Our Ref: 16-136.06L

FAO Bill Bird
McCarthy & Stone Retirement Lifestyles Ltd
Aspen House
Wykeham Road
Northminster Business Park
York
YO26 6QW

Arc Environmental Ltd
Solum House
Unit 1 Elliott Court
St Johns Road
Meadowfield
Durham
DH7 8PN

8th October 2018

Dear Bill,

Re: Clean Cover Validation Report – 52, Harton Lane, South Shields, Tyne & Wear

As requested by McCarthy & Stone Retirement Lifestyles Ltd, a site visit was undertaken to check the suitability and thickness of imported clean cover materials at the above site, where a retirement apartment block has been constructed.

Full details of the locations of the trial pits, sample recovery and details of the findings can be found on the Clean Cover Validation Works Record Sheet attached. Representative samples of the imported clean cover materials were recovered from the completed soft landscaping areas in order to assess the suitability of these materials for use on site.

The following documents should be read in conjunction with this validation report.

- Arc Environmental Ltd - Phase 1: Desk Top Study Report (Ref. No. 16-136, March 2016)
- Arc Environmental Ltd - Phase 2: Ground Investigation Report (Ref. No. 16-136, July 2016)
- Arc Environmental Ltd - Hazardous Ground Gas Risk Assessment Addendum Report (Ref. No. 16-136, October 2017)
- Arc Environmental Ltd - Remediation Strategy & Interim Validation Report (Ref. No. 16-136, July 2018)

From the remediation strategy, the site was affected by several elevated contaminants (Arsenic, PAHs and VOCs / SVOCs and a 600mm clean cover system was recommended in all areas of soft landscaping to protect the future site end-users.

A representative from Arc Environmental Limited visited site on Friday 28th September 2018 in order to recover samples of emplaced materials from the completed soft landscaping areas, as detailed on the Clean Cover Validation Works Record Sheet attached. Four trial pits were excavated to recover soil samples, and a minimum 600mm clean cover was recorded. A further two samples were recovered from a stockpile of clean cover material awaiting emplacement.

Representative samples of the imported materials were collected from the trial pit locations and the stockpile for confirmatory laboratory analysis and were dispatched to Chemtech Environmental Limited. To ascertain the suitability of the materials used as part of the clean cover, the soils were screened for the following range of analytes;

- Arsenic, Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Sulphur, Cyanide and Total Organic Carbon.

- Speciated Polycyclic Aromatic Hydrocarbons (PAH's), based on the current USEPA 16 PAH's + Benzo(j)fluoranthene.
- Speciated Total Petroleum Hydrocarbons (TPH's – 8 Carbon Bands).
- Asbestos presence.

A summary of the results, based on the soil concentrations recorded can be seen in Table 1 below. The results can also be seen in the Chemtech Environmental Limited analytical test report (Report No. 74393) attached to this report. The results have been assessed against the most up to date and appropriate assessment criteria.

Table 1

Analyte	Critical Conc. (C_C) mg/kg	No. of Samples Screened	Max. Conc. (C_M) recorded (mg/kg)
Generic			
Arsenic	40[1]	6	3.7
Cadmium	85[1]	6	<0.2
Chromium III	3,000[1]	6	26
Chromium VI	6[1]	6	<1
Copper	7,100[1]	6	11
Lead	310[2]	6	28
Mercury	56[1]	6	<0.5
Nickel	180[1]	6	8.4
Selenium	430[1]	6	0.3
Zinc	40,000[1]	6	36
Cyanide	34[3]	6	<1
Asbestos	Presence	6	NAD
Speciated PAH's			
Acenaphthene	6,000[1]	6	<0.01
Acenaphthylene	6,000[1]	6	<0.01
Anthracene	37,000[1]	6	0.03
Benzo(a)anthracene	15[1]	6	0.09
Benzo(a)pyrene	3.2[1]	6	0.09
Benzo(b)fluoranthene	4[1]	6	0.14
Benzo(ghi)perylene	360[1]	6	0.07
Benzo(k)fluoranthene	110[1]	6	0.05
Chrysene	32[1]	6	0.13
Dibenz(ah)anthracene	0.32[1]	6	<0.02
Fluoranthene	1,600[1]	6	0.19
Fluorene	4,500[1]	6	0.01
Indeno(123cd)pyrene	46[1]	6	0.08
Naphthalene	13[1]	6	0.03
Phenanthrene	1,500[1]	6	0.16
Pyrene	3,800[1]	6	0.16
Speciated TPH's			
VPH (>C5-C7)	78	6	<0.10
VPH (>C7-C8)	230	6	<0.10
VPH (>C8-C10)	65	6	<0.10
EPH (>C10-C12)	330	6	<4
EPH (>C12-C16)	2300	6	<4
EPH (>C16-C21)	1900	6	7
EPH (>C21-C35)	1900	6	68
EPH (>C35-C44)	1900	6	13

[1] = The LQM / CIEH Suitable 4 Use Levels – Residential without home-grown produce based on 6.0% SOM, [2] = CL:AIRE Category 4 Screening Levels – Residential without home-grown produce, [3] = ATRISK^{SOIL} Soil Screening Values (2015).

Re: Clean Cover Validation Report–52, Harton Lane, South Shields, Tyne & Wear (Cont'd)

The ground contamination screening has identified that none of the maximum concentration (C_M) values for the contaminants displayed in Table 1 exceed the critical concentration (C_C) values associated with the current designated end-use of Residential without home-grown produce. It has therefore been determined that the soils which have been imported to the site and used within the areas of soft landscaping are appropriate for use.

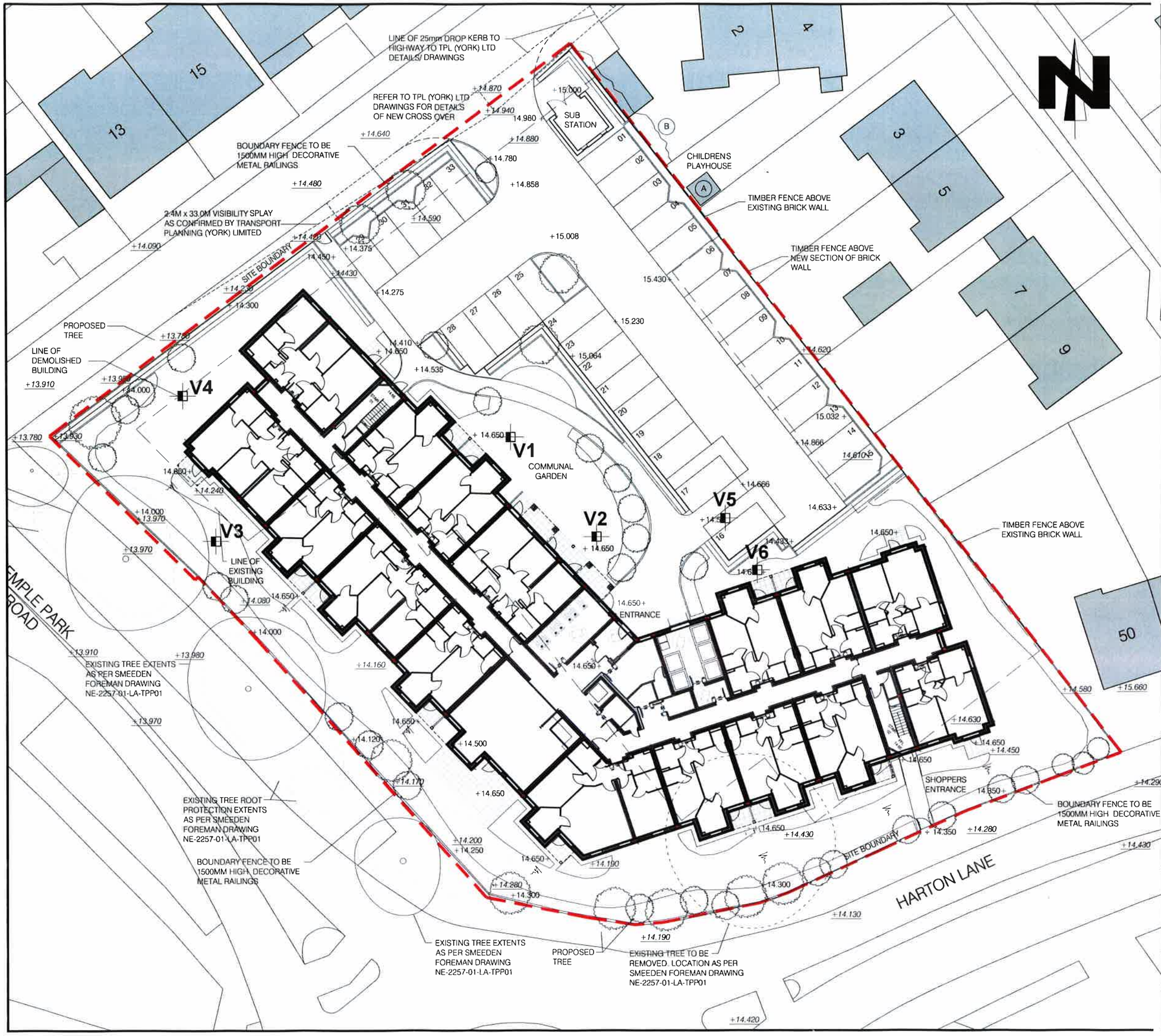
A minimum thickness of 600mm was recorded within the areas completed and a void of 600mm was identified where the soils were yet to be emplaced.

From the validation works undertaken it is the opinion of Arc Environmental Limited that the clean cover provided meets the requirements of the remediation strategy and is suitable for use.

We trust the contents of this report are to your satisfaction, and if you require any further information or clarification, please do not hesitate to contact us.

Yours Sincerely

.....
For and on behalf of Arc Environmental Ltd
Geoff Heron
Senior Field Technician



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LEGEND	
	APPROXIMATE SITE BOUNDARY
	CLEAN COVER VALIDATION TRIAL PIT

rev.	date	amendments	drawn	chckd

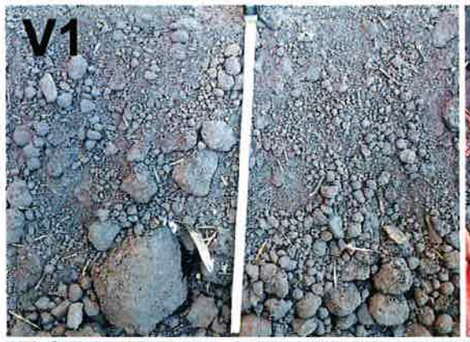
Client:
McCARTHY & STONE (RETIREMENT LIFESTYLES LTD)

Project Title:
Proposed CAT II Accommodation
Harton Centre, 52 Harton Lane
South Shields, Tyne & Wear, NE34 0EE

Drawing Title:
Clean Cover Validation Plan

Scale at A3:	Date:	Drawn by:	Approved by:
NTS @ A3	08.10.18	P.D	G.H

Job Ref:	Drg no:	Rev:
16-136	–	–



















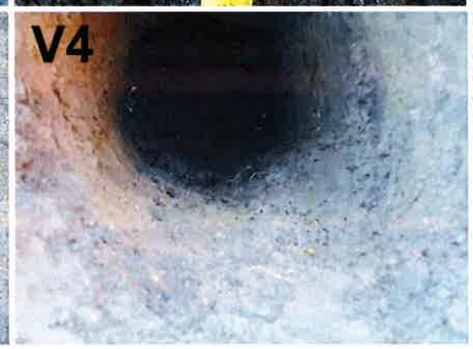


















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rev.	date	amendments	drawn	chckd

Client:
McCARTHY & STONE (RETIREMENT LIFESTYLES LTD)

Project Title:
Proposed CAT II Accommodation
Harton Centre, 52 Harton Lane
South Shields, Tyne & Wear, NE34 0EE

Drawing Title:
Clean Cover Photographic Record Sheet

Scale at A3:	Date:	Drawn by:	Approved by:
NTS @ A3	08.10.18	P.D	G.H

Job Ref:	Drg no:	Rev:
16-136	–	–

Clean Cover Validation Works Record Sheet

Laboratory Contamination Results

T: 0191 378 6380
E: admin@arc-environmental.com
W: www.arc-environmental.com
Registered in England No. 05539784

Reset Member Company
Constructionline Part of Capita plc
CHAS
smas worksafe consultant www.smasltd.com
SSIP

2531

CHEMTECH environmental

ANALYTICAL TEST REPORT

Contract no: 74393

Contract name: Harton Lane, South Shields

Client reference: 16-136

Clients name: ARC Environmental

Clients address: Solum House,
Unit 1 Elliott Court, St Johns Road
Meadowfield, Durham
DH7 8PN

Samples received: 28 September 2018

Analysis started: 28 September 2018

Analysis completed: 05 October 2018

Report issued: 05 October 2018

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:

Karan Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
74393-1	V1	0.00-0.60	Loamy Clayey Sand	-	-	14.9
74393-2	V2	0.00-0.60	Loamy Clayey Sand	-	-	15.7
74393-3	V3	0.00-0.60	Clayey Sand with Gravel	-	-	16.3
74393-4	V4	0.00-0.60	Clayey Sand with Gravel	-	-	18.3
74393-5	V5	Stockpile	Loamy Clayey Sand	-	-	18.4
74393-6	V6	Stockpile	Clayey Sand	-	-	17.3

Chemtech Environmental Limited

SOILS

Lab number			74393-1	74393-2	74393-3	74393-4	74393-5	74393-6
Sample id			V1	V2	V3	V4	V5	V6
Depth (m)			0.00-0.60	0.00-0.60	0.00-0.60	0.00-0.60	Stockpile	Stockpile
Date sampled			28/09/2018	28/09/2018	28/09/2018	28/09/2018	28/09/2018	28/09/2018
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	3.7	1.5	1.2	<1	<1	2.1
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	26	14	10	4.4	7.1	15
Chromium (III)	-	mg/kg CrIII	26	14	10	4.4	7.1	15
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	11	7.1	5.9	6.7	5.5	7.1
Lead (total)	CE127 M	mg/kg Pb	28	17	15	20	20	22
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	8.4	5.5	4.3	4.3	4.2	5.8
Selenium (total)	CE127 M	mg/kg Se	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Zinc (total)	CE127 M	mg/kg Zn	36	21	19	31	22	24
pH	CE004 M	units	7.0	7.2	7.3	7.4	7.4	7.4
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	46	37	28	71	37	49
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Total Organic Carbon (TOC)	CE072 M	% w/w C	2.84	2.65	3.28	5.03	2.87	3.00
PAH								
Acenaphthene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	CE087 U	mg/kg	0.03	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	CE087 U	mg/kg	0.09	0.05	0.06	0.05	0.04	0.06
Benzo(a)pyrene	CE087 U	mg/kg	0.09	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(b)fluoranthene	CE087 M	mg/kg	0.14	0.08	0.08	0.06	0.06	0.06
Benzo(ghi)perylene	CE087 M	mg/kg	0.07	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	CE087 M	mg/kg	0.05	<0.02	<0.02	<0.02	<0.02	<0.02
Chrysene	CE087 M	mg/kg	0.13	0.06	0.07	0.04	0.07	0.05
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.19	0.10	0.11	0.08	0.10	0.10
Fluorene	CE087 U	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene	CE087 M	mg/kg	0.08	<0.02	<0.02	<0.02	<0.02	<0.02
Naphthalene	CE087 M	mg/kg	0.03	0.03	0.03	<0.01	<0.01	0.03
Phenanthrene	CE087 M	mg/kg	0.16	0.10	0.11	0.07	0.09	0.08
Pyrene	CE087 M	mg/kg	0.16	0.08	0.11	0.07	0.08	0.09
PAH (total of USEPA 16)	CE087	mg/kg	1.22	0.50	0.57	0.38	0.44	0.47
Benzo(j)fluoranthene	CE087	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PAH (total of OIL 8)	CE087	mg/kg	0.57	0.19	0.21	0.16	0.17	0.17

Chemtech Environmental Limited

SOILS

Lab number			74393-1	74393-2	74393-3	74393-4	74393-5	74393-6
Sample id			V1	V2	V3	V4	V5	V6
Depth (m)			0.00-0.60	0.00-0.60	0.00-0.60	0.00-0.60	Stockpile	Stockpile
Date sampled			28/09/2018	28/09/2018	28/09/2018	28/09/2018	28/09/2018	28/09/2018
Test	**Method**	**Units**						
TPH								
VPH (>C5-C7)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH (>C7-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH (>C10-C12)	CE033 M	mg/kg	<4	<4	<4	<4	<4	<4
EPH (>C12-C16)	CE033 M	mg/kg	<4	<4	<4	<4	<4	<4
EPH (>C16-C21)	CE033 M	mg/kg	5	6	5	4	7	5
EPH (>C21-C35)	CE033 M	mg/kg	29	29	28	19	68	28
EPH (>C35-C44)	CE033 M	mg/kg	11	<10	<10	<10	13	<10
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE159	Sulphate (2:1 water soluble)	Rapid method, aqueous extraction, ICP-OES	Dry		10	mg/l SO_4
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		1	mg/kg CN
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
CE087	Benzo(j)fluoranthene	Solvent extraction, GC-MS	Wet		0.02	mg/kg
CE087	PAH (total of OIL 8)	Solvent extraction, GC-MS	Wet		0.15	mg/kg
CE067	VPH (>C5-C7)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH (>C7-C8)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH (>C8-C10)	Headspace GC-FID	Wet		0.1	mg/kg
CE033	EPH (>C10-C12)	Solvent extraction, GC-FID	Wet	M	4	mg/kg
CE033	EPH (>C12-C16)	Solvent extraction, GC-FID	Wet	M	4	mg/kg
CE033	EPH (>C16-C21)	Solvent extraction, GC-FID	Wet	M	4	mg/kg
CE033	EPH (>C21-C35)	Solvent extraction, GC-FID	Wet	M	6	mg/kg
CE033	EPH (>C35-C44)	Solvent extraction, GC-FID	Wet	M	10	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
74393-1	V1	0.00-0.60	N	
74393-2	V2	0.00-0.60	N	
74393-3	V3	0.00-0.60	N	
74393-4	V4	0.00-0.60	N	
74393-5	V5	Stockpile	N	
74393-6	V6	Stockpile	N	