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**THE VINERY
POLING
WEST SUSSEX**

**GEOTECHNICAL AND
CONTAMINATION (PHASE II)
ASSESSMENT REPORT**

Report No. LW23270 December 2012

Regional Office
Hertfordshire
(Contact via Head Office)

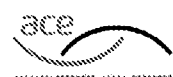
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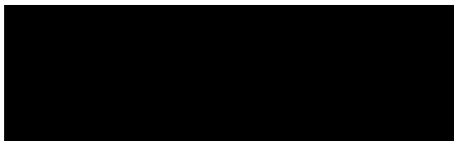
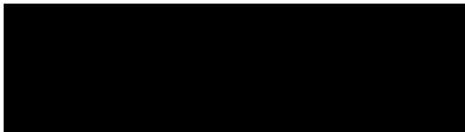
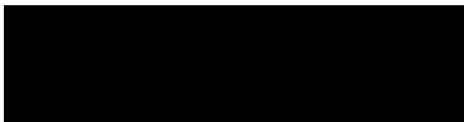
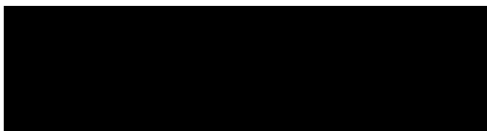
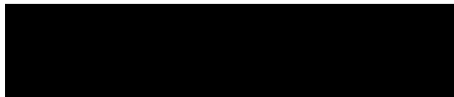
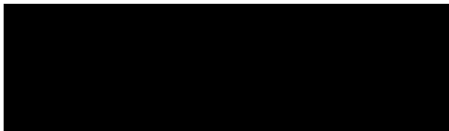
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FACTUAL REPORT	
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GEOTECHNICAL ASSESSMENT	
Prepared By:  Rebecca Jones BSc FGS	Approved By:  Steven McSwiney BA mod Geol MSc FGS
PHASE 2 CONTAMINATION ASSESSMENT	
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1. INTRODUCTION

The development proposals for the site are understood to comprise the construction of a new steel portal-framed warehouse. The construction of this warehouse is likely to involve the use of cut and filling techniques. It is also proposed to construct a planted soil bund along the southern and western boundaries.

Ashdown Site Investigation Limited was commissioned to carry out a combined geotechnical and contamination assessment of the site by Mr C Self of:

Millwood House Consultants Ltd
The Studio
Millwood House
Littlehampton Road
Ferring
West Sussex
BN12 6PG

The instruction to proceed was received on behalf of the client, Fargro Ltd, in an email dated 23rd October 2012.

The purpose of the works was to:

- i. assess the expected geology and hydrogeology underlying the site;
- ii. assess shallow ground and groundwater conditions prevailing at the site;
- iii. provide information to assist others in undertaking design of foundations, ground floors, road pavements, and soakaways;
- iv. test for the presence of potentially hazardous contamination in the ground;
- v. provide a quantitative contamination risk assessment; and
- vi. provide a quantitative site specific conceptual model.

Previous intrusive ground investigations have been undertaken across the wider site by Ashdown Site Investigation Ltd. The findings of the previous investigation are provided in letter reports reference LW23012, dated 25th January 2012 and LW23095, dated 25th April 2012.

The analysis and discussions contained in this report are based on the ground conditions encountered during the recent site work together with the findings from a programme of laboratory analyses. The possibility of a variation in ground and groundwater conditions away from the positions investigated should not be overlooked. Groundwater conditions can vary both seasonally and due to other effects.

This report should be read in conjunction with the phase 1 preliminary contamination risk assessment report produced by Ashdown Site Investigation Ltd (Report Ref: LW23270/ds, dated November 2012)

It is noted that the investigation was undertaken and the report was prepared specifically for the Client's project and the recommendations given may not be

appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned, or where the exploratory hole records and test results contained therein are interpreted by anyone other than the Company.

The general methodology adopted for the investigation of the site follows the guidance published within:

- BS10175:2011 Investigation of Potentially Contaminated Sites - Code of Practice;
- BS5930:1999 +A2:2010 Code of Practice for Site Investigations;
- BS EN 1997-2:2007 Geotechnical Design – Part 2: Ground investigation and testing;
- CLR11 - Model Procedures for the Management of Land Contamination.

The risk assessment presented in this report follows ‘source-pathway-receptor’ techniques for the determination of whether a site is contaminated, which are standard practice in the UK, being intrinsic to the Contaminated Land (England) Regulations 2000 - Part 2A of the Environmental Protection Act 1990.

The report considers end users as the most sensitive human health receptors. If significant risks to construction workers are identified by the preliminary assessment attention is drawn to this. No assessment of risk from acute exposure has been undertaken in this connection.

This report is not intended to be either an ecological or archaeological assessment. An appropriate specialist should be consulted about any concerns that may arise in this regard.

2. SITE CONTEXT

2.1 Site Details and Description

The site comprises an irregular shaped plot of land located at The Vinery, Poling, West Sussex, and is centred on the approximate Ordnance Survey national grid reference TQ 0518 0549. A site location plan is presented as Figure 1. Figure 2 shows the site layout and boundary.

The site lies to the south of an access road named The Vinery and is bound to the north by industrial units, and to the south, west and east by open fields. The industrial units and buildings were used for a variety of business such as a microbrewery and antiques furniture storage. Many of the units were formerly used for mushroom growing and had been converted to business use. An industrial warehouse building located immediately to the north east of the site is understood to have been used to store stage props. Outside of this building were several large empty plastic containers. To the east of The Vinery are several rows of terraced houses with associated gardens.

At the time of the investigation the majority of the site comprised a grass field used for horse grazing and divided into paddocks with temporary electric fences. Several sheds and small buildings associated with the paddocks were located in the north eastern corner of the field. A drainage ditch ran along the northern boundary and turned southwards through ninety degrees to cross the eastern side of the site in a north to south direction. The ditch was noted to be overgrown with shrubs and several trees were located along its length. Numerous mature trees and shrubs were also located along the site boundaries. Two poly tunnels were present in the north western corner of the field.

The site to the east of the ditch comprised an area of rough open ground used partly as a paddock and partly as a storage area. In the south eastern corner the site was in use as a plant nursery storing plants in pots, bags of compost, old pots, plastic tubing, timber pallets, stakes and metal posts. Several stockpiles of soil and topsoil were located in this area along with a large telecoms mast.

A sewage filter bed, associated with the residential properties to the east of The Vinery was located on a finger of land penetrating the easternmost side of the site from north to site. The finger was almost wholly enclosed by, but is not considered to be part of, the site.

Beyond the north-western corner of the site was a large metal tank which was rusting and no longer appeared to be in use. From its appearance and very large size, and given the context that the site was used as a vinery and a mushroom farm, it is considered likely that the tank was used for water storage.

2.2 Expected Geology

The stratigraphic succession expected to underlie the site is presented in the following table. In preparing the table reference has been made to the British Geological Survey 1:50,000 series scale map Sheet 317, and the British Geological Survey lexicon of named rock units.

Table 1. Anticipated Geological Strata

Type	Stratum	Age
Superficial Deposits	Head	Quaternary
	River Terrace Deposits	Quaternary
Bedrock Geology	Lambeth Group	Palaeocene

2.2.1 Head

The Head deposits are indicated to be present beneath the south eastern corner of the site only. The Head deposits generally comprise silty clay with variable amounts of gravel and cobbles of flint. The lithology of the Head reflects the nature of the parent bedrock strata and previously existing Quaternary, largely clay, strata.

2.2.2 River Terrace Deposits

The River Terrace Deposits, which are shown to underlie much of the site, generally comprise well graded sandy fine to coarse gravel of flint. Locally sand or gravel strata may predominate. Gravels normally include a high proportion of sub-angular flint and chert and Lower Greensand rock types.

2.2.3 Lambeth Group

The Lambeth Group (formerly named the Woolwich and Reading Beds) comprises a complex and laterally variable sequence of sedimentary deposits including clay, silt, sand and gravel. Inter-laminated clay and sand deposits are common in the lower part of the succession. The component formations are the Upnor Formation, Reading Formation and Woolwich Formation.

3. GROUND INVESTIGATION

3.1 Introduction

The ground investigation comprised the excavation of a series of mechanically dug trial pits, together with dynamic sampler boreholes. The fieldwork was carried out on 12th November 2012. The exploratory hole locations are shown on the Site Plan (Figure 2).

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix A. Notes to assist in the interpretation of the records are also contained in the appendix.

3.2 Investigation and Sampling Strategy

The Phase 1 contamination assessment identified the potential for localised made ground and associated metal and PAH contamination from demolished structures located in the north eastern part of the site.

The exploratory hole locations were proposed by the Client's Engineer (Millwood House Consultants Ltd) and generally were positioned to provide geotechnical information and non-targeted contamination sampling. Trial pits TP15 and TP14 were located in the north eastern part of the site to target potential made ground associated with previously demolished structures.

The results from the ground investigation, together with the findings of the phase 1 contamination assessment, are considered adequate to allow the preparation of a quantitative risk assessment for the site.

3.3 Methodology

3.3.1 *Dynamic Sampler Boreholes*

Six boreholes (designated WS10 to WS15) were drilled to depths of between 1.0m and 3.0m below ground level.

The dynamic sampler boreholes were formed by a series of 1.0m long hollow steel tubes, reducing in diameter from 100mm to 35mm, which are driven successively into the ground by means of either a track-mounted drop weight or a hand held hydraulic hammer. The sampler was extracted from the ground using a hydraulically operated jack and the enclosed samples recovered in 1.0m long plastic liners. The system enables sub-samples to be taken for detailed examination and laboratory testing.

3.3.1.1 Trial Pits

Nine trial pits (designated TP10 to TP15, TP15a, TP16 and TP17) were dug by mechanical excavator to depths of between 1.5m and 3.3m below ground level. The pits were unsupported and were logged from the surface.

3.3.2 Sampling

Disturbed samples of soil were taken at the depths shown in the exploratory hole records and collected in either plastic bags, plastic tubs or amber glass jars fitted with gas tight lids. On collection the amber glass jars were stored in cool boxes containing cooling blocks to maintain temperatures below 4°C and were transferred to refrigerators upon return to the office until forwarded to the external accredited laboratory.

3.3.3 In Situ Testing

The depths of in situ testing, together with the test results, are given on the exploratory hole records or are summarised separately in Appendix A. Notes providing additional information on the tests that were performed are also included in Appendix A.

3.3.3.1 DPSH Dynamic Probe (Super Heavy) Testing

Dynamic probe testing was carried out adjacent to dynamic sampler boreholes WS10, WS12, WS14 and WS15. The dynamic probing was undertaken in accordance with BS EN ISO 22476-2:2005 using a super heavy probing geometry.

The DPSH configuration is similar to that of the standard penetration test (SPT) except that the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

3.3.3.2 Undrained Shear Strength

Undrained shear strength determinations were made in situ within the fine grained soils using a Geonor hand shear vane as part of the investigation.

Additionally undrained shear strength determinations were made within samples of the fine grained soils held in the dynamic sampler liners using a hand penetrometer. Although samples taken by the window sampling technique cannot be regarded as being undisturbed for testing purposes, penetrometer testing can provide a useful indication of the strength of the material.

3.3.3.3 California Bearing Ratio Tests

In situ testing using a hand-held Farnell cone penetrometer was conducted at shallow depths within each of the trial pits.

3.3.3.4 Soakage Testing

Falling head soakage testing was carried out in trial pits TP13 and TP15a at a depth of 3.0m within the River Terrace Deposits. The tests were carried out in general accordance with Building Research Establishment (BRE) Digest 365 (1991), other than the pits were filled only once rather than the 3 times suggested by the digest.

3.4 Laboratory Testing

Geotechnical and chemical testing of the soils was undertaken as part of the ground investigation. The results from the laboratory tests are provided in Appendix B. Further details of the tests carried out are presented below.

3.4.1 Geotechnical Testing

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd in accordance with the methods given in BS1377:1990 Parts 1 to 8 'Methods of test for soils for civil engineering purposes'. Notes to assist with the interpretation of the tests are contained within Appendix B.

The types and numbers of tests carried out are detailed in the following table. The test results are discussed in Section 5.

Table 2. Geotechnical Testing

Type of test	No. of samples tested
Moisture Content	20
Atterberg Limits	20
Particle Size Distribution	5

3.4.2 Chemical Testing

Chemical testing of selected samples was scheduled by Ashdown Site Investigation Ltd, and was undertaken by a laboratory with recognised (UKAS and MCERTS) accreditation for quality control.

The types and numbers of tests undertaken are detailed in the following table. Analysis of the test results is presented within Section 6.

Table 3. Chemical Testing

Determinand	No. of soil samples tested
Arsenic	15
Cadmium	15
Chromium	15
Lead	15
Mercury	15
Nickel	15
Selenium	15
Copper	15
Zinc	15
Hexavalent Chromium	15
Water Soluble Boron	15
pH	21
Organic Matter	15
Total Sulphate	2
Total Cyanide	2
Free Cyanide	2
Sulphide	2
Total Sulphur	2
Thiocyanate	2
Total Monohydric Phenols	2
Ammonium	2
Speciated PAH	15
Speciated Petroleum Hydrocarbons (Equivalent Carbon Weight Fractions)	13
Asbestos	13
Water Soluble Sulphate	6

4. GROUND CONDITIONS

4.1 Stratigraphy

The ground conditions encountered by the current ground investigation are similar to those recorded elsewhere on the wider site area by previous ground investigations conducted by Ashdown Site Investigation Ltd.

The ground conditions encountered by the current ground investigation are summarised below. Detailed records of the strata and groundwater conditions encountered at each exploratory position are presented in Appendix A.

4.1.1 Surface Covering

In general each of the exploratory holes was excavated through a surface cover of topsoil some 100mm to 300mm in thickness.

No specific surfacing materials were encountered in trial pit TP14.

4.1.2 Made Ground

Made ground, generally comprising sandy silty clay containing a variable quantity of gravel was recorded within trial holes WS15, TP12, TP13, TP14, TP15 and TP15a to depths of between 0.35m and 0.80m. The gravel comprised variable proportions of flint, brick, chalk, clinker, wood, plastic, metal, nails, leather and glass.

It is noted that the made ground was recorded within the exploratory holes located in the eastern part of the site. Within trial pit TP12 possible asbestos containing material was noted in the made ground soils, though it is noted that screening of soil samples for asbestos (including a sample from this location) did not encounter any asbestos fibres within the soils (See Section 6.2.2.3) for more detailed discussion).

4.1.3 River Terrace Deposits

Underlying the surfacing and made ground soils where present, the investigation progressed into undisturbed generally firm and stiff clays and medium dense sands containing a variable proportion of flint and ironstone gravel. These deposits, considered to represent the River Terrace Deposits indicated on the published geological map, were recorded to the full depth of investigation of 3m.

4.1.4 *Groundwater Conditions*

Groundwater seepages were encountered within the trial pits at depths of between 2.5m and 2.7m below ground level. Standing water depths of between 1.1m and 1.8m were recorded within the dynamic sampler boreholes.

Groundwater seepages were not recorded within trial holes WS13, TP14, TP15 or TP15a during the course of their excavation.

4.2 *Stability*

With the exception of trial pits TP14, TP15 and TP15a, each of the exploratory holes was recorded to be unstable. Whilst in general instability was most pronounced within the coarse grained soils, particularly where groundwater ingress was noted, instability was also recorded within the clay soils.

5. GEOTECHNICAL ASSESSMENT

The development proposals for the site are understood to comprise the construction of a new steel portal-framed warehouse together with associated access roads. It is also proposed to construct a planted soil bund along the southern and western boundaries of the site.

At the time of writing, no details were available concerning the specific loads to be applied to the foundations.

5.1 Foundations

5.1.1 *Soil Shrinkage/Heave Potential*

The undisturbed sand and gravel soils of the River Terrace Deposits may be considered to be non plastic and hence non shrinkable.

The fine grained soils of the River Terrace Deposits have been classified as clays of low to high plasticity and with modified plasticity indices in the range of 10% to 29% the soils may be expected to exhibit a low to medium volume change potential.

It is recommended that precautions against shrinkage and heave for any foundation system constructed within the fine grained River Terrace Deposit soils should assume a medium volume change potential and take into account current guidance such as that given by the Building Research Establishment (BRE) or the National House Builders Council (NHBC).

Whilst this report has been prepared to provide advice to assist designers in undertaking detailed design, the report itself does not represent a detailed design statement. All detailed foundation design including assessment of minimum founding depths for spread foundations, requirements for sleeving or reinforcing of piled foundations and requirements for placement of void formers must take into account the volume change potential of the soil and the presence of trees (previous, present and proposed).

5.1.2 *Spread Foundations*

Made ground was recorded to depths of between 0.35m and 0.80m below ground level. Any made ground, and any soils disturbed by the construction or removal of any previously existing foundations and services, should be regarded as potentially variable in nature and state of compaction and, as such, unsuitable as a founding medium for shallow footings. New footings should be constructed below these soils so as to bear within undisturbed natural soils.

For design purposes, a net allowable bearing capacity of 150kN/m² may be assumed for the construction of spread (pad or strip) foundations up to 2.0m across bearing within the minimum firm clays and medium dense sands of the

River Terrace Deposits. The quoted bearing capacity is expected to limit settlement to less than 25mm. Whilst a minimum depth to formation of 0.9m should be adopted, foundations may need to be deepened to bear below made ground or soft/loose soils not identified by this investigation or, in accordance with BRE or NHBC guidance, to protect foundations against the effects of seasonal soil volume changes close to trees.

Attention is drawn to the presence of mixed clay, gravel and sand soils across the site. Given the potential for mixed soil conditions to be present beneath footings, it is recommended that foundations should be suitably reinforced both top and bottom to minimise the potential for cracking to occur due to differential settlement.

5.2 Groundwater

Groundwater was typically encountered across the site at depths of between 1.1m and 1.8m within the boreholes with seepages noted in the trial pits from below depths of between 2.5m and 2.7m below ground level.

Excavations beneath the water table, and particularly within coarse grained soils, will require active groundwater control to maintain adequately dry working conditions and excavation stability. It is recommended that trial pumping from proposed formation depths be undertaken in advance of detailed design of the foundation system to fully establish requirements for pumping at this site where excavations below the groundwater table are proposed.

5.3 Stability of Excavations

All excavations should be assumed to be potentially unstable. Where excavations are required to remain stable, they should be suitably supported or side slopes battered back to a safe angle of repose. Excavations below the water table are likely to be problematic without active groundwater control as discussed above.

Where personnel access is required to any excavation its stability should be assessed by a suitably qualified and experienced responsible person. Entry into unsupported excavations should only be permitted where they have been assessed as safe to enter but in any case it is advised that personnel access to unsupported excavations greater than 1.2m depth should be prohibited.

5.4 Aggressivity to Concrete

In view of the soils encountered beneath the site, and its history, it is considered that 'natural ground conditions' may be assumed for the purposes of assessing the aggressivity of the chemical environment for concrete classification (ACEC class). Given the noted occurrence of groundwater, 'mobile groundwater' conditions should be assumed.

Chemical analysis of the soil indicates a sulphate content falling into Design Sulfate Class DS-1 of Table C1 of the Building Research Establishment Special Digest No 1 "Concrete in aggressive ground", 2005. The results of the pH tests indicate that the underlying soils are neutral to slightly alkaline.

In accordance with the BRE digest, a DS-1 Design Sulfate Class and an AC-1 ACEC classification may be assumed as a minimum for the design of concrete in contact with the ground at the site.

5.5 Ground Floors

In view of the variable thickness of made ground and the presence of soils of up to medium volume change potential, it is recommended that ground floors be suspended for all sensitive structures.

Ground bearing floor slabs may, however, be considered where made ground soils are not present or are to be removed from beneath building footprints and the depth of foundations required to protect against seasonal soil volume changes close to trees is less than 1.5m. In such circumstances further works should be undertaken to demonstrate, that close to the time of construction, no significant soil desiccation is present. If ground bearing floors are adopted it is recommended that the potential for differential movement both between the floor slab and walls and across the floor slab itself should be anticipated. Such floors should be fully debonded from walls and should be suitably reinforced to enable spanning of soft spots. Formations should be adequately proof rolled and any excessively soft materials excavated and replaced with suitable well graded coarse grained fill material. The depth of any fill materials should be limited to a maximum of 600mm unless placed to an appropriate engineering specification design to mitigate internal settlement of the fill.

The detailing of services through, or under, ground-bearing floors should incorporate flexible connections and, where appropriate, enhanced falls.

5.6 Pavement Design

In situ Farnell cone penetrometer tests for the direct estimation of California bearing ratio indicated CBR values ranging between 1% and 6% but typically in the range 1% to 2% in the underlying clay River Terrace Deposit soils. During previous works CBR values between 1% and 20% were recorded elsewhere on the wider site area.

The former Department of the Environment, Transport and the Regions Design Manual for Roads and Bridges, Volume 7 (Pavement Design & Maintenance), Section 2, Part 2 1994 provides a useful correlation between soil type and equilibrium (long term) CBR values. This guidance suggests a design equilibrium CBR value of 2% to 4% applicable to the natural clay soils for the construction of thin (300mm) pavement in poor to average construction conditions and assuming a high groundwater table.

Based upon review of the in situ test results and the quoted guidance it is suggested that for the clay River Terrace Deposit soils a CBR value of 3% may be adopted for preliminary pavement design.

All formations should be proof rolled and any very loose, bulky, soft, degradable or otherwise unsuitable materials thus identified should be removed and replaced with well compacted coarse grained fill. Prepared subgrades should be protected from severe adverse weather by ensuring they are graded to falls to prevent ponding, and they should be reasonably protected from trafficking during construction.

The subgrade may be assumed not to be susceptible to frost heave.

5.7 Drainage

In situ soakage testing was carried out in general accordance with the requirements of BRE 365 'Soakaway Design'.

The soakage test carried out within Trial Pit TP13 recorded only a 450mm fall in the water level during the 232 minute test period. Given that water levels within the test pit did not reach 75% of the test hole depth the soil infiltration rate could not be calculated strictly in accordance with the BRE 365 guidance. The infiltration rate was therefore calculated by dividing the quantity of water lost by the average surface area of the trial pit in contact with water during the test and the test duration in seconds.

Within trial pit TP15a the water level was recorded to rise during the soakage test observation period indicating the soils have only a negligible infiltration rate.

TP13 $f = 3.9 \times 10^{-6}$ m/s

TP15a $f = \text{Negligible}$

The value 'f' is equivalent to the soil infiltration coefficient 'q' quoted in the Construction Industry Research and Information Association (CIRIA) Report 156.

It is considered that the predominantly clay soils of the River Terrace Deposits will only be suitable for the construction of peak flow storage tanks connected via attenuated drainage pipes to mains surface water drainage or open water courses.

In the event that discharge to ground via soakaways is proposed, it is recommended that designers refer to Pollution Prevention Guidance Notes (PPGs) published by the Environment Agency for advice on legal requirements and good practice to reduce risks to groundwater. In particular reference should be made to PPGs 1 and 3, providing general advice on the prevention of pollution and the use and design of oil separators in surface water drainage systems, respectively. The Local Authority and/or relevant water company should be consulted in relation to consent for discharge of water from rooftops, areas of hardstanding and roadways to drains.

6. PHASE 2 CONTAMINATION ASSESSMENT

6.1 Introduction

In consideration of findings of the phase 1 contamination assessment, the ground conditions encountered on site and as a further precaution considering the proximity of the infiltration beds, the following commonly occurring significant contaminants have been considered for assessment: arsenic, cadmium, chromium, lead (including lead compounds), mercury, nickel, copper, zinc, selenium, boron, asbestos, petroleum hydrocarbons, cyanide compounds, phenols and polycyclic aromatic hydrocarbons (PAH). The polycyclic aromatic hydrocarbons were speciated into the sixteen individual compounds specified by the United States Environmental Protection Agency (USEPA).

6.1.1 Soils

The results from the majority of the analyses can be assessed by way of careful consideration of the proposed end use as well as physical features of the soil type and wider environment as part of a quantitative 'Contaminated Land Exposure Assessment' or 'CLEA model' assessment.

Quantitative risk assessment using the CLEA model is the method preferred by the regulatory authorities in the UK to assist in determining the contamination status of soils in terms of risk to human health.

6.2 Analysis of Contamination Test Results

Results from the chemical (contamination) testing are summarised in Appendix B.

A quantitative assessment of the results of this investigation has been undertaken comparing soil contaminant concentrations on site against Soil Screening Values generated by Ashdown Site Investigation Ltd using the CLEA Model, published by the Environment Agency. For further information on the derivation of these values see the notes in Appendix C. The chemical data used within the CLEA model is also summarised within Appendix C. The data was obtained from various sources including guidance documents published by the Environment Agency and other statutory bodies.

In view of the proposed development the soil screening values used in this assessment have been calculated using the default land use of "commercial" as set out in Science Report SC050021/SR3, January 2009. The critical receptor for this land use is considered to be a full time female staff member working at the site between the ages of 17 and 65. Exposure routes that are considered include the potential for direct ingestion of the soil, the outdoor and indoor ingestion of dust and the potential inhalation of dust and vapours.

6.2.1 Statistical Analysis

Statistical analysis of the data set has been undertaken in line with guidance set out in 'Comparing Soil Contamination Data with a Critical Concentration' report, published by the CIEH/ CL:AIRE (May 2008). The report replaces the (now withdrawn) guidance set out in CLR7.

The CIEH/CL:AIRE guidance provides a framework for assessing measured contaminant concentrations on a site against user defined critical concentrations – or indicators of risk.

Under a planning scenario, the null hypothesis tested is whether the true population mean is greater than a “critical concentration”. The critical concentration used within this assessment is the relevant screening value for the proposed end use.

The null hypothesis can be rejected if it can be shown (with a sufficient degree of confidence) that the true population mean lies below the critical concentration. The confidence level recommended within the guidance is 95% i.e. the statistical evidence must show that there is 95% likelihood that the true population mean lies below the critical concentration. In this instance the site is considered suitable for the proposed use.

Where there is insufficient evidence to reject the null hypothesis, further risk assessment and/or remediation may be necessary.

Guidance on comparing soil contamination data with a critical concentration are provided in Appendix C. The summary sheets from the statistical analysis are also presented in Appendix C.

6.2.2 Inorganic Contamination

Testing for a range of metals and asbestos was undertaken on samples taken from across the site as part of the ground investigation. Samples from trial pits TP12 and TP14, located close to off-site infiltration beds, were also tested for cyanide compounds.

6.2.2.1 Metals

The data set for the inorganic contaminants tested for comprised 15 samples of the shallow made ground and topsoil. The data set was considered to represent soils with a pH of 7 and an organic content of 1%.

The following table summarises the calculated soil screening values along with sample means and 95th percentile upper confidence limits.

Table 4. Soil Screening Values and Upper Confidence Limits for Inorganic Contaminants

Contaminant	Soil Screening Value (mg/kg)	Sample Mean (mg/kg)	95% Upper Confidence Limit (mg/kg)	Can H ₀ be rejected	Evidence against H ₀ (%)
Arsenic	640	39.90	114.77	Yes	100
Cadmium	230	0.74	1.75	Yes	100
Chromium	8840	49.14	104.51	Yes	100
Lead	5120	151.59	298.64	Yes	100
Mercury	3600	0.25	0.25	Yes	100
Nickel	1800	18.66	27.47	Yes	100
Copper	71700	58.65	136.66	Yes	100
Zinc	660000	368.62	991.69	Yes	100
Selenium	13000	2.39	3.49	Yes	100
Boron	192000	1.53	1.96	Yes	100
Chromium VI	35	1.00	1.00	Yes	100

In view of the analysis presented above, the concentrations of the elements tested for are not considered to be significantly elevated in the context of a commercial development, nor are they considered to be sufficiently elevated so as to pose a risk to groundwater.

6.2.2.2 Cyanide Compounds

The two samples tested from TP12 and TP14 for the presence of cyanide compounds did not record the presence of cyanide or cyanide compounds at concentrations above the detection limit of the test. In their absence, no further risk assessment in this regard is considered to be necessary.

6.2.2.3 Asbestos

A fragment of suspected asbestos containing material was noted within the made ground encountered in TP12.

The made ground at the location of TP12 together with twelve further samples were tested for the presence of asbestos. None of the samples tested recorded the presence of any asbestos.

In the absence of asbestos fibres within the soils, the limited extent and thickness of made ground, and that only a single fragment of suspected bound asbestos containing materials was encountered, asbestos within the soils is not considered to pose a significant risk to end users of the site.

6.2.3 Organic Contamination

6.2.3.1 Polycyclic Aromatic Hydrocarbons (PAH)

Polycyclic Aromatic Hydrocarbon (PAH) compounds are a group of chemicals that contain two or more benzene rings fused together. In general PAH compounds have relatively low solubility in water but are soluble in organic solvents. Due to their low vapour pressures they tend to readily adsorb onto airborne particulates.

Individual PAH compounds exhibit a range of physical properties and human toxicities and therefore, where they are present, a risk assessment cannot effectively be made against the total PAH concentration.

To allow an assessment to be made, the PAH concentrations within the soil samples were speciated to give concentrations of 16 individual PAH defined by the United States Environmental Protection Agency (USEPA).

The data set for PAH compounds comprised 15 samples of the shallow made ground and topsoil. The data set was considered to represent soils with a pH of 7 and an organic content of 1%.

The following table summarises the calculated soil screening values along with sample means and 95th percentile upper confidence limits.

Table 5. Soil Screening Values and Upper Confidence Limits for PAH Compounds

Contaminant	Soil Screening Value (mg/kg)	Sample Mean (mg/kg)	95% Upper Confidence Limit (mg/kg)	Can H ₀ be rejected	Evidence against H ₀ (%)
Naphthalene	183.0	0.25	0.25	Yes	100
Acenaphthylene	212	0.25	0.25	Yes	100
Acenaphthene	141	0.25	0.25	Yes	100
Fluorene	69000	0.25	0.25	Yes	100
Phenanthrene	22000	0.31	0.58	Yes	100
Anthracene	540000	0.25	0.25	Yes	100
Fluoranthene	23000	0.44	1.15	Yes	100
Pyrene	54000	0.42	1.06	Yes	100
Benz(a)anthracene	95.0	0.34	0.65	Yes	100
Chrysene	140.0	0.36	0.67	Yes	100
Benzo(b)fluoranthene	100.0	0.35	0.61	Yes	100
Benzo(k)fluoranthene	140.0	0.35	0.62	Yes	100
Benzo(a)pyrene	14.0	0.35	0.63	Yes	100
Indeno(123-cd)pyrene	61.0	0.30	0.47	Yes	100
Dibenz(ah)anthracene	13.0	0.28	0.44	Yes	100
Benzo(ghi)perylene	660.0	0.32	0.53	Yes	100

* Based on a SOM concentration of 1%

The statistical analysis confirms that the concentrations of PAH compounds recorded by the testing do not represent a significant risk to commercial workers. The levels of PAH compound recorded are not considered to pose a significant risk to groundwater.

6.2.3.2 **Petroleum Hydrocarbons**

Petroleum hydrocarbons encompass a large number of individual chemical compounds found within substances such as petrol, diesel, lubricating oil, waxes and tar based substances. Consequently they are associated with a wide range of land uses and encountered on a large number of sites investigated, from fuel filling stations and car maintenance garages to more innocuous land uses such as domestic garages and car parking areas.

Petroleum hydrocarbons can be split into aromatic (containing benzene rings) and aliphatic fractions and can be further subdivided into equivalent carbon weight fractions which exhibit similar fate and transport and toxicological properties.

Soil screening values for equivalent carbon fractions of petroleum hydrocarbons have been calculated as a joint project between LQM and CIEH and published in 'The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment' 2nd Edition, 2009." The screening values have been developed for the standard "Commercial" land use as set out in Science Report SC050021/SR3, January 2009.

The following table lists the screening values for equivalent carbon weight fractions calculated for 1% organic content.

Table 6. Soil Screening Values for petroleum hydrocarbons calculated by LQM/CIEH.

Petroleum Hydrocarbon Fraction	Screening Value (mg/kg)
Aliphatic EC 5-6	3400
Aliphatic EC >6-8	8300
Aliphatic EC >8-10	2100
Aliphatic EC >10-12	10000
Aliphatic EC >12-16	61000
Aliphatic EC >16-35	1600000
Aliphatic EC >35-44	1600000
Aromatic EC 5-7	28000
Aromatic EC >7-8	59000
Aromatic EC >8-10	3700
Aromatic EC >10-12	17000
Aromatic EC >12-16	28000
Aromatic EC >16-21	28000
Aromatic EC >21-35	28000

Thirteen samples were tested for total concentrations of petroleum hydrocarbons with the results speciated by equivalent carbon weight fractions.

In general the samples tested did not record petroleum hydrocarbons above the limit of detection of the test. Samples tested from TP12, TP14 and WS15, recorded total concentrations of 53mg/kg, 17mg/kg and 24mg/kg, respectively. Where detectable concentrations were recorded, these were found to be within the heavier range C₂₁-C₃₅ fraction. Even assuming the petroleum hydrocarbons to comprise aromatic compounds, the levels detected are significantly below the relevant SSV and are not considered likely to pose a significant risk to human health.

6.2.3.3 Total Monohydric Phenols

Two samples, taken from TP12 and TP14 close to the off-site infiltration beds, were tested for the presence of total monohydric phenol compounds. No phenol compounds above the detection limit of the test were recorded by the laboratory testing. No further risk assessment in respect of these compounds is deemed to be required.

6.3 Quantitative Contamination Risk Assessment

An appropriate contamination risk assessment of a site considers the potential sources of contamination, the potential receptors and how the sources and receptors may be linked (the pathways). The assessment of risk has been carried out in line with guidance published within "Contaminated Land Risk Assessment: A guide to good practice" published by CIRIA (C552, 2001).

A significant risk is only deemed to exist where a significant pollutant linkage has been identified i.e. where a potentially significant source is linked to the receptor via a significant pollutant pathway. A site is considered suitable for use where no significant pollutant linkages are present.

The quantitative risk assessment takes into account the findings of the intrusive works and laboratory testing along with on-site observations in order to identify potentially significant risks.

The risk assessment has been carried out based on the site being developed for commercial purposes including the provision of limited areas of soft landscaping. Should the proposed end use be altered, a revised risk assessment may be required.

6.3.1 Quantitative Contamination Risk Assessment (Human Health and Groundwater)

In the absence of any significant source of contamination having been identified at the site, no source pathway receptor linkages can be identified by this assessment. Consequently, there is not considered to be any significant ground contamination risks posed to human health or controlled water (groundwater) by the proposed development of the site.

A quantitative human health risk assessment conceptual model representing this conclusion is presented in the following table of this report and is presented diagrammatically as Figure 3.

Table 7. Quantitative Human Health Conceptual Model - Pollutant Linkages and Assessment of Risk

Contaminant Source	Potential Pathway(s)	Likelihood	Severity	Initial Assessment of Risk to Human Health
No significant sources identified	N/A	N/A	N/A	None

6.4 Risks to Other Potential Receptors

The following general guidance is given with regards to other potential on site receptors, which may not necessarily be statutory drivers for remedial works.

6.4.1 Construction Workers

The concentrations of contaminants recorded at the site are not considered to pose an acute risk to construction workers. The presence of localised fragments of potential asbestos containing materials within the soil matrix are unlikely to pose a significant risk to construction workers provided care is taken to prevent dust generation during any excavation works. Site staff should be appropriately briefed to recognise asbestos containing materials and should any loose or fibrous materials be encountered during the construction works an appropriate risk assessment should be undertaken immediately and, if necessary, appropriately trained personnel consulted over its removal.

It is recommended that as a minimum and in accordance with industry best practise all ground-workers should be issued with the appropriate PPE and should be instructed in safe working methods. As a precaution instructions should also be given in the recognition of potentially hazardous materials, including oily and odorous soil and water and discoloured or fibrous substances. Any oil-like substances contacting the skin must be washed off immediately using an appropriate cleanser. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food and smoking must be confined to designated clean areas. Suitable welfare (washing) facilities should be provided. These precautions should be taken in addition to anything highlighted by a site specific risk assessment which should be undertaken by any contractor prior to commencing work.

6.4.2 Services

The risk of damage to services from the concentrations of the contaminants identified is considered to be very low. It is considered that the service providers'

requirements represent the most informed decision when it comes to the protection of their services. It is recommended that all service providers should be contacted with regard to specific precautions they may require and all precautions complied with.

6.4.3 Planting

Maximum concentrations of the phytotoxic elements copper, zinc and boron of 237mg/kg, 1826mg/kg and 3mg/kg, respectively, were recorded within the samples tested. These concentrations may pose a risk to specific planting schemes and it is recommended that a horticulturist should be consulted with regard to any specific planting schemes proposed.

Attention is also drawn to the need for structural engineers to consider any proposed planting of trees or significant shrubs and reference should be made to Section 5.1.1 in this regard.

6.5 Recommendations

It is recommended that this report should be forward to regulators and/or warrantors, where required by conditions they may impose, to confirm their acceptance (or otherwise) of the conclusions of this report and to establish whether they require any additional works to be undertaken in respect of ground contamination risk assessment.

6.6 Handling and Disposal of Waste and Quality of Imported Materials

6.6.1 Waste Management

Soils and other materials taken for disposal should be handled, transferred and disposed of as controlled waste in accordance with the requirements of the Waste Management, Duty of Care Regulations. Copies of waste transfer notes detailing the site address, the waste type, details of the haulage contractor and full details of the disposal site must be kept.

The Site Waste Management Plans Regulations, 2008, require a site waste management plan to be prepared and implemented by clients and principal contractors for all construction projects with an estimated cost greater than £300,000 excluding VAT. The plans must record details of the construction project, estimates of the types and quantities of waste that will be produced, and confirmation of the actual waste types generated and how they have been managed. More detailed reporting requirements apply to projects exceeding £500,000.

Specifically, the disposal of any asbestos containing materials should be undertaken by appropriately trained personnel. The disposal of such material would need to be undertaken in accordance with the Hazardous Waste Regulations 2005.

6.6.2 *Quality of Imported Soils*

Full details of the source of any imported soils, if required for the development of the site, should be documented (including topsoil). Any material from a potentially contaminated (e.g. industrial) site should be rejected. It is recommended that chemical (contamination) testing results are obtained and supplied for comment prior to accepting the soils on site. As a minimum the contaminants tested for should include arsenic, cadmium, chromium, lead, mercury, nickel, selenium and polycyclic aromatic hydrocarbons. The material should be free from petroleum hydrocarbons, and contain no significant quantity of putrescible material (incl. wood or paper). Materials must comply with current CLEA guidance for the proposed end use of the site.

Topsoil should, when inspected visually, be free from propagules of aggressive weeds, fragments of glass, bricks, concrete, wire or other potentially hazardous foreign matter and bulk vegetative growth, in order to ensure negligible risk of subsequent weed problems (introduced in the soil) or traumatic injury.

It is stressed that the quality of any materials imported onto the site is critical to the successful completion of site works.

7. CONCLUSIONS

The following conclusions present a summary of the main findings of the investigation. However, no reliance should be placed on any point of the conclusions until the whole of the report has been read as other sections of the report may put into context the information contained herein.

7.1 Geotechnical Assessment

- The ground investigation confirmed the underlying soils to comprise a shallow thickness of made ground, overlying River Terrace Deposits.
- Groundwater was typically encountered across the site at depths of between 1.1m and 1.8m within the boreholes with seepages noted in the trial pits at depths of between 2.5m and 2.7m below ground level.
- Precautions against shrinkage and heave for any foundation system constructed within the fine grained River Terrace Deposits soils should assume a medium volume change potential and take into account current guidance such as that given by the National House Builders Council (NHBC).
- A net allowable bearing capacity of 150kN/m² may be assumed for the construction of spread (pad or strip) foundations up to 2.0m across bearing within the minimum firm clays and medium dense sands of the River Terrace Deposits. The quoted bearing capacity is expected to limit settlement to less than 25mm. Foundations should be reinforced.
- Excavations beneath the water table, and particularly within coarse grained soils, will require active drainage to maintain adequately dry working conditions and excavation stability.
- All excavations should be assumed to be subject to short term instability. Where excavations are required to remain stable they should be suitably supported or side slopes battered back to a safe angle of repose.
- A DS-1 Design Sulfate Class and an AC-1 ACEC classification may be assumed as a minimum for the design of concrete in contact with the ground.
- In view of the locally variable thickness of made ground and the presence of soils of up to medium volume change potential, it is recommended that ground floors be suspended for all sensitive structures. However, ground bearing floor slabs may be adopted subject to the advice given within the body of this report.
- An equilibrium CBR of 3% may be assumed for the design of pavement bearing on the River Terrace Deposits. The subgrade is not likely to be susceptible to frost heave.

- It is considered that the predominantly clay soils of the River Terrace Deposits will only be suitable for the construction of peak flow storage tanks connected via attenuated drainage pipes to mains surface water drainage or open water courses.

7.2 Contamination Status Assessment

- The site is currently occupied by fields used as horse paddocks with the eastern part of the site being used as a nursery and storage area.
- The River Terrace Deposits encountered beneath the site are classed as a Secondary A Aquifer.
- The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.
- The testing undertaken has not identified contaminants at levels in excess of critical concentrations for the proposed end use.
- A quantitative conceptual model has been prepared highlighting the absence of any complete pollutant linkages having been identified in relation to human health or controlled waters. This conclusion is represented in Table 7 and is also presented as Figure 3.
- It is advised that the local authority has ultimate jurisdiction over contamination assessment, and, as such, they must be consulted to establish whether or not they concur with the findings of this report. Equally warrantors should also be consulted to ensure that no further works, in relation to ground contamination risk assessment, are required.

**Ashdown Site Investigation Limited
December 2012**

APPENDIX A

Exploratory Hole Notes

In Situ Testing Notes

Exploratory Hole Records

DPSH Continuous Dynamic Probe N100 v
Depth Profile

Summary of in situ Farnell Cone Penetrometer
(CBR) Test Results

Summary of Trial Pit Falling Head Soakage
Test Results

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U	'Undisturbed' Sample: - also known as 'U100' or 'U4' - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Uo	Sample not obtained.
U*	Full penetration of sample not obtained.
U**	Full penetration obtained but limited sample recovered.
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample.
R	Root Sample.
B	Bulk Disturbed Sample.
W	Water Sample.
J	Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T	Tub Sample
E	Environmental Suite (including a jar sample, tub sample and vial sample)

In situ Testing

S	Standard penetration test (SPT): In the borehole record the depth of the test is that at the start of the normal 450mm penetration, the number of blows to achieve the standard penetration of 300mm (the 'N' value) is shown after the test index letter, but the seating blows through the initial 150mm penetration are not reported unless the full penetration of 450mm cannot be achieved. In the latter case, the symbols below are added to the test index letter:-
S(R)	Refusal of standard penetration test. Blow count reported includes seating blows. Total penetration of refused SPT reported in mm in brackets on borehole record.
So	'Split spoon' SPT sampler sank under its own weight. The test is usually completed when the number of blows reaches 50 (25 blows for seating count). The depths of both the top and bottom of the test drive are shown in the sample column on the Borehole Record. If a sample is not recovered in the sampler, a disturbed sample is taken over the depth of the test as boring continues.
C	Standard Penetration Test (SPT) conducted usually in coarse grained soils or weak rocks using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone fitted in place of the sampler. Variations in test results are indicated by the same symbols as for the SPT (above).
V	Shear Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
H	Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
P	Perth Penetrometer Test: See Insitu Testing Notes in Appendix C for full description. Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column. In sand the number of blows is approximately equivalent to the SPT "N" value.

2 **Soil Description**

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1:2002) and Part 2 Principles of classification (BS EN 14688-2:2004).

Fine Grained Soils

The consistency of fine grained soils given in the report is based on visual inspection of the samples and the strength is based on results of in situ and/or laboratory undrained shear strength tests when carried out.

The consistency is determined on the following basis:

Consistency	Manual Test
Very Soft	Soil exudes between fingers when squeezed in hand
Soft	Soils can be moulded by light finger pressure
Firm	Cannot be moulded by finger but rolled to 3mm threads without breaking/crumbling
Stiff	Crumbles/breaks when rolled to 3mm thick threads but can be moulded into a lump again
Very Stiff	Cannot be moulded and crumbles under pressure, can be indented by thumbnail

Based on BS EN ISO 14688-1:2002

The terms used for the designation of the undrained shear strength are as follows:

Undrained Shear Strength	
Extremely to Very Low	<20 kPa
Low	20-40 kPa
Medium	40-75 kPa
High	75-150 kPa
Very High	150-300 kPa
Extremely high	300-600 kPa

Based on BS EN ISO 14688-2:2004

Note: The undrained shear strength of the soils is measured either by laboratory testing or in the field using hand penetrometer or shear vane.

It is recognised that any coarse grained soil that has in excess of approximately 35% fine grained soil (clay and silt) can often be expected to behave as a fine grained soil despite the dominance of coarse grained material within the soil mass. To reflect this, it is the soil type that dominates the behaviour of the soil mass that appears on the exploratory hole records.

Coarse Grained Soils

The relative densities of coarse grained soils (sand and gravel) given in the report are based on field estimations and the results of the Standard Penetration Test (SPT) and equivalent correlation from other testing. The classification in terms of "N" Values is as follows:

SPT 'N' Value	Relative Density
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Greater than 50	Very Dense

3 **Rock Description**

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1:2003).

The description of rock mass includes the type of rock, structure, discontinuities and weathering.

The unconfined compressive strength of rock material is determined on the following basis:

Term	Field Identification	Unconfined Compressive Strength (MPa)
Extremely Weak	Indented by thumbnail	Less than 1
Very Weak	Crumbles under firm blows with point of geological hammer, peeled by pocket knife	1 to 5
Weak	Peeled by pocket knife with difficulty, shallow indentations made by firm blow with geological hammer	5 to 25
Medium Strong	Cannot be peeled or scraped with knife, can be fractured with single firm blow of geological hammer	25 to 50
Strong	Requires more than one blow of geological hammer to fracture	50 to 100
Very Strong	Requires many blows of geological hammer to fracture it	100 to 250
Extremely Strong	Can only be chipped with geological hammer	Greater than 250

The terms describing discontinuity and bedding spacing are as follows:

Bedding Thickness

Very Thick	>2000mm
Thick	2000-600mm
Medium	600-200mm
Thin	200-60mm
Very Thin	60-20mm
Thickly Laminated	20-6mm
Thinly Laminated	<6mm

Discontinuity Spacing

Very Wide	>2000mm
Wide	2000-600mm
Medium	600-200mm
Close	200-60mm
Very Close	60-20mm
Extremely Close	<20mm

Chalk

Chalk description is based on BS EN ISO 14688 and BS EN ISO 14689. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk. See additional chalk classification notes.

IN-SITU TESTING NOTES

1 Standard Penetration Testing

Standard penetration testing (SPT) is carried out within a cased cable percussion borehole. The test is performed using either a split spoon (barrel) sampler in finer grained deposits, or, in coarser grained soils or weak rocks, using a 50mm diameter, 60° apex solid cone fitted in place of the sampler.

The sampler is driven into the deposits at the base of the borehole by means of a 63.5kg hammer falling freely through 760mm.

In the borehole record the depth of the test is that at the start of the normal 450mm penetration, the number of blows to achieve the standard penetration of 300mm (the "N" value) is shown after the test index letter, but the seating blows through the initial 150mm penetration are not reported unless the full penetration of 450mm cannot be achieved.

(BS EN ISO 22476-3:2005, Geotechnical investigation and testing – Field Testing, Part 3)

2 Dynamic Probe Testing

The DPH (heavy) dynamic probing rig drives a 32mm diameter rod with a 15cm² area, 90° end cone into the ground by means of a 50kg hammer which falls freely through a distance of 0.5m. The number of blows per 100mm penetration (N_{100}) is recorded.

The DPSH (super heavy) dynamic probing rig drives a 35mm diameter rod with a 20cm² area, 90° end cone into the ground by means of a 63.5kg hammer that falls freely through a distance of 0.75m. The number of blows per 100mm penetration (N_{100}) is recorded. The results can provide a useful indication of the relative strength of the material. The dynamic probing is carried out in accordance with BS EN ISO 22476-2:2005.

A tentative correlation with the Standard Penetration Test (SPT) N value can be made summing three consecutive the N_{100} blow counts.

3 Perth Penetrometer Test

In this test a hardened stainless steel rod is driven into the deposit by a 9.5kg sliding hammer falling freely through 600mm. After an initial penetration of 150mm the number of blows required to drive the rod a further 300mm is recorded. In sand the Perth blow count gives a close correlation to the "N-value" that could be expected from a standard penetration test (SPT) made in similar materials. The results are less reliable in coarser grained materials but can give an indication of their engineering properties. The perth penetrometer test is carried out in accordance with the Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes, there is no European equivalent code.

4 Undrained Shear Strength

Undrained shear strength determinations are made in situ within the fine grained soils using a Geonor hand shear vane or (usually in the case of window sampler boreholes) a hand penetrometer. The test records the undrained shear strength (cohesion) in kN/m². The shear vane records a maximum shear strength of 130kN/m² and the hand penetrometer records a maximum shear strength of 250kN/m².

3 California Bearing Ratio Test

In this test a hand held Farnell cone penetrometer apparatus is pushed into the deposits for the estimation of the California bearing ratio of the subgrade (for use in pavement design). The test equipment is design for the estimation of the bearing ratio of fine grained soils (clay and silt) only and is unsuitable for use in coarse grained soils and rock.



GEOTECHNICAL AND ENVIRONMENTAL
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Borehole No.: WS10

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J	0.05						Topsoil
	J D	0.20					0.30	
	J D	0.40						Firm orange brown silty CLAY with occasional black iron staining. (River Terrace Deposits)
	H	0.70		60				
	V	1.00		100				with occasional fine to medium gravel of flint below 1.5m depth.
	D	1.50						
							2.30	
	D	2.50					2.60	Stiff light grey and orange brown slightly gravelly sandy CLAY. Gravel is fine flint. (River Terrace Deposits)
								Medium dense orange brown silty fine SAND. (River Terrace Deposits)
	D	2.90					3.00	
								End of Borehole

Remarks:

Standing water depth at 1.1m on completion of borehole.

Borehole collapsed to 1.5m depth.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC



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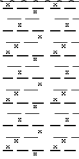
Borehole No.: WS11

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)				
						0.00	Ground Level
	D J	0.20		>130		0.30	Topsoil
	D J	0.50					Stiff orange brown silty CLAY. (River Terrace Deposits)
	V	1.00					
	D	1.50					with fine to coarse gravel below 1.5m depth.
	D	1.90				1.80	Orange mottled brown sandy CLAY. (River Terrace Deposits)
						2.00	Orange brown silty fine SAND. (River Terrace Deposits)
	D	2.65				3.00	
							End of Borehole

Remarks:

Standing water depth at 1.1m depth on completion of borehole.

Borehole collapsed to 1.2m depth on completion.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC



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Borehole No.: WS12

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
							0.30	Topsoil with occasional fine gravel of flint and chalk.
	J	0.20						Stiff orange brown slightly gravelly silty CLAY. Gravel is fine to medium ironstone and flint. (River Terrace Deposits)
	D	0.30						
	J	0.40						
	D	0.50						
	H	0.70		90				with coarse gravel of flint below 1.5m depth.
	V	1.00		>130				
	DH	1.50		60			1.90	
	D	2.00					2.40	
								Firm orange mottled brown sandy CLAY. (River Terrace Deposits)
								with fine to coarse gravel of flint at 2.2m depth.
	D	2.80					3.00	Medium dense orange brown clayey fine SAND with occasional ironstone. (River Terrace Deposits)
								End of Borehole

Remarks:

Standing water depth at 1.4m on completion of borehole.

Borehole collapsed to 1.8m depth.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC



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Borehole No.: WS13

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)				
						0.00	Ground Level
						0.20	Topsoil
	DH	0.50		100			Firm to stiff light brown and light grey mottled silty CLAY with occasional dark brown ironstaining and gravel of ironstone. (River Terrace Deposits)
	DH	0.90		115		1.00	becoming stiff below 0.8m depth.
							End of Borehole

Remarks:

Borehole dry and stable on completion.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: TH



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Borehole No.: WS14

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
							0.30	Topsoil
	D J	0.30						Firm to stiff orange brown slightly gravelly silty CLAY. Gravel is fine ironstone. (River Terrace Deposits) with fine to coarse gravel of flint below 1.6m depth.
	D J	0.50						
	V	1.00		>130				
	D	1.50						
	H	1.70		60				
	H	2.20		90				
	H	2.40		60			2.50	
	D	2.50						
	D	2.80					2.80	
							3.00	Medium dense orange brown clayey fine SAND. (River Terrace Deposits)
								End of Borehole

Remarks:

Standing water depth at 1.8m depth on completion of borehole.

Borehole collapsed to 2.0m depth.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC



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Borehole No.: WS15

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J	0.05					0.10	Topsoil
	J	0.20						MADE GROUND: Black brown gravelly silt. Gravel is fine to medium brick, flint and chalk.
	D	0.30						
							0.80	
	J	0.90						Firm to stiff brown mottled orange slightly gravelly silty CLAY. Gravel is fine ironstone. (River Terrace Deposits) becoming stiff below 1.5m depth. with occasional fine gravel of flint below 2.5m depth.
	D V	1.00		>130				
	H	1.20		90				
	D	1.50						
	H	1.90		115				
	D V	2.00		>130				
	H	2.20		115				
	D	2.50		35				
							2.90	
	D	2.90					3.00	
								Firm to stiff orange gravelly CLAY. Gravel is fine to coarse flint. (River Terrace Deposits)
								End of Borehole

Remarks:

Standing water depth at 1.7m depth on completion of borehole.

Borehole collapsed at 2.0m depth on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC



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Trial Pit No.: TP10

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.15				0.30	Topsoil
J T D V	0.40 0.50		>130			Stiff orange brown and mottled grey brown slightly gravelly silty CLAY. Gravel is fine to coarse flint. (River Terrace Deposits)
D V	1.00 1.10		125		1.40	
D V	1.50		130		1.80	Very stiff orange brown and light grey slightly gravelly slightly silty sandy CLAY. Gravel is fine to coarse and occasional cobbles of flint. (River Terrace Deposits)
D	2.50					Orange brown and grey silty fine to medium SAND. (River Terrace Deposits)
D	3.00				3.00	
						End of Pit
Remarks: Trial pit collapsed to 2.0m depth on completion. Groundwater seepage noted below 1.80m depth.						Excavation Method: Mechanical Excavator
						Dimensions: Various
						Made By: LG



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Trial Pit No.: TP11

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.10		>130		0.25	Topsoil
J T	0.35					Stiff orange brown slightly gravelly sandy silty CLAY. Gravel is fine to medium flint and trace of ironstone. (River Terrace Deposits)
D V	0.50					
D V	1.00		120			
D	2.00				1.80	Orange brown and mottled light grey very sandy CLAY. with occasional cobbles of flint. (River Terrace Deposits)
					2.20	
D	3.00					Orange brown and light grey mottled very silty fine to mediu SAND. (River Terrace Deposits)
					3.00	
						End of Pit

Remarks:

Trial pit unstable below 2.2m depth.

Groundwater seepage noted below 2.5m depth.

Excavation Method: Mechanical Excavator

Dimensions: Various

Made By: LG



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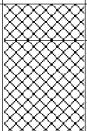
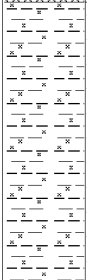
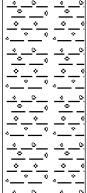
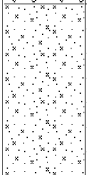
Trial Pit No.: TP12

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.10	0.60	105		0.15	Topsoil
J T	0.25				MADE GROUND: Brown slightly sandy slightly gravelly silty clay. Gravel is fine to coarse clinker, flint, wood, plastic, metal and possible ACM.	
B	0.50					
J T D	0.65					
D V	1.00				Stiff light orange brown slightly gravelly sandy silty CLAY. Gravel is fine to coarse flint. (River Terrace Deposits)	
D V	1.70					
D	2.00					
						Orange brown and grey mottled slightly sandy gravelly CLAY. Gravel is fine to coarse flint. (River Terrace Deposits)
					3.30	Orange brown silty fine to medium SAND. (River Terrace Deposits)
					End of Pit	
Remarks: Trial pit unstable below 2.6m depth. Trial pit collapsed to 2.8m depth on completion. Rapid groundwater seepage noted below 2.60m depth.						Excavation Method: Mechanical Excavator
						Dimensions: Various
						Made By: LG



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Trial Pit No.: TP13

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.10		115		0.15	Topsoil with occasional fine to medium gravel of flint.
J T	0.25					MADE GROUND: Brown sandy gravelly clay. Gravel is fine to coarse flint and glass with occasional clinker, metal and clay pipe.
D	0.50				0.70	
J T D V	0.80 0.90					Stiff light brown slightly gravelly sandy silty CLAY. Gravel is predominantly coarse and occasionally fine to medium flint. (River Terrace Deposits)
			>130			
D	1.80					
V	1.90					
D	2.40				2.50	Orange brown silty fine to medium SAND. (River Terrace Deposits)
D	3.00				3.00	
						End of Pit

Remarks:

Groundwater seepage noted below 2.5m depth.

Trial pit unstable below 2.5m depth. Trial pit collapsed to 2.9m depth on completion.

Excavation Method: Mechanical Excavator

Dimensions: 2.0m x 0.7m

Made By: LG



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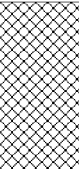
Trial Pit No.: TP14

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

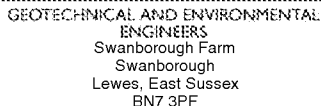
Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.20					MADE GROUND: Brown and dark grey slightly clayey silty sandy fine to coarse gravel of brick, metal, nails, leather, clinker and plastic.
J T	0.60				0.70	
D V	0.80		>130			Stiff orange brown slightly gravelly sandy silty CLAY. Gravel is fine to coarse flint and fine ironstone. (River Terrace Deposits)
D V	1.10		110			
V	1.60		100			
D	2.00					
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
						
					3.00	
						End of Pit

Remarks:
Trial pit dry and stable on completion.

Excavation Method: Mechanical Excavator

Dimensions:

Made By: LG



End Date: 12/11/2012

Made By: LG



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Trial Pit No.: TP16

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.10				0.30	Topsoil.
J T D V	0.40 0.50		>130			Stiff orange brown slightly gravelly sandy silty CLAY. Gravel is fine to coarse chalk and flint with a trace of ironstone. (River Terrace Deposits)
D V	1.00		130			
V	1.60		110			becoming light grey and orange brown mottled below 1.6m depth.
D	2.00				2.50	
D	2.60					Orange brown and light grey mottled clayey fine to medium SAND. (River Terrace Deposits)
D	3.00				3.00	becoming brown below 2.8m depth.
						End of Pit

Remarks:

Trial pit collapsing below 2.5m depth.

Groundwater seepage noted below 2.5m depth.

Excavation Method: Mechanical Excavator

Dimensions:

Made By: LG



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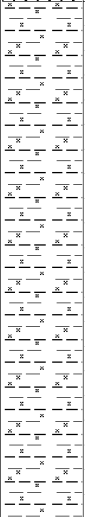
Trial Pit No.: TP17

Site Name: The Vinery, Poling, West Sussex

Job No.: LW23270

Start Date: 12/11/2012

End Date: 12/11/2012

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.10		120		0.20	Topsoil.
J T	0.30					Stiff orange brown slightly gravelly very silty CLAY. Gravel is fine to medium flint with a trace of ironstone. (River Terrace Deposits)
D V	0.50					
D V	1.00		115			
			120			
D V	2.00					
					2.30	
						Very stiff light grey and orange brown silty sandy CLAY with occasional cobbles of flint. (River Terrace Deposits)
D	2.50				2.70	
						Orange brown silty fine to medium SAND. (River Terrace Deposits)
D	3.00				3.00	
						End of Pit

Remarks:

Trial pit collapsing below 2.7m depth.

Ground water seepage noted below 2.7m depth.

Excavation Method: Mechanical Excavator

Dimensions: Various

Made By: LG

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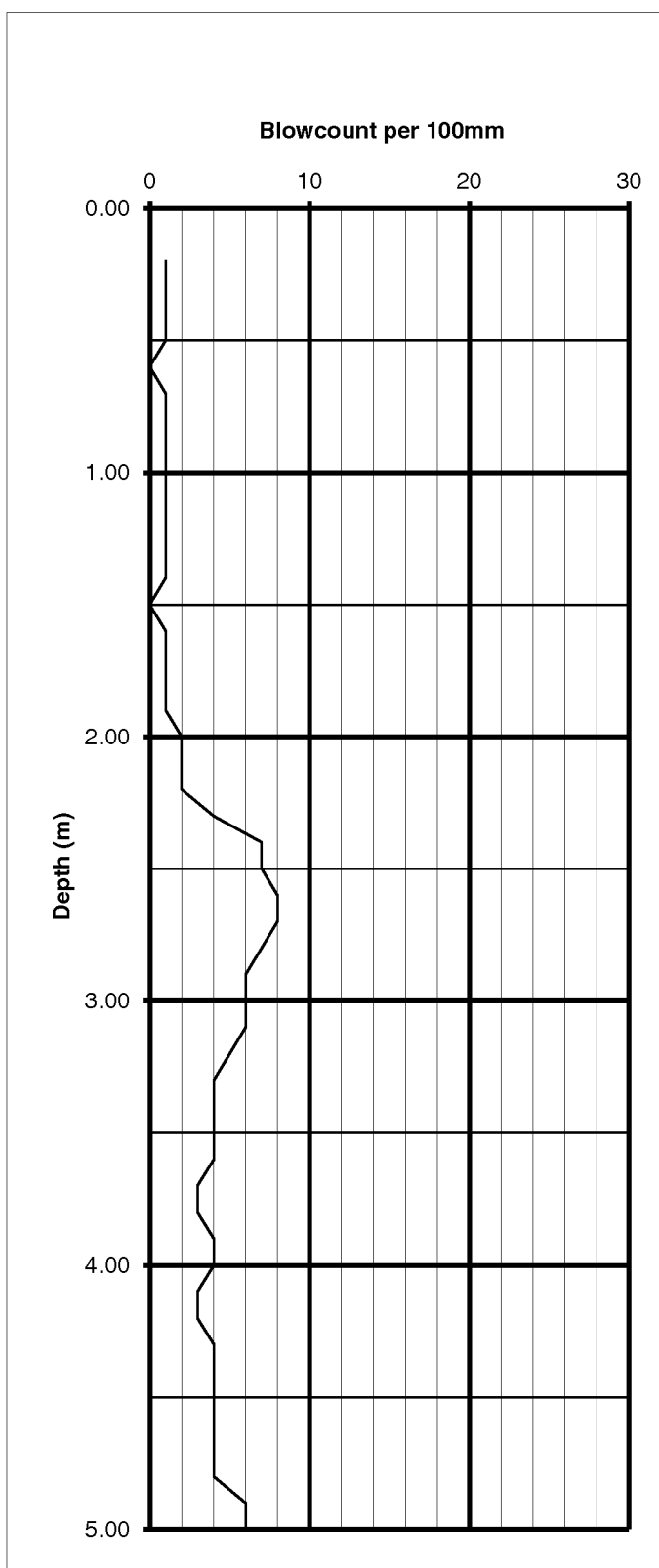
DPSH Continuous Dynamic Probe N₁₀₀ vs Depth Profile

SITE The Vinery, Poling, West Sussex

Report Ref. LW23270

DP No. WS10

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	1	
0.30	1	
0.40	1	
0.50	1	
0.60	0	
0.70	1	
0.80	1	
0.90	1	
1.00	1	
1.10	1	
1.20	1	
1.30	1	
1.40	1	
1.50	0	
1.60	1	
1.70	1	
1.80	1	
1.90	1	
2.00	2	
2.10	2	
2.20	2	
2.30	4	
2.40	7	
2.50	7	
2.60	8	
2.70	8	
2.80	7	
2.90	6	
3.00	6	
3.10	6	
3.20	5	
3.30	4	
3.40	4	
3.50	4	
3.60	4	
3.70	3	
3.80	3	
3.90	4	
4.00	4	
4.10	3	
4.20	3	
4.30	4	
4.40	4	
4.50	4	
4.60	4	
4.70	4	
4.80	4	
4.90	6	
5.00	6	



Comments

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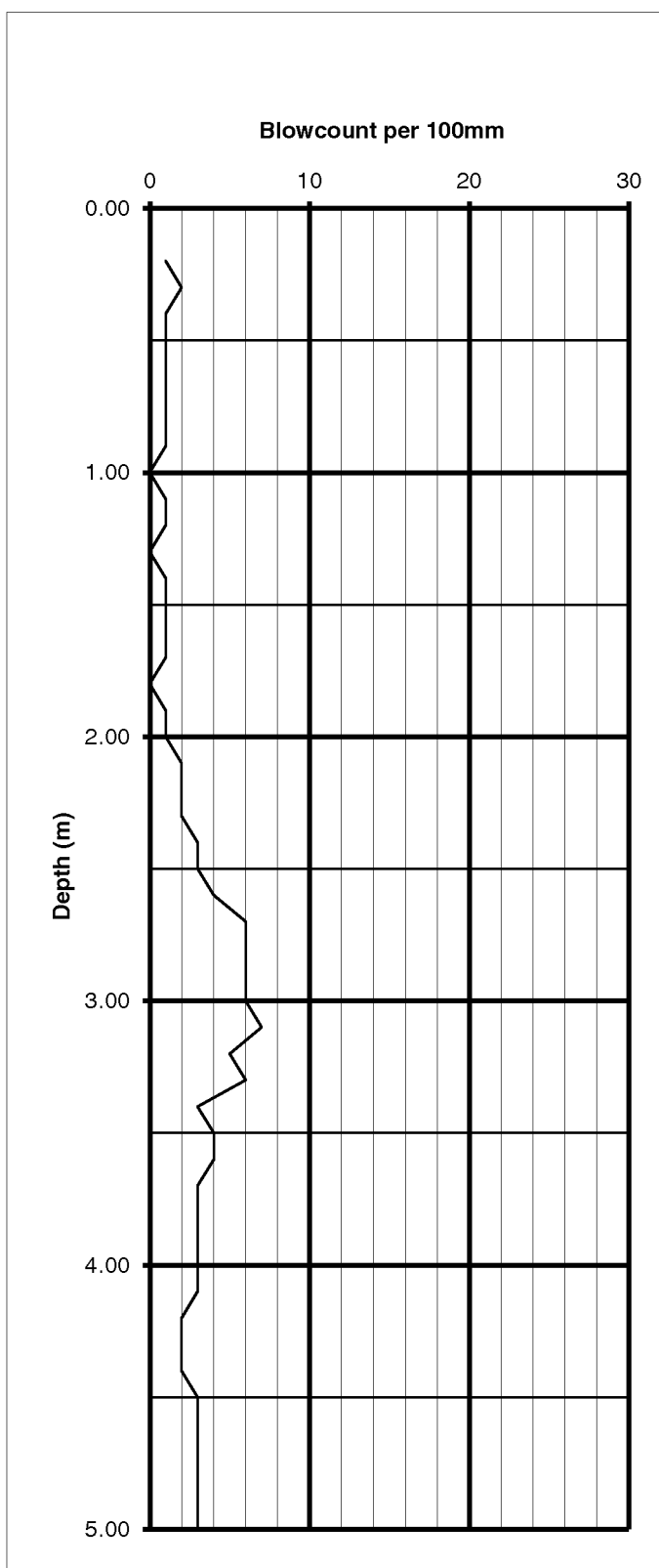
DPSH Continuous Dynamic Probe N₁₀₀ vs Depth Profile

SITE The Vinery, Poling, West Sussex

Report Ref. LW23270

DP No. WS12

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	1	
0.30	2	
0.40	1	
0.50	1	
0.60	1	
0.70	1	
0.80	1	
0.90	1	
1.00	0	
1.10	1	
1.20	1	
1.30	0	
1.40	1	
1.50	1	
1.60	1	
1.70	1	
1.80	0	
1.90	1	
2.00	1	
2.10	2	
2.20	2	
2.30	2	
2.40	3	
2.50	3	
2.60	4	
2.70	6	
2.80	6	
2.90	6	
3.00	6	
3.10	7	
3.20	5	
3.30	6	
3.40	3	
3.50	4	
3.60	4	
3.70	3	
3.80	3	
3.90	3	
4.00	3	
4.10	3	
4.20	2	
4.30	2	
4.40	2	
4.50	3	
4.60	3	
4.70	3	
4.80	3	
4.90	3	
5.00	3	



Comments

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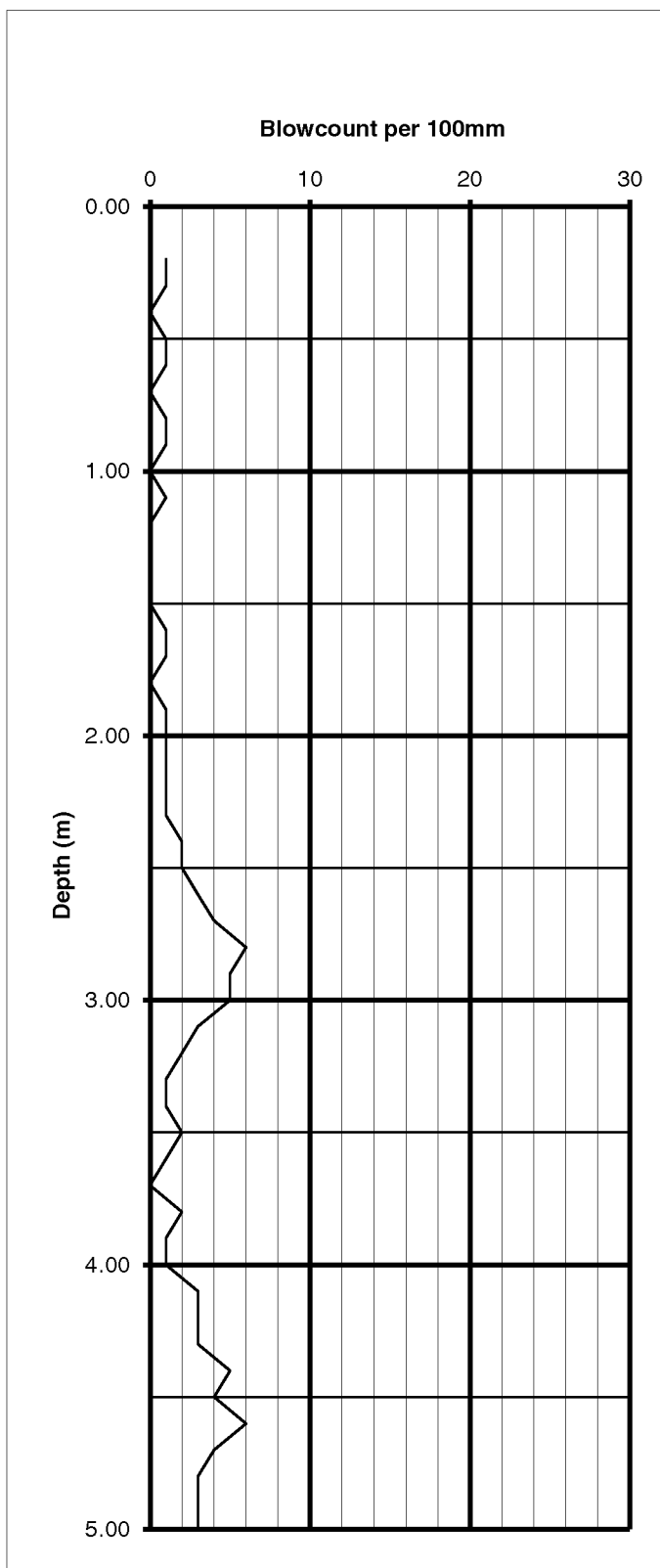
DPSH Continuous Dynamic Probe N₁₀₀ vs Depth Profile

SITE The Vinery, Poling, West Sussex

Report Ref. LW23270

DP No. WS14

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	1	
0.30	1	
0.40	0	
0.50	1	
0.60	1	
0.70	0	
0.80	1	
0.90	1	
1.00	0	
1.10	1	
1.20	0	
1.30	0	
1.40	0	
1.50	0	
1.60	1	
1.70	1	
1.80	0	
1.90	1	
2.00	1	
2.10	1	
2.20	1	
2.30	1	
2.40	2	
2.50	2	
2.60	3	
2.70	4	
2.80	6	
2.90	5	
3.00	5	
3.10	3	
3.20	2	
3.30	1	
3.40	1	
3.50	2	
3.60	1	
3.70	0	
3.80	2	
3.90	1	
4.00	1	
4.10	3	
4.20	3	
4.30	3	
4.40	5	
4.50	4	
4.60	6	
4.70	4	
4.80	3	
4.90	3	
5.00	3	



Comments

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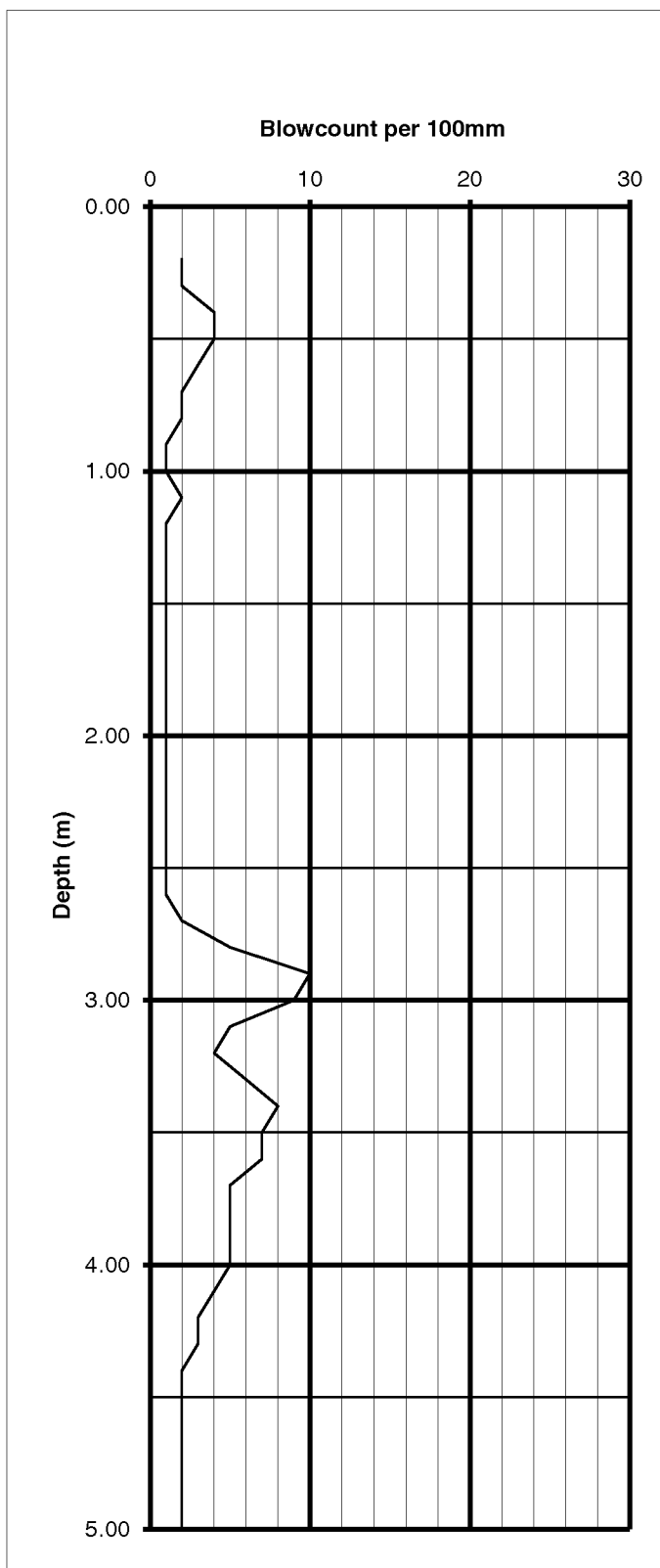
DPSH Continuous Dynamic Probe N₁₀₀ vs Depth Profile

SITE The Vinery, Poling, West Sussex

Report Ref. LW23270

DP No. WS15

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	2	
0.30	2	
0.40	4	
0.50	4	
0.60	3	
0.70	2	
0.80	2	
0.90	1	
1.00	1	
1.10	2	
1.20	1	
1.30	1	
1.40	1	
1.50	1	
1.60	1	
1.70	1	
1.80	1	
1.90	1	
2.00	1	
2.10	1	
2.20	1	
2.30	1	
2.40	1	
2.50	1	
2.60	1	
2.70	2	
2.80	5	
2.90	10	
3.00	9	
3.10	5	
3.20	4	
3.30	6	
3.40	8	
3.50	7	
3.60	7	
3.70	5	
3.80	5	
3.90	5	
4.00	5	
4.10	4	
4.20	3	
4.30	3	
4.40	2	
4.50	2	
4.60	2	
4.70	2	
4.80	2	
4.90	2	
5.00	2	



Comments

ASHDOWN SITE INVESTIGATION LIMITED

Site: The Vinery, Poling, West Sussex

Report No.: LW23270

Sheet No.: 1 of 2

SUMMARY OF IN SITU FARNELL CONE PENETROMETER (CBR) TEST RESULTS

BH/ TP No.	Depth m	Moisture Content %	Classification	CBR Values			Cone Depth
				Test 1	Test 2	Test 3	
				%	%	%	
TP10	0.50			2.0	2.0	2.0	Base of pit.
				2.0	2.0	2.0	75mm below base of pit.
				2.0	2.0	2.0	150mm below base of pit.
				2.0	2.0	2.0	225mm below base of pit.
				2.0	2.0	2.0	300mm below base of pit.
TP11	0.50			1.0	1.5	1.5	Base of pit.
				1.0	1.5	2.0	75mm below base of pit.
				1.0	1.5	2.0	150mm below base of pit.
				1.0	1.5	2.0	225mm below base of pit.
				1.0	1.5	2.0	300mm below base of pit.
TP12	0.50			2.0	1.5	1.5	Base of pit.
				4.0	2.0	2.0	75mm below base of pit.
				1.5	1.5	1.5	150mm below base of pit.
				1.5	1.5	1.5	225mm below base of pit.
				1.5	1.5	1.5	300mm below base of pit.
TP14	0.50			6.0	6.0	6.0	Base of pit.
				2.0	2.0	2.0	75mm below base of pit.
				2.0	2.0	2.0	150mm below base of pit.
				2.0	2.0	2.0	225mm below base of pit.
				2.0	2.0	2.0	300mm below base of pit.
TP15	0.50			1.5	1.5	1.5	Base of pit.
				1.5	2.0	1.5	75mm below base of pit.
				1.5	1.5	1.5	150mm below base of pit.
				1.5	1.5	1.5	225mm below base of pit.
				1.5	1.5	1.5	300mm below base of pit.
TP15a	0.50			1.5	1.5	1.5	Base of pit.
				2.0	1.5	2.0	75mm below base of pit.
				2.0	1.5	2.0	150mm below base of pit.
				2.0	1.5	2.0	225mm below base of pit.
				2.0	1.5	2.0	300mm below base of pit.

ASHDOWN SITE INVESTIGATION LIMITED

Site: The Vinery, Poling, West Sussex

Report No.: LW23270

Sheet No.: 2 of 2

SUMMARY OF IN SITU FARNELL CONE PENETROMETER (CBR) TEST RESULTS

BH/ TP No.	Depth m	Moisture Content %	Classification	CBR Values			Cone Depth
				Test 1	Test 2	Test 3	
				%	%	%	
TP16	0.50			1.0	1.0	1.0	Base of pit.
				1.0	2.0	1.5	75mm below base of pit.
				1.0	1.0	1.5	150mm below base of pit.
				1.0	1.0	1.5	225mm below base of pit.
				1.0	1.0	1.5	300mm below base of pit.
TP17	0.50			2.0	2.0	2.0	Base of pit.
				2.0	2.0	2.0	75mm below base of pit.
				2.0	2.0	2.0	150mm below base of pit.
				2.0	2.0	2.0	225mm below base of pit.
				2.0	2.0	2.0	300mm below base of pit.

ASHDOWN SITE INVESTIGATION LIMITED

Site: The Vinery, Poling, West Sussex

Report No.: LW23270

Sheet No.: 1 of 1

SUMMARY OF TRIAL PIT FALLING HEAD SOAKAGE TEST RESULTS

Trial Pit TP13	
Time (mins)	Depth to water (m bgl)
0	0.90
1	0.92
2	0.94
4	0.96
6	0.98
10	0.99
35	1.07
82	1.17
158	1.28
232	1.35
Pit Length – 2.00m Pit Width - 0.70m Pit Depth – 3.00m bgl	

Trial Pit TP15a	
Time (mins)	Depth to water (m bgl)
0	0.69
1	0.69
2	0.69
4	0.68
6	0.68
31	0.67
79	0.67
156	0.67
Pit Length – 1.70m Pit Width - 0.55m Pit Depth – 3.00m bgl	

Remarks:

TP13 - Standing water level at 2.4m prior to start of test.

TP15a - Water ponding at base of trial pit prior to start of test.

bgl - below ground level.

APPENDIX B

Geotechnical Laboratory Testing Notes

Laboratory Test Results

i) Geotechnical Testing

ii) Contamination Testing

GEOTECHNICAL LABORATORY TESTING NOTES

1 Index Tests

Index (Atterberg Limit) tests are undertaken on samples of fine grained soils provide the primary information for the classification of fine grained soils.

Fine grained soil is tested to determine its liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These tests are used to evaluate indices used for soil identification and to help determine the shrinkage and swelling characteristics of the soil under conditions of changing moisture content. The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

The consistency index is derived from the Index Tests and is summarized in the following table. These divisions may be approximate, particularly for low plasticity soils.

Consistency	Consistency Index
Very Soft	<0.25
Soft	0.25 to 0.50
Firm	0.50 to 0.75
Stiff	0.75 to 1.00
Very Stiff	>1.00

Based on BN EN ISO 14688-2:2004

2 Particle Size Distribution Tests

Sieve analyses are carried out soil samples to establish their particle size distribution that can assist in the assessment of the permeability and classification of granular soils.

The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

3 Natural Moisture/ Saturated Moisture Content Determination of Chalk

The results of natural moisture or saturated moisture content tests of disturbed samples of chalk are used to assist in the classification of the chalk to determine key geotechnical parameters of strength, density and crushing properties.

The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

4 Soil Suction Testing

Soil suction tests are undertaken for the determination of the state of desiccation in clay soils.

The testing is carried out in accordance with the Building Research Establishment Information Paper IP4/93, dated February 1993.

5 Triaxial Compression Tests

Undrained triaxial compression tests are carried out on undisturbed samples of cohesive soil in order to assist in the determination of the undrained shear strength of the soil. The results of moisture content and density determinations are also included.

The tests are carried out in accordance with BS1377: Part 7: 1990 + A1:1994 Shear strength tests (total stress).

6 Shear Vane and Hand Penetrometer Testing

Undisturbed samples are tested in the laboratory using a Geonor Hand Shear Vane for the determination of their undrained shear strength.

The vane tests are carried out in general accordance with BS1377: Part 7: 1990 + A1:1994 Shear strength tests (total stress).

7 One Dimensional Consolidation Tests

One-dimensional consolidation tests are performed on undisturbed soil samples to ascertain their settlement characteristics.

The tests are carried out in accordance with BS1377: Part 5: 1990 + A1:1994 Compressibility, Permeability and Durability tests.

8 Dry Density / Moisture Content Relationship (Compaction) Testing

Compaction testing for the determination of the dry density / moisture content relationship is carried out on using either a 2.5kg, 4.5kg hammer or a vibrating hammer.

The tests are carried out in accordance with the British Standard BS1377: Part 4: 1990 + A1 & A2:2002 Compaction-related tests.

9 California Bearing Ratio

The soil is usually compacted at the as dug “natural” moisture content and often at moisture contents around the natural moisture content.

The California bearing ratio is determined in accordance with the British Standard BS1377: Part 4: 1990 + A1 & A2:2002 Compaction related tests.

10 Chemical Testing

Soil samples are tested for their concentration of water soluble sulphate and pH for use in concrete mix design.

Water samples are tested for total sulphate concentration and pH value.

Where a water soluble sulphate content in soils or a total sulphate content in groundwater exceeds 3000mg/l SO₄ the magnesium sulphate content of the samples is required to be determined (BRE Special Digest 1:2005).

ASHDOWN SITE INVESTIGATION LTD

Site:	The Vinery, Poling, West Sussex.	Report No:	LW23270
		Sheet No:	1 of 2

SOIL CLASSIFICATION SUMMARY

Sample No.	Depth (m)	Nat. Moist. Cont. (w %)	Equiv. Moist. Cont. (w _a %)	Atterberg Limits			Class'n	Cons. Index (I _c)	% passing 425 μ m sieve	Visual Description of Sample
				W _l %	W _p %	I _p %				
TP10	1.00	23	23	41	19	22	CI	0.81	100	Stiff brown slightly sandy CLAY.
TP11	0.35	24	24	38	19	19	CI	0.73	100	Firm green brown slightly sandy silty CLAY with a single root <4mm diameter.
	1.00	26	27	50	21	29	CI	0.81	100	Stiff brown sandy CLAY with rare fine flint gravel.
TP12	2.00	13	38	51	18	33	CH	0.39	29	Brown and light grey slightly sandy very gravelly CLAY. Gravel is fine to coarse flint.
TP13	0.80	21	22	33	21	12	CL	0.92	97	Stiff brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse flint.
	2.40	20	21	34	16	18	CL	0.73	95	Firm brown and grey slightly gravelly sandy CLAY. Gravel is fine to medium flint.
TP14	1.10	28	28	43	18	25	CI	0.60	100	Firm brown silty CLAY.
	3.00	17	21	27	11	16	CL	0.38	80	Brown slightly gravelly sandy CLAY. Gravel is fine to coarse flint.
TP15	1.00	26	26	44	19	25	CI	0.72	100	Firm brown silty CLAY.
TP16	0.50	24	24	40	21	19	CI	0.83	75	Stiff brown slightly gravelly silty CLAY. Gravel is fine to medium chalk.
	2.00	19	21	36	14	22	CI	0.67	87	Firm brown and grey occasionally black stained slightly gravelly CLAY. Gravel is fine to medium flint.
TP17	0.50	26	26	44	18	26	CI	0.69	100	Firm brown silty CLAY with occasional roots < 1mm.
	2.00	22	22	33	17	16	CL	0.72	100	Firm grey and brown silty CLAY.

Remarks: Gravel in sample TP16 – 0.50m all broke down during sample preparation.

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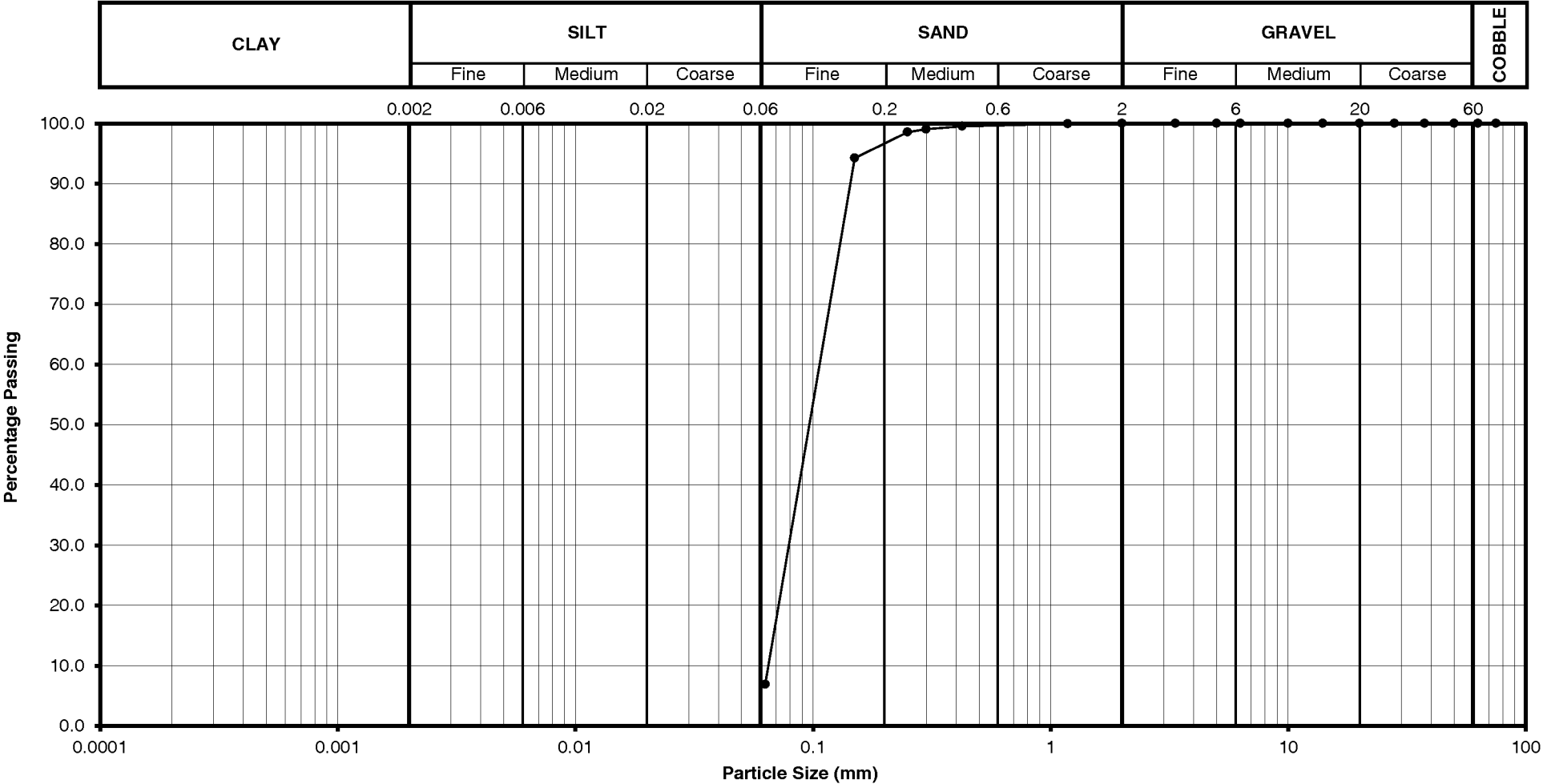
Site:	The Vinery, Poling, West Sussex.	Report No:	LW23270
		Sheet No:	2 of 2

SOIL CLASSIFICATION SUMMARY

Sample No.	Depth (m)	Nat. Moist. Cont. (w %)	Equiv. Moist. Cont. (w _a %)	Atterberg Limits			Class'n	Cons. Index (I _c)	% passing 425 μ m sieve	Visual Description of Sample
				W _l %	W _p %	I _p %				
WS10	1.50	20	21	32	17	15	CL	0.72	95	Firm brown slightly gravelly silty CLAY. Gravel is fine to medium flint.
WS11	0.50	26	26	46	19	27	CI	0.74	100	Firm brown silty CLAY with occasional fine (<1mm) roots.
	1.90	14	14	32	12	20	CL	0.85	95	Stiff grey brown slightly gravelly CLAY. Gravel is fine to coarse flint.
WS12	1.50	23	23	35	18	17	CL/CI	0.73	100	Firm brown silty CLAY.
	2.00	16	20	26	12	14	CL	0.45	80	Soft to firm grey brown slightly gravelly CLAY. Gravel is fine to coarse flint.
WS14	1.60	17	20	30	15	15	CL	0.67	84	Firm brown slightly gravelly silty CLAY. Gravel is fine to medium flint.
WS15	1.50	25	25	43	18	25	CI	0.72	100	Firm grey and dark brown gravelly silty CLAY.

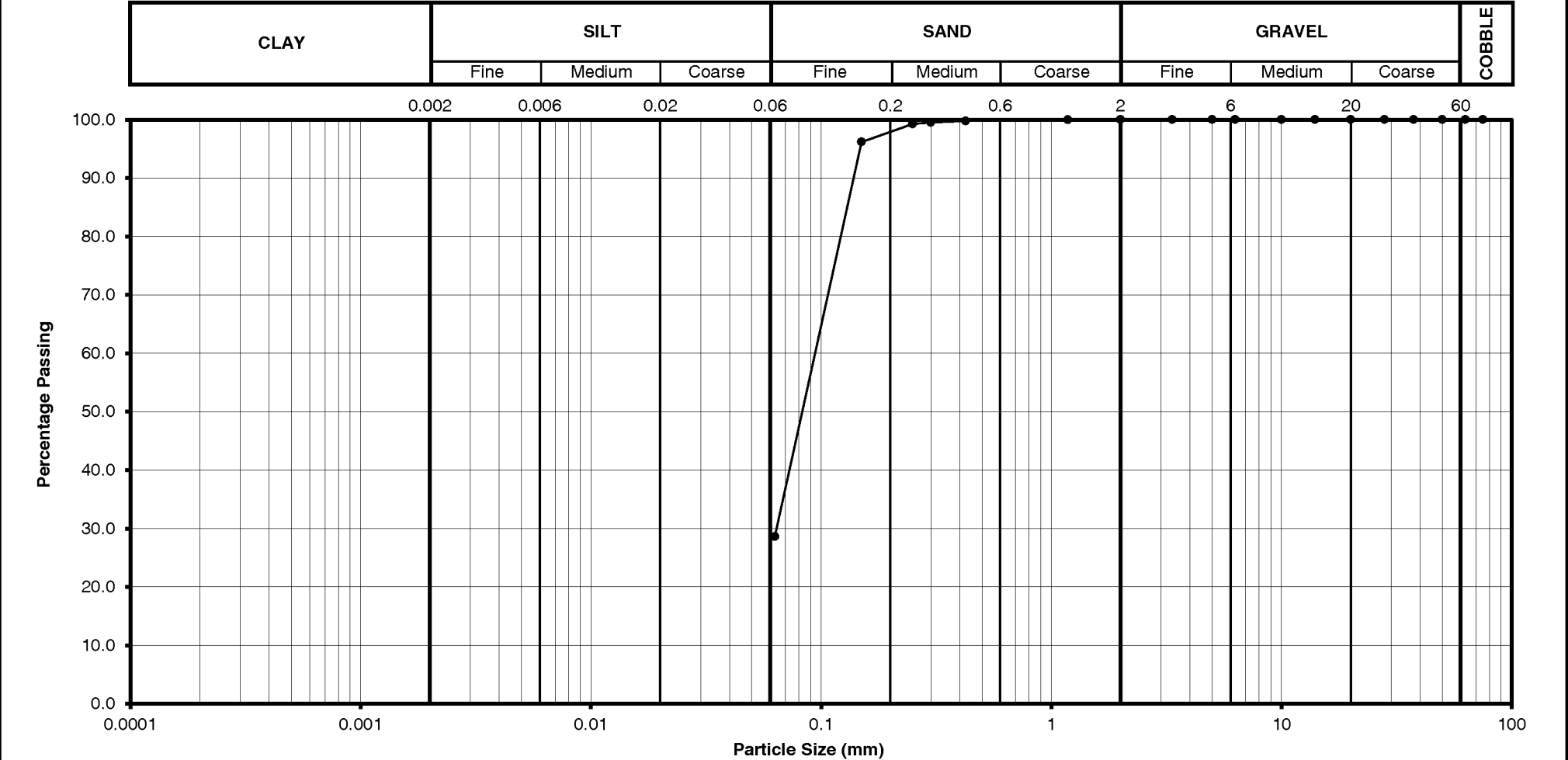
Remarks:

Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990



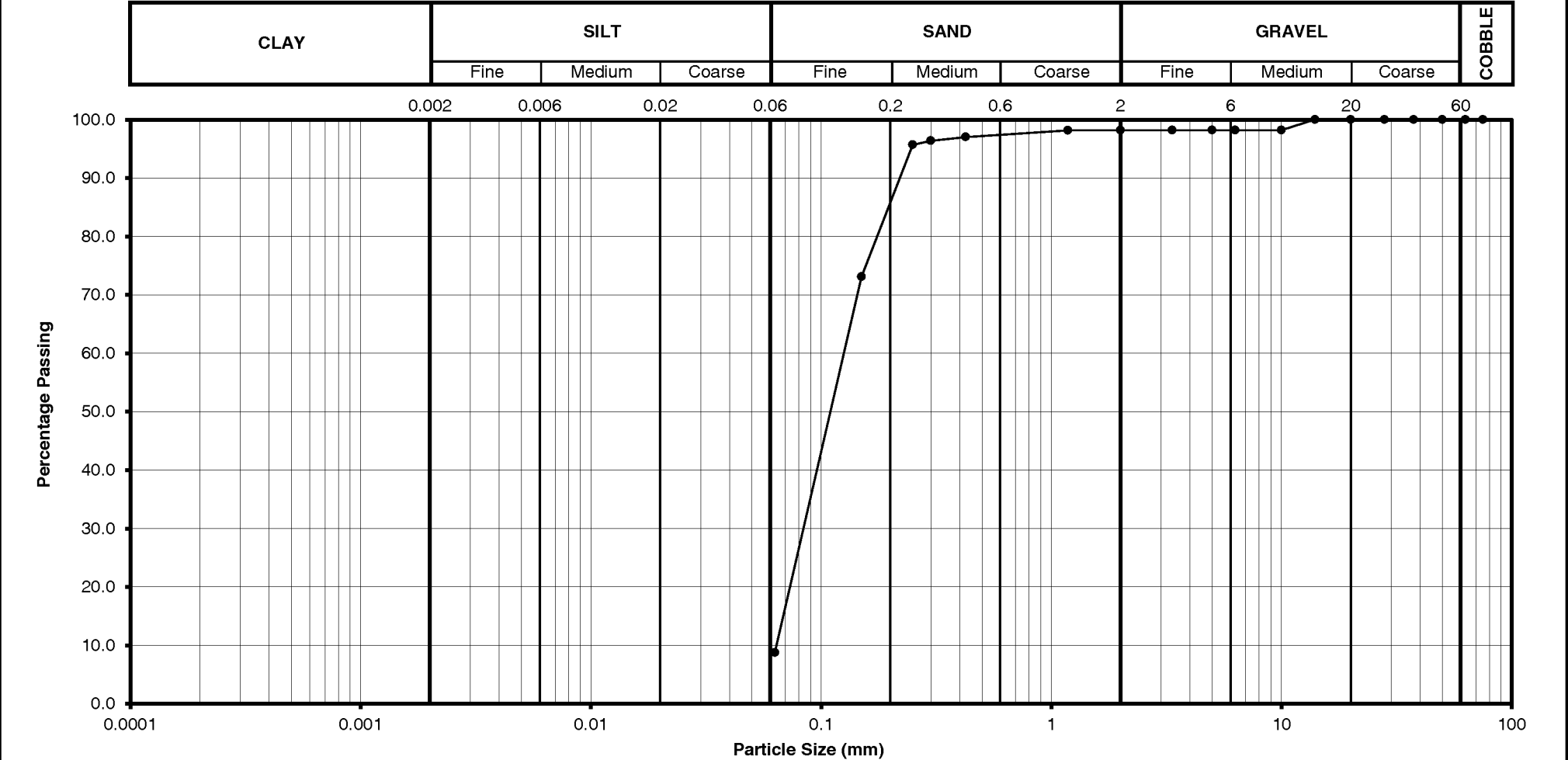
Job Name	The Vinery, Poling, West Sussex	BH/ TP No.	TP10	Sample Description	Silty SAND.
Job No.	LW23270	Sample Depth (m)	2.50m		

Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990



Job Name	The Vinery, Poling, West Sussex	BH/ TP No.	TP11	Sample Description	Very silty SAND.
Job No.	LW23270	Sample Depth (m)	3.00m		

Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990



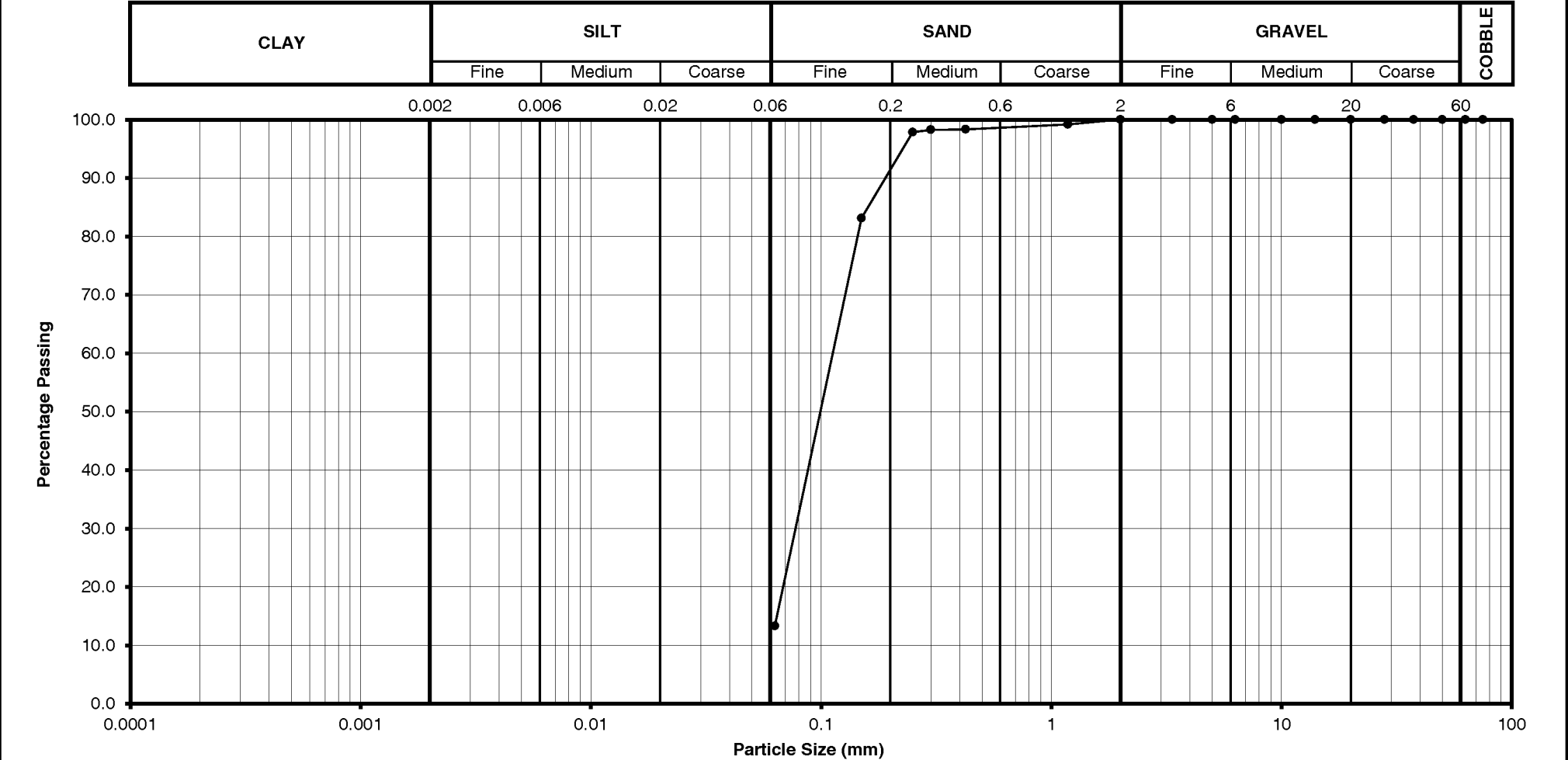
Job Name	The Vinery, Poling, West Sussex	BH/ TP No.	TP13	Sample Description	Slightly gravelly silty SAND.
Job No.	LW23270	Sample Depth (m)	3.00m		

Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990

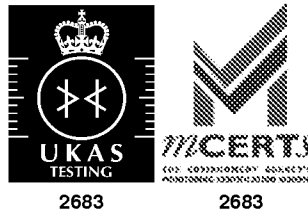


Job Name	The Vinery, Poling, West Sussex	BH/ TP No.	TP16	Sample Description	Silty SAND.
Job No.	LW23270	Sample Depth (m)	3.00m		

Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990



Job Name	The Vinery, Poling, West Sussex.	BH/ TP No.	WS10	Sample Description	Silty SAND
Job No.	LW23270	Sample Depth (m)	2.90		



Unit A2
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St Leonards on Sea
East Sussex
TN38 9BY

THE ENVIRONMENTAL LABORATORY LTD

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Reporting Date: 22/11/12

ANALYTICAL REPORT No. AR41576

Samples Received By:-	Laboratory Courier
Samples Received:-	15/11/12
Your Job No:	LW23270
Site Location:	The Vinery, Poling, West Sussex
No Samples Received:-	6

Report Checked By:-

Steve Knight
Director

Authorised By:-

Mike Varley BSc, CChem, CSci, FRSC
Chief Chemist

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY

ANALYTICAL REPORT No. AR41576

Location: The Vinery, Poling, West Sussex



Your Job No: LW23270

Reporting Date: 22/11/12

**F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF**

Soils

IS		Characteristic	Clay	Clay	Clay	Clay	Sand	Sand
		TP/BH	TP13	TP14	WS10	WS11	WS11	WS14
		Depth (m)	0.80	2.00	2.50	1.50	2.60	2.80
		Our ref	54346	54347	54348	54349	54350	54351
pH Value**	(Units)	7.6	7.5	7.6	7.8	7.7	8.0	
Water Soluble Sulphate	(mg/l as SO ₄)	25	21	11	11	12	16	

All results expressed on dry weight basis

** - MCERTS accredited test

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St Leonards on Sea
East Sussex
TN38 9BY

THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR41576
Your Job No: LW23270
Sample Receipt Date: 15/11/12
Reporting Date: 22/11/12

Registered: 15/11/12
Prepared: 16/11/12
Analysis complete: 22/11/12

TEST METHOD SUMMARY

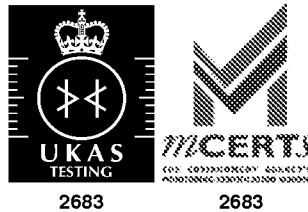
PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
pH Value**	Air dried sample	20/11/12	113	Probe
Water Soluble Sulphate	Air dried sample	21/11/12	209	Colorimetry

** - MCERTS Accredited test

Determinands not marked with * or ** are non accredited

MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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Ponswood Industrial Estate
St Leonards on Sea
East Sussex
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THE ENVIRONMENTAL LABORATORY LTD

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Reporting Date: 23/11/2012

ANALYTICAL REPORT No. AR41577

Samples Received By:- Laboratory Courier
Samples Received:- 15/11/12
Your Job No: LW23270
Site Location: The Vinery, Poling, West Sussex
No Samples Received:- 15

Report Checked By:-

Steve Knight
Director

Authorised By:-

Mike Varley BSc, CChem, CSci, FRSC
Chief Chemist

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ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

Your Job No: LW23270

Reporting Date: 23/11/12

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

<u>Soils</u>	Characteristic	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Sandy silt loam	Sandy silt loam	Silty clay loam	Silt Loam	Silt Loam
	TP/BH	TP10	TP11	TP12	TP13	TP13	TP14	TP14	TP15	TP15A	TP16
	Depth (m)	0.15	0.10	0.25	0.10	0.25	0.20	0.60	0.25	0.30	0.10
	Our ref	54354	54355	54356	54357	54358	54359	54360	54361	54362	54363
Stone Content	(%)	<1	<1	<1	<1	<1	<1	17	<1	8	<1
Arsenic**	(mg/kg)	10.4	11.2	9.6	11.3	20.1	165.2	59.3	14.9	11.4	12.1
Cadmium**	(mg/kg)	<0.5	<0.5	0.5	0.6	0.5	1.8	3.3	<0.5	0.6	<0.5
Chromium**	(mg/kg)	30	30	26	29	37	136	75	21	28	29
Lead**	(mg/kg)	27	34	247	194	241	410	270	301	108	66
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel**	(mg/kg)	17	19	17	19	17	45	18	15	15	18
Copper**	(mg/kg)	21	21	40	44	49	205	92	53	32	27
Zinc**	(mg/kg)	74	95	215	244	182	1826	613	256	126	96
Selenium**	(mg/kg)	2.0	2.3	3.4	3.5	2.0	3.7	3.9	2.2	1.6	1.6
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water Soluble Boron	(mg/kg)	<0.5	1.1	3.0	2.2	2.1	2.9	2.9	2.0	1.1	1.0
pH Value**	(Units)	7.1	7.0	7.2	7.3	7.4	7.5	7.6	7.4	7.0	7.3
Total Sulphate	(% as SO ₄)	n/t	n/t	<0.05	n/t	n/t	n/t	<0.05	n/t	n/t	n/t
Total Cyanide**	(mg/kg)	n/t	n/t	<1	n/t	n/t	n/t	<1	n/t	n/t	n/t
Free Cyanide	(mg/kg)	n/t	n/t	<1	n/t	n/t	n/t	<1	n/t	n/t	n/t
Sulphide	(mg/kg)	n/t	n/t	<2	n/t	n/t	n/t	<2	n/t	n/t	n/t
Total Sulphur	(%)	n/t	n/t	<10	n/t	n/t	n/t	<10	n/t	n/t	n/t
Thiocyanate	(mg/kg)	n/t	n/t	<2	n/t	n/t	n/t	<2	n/t	n/t	n/t
Total Monohydric Phenols***	(mg/kg)	n/t	n/t	<1	n/t	n/t	n/t	<1	n/t	n/t	n/t
Soil Organic Matter*	(%)	1.8	2.3	3.0	2.6	2.6	4.8	2.8	3.7	2.6	2.2
Ammonium	(mg/l)	n/t	n/t	<0.1	n/t	n/t	n/t	<0.1	n/t	n/t	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* - UKAS accredited test

*** - Sum of Phenol, 2, 3, 5,-Trimethylphenol, 2, 3,-Dimethylphenol, 3, 4-Dimethylphenol, Resorcinol/Catechol, o-Cresol, m, p-Cresol & Napthol

GM



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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY

ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex



Your Job No: LW23270

Reporting Date: 23/11/12

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

Characteristic	Silt Loam	Silt Loam	Silt Loam	Sandy silt loam	Silty clay loam
TP/BH	WS10	WS12	WS14	WS15	WS15
Depth (m)	0.20	0.20	0.30	0.20	0.90
Our ref	54364	54365	54366	54367	54368
Stone Content (%)	<1	<1	<1	<1	<1
Arsenic** (mg/kg)	9.5	8.5	10.9	230.7	13.4
Cadmium** (mg/kg)	<0.5	<0.5	<0.5	1.9	<0.5
Chromium** (mg/kg)	26	26	29	191	25
Lead** (mg/kg)	24	20	24	275	35
Mercury** (mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel** (mg/kg)	13	14	18	22	12
Copper** (mg/kg)	13	14	16	237	16
Zinc** (mg/kg)	58	55	64	1535	92
Selenium** (mg/kg)	1.7	1.4	1.1	3.9	1.7
Hexavalent Chromium (mg/kg)	<2	<2	<2	<2	<2
Water Soluble Boron (mg/kg)	0.6	0.7	<0.5	1.7	1.1
pH Value** (Units)	5.7	7.0	7.0	7.2	8.0
Soil Organic Matter* (%)	1.5	2.1	2.1	6.3	1.4

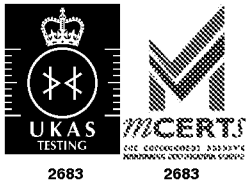
All results expressed on dry weight basis

** - MCERTS accredited test

* - UKAS accredited test

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*** - Sum of Phenol, 2, 3, 5,-Trimethylphenol, 2, 3,-Dimethylphenol, 3, 4-Dimethylphenol, Resorcinol/Catechol, o-Cresol, m, p-Cresol & Napthol



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY



ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

Your Job No: LW23270

Reporting Date: 23/11/12

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

<u>Soils</u>		Characteristic	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Sandy silt loam	Sandy silt loam	Silty clay loam	Silt Loam	Silt Loam
		TP/BH	TP10	TP11	TP12	TP13	TP13	TP14	TP14	TP15	TP15A	TP16
		Depth (m)	0.15	0.10	0.25	0.10	0.25	0.20	0.60	0.25	0.30	0.10
		Our ref	54354	54355	54356	54357	54358	54359	54360	54361	54362	54363
Naphthalene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
Anthracene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	2.6	<0.5	<0.5
Pyrene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	2.4	<0.5	<0.5
Benz(a)anthracene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1.3	<0.5	<0.5
Chrysene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1.3	<0.5	<0.5
Benzo(b)fluoranthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1.0	<0.5	<0.5
Benzo(k)fluoranthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1.2	<0.5	<0.5
Benzo(a)pyrene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1.2	<0.5	<0.5
Indeno(123-cd)pyrene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5
Dibenz(ah)anthracene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5
Benzo(ghi)perylene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5
Total PAH**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.8	13.9	<0.5	<0.5

All results expressed on dry weight basis

** - MCERTS accredited test

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY



ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

Your Job No: LW23270

Reporting Date: 23/11/12

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

<u>Soils</u>		Characteristic	Silt Loam	Silt Loam	Silt Loam	Sandy silt loam	Silty clay loam
		TP/BH	WS10	WS12	WS14	WS15	WS15
		Depth (m)	0.20	0.20	0.30	0.20	0.90
		Our ref	54364	54365	54366	54367	54368
Naphthalene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene**	(mg/kg)		<0.5	<0.5	<0.5	0.5	<0.5
Benzo(b)fluoranthene**	(mg/kg)		<0.5	<0.5	<0.5	0.7	<0.5
Benzo(k)fluoranthene**	(mg/kg)		<0.5	<0.5	<0.5	0.5	<0.5
Benzo(a)pyrene**	(mg/kg)		<0.5	<0.5	<0.5	0.6	<0.5
Indeno(123-cd)pyrene**	(mg/kg)		<0.5	<0.5	<0.5	0.5	<0.5
Dibenz(ah)anthracene**	(mg/kg)		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(ghi)perylene**	(mg/kg)		<0.5	<0.5	<0.5	0.6	<0.5
Total PAH**	(mg/kg)		<0.5	<0.5	<0.5	3.4	<0.5

All results expressed on dry weight basis

** - MCERTS accredited test

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY



ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

Your Job No: LW23270

Reporting Date: 23/11/12

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

Characteristic	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Sandy silt loam	Sandy silt loam	Silty clay loam	Silt Loam	Silt Loam
TP/BH	TP10	TP11	TP12	TP13	TP13	TP13	TP14	TP14	TP15	TP15A	WS10
Depth (m)	0.15	0.10	0.25	0.10	0.25	0.20	0.60	0.25	0.30	0.20	
Our ref	54354	54355	54356	54357	54358	54359	54360	54361	54362	54364	
C ₈ -C ₁₀ (mg/kg)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C ₁₀ -C ₁₂ (mg/kg)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C ₁₂ -C ₁₆ (mg/kg)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C ₁₆ -C ₂₁ (mg/kg)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C ₂₁ -C ₃₅ (mg/kg)	<5	<5	53	<5	<5	17	<5	<5	<5	<5	<5
Total Petroleum Hydrocarbons** (mg/kg)	<5	<5	53	<5	<5	17	<5	<5	<5	<5	<5

Accredited for TPH only, not banding
All results expressed on dry weight basis

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY



ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

Your Job No: LW23270

Reporting Date: 23/11/12

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	Characteristic	Silt Loam	Sandy silt loam	Silty clay loam
	TP/BH	WS14	WS15	WS15
	Depth (m)	0.30	0.20	0.90
	Our ref	54366	54367	54368
	C ₈ -C ₁₀	(mg/kg)	<5	<5
	>C ₁₀ -C ₁₂	(mg/kg)	<5	<5
	>C ₁₂ -C ₁₆	(mg/kg)	<5	<5
	>C ₁₆ -C ₂₁	(mg/kg)	<5	<5
	>C ₂₁ -C ₃₅	(mg/kg)	<5	24
	Total Petroleum Hydrocarbons**	(mg/kg)	<5	24

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ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No: LW23270

Reporting Date: 23/11/12

Asbestos Identification

Sample ref:	TP10
Depth (m)	0.15
Our ref:	54354
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

Sample ref:	TP11
Depth (m)	0.10
Our ref:	54355
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

Sample ref:	TP12
Depth (m)	0.25
Our ref:	54356
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

Sample ref:	TP13
Depth (m)	0.10
Our ref:	54357
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

Sample ref:	TP13
Depth (m)	0.25
Our ref:	54358
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

*= UKAS accredited

Analytical result only applies to the sample as submitted by the client

Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY



ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No: LW23270

Reporting Date: 23/11/12

Asbestos Identification

Sample ref:	TP14
Depth (m)	0.20
Our ref:	54359
#Description of Sample Matrix:	Sandy silt loam
*Result	No asbestos identified

Sample ref:	TP14
Depth (m)	0.60
Our ref:	54360
#Description of Sample Matrix:	Sandy silt loam
*Result	No asbestos identified

Sample ref:	TP15
Depth (m)	0.25
Our ref:	54361
#Description of Sample Matrix:	Silty clay loam
*Result	No asbestos identified

Sample ref:	TP15A
Depth (m)	0.30
Our ref:	54362
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

Sample ref:	WS10
Depth (m)	0.20
Our ref:	54364
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

*= UKAS accredited

Analytical result only applies to the sample as submitted by the client

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY



ANALYTICAL REPORT No. AR41577

Location: The Vinery, Poling, West Sussex

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No: LW23270

Reporting Date: 23/11/12

Asbestos Identification

Sample ref:	WS14
Depth (m)	0.30
Our ref:	54366
#Description of Sample Matrix:	Silt Loam
*Result	No asbestos identified

Sample ref:	WS15
Depth (m)	0.20
Our ref:	54367
#Description of Sample Matrix:	Sandy silt loam
*Result	No asbestos identified

Sample ref:	WS15
Depth (m)	0.90
Our ref:	54368
#Description of Sample Matrix:	Silty clay loam
*Result	No asbestos identified

*= UKAS accredited

Analytical result only applies to the sample as submitted by the client

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THE ENVIRONMENTAL LABORATORY LTD

SOLID SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR41577
Your Job No: LW23270
Sample Receipt Date: 15/11/12
Reporting Date: 23/11/12

Registered: 15/11/12
Prepared: 16/11/12
Analysis complete: 23/11/12

SOLID TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	22/11/12	118	ICPMS
Cadmium**	Air dried sample	22/11/12	118	ICPMS
Chromium**	Air dried sample	22/11/12	118	ICPMS
Lead**	Air dried sample	22/11/12	118	ICPMS
Mercury**	Air dried sample	22/11/12	118	ICPMS
Nickel**	Air dried sample	22/11/12	118	ICPMS
Copper**	Air dried sample	22/11/12	118	ICPMS
Zinc**	Air dried sample	22/11/12	118	ICPMS
Selenium**	Air dried sample	22/11/12	118	ICPMS
Hexavalent Chromium	As submitted sample	20/11/12	110	Colorimetry
Water Soluble Boron	Air dried sample	21/11/12	202	Colorimetry
pH Value**	Air dried sample	20/11/12	113	Electrometric
Total Sulphate	Air dried sample	21/11/12	208	Colorimetry
Total Cyanide**	As submitted sample	21/11/12	204	Automated Flow Digital Colorimetry
Free Cyanide	As submitted sample	21/11/12	107	Colorimetry
Sulphide	As submitted sample	20/11/12	109	Colorimetry
Total Sulphur	Air dried sample	21/11/12	210	IR Adsorption
Thiocyanate	As submitted sample	20/11/12	146	Colorimetry
Total Monohydric Phenols***	As submitted sample	21/11/12	121	HPLC
Soil Organic Matter*	Air dried sample	20/11/12	111	Titration
Ammonium	As submitted sample	23/11/12	138	Colorimetry
Asbestos*	As submitted sample	20/11/12	179	See note
Speciated PAH**	As submitted sample	19/11/12	133	Gas Chromatography
Carbon Banding (TPH BCB)	As submitted sample	20/11/12	218	Gas chromatography

Asbestos analysis qualitative only

Note:- Documented In-house procedure based on HSG 248 2005

* = UKAS Accredited test

** - MCERTS Accredited test

Determinands not marked with * or ** are not accredited

MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

APPENDIX C

Notes on CLEA

Guidance on Comparing Soil Contamination
Data with a Critical Concentration

CLEA Model Chemical Data Inputs

Statistical Analysis Summary Sheets

ASHDOWN SITE INVESTIGATION LIMITED

Notes on the Contaminated Land Exposure Assessment & Calculation of Soil Screening Values

Assessing risk to human health using the CLEA Model

Background to the CLEA Model

The Environment Agency and DEFRA published the Contaminated Land Exposure Assessment (CLEA) model in 2002. The methodology for the generation of assessment criteria was set out within Contaminated Land Reports (CLR) 7 to 10.

Toxicological data reports (TOX documents) for 23 individual contaminants were also published between 2002 and 2004 for use within the CLEA model.

Following the release of the TOX documents the Environment Agency published a series of Soil Guideline Values (SGVs) for the contaminants arsenic, cadmium, chromium, lead, mercury, nickel, selenium, phenol, toluene and ethylbenzene. SGVs are generic assessment criteria developed for three land uses, the assumptions for each land use were included within the CLR reports.

The generic land uses considered were:

- Residential (with and without plant uptake/vegetable growing)
- Allotments
- Commercial and Industrial

The SGVs can be used as preliminary screening values for sites which fit with the conceptual model (assumptions) of the generic land uses.

The CLEA UK version of the model was released in 2005. This model could be used to generate more detailed and site specific assessment criteria. The CLEA UK model could also be used to generate generic assessment criteria for sites which lie outside of the generic land uses.

Current Guidance

In August 2008 the CLR 7 to 10 documents were officially 'withdrawn' by the Environment Agency along with published SGV reports.

Three new guidance documents were released, replacing the withdrawn CLR7-CLR10 documents, these were:

"Guidance on Comparing Soil Contamination Data with a Critical Concentration", CIEH/CL:AIRE (May 2008) – replacing CLR7;

"Human health toxicological assessment of contaminants in soil (Science Report SC050021/SR2)" Environment Agency, August 2008 – replacing CLR9; and,

"Updated technical background to the CLEA model (Science Report SC050021/SR3)", Environment Agency, August 2008 - replacing CLR10

A revised version of the CLEA UK software model (ver 1.04) was also released in conjunction with the revised guidance. The latest version of the model uses purely deterministic calculations to derive assessment criteria.

The Environment Agency website (www.environment-agency.go.uk) presents the latest guidance. They advise that the current schedule of work includes the review, revision if necessary and re-issue of the TOX reports previously published. As each new TOX report is published, the previous one will be withdrawn.

In the absence of official government figures for some of the contaminants Ashdown Site Investigation Ltd have used the CLEA model to generate Soil Screening Values (SSVs) for a number of the priority contaminants. Where possible the chemical data used to generate these figures has

ASHDOWN SITE INVESTIGATION LIMITED

Notes on the Contaminated Land Exposure Assessment & Calculation of Soil Screening Values

been taken from reports published by the Environment Agency, where no data exists, reference has been made to other published data.

Discussion on Adjustment of Background Daily Intake of Contaminants for Child Targets

As exposure to soils is unlikely to be the sole means through which people may be exposed to a contaminant a background exposure or Mean Daily Intake (MDI) is calculated for each contaminant. Adjustment factors for the MDI are included within Science Report SC050021/SR2 in order to take into consideration the different bodyweights and respiration rates for different age classes.

The starting principle for deriving SSVs is that they are set so that the Average Daily Exposure (ADE) from soils plus the MDI equals the Tolerable Daily Intake (TDI) for that contaminant.

Where the MDI is equal to 50% or greater than TDI then exposure from soils is to be allowed to contribute up to 50% of the TDI when deriving SSVs. When calculating an SSV, this portion of the TDI is referred to as the Tolerable Daily Soil Intake (TDSI).

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Notes on the “Guidance on Comparing Soil Contamination Data with a Critical Concentration” (CIEH & CL: AIRE, May 2008)

The Chartered Institute of Environmental Health & CL:AIRE, have published updated guidance on the statistical assessment of contaminated land data, “*Guidance on Comparing Soil Contamination Data with a Critical Concentration*” (May 2008). This is an update to previous guidance published within Contaminated Land Report CLR7 (Defra, 2002).

The CIEH/CL:AIRE guidance forms part of a package of proposed improved UK guidance highlighted in the Defra discussion paper, “*Assessing risks from land contamination –a proportionate approach. Soil guideline values: The Way Forward (CLAN 06/2006)*”. This discussion paper discussed the role and use of SGVs for managing the risks associated with soil contamination.

The guidance states that its overall aim is to “increase understanding amongst stakeholders of the role that statistics can play in quantifying the uncertainty attached to estimates of the mean concentration of contaminants in soil, thereby creating a more informed basis for regulatory decision-making”.

The initial question, on which the guidance is based, is whether the Site under consideration is to be assessed under the Planning System or under Part 2A of the Environmental Protection Act 1990. The key questions asked when considering contaminant concentrations vary depending on the scenario under consideration. The key questions will generally be:

- **Planning Scenario** – “can we confidently say that the level of contamination on this land is low relative to some appropriate measure of risk?” or “that the level of contamination is lower than the critical concentration” (alternative hypothesis).
- **Part 2A Scenario** – “can we confidently say that the level of contamination on this land is high relative to some appropriate measure of risk?” or “that the level of contamination is higher than the critical concentration” (alternative hypothesis).

Within the guidance, to ‘answer’ the relevant question above, a null hypothesis has been outlined for each scenario, which, if rejected with a high degree of confidence, means that the alternative hypothesis can be accepted. The null hypothesis for a planning scenario is that the soils contain levels of contamination above the critical concentration (i.e. the soils are assumed to be unsuitable for use until proven otherwise). Under the Part 2A scenario, the null hypothesis is that the soils contain levels of contamination below the critical concentration (i.e. the land is assumed not to fall within Part 2A legislation until proved otherwise).

For the planning scenario the null hypothesis may be rejected if it is considered that the 95th percentile of the normally distributed population as a whole lies below the critical concentration i.e. there is a 95% probability that your true population mean lies below the critical concentration. A lower probability of the true mean lying below the critical concentration may be used, but deviation from the standard 95% requires justification.

For the Part 2A scenario the null hypothesis may be rejected if it can be shown that the lower 95th percentile lies above the critical concentration. If the lower 95th percentile lies below the critical concentration but the true population mean lies above the critical concentration further assessment should be undertaken before the Site can be classified under Part 2A.

Guidance on the treatment of outliers (results that are not representative of a sample population), is also provided in the report. The guidance confirms that outliers should only be excluded from the dataset where they are either demonstrably the result of an error that can be identified and explained, or clearly indicate that more than one soil population exists within the dataset.

Where an individual result is recognised as a ‘statistical outlier’ or ‘contamination hot-spot’ within the data set (and where the critical concentration for that contaminant is exceeded), remediation work and or further investigation may be required.

CLEA Model Chemical Data Inputs

Chemical	Chemical Type	Oral HCV						Inhalation HCV					
		Type	$\mu\text{g kg}^{-1} \text{BW day}^{-1}$	Notes	Compare with oral exposure	Compare with dermal exposure	Compare with inhalation exposure	Type	$\mu\text{g kg}^{-1} \text{BW day}^{-1}$	Notes	Compare with oral exposure	Compare with dermal exposure	Compare with inhalation exposure
Chromium (III)	inorganic	TDI	150	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	0.03	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Chromium (VI)	inorganic	TDI	1	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0001	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Lead	inorganic	TDI	3.57	Evaluation of certain food additives and contaminants (Fifty-third report of the Joint FAO/WHO Expert Committee on Food Additives). WHO Technical Report Series, No. 896, 2000.	Yes	Yes	No	TDI	0.071	EPAQS, 1998. Lead. Department of the Environment, Transport and the Regions. Expert Panel on Air Quality Standards. London: The Stationary Office. ISBN 0117534471	No	No	Yes
Copper	inorganic	TDI	160	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	0.286	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Zinc	inorganic	TDI	600	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR	0	No Inhalation HCV	No	No	No
Boron	inorganic	TDI	160	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	2.9	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Naphthalene	organic	TDI	20	TOX20	Yes	Yes	No	TDI	0.86	TOX20	No	No	Yes
Acenaphthylene	organic	TDI	60	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Acenaphthene	organic	TDI	60	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Fluorene	organic	TDI	40	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Phenanthrene	organic	TDI	12.5	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Anthracene	organic	TDI	300	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Fluoranthene	organic	TDI	12.5	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Pyrene	organic	TDI	30	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	Yes	No	No
Benzo(a)anthracene	organic	ID	0.138	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.00048	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Chrysene	organic	ID	0.2	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0007	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(b)fluoranthene	organic	ID	0.142	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0005	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(k)fluoranthene	organic	ID	0.2	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0007	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(a)pyrene	organic	ID	0.02	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.00007	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Indeno(123-cd)pyrene	organic	ID	0.086	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0003	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Dibenz(ah)anthracene	organic	ID	0.018	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.000063	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(ghi)perylene	organic	ID	0.909	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0032	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes

Chemical	Chemical Type	Combine oral and Inhalation AC	Oral MDI for Adults		Inhalation MDI for adults		Air-water partition coefficient (K_{aw})		Diffusion coefficient in air	
			$\mu\text{g day}^{-1}$	Notes	$\mu\text{g day}^{-1}$	Notes	$\text{cm}^3 \text{cm}^{-3}$	Notes (measured or calculated at 283K unless stated)	$\text{m}^2 \text{s}^{-1}$	Notes (measured or calculated at 283K unless stated)
Chromium (III)	inorganic	Yes	60.2	LQM/CIEH GAC 2nd Edition (2009)	0.27	LQM/CIEH GAC 2nd Edition (2009)	NR	0	NR	0
Chromium (VI)	inorganic	Yes	6.7	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)	NR	0	NR	0
Lead	inorganic	Yes	31	Environment Agency, 2002. Contaminants in soil. Collation of toxicological data and intake values for humans - lead, TOX 6	2	Department of the Environment, Transport and the Regions. Air Quality Information Archive, http://www.aeat.co.uk/het/en/aqarchive/nonauto/pbdata.html	NR	Inorganic Chemical	NR	Inorganic Chemical
Copper	inorganic	Yes	7000	LQM/CIEH GAC 2nd Edition (2009)	0.68	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical	NR	Inorganic Chemical
Zinc	inorganic	Yes	27000	LQM/CIEH GAC 2nd Edition (2009)	2.4	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical	NR	Inorganic Chemical
Boron	inorganic	Yes	3700	LQM/CIEH GAC 2nd Edition (2009)	0.398	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical	NR	Inorganic Chemical
Naphthalene	organic	Yes	7	TOX20	2.8	TOX20	0.00662	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000652	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthylene	organic	Yes	0.14	LQM/CIEH GAC 2nd Edition (2009)	0.011	LQM/CIEH GAC 2nd Edition (2009)	0.000568	LQM/CIEH GAC 2nd Edition (2009)	0.00000597	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthene	organic	Yes	0.98	LQM/CIEH GAC 2nd Edition (2009)	0.025	LQM/CIEH GAC 2nd Edition (2009)	0.000759	LQM/CIEH GAC 2nd Edition (2009)	0.00000585	LQM/CIEH GAC 2nd Edition (2009)
Fluorene	organic	Yes	0.59	LQM/CIEH GAC 2nd Edition (2009)	0.096	LQM/CIEH GAC 2nd Edition (2009)	0.000412	LQM/CIEH GAC 2nd Edition (2009)	0.00000558	LQM/CIEH GAC 2nd Edition (2009)
Phenanthrene	organic	Yes	1.54	LQM/CIEH GAC 2nd Edition (2009)	0.518	LQM/CIEH GAC 2nd Edition (2009)	0.000143	LQM/CIEH GAC 2nd Edition (2009)	0.00000534	LQM/CIEH GAC 2nd Edition (2009)
Anthracene	organic	Yes	0.08	LQM/CIEH GAC 2nd Edition (2009)	0.041	LQM/CIEH GAC 2nd Edition (2009)	0.000181	LQM/CIEH GAC 2nd Edition (2009)	0.00000536	LQM/CIEH GAC 2nd Edition (2009)
Fluoranthene	organic	Yes	0.35	LQM/CIEH GAC 2nd Edition (2009)	0.084	LQM/CIEH GAC 2nd Edition (2009)	0.0000629	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000501	LQM/CIEH GAC 2nd Edition (2009)
Pyrene	organic	Yes	0.35	LQM/CIEH GAC 2nd Edition (2009)	0.065	LQM/CIEH GAC 2nd Edition (2009)	0.0000564	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000501	LQM/CIEH GAC 2nd Edition (2009)
Benz(a)anthracene	organic	Yes	NR	index dose used	NR	index dose used	0.0000316	Environment Agency, 2008. Science Report - SC050021/SR7	0.0000046	LQM/CIEH GAC 2nd Edition (2009)
Chrysene	organic	Yes	NR	index dose used	NR	index dose used	0.00000318	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000457	LQM/CIEH GAC 2nd Edition (2009)
Benzo(b)fluoranthene	organic	Yes	NR	index dose used	NR	index dose used	0.00000205	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000436	LQM/CIEH GAC 2nd Edition (2009)
Benzo(k)fluoranthene	organic	Yes	NR	index dose used	NR	index dose used	0.00000174	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000436	LQM/CIEH GAC 2nd Edition (2009)
Benzo(a)pyrene	organic	Yes	NR	index dose used	NR	index dose used	0.00000176	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000438	LQM/CIEH GAC 2nd Edition (2009)
Indeno(123-cd)pyrene	organic	Yes	NR	index dose used	NR	index dose used	0.00000205	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000417	LQM/CIEH GAC 2nd Edition (2009)
Dibenz(ah)anthracene	organic	Yes	NR	index dose used	NR	index dose used	0.0000054	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000408	LQM/CIEH GAC 2nd Edition (2009)
Benzo(ghi)perylene	organic	Yes	NR	index dose used	NR	index dose used	0.00000286	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000422	LQM/CIEH GAC 2nd Edition (2009)

Chemical	Chemical Type	Diffusion coefficient in water		Relative molecular mass		Vapour pressure		Water solubility		Organic carbon - water partition coefficient (K _{oc})	
		m ² s ⁻¹	Notes (measured or calculated at 283K unless stated)	g mol ⁻¹	Notes	Pa	Notes (measured or calculated at 283K and standard pressure unless stated)	mg L ⁻¹	Notes (measured or calculated at 283K unless stated)	Log (cm ³ g ⁻¹)	Notes
Chromium (III)	inorganic	NR	0	NR	0	NR	0	585000	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)
Chromium (VI)	inorganic	NR	0	NR	0	NR	0	2300000	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)
Lead	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	100000	0	NR	Inorganic Chemical
Copper	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	1378000	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical
Zinc	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	4320000	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical
Boron	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	63500	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical
Naphthalene	organic	5.16E-10	LQM/CIEH GAC 2nd Edition (2009)	128.17	LQM/CIEH GAC 2nd Edition (2009)	2.31	LQM/CIEH GAC 2nd Edition (2009)	19	LQM/CIEH GAC 2nd Edition (2009)	2.81	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthylene	organic	4.82E-10	LQM/CIEH GAC 2nd Edition (2009)	152.19	LQM/CIEH GAC 2nd Edition (2009)	0.0708	LQM/CIEH GAC 2nd Edition (2009)	7.95	LQM/CIEH GAC 2nd Edition (2009)	3.26	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthene	organic	4.7E-10	LQM/CIEH GAC 2nd Edition (2009)	154.21	LQM/CIEH GAC 2nd Edition (2009)	0.0737	LQM/CIEH GAC 2nd Edition (2009)	4.11	LQM/CIEH GAC 2nd Edition (2009)	3.37	LQM/CIEH GAC 2nd Edition (2009)
Fluorene	organic	4.47E-10	LQM/CIEH GAC 2nd Edition (2009)	166.22	LQM/CIEH GAC 2nd Edition (2009)	0.0156	LQM/CIEH GAC 2nd Edition (2009)	1.86	LQM/CIEH GAC 2nd Edition (2009)	3.45	LQM/CIEH GAC 2nd Edition (2009)
Phenanthrene	organic	4.32E-10	LQM/CIEH GAC 2nd Edition (2009)	178.23	LQM/CIEH GAC 2nd Edition (2009)	0.00282	LQM/CIEH GAC 2nd Edition (2009)	1.12	LQM/CIEH GAC 2nd Edition (2009)	3.74	LQM/CIEH GAC 2nd Edition (2009)
Anthracene	organic	4.36E-10	LQM/CIEH GAC 2nd Edition (2009)	178.23	LQM/CIEH GAC 2nd Edition (2009)	0.0000849	LQM/CIEH GAC 2nd Edition (2009)	0.056	LQM/CIEH GAC 2nd Edition (2009)	3.75	LQM/CIEH GAC 2nd Edition (2009)
Fluoranthene	organic	4.11E-10	LQM/CIEH GAC 2nd Edition (2009)	202.25	LQM/CIEH GAC 2nd Edition (2009)	0.000131	LQM/CIEH GAC 2nd Edition (2009)	0.23	LQM/CIEH GAC 2nd Edition (2009)	4.26	LQM/CIEH GAC 2nd Edition (2009)
Pyrene	organic	4.15E-10	LQM/CIEH GAC 2nd Edition (2009)	202.25	LQM/CIEH GAC 2nd Edition (2009)	0.000153	LQM/CIEH GAC 2nd Edition (2009)	0.13	LQM/CIEH GAC 2nd Edition (2009)	4.21	LQM/CIEH GAC 2nd Edition (2009)
Benz(a)anthracene	organic	3.8E-10	LQM/CIEH GAC 2nd Edition (2009)	228.29	LQM/CIEH GAC 2nd Edition (2009)	0.00000124	LQM/CIEH GAC 2nd Edition (2009)	0.0038	LQM/CIEH GAC 2nd Edition (2009)	4.89	LQM/CIEH GAC 2nd Edition (2009)
Chrysene	organic	3.77E-10	LQM/CIEH GAC 2nd Edition (2009)	228.29	LQM/CIEH GAC 2nd Edition (2009)	4.52E-08	LQM/CIEH GAC 2nd Edition (2009)	0.002	LQM/CIEH GAC 2nd Edition (2009)	4.74	LQM/CIEH GAC 2nd Edition (2009)
Benzo(b)fluoranthene	organic	3.62E-10	LQM/CIEH GAC 2nd Edition (2009)	252.31	LQM/CIEH GAC 2nd Edition (2009)	6.34E-08	LQM/CIEH GAC 2nd Edition (2009)	0.002	LQM/CIEH GAC 2nd Edition (2009)	5.02	LQM/CIEH GAC 2nd Edition (2009)
Benzo(k)fluoranthene	organic	3.62E-10	LQM/CIEH GAC 2nd Edition (2009)	252.31	LQM/CIEH GAC 2nd Edition (2009)	1.64E-08	LQM/CIEH GAC 2nd Edition (2009)	0.0008	LQM/CIEH GAC 2nd Edition (2009)	5.17	LQM/CIEH GAC 2nd Edition (2009)
Benzo(a)pyrene	organic	3.67E-10	LQM/CIEH GAC 2nd Edition (2009)	252.31	LQM/CIEH GAC 2nd Edition (2009)	0.00000002	LQM/CIEH GAC 2nd Edition (2009)	0.0038	LQM/CIEH GAC 2nd Edition (2009)	5.11	LQM/CIEH GAC 2nd Edition (2009)
Indeno(123-cd)pyrene	organic	3.51E-10	LQM/CIEH GAC 2nd Edition (2009)	276.33	LQM/CIEH GAC 2nd Edition (2009)	2.12E-09	LQM/CIEH GAC 2nd Edition (2009)	0.0002	LQM/CIEH GAC 2nd Edition (2009)	4.94	LQM/CIEH GAC 2nd Edition (2009)
Dibenz(ah)anthracene	organic	3.4E-10	LQM/CIEH GAC 2nd Edition (2009)	278.35	LQM/CIEH GAC 2nd Edition (2009)	1.66E-10	LQM/CIEH GAC 2nd Edition (2009)	0.0006	LQM/CIEH GAC 2nd Edition (2009)	5.27	LQM/CIEH GAC 2nd Edition (2009)
Benzo(ghi)perylene	organic	3.56E-10	LQM/CIEH GAC 2nd Edition (2009)	276.33	LQM/CIEH GAC 2nd Edition (2009)	1.55E-10	LQM/CIEH GAC 2nd Edition (2009)	0.00026	LQM/CIEH GAC 2nd Edition (2009)	5.62	LQM/CIEH GAC 2nd Edition (2009)

Chemical	Chemical Type	Octanol - water partition coefficient (K_{ow})		Soil-water partition coefficient (K_d)		Dermal absorption fraction		Soil-plant availability correction	Root - shoot correction factor	Root - root store correction factor	Root - tuber correction factor	Root - fruit correction factor	Soil-to-plant concentration factor (green vegetables)		
		Log (dimensionless)	Notes	$\text{cm}^3 \text{g}^{-1}$	Notes	dimensionless	Notes	dimensionless	dimensionless	dimensionless	dimensionless	dimensionless	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes
Chromium (III)	inorganic	NR	LQM/CIEH GAC 2nd Edition (2009)	4800	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Chromium (VI)	inorganic	NR	LQM/CIEH GAC 2nd Edition (2009)	18	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.0002	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Lead	inorganic	NR	Inorganic Chemical	36000	RIVM report 711701 023, 2001 . Technical evaluation of the Intervention Values for Soil/sediment and Groundwater	0	Environment Agency, 2009. Science Report Final SC050021/SR3	5	0.5	0.5	0.5	0.5	0	model	CLEA to estimate
Copper	inorganic	NR	Inorganic Chemical	100	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.0206	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Zinc	inorganic	NR	Inorganic Chemical	38	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.054	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Boron	inorganic	NR	Inorganic Chemical	10	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	1	0.5	0.5	0.5	0.4	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Naphthalene	organic	3.34	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Acenaphthylene	organic	3.91	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Acenaphthene	organic	4.03	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Fluorene	organic	4.13	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Phenanthrene	organic	4.5	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Anthracene	organic	4.5	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Fluoranthene	organic	5.13	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Pyrene	organic	5.08	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benz(a)anthracene	organic	5.91	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Chrysene	organic	5.73	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(b)fluoranthene	organic	6.08	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(k)fluoranthene	organic	6.26	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(a)pyrene	organic	6.18	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Indeno(123-cd)pyrene	organic	5.97	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Dibenz(ah)anthracene	organic	6.38	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(ghi)perylene	organic	6.81	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate

Chemical	Chemical Type	Soil-to-plant concentration factor (root vegetables)			Soil-to-plant concentration factor (tuber vegetables)			Soil-to-plant concentration factor (herbaceous fruit)			Soil-to-plant concentration factor (shrub fruit)			Soil-to-plant concentration factor (tree fruit)			Soil-to-dust transport factor (g g ⁻¹ DW)	Sub-surface soil to indoor air correction factor (Dimensionless)
		mg g ⁻¹ plant (DW or FW basis) over mg g ⁻¹ DW soil	Type	Notes	mg g ⁻¹ plant (DW or FW basis) over mg g ⁻¹ DW soil	Type	Notes	mg g ⁻¹ plant (DW or FW basis) over mg g ⁻¹ DW soil	Type	Notes	mg g ⁻¹ plant (DW or FW basis) over mg g ⁻¹ DW soil	Type	Notes	mg g ⁻¹ plant (DW or FW basis) over mg g ⁻¹ DW soil	Type	Notes		
Chromium (III)	inorganic	0.0003	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.5	1
Chromium (VI)	inorganic	0.0001	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0001	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.09	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.09	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.5	1
Lead	inorganic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Copper	inorganic	0.0206	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0206	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0233	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0206	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.0206	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.5	1
Zinc	inorganic	0.054	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.054	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.143	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.054	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.054	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.5	1
Boron	inorganic	0.2	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LOM/CIEH GAC 2nd Edition (2009)	0.5	1
Naphthalene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Acenaphthylene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Acenaphthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Fluorene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Phenanthrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Anthracene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Fluoranthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benz(a)anthracene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Chrysene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(b)fluoranthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(k)fluoranthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(a)pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Indeno(123-cd)pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Dibenz(ah)anthracene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(ghi)perylene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1

Statistical Analysis Summary Sheets

Client/client ref:
 Project ref: LW23270
 Site ref: The Vinery, Poling, West Sussex
 Data description: Topsoil and Shallow Made
 Ground
 Contaminant(s): Arsenic, Cadmium,
 Chromium, Lead, Mercury, Nickel, Copper,
 Zinc, Selenium, Boron

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Copper (mg/kg)	Zinc (mg/kg)	Selenium (mg/kg)	Boron (mg/kg)	Chromium VI (mg/kg)
Critical concentration, C_c	640	230	8840	5120	3600	1800	71700	660000	13000	192000	35
Notes	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial
Sample size, n	15	15	15	15	15	15	15	15	15	15	15
Sample mean, $\bar{x}$	39.8984812	0.74344497	49.1428453	151.593534	0.25	18.6581919	58.6487685	368.62129	2.39237957	1.53066667	1
Standard deviation, s	66.5292932	0.89285459	49.1916904	130.658063	0	7.82705346	69.3138114	553.611939	0.97853189	0.94782809	0
Number of non-detects	0	8	0	0	15	0	0	0	0	2	15
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Single value	Non-normal	Non-normal	Non-normal	Non-normal	Normal	Single value
Statistical approach	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: One-sample t	Auto: Chebyshev
Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)?					Evidence level required	95%	Use Normal distribution to test for outliers			
t statistic, t_0 (or k_0)	-34.93473442	-994.4584866	-692.1259074	-147.2741621	N/A	-681.4437262	-4003.037123	-4614.678919	-51443.92143	-784537.7017	N/A
Upper confidence limit (or true mean concentration, μ)	114.77473	1.74831966	104.506266	298.644333	0.25	27.4672499	136.65889	991.69097	3.49368088	1.96170886	1
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$

Client/client ref:
 Project ref: LW23270
 Site ref: The Vinery, Poling, West Sussex
 Data description: Topsoil and Shallow Made
 Ground
 Contaminant(s): Naphthalene,
 Acenaphthylene, Acenaphthene, Fluorene,
 Phenanthrene, Anthracene, Fluoranthene,
 Pyrene, Benzo(a)anthracene, Chrysene

	Naphthalene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Fluorene (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)
Critical concentration, C_c	183.0	212	141	69000	22000	540000	23000	54000
Notes	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial
Sample size, n	15	15	15	15	15	15	15	15
Sample mean, $\bar{x}$	0.25	0.25	0.25	0.25	0.31109255	0.25	0.44457804	0.42128067
Standard deviation, s	0	0	0	0	0.23661044	0	0.62323516	0.56319353
Number of non-detects	15	15	15	15	14	15	13	13
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	No	No	No	No	Yes	No	Yes	Yes
Distribution	Single value	Single value	Single value	Single value	Non-normal	Single value	Non-normal	Non-normal
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev

Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?				Evidence level required:	95%	Use Normal distribution
t statistic, t_s (or k_d)	N/A	N/A	N/A	N/A	-360104.2597	N/A	-371345.6503
Upper confidence limit (on true mean concentration, μ)	0.25	0.25	0.25	0.25	0.57738882	0.25	1.05513408
Evidence level	100%	100%	100%	100%	100%	100%	100%
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$

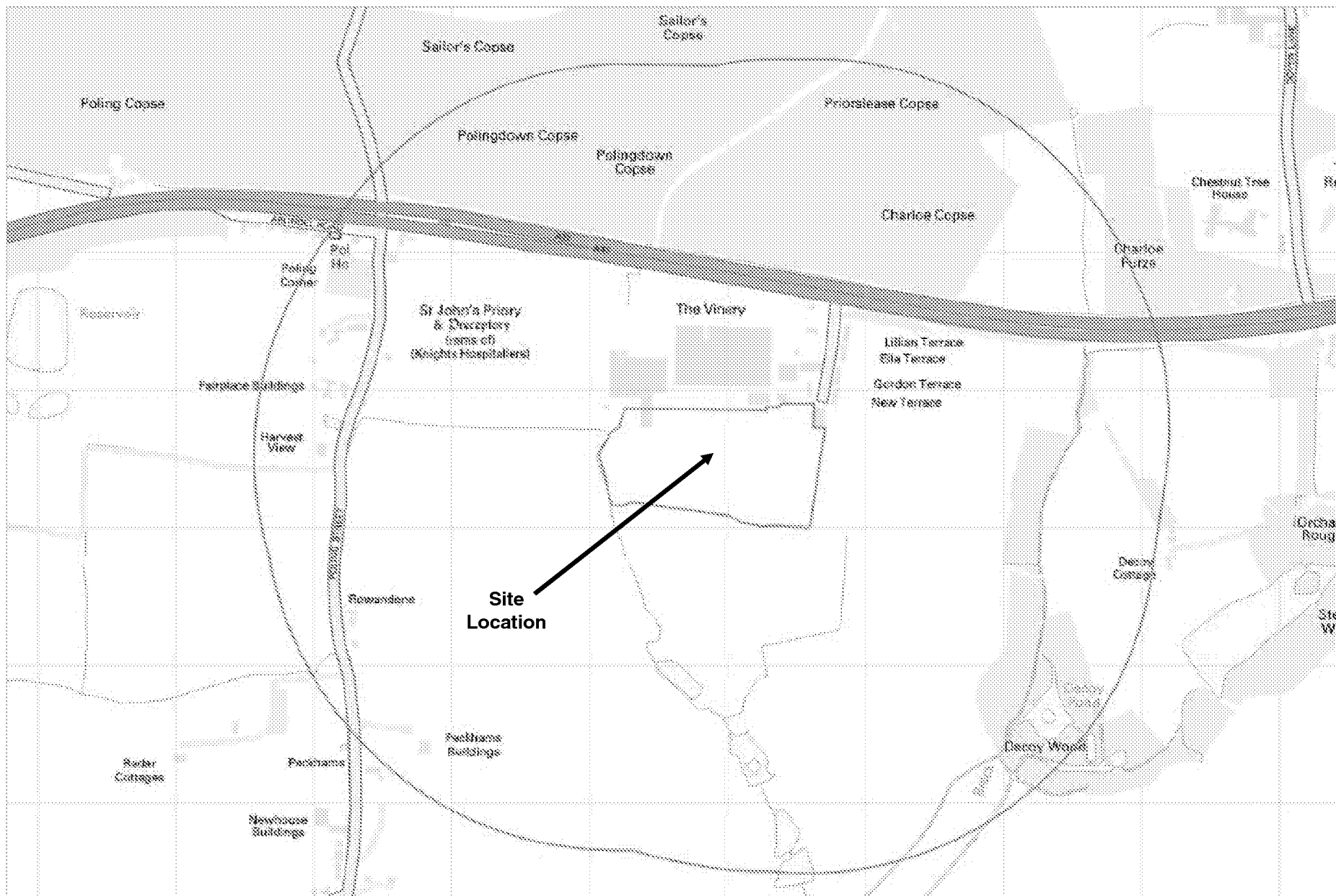
Client/client ref:
 Project ref: LW23270
 Site ref: The Vinery, Poling, West Sussex
 Data description: Topsoil and Shallow Made
 Ground
 Contaminant(s): Naphthalene,
 Acenaphthylene, Acenaphthene, Fluorene,
 Phenanthrene, Anthracene, Fluoranthene,
 Pyrene, Benzo(a)anthracene, Chrysene

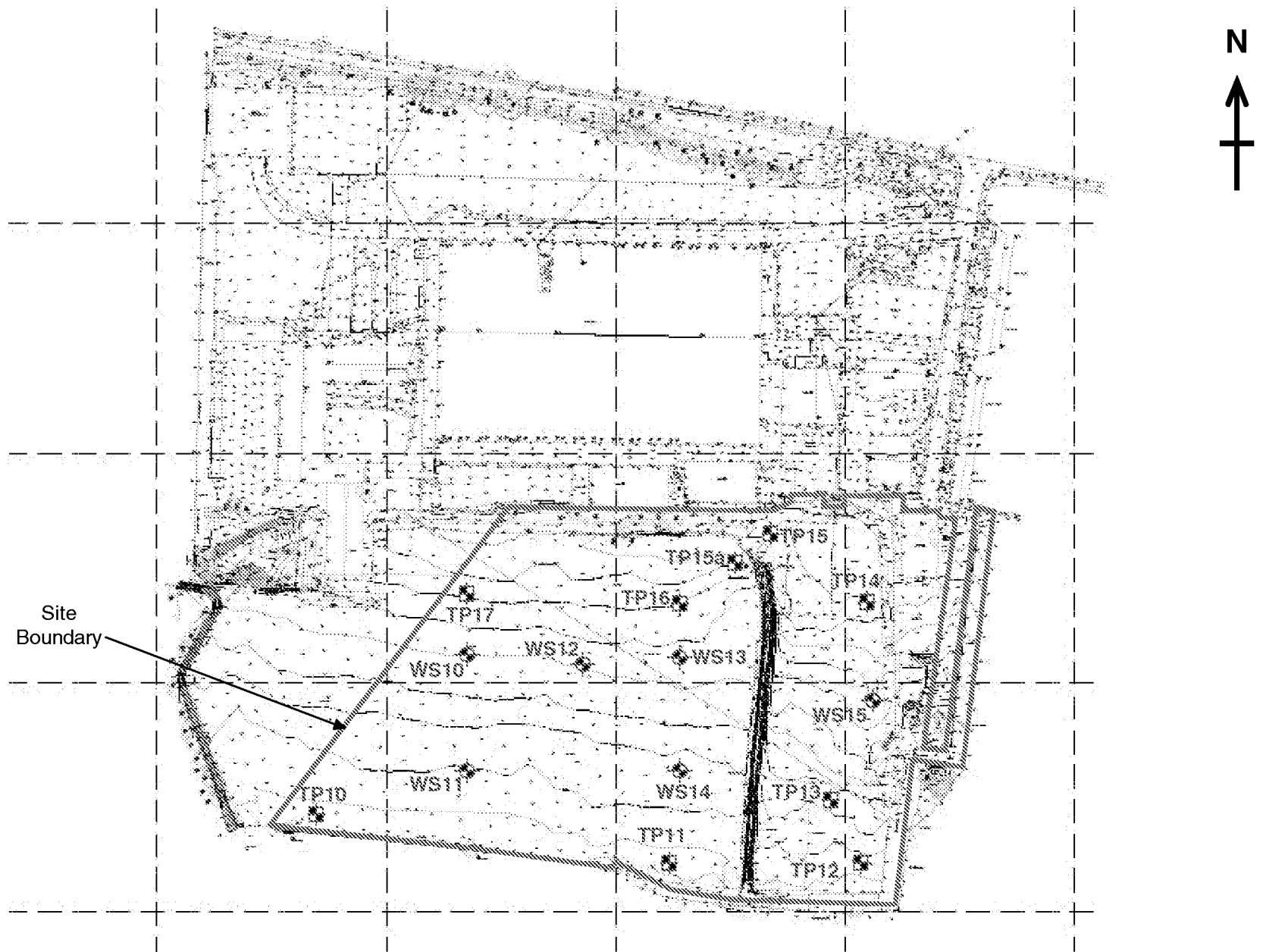
	Benz(a)anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Benzo(a)pyrene (mg/kg)	Indeno(123-cd)pyrene (mg/kg)	Dibenz(ah)anthracene (mg/kg)	Benzo(ghi)perylene (mg/kg)
Critical concentration, C_c	95.0	140.0	100.0	140.0	14.0	61.0	13.0	660.0
Notes	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial	ASI Ltd SSV Commercial
Sample size, n	15	15	15	15	15	15	15	15
Sample mean, $\bar{x}$	0.3375039	0.35503455	0.35022407	0.34553065	0.35219732	0.30183948	0.28499048	0.31714606
Standard deviation, s	0.27389977	0.27895788	0.23020569	0.24442882	0.25023753	0.14651757	0.13551753	0.18646543
Number of non-detects	13	12	12	12	12	13	14	13
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev

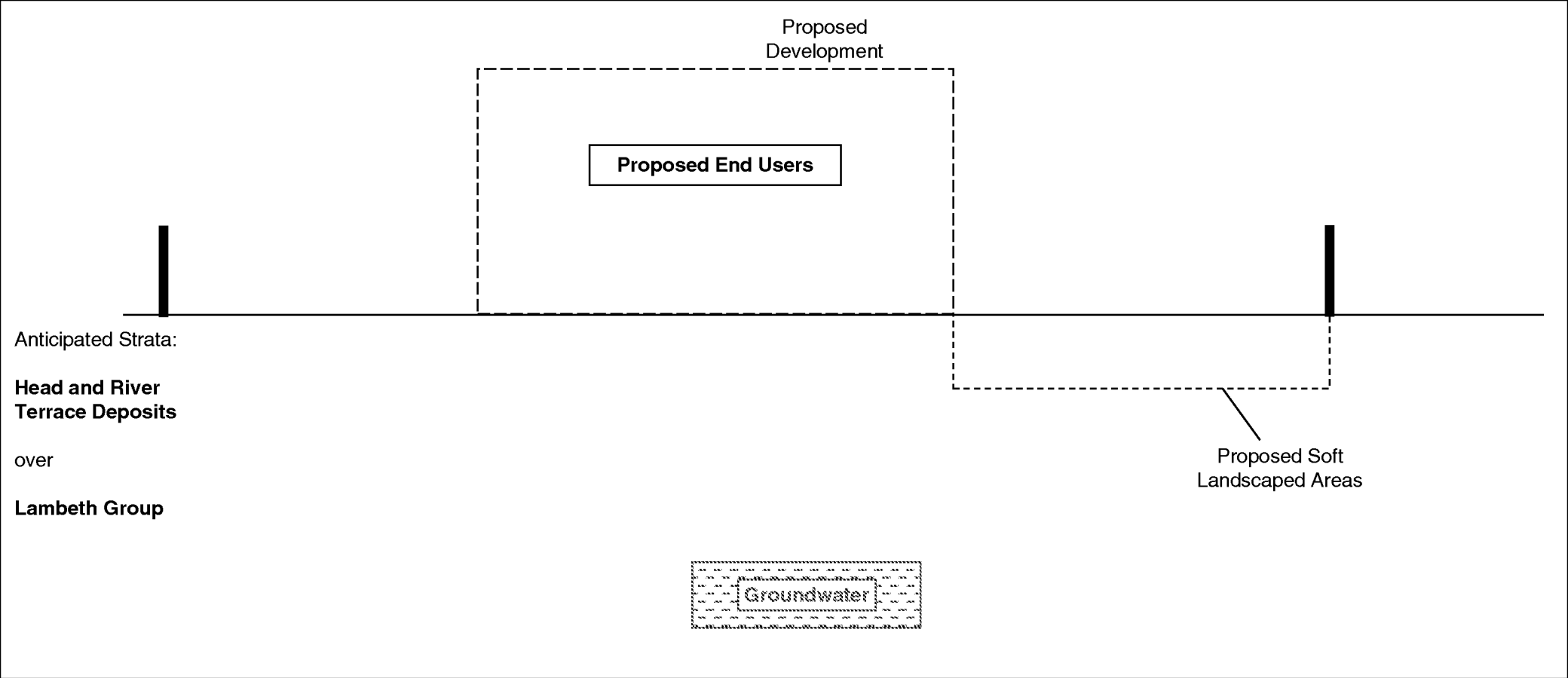
Test scenario:	tion to test for outliers							
t statistic, t_s (or k_d)	-1338.541727	-1938.796752	-1676.50903	-2212.830017	-211.2301574	-1604.469493	-363.3848666	-13701.95388
Upper confidence limit (on true mean concentration, μ)	0.64576792	0.66899129	0.60931203	0.62062621	0.63383036	0.46673956	0.43751043	0.52700598
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$

FIGURES

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|----------|-------------------------------|
| Figure 1 | Site Location Plan |
| Figure 2 | Site Plan |
| Figure 3 | Quantitative Conceptual Model |







<u>Key</u>		<u>Pathways</u>
No significant source pathway receptor linkages identified.		N/A