

Mr Robert McLaughlin
Galliford Try
Crab Lane
Warrington
WA2 8XR



Date: 21/06/19

Dear Sir,

RE: Phase AS, Plots 197-198 & Phase P, Plots 187-194 - Galliford Try, Brunswick

Summary

Description	NHBC CML	
	Pass	Fail
The cover system in the rear gardens of Phase AS, Plots 197-198 & Phase P, Plots 187-194 has achieved the required chemical quality and has been placed at the appropriate thickness.	✓	

A site inspection assessed the soils placed in the rear gardens of Phase 82, Plots 172-177. The material is known to be a second generation product with no evidence of any significant visual or olfactory contamination. A review of chemical test results indicated the tested soil meets with the quality requirements of the development. The Chemical Laboratory Results are found in Appendix A. In addition and in accordance with the remediation strategy inspection pits have been excavated in the rear gardens of each property. The inspection pits indicated the soil to have been placed at the appropriate thickness in accordance with the requirements of the URA, Brunswick PFI, Remediation Strategy, April 2015, Report No. 47069217 – Phases 1-3, prepared for: Galliford Try.

Introduction

A development of approximately 517 new houses is being constructed in phases by Galliford Try at Brunswick, Manchester. The redevelopment of the Brunswick Neighbourhood forms part of the Brunswick PFI regeneration project, and has been granted planning permission by Manchester City Council (Planning Application No. 101664/FO/2013/N2).

The site is currently occupied by residential housing with associated schools and public open spaces however most areas of the site were previously occupied by various types of historical industrial works. Prior to construction of the new properties land had been remediated in phases to remove buried obstructions, deal with contamination and re-profile site levels.

Remediation Works

Remediation works have been split into five scenarios. The proposed mitigation measures to reduce the risk to acceptable levels include the following:

Scenario 1: Site Wide Residential Gardens.

A minimum 600mm clean validated imported soil is recommended for gardens areas. This will consist of 150mm of topsoil underlain by 450mm of sub soil. Deeper clean 'soil bowls' of 1000mm are recommended for any proposed tree species to be planted.

Scenario 2: Statistical ‘Hot Spots’ Residential.

A minimum 600mm clean validated imported soil is recommended for gardens areas. This will consist of 150mm of topsoil underlain by 450mm of sub soil over a 100mm stone layer and geotextile. Deeper clean ‘soil bowls’ of 1000mm are recommended for any proposed tree species to be planted.

Scenario 3: Recreational space and landscaped areas.

A minimum of 300mm clean validated imported soil is recommended over these open spaces. This will consist of 150mm of topsoil underlain by 150mm of sub soil. Deeper clean ‘soil bowls’ of 1000mm are recommended for any proposed tree species.

Scenario 4: Play areas for children.

It is recommended that raised beds are considered for landscaped areas within the play areas. A minimum 450mm clean validated imported soil is recommended. This will consist of 150mm of topsoil underlain by 300mm of sub soil.

Scenario 5: Orchard and allotment areas.

A minimum of 600mm clean validated imported soil is recommended for the allotment areas. This will consist of 150mm of topsoil underlain by 450mm of sub soil. Deeper clean ‘soil bowls’ of 1000mm are required for any proposed tree species.

Engagement

Redstart was instructed by Chandos Civil Engineering (CCE) to take soil samples, submit them for chemical analysis and interpret the laboratory results of imported ‘visually clean’ soils. The interpretation includes assessing soils against quality criteria for reuse included within the remediation strategy. The instruction included attending site to visually assess soils following placement and completion of inspection pits to confirm the soil had been placed at the appropriate thickness.

Imported Soil

A visual inspection of the imported soil was undertaken. The soil appeared of good quality with no visual or olfactory evidence of significant contaminants and no oversized material (such as brick rubble / construction debris). There were however very minor fragments of possible concrete and brick within the soil indicating the soil was a second generation product.

Chemical Testing

11No. samples were taken from the imported soil stockpile between July and October 2018. The samples were submitted to the independent MCERTS accredited laboratory Chemtest for analysis including pH, Metals, PAHs and TPH and Asbestos Screen in general accordance with the requirements of the remediation strategy. The remediation criteria are included as Appendix B. The chemical laboratory results indicated that Chromium (III) and Benzo(a)Pyrene were identified in excess of the URS criteria target levels, the below table summarises the results:

Contaminant	Chemical Analysis Result	URS Specification	LQM/CIEH S4UL (5% SOM)	DEFRA C4SL
	mg/kg			
Chromium (III)	15-32	4.3	910	-
Benzo(a)Pyrene	1.2-8.5	0.94	3	5

Following discussions with the Manchester City Council, Environmental Health Department the Human Health Assessment Criteria for Residential with Plant Uptake end use scenario Soil Guideline Values (SGVs) can be taken from the DEFRA C4SL or LQM/CIEH S4ULs which were released after the URS remediation strategy was produced. When the soil chemical analysis is compared against the C4SL or S4ULs SGVs only 1 exceedance was identified (detailed below) and the soil was therefore considered suitable for use. The results of the chemical analysis testing are included in Appendix A.

Laboratory Results

The chemical laboratory results indicated that all but one of the 11 samples met the remediation criteria and are suitable for use. The section of stockpiled material containing sample ID P344, where PAH exceedances was identified was further inspected. No visual or olfactory sign of contamination was noted, as a precaution material around the sampling vicinity was removed from the stockpile and instead used in a POS area.

Soil Thickness

Soil thickness was confirmed during a second visit when the soil had been placed in the rear gardens. Phase AS, Plots 197-198 & Phase P, Plots 187-194 fall under Scenario 2: Statistical 'hot spots' residential. The remediation strategy requires placement of 600mm clean validated imported soil cover within the rear gardens. This will consist of 150mm of topsoil underlain by 450mm of sub soil as well as a 100mm stone layer and Geotextile.

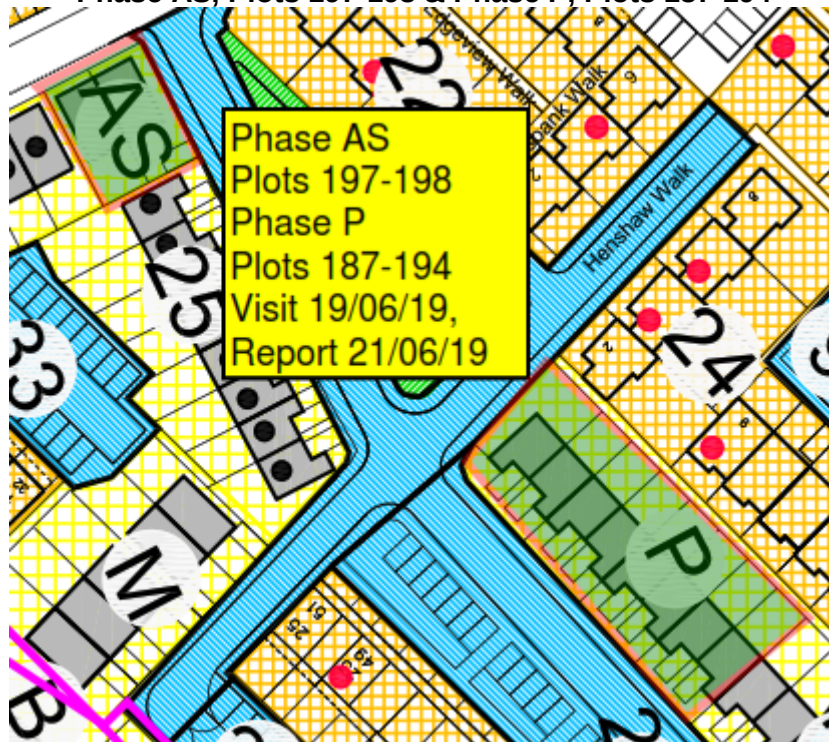
Hand excavated inspection pits were advanced in the rear gardens of Phase AS, Plots 197-198 & Phase P, Plots 187-194. The thickness of the soil was measured and photographed. The clean cover soil was measured at a minimum thickness of 600mm with either the 100mm stone layer or Geotextile uncovered below. A location plan and photographs are included below.

Conclusions

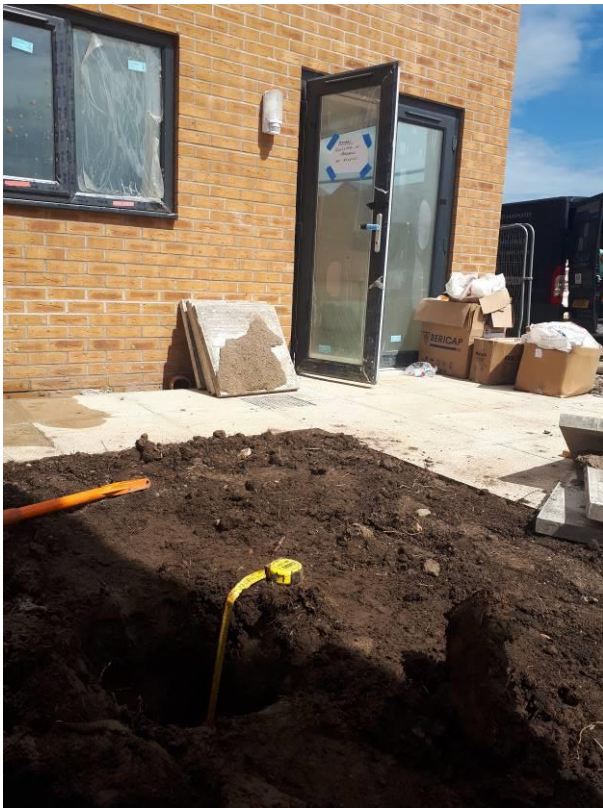
Overall, the quality of the soil analysed meets with the requirements of the development. A visual inspection of the soil confirmed the soil to be second generation and of a reasonable quality. Inspection pits completed in the rear gardens indicates the soil has been placed in accordance with the recommendations for soil thickness in the specification.

Sampling Plot Location Plan

Phase AS, Plots 197-198 & Phase P, Plots 187-194



Depth Validation Location Photographs - Phase AS



Photograph 1: Plot 197 Validation Pit Location 1



Photograph 2: Plot 197 Validation Pit Depth



Photograph 3: Plot 197 Geotextile at the base of Validation Pit Location 1



Photograph 4: Plot 197 Validation Pit Location 2



Photograph 5: Plot 197 Validation Pit Depth



Photograph 6: Plot 197 Geotextile at base of Validation Pit Location 2



Photograph 7: Plot 198 Validation Pit Location 1



Photograph 8: Plot 198 Validation Pit Depth



Photograph 9: Plot 198 Geotextile at base of Validation Pit 1



Photograph 10: Plot 198 Validation Pit Location 2



Photograph 11: Plot 198 Validation Pit Depth



Photograph 12: Plot 198 Geotextile at base of Validation Pit 2

Depth Validation Location Photographs - Phase P



Photograph 13: Plot 187 Validation Pit Location 1



Photograph 14: Plot 187 Validation Pit Depth



Photograph 15: Plot 187 Geotextile at the base of Validation Pit 1



Photograph 16: Plot 187 Validation Pit Location 2



Photograph 17: Plot 187 Validation Pit Depth



Photograph 18: Plot 187 Geotextile at base of Validation Pit Location 2



Photograph 19: Plot 188 Validation Pit Location 1



Photograph 20: Plot 188 Validation Pit Depth



Photograph 21: Plot 188 Geotextile at base of Validation Pit Location 1



Photograph 22: Plot 188 Validation Pit Location 2



Photograph 23: Plot 188 Validation Pit Depth



Photograph 24: Plot 188 Geotextile at base of Validation Pit 2



Photograph 25: Plot 189 Validation Pit Location 1



Photograph 26: Plot 189 Validation Pit Depth



Photograph 27: Plot 189 Geotextile at base of Validation Pit Location 1



Photograph 28: Plot 189 Validation Pit Location 2



Photograph 29: Plot 189 Validation Pit Depth



Photograph 30: Plot 189 Geotextile at base of Validation Pit Location 2



Photograph 31: Plot 190 Validation Pit Location 1



Photograph 32: Plot 190 Validation Pit Depth



Photograph 33: Plot 190 Geotextile at base of Validation Pit Location 1



Photograph 34: Plot 190 Validation Pit Location 2



Photograph 35: Plot 190 Validation Pit Depth



Photograph 36: Plot 190 Geotextile at base of Validation Pit 2



Photograph 37: Plot 191 Validation Pit Location 1



Photograph 38: Plot 191 Validation Pit Depth



Photograph 39: Plot 191 Geotextile at base of Validation Pit Location 1



Photograph 40: Plot 191 Validation Pit Location 2



Photograph 41: Plot 191 Validation Pit Depth



Photograph 42: Plot 191 Geotextile at base of Validation Pit Location 2



Photograph 43: Plot 192 Validation Pit Location 1



Photograph 44: Plot 192 Validation Pit Depth



Photograph 45: Plot 192 Geotextile at base of Validation Pit Location 1



Photograph 46: Plot 192 Validation Pit Location 2



Photograph 47: Plot 192 Validation Pit Depth



Photograph 48: Plot 192 Geotextile at base of Validation Pit 2



Photograph 49: Plot 193 Validation Pit Location 1



Photograph 50: Plot 193 Validation Pit Depth



Photograph 51: Plot 193 Geotextile at base of Validation Pit Location 1



Photograph 52: Plot 194 Validation Pit Location 2



Photograph 53: Plot 193 Validation Pit Depth



Photograph 54: Plot 193 Geotextile at base of Validation Pit Location 2



Photograph 55: Plot 194 Validation Pit Location 1



Photograph 56: Plot 194 Validation Pit Depth



Photograph 57: Plot 194 Geotextile at base of Validation Pit Location 1



Photograph 58: Plot 194 Validation Pit Location 2



Photograph 59: Plot 194 Validation Pit Depth



Photograph 60: Plot 194 Geotextile at base of Validation Pit 2

Final Remarks

We trust this meets with your requirements. Please do not hesitate to contact us if you require further information.

For and on behalf of Redstart

A handwritten signature in black ink, appearing to read 'D. Newton', with a long horizontal flourish extending to the right.

**David Newton BSc FGS
Geo-Environmental Engineer**

Enclosed:

*Appendix A – Laboratory Testing Results
Appendix B – Clean Cover Requirements*

Appendix A

Laboratory Results



2183

Final Report

Report No.: 18-31541-1

Initial Date of Issue: 19-Oct-2018

Client Chandos Remediation Services Limited

Client Address: Chandos House
Oak Green Business Park
Earl Road
Cheadle
SK8 6QL

Contact(s): Phil Sales

Project 214.23 Brunswick

Quotation No.: Q18-12443

Date Received: 15-Oct-2018

Order No.:

Date Instructed: 15-Oct-2018

No. of Samples: 4

Turnaround (Wkdays): 5

Results Due: 19-Oct-2018

Date Approved: 19-Oct-2018

Approved By:



Details: Martin Dyer, Laboratory Manager

Project: 214.23 Brunswick

Client: Chandos Remediation Services Limited	Chemtest Job No.:				18-31541	18-31541	18-31541	18-31541
Quotation No.: Q18-12443	Chemtest Sample ID.:				705756	705757	705758	705759
	Client Sample ID.:				P801	P802	P803	P804
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Date Sampled:				12-Oct-2018	12-Oct-2018	12-Oct-2018	12-Oct-2018
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Asbestos by Gravimetry	U	2192	%	0.001	-	-	-	-
Total Asbestos	N	2192	%	0.001	-	-	-	-
Moisture	N	2030	%	0.020	18	19	15	13
pH	U	2010		N/A	7.8	7.8	8.7	8.7
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	< 0.40	0.43	< 0.40
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	g/l	0.010	0.039	0.028	0.098	0.091
Total Sulphur	U	2175	%	0.010	0.052	0.055	0.059	0.056
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Total)	U	2430	%	0.010	0.11	0.098	0.10	0.11
Arsenic	U	2450	mg/kg	1.0	12	11	12	13
Barium	U	2450	mg/kg	10	110	92	89	91
Beryllium	U	2450	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	U	2450	mg/kg	0.10	0.42	0.35	0.33	0.41
Molybdenum	U	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	17	17	22	20
Mercury	U	2450	mg/kg	0.10	< 0.10	0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	15	12	14	15
Lead	U	2450	mg/kg	0.50	50	50	59	59
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	23	21	23	24
Zinc	U	2450	mg/kg	0.50	69	62	63	63
Chromium (Trivalent)	N	2490	mg/kg	1.0	17	15	18	19
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	4.1	4.8	3.5	3.3
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	30	34	44	34
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	30	34	44	34
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0

Project: 214.23 Brunswick

Client: Chandos Remediation Services Limited	Chemtest Job No.:				18-31541	18-31541	18-31541	18-31541
Quotation No.: Q18-12443	Chemtest Sample ID.:				705756	705757	705758	705759
	Client Sample ID.:				P801	P802	P803	P804
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Date Sampled:				12-Oct-2018	12-Oct-2018	12-Oct-2018	12-Oct-2018
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	9.1	2.6	8.4	2.5
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	76	46	80	59
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	86	49	89	61
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	120	82	130	95
Naphthalene	U	2700	mg/kg	0.10	0.18	0.17	< 0.10	0.24
Acenaphthylene	U	2700	mg/kg	0.10	0.11	< 0.10	< 0.10	0.13
Acenaphthene	U	2700	mg/kg	0.10	0.19	0.22	0.10	0.32
Fluorene	U	2700	mg/kg	0.10	0.14	0.19	0.12	0.26
Phenanthrene	U	2700	mg/kg	0.10	1.2	1.6	0.94	2.1
Anthracene	U	2700	mg/kg	0.10	0.16	0.35	0.18	0.47
Fluoranthene	U	2700	mg/kg	0.10	1.5	2.0	1.3	2.5
Pyrene	U	2700	mg/kg	0.10	1.7	1.9	1.5	2.6
Benzo[a]anthracene	U	2700	mg/kg	0.10	0.85	0.87	0.67	1.1
Chrysene	U	2700	mg/kg	0.10	1.1	1.8	1.2	1.7
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	1.1	1.1	0.97	1.3
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	0.57	0.65	0.50	0.76
Benzo[a]pyrene	U	2700	mg/kg	0.10	0.77	0.83	0.78	1.2
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	0.31	0.50	0.43	0.57
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	0.15	0.24	0.29	0.33
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	0.55	0.58	0.68	0.74
Total Of 16 PAH's	U	2700	mg/kg	2.0	11	13	9.7	16
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



2183

Final Report

Report No.: 18-19551-1

Initial Date of Issue: 11-Jul-2018

Client Chandos Remediation Services Limited

Client Address: Chandos House
Oak Green Business Park
Earl Road
Cheadle
SK8 6QL

Contact(s): Phil Sales

Project 314.23 Brunswick

Quotation No.: Q18-12443

Date Received: 05-Jul-2018

Order No.:

Date Instructed: 05-Jul-2018

No. of Samples: 7

Turnaround (Wkdays): 5

Results Due: 11-Jul-2018

Date Approved: 11-Jul-2018

Approved By:



Details: Glynn Harvey, Laboratory Manager

Results - Soil

Project: 314.23 Brunswick

Client: Chandos Remediation Services Limited	Chemtest Job No.:				18-19551	18-19551	18-19551	18-19551	18-19551	18-19551	18-19551
Quotation No.: Q18-12443	Chemtest Sample ID.:				649318	649319	649320	649321	649322	649323	649324
	Client Sample ID.:				P341	P342	P343	P344	P345	P346	P347
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Date Sampled:				04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD							
ACM Type	U	2192		N/A	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Asbestos by Gravimetry	U	2192	%	0.001	-	-	-	-	-	-	-
Total Asbestos	N	2192	%	0.001	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	12	8.7	7.7	13	18	20	11
pH	U	2010		N/A	7.6	8.0	8.2	7.6	7.2	7.2	8.0
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	1.0	0.95	0.99	0.84	0.62	0.73	0.97
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	g/l	0.010	0.33	0.44	0.43	0.24	0.15	0.16	0.28
Total Sulphur	U	2175	%	0.010	0.078	0.022	0.087	0.047	0.032	0.042	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	51	11	1.0	0.70	1.3	< 0.50	0.80
Sulphate (Total)	U	2430	%	0.010	0.24	0.30	0.31	0.16	0.15	0.16	0.17
Arsenic	U	2450	mg/kg	1.0	12	18	20	16	11	21	19
Barium	U	2450	mg/kg	10	110	110	120	100	85	130	120
Beryllium	U	2450	mg/kg	1.0	< 1.0	1.1	< 1.0	< 1.0	< 1.0	1.1	< 1.0
Cadmium	U	2450	mg/kg	0.10	0.31	0.58	0.51	0.47	0.40	0.54	0.39
Molybdenum	U	2450	mg/kg	2.0	< 2.0	2.4	2.2	< 2.0	< 2.0	2.3	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	2.6	2.3	2.3	< 2.0	2.3	2.1
Copper	U	2450	mg/kg	0.50	30	39	34	30	27	41	30
Mercury	U	2450	mg/kg	0.10	0.17	0.26	0.24	0.34	0.15	0.21	0.27
Nickel	U	2450	mg/kg	0.50	15	23	21	21	14	29	19
Lead	U	2450	mg/kg	0.50	110	75	84	75	49	72	100
Selenium	U	2450	mg/kg	0.20	< 0.20	0.37	0.36	0.38	0.42	0.49	0.44
Vanadium	U	2450	mg/kg	5.0	20	32	28	32	23	47	26
Zinc	U	2450	mg/kg	0.50	91	95	110	87	61	100	100
Chromium (Trivalent)	N	2490	mg/kg	1.0	16	24	21	21	15	32	17
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	5.3	4.0	4.3	8.6	4.5	5.5	3.5
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	22	56	33	16	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	7.7	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	22	56	33	24	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 314.23 Brunswick

Client: Chandos Remediation Services Limited	Chemtest Job No.:				18-19551	18-19551	18-19551	18-19551	18-19551	18-19551	18-19551
Quotation No.: Q18-12443	Chemtest Sample ID.:				649318	649319	649320	649321	649322	649323	649324
	Client Sample ID.:				P341	P342	P343	P344	P345	P346	P347
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Date Sampled:				04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018	04-Jul-2018
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD							
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	3.2	< 1.0	1.8	3.9	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	61	140	130	38	48	< 1.0	41
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	64	140	130	42	48	< 5.0	41
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	87	200	160	66	48	< 10	41
Naphthalene	U	2700	mg/kg	0.10	< 0.10	0.30	< 0.10	0.36	0.42	< 0.10	0.15
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.76	0.29	< 0.10	0.12
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	1.4	< 0.10	2.0	0.82	< 0.10	0.22
Fluorene	U	2700	mg/kg	0.10	< 0.10	1.1	< 0.10	2.1	0.61	< 0.10	0.28
Phenanthrene	U	2700	mg/kg	0.10	2.4	9.1	0.94	18	5.2	0.63	3.7
Anthracene	U	2700	mg/kg	0.10	< 0.10	2.7	0.23	5.6	1.1	0.13	0.86
Fluoranthene	U	2700	mg/kg	0.10	2.7	10	1.2	26	5.6	1.2	5.4
Pyrene	U	2700	mg/kg	0.10	3.2	9.7	1.6	23	5.4	1.3	5.2
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	3.2	< 0.10	9.6	2.0	0.50	1.8
Chrysene	U	2700	mg/kg	0.10	< 0.10	6.2	2.2	12	4.1	0.81	2.8
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	3.5	< 0.10	11	2.5	0.84	2.7
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	2.2	< 0.10	4.5	1.1	0.55	1.3
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	3.6	< 0.10	8.5	2.0	0.58	2.1
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	5.9	1.2	0.26	1.0
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.1	0.28	0.13	0.30
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	5.7	2.3	0.54	1.9
Total Of 16 PAH's	U	2700	mg/kg	2.0	8.3	53	6.2	140	35	7.5	30
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk

Appendix B

Clean Cover Protocol

APPENDIX A

Determinand	LOD	Units	Residential with plant uptake assessment criteria
Arsenic	1	mg/kg	32
Boron (water-soluble)	1	mg/kg	291
Cadmium	1	mg/kg	10
Chromium	1	mg/kg	4.3
Chromium VI	1	mg/kg	4.3
Copper	1	mg/kg	2330
Lead	1	mg/kg	354
Mercury	1	mg/kg	170
Nickel	1	mg/kg	130
Selenium	3	mg/kg	350
Zinc	1	mg/kg	3750
Cyanide(Complex)	1	mg/kg	400
Cyanide(free)	1	mg/kg	25
pH	0.1	Units	No criteria
Phenols	1	mg/kg	390
SO4(Total)	0.01	%	No criteria
Sulphide	10	mg/kg	No criteria
Sulphur(Free)	500	mg/kg	No criteria
Thiocyanate	10	mg/kg	No criteria
Naphthalene	0.01	mg/kg	3.7
Acenaphthylene	0.01	mg/kg	400
Acenaphthene	0.01	mg/kg	480
Fluorene	0.01	mg/kg	380
Phenanthrene	0.01	mg/kg	200
Anthracene	0.01	mg/kg	4900
Fluoranthene	0.01	mg/kg	460
Pyrene	0.01	mg/kg	1000
Benzo(a)Anthracene	0.01	mg/kg	4.7
Chrysene	0.01	mg/kg	8
Benzo(b)Fluoranthene	0.01	mg/kg	6.5
Benzo(k)Fluoranthene	0.01	mg/kg	9.6
Benzo(a)Pyrene	0.01	mg/kg	0.94
Indeno(123-cd)Pyrene	0.01	mg/kg	3.9
Dibenzo(ah)Anthracene	0.01	mg/kg	0.86
Benzo(ghi)Perylene	0.01	mg/kg	46
PAH(total)	0.01	mg/kg	No criteria

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PAH(total)	0.01	mg/kg	No criteria