

Our Ref: RH/12032P1/Validation

Your Ref:

Contact: Ruth Howells

Terra Firma (Wales) Ltd.

Consulting Geotechnical & Geo-Environmental Engineers
Site Investigation Contractors

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30th July 2018

Engie Regeneration Limited
Second Floor
31 Bocam Park
Pencoed
Bridgend
CF35 5LJ

For the attn. of Mr Tom James

Dear Tom

VALIDATION OF CAPPING: PHASE 1, HEBERT ROAD, NEWPORT

1.0 Introduction

Engie is currently completing the residential development of Phase 1, Herbert Road, Newport. This comprises three apartment buildings with front landscaped communal lawns. An area south of the apartments has also been landscaped, along the new access road on to the site.

Terra Firma (Wales) Limited previously completed an investigation of these areas, as reported in Geotechnical and Geo-environmental Report No. 12032P1, dated February 2017. This report concluded that no remedial measures were required. However, Engie specified a 600mm clean capping layer within the small front communal gardens to the apartments with an underlying no-dig barrier.

Topsoil of a volume <250m³ was imported for use in the gardens and landscaped areas.

Pre-import chemical test data for the soils was provided by Afan Landscapes, which confirmed that the soil was suitable for use.

Following import to site Terra Firma obtained representative samples of the soils for chemical analysis. Four representative samples were taken, one from the landscaped area, and three from the stockpile to be used for the apartment gardens.

2.0 Soil Analysis

The four representative samples of capping soil were submitted for laboratory analysis at the laboratory of Derwentside Environmental Testing Services. The results are given in the table below. The chemical test certificates may be found in **Annex A**.

Comparison of the analytical results has been made with the 2015 residential (excluding plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs) or CLEA SGVs

Table 1 Summary of Soil Chemical Test Results					
Substance	SGV/S4UL (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	40	CIEH	12	15	0
Boron	11000	CIEH	<0.2	2.0	0
Cadmium	85	CIEH	0.4	0.5	0
Chromium III	910	CIEH	20	22	0
Chromium VI	6	CIEH	<1.0	<1.0	0
Copper	7100	CIEH	17	22	0
Lead	310	C4SL	34	45	0
Mercury	56	CIEH	<0.05	<0.05	0
Nickel	180	CIEH	19	21	0
Selenium	430	CIEH	<0.5	0.9	0
Zinc	40000	CIEH	82	100	0
Cyanide	8	CLEA	0.4	0.6	0
Phenols	120	CIEH	<0.3	0.5	0
Sulphate	2400	BRE	500	600	0
Organic Matter	-	-	0.1	3.1	-
pH	-	-	7.0	7.4	-
Total PAH	-	-	0.44	3.4	-
Asbestos	-	-	Not detected	Not detected	0

Table 1 Summary of Soil Chemical Test Results (Continued)

Substance	SGV/S4UL (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	0.04	0
Acenaphthylene	2900	CIEH	<0.03	<0.03	0
Acenaphthene	3000	CIEH	<0.03	0.05	0
Fluorene	2800	CIEH	<0.03	0.04	0
Phenanthrene	1300	CIEH	0.05	0.3	0
Anthracene	31000	CIEH	<0.03	0.04	0
Fluoranthene	1500	CIEH	0.11	0.56	0
Pyrene	3700	CIEH	0.09	0.42	0
Benzo(a)anthracene	11	CIEH	0.05	0.29	0
Chrysene	30	CIEH	0.06	0.38	0
Benzo(b)fluoranthene	3.9	CIEH	0.06	0.5	0
Benzo(k)fluoranthene	110	CIEH	<0.03	0.19	0
Benzo(a)pyrene	3.2	CIEH	0.03	0.33	0
Indeno(123cd)pyrene	45	CIEH	<0.03	0.19	0
Dibenzo(ah)anthracene	0.31	CIEH	<0.03	<0.03	0
Benzo(ghi)perylene	360	CIEH	<0.03	0.2	0

Notes:

- PAH Thresholds based on 1.0% SOM

From the above table it can be seen that all substances tested for are present at levels below their respective human health threshold levels. It is therefore confirmed that the imported capping soil is uncontaminated and does not present a risk to the human health of future site residents, neighbouring site users or passers-by.

3.0 Capping Thickness and No-Dig Barrier Verification

On site inspection the front gardens of the apartments had been dug out to a verified depth of 600mm and an orange terram no-dig barrier laid.

Photographs confirming this are provided in **Annex B**.

I trust that the above is to your satisfaction, however, if you have any queries or require any further information please do not hesitate to contact me.

Yours sincerely
for: **Terra Firma (Wales) Ltd**



Mrs Ruth Howells

Annex A
Soil Chemical Test Results



Certificate of Analysis

Certificate Number 18-16628

18-Jul-18

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 18-16628

Client Reference 12032RH

Order No 12032RH

Contract Title H.Rd

Description 3 Soil samples.

Date Received 12-Jul-18

Date Started 12-Jul-18

Date Completed 18-Jul-18

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 18-16628

Client Ref 12032RH

Contract Title H.Rd

Lab No	1365539	1365540	1365541
Sample ID	VS1	VS2	VS3
Depth			
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	11/07/18	11/07/18	11/07/18
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Arsenic mg/kg	DETSC 2301#	0.2	mg/kg	13	13	12
Boron, Water Soluble mg/kg	DETSC 2123#	0.2	mg/kg	1.1	2.0	1.2
Cadmium mg/kg	DETSC 2301#	0.1	mg/kg	0.4	0.4	0.4
Chromium mg/kg	DETSC 2301#	0.15	mg/kg	20	22	20
Chromium III mg/kg	DETSC 2301*	0.15	mg/kg	20	22	20
Chromium, Hexavalent mg/kg	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper mg/kg	DETSC 2301#	0.2	mg/kg	18	20	17
Lead mg/kg	DETSC 2301#	0.3	mg/kg	40	39	34
Mercury mg/kg	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel mg/kg	DETSC 2301#	1	mg/kg	19	21	19
Selenium mg/kg	DETSC 2301#	0.5	mg/kg	0.9	< 0.5	0.7
Zinc mg/kg	DETSC 2301#	1	mg/kg	86	89	82
Inorganics						
pH	DETSC 2008#			7.0	7.2	7.4
Cyanide, Total mg/kg	DETSC 2130#	0.1	mg/kg	0.6	0.6	0.6
Organic matter %	DETSC 2002#	0.1	%	3.1	1.9	0.1
Sulphate as SO ₄ , Total %	DETSC 2321#	0.01	%	0.05	0.06	0.05
PAHs						
Naphthalene mg/kg	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Acenaphthylene mg/kg	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Acenaphthene mg/kg	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03
Fluorene mg/kg	DETSC 3303	0.03	mg/kg	0.03	< 0.03	< 0.03
Phenanthrene mg/kg	DETSC 3303#	0.03	mg/kg	0.22	0.07	0.05
Anthracene mg/kg	DETSC 3303	0.03	mg/kg	0.04	< 0.03	< 0.03
Fluoranthene mg/kg	DETSC 3303#	0.03	mg/kg	0.56	0.11	0.12
Pyrene mg/kg	DETSC 3303#	0.03	mg/kg	0.42	0.09	0.08
Benzo(a)anthracene mg/kg	DETSC 3303#	0.03	mg/kg	0.29	0.05	0.05
Chrysene mg/kg	DETSC 3303	0.03	mg/kg	0.38	0.06	0.06
Benzo(b)fluoranthene mg/kg	DETSC 3303#	0.03	mg/kg	0.50	0.06	0.06
Benzo(k)fluoranthene mg/kg	DETSC 3303#	0.03	mg/kg	0.19	< 0.03	< 0.03
Benzo(a)pyrene mg/kg	DETSC 3303#	0.03	mg/kg	0.33	0.03	0.03
Indeno(1,2,3-c,d)pyrene mg/kg	DETSC 3303#	0.03	mg/kg	0.19	< 0.03	< 0.03
Dibenzo(a,h)anthracene mg/kg	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene mg/kg	DETSC 3303#	0.03	mg/kg	0.20	< 0.03	< 0.03
PAH - USEPA 16, Total mg/kg	DETSC 3303	0.1	mg/kg	3.4	0.46	0.44
Phenols						
Phenol - Monohydric mg/kg	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	0.4

Summary of Asbestos Analysis

Soil Samples

Our Ref 18-16628

Client Ref 12032RH

Contract Title H.Rd

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1365539	VS1	SOIL	NAD	none	Colin Patrick
1365540	VS2	SOIL	NAD	none	Colin Patrick
1365541	VS3	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 18-16628

Client Ref 12032RH

Contract H.Rd

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1365539	VS1 SOIL	11/07/18	GJ 250ml, PT 1L		
1365540	VS2 SOIL	11/07/18	GJ 250ml, PT 1L		
1365541	VS3 SOIL	11/07/18	GJ 250ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



Certificate of Analysis

Certificate Number 18-17521

27-Jul-18

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 18-17521

Client Reference 12032RH

Order No 120320RH

Contract Title H. Rd

Description One Soil sample.

Date Received 23-Jul-18

Date Started 23-Jul-18

Date Completed 27-Jul-18

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 18-17521

Client Ref 12032RH

Contract Title H. Rd

Lab No	1369857
Sample ID	VS4
Depth	
Other ID	
Sample Type	SOIL
Sampling Date	19/07/18
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	15
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.5
Chromium	DETSC 2301#	0.15	mg/kg	22
Chromium III	DETSC 2301*	0.15	mg/kg	22
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	22
Lead	DETSC 2301#	0.3	mg/kg	45
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05
Nickel	DETSC 2301#	1	mg/kg	21
Selenium	DETSC 2301#	0.5	mg/kg	0.9
Zinc	DETSC 2301#	1	mg/kg	100
Inorganics				
pH	DETSC 2008#			7.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.4
Organic matter	DETSC 2002#	0.1	%	3.1
Sulphate as SO ₄ , Total	DETSC 2321#	0.01	%	0.06
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	0.04
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.05
Fluorene	DETSC 3303	0.03	mg/kg	0.04
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.30
Anthracene	DETSC 3303	0.03	mg/kg	0.04
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.30
Pyrene	DETSC 3303#	0.03	mg/kg	0.24
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.11
Chrysene	DETSC 3303	0.03	mg/kg	0.15
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.15
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.6
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.5

Summary of Asbestos Analysis Soil Samples

Our Ref 18-17521

Client Ref 12032RH

Contract Title H. Rd

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1369857	VS4	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 18-17521

Client Ref 12032RH

Contract H. Rd

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Holding time exceeded for tests	Inappropriate container for tests
		Sampled	Containers Received		
1369857	VS4 SOIL	19/07/18	GJ 250ml, PT 1L		
Key: G-Glass P-Plastic J-Jar T-Tub DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.					

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377. Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis. The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :- Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months
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Annex B
Capping Validation Photographs

