Method</b> Machine excavated trial pit	<b>Dimensions</b> L 1.5 x W 0.6 x D 2.4 m	<b>Ground Level (mOD)</b> 42.14	<b>Client</b> Birchwood Building Limited	<b>Job Number</b> 21.008
	<b>Location</b> 628251 E 329469 N	<b>Dates</b> 14/12/2021	<b>Engineer</b>	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.20 0.20	D1 ES1				(0.50)	MADE GROUND (Brown clayey gravelly fine coarse sand. Gravel is angular to subrounded fine to coarse flint and brick)	
				41.64	0.50	...membrane at the base of strata	
0.70 0.70	D2 ES2				(0.50)	MADE GROUND (Dark grey brown silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse flint, brick, concrete, metal, clinker and slate)	
				41.14	1.00	MADE GROUND (Orange brown silty fine to medium sand)	
					(0.35)		
				40.79	1.35	MADE GROUND (Brown mottled dark grey brown silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse flint, brick, chalk, concrete, clinker, glazed ceramic and slate. 1No. boulder size fragment of concrete)	
1.50 1.50	D3 ES3		ES3 = 1 jar		(0.55)		
				40.24	1.90	Orange brown silty slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium flint	
					(0.50)		
2.00	D4			39.74	2.40	Complete at 2.40m	
			14/12/2022: DRY				





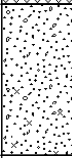

## Remarks



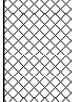
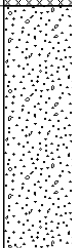
1. Location CAT scanned prior to excavation
2. No groundwater encountered
3. Trial pit remained open and sidewalls stable during excavation.
4. Trial pit backfilled with arisings upon completion.


Logged in accordance BS5930:1999 A2


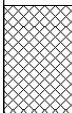
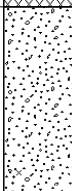

<b>Scale (approx)</b> 1:20	<b>Logged By</b> DJM	<b>Figure No.</b> 21.008.TP103
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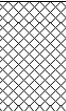




 <b>A F Howland Associates</b> <b>Geotechnical Engineers</b>				<b>Site</b> Hornbeam Business Park, Hornbeam Road, North Walsham, Norfolk		<b>Trial Pit Number</b> <b>TP104</b>			
<b>Excavation Method</b> Machine excavated trial pit		<b>Dimensions</b> L 1.0 x W 0.6 x D 1.0 m		<b>Ground Level (mOD)</b> 42.08		<b>Client</b> Birchwood Building Limited		<b>Job Number</b> 21.008	
		<b>Location</b> 628222 E 329460 N		<b>Dates</b> 14/12/2021		<b>Engineer</b>		<b>Sheet</b> 1/1	
<b>Depth (m)</b>	<b>Sample / Tests</b>	<b>Water Depth (m)</b>	<b>Field Records</b>	<b>Level (mOD)</b>	<b>Depth (m) (Thickness)</b>	<b>Description</b>		<b>Legend</b>	
0.30 0.30	D1 ES1				(0.60)	MADE GROUND (Brown very silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse flint and brick)			
0.70 0.70	D2 ES2			41.48	0.60 (0.40)	Yellow brown mottled orange brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint			
			14/12/2022: DRY	41.08	1.00	Complete at 1.00m			
<div>  <div> <b>Remarks</b> <ol style="list-style-type: none"> <li>1. Location CAT scanned prior to excavation</li> <li>2. No groundwater encountered</li> <li>3. Trial pit remained open and sidewalls stable during excavation.</li> <li>4. Trial pit backfilled with arisings upon completion.</li> </ol> </div> </div>									
Logged in accordance BS5930:1999 A2						<b>Scale (approx)</b> 1:20		<b>Logged By</b> DJM	<b>Figure No.</b> 21.008.TP104

<div></div> <div><b>A F Howland Associates</b> <b>Geotechnical Engineers</b></div>				<b>Site</b> Hornbeam Business Park, Hornbeam Road, North Walsham, Norfolk		<b>Trial Pit Number</b> <b>TP105</b>			
<b>Excavation Method</b> Machine excavated trial pit		<b>Dimensions</b> L 1.1 x W 0.6 x D 1.1 m		<b>Ground Level (mOD)</b> 42.33		<b>Client</b> Birchwood Building Limited		<b>Job Number</b> 21.008	
		<b>Location</b> 628255 E 329436 N		<b>Dates</b> 14/12/2021		<b>Engineer</b>		<b>Sheet</b> 1/1	
<b>Depth (m)</b>	<b>Sample / Tests</b>	<b>Water Depth (m)</b>	<b>Field Records</b>	<b>Level (mOD)</b>	<b>Depth (m) (Thickness)</b>	<b>Description</b>			<b>Legend</b>
0.10	ES1		ES2 = 1 jar	42.18	(0.15) 0.15	MADE GROUND (Dark grey brown clayey slightly gravelly fine to coarse sand. Gravel is angular to subrounded flint and rare brick and concrete)			
0.30 0.30	D1 ES2			41.88	(0.30) 0.45	MADE GROUND (Brown silty gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse flint)			
0.60	D2				(0.65)	Orange brown mottled yellow brown silty slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint			
			14/12/2022:DRY	41.23	1.10	Complete at 1.10m			

	<b>Remarks</b>  1. Location CAT scanned prior to excavation 2. No groundwater encountered 3. Trial pit remained open and sidewalls stable during excavation. 4. Trial pit backfilled with arisings upon completion.		
	Logged in accordance BS5930:1999 A2		
	<b>Scale (approx)</b>  1:20	<b>Logged By</b>  DJM	<b>Figure No.</b>  21.008.TP105

<div></div> <div><div>A F Howland Associates</div><div>Geotechnical Engineers</div></div>					<div>Site</div> <div>Hornbeam Business Park, Hornbeam Road, North Walsham, Norfolk</div>		<div>Trial Pit Number</div> <div>TP106</div>	
<div>Excavation Method</div> <div>Machine excavated trial pit</div>		<div>Dimensions</div> <div>L 1.8 x W 0.6 x D2.2 m</div>		<div>Ground Level (mOD)</div> <div>42.33</div>		<div>Client</div> <div>Birchwood Building Limited</div>		<div>Job Number</div> <div>21.008</div>
		<div>Location</div> <div>628236 E 329442 N</div>		<div>Dates</div> <div>14/12/2021</div>		<div>Engineer</div>		<div>Sheet</div> <div>1/1</div>
<div>Depth (m)</div>	<div>Sample / Tests</div>	<div>Water Depth (m)</div>	<div>Field Records</div>	<div>Level (mOD)</div>	<div>Depth (m) (Thickness)</div>	<div>Description</div>		<div>Legend</div>
0.50 0.50	D1 ES1			42.03	0.30	MADE GROUND (Dark brown very silty gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse flint, brick and concrete)		
					0.50	MADE GROUND (Brown very silty gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse flint)		
1.00 1.00	D2 ES2				41.53	0.80	Orange brown mottled yellow brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint. With rare flint cobbles	
2.00 2.00	D3 ES3	(1.40)	...becoming gravelly and with occasional cobbles					
		40.13	2.20	Complete at 2.20m				
						<div>Remarks</div> <div>1. Location CAT scanned prior to excavation</div> <div>2. No groundwater encountered</div> <div>3. Trial pit sidewalls unstable from 1.8 m to the base of the pit</div> <div>4. Trial pit backfilled with arisings upon completion.</div>		
						Logged in accordance BS5930:1999 A2		
						<div>Scale (approx)</div> <div>1:20</div>	<div>Logged By</div> <div>DJM</div>	<div>Figure No.</div> <div>21.008.TP106</div>

<div></div> <div><b>A F Howland Associates</b> <b>Geotechnical Engineers</b></div>					<b>Site</b> Hornbeam Business Park, Hornbeam Road, North Walsham, Norfolk			<b>Trial Pit Number</b> <b>TP107</b>	
<b>Excavation Method</b> Machine excavated trial pit		<b>Dimensions</b> L 1.1 x W 0.6 x D 1.3 m		<b>Ground Level (mOD)</b> 42.19		<b>Client</b> Birchwood Building Limited		<b>Job Number</b> 21.008	
		<b>Location</b> 628226 E 329427 N		<b>Dates</b> 14/12/2021		<b>Engineer</b>		<b>Sheet</b> 1/1	
<b>Depth (m)</b>	<b>Sample / Tests</b>	<b>Water Depth (m)</b>	<b>Field Records</b>	<b>Level (mOD)</b>	<b>Depth (m) (Thickness)</b>	<b>Description</b>			<b>Legend</b>
0.10 0.10 0.10 0.10	A1 A2 D1 ES1		ES2 = 1 jar	41.89	0.30	MADE GROUND (Pinkish brown slightly sandy angular to subrounded fine to coarse brick, concrete, chalk, flint, ceramic and glass gravel. With 1No. fragment of cement board [A1] and 1No. fragment of fibrous concrete [A2] at 0.1m) ...orange membrane at the base of strata			
0.40	ES2			41.69	0.50	MADE GROUND (Grey very silty slightly gravelly fine to coarse sand. Gravel is angular to subrounded fine to medium clinker) Orange brown slightly silty slightly gravelly fine to coarse SAND. With slightly clayey pockets			
0.80	D2				(0.80)				
				14/12/2022:DRY		40.89	1.30	Complete at 1.30m	



#### Remarks

1. Location CAT scanned prior to excavation
2. No groundwater encountered
3. Trial pit remained open and sidewalls stable during excavation.
4. Trial pit backfilled with arisings upon completion.
5. Samples A1 and A2 were confirmed, via laboratory analysis, to not be asbestos containing materials (ACM)

Logged in accordance BS5930:1999 A2

<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
1:20	DJM	21.008.TP107

## APPENDIX C: LABORATORY TESTING

Analytical Report 21-14822



**A F Howland Associates**  
Geotechnical Engineers



Chris Smith  
AF Howland Associates Ltd  
The Old Exchange  
Newmarket Road  
Cringleford  
Norwich  
Norfolk  
NR4 6UF

**Derwentside Environmental Testing Services Ltd**  
Unit 1  
Rose Lane Industrial Estate  
Rose Lane  
Lenham Heath  
Kent  
ME17 2JN  
t: 01622 850410

## **DETS Report No: 21-14822**

**Site Reference:** Hornbeam Road

**Project / Job Ref:** 21.008

**Order No:** CPJS/21.008/00/02

**Sample Receipt Date:** 17/12/2021

**Sample Scheduled Date:** 17/12/2021

**Report Issue Number:** 2

**Reporting Date:** 06/01/2022

  
Dave Ashworth  
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.  
This report supersedes 21-14822, issue no.1.  
Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.



DETS Ltd  
Unit 1, Rose Lane Industrial Estate  
Rose Lane  
Lenham Heath  
Maidstone  
Kent ME17 2JN  
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	14/12/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hornbeam Road	TP / BH No	TP101	TP101	TP101	TP102	TP102
Project / Job Ref: 21.008	Additional Refs	A1	ES1	ES2	A1	ES2
Order No: CPJS/21.008/00/02	Depth (m)	0.20	0.20	0.80	0.30	0.30
Reporting Date: 06/01/2022	DETS Sample No	579799	579800	579801	579802	579803

Determinand	Unit	RL	Accreditation				
Asbestos Screen <sup>(S)</sup>	N/a	N/a	ISO17025		Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS		7.9	7.5	7.9
Total Cyanide	mg/kg	< 2	NONE		< 2	< 2	< 2
Complex Cyanide	mg/kg	< 2	NONE		< 2	< 2	< 2
Free Cyanide	mg/kg	< 2	NONE		< 2	< 2	< 2
Thiocyanate as SCN	mg/kg	< 3	NONE		< 3	< 3	< 3
Organic Matter (SOM)	%	< 0.1	MCERTS		1.5	2.1	2.3
Antimony (Sb)	mg/kg	< 1	NONE		1.7	2.1	1.5
Arsenic (As)	mg/kg	< 2	MCERTS		8	8	8
Beryllium (Be)	mg/kg	< 0.5	MCERTS		< 0.5	< 0.5	< 0.5
Cadmium (Cd)	mg/kg	< 0.2	MCERTS		< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS		9	10	9
Chromium (hexavalent)	mg/kg	< 2	NONE		< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS		14	18	14
Lead (Pb)	mg/kg	< 3	MCERTS		54	65	54
Mercury (Hg)	mg/kg	< 1	MCERTS		< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS		6	6	6
Selenium (Se)	mg/kg	< 2	MCERTS		< 3	< 3	< 3
Vanadium (V)	mg/kg	< 1	MCERTS		17	23	17
Zinc (Zn)	mg/kg	< 3	MCERTS		48	51	51
Total Phenols (monohydric)	mg/kg	< 2	NONE		< 2	< 2	< 2
TPH - Aliphatic >C35 - C40	mg/kg	< 10	NONE		< 10	< 10	< 10
TPH - Aromatic >C35 - C40	mg/kg	< 10	NONE		< 10	< 10	< 10
TPH - Aliphatic / Aromatic (C6 - C40) - Total	mg/kg	< 42	NONE		< 42	< 42	< 42

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation





DETS Ltd  
Unit 1, Rose Lane Industrial Estate  
Rose Lane  
Lenham Heath  
Maidstone  
Kent ME17 2JN  
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	14/12/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hornbeam Road	TP / BH No	TP103	TP103	TP104	TP106	TP107
Project / Job Ref: 21.008	Additional Refs	ES2	ES3	ES1	ES3	A1
Order No: CPJS/21.008/00/02	Depth (m)	0.70	1.50	0.30	2.00	0.10
Reporting Date: 06/01/2022	DETS Sample No	579804	579805	579806	579807	579808

Determinand	Unit	RL	Accreditation				
Asbestos Screen <sup>(S)</sup>	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	
pH	pH Units	N/a	MCERTS	7.7	7.8	7.9	
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	
Complex Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	
Free Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	
Thiocyanate as SCN	mg/kg	< 3	NONE	< 3	< 3	< 3	
Organic Matter (SOM)	%	< 0.1	MCERTS	2.9	2	0.8	
Antimony (Sb)	mg/kg	< 1	NONE	2.3	1.2	1.2	
Arsenic (As)	mg/kg	< 2	MCERTS	15	9	6	
Beryllium (Be)	mg/kg	< 0.5	MCERTS	0.5	< 0.5	< 0.5	
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.5	< 0.2	< 0.2	
Chromium (Cr)	mg/kg	< 2	MCERTS	9	6	8	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	37	40	8	
Lead (Pb)	mg/kg	< 3	MCERTS	334	561	24	
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	6	4	4	
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	
Vanadium (V)	mg/kg	< 1	MCERTS	19	12	14	
Zinc (Zn)	mg/kg	< 3	MCERTS	497	125	32	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	
TPH - Aliphatic >C35 - C40	mg/kg	< 10	NONE	< 10	< 10	< 10	
TPH - Aromatic >C35 - C40	mg/kg	< 10	NONE	< 10	< 10	< 10	
TPH - Aliphatic / Aromatic (C6 - C40)	mg/kg	< 42	NONE	< 42	< 42	< 42	
- Total							

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion  
Subcontracted analysis (S)





DETS Ltd  
Unit 1, Rose Lane Industrial Estate  
Rose Lane  
Lenham Heath  
Maidstone  
Kent ME17 2JN  
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Hornbeam Road	TP / BH No	TP107	TP107			
Project / Job Ref: 21.008	Additional Refs	A2	ES1			
Order No: CPJS/21.008/00/02	Depth (m)	0.10	0.10			
Reporting Date: 06/01/2022	DETS Sample No	579809	579810			

Determinand	Unit	RL	Accreditation	(n)			
Asbestos Screen <sup>(S)</sup>	N/a	N/a	ISO17025	Not Detected			
pH	pH Units	N/a	MCERTS	9.6			
Total Cyanide	mg/kg	< 2	NONE	< 2			
Complex Cyanide	mg/kg	< 2	NONE	< 2			
Free Cyanide	mg/kg	< 2	NONE	< 2			
Thiocyanate as SCN	mg/kg	< 3	NONE	< 3			
Organic Matter (SOM)	%	< 0.1	MCERTS	1.8			
Antimony (Sb)	mg/kg	< 1	NONE	2.5			
Arsenic (As)	mg/kg	< 2	MCERTS	7			
Beryllium (Be)	mg/kg	< 0.5	MCERTS	< 0.5			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	13			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	13			
Lead (Pb)	mg/kg	< 3	MCERTS	71			
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	8			
Selenium (Se)	mg/kg	< 2	MCERTS	< 3			
Vanadium (V)	mg/kg	< 1	MCERTS	22			
Zinc (Zn)	mg/kg	< 3	MCERTS	105			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2			
TPH - Aliphatic >C35 - C40	mg/kg	< 10	NONE	< 10			
TPH - Aromatic >C35 - C40	mg/kg	< 10	NONE	< 10			
TPH - Aliphatic / Aromatic (C6 - C40) - Total	mg/kg	< 42	NONE	< 42			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion  
Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	14/12/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hornbeam Road	TP / BH No	TP101	TP101	TP102	TP103	TP103
Project / Job Ref: 21.008	Additional Refs	ES1	ES2	ES2	ES2	ES3
Order No: CPJS/21.008/00/02	Depth (m)	0.20	0.80	0.30	0.70	1.50
Reporting Date: 06/01/2022	DETS Sample No	579800	579801	579803	579804	579805

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.62	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.22	0.46	0.22
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.25	< 0.1	0.47	0.61	0.39
Pyrene	mg/kg	< 0.1	MCERTS	0.23	< 0.1	0.43	0.53	0.33
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.12	< 0.1	0.22	0.29	0.17
Chrysene	mg/kg	< 0.1	MCERTS	0.16	< 0.1	0.26	0.39	0.23
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.19	< 0.1	0.30	0.42	0.21
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.14	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.13	< 0.1	0.22	0.27	0.15
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.15	0.18	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.14	0.16	< 0.1
Coronene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1	< 1	1.1	1.7	< 1
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1	< 1	1.7	3.1	1.2
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	2.4	4.1	1.7
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7	< 1.7	2.4	4.1	< 1.7

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Hornbeam Road	TP / BH No	TP104	TP107			
Project / Job Ref: 21.008	Additional Refs	ES1	ES1			
Order No: CPJS/21.008/00/02	Depth (m)	0.30	0.10			
Reporting Date: 06/01/2022	DETS Sample No	579806	579810			

Determinand	Unit	RL	Accreditation	(n)		
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	0.17	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	0.14	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	0.17	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	1.54	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.35	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	1.83	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	1.65	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.72	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.87	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.77	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.25	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.56	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.29	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	0.29	
Coronene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1	3.5	
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1	6.9	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	9.6	
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7	9.6	



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# Soil Analysis Certificate - TPH LOM Banded

DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	14/12/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hornbeam Road	TP / BH No	TP101	TP101	TP102	TP103	TP103
Project / Job Ref: 21.008	Additional Refs	ES1	ES2	ES2	ES2	ES3
Order No: CPJS/21.008/00/02	Depth (m)	0.20	0.80	0.30	0.70	1.50
Reporting Date: 06/01/2022	DETS Sample No	579800	579801	579803	579804	579805

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	< 30
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	3	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	6	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	4	8	3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	< 30
Total >C5 - C44	mg/kg	< 60	NONE	< 60	< 60	< 60	< 60	< 60

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Soil Analysis Certificate - TPH LOM Banded

DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Hornbeam Road	TP / BH No	TP104	TP107			
Project / Job Ref: 21.008	Additional Refs	ES1	ES1			
Order No: CPJS/21.008/00/02	Depth (m)	0.30	0.10			
Reporting Date: 06/01/2022	DETS Sample No	579806	579810			

Determinand	Unit	RL	Accreditation	(n)		
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10	
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	2	
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	12	
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	20	
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	< 30	35	
Total >C5 - C44	mg/kg	< 60	NONE	< 60	< 60	



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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	14/12/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hornbeam Road	TP / BH No	TP101	TP101	TP102	TP103	TP103
Project / Job Ref: 21.008	Additional Refs	ES1	ES2	ES2	ES2	ES3
Order No: CPJS/21.008/00/02	Depth (m)	0.20	0.80	0.30	0.70	1.50
Reporting Date: 06/01/2022	DETS Sample No	579800	579801	579803	579804	579805

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Hornbeam Road	TP / BH No	TP104	TP107			
Project / Job Ref: 21.008	Additional Refs	ES1	ES1			
Order No: CPJS/21.008/00/02	Depth (m)	0.30	0.10			
Reporting Date: 06/01/2022	DETS Sample No	579806	579810			

Determinand	Unit	RL	Accreditation	(n)		
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	



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Leachate Analysis Certificate						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	14/12/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Hornbeam Road	TP / BH No	TP101	TP102	TP106	TP107	TP107
Project / Job Ref: 21.008	Additional Refs	A1	A1	ES3	A1	A2
Order No: CPJS/21.008/00/02	Depth (m)	0.20	0.30	2.00	0.10	0.10
Reporting Date: 06/01/2022	DETS Sample No	579799	579802	579807	579808	579809

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025			7.7	
Total Cyanide	ug/l	< 5	NONE			< 5	
Complex Cyanide	ug/l	< 5	NONE			< 5	
Free Cyanide	ug/l	< 5	NONE			< 5	
Thiocyanate as SCN	ug/l	< 10	NONE			< 10	
Antimony	ug/l	< 5	ISO17025			< 5	
Arsenic	ug/l	< 5	ISO17025			< 5	
Beryllium	ug/l	< 3	ISO17025			< 3	
Cadmium	ug/l	< 0.4	ISO17025			< 0.4	
Chromium	ug/l	< 5	ISO17025			< 5	
Chromium (hexavalent)	ug/l	< 20	NONE			< 20	
Copper	ug/l	< 5	ISO17025			< 5	
Lead	ug/l	< 5	ISO17025			< 5	
Mercury	ug/l	< 0.05	ISO17025			< 0.05	
Nickel	ug/l	< 5	ISO17025			< 5	
Selenium	ug/l	< 5	ISO17025			< 5	
Vanadium	ug/l	< 5	ISO17025			< 5	
Zinc	ug/l	< 2	ISO17025			6	
Total Phenols (monohydric)	ug/l	< 10	NONE			< 10	

Subcontracted analysis <sup>(5)</sup>





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Leachate Analysis Certificate - Speciated PAH						
DETS Report No: 21-14822	Date Sampled	14/12/21				
AF Howland Associates Ltd	Time Sampled	None Supplied				
Site Reference: Hornbeam Road	TP / BH No	TP106				
Project / Job Ref: 21.008	Additional Refs	ES3				
Order No: CPJS/21.008/00/02	Depth (m)	2.00				
Reporting Date: 06/01/2022	DETS Sample No	579807				

Determinand	Unit	RL	Accreditation				
Naphthalene	ug/l	< 0.01	NONE	0.01			
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01			
Acenaphthene	ug/l	< 0.01	NONE	< 0.01			
Fluorene	ug/l	< 0.01	NONE	< 0.01			
Phenanthrene	ug/l	< 0.01	NONE	0.03			
Anthracene	ug/l	< 0.01	NONE	< 0.01			
Fluoranthene	ug/l	< 0.01	NONE	0.01			
Pyrene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01			
Chrysene	ug/l	< 0.01	NONE	< 0.01			
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01			
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01			
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01			
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008			
Total EPA-16 PAHs	ug/l	< 0.16	NONE	< 0.16			



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Leachate Analysis Certificate - TPH CWG Banded						
DETS Report No: 21-14822	Date Sampled	14/12/21				
AF Howland Associates Ltd	Time Sampled	None Supplied				
Site Reference: Hornbeam Road	TP / BH No	TP106				
Project / Job Ref: 21.008	Additional Refs	ES3				
Order No: CPJS/21.008/00/02	Depth (m)	2.00				
Reporting Date: 06/01/2022	DETS Sample No	579807				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10			
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10			
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10			
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10			
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10			
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10			
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10			
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70			
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10			
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10			
Aromatic >C8 - C10	ug/l	< 10	NONE	< 10			
Aromatic >C10 - C12	ug/l	< 10	NONE	< 10			
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10			
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10			
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10			
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70			
Total >C5 - C35	ug/l	< 140	NONE	< 140			



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Leachate Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-14822	Date Sampled	14/12/21				
AF Howland Associates Ltd	Time Sampled	None Supplied				
Site Reference: Hornbeam Road	TP / BH No	TP106				
Project / Job Ref: 21.008	Additional Refs	ES3				
Order No: CPJS/21.008/00/02	Depth (m)	2.00				
Reporting Date: 06/01/2022	DETS Sample No	579807				

Determinand	Unit	RL	Accreditation				
Benzene	ug/l	< 1	ISO17025	< 1			
Toluene	ug/l	< 5	ISO17025	< 5			
Ethylbenzene	ug/l	< 5	ISO17025	< 5			
p & m-xylene	ug/l	< 10	ISO17025	< 10			
o-xylene	ug/l	< 5	ISO17025	< 5			
MTBE	ug/l	< 10	ISO17025	< 10			



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Bulk Analysis Certificate						
DETS Report No: 21-14822	Date Sampled	14/12/21	14/12/21	14/12/21	14/12/21	
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Hornbeam Road	TP / BH No	TP101	TP102	TP107	TP107	
Project / Job Ref: 21.008	Additional Refs	A1	A1	A1	A2	
Order No: CPJS/21.008/00/02	Depth (m)	0.20	0.30	0.10	0.10	
Reporting Date: 06/01/2022	DETS Sample No	579799	579802	579808	579809	

Determinand	Unit	RL	Accreditation				
Asbestos Type <sup>(S)</sup>	PLM Result	N/a	ISO17025	Chrysotile	Chrysotile	Not Detected	Not Detected
Sample Matrix <sup>(S)</sup>	Material Type	N/a	NONE	Cement	Cement	Cement	Cement

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification) that is in accordance with the Health and Safety Executive HSG 248 Appendix 2.

This report refers to samples as received, and Dets Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

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

RL: Reporting Limit

Subcontracted analysis <sup>(S)</sup>



DETS Ltd  
Unit 1, Rose Lane Industrial Estate  
Rose Lane  
Lenham Heath  
Maidstone  
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#### Soil Analysis Certificate - Sample Descriptions

DETS Report No: 21-14822
AF Howland Associates Ltd
Site Reference: Hornbeam Road
Project / Job Ref: 21.008
Order No: CPJS/21.008/00/02
Reporting Date: 06/01/2022

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
579800	TP101	ES1	0.20	10.4	Brown sandy clay with stones
579801	TP101	ES2	0.80	11.3	Brown sandy clay with stones
579803	TP102	ES2	0.30	8.7	Brown sandy clay with stones and brick
579804	TP103	ES2	0.70	11.8	Brown sandy clay with brick
579805	TP103	ES3	1.50	12.3	Brown sandy clay with stones and brick
579806	TP104	ES1	0.30	9.4	Brown sandy clay with stones
579810	TP107	ES1	0.10	16.8	Brown sandy gravel with stones and brick

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample <sup>1/5</sup>



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# Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 21-14822

AF Howland Associates Ltd

Site Reference: Hornbeam Road

Project / Job Ref: 21.008

Order No: CPJS/21.008/00/02

Reporting Date: 06/01/2022

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried  
AR As Received



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# Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 21-14822

AF Howland Associates Ltd

Site Reference: Hornbeam Road

Project / Job Ref: 21.008

Order No: CPJS/21.008/00/02

Reporting Date: 06/01/2022

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1.5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LOM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

## Key

F Filtered  
UF Unfiltered

## APPENDIX D: DRAWINGS

Drawing 21.008/CA/01	Site Location Plan
Drawing 21.008/CA/Phase4/02	Exploratory Hole Location Plan
Phase 4 Proposal (Birchwood Building Limited, dated September 2021)	







North



Circle indicates approximate location of site

Scale 1: 50,000 @ A4

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**A F Howland Associates**  
Geotechnical Engineers

**Site:** Hornbeam Business Park, Hornbeam Road, North Walsham

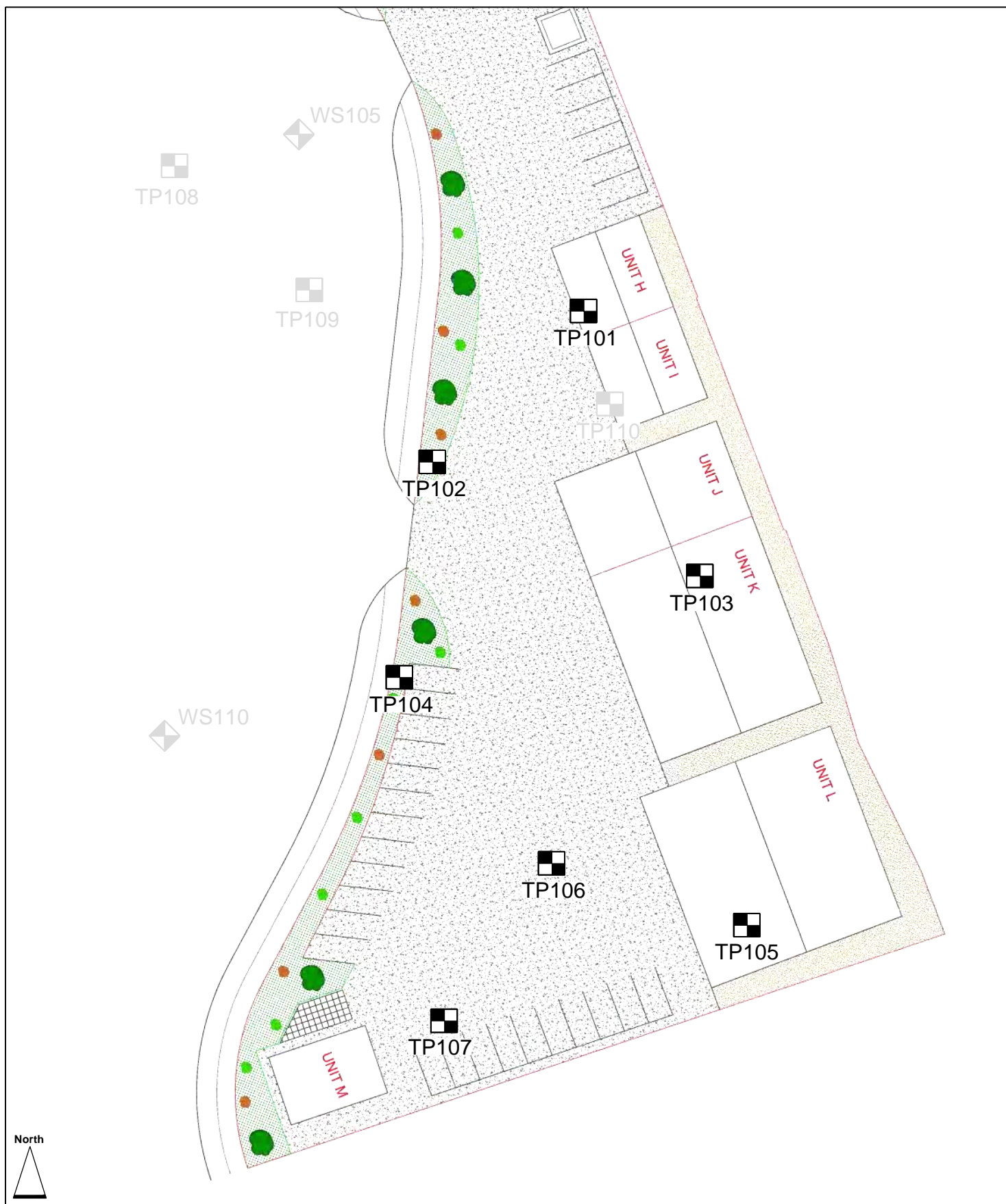
**SITE LOCATION PLAN**

**Client :** Birchwood Building Limited

**Date :** January 2022

**Dwg :** 21.008/CA/01





Key:



Trial pit location and reference



Previous ground investigation location and reference  
(Harrison Group Environmental Limited, 2013)

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**Client:** Birchwood Building

**Site:**  
Hornbeam Business Park, Hornbeam Road,  
North Walsham

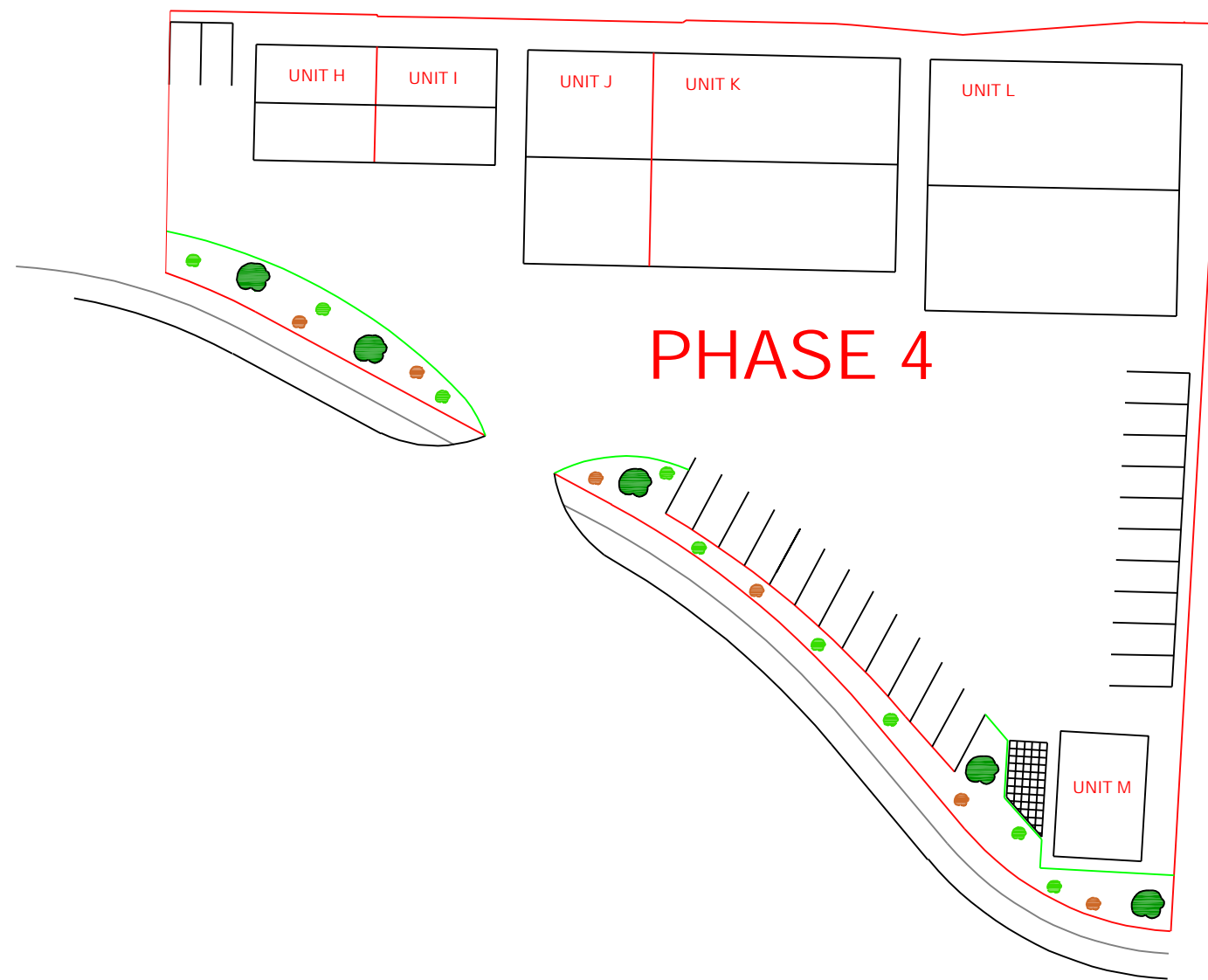
**Job No.:** 19.262

**Drawing Title:**  
EXPLORATORY HOLE LOCATION PLAN

**Date:** January 2022

**Drawing No:** 21.008/CA/Phase4/02

**Scale:** 1:500 @ A4



PHASE 4 PROPOSAL

PHASE 4

N/A

19.09.2021

S. GARDNER

A

## APPENDIX E: RISK ASSESSMENT CLASSIFICATION

Classification	Definition	Examples
High Likelihood	There is a pollution linkage and an event which would either appear very likely in the short term and almost inevitable over the long term, or, there is evidence at the receptor of harm or pollution.	Free product visible on surface of sensitive water body or in the soil.  On site or adjacent gassing 'landfill site'.
Likely	There is a pollution linkage and all the elements are present and in the right place which means that it is probable that an event will occur.  Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.	Potentially contaminative land use i.e. 'Brownfield' site, fuel storage depot, factory, petrol station etc.  Sensitive receptors to be introduced as part of site redevelopment. Potentially infilled land identified on site or off-site with credible migration pathway.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur.  However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.	Potential source of contamination identified i.e. historical land use as allotments or domestic above ground fuel storage tanks, areas of burning garden waste. Possible off-site infilled land.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.	No significant potential sources of contamination identified e.g. 'Greenfield' site. No potential sources of ground gas.

TABLE E1: CLASSIFICATION OF PROBABILITY

Classification	Definition	Examples
Severe	Short term (acute) risk to human health. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short term risk to a particular ecosystem.	High concentrations of cyanide on the surface of an informal recreation area.  Major spillage of contaminants from site into controlled water. Credible source of ground gas.
Medium	Chronic damage to Human Health.  Pollution of sensitive water resources.  A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of a contaminant from site exceeds the generic, or site specific assessment criteria.  Leaching of contaminants from a site to a Secondary or Principal aquifer or watercourse.
Mild	Pollution of non-sensitive water resources.  Significant damage to buildings/structures and crops ("significant harm" as defined in the Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures or the environment.	Concentrations of a contaminant do not exceed the generic, or site specific assessment criteria.  Leaching of contaminants from a site to an Unproductive Aquifer.  Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as Personal Protective Equipment, etc).	The presence of contaminants at such concentrations that protective equipment is required during site works.  The loss of plants in a landscaping scheme.

TABLE E2: CLASSIFICATION OF CONSEQUENCE



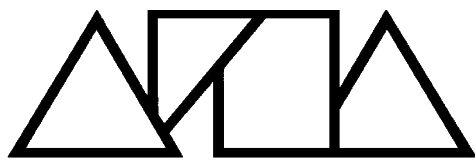
Classification	Definition
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is occurring. The risk, if realised, is likely to result in a substantial liability. Urgent investigation and remediation will be required.
High Risk	Harm or chronic damage is likely to arise to a designated receptor from an identified hazard. Investigation is required and remediation is likely to be required to ensure the site is suitable for a proposed use.
Moderate Risk	It is possible that harm or chronic damage could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe. Investigation and remediation are likely to be required to ensure the site is suitable for a proposed use.
Low/Moderate Risk	It is possible that harm or chronic damage could arise to a designated receptor from an identified hazard. Investigation is likely to be required. However, circumstances are such that investigation may prove the consequence to be mild and the site suitable for use without remediation.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst be mild. Investigation is unlikely to be required.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe. Investigation is not required.

TABLE E3: DESCRIPTION OF RISK

		CONSEQUENCE			
		Severe	Medium	Mild	Minor
PROBABILITY	High likelihood	Very High	High	Moderate	Low/Moderate
	Likely	High	Moderate	Low/Moderate	Low
	Low likelihood	Moderate	Low/Moderate	Low	Very Low
	Unlikely	Low/Moderate	Low	Very Low	Very Low

TABLE E4: DETERMINATION OF RISK





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