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CERTIFICATE OF ANALYSIS

Date of report Generation:	24 July 2020
Customer:	Apex Testing Solutions Limited
Sample Delivery Group (SDG):	200717-88
Your Reference:	D20210
Location:	TATA - I H
Report No:	560288

We received 4 samples on Friday July 17, 2020 and 4 of these samples were scheduled for analysis which was completed on Friday July 24, 2020. 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 ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





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Validated

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Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
22497710	BH1		29.00	03/07/2020
22497708	BH2A		3.00 - 3.45	16/07/2020
22497711	BH2A		30.00	16/07/2020
22497709	BH2A		4.00 - 4.45	16/07/2020

Maximum Sample/Coolbox Temperature (°C) :

18.6

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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



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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	Inclusions	Inclusions 2
22497708	BH2A	3.00 - 3.45	Light Brown	Loamy Sand	Stones	None
22497709	BH2A	4.00 - 4.45	Light Brown	Loamy Sand	Stones	None

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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Results Legend			Customer Sample Ref.	BH1	BH2A	BH2A	BH2A		
#	ISO17025 accredited.			29.00	3.00 - 3.45	30.00	4.00 - 4.45		
M	mCERTS accredited.			Ground Water (GW)	Soil/Solid (S)	Ground Water (GW)	Soil/Solid (S)		
aq	Aqueous / settled sample.			03/07/2020	16/07/2020	16/07/2020	16/07/2020		
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-3*5@	Sample deviation (see appendix)								
Component		LOD/Units	Method						
Sulphate		<2 mg/l	TM184	131		128			
				#		#			
pH		<1 pH Units	TM256	7.71		7.62			
				@ #		#			
Moisture Content Ratio (% of as received sample)		%	PM024		21		18		
Organic Carbon, Total		<0.2 %	TM132		<0.2		<0.2		
					M		M		
pH		1 pH Units	TM133		9.17		8.58		
					M		M		
Arsenic		<0.6 mg/kg	TM181		8.8		5.71		
					M		M		
Cadmium		<0.02 mg/kg	TM181		0.145		0.103		
					M		M		
Chromium		<0.9 mg/kg	TM181		4.85		5.62		
					M		M		
Copper		<1.4 mg/kg	TM181		4.05		1.75		
					M		M		
Lead		<0.7 mg/kg	TM181		4.87		4.68		
					M		M		
Mercury		<0.14 mg/kg	TM181		<0.14		<0.14		
					M		M		
Nickel		<0.2 mg/kg	TM181		5.05		4.88		
					M		M		
Selenium		<1 mg/kg	TM181		<1		<1		
					#		#		
Zinc		<1.9 mg/kg	TM181		19.2		16.3		
					M		M		
Calcium		<21 mg/kg	TM224		24500		8500		



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PAH by GCMS

Results Legend			Customer Sample Ref.	BH2A	BH2A			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	3.00 - 3.45 Soil/Solid (S) 16/07/2020 17/07/2020 200717-88 22497708	4.00 - 4.45 Soil/Solid (S) 16/07/2020 17/07/2020 200717-88 22497709				
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-3*5@	Sample deviation (see appendix)							
Component	LOD/Units							
Naphthalene-d8 % recovery**	%	TM218	88.4	85.7				
Acenaphthene-d10 % recovery**	%	TM218	91.5	88.6				
Phenanthrene-d10 % recovery**	%	TM218	95.9	93.4				
Chrysene-d12 % recovery**	%	TM218	84.9	82.9				
Perylene-d12 % recovery**	%	TM218	78.1	77				
Naphthalene	<9 µg/kg	TM218	<9	<9				
Acenaphthylene	<12 µg/kg	TM218	<12	<12				
Acenaphthene	<8 µg/kg	TM218	<8	<8				
Fluorene	<10 µg/kg	TM218	<10	<10				
Phenanthrene	<15 µg/kg	TM218	<15	32.3				
Anthracene	<16 µg/kg	TM218	<16	<16				
Fluoranthene	<17 µg/kg	TM218	<17	49.5				
Pyrene	<15 µg/kg	TM218	<15	37.5				
Benz(a)anthracene	<14 µg/kg	TM218	<14	25.9				
Chrysene	<10 µg/kg	TM218	<10	23.3				
Benzo(b)fluoranthene	<15 µg/kg	TM218	<15	30.3				
Benzo(k)fluoranthene	<14 µg/kg	TM218	<14	<14				
Benzo(a)pyrene	<15 µg/kg	TM218	<15	<15				
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<18	<18				
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23	<23				
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<24	<24				
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	<118	199				



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Asbestos Identification - Solid Samples

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&*\$\$@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH2A 3.00 - 3.45 SOLID 16/07/2020 00:00:00 17/07/2020 05:00:00 200717-88 22497708 TM048	24/07/2020	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH2A 4.00 - 4.45 SOLID 16/07/2020 00:00:00 17/07/2020 05:00:00 200717-88 22497709 TM048	24/07/2020	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



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Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM224	US EPA Method 6010B	Determination of Alkaline Metals by iCap 6500 Duo ICP-OES
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter
TM414	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

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Test Completion Dates

Lab Sample No(s)
Customer Sample Ref.

AGS Ref.

Depth

Type

	22497710	22497708	22497709	22497711
	BH1	BH2A	BH2A	BH2A
	29.00	3.00 - 3.45	4.00 - 4.45	30.00
	Ground Water	Soil/Solid (S)	Soil/Solid (S)	Ground Water
Alkali Metals by iCap-OES (Soil)		23-Jul-2020	22-Jul-2020	
Anions by Kone (w)	22-Jul-2020			22-Jul-2020
Asbestos ID in Solid Samples		24-Jul-2020	24-Jul-2020	
EPH CWG GC (S)		24-Jul-2020	24-Jul-2020	
GRO by GC-FID (S)		23-Jul-2020	23-Jul-2020	
Metals in solid samples by OES		22-Jul-2020	22-Jul-2020	
PAH by GCMS		23-Jul-2020	23-Jul-2020	
pH		21-Jul-2020	21-Jul-2020	
pH Value	22-Jul-2020			22-Jul-2020
Sample description		20-Jul-2020	20-Jul-2020	
Total Organic Carbon		23-Jul-2020	22-Jul-2020	
TPH CWG GC (S)		24-Jul-2020	24-Jul-2020	
VOC MS (S)		23-Jul-2020	23-Jul-2020	



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Appendix

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. 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. ALS reserve the right to charge for samples received and stored but not analysed.

3. 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.

4. 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.

5. 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.

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

7. Results relate only to the items tested.

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

9. **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%. 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.

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

11. 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.

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

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

14. 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 GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID 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.

16. 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.

General

17. **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.

18. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

19. Asbestos

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

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 ALS (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 ALS (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.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Standing Committee of Analysts, *The Quantification of Asbestos in Soil* (2017).

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.