



**Richard Jackson**  
Engineering Consultants

## PHASE TWO GEO-ENVIRONMENTAL ASSESSMENT

Brook Hall Farm, Church Road, Crowfield, Suffolk, IP6 9TG

Joy Cox

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### EXECUTIVE SUMMARY

<b>Purpose:</b>	To undertake an intrusive ground investigation to establish the prevailing ground conditions, recover soil samples, assess the contamination status of the site and install monitoring standpipes in order that an assessment of the gassing regime beneath the site may be made.
<b>Site Status:</b>	At the time of investigation, the site comprised an active farm. The area of investigation was occupied by 2no. barns with an access road and an area of concrete hardstanding between. Further farm buildings were present to the east, south and west together with a number of ponds.
<b>Fieldwork:</b>	The fieldwork comprised the formation of 6no. windowless sampler boreholes together with in-situ testing, soil sampling and the installation and subsequent monitoring of 3no. standpipes.
<b>Ground Conditions:</b>	<p>The following ground conditions were encountered:</p> <ul style="list-style-type: none"> <li>• Surface materials / made ground to a maximum depth of 2.00m below ground level (bgl);</li> <li>• Lowestoft Formation to the base of this investigation at 5.00m bgl;</li> </ul> <p>Groundwater was encountered at a minimum depth of 0.70m bgl during the investigation, with a minimum standing water level (SWL) of 0.45m bgl recorded during monitoring on 14<sup>th</sup> April 2023.</p>
<b>Soil Contamination:</b>	Elevated concentrations of PAH compounds were recorded in made ground soils beneath the site at locations WS02, WS02A and WS03. Asbestos was also recorded in the Made Ground in WS02 & WS02A associated with an infilled pond. Delineation of the encountered contamination is recommended and remediation of soft landscaping will be required.
<b>Gassing Regime:</b>	<p>Gas monitoring to date has recorded;</p> <ul style="list-style-type: none"> <li>• Maximum carbon-dioxide concentrations of 1.2% by volume (% v/v);</li> <li>• Minimum oxygen concentrations of 20.0% v/v;</li> <li>• Maximum flow rates of 2.0 l/hr;</li> <li>• Maximum volatile organic compound (VOC) concentrations of 0.9ppm;</li> <li>• No methane concentrations have been detected.</li> </ul> <p>The gas monitoring programme is ongoing.</p>
<b>Structural Foundations:</b>	Shallow mass concrete foundations bearing onto the cohesive Lowestoft Formation are considered appropriate on site. Safe bearing pressures of 80kN/m <sup>2</sup> at 1.00m bgl, 110kN/m <sup>2</sup> at 1.50m bgl and 150kN/m <sup>2</sup> at 2.00m bgl, have been determined for 0.60m wide strip foundations.
<b>Ground Floor Construction:</b>	Fully suspended ground floor slabs are recommended for adoption on site and should incorporate a sub floor void appropriate to medium volume change potential soils.
<b>Concrete Grade:</b>	A design sulphate class of DS-1 is considered appropriate for use on site, with an aggressive chemical environment for concrete (ACEC) classification of AC-1 recommended.

**Pavement  
Design:**

The following design CBR values are recommended;

- Made Ground – 1%
- Lowestoft Formation – 3%.

## 1. Introduction

Richard Jackson Ltd (RJL) received an instruction to undertake ground investigation works in connection with the proposed development at Brook Hall Farm, Church Road, Crowfield, Suffolk, IP6 9TG.

The works were instructed by Whymark & Moulton Chartered Surveyors on behalf of the Client, Joy Cox and were carried out in accordance with our fee proposal of 23<sup>rd</sup> March 2023, reference JG/60742/GFQ\_Rev\_A

It is our understanding that the works are required to aid the discharge of land contamination planning condition 18 associated with planning reference DC/22/00958 and to provide information to assist in the design and construction of the proposed scheme including to provide information for consideration by building warranty providers.

A phase one desk study report has previously been prepared for the site by RJL, report reference 60742 dated June 2020. This is briefly reviewed in this report.

The intrusive investigation, on which this report is based, comprised 5no. windowless sampler (WLS) boreholes. In-situ testing and soil sampling were also undertaken. Semi-permanent monitoring standpipes were installed in 3no. of the WLS boreholes and gas monitoring is currently on-going at the time of writing.

This report assesses the findings of the intrusive investigation and gives recommendations for use in the design and construction of the proposed scheme.

Chemical analyses have been undertaken in order that the contamination status of the site may be determined and the need for further investigation or remediation assessed.

This report shall be read in conjunction with the limitations of use provided in Appendix F.

## 2. Site Location and Description

The site was located to the north of Church Road, Crowfield, Suffolk, IP6 9TG. The approximate Ordnance Survey grid reference for the centre of the site was TM 148 581. A site location plan is presented as Figure 1 in Appendix A.

The site was irregular in shape, with approximate dimensions of 50m east to west, and 40m north to south.

At the time of the investigation, the site comprised a large barn (Barn A) and breeze-block garage in the north, and a smaller barn (Barn B) and adjacent silo to the south.. Asbestos cement roofing was present on both of the barn buildings.

A concrete hardstanding area was present across the interjoining central area of the site. Grain silos were noted within Barn A which also contained a covered underground storage area. Storage of miscellaneous farm equipment was noted across the site. The southern area comprised an overgrown area of depressed topography, with mature trees up to 20m in height, and a concrete driveway leading from Church Road to the south.

The wider farm area was noted to contain various buildings together with 2no. ponds located to the southwest of the subject site and a further 2no. ponds to the east. A drainage ditch, which was noted to contain water at the time of the investigation was located to the immediate north of the site and formed the northern site boundary.

### **3. Proposed Development**

It is understood that the proposed redevelopment is to comprise the demolition of existing buildings on site and construction of 3no. detached residential dwellings with associated garages and garden areas.

Proposed development plans are presented in Appendix A.

### **4. Review of RJL Phase One Desk Study Report, ref. 60742 (June 2020)**

At the time of the desk study report, the site was in use as an active farm and comprised a number of barns/farm outbuildings together with areas of soft and hard landscaping. Two large barns were present on-site, with a silo adjacent to the southern barn.

The surrounding area comprised further farm buildings to the southwest and east together with a number of off-site ponds.

The British Geological Survey (BGS) 1:50,000 scale series online mapping of the area indicated that the site was underlain by the Lowestoft Formation (diamicton). The bedrock geology was indicated to be the Undifferentiated Lewes Nodular, Seaford, Newhaven and Culver Chalk Formations.

The underlying Lowestoft Formation was classified as a Secondary Undifferentiated Aquifer. The underlying Undifferentiated Chalk Formations were classified as a Principal Aquifer.

Based on the historical map review, the site had undergone various phases of development and redevelopment associated with a farm, since 1884. A pond was shown in the southern part of the site until the early 2000s when it is believed to have been infilled.

The surrounding area was characterised by open farmland from the start of the examined period (1883), with the site itself located within a cluster of buildings associated with Brook Hall Farm.

Potential sources of contamination on-site were identified as made ground and the infilled pond, in addition to farming activities both on and off-site.



Several potential receptors of contamination were identified including residential end users, construction workers, flora, controlled waters, structures and services.

A moderate risk from soil and groundwater contamination to the identified sensitive receptors at the site was considered to exist. A high risk was presented to the site from ground gases.

It was recommended that intrusive ground investigations were undertaken at the site to confirm the prevailing ground conditions, establish the presence and extent of made ground and assess the contamination status, including the gassing regime, of the site.

## **5. Factual Ground Investigation Information**

The findings of the factual ground investigation are provided in the following sections.

### **5.1. Fieldwork**

The fieldwork on which the report is based was undertaken on 30<sup>th</sup> March 2023 and comprised the following:

- The formation of 6no. small diameter windowless sampler boreholes (WLS) – WS01, WS02, WS02A & WS03 - WS05;
- The installation of 3no. semi-permanent monitoring standpipes in WLS boreholes;
- Gas monitoring visits undertaken between 14<sup>th</sup> April and 5<sup>th</sup> May 2023. A further 4no visits are scheduled.

An exploratory hole location plan is presented as Figure 2 in Appendix A.

Exploratory hole logs are presented in Appendix B and give descriptions and depths of strata encountered, together with details of samples taken, in-situ tests, well installations and other relevant information.

Soil samples were recovered from throughout the depth of exploratory holes for chemical analyses, geotechnical testing and record keeping purposes. Samples recovered for chemical analyses were stored in airtight plastic containers and amber glass jars.

Samples recovered for chemical analysis were transported to the analytical laboratory, Eurofins Chemtest Ltd, in cool boxes under chain of custody protocols.

Where applicable, investigative techniques, sampling, logging of soils and insitu testing complied with the requirements of British Standard BS5930:2015- 'Code of Practice for Site Investigations'.

### 5.1.1. Windowless Sampling

The windowless sampling (WLS) utilised a track-mounted hydraulic power-pack and percussive hammer to drive a series of small diameter windowless tubes into the ground.

The WLS boreholes were formed to depths of between 2.00m below ground level (bgl) (WS02A) and 5.00m bgl (WS01 – WS05).

Very poor sample recovery was noted at location WS02 within the top 2.00m bgl during formation of the borehole, considered to be most likely due to the presence of shallow cobbles in the underlying shallow soils. Location WS02A was therefore advanced adjacent to WS02 to a depth of 2.00m bgl to confirm the shallow prevailing ground conditions present in this part of the site.

WLS boreholes were positioned to provide a representative site coverage whilst targeting potential sources of contamination identified in the phase one desk study and taking into account the proposed development scheme. Table 1, provides a summary of the rationale for borehole locations.

*Table 1: Borehole Location Rationale*

Borehole(s)	Rationale
WS01, WS03 – WS05	To provide representative site coverage.
WS02 & WS02A	To target the area of the historical pond on site and potential contamination associated with the on-site silo.

In-situ standard penetration tests (SPTs) were undertaken throughout the depth of the WLS boreholes to provide an indication of the soil density / stiffness. The number of blows required to advance a 60° nose cone over the final 300mm of a 450mm total drive was recorded as the 'N' value these values were presented on the borehole logs.

Where cohesive soils were encountered, a hand shear vane was used to assess the undrained shear strength of the encountered soils. The results of these tests are recorded as the 'IVN' values respectively and are presented on the logs in Appendix B.

On completion of WLS boreholes WS02, WS03 and WS04, semi-permanent 50mm diameter HDPE gas and groundwater monitoring standpipes were installed to a maximum depth of 5.00m bgl.

### 5.1.2. Gas Monitoring

The installed standpipes have been monitored on 2no. occasions since installation for the presence of methane, carbon-dioxide and oxygen using an infra-red portable gas analyser. Gas flow, atmospheric pressure, and standing water levels (SWLs) were also monitored during each visit.

A photo-ionisation detector (PID) was also used during each of the 2no. visits to assess the installations for the presence of volatile organic compounds (VOCs).

Measurements to the base of the standpipes were also made to confirm the depth of the installation.

## **5.2. Laboratory Testing**

### **5.2.1. Geo-Environmental Testing**

Chemical analyses were undertaken on a number of soil samples recovered from the site. Details of chemical analyses undertaken are provided in Section 6.1. Results of chemical analyses are presented in full in Appendix C.

### **5.2.2. Geotechnical Testing**

Disturbed soil samples recovered from the exploratory holes were sent to a UKAS accredited soil testing laboratory Soil Property Testing (SPT) Ltd. The following tests were carried out in accordance with BS EN ISO: 17892-2:2014 & BS1377:1990:

- 22no. water content determinations;
- 8no. Atterberg limit tests (four-point liquid limit cone method);
- 2no. BRE SD1 suites;
- 3no. pH value and sulphate content (2:1 water soil extract) determinations\*;

*\* These tests were undertaken by the UKAS and MCerts accredited laboratory Eurofins*

The results of these tests are presented in Appendices C & D.

## **5.3. Ground Conditions**

The British Geological Survey (BGS) 1:50,000 scale series online mapping of the area indicated that the site was underlain by the Lowestoft Formation (diamicton). The bedrock geology was indicated to be the Undifferentiated Lewes Nodular, Seaford, Newhaven and Culver Chalk Formations.

The deposits encountered in this investigation comprised the following sequence:

- Surface Materials / Made Ground
- Lowestoft Formation

### 5.3.1. Surface Materials / Made Ground

Concrete was encountered from ground level at 2no. locations (WS03 & WS04) to depths of 0.10m and 0.26m bgl respectively.

Made ground was encountered from ground level in 4no. of exploratory boreholes (WS01, WS02, WS02A & WS05) and beneath the concrete hardstanding at WS03 & WS04. The base of the made ground ranged from 0.55m bgl (WS05) to 1.90m bgl / 2.00m bgl (WS02A / WS02).

The made ground encountered generally comprised a soft sandy gravelly clay, noted to contain fragments of brick, macadam, concrete and ceramic.

A soft black mottled brown and grey gravelly silty clay noted to contain brick and macadam fragments was recorded as Made Ground in both WS02 & WS02A, which were advanced in the suspected location of an infilled pond.

### 5.3.2. Lowestoft Formation

Soils interpreted to represent the Lowestoft Formation were encountered beneath the Made Ground in each of the 6no. exploratory holes, to the base of this investigation at a maximum depth of 5.00m bgl (WS01 – WS05).

The Lowestoft Formation was typically encountered as a firm, becoming stiff to very stiff with depth, grey and brown mottled slightly gravelly slightly sandy clay. Gravel was noted to comprise chalk and flint.

SPTs were undertaken throughout the depth of the Lowestoft Formation in 5no. WLS boreholes (WS01 – WS05), not tests were undertaken in WS02A. The results of these tests ranged from N=7 (WS05 at 1.00m bgl) to N=41 (WS05 at 5.00m bgl). An SPT refusal was also recorded in WS02 at 5.00m bgl, recording 25 blows for 75mm penetration. Full results are provided in the WLS borehole logs presented in Appendix B and summarised on the ‘N’ value –vs- depth plot’ presented in Appendix B.

Hand shear vane tests were also undertaken throughout the depth of the Lowestoft Formation. The results of these tests ranged from 39kN/m<sup>2</sup> (WS05 at 0.90m bgl) to >130kN/m<sup>2</sup> (WS03 at 3.90m bgl and 4.20m bgl and WS04 at 3.70m bgl). Full results are provided on the exploratory hole logs and summarised on the ‘undrained shear strength –vs- depth’ plot presented in Appendix B.

Atterberg limit tests were undertaken on 8no. samples of the Lowestoft Formation, along with 22no. water content determinations. Full results of these tests are provided in Appendix D. The following results were measured:

- Water contents ranged from 15.8% (WS05 at 3.40m – 3.90m bgl) to 27.2% (WS04 at 3.00m – 3.30m bgl, WS05 at 0.60m – 0.80m bgl);
- Liquid Limits ranged from 27% (WS04 at 2.70m – 3.00m bgl) to 47% (WS05 at 0.60m – 0.80m bgl);

- Plastic Limits ranged from 13% (WS04 at 2.70m – 3.00m bgl) to 19% (WS05 at 0.60m – 0.80m bgl);
- Plasticity Indices ranged from 14% (WS04 at 2.70m – 3.00m bgl) to 28% (WS05 at 0.60m – 0.80m bgl).

Modified plasticity indices of between 11.6% (WS01 at 1.60m – 1.70m bgl) to 25.8% (WS05 at 0.60m – 0.80m bgl) were calculated on the basis of the following relationship:

- Modified plasticity index = (% samples passing 0.425mm sieve x plasticity index) / 100

The results of the Atterberg limit tests indicated the Lowestoft Formation to be of low to medium plasticity and of low to medium volume change potential.

### 5.3.3. Groundwater

Groundwater was encountered in a number of the exploratory holes during formation and subsequent monitoring. Table 2 below, provides a summary of the groundwater data and includes strike depth, observed rises in groundwater during borehole formation and standing water levels (SWLs) recorded during monitoring.

*Table 2: Summary of Groundwater Levels*

Exploratory Hole	Strike Depth (m bgl)	Rose to Depth (m bgl)	Stratum	SWLs during monitoring on 14.04.23 (m bgl)
WS01	Not encountered	Not encountered	N/A	No installation
WS02	Not encountered	Not encountered	N/A	0.70
WS02A	0.70	0.69	Lowestoft Formation	No installation
WS03	4.70	N/A	Lowestoft Formation	0.68
WS04	3.00	2.71	Lowestoft Formation	0.45
WS05	N/A	N/A	N/A	No installation

### 5.3.4. Ground Gases

Table 3 provides a summary of the gas monitoring results to date. Full results are presented in Appendix E along with the calibration certificates for the gas analyser and PID used at the site.

Table 3: Summary of Gas Monitoring Results –14.04.2023 – 05.05.2023

Borehole	Peak of CH <sub>4</sub> (% v/v)	Peak CO <sub>2</sub> (% v/v)	Min O <sub>2</sub> (% v/v)	Peak of VOCs (ppm)	Steady Flow Rates (l/hr)
WS02	0.0	0.4	<b>20.0 – 20.6</b>	0.2 – <b>0.9</b>	0.0
WS03	0.0	0.7 – 0.9	20.3 - 20.6	0.1	0.0
WS04	0.0	0.7 – <b>1.2</b>	20.2	0.1 - 0.3	<b>2.0</b>
<i>*Bold denotes worst case conditions</i>					

The results of the remaining 4no. monitoring visits will be presented under separate cover on completion of the monitoring regime.

## 6. Geo-Environmental Assessment

The purpose of this section is to provide an assessment of the contamination status of the site.

The soils analysis was undertaken by Eurofins., a UKAS and MCerts accredited laboratory.

### 6.1. Soil Analysis

A broad suite of analyses was scheduled, including metals, hydrocarbons, and inorganic compounds. 7no. samples of soil have been analysed for a broad suite of contaminants as follows:

Arsenic	pH
Cadmium	Total Cyanide
Chromium	Water Soluble Sulphate
Copper	Total Phenols
Nickel	BTEX Compounds
Lead	Total Sulphur
Mercury	Speciated Polyaromatic Hydrocarbons (PAH)
Selenium	Organic Matter Content
Zinc	Total Petroleum Hydrocarbons (TPH)

A further 3no. samples were analysed for the above listed metals and PAH compounds, with analysis for the presence of a range of Volatile Organic Compounds (VOC) undertaken on 2no. soil samples.

Asbestos screening was undertaken by the analytical laboratory on 5no. samples of soil.

#### 6.1.1. Reference Criteria

Screening values have been adopted for the site to reflect site-specific parameters, such as, intended end use and the Soil Organic Matter (SOM). Screening values have been developed on the basis of current guidance as given in The Land Quality Management / Chartered Institute of Environmental Health document, 'The LQM / CIEH S4ULS for human health assessment', (2015) publication no. S4UL3379.

It is understood that the site is to be developed for residential purposes to include areas of domestic gardens. Therefore, screening values specific to residential land use with homegrown produce have been adopted for the site.

A SOM of 1 % has been adopted for organic chemicals for the purposes of the initial assessment on the basis of laboratory analysis. A SOM of 6% has been adopted for inorganic chemicals as detailed in 'The LQM / CIEH S4ULS for human health assessment', (2015).

In the absence of published S4UL for lead, the DEFRA Category 4 Screening Level (C4SL) for lead has been adopted.

Full details of the reference criteria used to derive the screening values, including the adopted values, are provided in Appendix C and summarised below.

The adopted screening values are also summarised in the following section.

### 6.1.2. Discussion of Analytical Results – Soils

Results of the chemical analyses undertaken on soils are presented in Appendix C and summarised below in Table 4.

*Table 4: Results of Chemical Analyses - Soils*

Contaminant	No of Samples Tested	Screening Value (mg/kg)	Range of Concentrations (mg/kg)	No of samples exceeding screening value
Arsenic	10	37	1.9 – 15	0
Cadmium	10	11	0.15 – 0.63	0
Chromium	10	910	3.3 – 23	0
Copper	10	2,400	7.6 – 58	0
Nickel	10	180	4.3 – 26	0
Lead	10	200	5.8 – 110	0
Selenium	10	250	<0.25 – 1.5	0
Mercury	10	40	<0.05 – 0.12	0
Zinc	10	3,700	23 – 210	0
Benzo(a)pyrene	10	2.2	<0.10 – 19	<b>4</b>
Dibenz(a,h)anthracene	10	0.24	<0.10- 3.6	<b>5</b>
Naphthalene	10	2.3	<0.10 – 2.3	0
Total Phenols	10	280	<0.10 – 1.70	0
TPH Aromatic C <sub>5</sub> -C <sub>7</sub>	7	70	<0.05	0

Contaminant	No of Samples Tested	Screening Value (mg/kg)	Range of Concentrations (mg/kg)	No of samples exceeding screening value
TPH Aromatic C <sub>7</sub> -C <sub>8</sub>	7	130	<0.05	0
TPH Aromatic C <sub>8</sub> -C <sub>10</sub>	7	34	<0.05	0
TPH Aromatic C <sub>10</sub> -C <sub>12</sub>	7	74	<0.10 - 21	0
TPH Aromatic C <sub>12</sub> -C <sub>16</sub>	7	140	<0.10 - 25	0
TPH Aromatic C <sub>16</sub> -C <sub>21</sub>	7	260	8.1 – 180	0
TPH Aromatic C <sub>21</sub> -C <sub>35</sub>	7	1,100	4.0 – 510	0
TPH Aliphatic C <sub>5</sub> -C <sub>6</sub>	7	42	<0.05	0
TPH Aliphatic C <sub>6</sub> -C <sub>8</sub>	7	100	<0.05	0
TPH Aliphatic C <sub>8</sub> -C <sub>10</sub>	7	27	<0.05	0
TPH Aliphatic C <sub>10</sub> -C <sub>12</sub>	7	130	2.1 – 5.8	0
TPH Aliphatic C <sub>12</sub> -C <sub>16</sub>	7	1,100	2.9 – 5.3	0
TPH Aliphatic C <sub>16</sub> -C <sub>35</sub>	7	65,000	<3.0 – 23.4	0
Benzene	7	0.087	<0.001	0
Toluene	7	130	<0.001 – 0.0015	0
Ethylbenzene	7	47	<0.001	0
M & P xylene	7	56	<0.001	0
O xylene	7	60	<0.001	0
Vinyl Chloride	2	0.00064	<0.001	0
1,2 – Dichloroethane	2	0.0071	<0.001	0
Trichloroethene	2	0.016	<0.001	0
1,1,1 – Trichloroethane	2	8.8	<0.001	0
Tetrachloroethene	2	0.18	<0.001	0
Chlorobenzene	2	0.46	<0.001	0
Hexachlorobutadiene	2	0.29	<0.001	0

Asbestos was detected in 2no. of the samples which underwent asbestos screening, recorded as amosite and chrysotile fibres/clumps. Subsequent asbestos quantification was undertaken on the 2no. samples which gave results of:

- 0.077% (WS02 at 0.2m bgl)



- 0.20% (WS02A at 0.5m bgl)

From the above it is evident that a number of contaminants recorded concentrations in excess of their tier one screening values for human health. These are summarised in Table 5.

Table 5: Summary of Encountered Soil Contamination

Contaminant	Exploratory Hole (s)	Depth (m bgl)	Stratum
Asbestos	WS02	0.2	Made Ground – Pond
	WS02A	0.5	Made Ground - Pond
Benzo(a)pyrene	WS02	0.2	Made Ground – Pond
	WS02	1.0	Made Ground – Pond
	WS02A	0.5	Made Ground – Pond
	WS02A	1.3	Made Ground – Pond
Dibenz(a,h)anthracene	WS02	0.2	Made Ground – Pond
	WS02	1.0	Made Ground – Pond
	WS02A	0.5	Made Ground – Pond
	WS02A	1.3	Made Ground - Pond
	WS03	0.55	Made Ground

## 6.2. Risk Assessment

As detailed in the preceding sections, concentrations of PAH compounds have been recorded in made ground soils on site which exceed their tier one screening values for the protection of human health.

The majority of these exceedances have been recorded in the south of the site at WS02 and WS02A, which were positioned to target the former pond identified on historical mapping in this area.

In addition, asbestos has also been identified within the Made Ground within the former pond (WS02 / WS02A).

### 6.2.1. Soil Contamination and End Users

Considering initially end users of the site, exposure to contaminants would be primarily through direct contact, ingestion or inhalation of contaminated soils where soil is exposed such as in gardens or other soft landscaping areas.

There is considered to be a significantly reduced risk beneath buildings or in paved areas such as road/driveways, as in such areas there is no pathway by which the pollutant linkage may be completed.

On the basis of the results to date, remediation is likely to be required in soft landscaping areas at the site.

Further delineation of the elevated concentrations identified, particularly associated with the historical pond feature in the south, is recommended to provide information on the required extent of remedial works at the site.

A detailed remediation method statement (RMS) should be produced, indicating where remediation is required and how the remediation is to be achieved. The RMS should also include information on how implemented remedial measures are to be validated.

### **6.2.2. Soil Contamination and Controlled Waters**

The underlying Lowestoft Formation is classified as Secondary (undifferentiated) Aquifer and is considered to be of low resource value. The underlying Undifferentiated Chalk Formations are classified as a Principal Aquifer. Perched groundwater has been encountered at a number of borehole locations on site, with water levels recorded between 0.45m and 0.70m bgl during subsequent monitoring.

The cohesive nature and resultant low permeability of the Lowestoft Formation is considered likely to reduce the potential for leaching/migration to occur and for contaminants identified within made ground soils on site to impact the underlying Principal Aquifer associated with the chalk at depth. Where elevated PAH compounds have been identified, these compounds typically strongly sorb to organic soil particles in near surface soils which reduces their leaching and migration potential.

On the basis of the above, taking into account the low resource value of the Lowestoft Formation, the perched nature of the disclosed groundwater and the localised nature of the disclosed contamination together with requirement for soils remediation on site, the risk presented by the disclosed contamination to controlled waters is considered to be very low and further investigation or risk assessment is not considered to be required at this time.

### **6.2.3. Soil Contamination and Construction Workers, Maintenance Workers and the Public**

Risks to site workers and site neighbours during redevelopment arise primarily through dermal contact, ingestion and inhalation of contaminants. Given the identification of asbestos in soils in the south of the site, it is considered that the degree of contamination observed poses a potentially high risk to site workers and the general public.

In order to reduce the risk to site workers during redevelopment, appropriate safety measures should be adopted on site.

Workers should avoid contact with the soils by the use of protective boots, overalls and gloves, and should wash before eating, drinking and using the toilet. Where asbestos contamination is encountered/expected appropriate RPE should be adopted.

To prevent the inhalation of contaminants by site workers and the wind-blown transfer of contaminants off site, the generation of dust should be avoided; this can be achieved by spraying the materials with water if necessary. Measures should be taken to ensure that contaminated materials are not accidentally transferred off site, for example on vehicle tyres.

Reference should be made to CIRIA Report No.132 'A Guide for Safe Working on Contaminated Sites' (1996), and Health and Safety Guidance Document, 'Protection of Workers and the General Public during the Development of Contaminated Land' (1991).

#### **6.2.4. Soil Contamination and Flora**

Concentrations of the phytotoxic contaminants, zinc, copper and nickel have been compared to the threshold values presented in Table 1 of British Standard BS3882: 'Specification for Topsoil and Requirements for Use' (2007), in order that this risk to flora may be assessed. It should be appreciated that this specification is only applicable to topsoil materials which are being placed. Topsoil which is to remain in-situ is not required to comply with the specifications of BS3882.

The screening values for phytotoxic contaminants are pH dependent and the following values have been adopted on the basis of a pH greater than 7.

- Threshold Value for Zinc –300 mg/kg
- Threshold Value for Copper –200 mg/kg
- Threshold Value for Nickel - 110 mg/kg

Concentrations of the phytotoxic contaminants are below the threshold values and thus the analysed samples are not considered to pose a risk to flora.

#### **6.2.5. Soil Contamination and Structures and Services**

The recorded concentrations of PAH & TPH compounds are considered to pose a potential risk to water supply services. It would be prudent to contact the water supply company to see if barrier pipes should be installed within the proposed scheme.

#### **6.2.6. Ground Gas Contamination**

Gas monitoring to date has recorded the following:

- Maximum carbon-dioxide concentrations of 1.2% by volume (% v/v);
- Minimum oxygen concentrations of 20.0% v/v;
- Maximum volatile organic compound (VOC) concentrations of 0.9ppm;
- Maximum steady flow rate of 2.0l/hr;
- No methane concentrations have been detected.

Carbon-dioxide is a heavier gas than air, which affects the respiratory and central nervous systems. It can cause unconsciousness at concentrations of 5% by volume and death at concentrations of 10% to 15% by volume.

Table 8.5 of CIRIA Report 665 (2007) provides information on current UK practice with respect to gas control measures based upon a Gas Screening Value (GSV). It should be noted that this document only provides guidance with respect to carbon-dioxide and methane, it does not include guidance relevant to VOC.

A GSV is obtained by multiplying the maximum concentration of gas by the maximum flow rate. The following GSV has therefore been calculated for the site:

- GSV for CO<sub>2</sub>: 0.024 l/hr.

A GSV for methane has not been determined as no methane concentrations have been recorded at the site to date.

The calculated GSV typically corresponds to a characteristic situation 1 (CS-1). A CS-1 does not require the adoption of ground gas mitigation measures.

It should be noted that if the low-rise residential development proposed for the site is compliant with the NHBC definition of low rise-residential development (ref. NHBC Guidance on Carbon Dioxide and Methane' (2007)), then the gassing regime should be assessed and the required protection measures determined in accordance with the traffic-light classification system. The site would be classified as Green using the NHBC traffic-light system on the basis of the monitoring data obtained. A green classification does not require the adoption of gas mitigation measures.

It should be noted that gas monitoring is on-going, and the above will be reviewed upon completion of the full monitoring regime.

#### **6.2.7. Conceptual Model**

On the basis of the findings detailed in Section 6.1 together with the above discussion, we have produced a conceptual model which is presented as Table 6.

Table 6: Revised Conceptual Model

Contaminant	Source(s)	Pathway(s)	Receptor(s)	Comment
Asbestos	Infilled Pond	Ingestion, Inhalation, Direct Contact	Residential End Users, Maintenance Workers, General Public	Further delineation of the historical pond on site is recommended with remediation of soft landscaping to be required. Refer to Section 6.2.1.
			Construction Workers	Refer to Section 6.2.2.
PAH	Made Ground & Infilled Pond	Ingestion, Inhalation, Direct Contact	Residential End Users, Maintenance Workers, General Public	Further delineation of the historical pond on site is recommended with remediation of soft landscaping to be required. Refer to Section 6.2.1.
			Construction Workers	Refer to Section 6.2.3.
		Direct Contact	Water Supply Services	Refer to Section 6.2.5.
		Uptake through Roots	Flora	Refer to Section 6.2.4.
Ground Gas (CO <sub>2</sub> & CH <sub>4</sub> )	Made Ground & Infilled Pond	Inhalation, Accumulation, Explosion	Residential End Users, Site Workers, Maintenance Workers	Gas monitoring is on-going, and the requirement for gas mitigation measures shall be reviewed on completion of the monitoring regime.

### 6.2.8. Summary

On the basis of the above it is considered that the site may be redeveloped for its intended residential end use, subject to the following works being undertaken:

- Completion of the on-going gas monitoring, and review of the requirement for gas mitigation measures;
- Further delineation and sampling of the historical pond feature in the south of the site;
- Preparation of a remediation method statement (RMS) detailing how the identified contamination risks will be mitigated to bring the site to a condition suitable for its intended end use;

- Validation works and preparation of a verification report.

### **6.3. Waste**

Reference should be made to the EU Waste Framework Directive, Revised Directive 2008/98/EC and 'The definition of Waste: Development Industry Code of Practice (CoP) Version 2' published by CL:AIRE (2011) to establish whether soils generated from on-site works are classified as waste.

Waste will likely be generated from excavation works. There may be limited opportunities for re-use of materials on site, subject to compliance with the CoP.

The groundworks contractor should classify the waste in accordance with the document entitled, 'Guidance on the classification and assessment of waste (1<sup>st</sup> Edition 2021 V1.2), Technical Guidance WM3', to determine whether the soils to be disposed of off-site are considered to be hazardous or not.

There is, however, likely to be some waste to be disposed of off-site. Waste removed from the site, for disposal, must be classified according to the analytical methods and criteria recommended by the Landfill (England and Wales) (Amendment) Regulations 2004 and 2005. The regulations set new acceptance criteria for wastes to be disposed of at landfill sites with effect from 16th July 2005.

Full and detailed records should be kept of all waste soils removed from site for future reference purposes.

### **6.4. General**

As with any sampling exercise, the sampling process is representative and it is possible that areas of contamination may be found during the redevelopment of the site. Excavations on site should be supervised and any areas of suspected contamination should be assessed by a competent professional and subject to further analysis if necessary.

It should be noted that all remediation proposals are subject to the approval of the Local Authority. It would be prudent to involve the regulatory bodies early in the development of the proposed scheme and before construction commences in order that all requirements are met.

## **7. Geotechnical Assessment**

The recommendations provided within this section are based upon the above information and our understanding of the proposed scheme as detailed in Section 3, together with the proposed development plans included in Appendix A.

Exact details of building loads were not available at the time of writing this report, however, we anticipated that loadings for typical one to two storey residential dwellings will be applicable.

## **7.1. Structural Foundations**

The encountered ground conditions comprise made ground to maximum depths of 2.00m bgl, overlying natural superficial soils of the Lowestoft Formation.

An infilled pond was disclosed in the south of the site and it is recommended that further ground investigation is carried out to establish the extent of this feature, given the close proximity of the proposed dwelling Plot 1.

### **7.1.1. Shallow Foundations**

Conventional mass concrete foundations are considered appropriate for adoption on site, bearing onto the natural cohesive Lowestoft Formation soils. Made ground soils, including the infilled pond in the south of the site are not considered an appropriate bearing stratum and all foundations should fully penetrate the made ground.

Net safe bearing pressures have been determined for the site based on conventional strip footings. The net safe bearing pressures is the permissible increase in vertical stress at the level of the underside of the foundation, above existing overburden pressure which may be calculated on the basis of a soil bulk density of 20kN/m<sup>3</sup>.

Groundwater, considered to be perched, was encountered in a number of exploratory holes during formation at depths ranging 0.70m bgl (WS02A) to 4.70m bgl (WS03). Groundwater was not encountered during the formation of WS01, WS02 or WS05.

Subsequent monitoring of the installed standpipes has indicated high groundwater levels to be present, recorded between 0.45m bgl (WS04) an 0.70m bgl (WS02). These high levels are considered to be due to the installation combined with the cohesive soils acting as a sump for groundwater .

On the basis of the above and for the purposes of estimating net safe bearing pressures, we have taken a conservative approach and assumed that groundwater is at 1.00m bgl.

Table 7 below provides a summary of the calculated net safe bearing pressures at a range of depths bgl. The assumed shear strength of the cohesive Lowestoft Formation soils has been inferred from 'undrained shear strength –vs- depth' plot presented in Appendix B together with the soil descriptions provided by the site engineer. The undrained shear strengths have also been derived from SPT 'N' Values using the correlations provided in Stroud and Butlers Paper (1975). Elastic theory has been used to derive the stress distribution beneath the foundations.

Table 7: Net Safe Bearing Pressures

Foundation	Depth, bgl (m)	Bearing Stratum	Nett Safe Bearing Pressure (kN/m <sup>2</sup> )
0.6m wide strip footing	1.00	Lowestoft Formation	80
	1.50		110
	2.00		150

The net safe bearing pressures presented in Table 7 are intended to provide a guideline to allow for preliminary design of the proposed development scheme, in the absence of detailed design information. Alternative foundation sizes and depths may be feasible, but these would be subject to further assessment to confirm their suitability. It is envisaged that such works would be undertaken as part of the future detailed design of a confirmed scheme proposal and are therefore outside the scope of this study.

At the above net safe bearing pressures, total drained settlements have been calculated to be within tolerable limits.

Settlement in cohesive soils typically comprises a small amount of immediate settlement as loads are applied and a larger proportion of consolidation settlement which will occur over a longer period of time.

All made ground should be penetrated and foundations extended at least 150mm into undisturbed natural soils. The formation should be inspected by a competent engineer prior to concreting. If very soft or soft pockets are encountered, these should be excavated until a firm to stiff deposit suitable for bearing is encountered.

It should be noted that the Lowestoft Formation is a shrinkable material and therefore, where influenced by trees, hedgerows or other vegetation, foundations will need to be designed in accordance with NHBC Standards Chapter 4.2 'Building near Trees'. Based on laboratory testing the Lowestoft Formation should be considered to have a medium volume change potential.

Where foundations exceed a depth of 1.5m due to the influence of trees, anti-heave precautions should be adopted.

Foundations should be excavated beyond the depth of any significant roots encountered in the excavations. Reference should be made to NHBC standards when considering any new areas of planting.

It is likely that shallow perched groundwater will be encountered on site, particularly in the south close to WS02 and WS02A. Groundwater control measures may therefore be required to control groundwater ingress. Consideration should be given to this requirement in relation to the construction of foundations.



## **7.2. Ground Floor Construction**

Fully suspended ground floor slabs are recommended for adoption on site and should incorporate a sub floor void appropriate to medium volume change potential.

## **7.3. Groundworks**

The stability of made ground or disturbed ground must not be relied upon in unsupported excavations.

Safe working conditions must be provided at all times where operatives are required to work in excavations.

Heavy plant and stockpiles of materials should not be permitted close to the edges of open excavations.

Based on observations made during fieldwork, groundwater ingress from both the Made Ground and Lowestoft Formation could be encountered in excavations for structures or services and the requirement for groundwater control measures should be considered.

Further reference should be made to CIRIA Report No. 97, 'Trenching Practice' (1997).

Where operatives are required to work in excavations, the excavations should be monitored for the presence of toxic, anoxic or explosive conditions prior to being entered. Monitoring should also be undertaken throughout the duration of the works in excavations to ensure safe working conditions are maintained.

## **7.4. Concrete Grade**

Sulphate content and pH value determinations were carried out by both the geotechnical and analytical laboratories on a total of 12no. samples, 7no. recovered from the Made Ground and 5no. recovered from the Lowestoft Formation. Total sulphur determinations were undertaken on a total of 9no. samples. BRE pyrites suite analysis was undertaken on 3no. of the above samples.

The results of the testing can be summarised as follows:

- Water soluble sulphate – <10mg/l – 620mg/l SO<sub>4</sub>;
- pH – 7.9 – 9.0
- Total Sulphur – 0.016% – 0.43%

The above results have been compared to current guidance provided within BRE Special Digest 1, third edition 'Concrete in Aggressive Ground' (2005).

Given the observed extent of made ground at the site, the methodology provided within Section C5.1.3 has been used to determine the required concrete grade.

The following representative values have been adopted for the soils at the site:

- Water Soluble Sulphate – 500mg/l SO<sub>4</sub>;
- pH Value – 7.95;

In accordance with BRE SD1 (2005) and on the basis of the above results and an assumption of mobile groundwater, the following classifications are recommended for shallow buried concrete at the site.

- Design Sulphate Class – DS-1;
- Aggressive Chemical Environment for Concrete (ACEC) – AC-1

## **7.5. External Works**

### **7.5.1. Drainage**

Infiltration testing was outside the scope of this investigation. Given the predominantly cohesive nature of the underlying soils and presence of shallow perched groundwater, it is considered that infiltration drainage at the site is unlikely to be a viable option. Alternative methods of surface water disposal should be investigated.

### **7.5.2. Pavement Design**

The investigation identified the likely subgrade for pavement design to comprise either made ground of the Lowestoft Formation.

Given the variable nature of made ground, a conservative design CBR value of 1% should be adopted for preliminary design purposes in areas where made ground is present at subgrade level.

Reference has also been made to the 'Design Guidance for Road Pavement Foundations', Interim Advice Note 73106, Revision 1 (2009), when considering the CBR value appropriate for use where Lowestoft Formation soil materials exists at subgrade level.

Interim advice note 73106, Revision 1 (2009) provides recommendations for design CBR values on the basis of soil plasticity. The recorded plasticity index of the Lowestoft Formation ranged from 14% to 28%. This corresponds to a CBR value of 3%, for thin road pavements. Thin pavement construction is defined as a depth to subgrade of 300mm.

On the basis of the above, the following CBR values are recommended for preliminary design of road pavements:

- Made Ground – 1%
- Lowestoft Formation – 3%

Once formation level for the new road pavements has been achieved, proof rolling should be carried out using a heavy roller and any soft areas that are revealed should be excavated and a greater depth of subbase provided.

Exposed subgrades are likely to deteriorate rapidly on exposure to wet weather and should be shaped to shed water. Subbase should be placed as soon as possible to minimise the exposure of subgrade to adverse weather conditions.

## **8. Further Works**

On the basis of the findings of this investigation, it is considered that additional intrusive investigations could serve to provide additional information which may be beneficial during the proposed development.

The following sections provide a summary of the further works which are recommended. It should be appreciated that the works detailed below are not a comprehensive list and additional works may be required depending on the findings of future investigation.

### **8.1. Geotechnical**

The following further works are considered necessary to provide a more detailed geotechnical assessment of the site:

- Additional exploratory holes to delineate the extent of the historical pond feature identified in the south of the site.

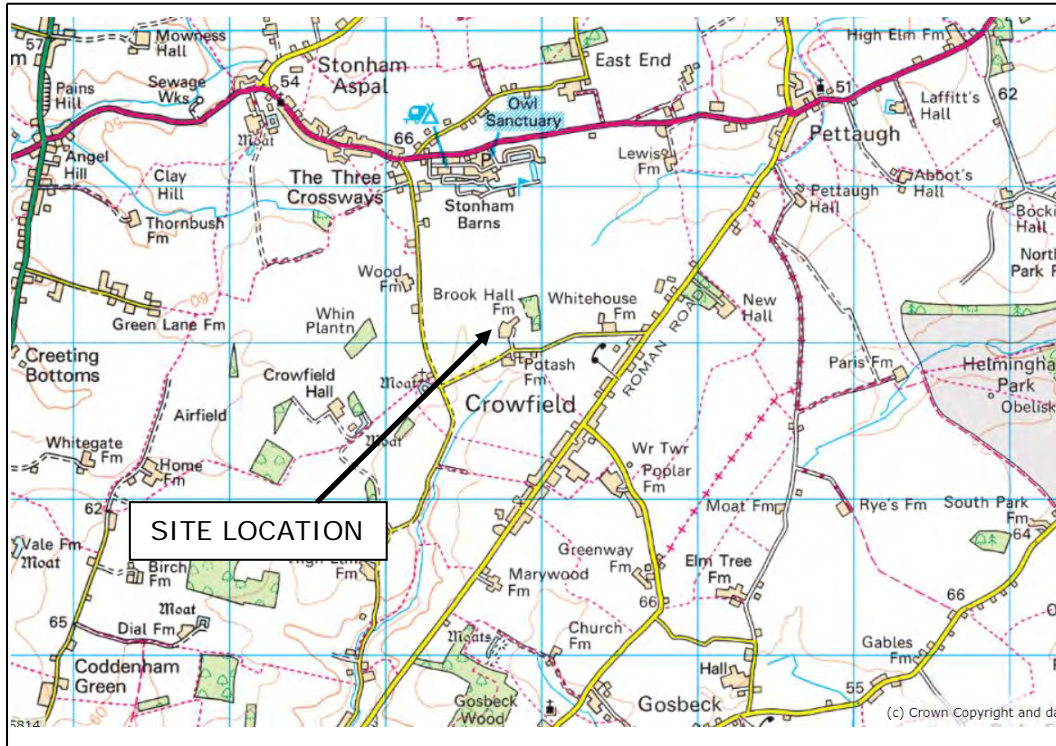
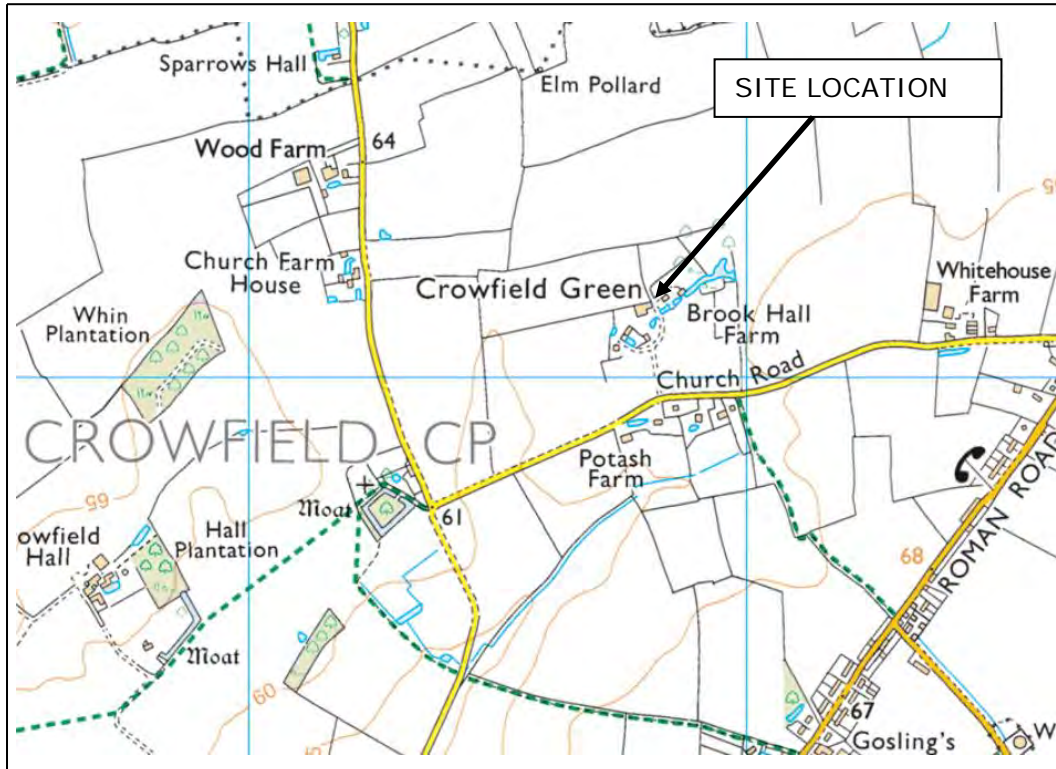
### **8.2. Geo-Environmental**

The following further works are considered likely to be required from a geo-environmental perspective:

- Additional exploratory holes and associated chemical analysis to delineate the extent of required remediation, specific consideration should be given to delineating the extent of the contamination disclosed in the infilled pond in the south of the site.
  - Completion of the on-going gas monitoring, and review of the requirement for gas mitigation measures.
  - Preparation of a remediation method statement (RMS).
  - Validation works and preparation of a verification report.
-

## Appendix A

Figures & Drawings



REPRODUCED FROM ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONARY OFFICE, © CROWN COPYRIGHT RICHARD JACKSON LTD – ACC No. 100002572

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847 The Crescent, Colchester, CO4 9YQ  
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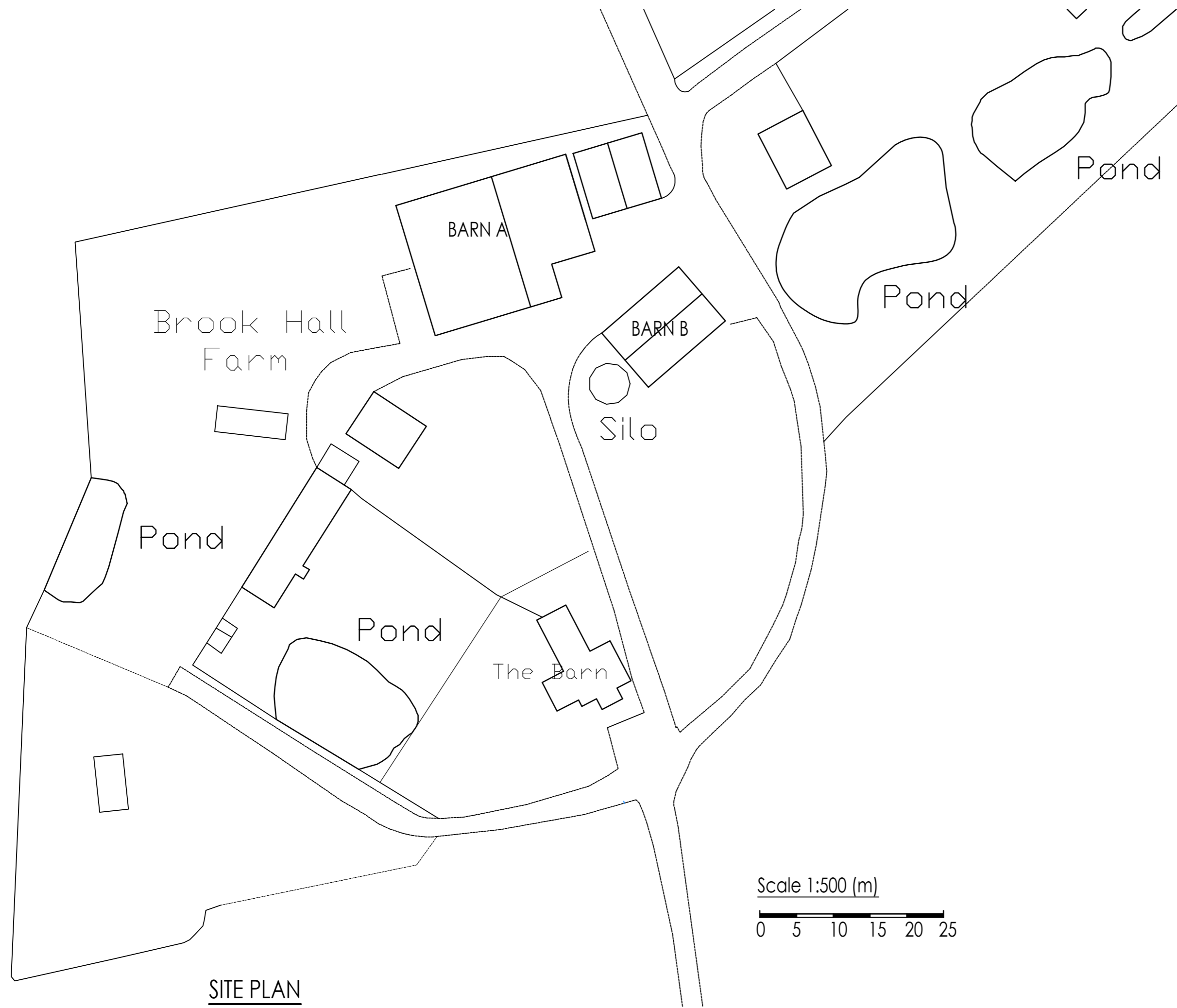
Brook Hall Farm, Church Road,  
Crowfield, Suffolk, IP6 9TG

**SITE LOCATION PLAN**

FIGURE 1

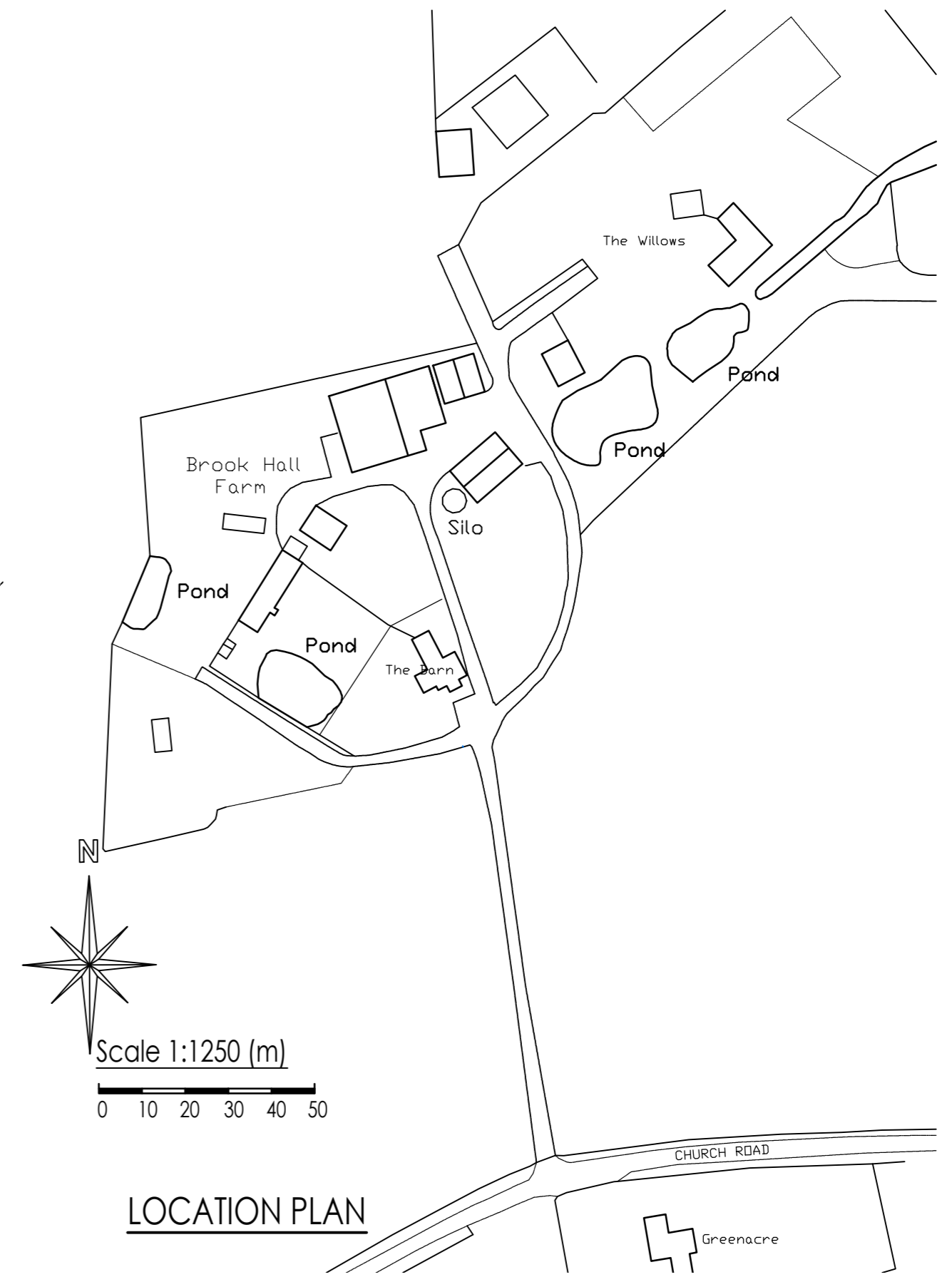
SCALE: N.T.S.

JOB NO: 60742



SITE PLAN

Scale 1:500 (m)  
 0 5 10 15 20 25



Scale 1:1250 (m)  
 0 10 20 30 40 50

LOCATION PLAN

**Whymark & Moulton**  
 Chartered Surveyors &  
 Building Engineers

14 Cornard Road, Sudbury,  
 Suffolk. CO10 2XA

Tele: 01787 371371



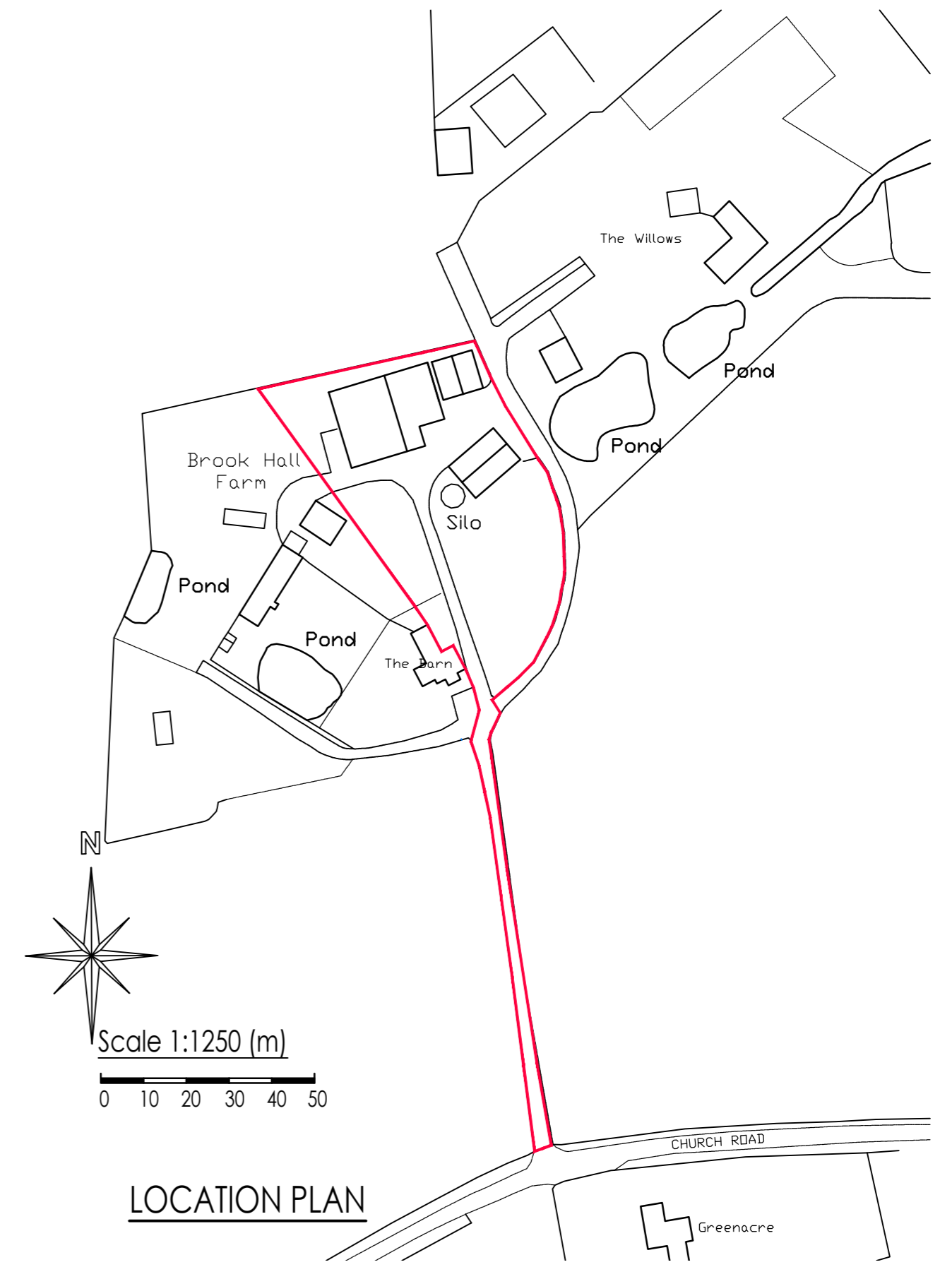

Project **BROOK HALL  
 CHURCH ROAD  
 CROWFIELD  
 IPSWICH  
 IP6 9TG**

**SITE PLAN AS EXISTING**

Scale **1:500, 1:1250** Date **May 2020**

Drawing No **19/070 - 01**

Amendments



**Whymark & Moulton**  
 Chartered Surveyors &  
 Building Engineers

**RICS**

14 Cornard Road, Sudbury,  
 Suffolk. CO10 2XA

Tele: 01787 371371

Project **BROOK HALL  
 CHURCH ROAD  
 CROWFIELD  
 IPSWICH  
 IP6 9TG**

**BLOCK AND LOCATION PLAN**


Scale **1:500, 1:1250** Date **Jan 2022**

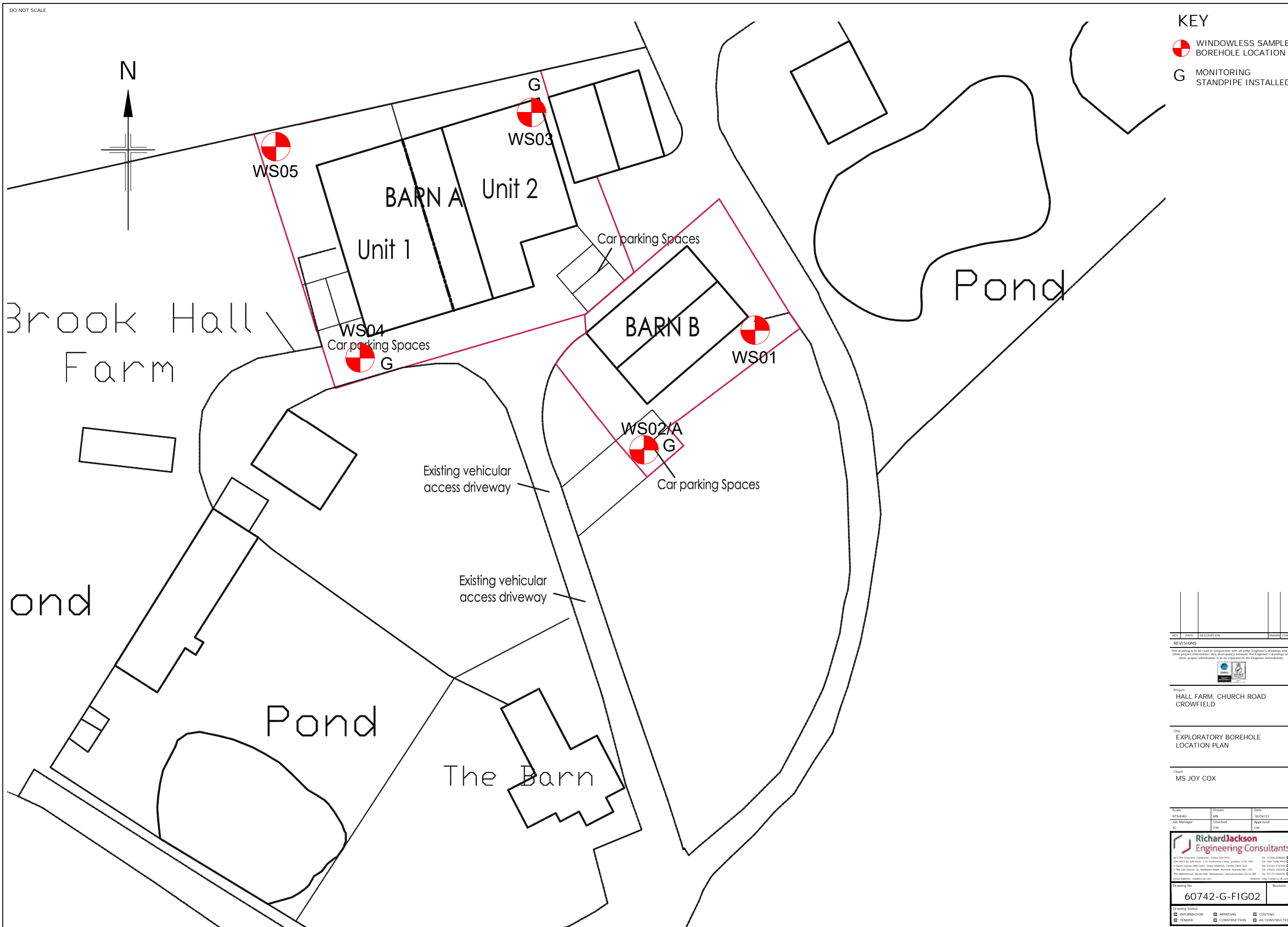
Drawing No **19/070-101**

Amendments

DO NOT SCALE

### KEY

-  WINDOWLESS SAMPLER BOREHOLE LOCATION
- G** MONITORING STANDPIPE INSTALLED



REV	DATE	DESCRIPTION	DRAWN	CHECKD
REVISIONS				

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.



Project  
**HALL FARM, CHURCH ROAD CROWFIELD**

Title  
**EXPLORATORY BOREHOLE LOCATION PLAN**

Client  
**MS JOY COX**

Scale	Drawn	Date
MS/BAO	MB	18/04/23

AD Manager	Checked	Approved
JG	CW	CW

**Richard Jackson Engineering Consultants**

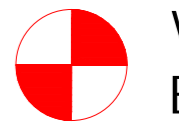

1st Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 2nd Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 3rd Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 4th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 5th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 6th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 7th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 8th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 9th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG  
 10th Floor, The Old Church, Church Road, Crowfield, Oxford, OX9 3JG

Drawing No.  
**60742-G-FIG02**

Drawing Status	Revision
<input type="checkbox"/> INFORMATION <input type="checkbox"/> TENDER <input type="checkbox"/> APPROVAL <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> AS CONSTRUCTED <input type="checkbox"/> COSTING	



KEY

-  WINDOWLESS SAMPLER BOREHOLE LOCATION
-  MONITORING STANDPIPE INSTALLED



REV	DATE	DESCRIPTION	DRAWN	CHECKD

REVISIONS  
 This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.



Project  
**HALL FARM, CHURCH ROAD CROWFIELD**

Title  
**EXPLORATORY BOREHOLE LOCATION PLAN WITH PROPOSED DEVELOPMENT**

Client  
**MS JOY COX**

Scale	Drawn	Date
NTS@A0	MB	15/05/23
Job Manager	Checked	Approved
JG	CW	CW

**Richard Jackson Engineering Consultants**

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 Website: www.rj-engineering.co.uk

Drawing No: **60742-G-FIG03**

Revisions:  
 INFORMATION APPROVAL COSTING  
 TENDER CONSTRUCTION AS CONSTRUCTED

## Appendix B

Exploratory Hole Logs and Data Plots



**Project Name:** Brook Hall Farm

**Dates**  
30/03/2023

**Project no.**  
60742

Hole Type  
**WLS**

**Location:** Church Road, Crowfield, Suffolk IP6 9TG

**Co-ordinates:**

Scale  
**1:30**

**Client:** Joy Cox

**Ground Level (m):**

Logged By  
**CW**

Well	Water		Samples & In-situ Tests				Level (m)	Depth (m)	Legend	Stratum Description	Scale
	Depth	Level	Casing	SWL	Depth	Type					
					0.30	ES1		0.15		Dark brown slightly gravelly CLAY with rootlets. Gravel is angular to subrounded fine flint. <b>MADE GROUND</b>	
					0.60	D1				Dark brown mottled black slightly sandy slightly gravelly CLAY with partings of black coarse sand and relict roots. Gravel is flint, brick and macadam. <b>MADE GROUND</b>	
			1.00		1.00	C	N=9 (1,1/1,2,3,3)	0.90		Firm grey mottled light brown and orange slightly gravelly CLAY with iron staining and relic roots. Gravel is subangular to rounded fine to coarse chalk. <b>LOWESTOFT FORMATION</b>	
					1.20	ES2					
					1.40	IVN	63				
					1.40 - 1.55	D2		1.55			
					1.60 - 1.70	D3		1.70			
					1.80 - 2.00	D4					
			1.00		1.90	IVN	88				
					2.00	C	N=22 (4,3/4,6,6,6)	2.00		Light brown mottled grey very clayey subangular to rounded fine to medium chalk GRAVEL. <b>LOWESTOFT FORMATION</b>	
					2.50	IVN	105			Stiff grey mottled brown and orange slightly gravelly CLAY with iron staining and relict roots. Gravel is subrounded fine to medium chalk and flint. <b>LOWESTOFT FORMATION</b>	
			1.00		3.00	C	N=32 (6,5/7,8,8,9)			Stiff to very stiff grey slightly gravelly CLAY with occasional iron staining. Gravel is angular to subrounded fine to coarse flint and chalk. <b>LOWESTOFT FORMATION</b>	
					3.50 - 3.90	D6					
					3.60	IVN	110				
			1.00		4.00	C	N=27 (5,5/5,6,7,9)				
				4.00 - 5.00	D7						
		1.00		5.00	C	N=30 (3,2/5,8,8,9)	5.00		End of Borehole at 5.000m		

**Groundwater:** Groundwater not encountered.

**Groundwater Key**

	Groundwater Strike
	Standing water level

**Sample Type Key**

<b>D</b>	Disturbed
<b>B</b>	Bulk
<b>U</b>	Undisturbed
<b>ES</b>	Environmental

**Test Type Key**

<b>IVN</b>	Hand vane
<b>S/C</b>	SPT / CPT
<b>PP</b>	Pocket penetrometer
<b>PID</b>	PID Reading

**Remarks:**



**Project Name:** Brook Hall Farm

**Dates**  
30/03/2023

**Project no.**  
60742

Hole Type  
**WLS**

**Location:** Church Road, Crowfield, Suffolk IP6 9TG

**Co-ordinates:**

Scale  
**1:30**

**Client:** Joy Cox

**Ground Level (m):**

Logged By  
**CW**

Well	Water		Samples & In-situ Tests				Level (m)	Depth (m)	Legend	Stratum Description	Scale
	Depth	Level	Casing	SWL	Depth	Type					
		0.72			0.20	ES1				Dark brown mottled black slightly gravelly CLAY with rootlets. Gravel is subangular to subrounded fine to medium flint and chalk and rare cobble size granite/paving block. (Poor Recovery) MADE GROUND	
			1.00		1.00	C	N=5	1.00		Soft to firm grey mottled brown and black CLAY with occasional subangular fine chalk gravel. (Poor Recovery) MADE GROUND	1
					1.00	ES2	(2,1/1,1,1,2)				
			2.00		2.00	C	N=15	2.00		Stiff to very stiff grey and brown slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse flint and chalk. LOWESTOFT FORMATION	2
					2.50 - 3.00	D1					
					2.70	IVN	109				
			2.00		3.00	C	N=31				
					3.50 - 4.00	D2					
					3.60	IVN	113				
			2.00		4.00	C	N=37				
				4.40 - 5.00	D3						
				4.60	IVN	124					
		2.00		5.00	C	25 (25 for 75mm/25 for 75mm)		5.00		End of Borehole at 5.000m	5

**Groundwater:** Groundwater not encountered. RWL at 0.75m on 14.04.23

**Groundwater Key**

	Groundwater Strike
	Standing water level

**Sample Type Key**

<b>D</b>	Disturbed
<b>B</b>	Bulk
<b>U</b>	Undisturbed
<b>ES</b>	Environmental

**Test Type Key**

<b>IVN</b>	Hand vane
<b>S/C</b>	SPT / CPT
<b>PP</b>	Pocket penetrometer
<b>PID</b>	PID Reading

**Remarks:** Potential historical pond location.



**Project Name:** Brook Hall Farm

**Dates**  
30/03/2023

**Project no.**  
60742

Hole Type  
**WLS**

**Location:** Church Road, Crowfield, Suffolk IP6 9TG

**Co-ordinates:**

Scale  
**1:30**

**Client:** Joy Cox

**Ground Level (m):**

Logged By  
**CW**

Well	Water		Samples & In-situ Tests				Level (m)	Depth (m)	Legend	Stratum Description	Scale
	Depth	Level	Casing	SWL	Depth	Type					
	0.69				0.50 - 0.60	ES1		0.20		Dark brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is subangular to rounded fine flint. <b>MADE GROUND</b>	0 1 2 3 4 5
	0.70				0.80 - 1.00	D1	1.00	Soft to firm brown mottled black slightly sandy slightly gravelly CLAY with partings of sandy subangular to rounded fine flint gravel. Gravel is subangular to rounded fine to medium flint, brick and macadam. <b>MADE GROUND</b>			
					1.30 - 1.50	ES2		...perched water within the made ground between 0.70m and 1.80m			
					1.90 - 2.00	ES3	1.90	Soft to firm grey mottled black silty CLAY. <b>MADE GROUND</b>			
							2.00		Stiff grey and brown slightly gravelly CLAY with iron staining. Gravel is subangular to rounded fine to medium flint and chalk <b>LOWESTOFT FORMATION</b> End of Borehole at 2.000m		

**Groundwater:** Groundwater struck at 0.70m, rising to 0.69m.

**Groundwater Key**

	Groundwater Strike
	Standing water level

**Sample Type Key**

<b>D</b>	Disturbed
<b>B</b>	Bulk
<b>U</b>	Undisturbed
<b>ES</b>	Environmental

**Test Type Key**

<b>IVN</b>	Hand vane
<b>S/C</b>	SPT / CPT
<b>PP</b>	Pocket penetrometer
<b>PID</b>	PID Reading

**Remarks:** Potential historical pond location.



<b>Project Name:</b> Brook Hall Farm	<b>Dates:</b> 30/03/2023	<b>Project no.:</b> 60742	Hole Type <b>WLS</b>
<b>Location:</b> Church Road, Crowfield, Suffolk IP6 9TG	<b>Co-ordinates:</b>		Scale <b>1:30</b>
<b>Client:</b> Joy Cox	<b>Ground Level (m):</b>		Logged By <b>CW</b>

Well	Water		Samples & In-situ Tests				Level (m)	Depth (m)	Legend	Stratum Description	Scale
	Depth	Level	Casing	SWL	Depth	Type					
					0.10				CONCRETE		
					0.40	ES1			Grey sandy gravelly CLAY. Gravel is subangular to rounded fine to medium chalk.		
					0.55	ES2					
					1.00	C	N=4 (1,1,1,1,1)		MADE GROUND	Soft dark grey CLAY with occasional angular fine chalk and relict roots. MADE GROUND ...mottled brown and soft between 0.70m and 1.40m	1
					1.40 - 1.60	D1					
					1.80 - 2.00	D2			Stiff grey mottled brown gravelly CLAY. Gravel is subangular fine to medium chalk and flint.		
					1.90	IVN	124				
					2.00	C	N=14		LOWESTOFT FORMATION	Firm dark grey slightly silty CLAY with occasional subangular fine chalk gravel and relict roots.	2
					2.20 - 2.40	ES3	(2,2/2,4,4,4)				
					2.45	IVN	124		LOWESTOFT FORMATION	Stiff grey mottled brown gravelly CLAY. Gravel is subangular fine to medium chalk and flint.	
					2.70 - 3.00	D3					
					3.00	C	N=18 (3,3/3,5,5,5)		LOWESTOFT FORMATION	Stiff grey mottled brown gravelly CLAY. Gravel is subangular fine to medium chalk and flint.	3
					3.50	IVN	111				
					3.50 - 4.00	D4			Stiff grey mottled brown gravelly CLAY. Gravel is subangular fine to medium chalk and flint.		
					3.90	IVN	130+				
				4.00	C	N=16		Stiff grey mottled brown gravelly CLAY. Gravel is subangular fine to medium chalk and flint.			
				4.20	IVN	(5,4/3,4,5,4) 130+					
				4.70	D5			Dense light grey gravelly very clayey medium to coarse SAND. Gravel is subangular to subrounded fine chalk.			
				5.00	C	N=36 (6,6/6,8,10,12)					
								LOWESTOFT FORMATION	End of Borehole at 5.000m	5	

<b>Groundwater:</b> Groundwater struck at 4.70m. RWL at 0.85m on 14.04.23.	<b>Groundwater Key</b>		<b>Sample Type Key</b>		<b>Test Type Key</b>	
		Groundwater Strike	<b>D</b>	Disturbed	<b>IVN</b>	Hand vane
<b>Remarks:</b>		Standing water level	<b>B</b>	Bulk	<b>S/C</b>	SPT / CPT
			<b>U</b>	Undisturbed	<b>PP</b>	Pocket penetrometer
			<b>ES</b>	Environmental	<b>PID</b>	PID Reading



**Project Name:** Brook Hall Farm

**Dates**  
30/03/2023

**Project no.**  
60742

Hole Type  
**WLS**

**Location:** Church Road, Crowfield, Suffolk IP6 9TG

**Co-ordinates:**

Scale  
**1:30**

**Client:** Joy Cox

**Ground Level (m):**

Logged By  
**CW**

Well	Water		Samples & In-situ Tests				Level (m)	Depth (m)	Legend	Stratum Description	Scale
	Depth	Level	Casing	SWL	Depth	Type					
					0.30 - 0.40	ES1		0.26	CONCRETE		
					0.80	IVN	91	0.45	Dark brown mottled grey and black slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine brick and chalk.		
					0.90 - 1.00	ES2	N=16	0.70		MADE GROUND	
			1.00		1.00	C	(3,2/4,4,4,4)		MADE GROUND	1	
					1.40 - 1.60	D1	124		Stiff light brown and grey slightly gravelly CLAY with iron staining and relict roots. Gravel is subangular to rounded fine to coarse chalk and flint. LOWESTOFT FORMATION		
					1.50	IVN					
			1.00		1.90	IVN	127		Firm brown mottled grey slightly sandy slightly gravelly silty CLAY with partings of fine to medium sand. Gravel is subangular to subrounded fine chalk and flint. LOWESTOFT FORMATION		
					2.00	C	N=16	2.30			
					2.00 - 2.20	D2	(3,2/3,4,5,4)				2
					2.60	IVN	47		Stiff to very stiff grey and brown slightly gravelly CLAY. Gravel is subangular to rounded fine to medium chalk and flint. LOWESTOFT FORMATION		
				2.70 - 3.00	D3		3.30				
		1.00		3.00	C	N=32		Stiff to very stiff grey and brown slightly gravelly CLAY. Gravel is subangular to rounded fine to medium chalk and flint. LOWESTOFT FORMATION			
				3.00 - 3.30	D4	(4,3/5,8,10,9)				3	
				3.70	IVN	130+					
				3.70 - 4.00	D5			Stiff to very stiff grey and brown slightly gravelly CLAY. Gravel is subangular to rounded fine to medium chalk and flint. LOWESTOFT FORMATION			
				4.00	C	N=37 (6,5/7,10,10,10)	4.00			4	
				4.50	IVN	121		Stiff to very stiff grey and brown slightly gravelly CLAY. Gravel is subangular to rounded fine to medium chalk and flint. LOWESTOFT FORMATION			
				4.50 - 5.00	D6		5.00				
		1.00	3	5.00	C	N=35 (7,6/7,9,9,10)			End of Borehole at 5.000m	5	

**Groundwater:** Groundwater struck at 3.10m rising to 2.71m. RWL at 0.22 on 14.04.23.

**Groundwater Key**

	Groundwater Strike
	Standing water level

**Sample Type Key**

<b>D</b>	Disturbed
<b>B</b>	Bulk
<b>U</b>	Undisturbed
<b>ES</b>	Environmental

**Test Type Key**

<b>IVN</b>	Hand vane
<b>S/C</b>	SPT / CPT
<b>PP</b>	Pocket penetrometer
<b>PID</b>	PID Reading

**Remarks:**



**Project Name:** Brook Hall Farm

**Dates**  
30/03/2023

**Project no.**  
60742

Hole Type  
**WLS**

**Location:** Church Road, Crowfield, Suffolk IP6 9TG

**Co-ordinates:**

Scale  
**1:30**

**Client:** Joy Cox

**Ground Level (m):**

Logged By  
**CW**

Well	Water		Samples & In-situ Tests				Level (m)	Depth (m)	Legend	Stratum Description	Scale
	Depth	Level	Casing	SWL	Depth	Type					
[Pattern]					0.35 - 0.45	ES1		0.55	[Pattern]	Dark brown mottled orange and black slightly gravelly CLAY with rootlets. Gravel is angular to subrounded fine to medium brick, ceramic, concrete, flint and chalk. <b>MADE GROUND</b> Soft grey mottled orange and brown slightly gravelly silty CLAY with iron staining and relict roots. Gravel is subangular to rounded fine to medium chalk and flint. <b>LOWESTOFT FORMATION</b> ...becoming firm from 1.50m ...becoming stiff from 1.80m ...becoming very stiff from 3.00m	1
					0.60 - 0.80	D1					
					0.80 - 1.00	ES2					
			1.00		0.90	IVN	39				
					1.00	C	N=7 (1,1/1,2,2,2)				
					1.40 - 1.70	D2					
					1.50	IVN	70				
					1.80	IVN	120				
			1.00		2.00	C	N=18 (3,2/3,4,6,5)				
					2.40 - 2.70	D3					
				2.70	IVN	106					
				3.00	C	N=27 (5,5/5,7,7,8)					
				3.40 - 3.90	D4						
				4.00	C	N=33					
				4.00 - 5.00	D5	(4,4/6,8,9,10)					
				5.00	C	N=41 (7,6/8,10,12,11)					
									End of Borehole at 5.000m	5	

**Groundwater:** Groundwater not encountered.

**Groundwater Key**

	Groundwater Strike
	Standing water level

**Sample Type Key**

<b>D</b>	Disturbed
<b>B</b>	Bulk
<b>U</b>	Undisturbed
<b>ES</b>	Environmental

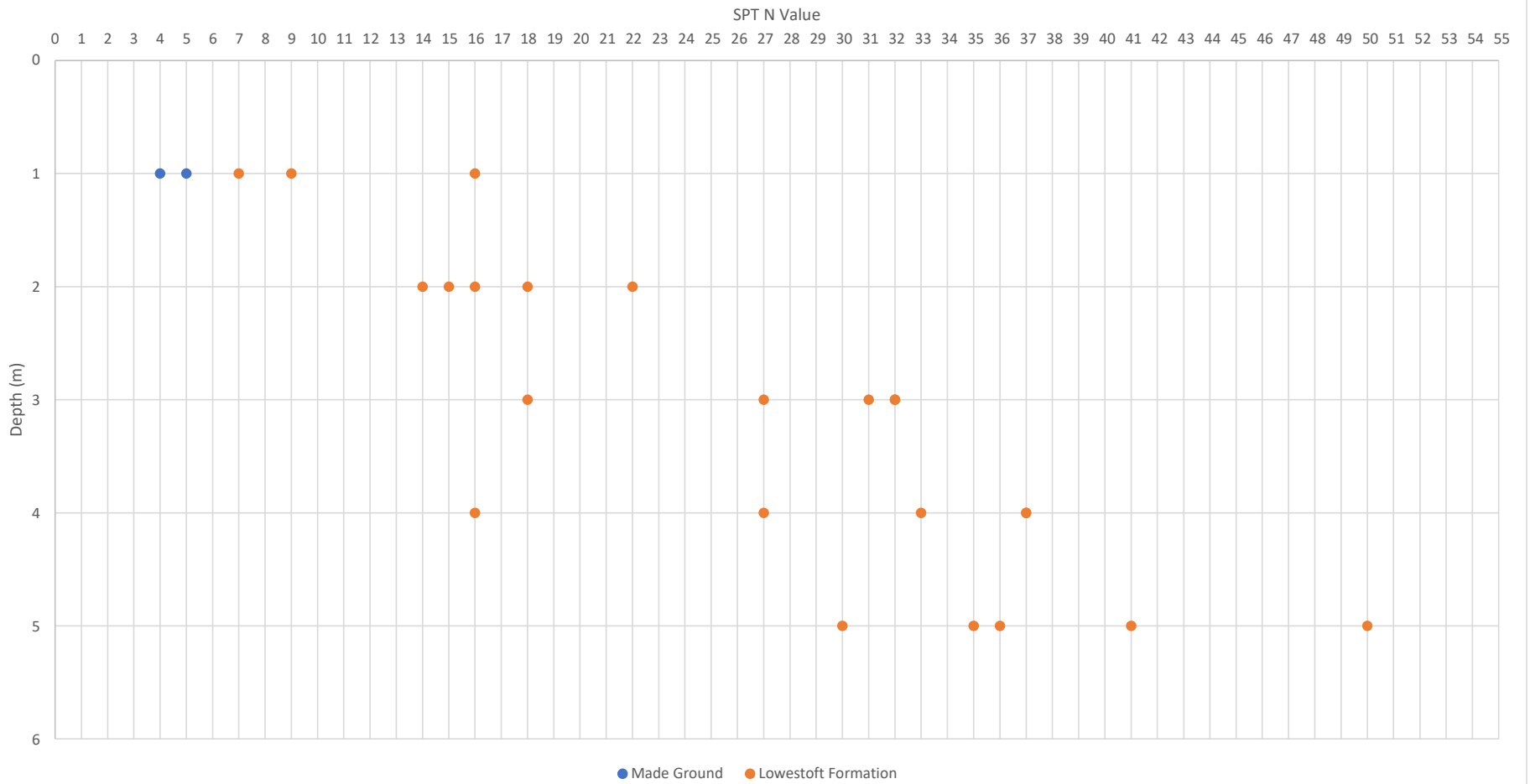
**Test Type Key**

<b>IVN</b>	Hand vane
<b>S/C</b>	SPT / CPT
<b>PP</b>	Pocket penetrometer
<b>PID</b>	PID Reading

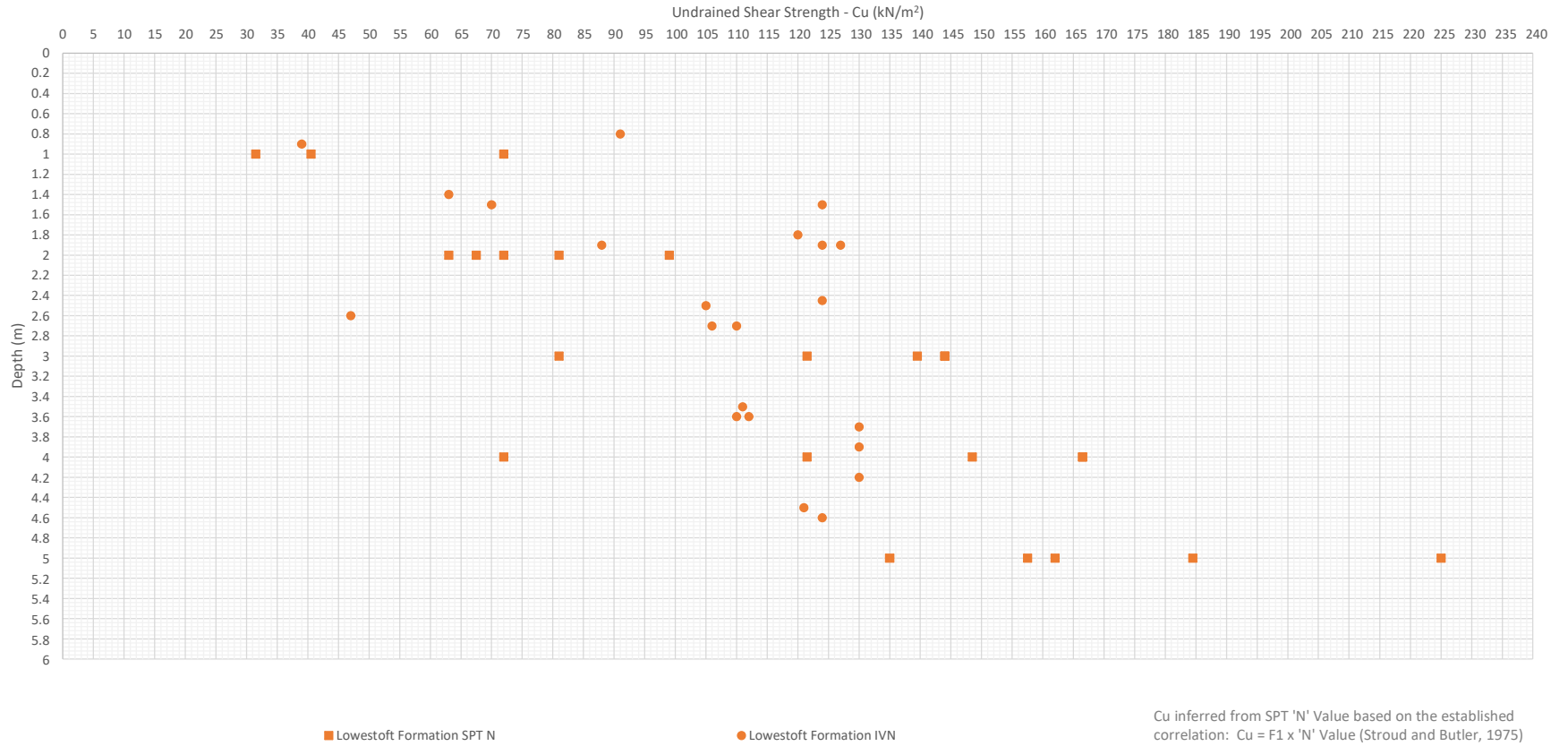
**Remarks:**



### 60742 Brook Hall Farm, Crowfield - SPT N Value vs Depth



### 60742 Brook Hall Farm, Crowfield - Undrained Shear Strength vs Depth



## Appendix C

### Results of Chemical Analyses

## 60742 – Brook Hall Farm, Crowfield

### Geo-environmental Assessment

#### Reference Criteria

#### Soils

In 2014 Land Quality Management Ltd (LQM) and the Chartered Institute of Environmental Health (CIEH) published 'Suitable 4 Use Levels' (S4ULs) for human health risk assessment. The S4ULs have been derived in accordance with UK legislation, national and Environment Agency policy using a modified version of the Contaminated Land Exposure Assessment (CLEA) software. The S4ULs are based on minimal or tolerable risk as described in SR2 (Environment Agency, 2009a).

The S4ULs are intended to replace the 2<sup>nd</sup> edition of the LQM/CIEH Generic Assessment Criteria (GAC).

The S4ULs have also been used to replace the Environment Agency Soil Guideline Values (SGVs), which were defined in 2009 alongside updates to the CLEA methodology and software.

The parameters detailed in the LQM/CIEH S4ULs publication have been adapted using the CLEA software to reflect site specific conditions, including the Soil Organic Matter (SOM), where these are significantly different from the values used to derive the SGV.

It is understood the site is to be developed for residential end use, therefore S4ULs for residential with homegrown produce have been adopted for this site.

A SOM of 1 % has been adopted for organic chemicals for the purposes of the initial assessment on the basis of laboratory analysis. A SOM of 6% has been adopted for inorganic chemical as detailed in 'The LQM / CIEH S4ULS for human health assessment', (2015).

The three most hazardous PAH's, benzo(a)pyrene, dibenz(a,h)anthracene and naphthalene have been considered on this occasion.

In the absence an S4UL for lead the Category 4 Screening Level (C4SL) for lead has been adopted. In March 2014 DEFRA published C4SLs for six contaminants including lead. The C4SLs are based on a unique toxicological benchmark, 'Low Level of Toxicological Concern' rather than the 'minimal or tolerable level of risk' which forms the basis for the S4ULs.

A summary of the tier one screening values for human health is given in the Table, below.

Contaminant	Origin of Screening Value	Screening Value (mg/kg)
Arsenic	S4UL <sup>1</sup>	37
Cadmium	S4UL <sup>1</sup>	11
Chromium	S4UL <sup>1</sup>	910
Copper	S4UL <sup>1</sup>	2,400
Nickel	S4UL <sup>1</sup>	180
Lead	C4SL <sup>2</sup>	200
Selenium	S4UL <sup>1</sup>	250
Mercury	S4UL <sup>1</sup>	40
Zinc	S4UL <sup>1</sup>	3,700
Benzo(a)pyrene	S4UL <sup>3</sup>	2.2
Dibenz(a,h)anthracene	S4UL <sup>3</sup>	0.24
Naphthalene	S4UL <sup>3</sup>	2.3
Total Phenols	S4UL <sup>3</sup>	280
TPH Aromatic C <sub>5</sub> -C <sub>7</sub>	S4UL <sup>3</sup>	70
TPH Aromatic C <sub>7</sub> -C <sub>8</sub>	S4UL <sup>3</sup>	130
TPH Aromatic C <sub>8</sub> -C <sub>10</sub>	S4UL <sup>3</sup>	34
TPH Aromatic C <sub>10</sub> -C <sub>12</sub>	S4UL <sup>3</sup>	74
TPH Aromatic C <sub>12</sub> -C <sub>16</sub>	S4UL <sup>3</sup>	140
TPH Aromatic C <sub>16</sub> -C <sub>21</sub>	S4UL <sup>3</sup>	260
TPH Aromatic C <sub>21</sub> -C <sub>35</sub>	S4UL <sup>3</sup>	1,100
TPH Aliphatic C <sub>5</sub> -C <sub>6</sub>	S4UL <sup>3</sup>	42
TPH Aliphatic C <sub>6</sub> -C <sub>8</sub>	S4UL <sup>3</sup>	100
TPH Aliphatic C <sub>8</sub> -C <sub>10</sub>	S4UL <sup>3</sup>	27
TPH Aliphatic C <sub>10</sub> -C <sub>12</sub>	S4UL <sup>3</sup>	130
TPH Aliphatic C <sub>12</sub> -C <sub>16</sub>	S4UL <sup>3</sup>	1,100
TPH Aliphatic C <sub>16</sub> -C <sub>35</sub>	S4UL <sup>3</sup>	65,000
Benzene	S4UL <sup>3</sup>	0.087
Toluene	S4UL <sup>3</sup>	130
Ethylbenzene	S4UL <sup>3</sup>	47

Contaminant	Origin of Screening Value	Screening Value (mg/kg)
M & P Xylene	S4UL <sup>3</sup>	56
O Xylene	S4UL <sup>3</sup>	60
Vinyl Chloride	S4UL <sup>3</sup>	0.00064
1,2 – Dichloroethane	S4UL <sup>3</sup>	0.0071
Trichloroethene	S4UL <sup>3</sup>	0.016
1,1,1 – Trichloroethane	S4UL <sup>3</sup>	8.8
Tetrachloroethene	S4UL <sup>3</sup>	0.18
Chlorobenze	S4UL <sup>3</sup>	0.46
Hexachlorobutadine	S4UL <sup>3</sup>	0.29

<sup>1</sup> Value derived for site specific conditions using CLEA software, S4UL parameters, at an SOM of 6% for residential with home grown produce.

<sup>2</sup> Category 4 Screening Level adopted based on DEFRA (2014)

<sup>3</sup> Value derived for site specific conditions using CLEA software, S4UL parameters, at an SOM of 1% for residential with home grown produce.

\*Although soils up to this value may not be harmful to human health, it should be noted that soils would be saturated at this value and remediation may still be necessary. Results will therefore be reviewed on a case by case basis.



# Amended Report

**Report No.:** 23-10918-4

**Initial Date of Issue:** 02-May-2023      **Date of Re-Issue:** 03-May-2023

**Client:** Richard Jackson Limited

**Client Address:** 847 The Crescent  
Colchester Business Park  
Colchester  
Essex  
CO4 9YQ

**Contact(s):** Camilla Watson

**Project:** 60742 BROOK HALL FARM

**Quotation No.:** Q22-29724      **Date Received:** 03-Apr-2023

**Order No.:** CW/60742      **Date Instructed:** 03-Apr-2023

**No. of Samples:** 8

**Turnaround (Wkdays):** 5      **Results Due:** 09-May-2023

**Date Approved:** 03-May-2023

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

# Amended Report

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<b>Report No.:</b>	23-10921-3	<b>Date of Re-Issue:</b>	03-May-2023
<b>Initial Date of Issue:</b>	28-Apr-2023		
<b>Client</b>	Richard Jackson Limited		
<b>Client Address:</b>	847 The Crescent Colchester Business Park Colchester Essex CO4 9YQ		
<b>Contact(s):</b>	Camilla Watson		
<b>Project</b>	60742 BROOK HALL FARM		
<b>Quotation No.:</b>	Q22-29724	<b>Date Received:</b>	03-Apr-2023
<b>Order No.:</b>	CW/60742	<b>Date Instructed:</b>	03-Apr-2023
<b>No. of Samples:</b>	6		
<b>Turnaround (Wkdays):</b>	7	<b>Results Due:</b>	13-Apr-2023
<b>Date Approved:</b>	28-Apr-2023		

**Approved By:**



**Details:** Stuart Henderson, Technical Manager

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## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:		23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10921
Quotation No.: Q22-29724		Chemtest Sample ID.:		1617135	1617137	1617138	1617139	1617140	1617141	1617142	1617143	1617155	
Order No.: CW/60742		Client Sample Ref.:		ES	ES	ES	ES	ES	ES	ES	ES	ES	
		Client Sample ID.:		1	1	2	1	2	3	1	2	1	
		Sample Location:		WS01	WS02	WS02	WS02A	WS02A	WS02A	WS03	WS03	WS04	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		0.3	0.2	1.0	0.5	1.3	1.9	0.4	0.55	0.3	
		Bottom Depth (m):				2.0	0.6	1.5	2.0			0.4	
		Date Sampled:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	
		Asbestos Lab:		COVENTRY	COVENTRY		COVENTRY				COVENTRY		
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A	-	Fibres/Clumps		Fibres/Clumps					
Asbestos Identification	U	2192		N/A	No Asbestos Detected	Chrysotile		Amosite Chrysotile				No Asbestos Detected	
Asbestos by Gravimetry	U	2192	%	0.001		0.077		0.20					
Total Asbestos	U	2192	%	0.001		0.077		0.20					
Moisture	N	2030	%	0.020	18	18	14	13	28	14	26	27	15
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones and Roots	Stones and Roots	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Clay	Sand	Clay	Clay	Sand	Clay	Sand
pH	M	2010		4.0	8.6	9.0		8.8	8.2			8.6	8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.5	0.64		1.4	0.95			1.1	1.7
Magnesium (Water Soluble)	N	2120	g/l	0.010									
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.012	0.031		< 0.010	0.17			0.018	0.087
Total Sulphur	M	2175	%	0.010	0.016	0.072		0.43	0.20			0.067	0.051
Chloride (Water Soluble)	M	2220	g/l	0.010									
Nitrate (Water Soluble)	N	2220	g/l	0.010									
Cyanide (Total)	M	2300	mg/kg	0.50	0.70	0.70		0.70	< 0.50			< 0.50	0.60
Ammonium (Water Soluble)	M	2220	g/l	0.01									
Sulphate (Acid Soluble)	U	2430	%	0.010									
Arsenic	M	2455	mg/kg	0.5	7.7	9.4	5.6	12	9.2	11	1.9	8.4	7.4
Cadmium	M	2455	mg/kg	0.10	0.28	0.24	0.15	0.49	0.19	0.21	0.22	0.55	0.28
Chromium	M	2455	mg/kg	0.5	14	16	14	17	12	19	3.3	19	15
Copper	M	2455	mg/kg	0.50	14	58	19	38	13	19	7.6	20	21
Mercury	M	2455	mg/kg	0.05	0.06	0.06	< 0.05	0.08	< 0.05	< 0.05	< 0.05	0.07	0.06
Nickel	M	2455	mg/kg	0.50	14	15	16	14	16	26	4.3	19	14
Lead	M	2455	mg/kg	0.50	24	33	11	51	16	15	5.8	45	38
Selenium	M	2455	mg/kg	0.25	0.54	1.2	1.4	0.96	0.76	1.5	< 0.25	0.73	0.63
Zinc	M	2455	mg/kg	0.50	64	130	44	160	53	64	23	91	56
Aliphatic VPH >C5-C6	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	< 0.05
Aliphatic VPH >C6-C7	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	< 0.05
Aliphatic VPH >C7-C8	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	< 0.05
Aliphatic VPH >C8-C10	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05			< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	U	2780	mg/kg	0.25	< 0.25	< 0.25		< 0.25	< 0.25			< 0.25	< 0.25
Aliphatic EPH >C10-C12	M	2690	mg/kg	2.00	3.5	2.1		2.3	2.6			5.8	3.1
Aliphatic EPH >C12-C16	M	2690	mg/kg	1.00	3.0	3.0		3.0	2.9			5.2	5.3

## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:		23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10921
Quotation No.: Q22-29724		Chemtest Sample ID.:		1617135	1617137	1617138	1617139	1617140	1617141	1617142	1617143	1617155
Order No.: CW/60742		Client Sample Ref.:		ES	ES	ES	ES	ES	ES	ES	ES	ES
		Client Sample ID.:		1	1	2	1	2	3	1	2	1
		Sample Location:		WS01	WS02	WS02	WS02A	WS02A	WS02A	WS03	WS03	WS04
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.3	0.2	1.0	0.5	1.3	1.9	0.4	0.55	0.3
		Bottom Depth (m):				2.0	0.6	1.5	2.0			0.4
		Date Sampled:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
		Asbestos Lab:		COVENTRY	COVENTRY		COVENTRY				COVENTRY	
Determinand	Accred.	SOP	Units	LOD								
Aliphatic EPH >C16-C21	M	2690	mg/kg	2.00	< 2.0	4.0		5.4	4.0		3.9	4.8
Aliphatic EPH >C21-C35	M	2690	mg/kg	3.00	< 3.0	12		18	9.3		13	13
Aliphatic EPH >C35-C40	N	2690	mg/kg	10.00	< 10	< 10		< 10	< 10		< 10	< 10
Total Aliphatic EPH >C10-C35	M	2690	mg/kg	5.00	8.9	21		28	19		28	26
Aromatic VPH >C5-C7	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05		< 0.05	< 0.05
Aromatic VPH >C7-C8	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05		< 0.05	< 0.05
Aromatic VPH >C8-C10	U	2780	mg/kg	0.05	< 0.05	< 0.05		< 0.05	< 0.05		< 0.05	< 0.05
Total Aromatic VPH >C5-C10	U	2780	mg/kg	0.25	< 0.25	< 0.25		< 0.25	< 0.25		< 0.25	< 0.25
Aromatic EPH >C10-C12	U	2690	mg/kg	1.00	< 1.0	21		4.1	3.9		< 1.0	12
Aromatic EPH >C12-C16	U	2690	mg/kg	1.00	< 1.0	25		12	8.7		2.4	23
Aromatic EPH >C16-C21	N	2690	mg/kg	2.00	8.8	180		64	19		8.1	27
Aromatic EPH >C21-C35	U	2690	mg/kg	2.00	4.0	510		180	93		6.4	32
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00	< 1.0	50		14	9.2		1.1	12
Total Aromatic EPH >C10-C35	U	2690	mg/kg	5.00	13	740		260	130		17	94
Total VPH >C5-C10	U	2780	mg/kg	0.50	< 0.50	< 0.50		< 0.50	< 0.50		< 0.50	< 0.50
Total EPH >C10-C35	U	2690	mg/kg	10.00	22	760		290	140		45	120
Organic Matter	M	2625	%	0.40	3.3	4.9		10	2.9		4.4	3.0
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0			< 1.0				
Chloromethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Bromomethane	M	2760	µg/kg	20	< 20			< 20				
Chloroethane	U	2760	µg/kg	2.0	< 2.0			< 2.0				
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,1-Dichloroethene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0			< 5.0				
Trichloromethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0		< 1.0	< 1.0		< 1.0	< 1.0
1,2-Dichloroethane	M	2760	µg/kg	2.0	< 2.0			< 2.0				
Trichloroethene	N	2760	µg/kg	1.0	< 1.0			< 1.0				
1,2-Dichloropropane	M	2760	µg/kg	1.0	< 1.0			< 1.0				

## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:		23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10921
Quotation No.: Q22-29724		Chemtest Sample ID.:		1617135	1617137	1617138	1617139	1617140	1617141	1617142	1617143	1617155
Order No.: CW/60742		Client Sample Ref.:		ES	ES	ES	ES	ES	ES	ES	ES	ES
		Client Sample ID.:		1	1	2	1	2	3	1	2	1
		Sample Location:		WS01	WS02	WS02	WS02A	WS02A	WS02A	WS03	WS03	WS04
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.3	0.2	1.0	0.5	1.3	1.9	0.4	0.55	0.3
		Bottom Depth (m):				2.0	0.6	1.5	2.0			0.4
		Date Sampled:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
		Asbestos Lab:		COVENTRY	COVENTRY		COVENTRY				COVENTRY	
Determinand	Accred.	SOP	Units	LOD								
Dibromomethane	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Bromodichloromethane	M	2760	µg/kg	5.0	< 5.0			< 5.0				
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10			< 10				
Toluene	M	2760	µg/kg	1.0	1.5	< 1.0		1.2	1.5		1.4	< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10			< 10				
1,1,2-Trichloroethane	M	2760	µg/kg	10	< 10			< 10				
Tetrachloroethene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0			< 2.0				
Dibromochloromethane	U	2760	µg/kg	10	< 10			< 10				
1,2-Dibromoethane	M	2760	µg/kg	5.0	< 5.0			< 5.0				
Chlorobenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0	< 2.0			< 2.0				
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0		< 1.0	< 1.0		< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0		< 1.0	< 1.0		< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0		< 1.0	< 1.0		< 1.0	< 1.0
Styrene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Tribromomethane	U	2760	µg/kg	1.0	< 1.0			< 1.0				
Isopropylbenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Bromobenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50			< 50				
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
2-Chlorotoluene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
1,3-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
1,4-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0				
1,2-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50			< 50				
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Hexachlorobutadiene	N	2760	µg/kg	1.0	< 1.0			< 1.0				
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0			< 2.0				

## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:		23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10918	23-10921
Quotation No.: Q22-29724		Chemtest Sample ID.:		1617135	1617137	1617138	1617139	1617140	1617141	1617142	1617143	1617155
Order No.: CW/60742		Client Sample Ref.:		ES	ES	ES	ES	ES	ES	ES	ES	ES
		Client Sample ID.:		1	1	2	1	2	3	1	2	1
		Sample Location:		WS01	WS02	WS02	WS02A	WS02A	WS02A	WS03	WS03	WS04
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.3	0.2	1.0	0.5	1.3	1.9	0.4	0.55	0.3
		Bottom Depth (m):				2.0	0.6	1.5	2.0			0.4
		Date Sampled:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
		Asbestos Lab:		COVENTRY	COVENTRY		COVENTRY				COVENTRY	
Determinand	Accred.	SOP	Units	LOD								
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0			< 1.0				
Naphthalene	M	2800	mg/kg	0.10	0.13	1.9	1.9	1.8	2.3	0.18	0.37	0.17
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	2.3	0.35	0.52	0.58	< 0.10	0.11	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	1.1	3.1	1.1	3.4	< 0.10	0.39	0.31
Fluorene	M	2800	mg/kg	0.10	< 0.10	1.6	4.5	1.1	5.7	< 0.10	0.67	0.24
Phenanthrene	M	2800	mg/kg	0.10	0.54	17	27	13	30	0.46	3.4	1.6
Anthracene	M	2800	mg/kg	0.10	0.17	5.3	7.9	1.8	7.1	< 0.10	0.95	0.50
Fluoranthene	M	2800	mg/kg	0.10	1.1	35	26	12	25	0.58	2.9	3.9
Pyrene	M	2800	mg/kg	0.10	0.90	29	20	8.9	18	0.41	2.2	3.3
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.55	17	8.8	3.3	7.9	< 0.10	1.0	1.7
Chrysene	M	2800	mg/kg	0.10	0.62	17	8.6	5.0	7.6	< 0.10	0.99	1.8
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.78	20	8.8	7.8	8.1	< 0.10	1.0	2.5
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.24	8.7	3.7	2.8	3.3	< 0.10	0.40	0.81
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.61	19	7.5	7.2	6.9	< 0.10	0.90	2.0
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.58	11	4.6	6.7	4.4	< 0.10	0.63	1.4
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.13	3.6	0.74	1.2	0.85	< 0.10	0.12	0.27
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.44	11	4.1	6.2	3.5	< 0.10	0.47	1.3
Total Of 16 PAH's	N	2800	mg/kg	2.0	6.8	200	140	80	130	< 2.0	17	22
Total Phenols	M	2920	mg/kg	0.10	0.16	1.7		0.27	< 0.10		< 0.10	< 0.10

## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:		23-10921	23-10921	23-10921	23-10921	23-10921
Quotation No.: Q22-29724		Chemtest Sample ID.:		1617157	1617158	1617159	1617160	1617161
Order No.: CW/60742		Client Sample Ref.:		ES	ES	D	D	D
		Client Sample ID.:		1	2	4	1	1
		Sample Location:		WS05	WS05	WS01	WS02	WS04
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.35	0.8	1.8	2.5	1.4
		Bottom Depth (m):		0.45	1.0	2.0	3.0	1.6
		Date Sampled:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
		Asbestos Lab:		DURHAM				
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-			
Asbestos Identification	U	2192		N/A	No Asbestos Detected			
Asbestos by Gravimetry	U	2192	%	0.001				
Total Asbestos	U	2192	%	0.001				
Moisture	N	2030	%	0.020	25	18	14	11
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Sand
pH	M	2010		4.0	8.2	8.6	8.4	7.9
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.44			
Magnesium (Water Soluble)	N	2120	g/l	0.010		< 0.010		< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	0.052	0.62
Total Sulphur	M	2175	%	0.010	0.089	0.044		0.045
Chloride (Water Soluble)	M	2220	g/l	0.010		0.011		< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010		< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50	0.50			
Ammonium (Water Soluble)	M	2220	g/l	0.01		< 0.01		< 0.01
Sulphate (Acid Soluble)	U	2430	%	0.010		0.043		0.027
Arsenic	M	2455	mg/kg	0.5	15			
Cadmium	M	2455	mg/kg	0.10	0.63			
Chromium	M	2455	mg/kg	0.5	23			
Copper	M	2455	mg/kg	0.50	46			
Mercury	M	2455	mg/kg	0.05	0.12			
Nickel	M	2455	mg/kg	0.50	26			
Lead	M	2455	mg/kg	0.50	110			
Selenium	M	2455	mg/kg	0.25	1.0			
Zinc	M	2455	mg/kg	0.50	210			
Aliphatic VPH >C5-C6	U	2780	mg/kg	0.05	< 0.05			
Aliphatic VPH >C6-C7	U	2780	mg/kg	0.05	< 0.05			
Aliphatic VPH >C7-C8	U	2780	mg/kg	0.05	< 0.05			
Aliphatic VPH >C8-C10	U	2780	mg/kg	0.05	< 0.05			
Total Aliphatic VPH >C5-C10	U	2780	mg/kg	0.25	< 0.25			
Aliphatic EPH >C10-C12	M	2690	mg/kg	2.00	2.2			
Aliphatic EPH >C12-C16	M	2690	mg/kg	1.00	3.8			

## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:				
Quotation No.: Q22-29724		23-10921	23-10921	23-10921	23-10921	23-10921
Order No.: CW/60742		Chemtest Sample ID.:				
Client Sample Ref.:		1617157	1617158	1617159	1617160	1617161
Client Sample ID.:		ES	ES	D	D	D
Sample Location:		1	2	4	1	1
Sample Type:		WS05	WS05	WS01	WS02	WS04
Top Depth (m):		SOIL	SOIL	SOIL	SOIL	SOIL
Bottom Depth (m):		0.35	0.8	1.8	2.5	1.4
Date Sampled:		0.45	1.0	2.0	3.0	1.6
Asbestos Lab:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
Determindand		DURHAM				
Accred.	SOP	Units	LOD			
M	2690	mg/kg	2.00	3.2		
M	2690	mg/kg	3.00	7.9		
N	2690	mg/kg	10.00	< 10		
M	2690	mg/kg	5.00	17		
U	2780	mg/kg	0.05	< 0.05		
U	2780	mg/kg	0.05	< 0.05		
U	2780	mg/kg	0.05	< 0.05		
U	2780	mg/kg	0.25	< 0.25		
U	2690	mg/kg	1.00	12		
U	2690	mg/kg	1.00	25		
N	2690	mg/kg	2.00	28		
U	2690	mg/kg	2.00	23		
N	2690	mg/kg	1.00	10		
U	2690	mg/kg	5.00	89		
U	2780	mg/kg	0.50	< 0.50		
U	2690	mg/kg	10.00	110		
M	2625	%	0.40	7.3		
U	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	20			
U	2760	µg/kg	2.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
U	2760	µg/kg	5.0			
M	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			
U	2760	µg/kg	1.0			
M	2760	µg/kg	1.0	< 1.0		
M	2760	µg/kg	2.0			
N	2760	µg/kg	1.0			
M	2760	µg/kg	1.0			

## Results - Soil

**Project: 60742 BROOK HALL FARM**

Client: Richard Jackson Limited		Chemtest Job No.:				
Quotation No.: Q22-29724		23-10921	23-10921	23-10921	23-10921	23-10921
Order No.: CW/60742		Chemtest Sample ID.:				
Client Sample Ref.:		1617157	1617158	1617159	1617160	1617161
Client Sample ID.:		ES	ES	D	D	D
Sample Location:		1	2	4	1	1
Sample Type:		WS05	WS05	WS01	WS02	WS04
Top Depth (m):		SOIL	SOIL	SOIL	SOIL	SOIL
Bottom Depth (m):		0.35	0.8	1.8	2.5	1.4
Date Sampled:		0.45	1.0	2.0	3.0	1.6
Asbestos Lab:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
Determinand		DURHAM				
Determinand	Accred.	SOP	Units	LOD		
Dibromomethane	M	2760	µg/kg	1.0		
Bromodichloromethane	M	2760	µg/kg	5.0		
cis-1,3-Dichloropropene	N	2760	µg/kg	10		
Toluene	M	2760	µg/kg	1.0	< 1.0	
Trans-1,3-Dichloropropene	N	2760	µg/kg	10		
1,1,2-Trichloroethane	M	2760	µg/kg	10		
Tetrachloroethene	M	2760	µg/kg	1.0		
1,3-Dichloropropane	U	2760	µg/kg	2.0		
Dibromochloromethane	U	2760	µg/kg	10		
1,2-Dibromoethane	M	2760	µg/kg	5.0		
Chlorobenzene	M	2760	µg/kg	1.0		
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0		
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	
o-Xylene	M	2760	µg/kg	1.0	< 1.0	
Styrene	M	2760	µg/kg	1.0		
Tribromomethane	U	2760	µg/kg	1.0		
Isopropylbenzene	M	2760	µg/kg	1.0		
Bromobenzene	M	2760	µg/kg	1.0		
1,2,3-Trichloropropane	N	2760	µg/kg	50		
N-Propylbenzene	U	2760	µg/kg	1.0		
2-Chlorotoluene	M	2760	µg/kg	1.0		
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0		
4-Chlorotoluene	U	2760	µg/kg	1.0		
Tert-Butylbenzene	U	2760	µg/kg	1.0		
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0		
Sec-Butylbenzene	U	2760	µg/kg	1.0		
1,3-Dichlorobenzene	M	2760	µg/kg	1.0		
4-Isopropyltoluene	U	2760	µg/kg	1.0		
1,4-Dichlorobenzene	M	2760	µg/kg	1.0		
N-Butylbenzene	U	2760	µg/kg	1.0		
1,2-Dichlorobenzene	M	2760	µg/kg	1.0		
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50		
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0		
Hexachlorobutadiene	N	2760	µg/kg	1.0		
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0		

## Results - Soil

**Project: 60742 BROOK HALL FARM**

<b>Client: Richard Jackson Limited</b>		<b>Chemtest Job No.:</b>		23-10921	23-10921	23-10921	23-10921	23-10921
Quotation No.: Q22-29724		<b>Chemtest Sample ID.:</b>		1617157	1617158	1617159	1617160	1617161
Order No.: CW/60742		Client Sample Ref.:		ES	ES	D	D	D
		Client Sample ID.:		1	2	4	1	1
		Sample Location:		WS05	WS05	WS01	WS02	WS04
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.35	0.8	1.8	2.5	1.4
		Bottom Depth (m):		0.45	1.0	2.0	3.0	1.6
		Date Sampled:		30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023	30-Mar-2023
		Asbestos Lab:		DURHAM				
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>				
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0				
Naphthalene	M	2800	mg/kg	0.10	0.64			
Acenaphthylene	N	2800	mg/kg	0.10	0.12			
Acenaphthene	M	2800	mg/kg	0.10	0.25			
Fluorene	M	2800	mg/kg	0.10	0.20			
Phenanthrene	M	2800	mg/kg	0.10	1.9			
Anthracene	M	2800	mg/kg	0.10	0.38			
Fluoranthene	M	2800	mg/kg	0.10	3.6			
Pyrene	M	2800	mg/kg	0.10	2.7			
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.4			
Chrysene	M	2800	mg/kg	0.10	1.5			
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	2.1			
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.65			
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.4			
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	1.1			
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.18			
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.97			
Total Of 16 PAH's	N	2800	mg/kg	2.0	19			
Total Phenols	M	2920	mg/kg	0.10	< 0.10			



## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2690	EPH A/A Split	Aliphatics: >C10-C12, >C12-C16, >C16-C21, >C21- C35, >C35- C40 Aromatics: >C10-C12, >C12-C16, >C16- C21, >C21- C35, >C35-C40	Acetone/Heptane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5-C6, >C6-C7,>C7-C8,>C8-C10 Aromatics: >C5-C7,>C7-C8,>C8-C10	Water extraction / Headspace GCxGC FID detection
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

## **Report Information**

### **Key**

---

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)


## Appendix D

### Geotechnical Test Results



**TEST REPORT**  
ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>
<b>Client:</b> Richard Jackson Limited  847 The Crescent Colchester Essex CO4 9YQ	<b><i>Soil Property Testing Ltd</i></b>  <b>15, 16, 18 Halcyon Court, St Margaret's Way, Stukeley Meadows, Huntingdon, Cambridgeshire, PE29 6DG</b>  <b>Tel: 01480 455579</b> <b>Email: <a href="mailto:enquiries@soilpropertytesting.com">enquiries@soilpropertytesting.com</a></b> <b>Website: <a href="http://www.soilpropertytesting.com">www.soilpropertytesting.com</a></b>
<b>Samples Submitted By:</b> Richard Jackson Limited  <b>Samples Labelled:</b> Brook Hall Farm	<b>Approved Signatories:</b>  <input checked="" type="checkbox"/> <b>J.C. Garner B.Eng (Hons) FGS</b> Technical Director & Quality Manager  <input type="checkbox"/> <b>W. Johnstone</b> Materials Lab Manager  
<b>Date Received:</b> 31/03/2023	<b>Samples Tested Between:</b> 31/03/2023 and 13/04/2023
<b>Remarks:</b> For the attention of Camilla Watson Your Reference No: 60742	
<b>Notes:</b> 1 All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary. 2 Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. 3 Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory. 4 This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory. 5 The results within this report only relate to the items tested or sampled.	





**TEST REPORT**  
**ISSUED BY SOIL PROPERTY TESTING LTD**  
**DATE ISSUED: 13/04/2023**



0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

**SUMMARY OF WATER CONTENT**

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Description	Remarks
WS01	1.40 - 1.55	D	2	22.5	Firm mottled bluish grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium angular to rounded chert and chalk	
WS01	1.60 - 1.70	D	3	18.5	Soft mottled grey and olive slightly sandy slightly gravelly silty CLAY with rare decayed roots. Gravel is fine to coarse rounded to subangular chalk	
WS01	2.50 - 2.80	D	5	19.3	Stiff mottled bluish grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine to coarse angular to subrounded chert and chalk	
WS01	3.50 - 3.80	D	6	18.3	Stiff olive grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chert and chalk	
WS01	4.00 - 5.00	D	7	16.9	Very stiff dark olive grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chert and chalk	
WS02	3.40 - 4.00	D	2	16.4	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse angular to subrounded chert and chalk	
WS02	4.40 - 5.00	D	3	16.1	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chalk	
WS03	1.40 - 1.60	D	1	25.7	Soft mottled light grey and olive slightly gravelly slightly sandy silty CLAY with rare decayed roots. Gravel is fine and medium rounded to subangular chalk	
WS03	1.80 - 2.00	D	2	19.8	Firm mottled grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine to coarse angular to rounded chert and chalk	
WS03	2.70 - 3.00	D	3	22.3	Stiff mottled grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine to coarse angular to subrounded chert and chalk	
WS03	3.50 - 4.00	D	4	17.2	Stiff mottled olive and dark grey slightly gravelly slightly sandy silty CLAY with rare orange staining. Gravel is fine to coarse angular to rounded chert and chalk	
WS03	4.75 - 5.00	D	5	21.2	White intact CHALK fragments from fine to coarse gravel size in a very soft dark grey sandy silty clay matrix	
WS04	2.00 - 2.20	D	2	21.7	Stiff mottled bluish grey and olive slightly gravelly slightly sandy silty CLAY with rare decayed roots. Gravel is fine and medium angular to subrounded chert and chalk	
WS04	2.70 - 3.00	D	3	18.4	Soft mottled bluish grey and light olive brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium angular to rounded chert and chalk	

Method Of Preparation: BS EN ISO: 17892-1: 2014  
Method of Test: BS EN ISO: 17892-1: 2014  
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter  
Comments:

Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110C



# TEST REPORT

**ISSUED BY SOIL PROPERTY TESTING LTD**  
**DATE ISSUED: 13/04/2023**



0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### SUMMARY OF WATER CONTENT

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Description	Remarks
WS04	3.00 - 3.30	D	4	27.2	Very soft light olive brown slightly gravelly clayey sandy SILT. Gravel is fine and medium subangular and subrounded chalk	
WS04	3.70 - 4.00	D	5	16.4	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse angular to rounded chalk	
WS04	4.50 - 5.00	D	6	17.3	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse angular to rounded chalk	
WS05	0.60 - 0.80	D	1	27.2	Soft mottled bluish grey and olive brown slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is fine and medium angular to subrounded chert and chalk	
WS05	1.40 - 1.70	D	2	22.2	Stiff mottled dark grey and olive slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chert and chalk	
WS05	2.40 - 2.70	D	3	20.3	Stiff mottled bluish grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots, rare orange staining and selenite crystals. Gravel is fine and medium angular to subrounded chert and chalk	Dried at 50°C due to the presence of selenite.
WS05	3.40 - 3.90	D	4	15.8	Stiff mottled dark grey and olive slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse angular to rounded chert and chalk	
WS05	4.00 - 5.00	D	5	16.0	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse angular to rounded chert and chalk	

Method Of Preparation: BS EN ISO: 17892-1: 2014  
 Method of Test: BS EN ISO: 17892-1: 2014  
 Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter  
 Comments:  
 Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110C



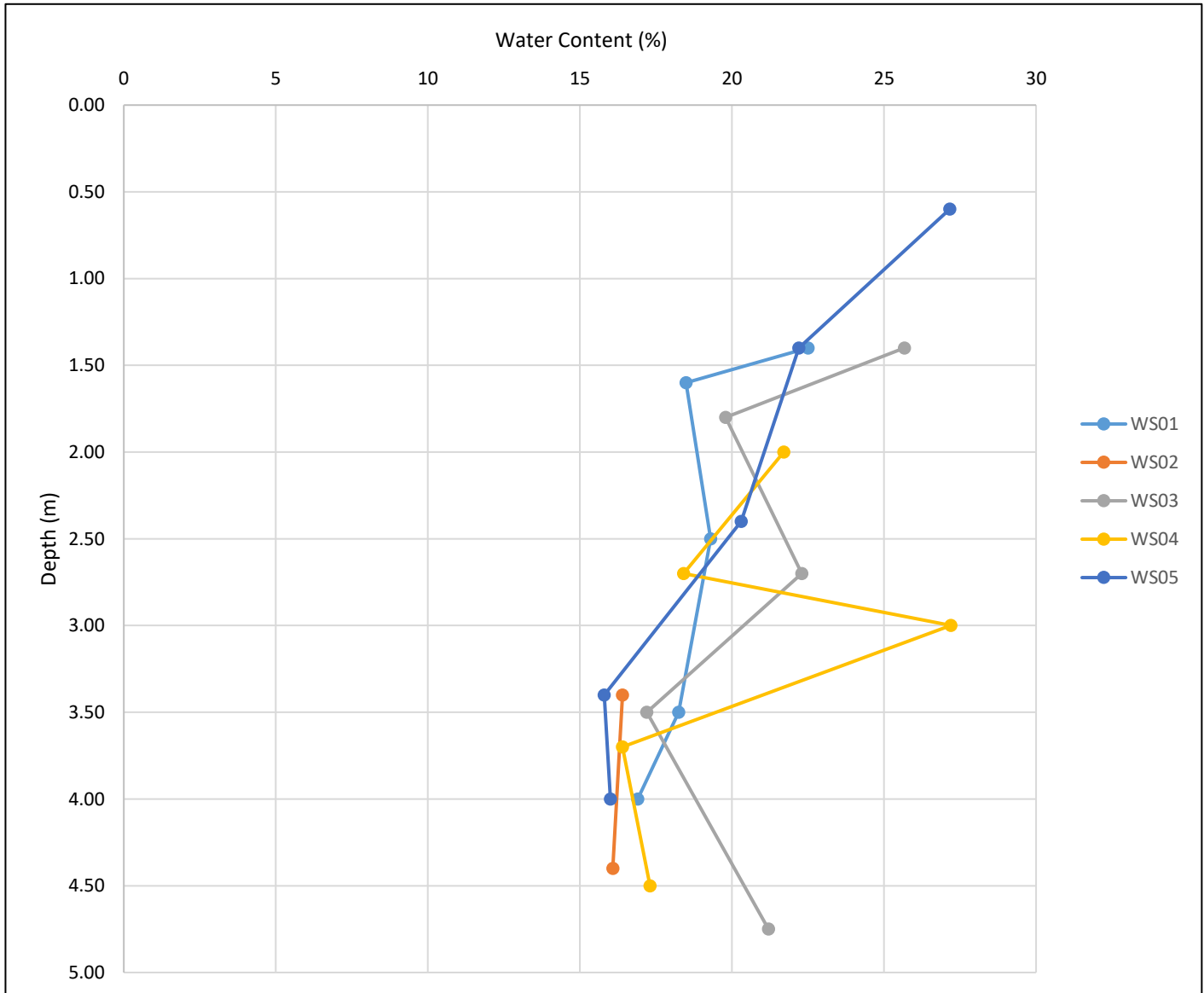
# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



Contract	Brook Hall Farm
Serial No.	42387_1

## WATER CONTENT VS DEPTH BELOW GROUND LEVEL



Method of Preparation:	BSEN ISO 17892-1: 2014
Method of Test:	BSEN ISO 17892-1: 2014
Type of Sample Key:	U - Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	
Remarks to Include:	Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C





# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

## SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquid-ity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
WS01	1.60 - 1.70	D	3	18.5	37	17	20	0.07	Wet Sieved	42 (M)	31.9*	27	Soft mottled grey and olive slightly sandy slightly gravelly silty CLAY with rare decayed roots. Gravel is fine to coarse rounded to subangular chalk	CI
WS01	3.50 - 3.80	D	6	18.3	44	18	26	0.01	Wet Sieved	10 (M)	20.3*	25	Stiff olive grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chert and chalk	CI
WS02	4.40 - 5.00	D	3	16.1	39	16	23	0.00	Wet Sieved	9 (M)	17.7*	24	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chalk	CI
WS03	1.40 - 1.60	D	1	25.7	40	18	22	0.35	Wet Sieved	8 (M)	27.9*	113	Soft mottled light grey and olive slightly gravelly slightly sandy silty CLAY with rare decayed roots. Gravel is fine and medium rounded to subangular chalk	CI
WS03	1.80 - 2.00	D	2	19.8	41	17	24	0.12	Wet Sieved	6 (M)	21.1*	121	Firm mottled grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine to coarse angular to rounded chert and chalk	CI
WS04	2.70 - 3.00	D	3	18.4	27	13	14	0.39	Wet Sieved	11 (M)	20.7*	115	Soft mottled bluish grey and light olive brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium angular to rounded chert and chalk	CL
WS05	0.60 - 0.80	D	1	27.2	47	19	28	0.29	Wet Sieved	8 (M)	29.5*	24	Soft mottled bluish grey and olive brown slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is fine and medium angular to subrounded chert and chalk	CI
WS05	2.40 - 2.70	D	3	20.3	45	18	27	0.09	Wet Sieved	8 (M)	22.1*	24	Stiff mottled bluish grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots, rare orange staining and selenite crystals. Gravel is fine and medium angular to subrounded chert and chalk	CI

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter  
 Comments: \*Corrected water content assume material greater than 0.425mm is non-porous. See BS1377: Part 2: 1990 Clause 3 Note 1.

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured



# TEST REPORT

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DATE ISSUED: 13/04/2023

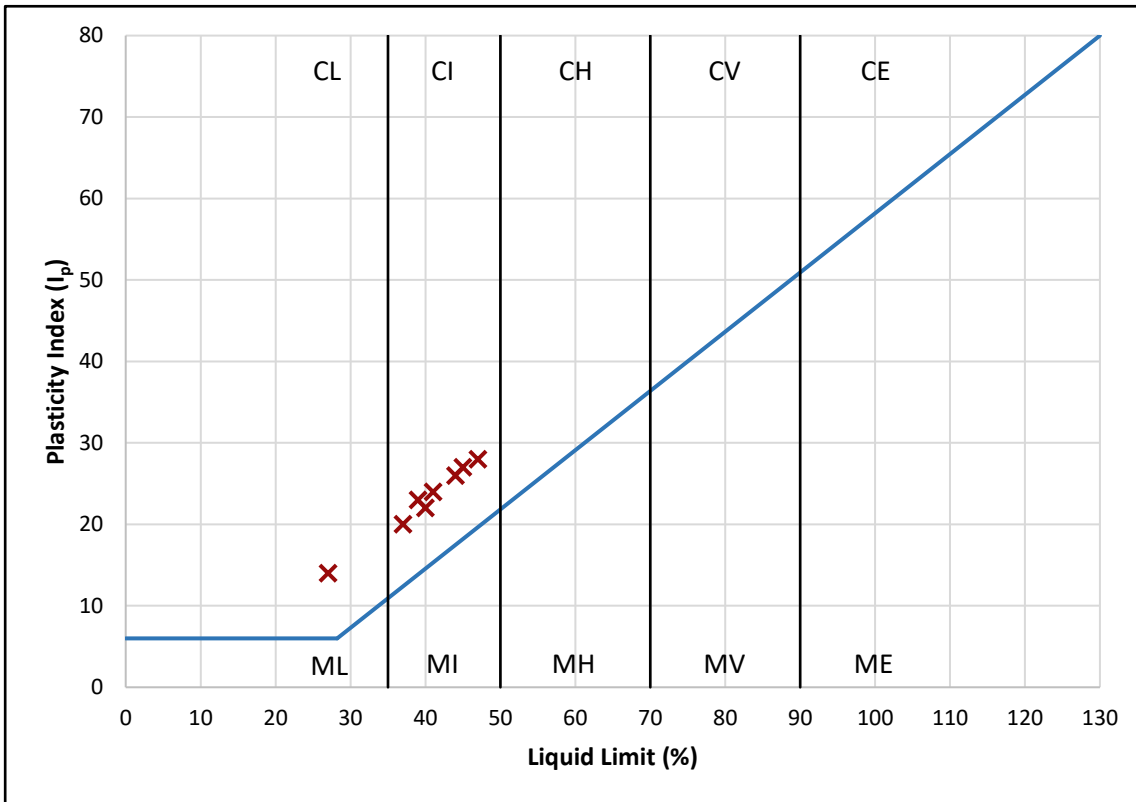


0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

High	NHBC Volume Change Potential
Medium	
Low	

Method of Preparation:	BS 1377: Part 2: 1990: 4.2
Method of Test:	BS1377: Part 2: 3.2, 4.3, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index



# TEST REPORT

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DATE ISSUED: 13/04/2023



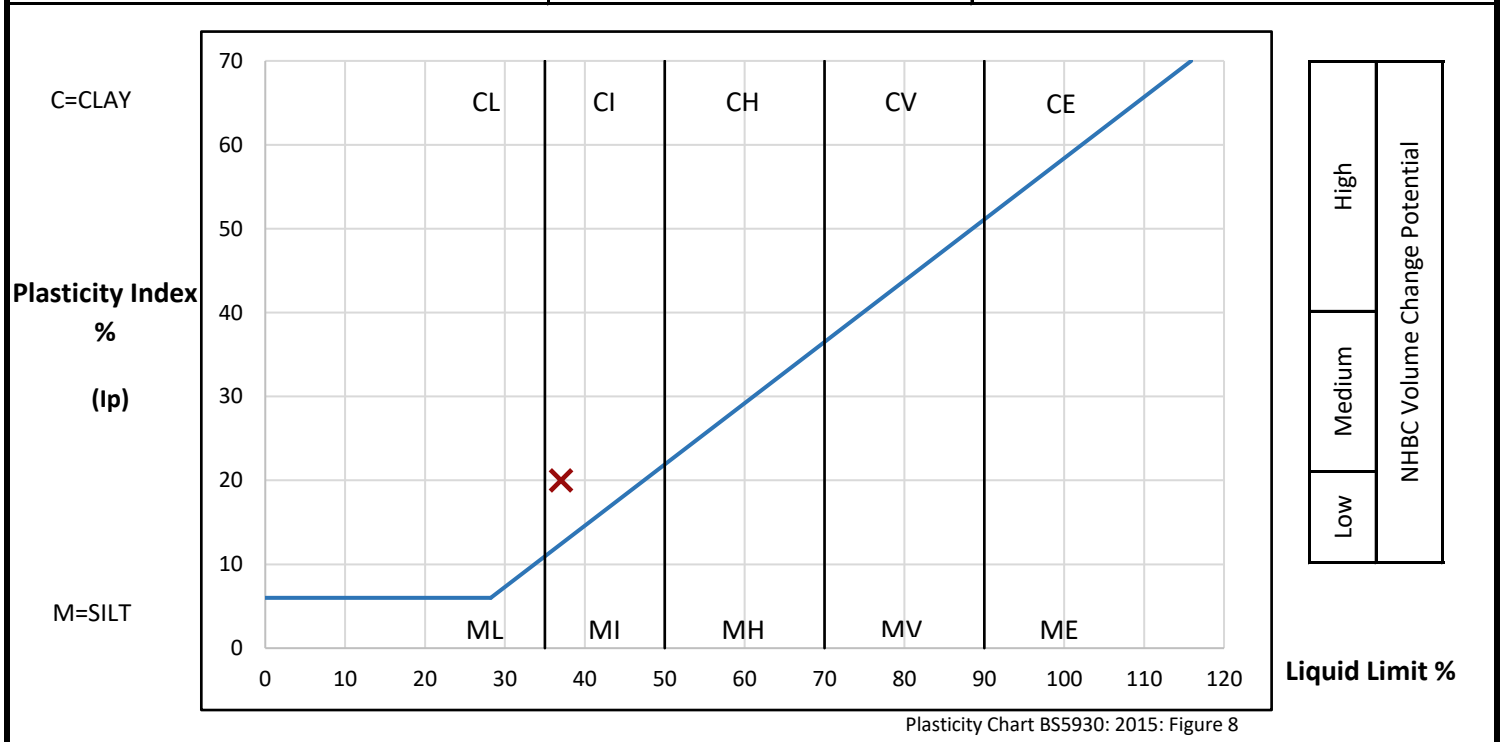
0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS01	1.60 - 1.70	D	3	18.5	Soft mottled grey and olive slightly sandy slightly gravelly silty CLAY with rare decayed roots. Gravel is fine to coarse rounded to subangular chalk	

<b>PREPARATION</b>			Liquid Limit	37 %	
Method of preparation			Wet sieved over 0.425mm sieve	Plastic Limit	17 %
Sample retained 0.425mm sieve	(Measured)	42 %	Plasticity Index	20 %	
Corrected water content for material passing 0.425mm			31.9 %	Liquidity Index	0.07
Sample retained 2mm sieve	(Measured)	30 %	NHBC Modified (I'p)	12 %	
Curing time	27 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



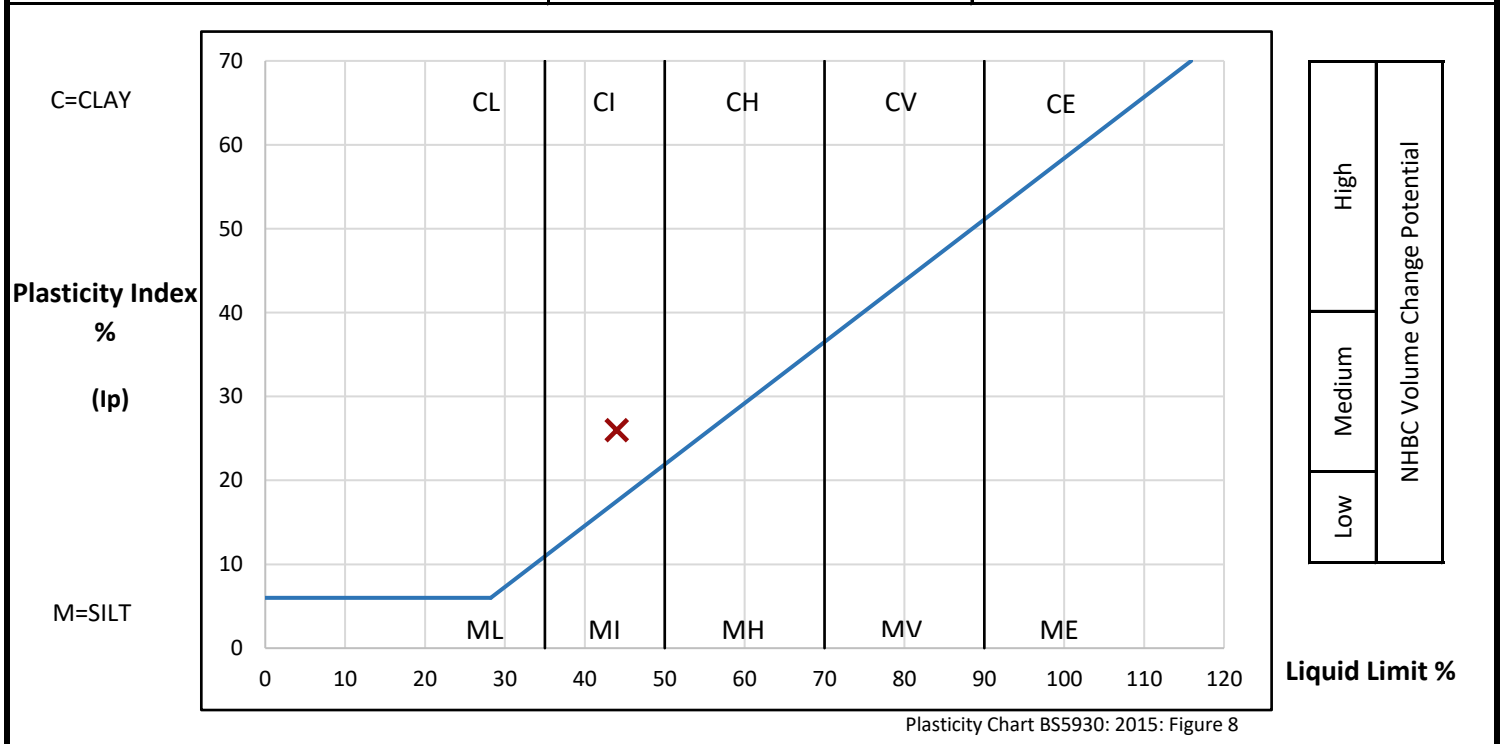
0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS01	3.50 - 3.80	D	6	18.3	Stiff olive grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chert and chalk	

<b>PREPARATION</b>			Liquid Limit	44 %	
Method of preparation			Wet sieved over 0.425mm sieve	Plastic Limit	18 %
Sample retained 0.425mm sieve	(Measured)	10 %	Plasticity Index	26 %	
Corrected water content for material passing 0.425mm			20.3 %	Liquidity Index	0.01
Sample retained 2mm sieve	(Measured)	5 %	NHBC Modified (I'p)	23 %	
Curing time	25 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



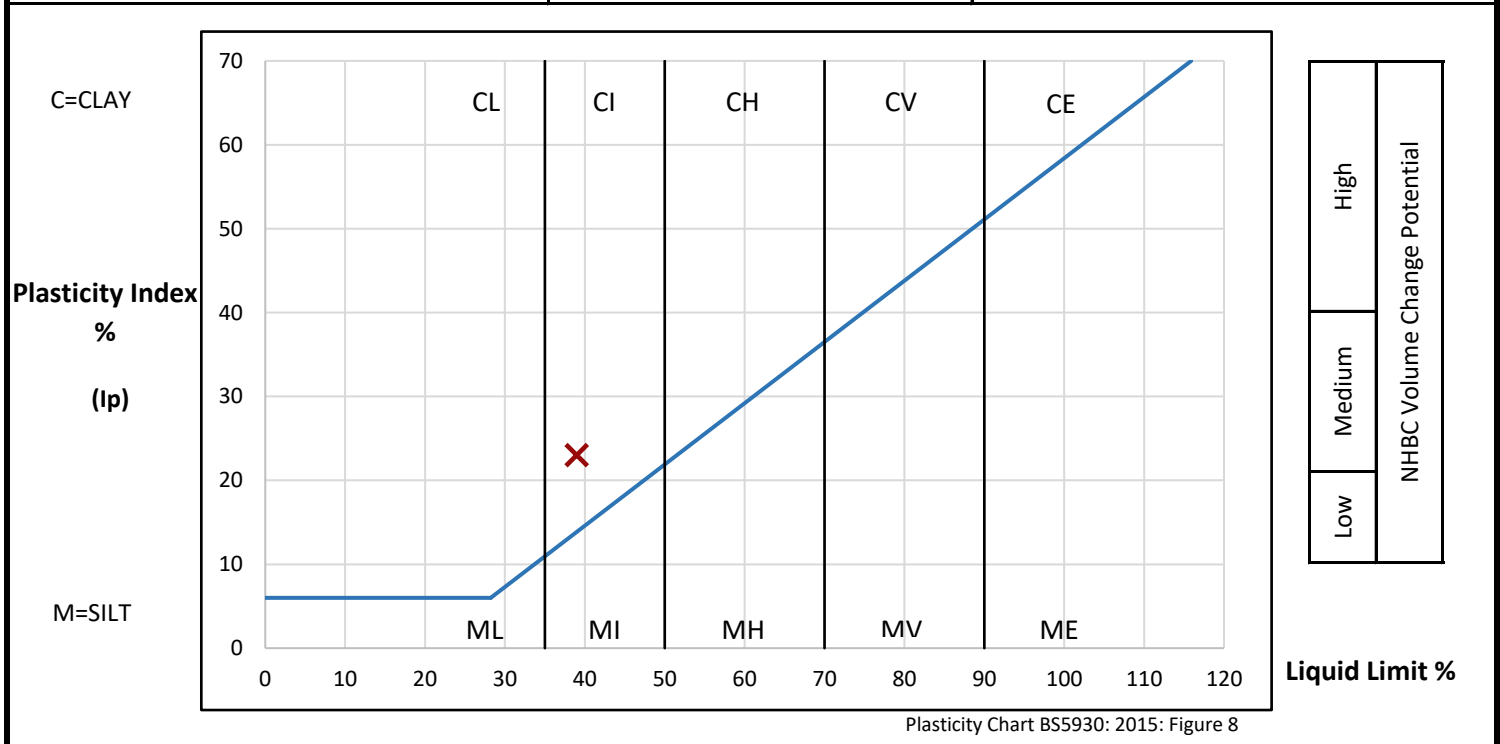
0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS02	4.40 - 5.00	D	3	16.1	Stiff dark grey slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium angular to subrounded chalk	

<b>PREPARATION</b>			Liquid Limit	39 %	
Method of preparation			Wet sieved over 0.425mm sieve	Plastic Limit	16 %
Sample retained 0.425mm sieve	(Measured)	9 %	Plasticity Index	23 %	
Corrected water content for material passing 0.425mm			17.7 %	Liquidity Index	0.00
Sample retained 2mm sieve	(Measured)	7 %	NHBC Modified (I'p)	21 %	
Curing time	24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



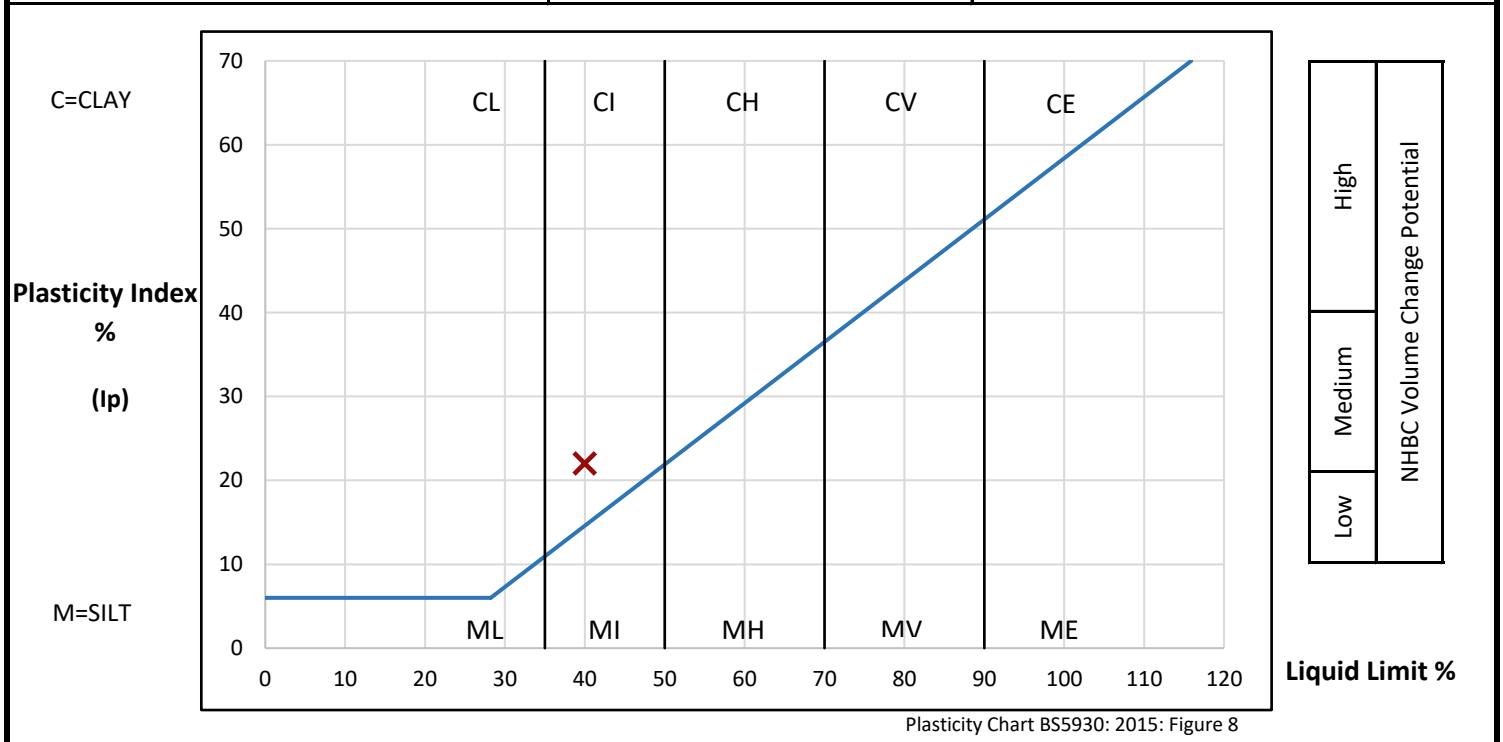
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<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS03	1.40 - 1.60	D	1	<b>25.7</b>	Soft mottled light grey and olive slightly gravelly slightly sandy silty CLAY with rare decayed roots. Gravel is fine and medium rounded to subangular chalk	

<b>PREPARATION</b>			Liquid Limit	<b>40 %</b>	
Method of preparation			<b>Wet sieved over 0.425mm sieve</b>	Plastic Limit	<b>18 %</b>
Sample retained 0.425mm sieve	(Measured)	<b>8 %</b>	Plasticity Index	<b>22 %</b>	
Corrected water content for material passing 0.425mm			<b>27.9 %</b>	Liquidity Index	<b>0.35</b>
Sample retained 2mm sieve	(Measured)	<b>5 %</b>	NHBC Modified (I'p)	<b>20 %</b>	
Curing time	<b>113 hrs</b>	Clay Content	<b>Not analysed</b>	Derived Activity	<b>Not analysed</b>



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



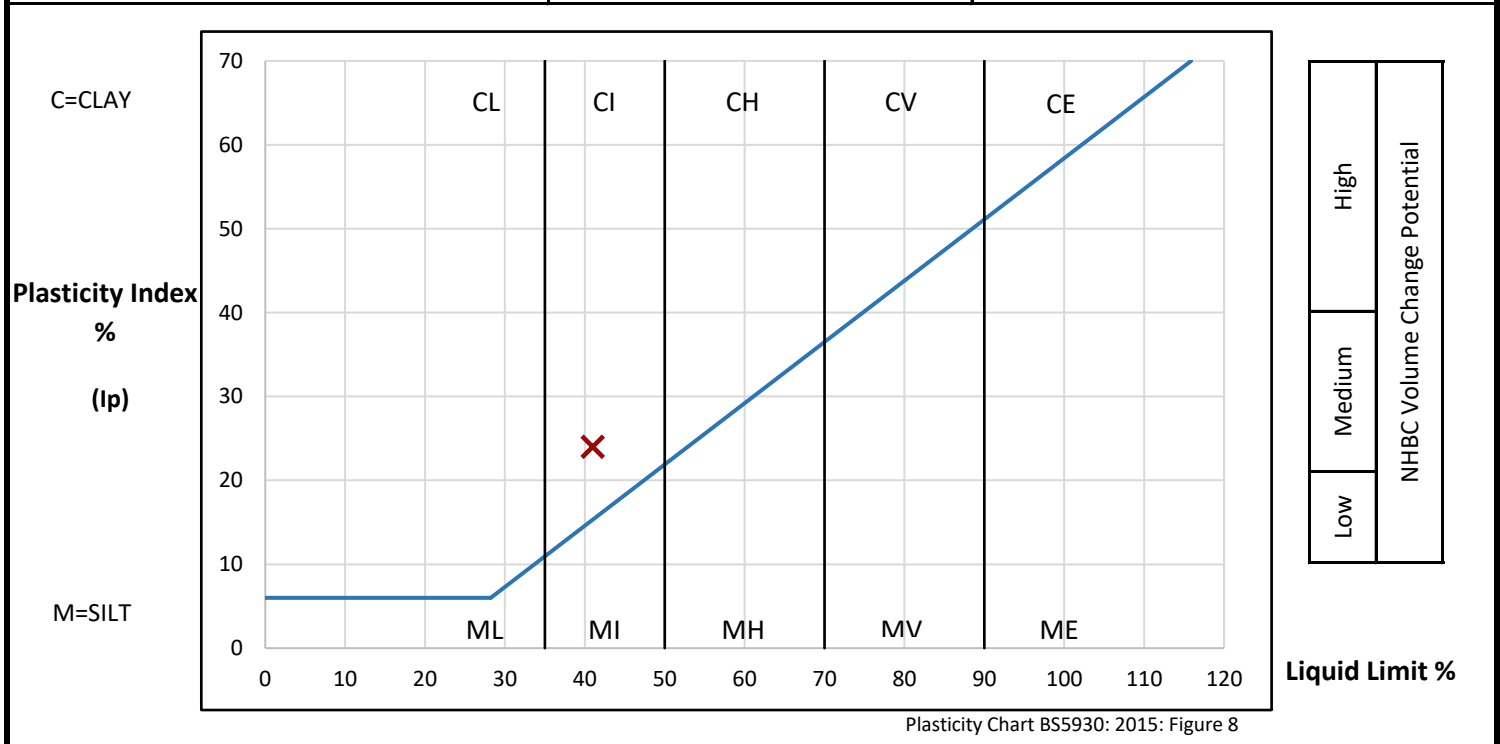
0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS03	1.80 - 2.00	D	2	<b>19.8</b>	Firm mottled grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine to coarse angular to rounded chert and chalk	

<b>PREPARATION</b>			Liquid Limit	<b>41 %</b>	
Method of preparation			<b>Wet sieved over 0.425mm sieve</b>	Plastic Limit	<b>17 %</b>
Sample retained 0.425mm sieve	(Measured)	<b>6 %</b>	Plasticity Index	<b>24 %</b>	
Corrected water content for material passing 0.425mm			<b>21.1 %</b>	Liquidity Index	<b>0.12</b>
Sample retained 2mm sieve	(Measured)	<b>4 %</b>	NHBC Modified (I'p)	<b>23 %</b>	
Curing time	<b>121 hrs</b>	Clay Content	<b>Not analysed</b>	Derived Activity	<b>Not analysed</b>



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023

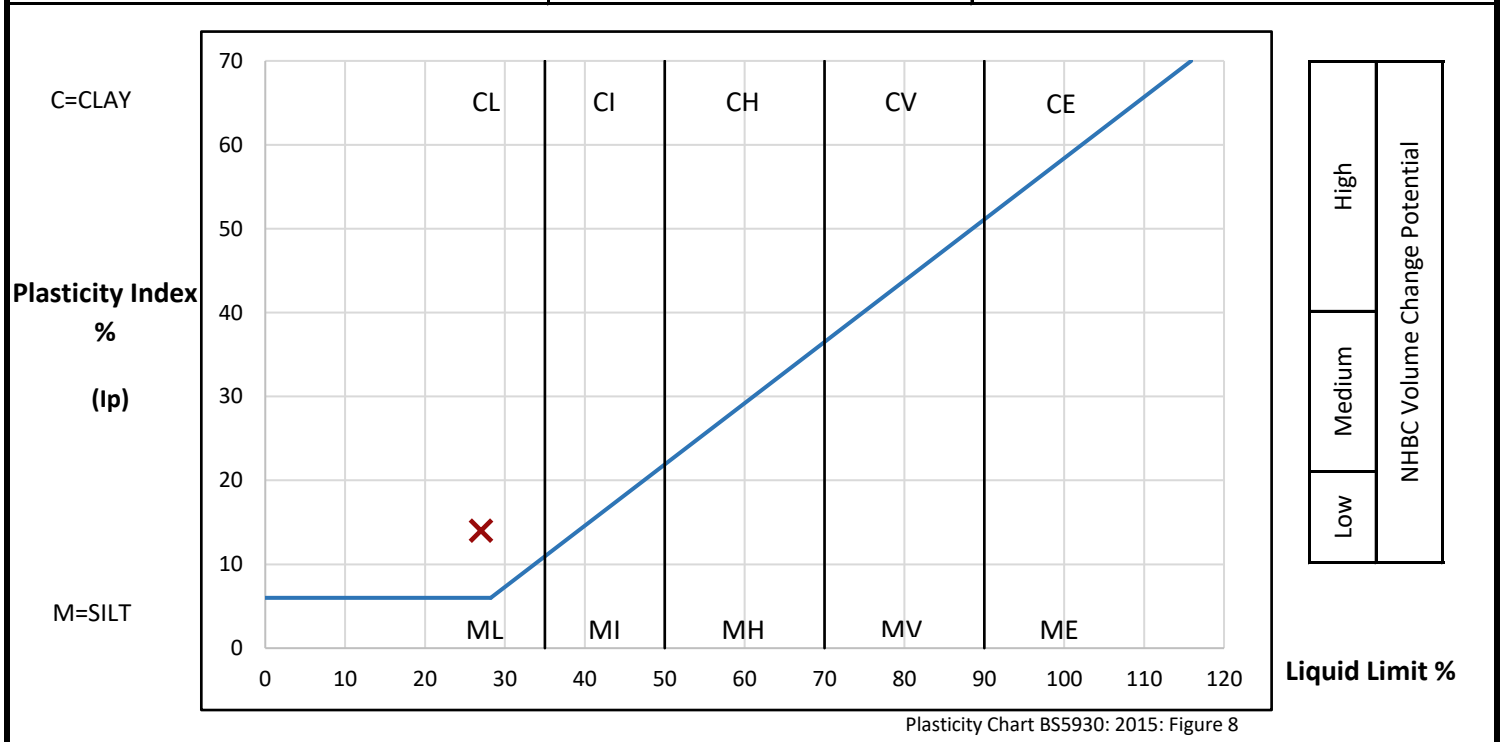


<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS04	2.70 - 3.00	D	3	18.4	Soft mottled bluish grey and light olive brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium angular to rounded chert and chalk	

<b>PREPARATION</b>			Liquid Limit	27 %	
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	13 %	
Sample retained 0.425mm sieve (Measured)	11 %		Plasticity Index	14 %	
Corrected water content for material passing 0.425mm	20.7 %		Liquidity Index	0.39	
Sample retained 2mm sieve (Measured)	7 %		NHBC Modified (I'p)	12 %	
Curing time	115 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)





# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



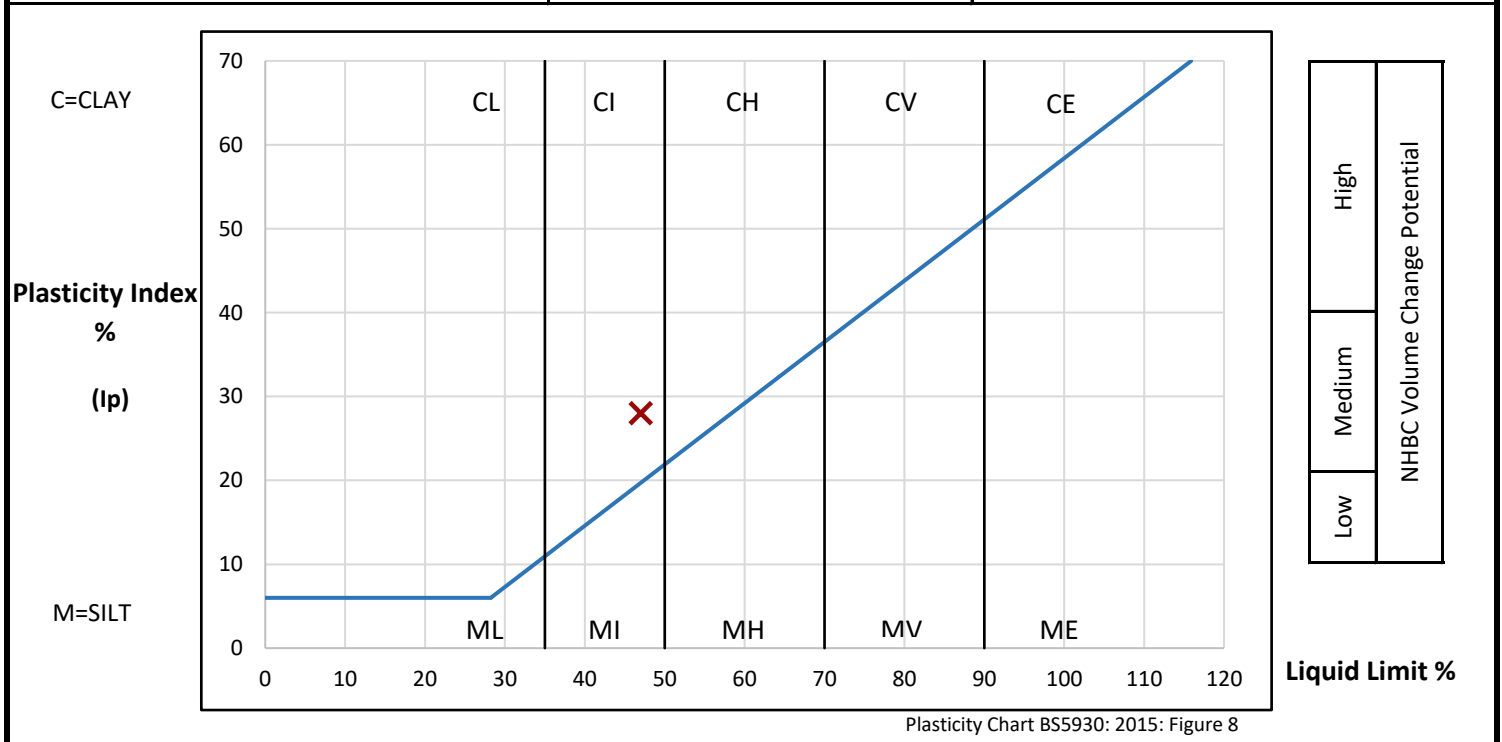
0998

<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

## DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS05	0.60 - 0.80	D	1	27.2	Soft mottled bluish grey and olive brown slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is fine and medium angular to subrounded chert and chalk	

<b>PREPARATION</b>			Liquid Limit	47 %	
Method of preparation		Wet sieved over 0.425mm sieve	Plastic Limit	19 %	
Sample retained 0.425mm sieve	(Measured)	8 %	Plasticity Index	28 %	
Corrected water content for material passing 0.425mm			Liquidity Index	0.29	
Sample retained 2mm sieve	(Measured)	5 %	NHBC Modified (I'p)	26 %	
Curing time	24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD  
DATE ISSUED: 13/04/2023



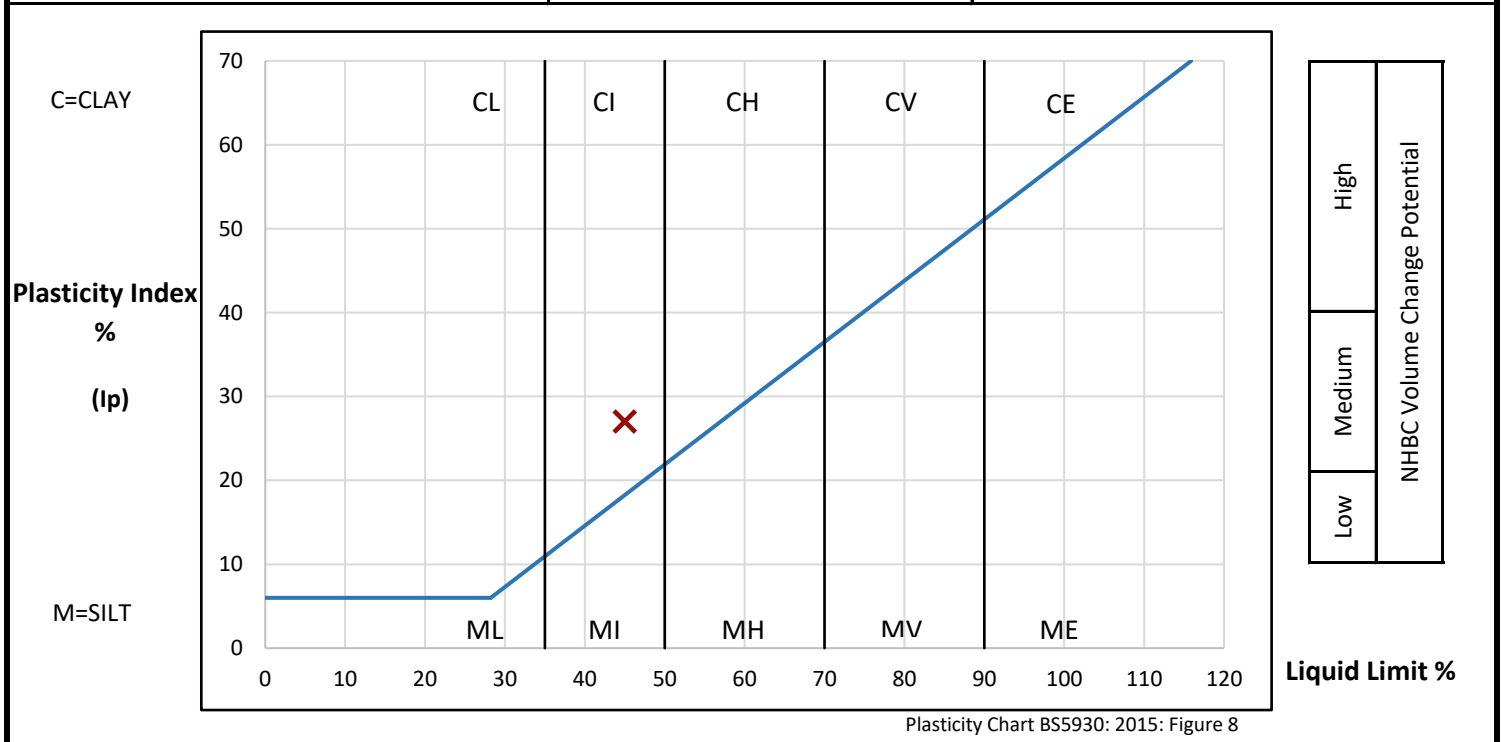
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<b>Contract</b>	<b>Brook Hall Farm</b>
<b>Serial No.</b>	<b>42387_1</b>

### DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS05	2.40 - 2.70	D	3	20.3	Stiff mottled bluish grey and olive slightly gravelly slightly sandy silty CLAY with occasional decayed roots, rare orange staining and selenite crystals. Gravel is fine and medium angular to subrounded chert and chalk	Specimen dried at 50°C due to the presence of selenite.

<b>PREPARATION</b>			Liquid Limit	45 %	
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	18 %	
Sample retained 0.425mm sieve	(Measured)	8 %	Plasticity Index	27 %	
Corrected water content for material passing 0.425mm		22.1 %	Liquidity Index	0.09	
Sample retained 2mm sieve	(Measured)	3 %	NHBC Modified (I'p)	25 %	
Curing time	24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2  
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.3, 5.3, 5.4  
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter  
 Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1  
 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index  
 Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



# TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 13/04/2023

<b>Contract:</b>	<b>Brook Hall Farm</b>
<b>Serial No:</b>	<b>42387_1</b>

## DETERMINATION OF THE SULPHATE CONTENT AND pH OF SOIL AND GROUNDWATER

Borehole / Pit No.	Depth (m)	Sample		Conc. of Soluble SO <sub>3</sub>		Calc'd Conc. Of SO <sub>4</sub> (g/L)	pH Value	% Sample Passing 2mm Sieve	Description	Remarks
		Type	Ref.	Water Soluble 2:1 (g/L)	Ground Water (g/L)					
WS03	1.40 - 1.60	D	1	0.03		0.04	8.0	95	Soft mottled light grey and olive slightly gravelly slightly sandy silty CLAY with rare decayed roots. Gravel is fine and medium rounded to subangular chalk	

Method of Preparation: BS1377: Part 1: 2016: 8.5, BS1377: Part 3: 1990: 5.3 Soil/Water Extract, 5.4 Groundwater  
 Method of Test: BS1377: Part 3: 1990: 5.5  
 Type of Sample Key: U= Undisturbed, B= Bulk, D= Disturbed, J= Jar, W= Water, SPT= Split Spoon Sample, C= Core Cutter  
 Comments: **Test not UKAS accredited**  
 Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location, and origin of test specimen within original sample. Oven drying temperature if not 105-110C.

## Appendix E

Gas Monitoring Results & Calibration Certificates

**Ground Gas Monitoring**

**60742 – Brook Hall Farm, Church Road, Crowfield, Suffolk, IP6 9TG**

Date: 14/04/2023      Weather: Cool, Windy, Dry  
Instrument No: 10820 / MiniRAE 3000      Engineer: TF

Location	CO <sub>2</sub> Conc. (% by volume)		CH <sub>4</sub> Conc. (% by volume)		O <sub>2</sub> Conc. (% by volume)		Time Monitoring Flow Rate (mins)	Time Monitoring Gas Level (mins)	VOC Conc. (ppm)	Peak Flow Rate (l/hr)	Atmospheric Pressure (mbar)	Standing Water Level (m bgl)	Depth to base (m bgl)	Differential Pressure (DP) (Pa)	Lower Explosive Limit (LEL) (%)	Remarks
	P	S	P	S	M	S										
WS02	0.4	0.3	0.0	0.0	20.0	20.6	5	10	0.2	0.0	1003	0.70	4.57	0	0.0	
WS03	0.7	0.6	0.0	0.0	20.6	20.8	5	10	0.1	0.0	1000	0.68	4.87	0	0.0	
WS04	0.7	0.6	0.0	0.0	20.2	20.3	5	10	0.3	2.4*	1001	0.45	3.75	0	0.0	*Steady flow rate of 2.0 l/hr

P = Peak, S = Steady, M = Minimum, DP = Differential Pressures, LEL = Lower Explosive Limit

Atmospheric Pressure 14/04/2023 (World Weather Online): 12am: 1008mbar, 3am: 1009mbar, 6am: 1009mbar, 9am: 1010mbar, 12pm: 1010mbar, 3pm: 1011mbar, 6pm: 1013mbar.

Date: 05/05/2023      Weather: Cool, Overcast, Damp  
Instrument No: 10820 / MiniRAE 3000      Engineer: TF/JA

Location	CO <sub>2</sub> Conc. (% by volume)		CH <sub>4</sub> Conc. (% by volume)		O <sub>2</sub> Conc. (% by volume)		Time Monitoring Flow Rate (mins)	Time Monitoring Gas Level (mins)	VOC Conc. (ppm)	Peak Flow Rate (l/hr)	Atmospheric Pressure (mbar)	Standing Water Level (m bgl)	Depth to base (m bgl)	Differential Pressure (DP) (Pa)	Lower Explosive Limit (LEL) (%)	Remarks
	P	S	P	S	M	S										
WS02	0.4	0.4	0.0	0.0	20.6	20.7	5	10	0.9	0.0	1011	0.73	4.57	0	0.0	
WS03	0.9	0.9	0.0	0.0	20.3	20.3	5	10	0.1	0.0	1010	0.85	4.87	0	0.0	
WS04	1.2	1.2	0.0	0.0	20.2	20.4	5	10	0.1	0.0	1011	0.22	3.75	0	0.0	

P = Peak, S = Steady, M = Minimum, DP = Differential Pressures, LEL = Lower Explosive Limit

Atmospheric Pressure 05/05/2023 (World Weather Online): 12am: 1014mbar, 3am: 1014mbar, 6am: 1014mbar, 9am: 1015mbar, 12pm: 1015mbar, 3pm: 1014mbar, 6pm: 1014mbar.

TEST DATE AND CONDITIONS			
Date	1.11.22		
Atmospheric Pressure	981	mB	
Ambient Temperature	21.1	°C	
Envionics Serial No.	5089		

<b>GAS DATA LTD</b> Unit 4 Fairfield Court Seven Stars Estate Coventry CV3 4LJ UK +44 (0)24 7630 3311	 <b>GAS DATA</b> <small>LISTEN · ANALYSE · INFORM</small>
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### GFM430 -1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Type	Instrument Serial Number + SW Version	Job Number(s)
332480	GFM430	10820 G430-24/13	123589

**Calibration Technician** ..... *[Signature]* ..... **Date** ..... 1.11.22 .....  
**Inspection Technician** ..... *[Signature]* ..... **Date** ..... 2.11.22 .....

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable (NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All Keys)	P	Leather Case		X
	Backlight	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mB)	n/a	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Hard Carry Case		X
	Service Date set to?	1.11.23	Gas Sample Tube – (new issue)		✓
Channel Test	Data Logging Enabled?	P	Flow Sample Tube – (new issue)		✓
	Verify CH4/LEL	P	Spares Pot		X
	Verify CO2	P	Allen Key		X
	Verify O2	P	Temperature Probe		X
	Verify LEL	P	Vane Anemometer		X
	Verify 1 <sup>st</sup> Option Gas	N/A	USB Cable		X
	Verify 2 <sup>nd</sup> Option Gas	N/A	USB Memory stick		X
	Verify 3 <sup>rd</sup> Option Gas	N/A	SiteMan Software	Ver 4.15	X
	Verify 4 <sup>th</sup> Option Gas	N/A	Internal Filter Pack	Qty	X
	Verify Atmospheric pressure	P	External Filter Pack	Qty	X
	Verify static pressure	N/A	Field Guide		X
	Verify differential pressure	P	Operation Manual (hard copy)		X
	Verify flow	P	Extra Items:		
	Verify temperature probe input	P			
Verify vane anemometer input	P				
DataBase Checks	Jobcard(s) completed and signed	P	Comments:		
	Jobcard(s) booked off database	P			
	Calibration certificate completed	P			
	Complete & print QI record	n/a			
Label Checks	No. of Calibration label fitted	GDC 11617			
	Warranty label fitted	P			
H2S Range	H2S Range from Sales Order	N/A	ppm		
	H2S Range from Cal Cert	N/A	ppm		
	Over-range value correct?	N/A			



**Life-saving solutions**

Instrument House  
 91-92 Shrivenham Hundred Business Park  
 Watchfield  
 Oxfordshire  
 SN6 8TY  
 Tel: 01793 780622  
[service@shawcity.co.uk](mailto:service@shawcity.co.uk)

**SERVICE / INSPECTION SHEET**

JOB NUMBER: 73857  
 INSTRUMENT: MiniRAE 3000  
 SERIAL NUMBER: 592-932995  
 DATE RECEIVED: 26/05/2022  
 LAMP FITTED:  
 FIRMWARE: V2.22A  
 UPGRADED TO: N/A

CUSTOMER: Richard Jackson Ltd

ITEMS RECEIVED	RECEIVED?	RTN?
Instrument	YES	
Rubber Boot	YES	
Flex-I-Probe	YES	
Charging Dock		
Charging/download cradle		
Mains Charger		
Alkaline Battery Adapter		
Water trap (external) filter		
Lamp Cleaning Kit		
Tool Kit		
ProRAE Studio II CD		
Comms Cable		
Operation CDRUM/USB		
Manual		
Filter/O Ring Pack		
Zeroing Kit		
Gas Outlet Port Adapter		
Peli Case		
Soft Case		
	<b>SIGNED:</b>	

TESTS	Pre Service	Post Service
Charger Test		ok
Battery charge Test		ok
Lamp Test		ok
AirFlow Test (450-550 ml/min)		516ml/min
Moisture Sensitivity (< 5 ppm)		0.0ppm
Switch Test		ok
PID Sensor Test		ok
Alarm Test		ok
PC Comms Test		ok
Datalog Test		ok
Display Test		ok
Physical Inspection		ok
PAT Test*		n/a

\* IF PAT TESTED, PRODUCT WILL BE LABELLED AND A CHARGE WILL BE MADE ON THE INVOICE

**Condition Status:**  
 OK = Good F = Faulty Blank = Not Received  
 RTN = Returned to Customer?

**COMMENTS:** (Unless stated, test gas: 100 ppm Isobutylene in air)  
 Sensor cleaned ultrasonically and oven dried  
 Sensor o-ring, metal filter and pump rebuild kit replaced as per annual service  
 Firmwear on latest version V2.22A  
 Flow 516ml/min  
 Lamp current driving figure 46  
 Pump max 38 + Block 94 =  $132 \div 2 = 66$  already Stall figure  
 Calibrated and bump tested



Life-saving solutions

### CERTIFICATE OF CALIBRATION

MiniRAE 3000

**CALIBRATION CERTIFICATE NO: 73857**

ISSUED BY: SHAWCITY LIMITED  
DATE: 7.6.22

APPROVED SIGNATORY: 

NAME: D House

CUSTOMER: Richard Jackson Ltd  
INSTRUMENT: MiniRAE 3000  
SERIAL NUMBER: 592-932995

CALIBRATION METHOD: CM03  
AMBIENT CONDITIONS: 20°C ± 2°C and 50% (± 20%) RH

---

Prior to calibration the instrument was allowed to stabilise in the laboratory for at least 30 minutes.  
The instrument was calibrated by exposing the sensor to known values of gas concentrations.  
All gases were sampled through the complete probe and in line filter, where applicable.  
The reference value is that generated by the certified source and the indicated value is that measured by the instrument.

---

### CALIBRATION RESULTS

GAS	LOT No	REF. VALUE	INDICATED VALUE
Isobutylene	WO347195-1	100 ppm	100 ppm

---

#### COMMENTS:

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ .  
This provides a level of confidence of uncertainty of approximately 95%.  
The uncertainty of measurement is ±2 %  
The results indicate that the instrument conforms to the applicable parts of the published specification.

---

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### LTH & SAFETY, OCCUPATIONAL HYGIENE AND ENVIRONMENTAL MONITORING INSTRUMENTS

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## Appendix F

Limitations of Use

### Limitations of Use

This report is based on the results of the exploratory boreholes, the laboratory testing carried out on samples recovered from those boreholes and on details of the scheme provided by the Client.

This report has been prepared for the benefit of Joy Cox, and its contents should not be relied upon by others without the written authority of Richard Jackson Ltd. If any unauthorised third party makes use of this report they do so at their own risk and Richard Jackson Ltd owes them no duty of care or skill.

All information provided by others is taken as being in good faith as being accurate, but Richard Jackson Ltd cannot, and does not, accept any liability for the detailed accuracy, errors or omissions in such information.

Subsoils are by their nature hidden from view and no investigation can be exhaustive to the extent that all soil conditions are revealed. Conditions may well be present beneath the site which was not evident from the investigations carried out.

Geological data, with the exception of geological maps held by Richard Jackson Ltd, Ordnance Survey maps and aerial photographs have not been inspected, nor has any other data relating to site conditions past or present, or any information regarding underground services, other than as indicated.

Groundwater levels can be subject to considerable seasonal variations, and the conditions encountered in the exploratory holes may not reflect long-term conditions.

There can be no guarantee that the samples analysed represent the highest concentrations of contamination present beneath the site. The chemical analysis results have been assessed to standards appropriate at the time of investigation.

Unless a greater period of retention of samples is agreed, it is our normal practice to discard all samples one month after submission of our final report.



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 **Norwich**  
01603 230240

 **Cambridge**  
01223 314794

 **Bristol**  
01172 020070

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