

10 July 2019
E1116.VER.R2/hlj/100719

Mr P Russell
Williams Homes (Bala) Ltd
Unit 18 -19
Enterprise Park
Bala
Gwynedd
LL23 7NL

Dear Sirs,

**PLOTS 1, 2, 3 TABOR HILL, COEDPOETH, WREXHAM
PHASE 4 – PLACED TOPSOIL VERIFICATION REPORT**

Background and Objectives

In June 2019 Williams Homes (Bala) Ltd instructed e-geo Solutions Ltd to undertake soil sample collection and analysis and prepare a Validation Report confirming the quality of topsoil at a development site known as Plots 1, 2 and 3 Tabor Hill, Coedpoeth, Wrexham.

The site has been redeveloped with three semi-detached residential properties and associated gardens, parking and access road.

During development of the site, ground was excavated to reduce levels and materials imported to restore ground levels in garden areas, including the placement of topsoil.

The objective of the sampling and analysis is to demonstrate and confirm that the topsoil is 'uncontaminated' and that the garden areas are 'fit for use' for residential purposes.

Topsoil Sampling

Three topsoil samples were collected on 24/06/29 from shallow trial holes excavated by hand in the garden areas at Plot 1, Plot 2 and Plot 3, at a depth of 0.10m.



TP1Location



TP1 Sample



TP2 Location



TP2 Sample



TP3 Location



TP3 Sample

Chemical Analysis

All three soil samples were analysed for a range of chemical parameters. The results are appended to this letter report.

The analytical results have been assessed against human health guideline values from the CLEA Soil Guideline Values published by the Environment Agency, WAG c4sl guidelines and the LQM/CIEH Generic Assessment Criteria.

The results indicate that concentrations of all chemical parameters are below the guideline concentrations with the exception of lead in TP2, and benzo(a)pyrene in TP3.

The concentrations of lead were 152mg/kg(TP1), 237mg/kg(TP2) and 151mg/kg(TP3). The concentration of 237mg/kg marginally exceeds the guideline of 210mg/kg (c4sl for residential with consumption of home grown vegetables). However when the results are averaged, which is reasonable considering the small volume of topsoil placed, the average lead concentration is 180mg/kg, which is below the guideline.

In addition the guideline value is based on residential with consumption of home grown vegetables, however growing garden produce is very unlikely in the small gardens and if the guideline value for residential without consumption of home grown vegetables is used, all lead concentrations are below the guideline.

The lead concentrations are not considered to present an unacceptable contamination risk.

The concentrations of benzo(a)pyrene (BaP) were 0.82mg/kg(TP1), 0.62mg/kg(TP2) and 1.52mg/kg(TP3). The concentration of 1.52mg/kg marginally exceeds the guideline of LQM/CIEH Generic Assessment Criteria guideline. However the average of 0.98mg/kg is practically at the guideline value. All concentrations are below the c4sl for residential with consumption of home grown produce guideline value of 2.4mg/kg.

The benzo(a)pyrene concentrations are not considered to present an unacceptable contamination risk.

Yours Sincerely,

Huw Littler-Jones
Director for e-geo Solutions Limited

Enc

Test Report 19/10210 Batch 1

E-Geo Solutions
Glasgow House
High Street
St Asaph
Denbighshire
LL17 0UN



Attention : Huw Littler-Jones
Date : 3rd July, 2019
Your reference : Tabor Hill
Our reference : Test Report 19/10210 Batch 1
Location : Tabor Hill
Date samples received : 24th June, 2019
Status : Final report
Issue : 2

Three samples were received for analysis on 24th June, 2019 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:



Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: E-Geo Solutions
Reference: Tabor Hill
Location: Tabor Hill
Contact: Huw Littler-Jones
EMT Job No: 19/10210

Report : Solid

Solids: V=60g VOC jar. J=250g glass jar. T=plastic tub

[illegible]

Element Materials Technology

Client Name: E-Geo Solutions
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EMT Job No: 19/10210

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3								Please see attached notes for all abbreviations and acronyms		
Sample ID	PLOT 1	PLOT 2	PLOT 3										
Depth	0.10	0.10	0.10										
COC No / misc													
Containers	J	J	J										
Sample Date	24/06/2019	24/06/2019	24/06/2019										
Sample Type	Clay	Clay	Clay										
Batch Number	1	1	1										
Date of Receipt	24/06/2019	24/06/2019	24/06/2019								LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 ^{#M}	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C6-C8 ^{#M}	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C10-C12 ^{#M}	<0.2	<0.2	<0.2								<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 ^{#M}	<4	10	<4								<4	mg/kg	TM5/PM8/PM16
>C16-C21 ^{#M}	<7	17	<7								<7	mg/kg	TM5/PM8/PM16
>C21-C35 ^{#M}	<7	70	<7								<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	<19	97	<19								<19	mg/kg	TM5/PM8/PM16/PM12/PM10
Aromatics													
>C5-EC7 [#]	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC7-EC8 [#]	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC8-EC10 ^{#M}	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC10-EC12 [#]	<0.2	<0.2	<0.2								<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 [#]	<4	<4	<4								<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 [#]	<7	<7	<7								<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 [#]	69	54	<7								<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 [#]	69	54	<19								<19	mg/kg	TM5/PM8/PM16/PM12/PM10
Total aliphatics and aromatics(C5-35)	69	151	<38								<38	mg/kg	TM5/PM8/PM16/PM12/PM10
MTBE [#]	<5	<5	<5								<5	ug/kg	TM31/PM12
Benzene [#]	<5	<5	<5								<5	ug/kg	TM31/PM12
Toluene [#]	<5	<5	<5								<5	ug/kg	TM31/PM12
Ethylbenzene [#]	<5	<5	<5								<5	ug/kg	TM31/PM12
m/p-Xylene [#]	<5	<5	<5								<5	ug/kg	TM31/PM12
o-Xylene [#]	<5	<5	<5								<5	ug/kg	TM31/PM12
Phenol ^{#M}	0.01	0.01	<0.01								<0.01	mg/kg	TM26/PM21
Natural Moisture Content	24.8	20.7	23.6								<0.1	%	PM4/PM0
Hexavalent Chromium [#]	<0.3	<0.3	<0.3								<0.3	mg/kg	TM38/PM20
Total Cyanide ^{#M}	<0.5	<0.5	<0.5								<0.5	mg/kg	TM89/PM45
Organic Matter	3.6	4.4	3.4								<0.2	%	TM21/PM24
Sulphide	<10	<10	<10								<10	mg/kg	TM107/PM119
pH ^{#M}	8.07	8.35	8.12								<0.01	pH units	TM73/PM11
Sample Type	Clay	Clay	Clay									None	PM13/PM0
Sample Colour	Medium Brown	Medium Brown	Medium Brown									None	PM13/PM0
Other Items	brick, vegetation	stones, vegetation	stones, vegetation									None	PM13/PM0

Note:

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.



Ryan Butterworth
Asbestos Team Leader

[illegible]

Client Name: E-Geo Solutions

Reference: Tabor Hill

Location: Tabor Hill

Contact: Huw Littler-Jones

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No: 19/10210

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 19/10210

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	No
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes

EMT Job No: 19/10210

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.	Yes	Yes	AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes	Yes	AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 19/10210

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes	Yes	AR	Yes
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM119	As received solid samples are extracted with 1M NaOH by orbital shaker for Sulphide and Thiocyanate analysis.			AR	Yes