

GroundSolve Ltd

Consulting Geotechnical, Engineering Geology and Environmental Engineers.

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Chester Road, Bretton,
Flintshire, CH4 0DH

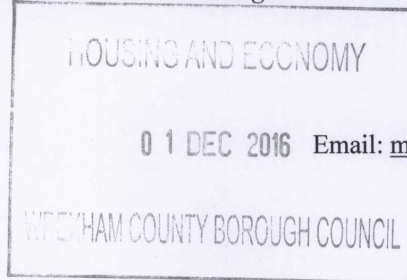
Tel: 01244 661361

Mob: 07977 218184

01 DEC 2016 Email: mikescott@groundsolve.com

REF: 1754/PSB/Topsoil/mjs

Helen Bradshawe
Public Protection Service
Wrexham County Borough Council
Ruthin Road
Wrexham LL13 7TU



29th November 2016

Dear Helen,

RE: PACKSADDLE BANK, WREXHAM: PROPOSED DEVELOPMENT: P/2014/0800

1.0 Introduction

Our geo-environmental report for the above job was issued on the 10th October 2016. In this report we highlighted that in the northern raised area (Area A) a slightly elevated level of lead was encountered in WS 03 (227mg/kg). Consequently, further testing of the topsoil was recommended to determine if this was an issue.

Therefore, a further ten samples of topsoil were taken from this area giving a total of eleven samples. The sampling was carried out from hand dug trial pits on the 27th October 2016, the location of which are shown on Figure 1.

The results of the lead testing for the topsoil on the northern section is summarised in the table below and the results presented in Appendix A.

WS/TP	Depth (m)	Lead value mg/kg
WS 3	0.0-0.15	227
HTP01	0.0-0.10	176
HTP02	0.0-0.15	260
HTP03	0.0-0.15	339
HTP04	0.0-0.10	271
HTP05	0.0-0.15	253
HTP06	0.0-0.15	86.1
HTP07	0.0-0.10	78
HTP08	0.0-0.10	111
HTP09	0.0-0.10	90.7
HTP10	0.0-0.10	84.9

The CLEA guidance values for lead were withdrawn in 2009 and have been replaced with Category 4 Screening Levels (C4SL), dated March 2014. This gives the following guidance values for Lead.

Substance	Residential (with home grown produce)	Residential (without home grown produce)	Public open Space 1	Public Open Space 2
Lead	200mg/kg	310mg/kg	630mg/kg	1300mg/kg

An analysis of the test results was undertaken using the ESI statistics calculator, the results of which are summarised below and attached in full in Appendix B.

- Sample mean 178.82mg/kg,
- Standard deviation 93.95,
- Evidence level 95%,
- Upper confidence Limit 231mg/kg.

The topsoil in Area A, see attached figure, is the area top soiled after filling of this area and as such must have been imported to site. However, it should be noted that all of the values exceeding the C4SL guidance levels are in the area previously used as a tennis court, Area A1.

Therefore the topsoil in Area A1 is considered to be unsuitable for use in the back gardens of Plots 3 to 6. However, it is considered suitable for re use in front gardens, where home grown produce will not be grown and also in areas of landscaping. One such area of landscaping is to cover the old road to the adjacent Water Treatment works, see Area B. It would also be suitable for use in Area C in the POS, with the topsoil in this area possible moved to other areas of garden.

Any surplus topsoil in Area D, which has always been on site, is considered suitable for use in Area A/A1. Should there be a shortfall in topsoil then it will need to be imported, although this is considered unlikely, prior to import it should be tested to ensure it is suitable for inclusion in the works.

The most appropriate way forward is therefore considered to be as follows:

- Strip topsoil from Area A1, and place in Area B,
- All other topsoil is suitable for inclusion in the works.

Following completion of the works a validation report will be issued to prove the works as described have been carried out.

We trust this is satisfactory, should you have any queries please call Mike Scott on 01244 661361.

Yours sincerely

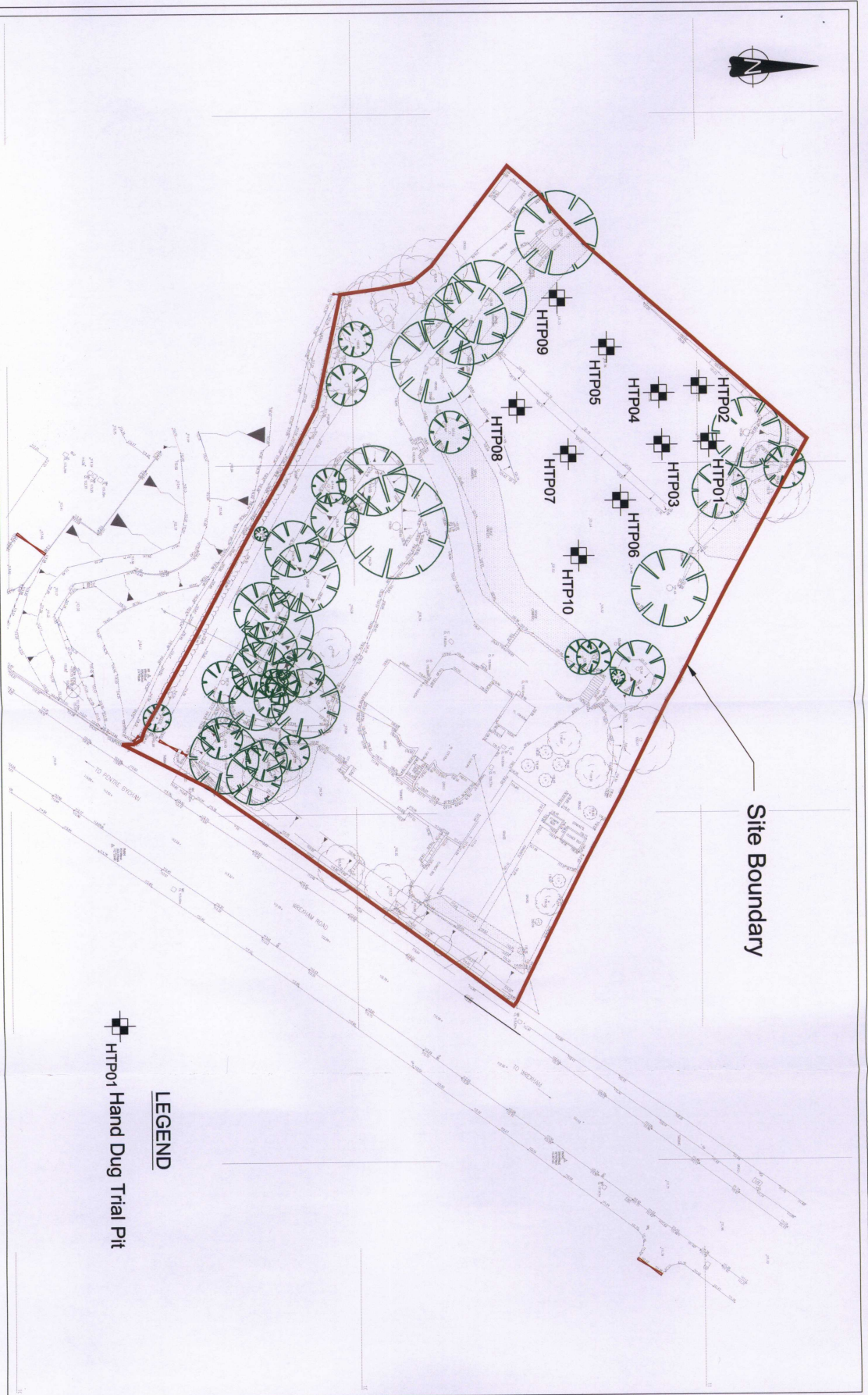


M J Scott

Enc.

CC Mike Forgrave Gower Homes

FIGURES



SCALE 1:500 @ A3

From the
EXISTING SITE LAYOUT &
HTP LOCATIONS

FIGURE 1

SCALE 1:500 @ A3

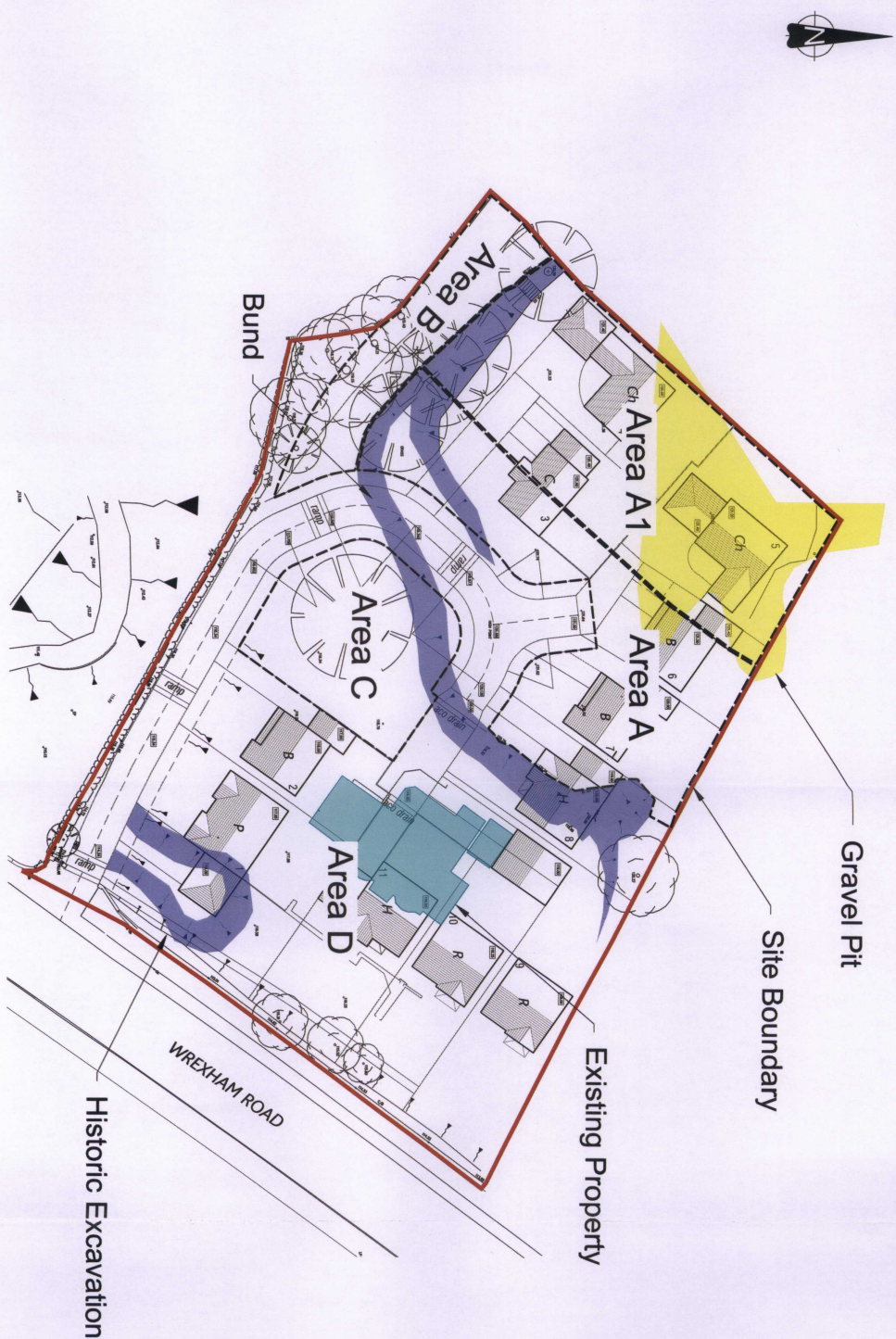


Figure 2
TOPSOIL REMEDIATION

APPENDIX A

Chemical Test Results



ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: customerservices@alcontrol.com
Website: www.alcontrol.com

Ground Solve
Unit 1
Well House Barns
Chester Road
Bretton
Cheshire
CH4 0DH

Attention: Phil Green

CERTIFICATE OF ANALYSIS

Date: 07 November 2016
Customer: H_GRSOLVE_BRE
Sample Delivery Group (SDG): 161027-104
Your Reference: 1754/pbg
Location: Packsaddle Bank, Wrexham
Report No: 385240

We received 10 samples on Thursday October 27, 2016 and 10 of these samples were scheduled for analysis which was completed on Monday November 07, 2016. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALcontrol Laboratories Hawarden (Method codes TM) or ALcontrol Laboratories Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager





ALcontrol Laboratories

CERTIFICATE OF ANALYSIS

Validated

SDG: 161027-104
Job: H_GRSOLVE_BRE-156
Client Reference: 1754/pbg

Location: Packsaddle Bank, Wrexham
Customer: Ground Solve
Attention: Phil Green

Order Number: 1754/pbg
Report Number: 385240
Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
14418241	HTP01		0.00 - 0.10	27/10/2016
14418242	HTP02		0.00 - 0.15	27/10/2016
14418243	HTP03		0.00 - 0.15	27/10/2016
14418244	HTP04		0.00 - 0.10	27/10/2016
14418245	HTP05		0.00 - 0.15	27/10/2016
14418246	HTP06		0.00 - 0.15	27/10/2016
14418247	HTP07		0.00 - 0.10	27/10/2016
14418248	HTP08		0.00 - 0.10	27/10/2016
14418249	HTP09		0.00 - 0.10	27/10/2016
14418250	HTP10		0.00 - 0.10	27/10/2016

Only received samples which have had analysis scheduled will be shown on the following pages.

SDG:	161027-104
Job:	H_GRSOLVE_BRE-156
Client Reference:	1754/pbg

Location:	Packsaddle Bank, Wrexham
Customer:	Ground Solve
Attention:	Phil Green

Order Number: 1754/pbg
Report Number: 385240
Superseded Report:

SOLID		
Results Legend		
X Test		
N No Determination Possible		
Lab Sample No(s)		
Customer Sample Reference		
AGS Reference		
Depth (m)		
Container		
Metals in solid samples by OES	All	NDPs: 0 Tests: 10
Sample description	All	NDPs: 0 Tests: 10



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Attention: Phil Green

Order Number: 1754/pbg
Report Number: 385240
Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
14418241	HTP01	0.00 - 0.10	Dark Brown	Silt Loam	0.002 - 0.063 mm	Vegetation	Stones
14418242	HTP02	0.00 - 0.15	Dark Brown	Silty Clay	0.002 - 0.063 mm	Stones	Vegetation
14418243	HTP03	0.00 - 0.15	Dark Brown	Silt Loam	0.002 - 0.063 mm	Vegetation	Stones
14418244	HTP04	0.00 - 0.10	Dark Brown	Sandy Loam	0.063 - 2.00 mm	Stones	Vegetation
14418245	HTP05	0.00 - 0.15	Dark Brown	Silt Loam	0.002 - 0.063 mm	Stones	Vegetation
14418246	HTP06	0.00 - 0.15	Dark Brown	Silt Loam	0.002 - 0.063 mm	Vegetation	Stones
14418247	HTP07	0.00 - 0.10	Dark Brown	Silt Loam	0.002 - 0.063 mm	Vegetation	N/A
14418248	HTP08	0.00 - 0.10	Dark Brown	Silt Loam	0.002 - 0.063 mm	Vegetation	Stones
14418249	HTP09	0.00 - 0.10	Light Brown	Silt Loam	0.002 - 0.063 mm	Vegetation	N/A
14418250	HTP10	0.00 - 0.10	Black	Silt Loam	0.002 - 0.063 mm	Vegetation	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

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Client Reference: 1754/pbg

Location: Packsaddle Bank, Wrexham
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Superseded Report:

[illegible]

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Job: H_GRSOLVE_BRE-156
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[illegible]



ALcontrol Laboratories

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Customer: Ground Solve
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Report Number: 385240
Superseded Report:

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample ¹	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALcontrol Laboratories Hawarden (Method codes TM) or ALcontrol Laboratories Aberdeen (Method codes S).



ALcontrol Laboratories

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Order Number: 1754/pbg
Report Number: 385240
Superseded Report:

Test Completion Dates

Lab Sample No(s)	14418241	14418242	14418243	14418244	14418245	14418246	14418247	14418248	14418249	14418250
Customer Sample Ref.	HTP01	HTP02	HTP03	HTP04	HTP05	HTP06	HTP07	HTP08	HTP09	HTP10
AGS Ref.										
Depth	0.00 - 0.10	0.00 - 0.15	0.00 - 0.15	0.00 - 0.10	0.00 - 0.15	0.00 - 0.15	0.00 - 0.10	0.00 - 0.10	0.00 - 0.10	0.00 - 0.10
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Metals in solid samples by OES	07-Nov-2016	07-Nov-2016	04-Nov-2016	04-Nov-2016	04-Nov-2016	07-Nov-2016	07-Nov-2016	04-Nov-2016	07-Nov-2016	07-Nov-2016
Sample description	02-Nov-2016	02-Nov-2016	02-Nov-2016	01-Nov-2016	02-Nov-2016	02-Nov-2016	02-Nov-2016	02-Nov-2016	02-Nov-2016	02-Nov-2016



SDG: 161027-104
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Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass, it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GC/FID/GCMS and all subcontracted analysis.

21. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GC/FID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before preservation was performed
6	Sampled on date not provided
7	Sample holding time exceeded in laboratory
8	Sample holding time exceeded due to sampled on date
9	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than:
- Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX B

Statistical Analysis

Test Results

Client/client ref:
Project ref:

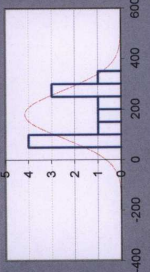
Site ref:
Data description:

Date: 00-Jan-1900
User details:

Dataset:

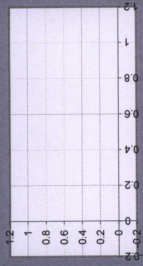
Sample mean	$\bar{x}$	179.82
Sample standard deviation, s		93.955
Sample size, n		11
Critical concentration, Cc		200

Use Normal distribution to test for



Outliers & non-defects

Outliers present?	No
Significance level	5%
Outliers excluded	0
Non-defects	#NAME?

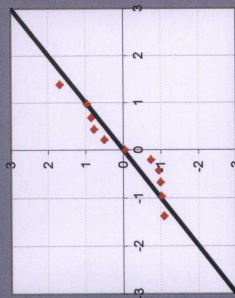


Normality test

Significance level: 5%

Normal distribution

Use: Auto: One-sample t-test

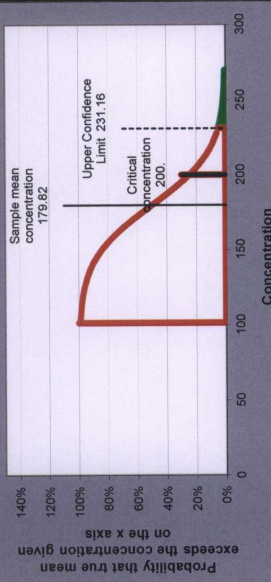


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < C_c$)?

Null hypothesis: The true mean concentration is equal to or greater than the critical concentration; $\mu \geq C_c$

Alternative hypothesis: The true mean concentration is less than the critical concentration; $\mu < C_c$



Evidence against Null hypothesis:

Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	No

Not enough evidence

Back to data

Back to summary

Go to outlier test

Go to normality test