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May 2018

PHASE 2: SITE INVESTIGATION REPORT

36-44 Carlton Avenue

FOR

Counterpoint Properties Ltd

CONSTRUCTIVE EVALUATION

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FORD LANE

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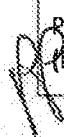
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The recommendations made and opinions expressed in the report are based on the conditions revealed by the site works together with an assessment of the data from the insitu and laboratory testing or in respect of the desktop reports. No responsibility can be accepted for conditions that have not been revealed by the research, site works and testing.

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Intrusive Field Operations

The data collected through direct operations in the production of this report has been so obtained, unless directly otherwise stated, in accordance with current UK guidance, law or accepted industry practice, including but not limited to: BS.5930: 1990 Code of Practice for Site Investigations (Amendment 2: 2010), BS 10175:2011+A1:2013 Investigations into Potentially Contaminated Sites, and BS.8576:2013 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds. Exact exploratory locations will depend upon access conditions, site use and plant capability, CE do not accept liability for issues arising from material identified between or outside of the area of exploratory locations.

Laboratory Testing

Unless stated otherwise within the text, all geotechnical and material laboratory tests have been performed in accordance with the relevant British Standard Documents. Laboratory testing for contaminated land assessment is completed under the UKAS / MCERTS accreditation schemes, unless identified as otherwise in the report.

Human Health Risk Assessment Criteria

The Environment Agency has recently undertaken revision of the Soil Guideline Values (SGVs) which are partially complete. Where standards are available using the "new" approach, these have been utilised for correlative purposes. Where standards have not yet been revised, guidance following the "old" approach has been utilised. Please note that upon release of the remaining guidelines, the standards contained within this report may be subject to change. In addition, the second edition of the LQM CIEH guidance has now been released and will be utilised in favour of previously published guideline values.

Third Parties

The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from previous Site investigations and chemical testing laboratories. Constructive Evaluation Limited has assumed that such information is correct. Constructive Evaluation Limited cannot and does not guarantee the authenticity or reliability of the information it has relied upon and can accept no responsibility for inaccuracies with the data supplied by other parties.

The accuracy of the historical map extracts supplied can not be guaranteed and it should be noted that different conditions may have existed between mapping sheet editions. Therefore, there can be no certainty that all areas of contamination have been identified during the Phase 1 investigation.

Definitions

Reference to the word "contamination" in this report does not relate to the statutory definition of contaminated land under 1990 Environmental Protection Act unless otherwise stated. The definition used in this report is: "Land that contains substances that, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets" (NATO CCMS, 1985).

1.0 INTRODUCTION

Constructive Evaluation (CE) Limited were instructed by Counterpoint Properties Ltd (the Client) (EQ12185, dated: October 2017), to carry out a 'Phase 2: Site Investigation' at 36-44, Carlton Avenue, Bognor Regis, PO21 3LR (hereafter referred to as the "site").

The site is situated to the east of Carlton Avenue and comprises of five private gardens (the residential dwellings that the gardens belong to are adjacent west of the site), these are mostly grassed with some small areas of planted borders and garden sheds.

Proposals include the construction of 8no. semi-detached properties with private gardens and roadway branching off of Carlton Avenue.

Intrusive works were conducted from 30th April to the 1st of May 2018 and comprised the following:

- One hand excavated trial pit (SA1) was conducted to allow the completion of BRE365 soakage tests;
- Two light weight windowless sample boreholes (WLS1-WLS2) to a maximum depth of 4.00mbgl;
- Seven Dynamic Probe tests (DP1-DP7) were completed to depths of 6.00mbgl;
- Three trial pits (TP1-TP3) were mechanically excavated using a tracked mini excavator;
- Three additional hand excavated trial pits (TP4-TP6).

CE have previously completed a Phase 1: Environmental Risk Assessment (Ref: 18.9887, Dated: May 2018), which should be read in conjunction with this report.

The purposes of this investigation are two-fold, 1) to provide necessary design parameters for the underlying ground conditions to allow temporary and permanent geotechnical design, and 2) refine the potential pollutant linkages as identified within the Phase 1 Report.

2.0 SITE DESCRIPTION

An Environmental Scientist from CE completed a walkover survey of the site on 23rd April 2018.

Site Address	36-44 Carlton Avenue, Bognor Regis, PO21 3LR
Grid Reference	490220, 99100
Site Area	0.35 ha
Site Ownership	unknown
Site Access	Via the west from Carlton Avenue
Ground Cover	Hard-standing (footpath and patio) – 10% Soft-standing (planted flower borders and grassed lawns) – 90%
Site Topography and Elevation	The site is relatively flat, and based on available OS map records situated approximately 5m AOD.

The site is situated to the east of Carlton Avenue and comprises of five private gardens (the residential dwellings that the gardens belong to are adjacent west of the site), these are mostly grassed with some small areas of planted borders and garden sheds.

The southern garden, belong to no. 38, extends adjacent to the property to gain access to Carlton Avenue. This garden is mostly grassed lawn with small patio area, flower borders and garden shed. CE has been informed verbally that the garden shed, was previously used as a chicken coop, there is no evidence present on the site that any livestock have been present recently.

The middle of the site to the east of no.40 and no.42, can only be accessed through no.40. during the walkover survey access was not granted to this garden. Additionally the far south of the site can only be accessed through no.34, which also was not accessible. Viewing from the exterior of the garden it appears largely unkempt grass with a wooden obelisk.

The north of the site, which is to the east of no.44 is accessed from the east of the site through Rose Green Recreational Ground. This area is largely over grown with unkempt grass, brambles, nettles and ivy.

A number of semi-mature and mature trees and shrubs were noted within the plots investigated and around the boundaries of the site which included possible Oak, Beech and Scots Pine. As such it is recommended that a full tree survey should be completed to identify all species of trees present in proximity to the proposed new development.

2.1 Surroundings

The site is within a residential setting of the village of Rose Green. To the west, south and north of the site are residential properties and to the east is Rose Green Recreational Ground. Directly east of the site is a drainage ditch, running parallel to the site boundary, during the walkover survey the ditch was noted to be dry.

3.0 PHYSICAL SETTING

3.1 Published Geology

The Geology of Britain Viewer (BGS, 2018) indicates the site is underlain by Superficial Deposits of the River Terrace Deposits (undifferentiated), over Bedrock Geology of the London Clay Formation. The table below identifies the expected composition of the published strata and the associated aquifer classification.

Superficial / Drift Geology	
Unit Name	River Terrace Deposits (undifferentiated)
Geology Description	Sand and gravel, locally with lenses of silt, clay or peat.
Aquifer Class	Secondary A
Aquifer Description	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Bedrock / Solid Geology	
Unit Name	London Clay Formation
Geology Description	The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.
Aquifer Class	Unproductive
Aquifer Description	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

3.2 Historical Boreholes

There are no historical boreholes within 500m of the site.

3.3 Hydrogeology and Hydrology

Groundwater Abstraction Licences – There are no records within 1000m of the site.

Potable Water Abstraction Licences – There are no records within 1000m of the site.

Surface Water Abstraction Licences – There are no records within 1000m of the site.

Source Protection Zones – The site and nearby surrounds (1000m from the site) are not situated within a SPZ.

Groundwater Vulnerability – The site is detailed as having soils of High Leaching Potential as soil information for urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise.

Surface Water Features – The nearest surface water feature is located on site, which is a drainage stream located in the east of the site, orientated north to south.

BGS Groundwater Flooding Susceptibility – The site has been identified as having potential for groundwater flooding to occur at the surface. Note, this data should not be used in isolation as a final indicator of flooding susceptibility and risk at individual properties.

4.0 PREVIOUS REPORTS

4.1 Phase 1 Environmental Risk Assessment – Constructive Evaluation Ltd

A Phase 1: Environmental Risk Assessment Report was completed by CE in May 2018 (Ref: 18.9887). The purpose of the Environmental Risk Assessment was to provide information on the following: the expected geology and hydrogeology; the development history and most recent uses of the site; potential sources of contamination; and, to enable the development of a preliminary Conceptual Site Model (CSM) and risk assessment.

Following a site walkover, review of historical maps, and information on public record, the potential sources of contamination have been identified as Made Ground associated with the use of the site and limited development. Potential contaminants of concern include, but are not exclusive to, heavy metals, hydrocarbons and asbestos. A summary of the Conceptual Site Model (CSM) and associated risks are detailed below:

Source	Pathway	Receptor	Potential Risk
1.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users.	Low to Moderate
		Site workers (during development).	Low
	Impacted soils.	Future Services.	Low
	Volatilisation of hydrocarbons in underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development.	Low
		Site workers (during development).	Negligible
	Infiltration and migration of contaminants through the underlying geology.	Underlying Superficial Principal Aquifer	Low
		Underlying Bedrock Principal Aquifer	Low

4.2 Recommendations following Preliminary CSM

Based on the findings of the Phase 1 Report, it was deemed that a Site Investigation would be required in order to assess/ refine the potential pollutant linkages identified within the preliminary CSM. It was detailed that the aims of the Site Investigation were to target the proposed areas of soft landscaping. The investigations that were considered necessary to assess the potential risks are detailed in the subsequent table.

Targeted Investigations	
Investigation Required	Purpose(s)
1no. intrusive position within each residential garden, to approx. 1.00mbgl.	Collect representative soil samples. Assess visual / olfactory evidence of contamination.
Non-Targeted Investigations	
Investigation Required	Purpose(s)
A series of 3-5no. intrusive positions across the site.	To provide sufficient coverage of site area. Collect representative soil samples. Assess visual / olfactory evidence of contamination.

Further details of recommendations can be viewed within the previously issued report. Actual fieldworks conducted, are detailed in Section 5.0 of this report.

5.0 FIELDWORKS

5.1 Site Management and Preparation

Suitably experienced CE staff supervised the investigation which was undertaken during a four day operation on 30th April to the 1st May 2018. The works were carried out in accordance with statutory guidance including BS5930:1999 *Code of Practice for Site Investigations (Amendment 3: 2015)* and BS 10175:2011+A1:2013 *Investigation of Potentially Contaminated Sites: Code of Practice*.

Available underground utility plans were consulted where applicable and prior to any excavations taking place a Cable Avoidance Tool (CAT) was used to check for the position of any underlying electrical services. In addition, starter pits were excavated to 1.00 metres below ground level (mbgl) to clear test locations prior to any intrusive work, where possible. A plan indicating intrusive locations can be viewed in **Appendix A**. Photographs of the site investigation being undertaken can also be viewed within **Appendix B**.

5.2 Investigation Conducted

- Two windowless sample boreholes (WS1 & WS2) were completed to a maximum depth of 4.00mbgl by means of a track mounted windowless sample rig. The recovered soils were logged with representative samples recovered. Insitu standard penetration testing was completed at regular intervals throughout the drilling of the borehole to provide a record of soil consistency.
- Due to assess restrictions five Dynamic Probe tests (DP1-DP5) were completed to depths of 6.00mbgl across the site to provide further insitu soils coverage across the site beyond window sample locations.
- Three trial pits (TP1-TP3) were mechanically excavated using a tracked mini excavator to provide sufficient coverage of the site for soil sampling. The trial pits were completed to depths of between 1.80mbgl (TP3) and 2.10mbgl (TP1).
- Four additional hand excavated trial pits (TP4-TP6 & SA1) were also completed to both provide sampling coverage and allow the completion of a soakage testing. These were completed to a depth 1.00mbgl with TP4-Tp6 and 1.60mbgl within SA1.
- Soakage testing in general accordance with BRE365 specification was completed within trial pit SA1. Due to time constraints only two tests were completed. The test hole was filled with potable water and the time taken for the water to soakaway recorded. The results of this testing and limitations of the testing procedure are contained in section 6.4.1 of this report.
- Seven Dynamic Cone Penetrometer tests (DCP1-DCP7) were completed to a maximum depth of between approximately ~800-800mm in order to provide a profile of the equivalent insitu California Bearing Ratio.

5.3 Soil Sample Collection

- All intrusive locations were logged and any visual or olfactory evidence of contamination noted in accordance with current protocol.

- Samples were handled using a fresh pair of nitrile gloves. Equipment was cleaned between use at different sampling locations and different sampling depths to prevent cross-contamination.
- Selected samples were placed in sealed glass jars or plastic tubs (dependent on the exact laboratory requirements and analysis to be undertaken) and stored in a temperature controlled environment before transit.

The results of the analytical soil testing are discussed in Section 7.2.2.

6.0 GROUND CONDITIONS

6.1 Soil

The following table summarises the strata conditions encountered during the intrusive works:

Stratum	Depth Range Encountered	Detail Description
Made Ground/Topsoil	GL to 0.20-0.80m	Grass over dark brown very clayey slightly gravelly silty Sand. Gravel is sub-angular to sub-rounded fine to coarse sized flint and occasional brick and ash.
Silty Sandy CLAY	0.20-0.80m to 1.40-1.60	Orange brown silty sandy CLAY. Sand is fine.
SAND	1.40-1.60m to 1.60-2.50m	Orange mottled pale yellow fine to medium SAND.
Gravelly SAND	1.40-2.50m to 1.80-3.10m	Orange mottled pale grey locally clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded, fine to coarse sized flint.
CLAY	2.90-3.10m to >4.45m	Pale brown becoming grey fissured CLAY. Fissures are extremely closely spaced and sub-horizontal to sub-vertical

Please refer to the stratigraphic logs contained within **Appendix C** for a more detailed description.

6.2 Groundwater

Groundwater was recorded at slightly variable depths across site with levels of between 1.23mbgl with WS1 and 2.00mbgl within TP1. This is considered to represent groundwater within the granular River Terrace Deposits perched on top of the cohesive London Clay Formation. The following table summarises groundwater depths:

Location	Groundwater Level (mbgl)	
	Strike level	Rise to level after >20 min period
WS1	1.30	1.23
WS2	1.50	1.30
TP1	2.00	-
TP2	1.90	-
TP3	1.80	-

Groundwater standpipes were installed within WS1 and WS2 to depths of 2.00mbgl which can be monitored to provide further information of groundwater levels.

6.3 Insitu Testing

6.3.1 Standard Penetration Testing (SPT's)

Standard Penetration testing was completed throughout the drilling of the windowless boreholes at approximately 1.00m centres to the full depth of the boreholes. This form of testing is completed using a 63.5kg drop hammer weight, over a 750mm drop, measuring the blow counts for six, 75mm increments. The first two values are recorded as seating blows, with the remaining four values, added together to provide an 'N-value'.

SPT testing at a depth of 1.00mbgl recorded values of between SPTN=8-9 suggesting a firm consistency/medium strength cohesive soil. At 2.00mbgl testing was completed within the granular River Terrace Deposits and recorded N values of SPTN=17 which correlates to a medium dense granular soil.

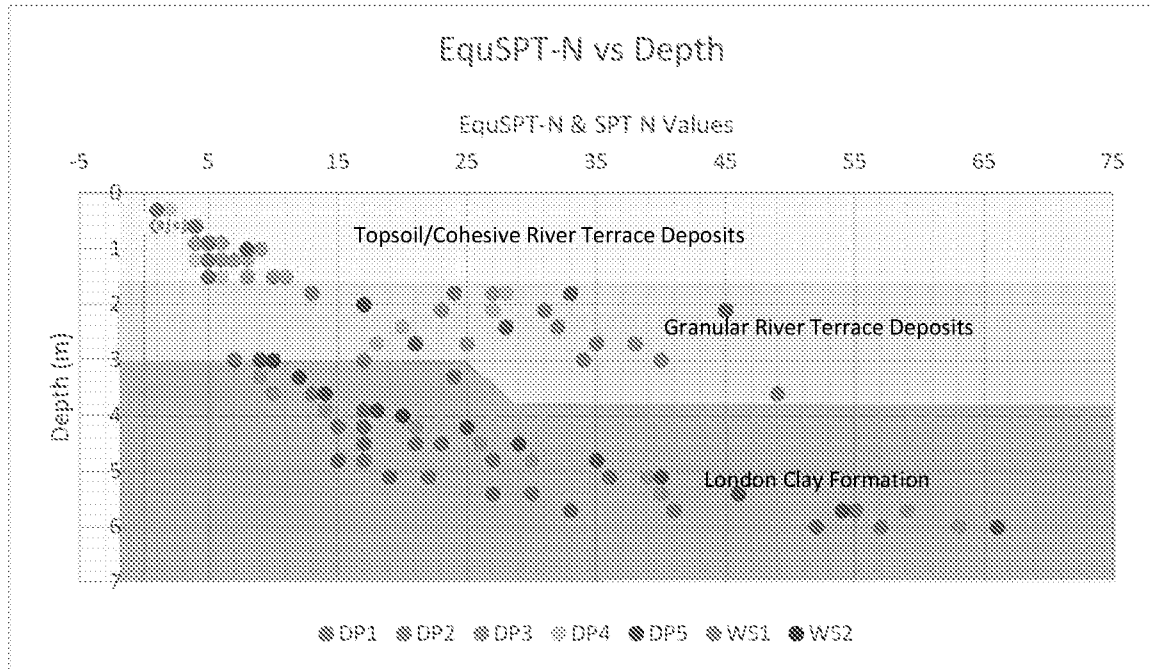
The London Clay recorded SPTN values of between SPTN=7-10 at 3.00m to 4.00mbgl suggesting firm consistency medium strength soil with the exception on the test completed within WS2 at 4.00mbgl. This value was SPTN=20 indication either a stiff (high strength) consistency cohesive soil or a medium dense (medium strength) granular soil and may represent the Bognor Sand Member encountered at depth and forms part of the London Clay Formation.

6.3.2 Dynamic Probe Testing (DP)

Due to access restrictions to the northern portion of the site for the track mounted windowless sampling rig used to complete the windowless sample boreholes heavy weight dynamic probing (DPH) was completed to provide further coverage of the site and provide additional insitu strength information. This testing utilises a 50kg drop weight, falling from a 500mm height and the number of hammer blows required to achieve each 100mm penetration (N100 value) is recorded.

The equivalent SPT-N values are determined by taking N100 values for three consecutive intervals, and dividing by 0.66. The resultant equ-SPTN generally follow the insitu soil strength trend seen by the SPT's completed within the windowless sample boreholes.

This form of testing has recorded insitu soil strength to greater depths than the SPT testing completed. The plot over page shows the SPTN and equivalent SPTN values against depth:



6.3.3 Dynamic Cone Penetrometer (DCP)

Seven locations were explored by means of the DCP probe in order to determine the equivalent insitu Californian Bearing Ratio (CBR) value across the site. The table below identifies the measured CBR% at given depths below ground level on the basis of the testing results.

Depth (*mbgl)	Recorded CBR%						
	DCP1	DCP2	DCP3	DCP4	DCP5	DCP6	DCP7
0.30	3	21	2	3	3	3	1
0.45	4	20	5	4	3	4	1
0.60	6	17	7	7	5	4	2
0.75	6	8	9	7	5	6	5

DCP results below topsoil at 0.40 ranged from 1-20% although the high value of 20% was felt to represent an area of artificially reworked ground and not representative of the natural underlying shallow soils.

From the testing completed it is suggested that a conservative CBR values in the order of 2-4% are used in the design of any new pavements.

6.4 Soakaway Testing

6.4.1 BRE 365 Soil Infiltration Testing

Soil infiltration testing was completed in a hand excavated trial pit (SA1) in accordance with BRE 365 methods. This test involves squaring of the pit walls, followed by the rapid filling of potable water and subsequent monitoring of the rate of decline in the head of water. The soil infiltration rate is calculated by the rate of outflow from 75% to 25% effective fill depth. The table below summarised the results.

Trial Hole ID	Test	Pit Depth (m)	Time at 75% (mins)	Time at 25% (mins)	Permeability Coefficient (m/s)	Drainage Conditions
SA1	1	1.55	27.5	180	9.57×10^{-6}	Good
	2	1.55	30	270	8.37×10^{-6}	

6.5 Ground Gas/ Soil Vapour Monitoring

The risk of ground gas and soil vapour to the site and end users was considered minimal from the data in the Phase 1 Preliminary Risk Assessment. From the observation made during the Phase 2 site investigation there was no new information obtained in relation to a risk from ground gas or soil vapour. Therefore in accordance with BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds*, there was deemed to be no need to conduct gas/vapour monitoring.

Therefore the risk from Ground gas and soil vapour is deemed to be 'Low'; however it should be noted that the entire site has not been investigated.

7.0 LABORATORY TESTING

7.1 Geotechnical Testing

7.1.1 Natural Moisture Content and Plasticity Index

In total, sixteen disturbed samples of the underlying soils were submitted for determination of their Natural Moisture Content (NMC) with eleven of these additionally tested for their Plasticity Index (PI).

The samples tested from the superficial cohesive River Terrace Deposits for NMC were selected from depths between 0.40m and 1.50mbgl. NMC values were found to range between 17-44%. Plasticity Index tests indicate Liquid Limit values of 30-44% and Plastic Limits of 16-22. Taking into account the portion of the sample retained upon the 425µm sieve (0-10%) the modified Plasticity Index results were found to range between 10% and 23%.

One sample of the underlying London Clay Formation was selected from a depth of 3.50-4.00mbgl and recorded a NMC of 30%. A Liquid Limit value of 70% and Plastic Limit of 26% was recorded. Taking into account the portion of the sample retained upon the 425µm sieve (4%) the modified Plasticity Index results were found to be 42%.

Based upon the samples of River Terrace Deposit analysed these shallow superficial cohesive deposits have been recorded to be clays of Low to Intermediate plasticity and as such can be classified as with a worst case medium volume change potential in accordance with NHBC guidance, Chapter 4.2 'Building near Trees'.

Test results of London Clay Formation analysed have shown this material to be a clay of high to very high plasticity and in accordance with NHBC Guidance can be classified as high volume change potential.

Comparison of the natural moisture content to 40% of the respective Liquid Limit (corrected for granular content) – which is used as a statistical measurement of desiccation; do not show any signs of desiccation for the samples tested.

7.1.2 Sulphate and pH Analysis

13no. samples of the Made Ground and underlying natural soils between depths of 0.20m to 4.00mbgl were forwarded to the laboratory for water soluble sulphate and pH determination.

Water soluble sulphate concentrations within the soils were found to range from <10mg/l (less than laboratory limit of detection) to 129mg/l, with pH levels ranging from 6.7 to 8.0.

7.2 Geo-Environmental Analysis

7.2.1 Soil Analysis

Four soil samples obtained from depths ranging between 0.20 and 0.80mbgl were submitted to QTS Environmental, a UKAS and MCERTS accredited laboratory testing facility, for a screen of contamination testing from both the Made Ground and shallow underlying natural soils. Although not all samples were tested for all analytical determinands, suites included an asbestos screen, heavy metals and hydrocarbons including speciated Total Petrol Hydrocarbons (TPH CWG aromatic/aliphatic split), BTEX, MTBE and speciated Polycyclic Aromatic Hydrocarbons (PAH), as well as a background suite of pH, SOM, total cyanide, and total phenols.

Rationale for Analysis

Specific soil samples were selected in order to fully refine previously identified contamination pollutant linkages and specifically based on contaminants of concern highlighted within the Phase 1 Report. Sample rationale is detailed in the subsequent table.

Source/ Location	Hole ID	Sample Depth (mbgl)	Analysis	Rationale for Sample/ Analysis
Made Ground associated with the use of the site and limited development	TP2	0.50	TPH, PAHS, BTEX, MTBE and heavy metals	The Made Ground strata is analysed to assess the composition.
	WS1	0.90		Shallow natural strata is analysed assess the migration pathways of the potential contaminants from the Made Ground.
	TP3	0.30		
	TP6	0.60		

Screening Criteria

The results of this laboratory testing have been compared to published guidance criteria, widely referred to by consultants and Regulatory Authorities within the industry, and include the following:

- The UK Soil Guideline (SGVs) for selected metals, BTEX and phenols, produced by the EA and the Department of Environment, Food and Rural Affairs (DEFRA), 2009;
- Suitable 4 Use Levels (S4ULs) Generic Assessment Criteria (GAC) for 82no. contaminants developed by the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management Ltd (2015). It is anticipated that this screening criteria will be applied by the Local Authorities, but it should be noted that the CIEH S4ULs have not been issued through the EA or DEFRA;
- A further set of GAC for 35no. mainly organic contaminants not already covered by SGV or S4ULs produced by the CIEH and published by Contaminated Land: Applications In Real Environments (CL:AIRE) in conjunction with the Association of Geotechnical and Environmental Specialists (AGS) and the Environmental Industries Commission (EIC), 2010; and,
- Provisional Category 4 Screening Levels (pC4SL) for lead, which have been produced by CL:AIRE (2014).

Comparisons were made against guidance criteria for the 'residential with home grown produce' land use setting, based on the end use of the site and the fact that areas of soft landscaping are proposed as shared spaces. A conservative Soil Organic Matter (SOM) value of 1% is used for organic contaminants (i.e. TPH and PAH) as a worst case scenario, due to the variable organic content results.

7.2.2 Soil Results

Results have not been subject to statistical analysis due to the targeted nature of the sampling strategy. Referring to guidance only systematic or unbiased sampling data should be subject to statistical testing.

Organic Matter and Asbestos

Organic matter content ranged from 0.8 - 4.0% (Avg. 2.1%); additionally Asbestos was not identified within any of the analysed samples following the asbestos screen.

Heavy Metals

There were no exceedances of the screening values for any of the heavy metal determinands from all tested soil samples. In addition, two of the heavy metal determinands: Mercury and Selenium, were recorded below their respective laboratory Level/Limit of Detection (LOD) for all tested soil samples.

PAHs

There were no exceedances of the screening values for any of the PAH determinands from all tested soil samples. Furthermore, all PAH determinands were below their respective laboratory LOD.

TPH

There were no exceedances of the associated screening criteria for any of the tested TPH determinands from all soil samples. Furthermore, all TPH determinands were below their respective laboratory LOD.

BTEX/ MTBE

There were no exceedances of the screening values for any of the BTEX/MTBE determinands from all tested soil samples. Furthermore, all BTEX/MTBE determinands were below their respective laboratory LOD.

Laboratory certificates can be viewed in **Appendix D**.

8.0 GEOTECHNICAL DISCUSSION

8.1 Soil Engineering Properties

The current proposal for the site is for the construction of eight mixed detached and semi-detached chalet and 1.5/2 storey residential properties with associated garages, access roads and garden areas. The exact proposed loadings are not known, however they are expected to be moderate on the basis of the anticipated low rise nature of the development.

Although the proposed development will cover the rear gardens of five existing properties, at the time of this phase of site investigation only two of the five plots were accessible.

In general below a surface cover of grass, the site was found to be underlain by a veneer of Made Ground soils of dark brown very clayey slightly gravelly silty Sand with fragments of flint and occasional brick recorded to depths of between 0.30m and 0.80mbgl.

Natural soils encountered below the Made Ground were initially described as orange brown silty sandy Clay and considered to represent superficial River Terrace Deposits. These were proven to depths of between 1.40m within TP3 and 1.60mbgl within TP1.

Insitu testing within these soils recorded SPT N values and equivalent SPT N values in the order of SPTN-4-9 indicating a soft becoming firm consistency.

Laboratory testing has indicated that these superficial deposits, are of worst case medium volume change potential.

Below the cohesive superficial deposits, granular superficial soils were encountered and recorded as orange mottled pale yellow fine to medium Sand becoming locally clayey gravelly Sand with gravel of subangular to subrounded fine to coarse sized flint. This material is also considered to represent River Terrace Deposits and were recorded to the maximum sample depths of 1.80-2.1mbgl with the machine excavated trial pit (TP1-TP3). With WS1 and WS2 this material was proven to depths of between 2.90m and 3.10mbgl.

Dynamic probing completed across the accessible site suggests that these granular deposits are present to depths of between 2.60mbgl (DP5) and 3.70mbgl (DP1). This testing along with the SPT's completed with WS1 and WS2 suggest that this soil is medium dense to dense.

The bedrock geology of the London Clay Formation was encountered below the River Terrace Deposits within WS1 and WS2 at levels of 2.90-3.10mbgl and proven to the maximum sampled depth of 4.45mbgl. This was described as pale brown becoming grey fissured CLAY. Fissures are extremely closely spaced and sub-horizontal.

Insitu testing indicates that this cohesive soil is of firm increasing to stiff consistency. Dynamic probing shows a steady increase in blow counts below ~4.00-4.50mbgl down to the maximum depth of 6.00mbgl. This increase in soil strength may represent the presence of the Bognor Sand Member which is a sandy soil within the London Clay Formation, however this was not proven in any samples recovered.

Groundwater records indicate that water was encountered between the depths of 1.30m and 2.00mbgl and noted to rise to standing levels of 1.23-1.30mbgl within the installed standpipes of WS1 and WS2.

8.2 Shallow Foundations

Proposed foundation construction at the time of writing is currently unknown, however the proposed construction involves a residential property of one and a half to two storeys, and therefore the anticipated loads are expected to be low to moderate. It should also be stated that only a portion of the total development area was available for access for the ground investigation works completed in this phase of investigation and subsequent works may be required to sufficiently cover the whole proposed development plot.

Any foundations formed within Made Ground soils would be expected to be subject to total and differential settlement beyond tolerable limits. These soils are frequently present in a variable and inconsistent nature such that would render them unsuitable as a founding strata.

It is considered that from the shallow natural soils encountered (Superficial River Terrace Deposits), insitu testing completed and assumed light to moderate anticipated loads, traditional spread type foundations can use used.

Based upon current NHBC Guidance and the medium volume change potential soils recorded on the site suggest a minimum foundation depth of 0.90mbgl should be adopted for footings formed outside the influence of tree root action. Taking into account for restricted planting this depth should be increased to 1.25mbgl. The NHBC Guidance (Chapter 4.2, building near Trees) can also provide minimum foundation depths required in relation to the trees noted within the site and around the site boundaries. Once the exact trees species have been identified (suspected Oak, Beech and Scots Pine among others) along with their proximity to the prosed development foundations.

Based on a foundation depth of between 1.25-1.40mbgl new foundations would be formed within the firm consistency cohesive River Terrace Deposits, and it is considered that a safe bearing capacity in the order of 75kN/m² is achievable.

Depending upon the trees species identified and their proximity to any new foundations, the minimum founding depth recommended by the NHBC may be greater than 1.25-1.40mbgl. As such foundations could be formed with the fine to medium Sand recorded below the cohesive deposits at levels of between 1.40-1.60mbgl. A safe bearing capacity for this material at depths of between 1.40-2.00mbgl of 125kN/m² is considered achievable.

Care should be taken if foundations are to be taken to greater depths in relation to the groundwater levels. Groundwater was encountered at levels of between 1.30-2.00mbgl during the field works and noted to rise to a level of 1.23mbgl with WS1.

Water ingress into excavations may cause instability of trench sides and issued with regards to running sands and the construction of traditional trench fill foundations. As such ground works should be completed during dry seasons and prior to any deep excavations being completed the groundwater monitoring standpipes should be measured.

If groundwater levels are not found to drop during dryer periods, traditional spread type foundations may prove impractical and/or uneconomic and alternative foundation solutions should be considered such a piles/mini piles. If this proves to be the case deeper ground investigation sampling/testing techniques may be required to provide sufficient information to aid a piled foundation design.

8.3 Floor Slab

The floor slab design will depend on the final foundation designs and is dependent on the underlying materials, including bearing capacity and the presence of any cohesive or Made Ground Soils.

Owing to the presence of worst case medium volume change potential soils, it is recommended that a fully suspended floor slab is adopted for the new development.

Given the medium Volume Change Potential soil NHBC Guidance suggest a minimum void dimensions of 25mm should be used against the side of ground beams and 250mm should be used underneath suspended in-situ concrete floors.

8.4 Excavations and Groundwater

It is likely that excavations within the shallow Made Ground and shallow natural soils will stay open in the short term during excavation and as such should not require temporary support. However should excavation be left open for prolonged periods of time, during periods of heavy rain fall or if manned entry is required then adequate trench support should be provided in order to satisfy statutory safety regulations.

Groundwater levels are dependent upon seasonal variations and levels may change after periods of heavy rainfall or prolonged drought. Levels have been recorded up to 1.23mbgl during investigation works, however open excavations may be subject to the pooling of water in poor weather. Where groundwater or surface water is encountered within any excavations during the construction phase it should be dealt with appropriately and removed using good engineering practices.

Groundwater monitoring installations installed during the site works can be used to check on groundwater levels prior to any works as groundwater levels can change over time and are dependent upon seasonal variations. If groundwater is identified within any excavations during any remediation phase of works then it should be dealt with appropriately and removed using good engineering practices.

The design of any temporary retaining structures to support excavation faces should be made assuming the following moderately conservative parameters:

Material	Effective angle of friction (ϕ')	Effective Cohesion, c' (kPa)	Bulk Density kN/m^3
Made Ground/Topsoil	22-24	0	16-17
Silty sandy Clay	24-26	0	17-18
Gravelly Sand	32-34	0	17-18

8.5 Pavement Design

DCP CBR probes tests were undertaken along the proposed line of the new access road at seven locations (within the accessible plots). The probe profiles are appended for reference. With the exception of DCP2, which is considered to be located within an area of re-worked ground/possible paving sub-base and has returned higher values, the general results recorded CBR values of between 2-9%, below existing Topsoil/Made Ground horizons.

Based on this testing it is considered that conservative CBR values of between 2-4% should be used in the design of any new pavements on site for the silty sandy clayey subgrade material identified, unless on-site inspection and testing can establish otherwise, once formations have been prepared.

Atterberg testing has indicated that the proportion of fines within these soils is generally less than 10% and as such not regarded as frost susceptible. Irrespective of private driveways and hardstanding, any adoptable roads will be subject to local highways agency design & construction specifications. Site and laboratory work in this regard may have to be undertaken on the eventual formation of the road. Landrover mounted in-situ CBR's, or remolded laboratory CBR's, may be requested at set chainages.

8.7 Soakaway Design

Soakage testing was completed in general accordance with BRE365 within 1no. hand excavated trial pit to depth of 1.50mbgl.

Due to time constraints / soakage rates only 2No. tests were completed out of the 3 required within the BRE specification. The results recorded infiltration rates of between 9.57×10^{-6} m/s (test no1) and 8.37×10^{-6} m/s (test No2).

These rates correlate to the boundary between 'Good' and 'poor' drainage (Ref: Soil Mechanics in Engineering practice by Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri; Table 14.1 Permeability and drainage characteristics of soils (after casagrande and Fadum 1940)).

Although a soakage rate has been recorded it should be stated that ground water levels at the location of this soakage test were in the order of 2.00mbgl and as such the viability of traditional soakaways may be in question.

A specialist drainage engineer should be consulted on final soakaway designs and their viability and results should be presented to the local authority who may require winter monitoring to assess the groundwater levels during the wettest parts of the year.

8.8 Concrete in Aggressive Ground

The results of laboratory testing have indicated that a design class of DS-1 and subclass of AC-1 will be suitable for buried concrete on this site. This is in response to a maximum water soluble sulphate concentration of 129mg/l and a minimum pH value of 6.7.

9.0 GEO-ENVIRONMENTAL DISCUSSION

9.1 Discussion of Findings

The preliminary CSM identified a potential contamination linkages from the potential onsite Made Ground associated with the use of the site and the limited redevelopment. Based on the Phase 1 findings, it was deemed that a Site Investigation would be required in order to assess the potential pollutant linkages identified. The aims of the Site Investigation were to: target the proposed soft scraped areas within the private gardens to assess the extent of Made Ground.

From the findings of the SI there were no exceedances of heavy metals or hydrocarbons within the soil samples in relation to the '*residential with home grown produce*' guideline values. Additionally there was no identified asbestos within the soils.

Due to the lack of sources identified within the site investigation, there formulation of a CSM (Conceptual Site Model) was not conducted. However as the entire site was not investigated, there is a potential for unidentified sources to be within the site. As such we recommend that further works are carried out to assess the rest of the site.

10.0 GEO-ENVIRONMENTAL RECOMMENDATIONS

The following recommendations are based on the plans proposed at the time of writing this report and may be subject to change. As the site investigation did not access all areas of the site a full assessment cannot be made. As such it is recommended that an additional site investigation is conducted to include the areas of the site not accessible in this phase of the works.

The additional site investigation should follow the same scope as the investigation that has been conducted including shallow excavations by means of windowless samples and trial pits, targeting the private gardens and development areas.

It is noted within the areas that have been surveyed within this investigation will require the removal of the Made Ground within the soft scaped areas, as the Made Ground is not suitable.

10.1 Services

We would recommend that if new services are present in the design of this development, the local water board are contacted to determine the type of pipework that should be used on this site.

It is recommended the services are situated within lined trenches. The trenches should be lined with a geotextile membrane and backfilled with clean fill, such as pea shingle, which will demarcate the services from the surrounding soils, protecting both the services and the future maintenance workers.

10.2 Decommissioning of Monitoring Wells

The client or site owner should ensure that the installed monitoring wells and their protective covers are not damaged or covered until such time as data is no longer required from them. Additional costs may be incurred if it is necessary to reinstate damaged wells.

Nevertheless, the monitoring wells installed on site will require eventual decommissioning. CE should be consulted prior to decommissioning. This process should be completed in accordance with the EA's (2012) guidance document '*Good Practice for Decommissioning Redundant Boreholes and Wells*'.

The above referenced document provides the following guidance - The ground should be restored as closely as possible to its pre-drilled condition. The well should be backfilled with clean (washed), uncontaminated materials so that the permeability of the selected materials are similar to the properties of the geological strata against which they are placed. The backfilled well will then mimic the surrounding natural strata and groundwater flow, and quality will be protected.

10.3 Statutory Consultees

We would recommend that this report be forwarded to the relevant Statutory Consultees including the Local Council's Environmental Health and Planning Department to seek their comments and subsequent approval prior to works commencing on site.

The Statutory Authorities may require a Validation and/or closure report providing documentation/audit trail for the importation/removal/reuse of material on site and any other remedial works completed on site.

APPENDICES

Appendix A – Site Plan

Appendix B – Photographic Logs

Appendix C – Stratigraphic Logs & Insitu Testing Results Sheets

Appendix D – Laboratory Certificates



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APPENDIX A

Site Plan



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APPENDIX B

Photographic Logs



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Investigation Photographs

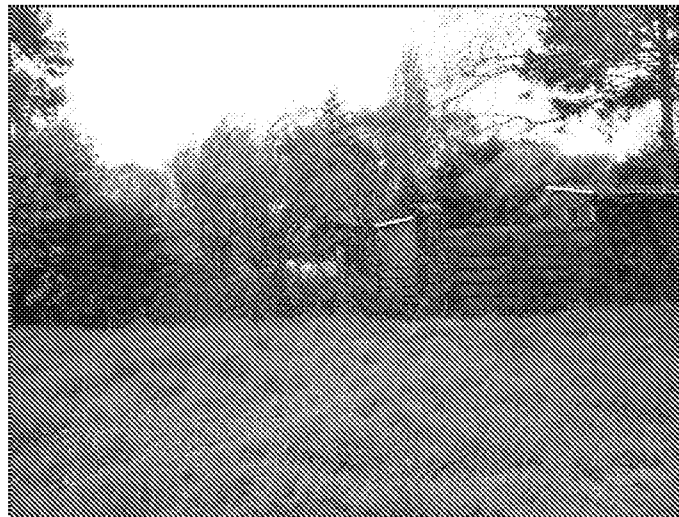
Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

1.



2.



- 1) View of southern plot looking east
- 2) View of southern plot looking south
- 3) View of southern plot looking west
- 4) View of northern plot looking east

3.



4.



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Investigation Photographs

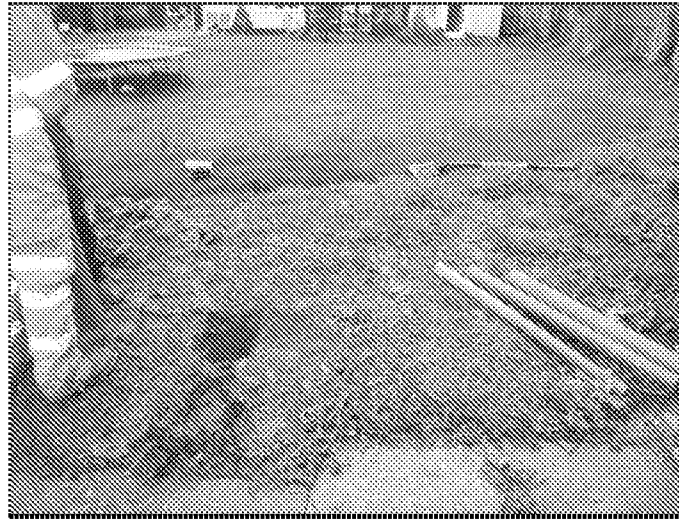
Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

5.



6.

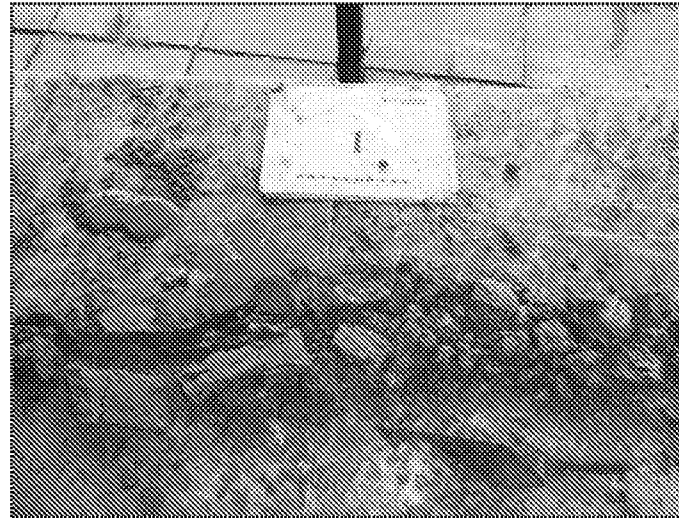


- 5) View of northern plot looking west
- 6) WS1 Location
- 7) WS1 Starter pit
- 8) WS1 1.00-2.00mbgl

7.



8.

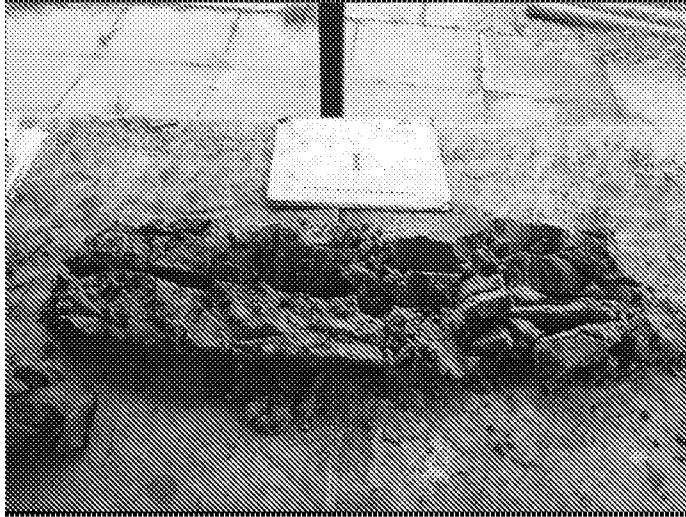


Investigation Photographs

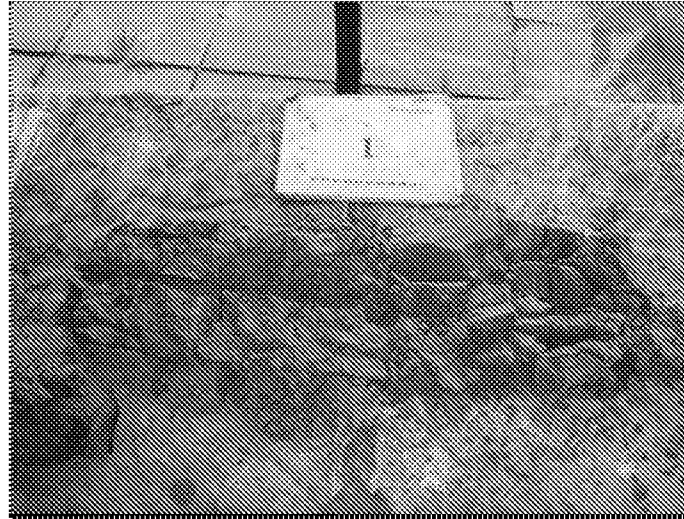
Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

9.

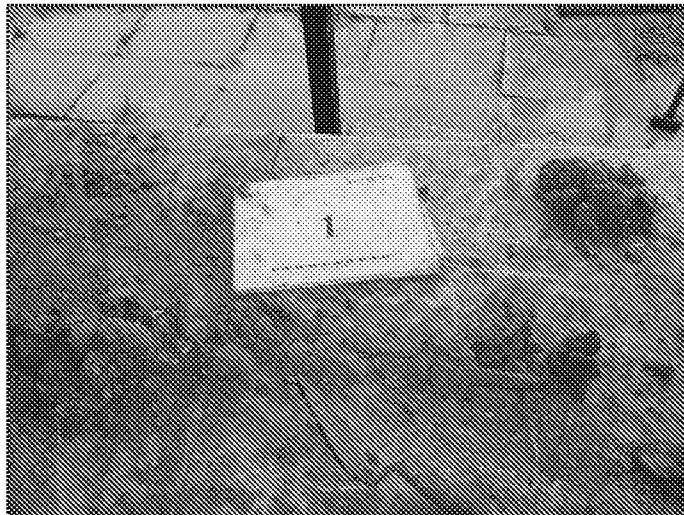


10.



- 9) WS1 2.00-3.00mbgl
- 10) WS1 2.00-3.00mbgl
- 11) WS1 3.00-4.00mbgl
- 12) WS2 1.00-2.00mbgl

11.



12.



Investigation Photographs

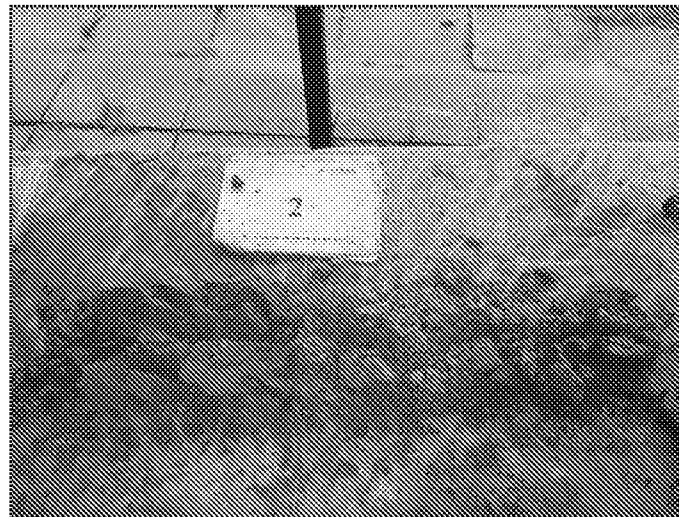
Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

13.



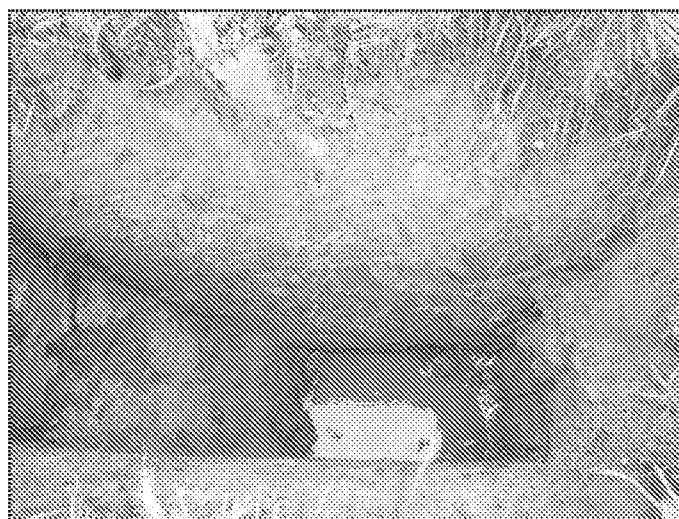
14.



15.



16.



13) WS2 2.00-3.00mbgl

14) WS2 3.00-4.00mbgl

15) TP1

16) TP2



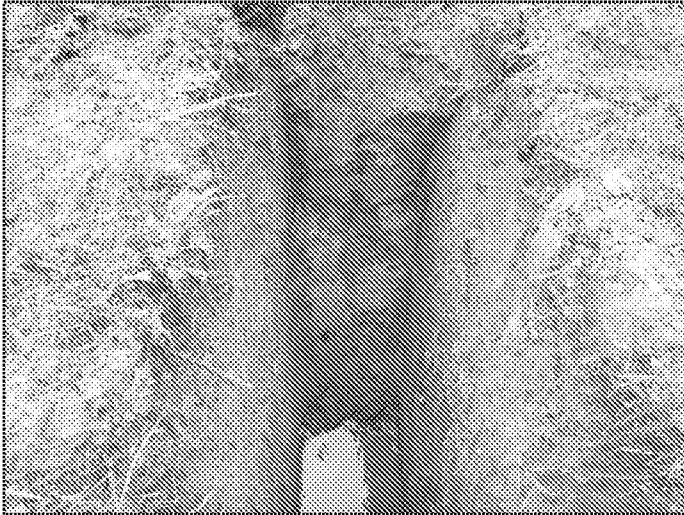
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Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

17.



18.

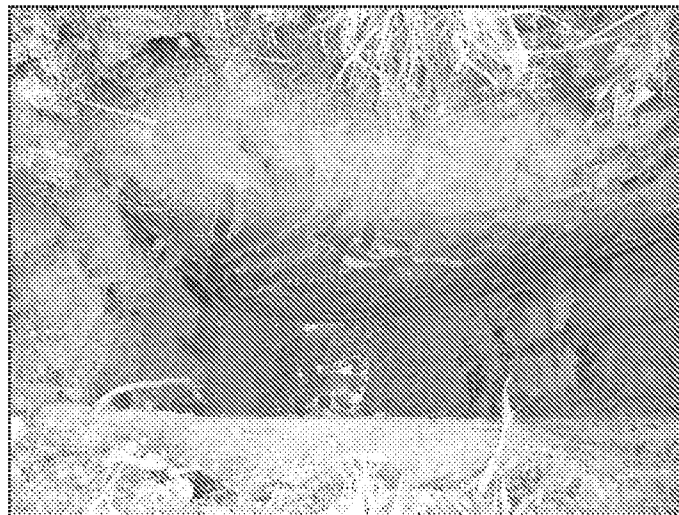


- 17) TP1
- 18) TP1 Spoil
- 19) TP2
- 20) TP2

19.



20.



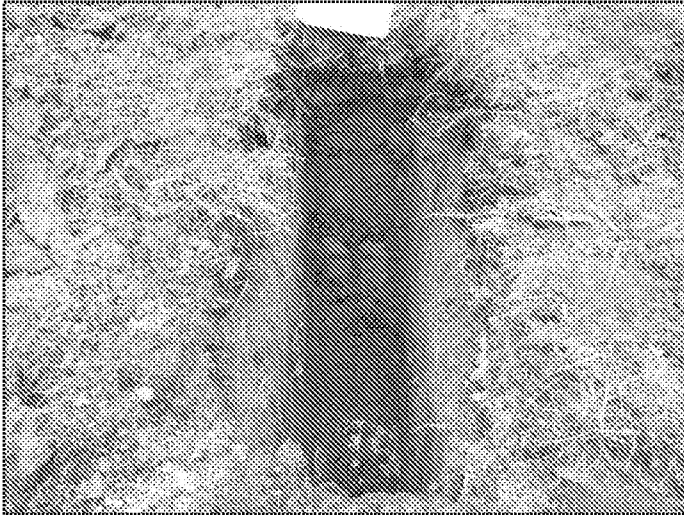
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Investigation Photographs

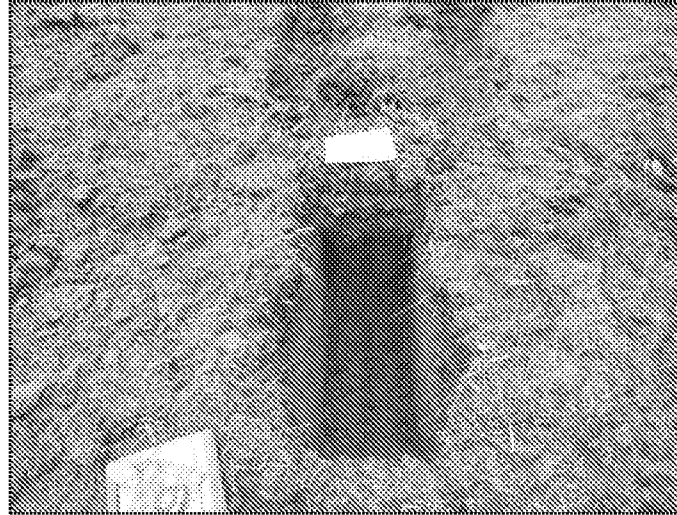
Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

21.



22.



21) TP2

22) TP3

23) TP3

24) TP4

23.



24.



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Investigation Photographs

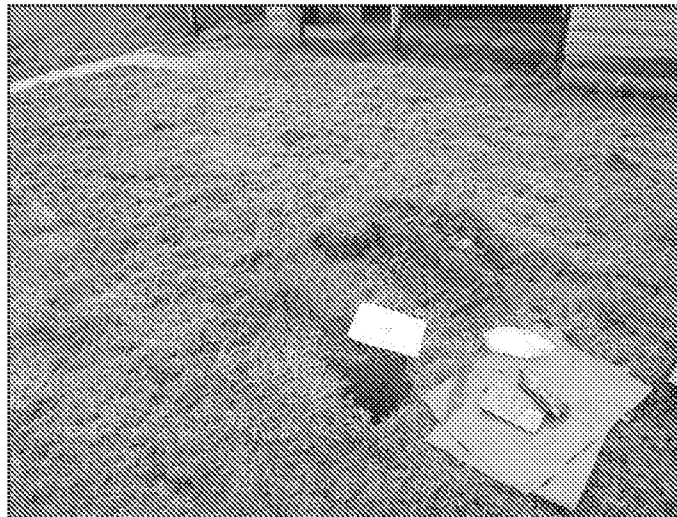
Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

25.



26.



25) TP4

26) TP5

27) TP5

28) TP6

27.



28.

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Investigation Photographs

Project Ref: 18.9887

Site Name: 36-44 Carlton Avenue

29.



30.

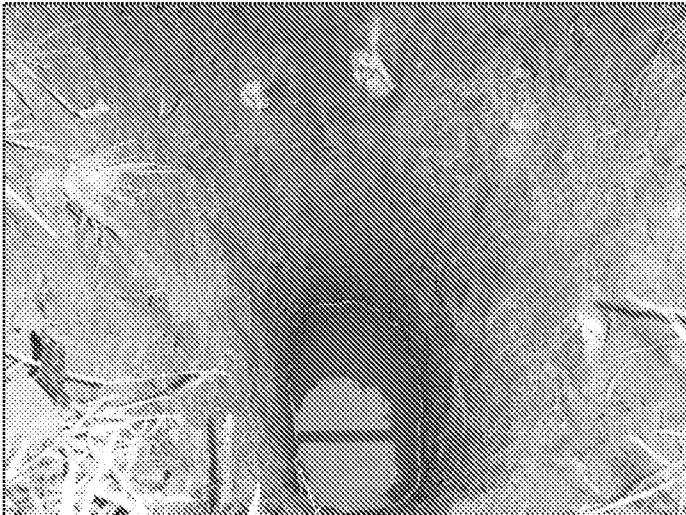


29) TP6

30) SA1

31) SA1

31.



APPENDIX B

Photographic Logs & Insitu Test Results Sheets



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Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Project Name: 36-44 Carlton Avenue

Project No.
18.9887

Co-ords:

Hole Type
WLS

Location: Bognor Regis, West Sussex

Level:

Scale
1:50

Client: Counterpoint Properties Ltd

Dates:

Logged By
RM

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.20	ES	N=9 (1,1/2,2,1,4)	0.30			MADE GROUND: Grass over dark brown very clayey slightly gravelly silty Sand. Sand is fine. Gravel is subangular to subrounded fine to coarse sized flint and occasional brick (TOPSOIL). (Soft to firm) orange brown silty sandy CLAY. Sand is fine (RIVER TERRACE DEPOSITS).	1					
		0.40	D											
		0.80	D											
		1.00	ES											
		1.00 - 1.50	D											
		1.00	SPT											
		1.50 - 2.00	D	N=17 (2,2/3,2,3,9)	1.50			Orange mottled pale yellow fine to medium SAND (RIVER TERRACE DEPOSITS).	2					
		2.00	SPT											
		2.50												
		2.90 - 3.00	D							N=7 (3,3/2,1,2,2)	2.90		Orange mottled pale grey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse sized flint (RIVER TERRACE DEPOSITS).	3
		3.00 - 4.00	D											
		3.00	SPT											
		4.00		End of Borehole at 3.000m										
										5				
										6				
										7				
										8				
										9				
								10						

Remarks

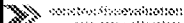
Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at ~1.30mbgl and noted to rise to 1.23mbgl.



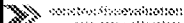
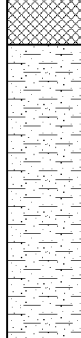
 constructiveevaluation site investigation • building pathology				Borehole Log				Borehole No. WS2 Sheet 1 of 1	
Project Name: 36-44 Carlton Avenue				Project No. 18.9887		Co-ords:		Hole Type WLS	
Location: Bognor Regis, West Sussex						Level:		Scale 1:50	
Client: Counterpoint Properties Ltd						Dates:		Logged By RM	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30		MADE GROUND: Grass over dark brown very clayey slightly gravelly silty Sand. Sand is fine. Gravel is subangular to subrounded fine to coarse sized flint and occasional brick (TOPSOIL). (Soft to firm) orange brown silty sandy CLAY. Sand is fine (RIVER TERRACE DEPOSITS).	1	
		0.40	D						
		0.50	ES						
		0.80	D		1.50		Orange mottled pale yellow fine to medium SAND (RIVER TERRACE DEPOSITS).	2	
		1.00	D						
		1.00 - 1.50	D						
		1.00	SPT	N=8 (1,1/2,2,2,2)		2.50		Orange mottled pale yellow fine to medium SAND (RIVER TERRACE DEPOSITS).	3
		1.50 - 2.00	D						
		2.00 - 2.50	D						
		2.00	SPT	N=17 (1,1/3,4,5,5)		2.90		Orange mottled pale grey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse sized flint (RIVER TERRACE DEPOSITS). (Firm) brown CLAY. fissures are extremely closely spaced and sub-vertical to sub-horizontal (weathered LONDON CLAY FORMATION)	4
	2.50 - 2.90	D							
	3.00	SPT	N=10 (1,1/2,2,2,4)						
	3.10 - 3.40	D			3.40		(Firm) grey fissured CLAY. fissures are extremely closely spaced and sub-vertical to sub-horizontal (LONDON CLAY FORMATION)	5	
	3.50 - 4.00	D							
	4.00	SPT	N=20 (3,4/3,4,4,9)						
					4.45		End of Borehole at 4.450m	6	
								7	
								8	
								9	
								10	

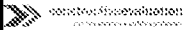
Remarks Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at ~1.50mbgl and noted to rise to 1.30mbgl.		
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				Trial Pit Log			Trialpit No TP1 Sheet 1 of 1		
Project Name: 36-44 Carlton Avenue				Project No. 18.9887		Co-ords: - Level:		Date	
Location: Bognor Regis, West Sussex				Dimensions (m):		1.3 		Scale 1:25	
Client: Counterpoint Properties Ltd				Depth 2.10		0.4 		Logged RM	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
▼	0.20	ES		0.20			MADE GROUND: Grass over dark brown very clayey slightly gravelly silty Sand. Sand is fine. Gravel is subangular to subrounded fine to coarse sized flint and occasional brick (TOPSOIL). (Soft to firm) orange brown silty sandy CLAY. Sand is fine (RIVER TERRACE DEPOSITS).		
	0.50	D							
	0.80	ES							
	1.30	D							
				1.60				Orange mottled pale yellow fine to medium SAND (RIVER TERRACE DEPOSITS).	
				1.90			Orange mottled pale grey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse sized flint (RIVER TERRACE DEPOSITS).		
	2.10	D		2.10			End of pit at 2.10 m		
1 2 3 4 5									
Remarks: Machine excavated trial pit to 2.10mbgl. Groundwater encountered at 2.00mbgl.									
Stability: Good									

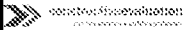
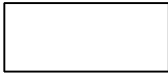


				Trial Pit Log			Trialpit No TP2 Sheet 1 of 1		
Project Name: 36-44 Carlton Avenue				Project No. 18.9887		Co-ords: - Level:		Date	
Location: Bognor Regis, West Sussex				Dimensions (m):		1.3 		Scale 1:25	
Client: Counterpoint Properties Ltd				Depth 2.00		0.4 		Logged RM	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.20			MADE GROUND: Dark grey silty sandy CLAY and Ash (Bonfire remains).		
	0.40	D					Dark brown very clayey slightly gravelly silty Sand. Sand is fine. Gravel is subangular to subrounded fine to coarse sized flint and occasional brick (TOPSOIL).		
	0.40	ES		0.50			(Soft to firm) orange brown silty sandy CLAY. Sand is fine (RIVER TERRACE DEPOSITS).		
	0.80	ES							
	1.00	D							
				1.50			Orange mottled pale yellow fine to medium SAND (RIVER TERRACE DEPOSITS).		
1.70	D		1.70			Orange mottled pale grey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse sized flint (RIVER TERRACE DEPOSITS).			
			2.00		End of pit at 2.00 m				
									
Remarks: Machine excavated trial pit to 2.00mbgl. Groundwater encountered at 1.90mbgl.									
Stability: Good									



				Trial Pit Log			Trialpit No TP3 Sheet 1 of 1		
Project Name: 36-44 Carlton Avenue				Project No. 18.9887		Co-ords: - Level:		Date	
Location: Bognor Regis, West Sussex				Dimensions (m):		1.3 		Scale 1:25	
Client: Counterpoint Properties Ltd				Depth 1.80		0.4 		Logged RM	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10	ES		0.20			MADE GROUND: Grass over dark brown very clayey slightly gravelly silty Sand. Sand is fine. Gravel is subangular to subrounded fine to coarse sized flint and occasional brick (TOPSOIL). (Soft to firm) orange brown silty sandy CLAY. Sand is fine (RIVER TERRACE DEPOSITS).		
	0.30	D							
	0.80	ES		0.60			(Soft to firm) orange brown silty CLAY (RIVER TERRACE DEPOSITS).		
	1.00	D							
	1.70	D		1.40			Orange mottled pale yellow fine to medium SAND (RIVER TERRACE DEPOSITS).		
				1.60					
				1.80					
Remarks: Machine excavated trial pit to 1.80mbgl. Groundwater encountered at 1.80mbgl.									
Stability: Good									



				Trial Pit Log			Trialpit No TP6 Sheet 1 of 1		
Project Name: 36-44 Carlton Avenue				Project No. 18.9887		Co-ords: - Level:		Date	
Location: Bognor Regis, West Sussex				Dimensions (m):		0.4		Scale 1:25	
Client: Counterpoint Properties Ltd				Depth 1.00				Logged RM	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30			MADE GROUND: Grass over dark brown very clayey slightly gravelly silty Sand. Sand is fine. Gravel is subangular to subrounded fine to coarse sized flint and occasional brick (TOPSOIL).		
	0.80	D					(Soft to firm) orange brown silty sandy CLAY. Sand is fine (RIVER TERRACE DEPOSITS).		
	1.00	ES		1.00			End of pit at 1.00 m		
Remarks: Hand excavated trial pit to 1.00mbgl. No groundwater encountered.									
Stability: Good									

SITE DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

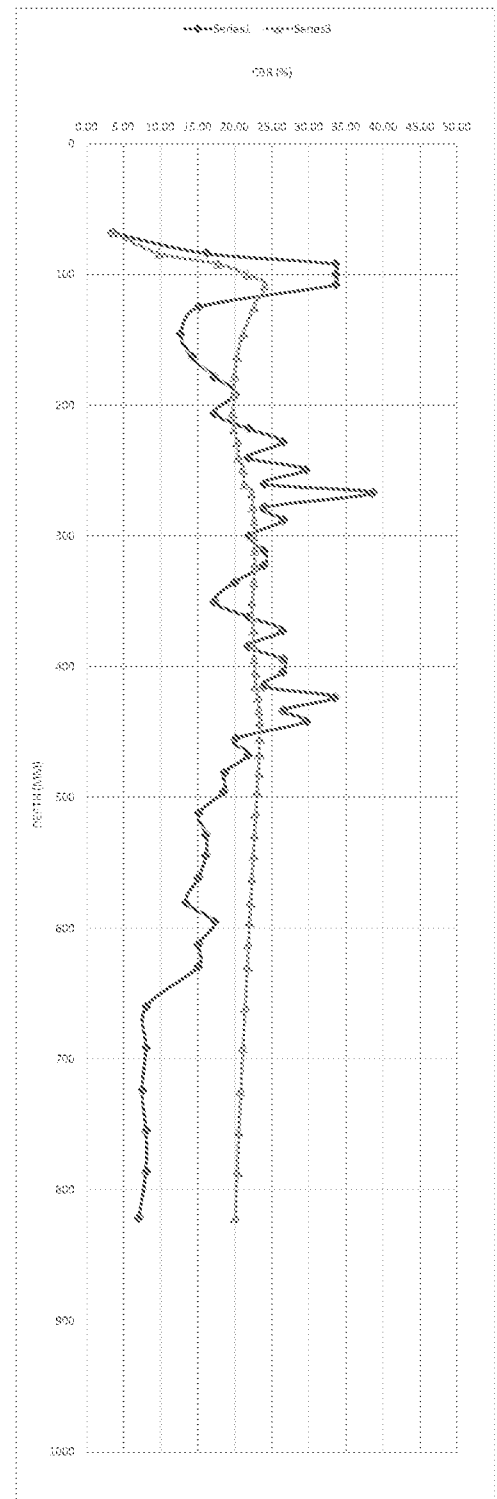
Sample Reference

Project ID	DCP2
Address	36-44 Carlton Ave
Start Date	01/05/2018
Material	Topsoil/silty sandy CLAY
Unit	G.L.

Iteration	Start Point	End Point	End - Start (Iter)	Cost (Iter)	Iteration (n)	Cost (n)	Gradient (n)
START POSITION:							
	zero	140		0			
1	1	208		68	68	0.5430381	
1	2	224		84	16	1.2072452	3.5
1	3	232		92	8	1.5254339	33.5
1	4	240		100	8	1.5254339	33.5
1	5	248		108	8	1.5254339	33.5
1	6	265		125	17	1.1794155	15.1
1	7	285		145	20	1.1048113	12.7
1	8	303		163	18	1.153177	14.2
1	9	318		178	15	1.2368715	17.3
1	10	331		191	13	1.3025619	20.1
1	11	346		206	15	1.2368715	17.3
1	12	358		218	12	1.3393054	21.8
1	13	368		228	10	1.423	26.5
1	14	380		240	12	1.3393054	21.8
1	15	389		249	9	1.4713657	29.6
1	16	400		260	11	1.3792479	23.9
1	17	407		267	7	1.5867314	38.6
1	18	418		278	11	1.3792479	23.9
1	19	428		288	10	1.423	26.5
1	20	440		300	12	1.3393054	21.8
1	21	451		311	11	1.3792479	23.9
1	22	462		322	11	1.3792479	23.9
1	23	475		335	13	1.3025619	20.1
1	24	490		350	15	1.2368715	17.3
1	25	502		362	12	1.3393054	21.8
1	26	512		372	10	1.423	26.5
1	27	524		384	12	1.3393054	21.8
1	28	534		394	10	1.423	26.5
1	29	544		404	10	1.423	26.5
1	30	555		415	11	1.3792479	23.9
1	31	563		423	8	1.5254339	33.5
1	32	573		433	10	1.423	26.5
1	33	582		442	9	1.4713657	29.6
1	34	595		455	13	1.3025619	20.1
1	35	607		467	12	1.3393054	21.8
1	36	621		481	14	1.2685427	18.6
1	37	635		495	14	1.2685427	18.6
1	38	652		512	17	1.1794155	15.1
1	39	668		528	16	1.2072452	16.1
1	40	684		544	16	1.2072452	16.1
1	41	701		561	17	1.1794155	15.1
1	42	720		580	19	1.1283574	13.4
1	43	735		595	15	1.2368715	17.3
1	44	752		612	17	1.1794155	15.1
1	45	769		629	17	1.1794155	15.1
1	46	800		660	31	0.9036307	8.0
1	47	831		691	31	0.9036307	8.0
1	48	864		724	33	0.8749308	7.5
1	49	895		755	31	0.9036307	8.0
1	50	926		786	31	0.9036307	8.0
1	51	961		821	35	0.8479201	7.0

Remarks

TEST DCP2



SITE DCP Testing

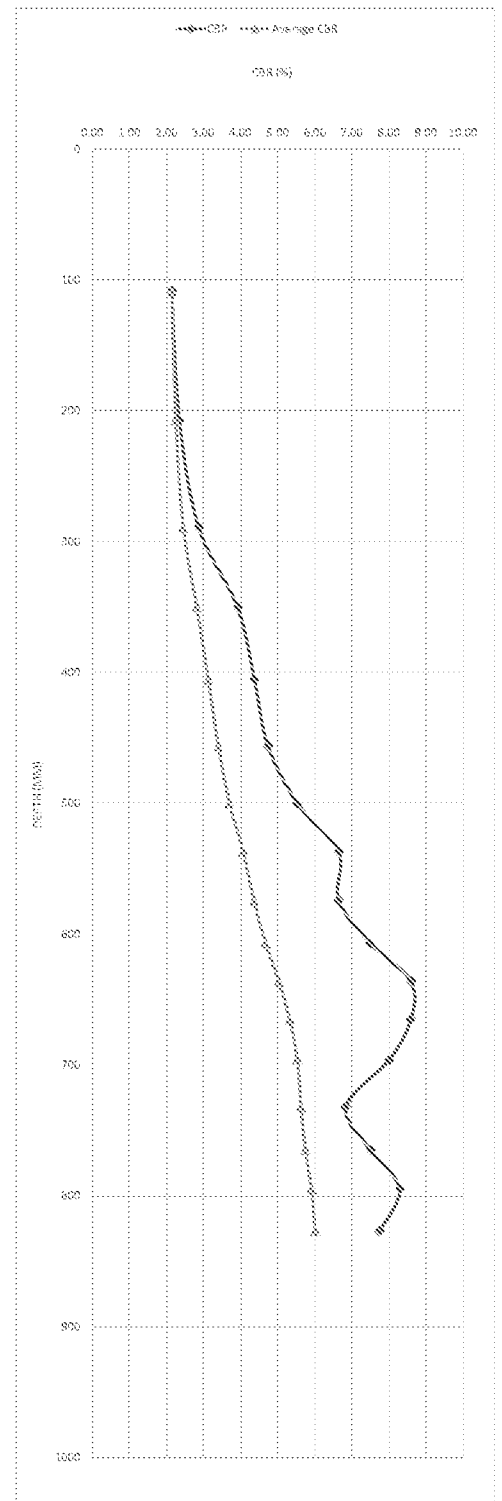
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Sample Reference

DCP#	DCP4
Address	36-44 Carlton Ave
Date	01/05/2018
Material	Topsoil/silty sandy CLAY
Unit	G.L.

[illegible]

TEST DCP4



constructiveevaluation
critical assessments & building practices

Trial Hole: SA1

Test 1

INFILTRATION CALCULATED FROM 75%-25% WATER DEPTH RANGES

Infiltration Rate	from75%-25%	9.5763E-06
--------------------------	-------------	-------------------



constructiveevaluation
critical evaluation's building technology

Trial Hole: SA1

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.280	1.27	100.0%
0.50	0.300	1.25	98.4%
1.00	0.320	1.23	96.9%
2.00	0.330	1.22	96.1%
3.00	0.350	1.20	94.5%
4.00	0.370	1.18	92.9%
5.00	0.380	1.17	92.1%
6.00	0.390	1.16	91.3%
7.00	0.400	1.15	90.6%
8.00	0.410	1.14	89.8%
9.00	0.420	1.13	89.0%
10.00	0.430	1.12	88.2%
15.00	0.460	1.09	85.8%
20.00	0.490	1.06	83.5%
25.00	0.550	1.00	78.7%
30.00	0.600	0.95	74.8%
40.00	0.630	0.92	72.4%
50.00	0.650	0.90	70.9%
60.00	0.670	0.88	69.3%
90.00	0.770	0.78	61.4%
120.00	0.840	0.71	55.9%
150.00	0.890	0.64	50.4%
180.00	0.980	0.57	44.9%
210.00	1.070	0.48	37.8%
240.00	1.140	0.41	32.3%
270.00	1.220	0.33	26.0%
300.00	1.280	0.27	21.3%
15.00	1.360	0.19	11.8%

Pit size		Time in mins	
Length	0.55	30	75%
Width	0.65	270	25%
Depth	1.55		

The graph, titled "Permeability Graph", plots "Depth in metres" on the y-axis (0.0% to 100.0%) against "Time in minutes" on the x-axis (0.00 to 350.00). The curve starts at 100.0% depth at 0.00 minutes, drops sharply to about 75.0% at 50.00 minutes, and then continues a steady decline to approximately 25.0% at 300.00 minutes.

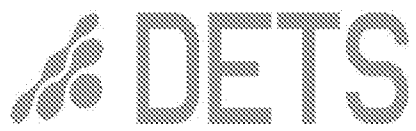
Time in minutes	Depth in metres (%)
0.00	100.0
10.00	95.0
20.00	85.0
30.00	75.0
40.00	72.0
50.00	70.0
100.00	60.0
150.00	50.0
200.00	40.0
250.00	30.0
300.00	25.0

APPENDIX D

Laboratory Certificates



constructiveevaluation
site investigation • building pathology



Rob Marsh
Constructive Evaluation Ltd
Unit 15 & 16
Ford Lane Business
Ford Lane
Ford
Arundel
BN18 0UZ

DETS Ltd
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t: 01622 850410
russell.jarvis@qtsenvironmental.com

DETS Report No: 18-74742

Site Reference: 36-44 Carlton Avenue

Project / Job Ref: 18.9887

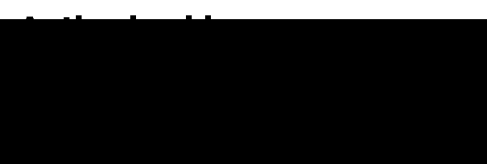
Order No: 18.9887/RM

Sample Receipt Date: 03/05/2018

Sample Scheduled Date: 03/05/2018

Report Issue Number: 1

Reporting Date: 10/05/2018



Kevin Old
Associate Director of Laboratory



Russell Jarvis
Associate Director of Client Services



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Soil Analysis Certificate						
DETS Report No: 18-74742	Date Sampled	30/04/18	30/04/18	30/04/18	30/04/18	30/04/18
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 36-44 Carlton Avenue	TP / BH No	TP1	TP2	TP3	TP4	TP6
Project / Job Ref: 18.9887	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 18.9887/RM	Depth (m)	0.80	0.40	0.80	1.00	0.20
Reporting Date: 10/05/2018	QTSE Sample No	331973	331974	331975	331976	331977

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025		Not Detected	Not Detected		Not Detected
pH	pH Units	N/a	MCERTS	7.3	6.9	6.9	7.2	6.7
Total Cyanide	mg/kg	< 2	NONE		< 2	< 2		< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	34	14	32	16	16
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.03	0.01	0.03	0.02	0.02
Organic Matter	%	< 0.1	MCERTS		1.5	0.8		2
Arsenic (As)	mg/kg	< 2	MCERTS		6	8		6
Cadmium (Cd)	mg/kg	< 0.2	MCERTS		< 0.2	< 0.2		< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS		15	34		22
Copper (Cu)	mg/kg	< 4	MCERTS		12	14		11
Lead (Pb)	mg/kg	< 3	MCERTS		26	13		33
Mercury (Hg)	mg/kg	< 1	NONE		< 1	< 1		< 1
Nickel (Ni)	mg/kg	< 3	MCERTS		9	28		13
Selenium (Se)	mg/kg	< 3	NONE		< 3	< 3		< 3
Zinc (Zn)	mg/kg	< 3	MCERTS		44	55		77
Total Phenols (monohydric)	mg/kg	< 2	NONE		< 2	< 2		< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 18-74742	Date Sampled	30/04/18	30/04/18	30/04/18	30/04/18	30/04/18
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 36-44 Carlton Avenue	TP / BH No	WS1	WS1	WS1	WS1	WS1
Project / Job Ref: 18.9887	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 18.9887/RM	Depth (m)	0.20	0.50	1.00	2.00	3.10 - 4.00
Reporting Date: 10/05/2018	QTSE Sample No	331978	331979	331980	331981	331982

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected				
pH	pH Units	N/a	MCERTS	7.0	7.8	7.6	7.9	7.8
Total Cyanide	mg/kg	< 2	NONE	< 2				
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10	28	10	11	11
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01	0.03	0.01	0.01	0.01
Organic Matter	%	< 0.1	MCERTS	4				
Arsenic (As)	mg/kg	< 2	MCERTS	6				
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3				
Chromium (Cr)	mg/kg	< 2	MCERTS	17				
Copper (Cu)	mg/kg	< 4	MCERTS	15				
Lead (Pb)	mg/kg	< 3	MCERTS	94				
Mercury (Hg)	mg/kg	< 1	NONE	< 1				
Nickel (Ni)	mg/kg	< 3	MCERTS	11				
Selenium (Se)	mg/kg	< 3	NONE	< 3				
Zinc (Zn)	mg/kg	< 3	MCERTS	163				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 18-74742	Date Sampled	30/04/18	30/04/18	30/04/18		
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: 36-44 Carlton Avenue	TP / BH No	WS2	WS2	WS2		
Project / Job Ref: 18.9887	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 18.9887/RM	Depth (m)	0.50	2.00	3.10 - 3.50		
Reporting Date: 10/05/2018	QTSE Sample No	331983	331984	331985		

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	7.6	8.0	7.9		
Total Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	129	18	14		
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.13	0.02	0.01		
Organic Matter	%	< 0.1	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS					
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	NONE					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 3	NONE					
Zinc (Zn)	mg/kg	< 3	MCERTS					
Total Phenols (monohydric)	mg/kg	< 2	NONE					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 18-74742	Date Sampled	30/04/18	30/04/18	30/04/18	30/04/18	
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 36-44 Carlton Avenue	TP / BH No	TP2	TP3	TP6	WS1	
Project / Job Ref: 18.9887	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 18.9887/RM	Depth (m)	0.40	0.80	0.20	0.20	
Reporting Date: 10/05/2018	QTSE Sample No	331974	331975	331977	331978	

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 18-74742	Date Sampled	30/04/18	30/04/18	30/04/18	30/04/18	
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 36-44 Carlton Avenue	TP / BH No	TP2	TP3	TP6	WS1	
Project / Job Ref: 18.9887	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 18.9887/RM	Depth (m)	0.40	0.80	0.20	0.20	
Reporting Date: 10/05/2018	QTSE Sample No	331974	331975	331977	331978	

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42	< 42	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 18-74742	Date Sampled	30/04/18	30/04/18	30/04/18	30/04/18	
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 36-44 Carlton Avenue	TP / BH No	TP2	TP3	TP6	WS1	
Project / Job Ref: 18.9887	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 18.9887/RM	Depth (m)	0.40	0.80	0.20	0.20	
Reporting Date: 10/05/2018	QTSE Sample No	331974	331975	331977	331978	

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

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 18-74742	
Constructive Evaluation Ltd	
Site Reference: 36-44 Carlton Avenue	
Project / Job Ref: 18.9887	
Order No: 18.9887/RM	
Reporting Date: 10/05/2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
331973	TP1	None Supplied	0.80	14.4	Brown sandy clay
331974	TP2	None Supplied	0.40	19.7	Brown sandy clay with stones
331975	TP3	None Supplied	0.80	18.5	Brown sandy clay
331976	TP4	None Supplied	1.00	17.6	Brown sandy clay
331977	TP6	None Supplied	0.20	13.8	Brown sandy clay with vegetation
331978	WS1	None Supplied	0.20	16.3	Brown sandy clay with stones and vegetation
331979	WS1	None Supplied	0.50	17.8	Brown sandy clay with vegetation
331980	WS1	None Supplied	1.00	15.1	Brown sandy clay with vegetation
331981	WS1	None Supplied	2.00	17.4	Orange sandy clay
331982	WS1	None Supplied	3.10 - 4.00	18	Brown clay
331983	WS2	None Supplied	0.50	16.8	Brown sandy clay
331984	WS2	None Supplied	2.00	18.5	Orange sandy clay with stones
331985	WS2	None Supplied	3.10 - 3.50	16.1	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample ^{1/5}
Unsuitable Sample ^{U/5}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-74742

Constructive Evaluation Ltd

Site Reference: 36-44 Carlton Avenue

Project / Job Ref: 18.9887

Order No: 18.9887/RM

Reporting Date: 10/05/2018

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

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AR As Received