

Paul Hodgkiss
Arcadis LLP
3 Piccadilly Place
Manchester
M1 3BN

Dear Paul,

Date 14/08/2019

Plot 5 First Street, Verification Report Addendum Letter

First Street Plot 5 development works ground contamination verification work was reported in *Ramboll, September 2017, Plot No.5, First Street, Verification Report* prepared for Carillion. There were minor outstanding actions which required further verification on completion of the development. However, the main contractor onsite, Carillion, became insolvent in May 2018. Therefore, outstanding actions from our Verification report have now been taken up by Rayner Rowen Construction Limited, the contractor onsite, in order discharge Planning Condition 6 of Planning Permission 108963/FO/2015/C1 and also for the Principal Contractors Health and Safety file.

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Outstanding actions from 2017 Verification Report

At the time of writing the Verification Report in September 2017 no topsoil had been imported. However, Raynor Rowen have imported topsoil to site since that time. There has been approximately 250m² of material imported from R Draper Ltd from their facility in Ormskirk. Tim O'Hare Associates Ltd analysed the material and stated it was compliant to BS3882:2015 specification for topsoil – multipurpose topsoil. All correspondence from Tim O'Hare associates is **appended to this letter.**

The material was stated by Raynor Rowen to have been used in raised planters and soft landscaping areas. As these are localised areas for tree planting, it is deemed unlikely that site users will come into contact with the material. However, as there has been no analysis for human health, it must be stated in

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Registered office:
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the Site Health and Safety file that if any excavations or maintenance works are to be carried out in these areas, appropriate PPE will be required to mitigate against any risks to human health.

Additional actions relevant to ground contamination since Raynor Rowen's takeover of the site.

- Asbestos in soils - Site health and safety practices were undertaken to manage the risks. Face fit tests of respirators and awareness in induction training were implemented by Carillion, as noted in the verification report. Raynor Rowen have also undertaken these measures onsite. Additional soil testing by Raynor Rowen was also undertaken in June 2018 to provide information to groundworkers regarding asbestos. The results identified Chrysotile fibres in 4 out of the 5 samples analysed, however at concentration of <0.001 %. **The results of the analysis are appended to this letter.**
- Alkaline pH - pH was noted across the site between pH8.5 and pH11. This was to be expected due to use of lime stabilisation techniques during the remediation of the site. However, there is a risk to construction workers from such elevated pH concentrations. These were managed through the project by the use of general PPE (gloves, and overalls) by Carillion which is noted in the site health and safety file. The mandatory PPE guidance is included within Appendix E of the 2017 Verification report. This has also been undertaken by Raynor Rowen.
- Material export – It is understood that a small amount of material was taken offsite by Raynor Rowen. It is thought that this material was from minor excavations e.g. drainage and service trenches. No further information has been supplied.
- Material movements onsite - Raynor Rowen have stated that there has been no material moved around onsite.
- Areas of previously unidentified contamination – No new areas of contamination have been identified by Raynor Rowen.
- Site Inspection from Regulators – No visits from the Environment Agency or Contaminated Land Officer have been undertaken onsite.
- Monitoring onsite – Raynor Rowen have had dust suppression measures in place in the form of a Road sweeper during their time onsite.
- Complaints – Raynor Rowen have stated that no complaints from neighbours have been noted during their time onsite.

This addendum letter report addresses all the outstanding actions and Ramboll considers this sufficient to enable the sign off of Condition 6 of Planning Permission 108963/FO/2015/C1.

If you have any queries, do not hesitate to contact me.

Yours sincerely
For Ramboll



Caroline Clark

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Hazel Comyn

Associate

enc -
Lab data from Murray Rix
Asbestos data from I2
Tim O'Hare Associates Topsoil testing letter report



Your Reference PO13-001
Our Reference MRN 3382-1

Date 22 June 2018

Rayner Rowen Construction Ltd
Blackthorn House
Skull House Lane
Appley Bridge
Wigan
WN6 9DB

For the attention of P Knowles Esq.

Dear Mr Knowles

Re: Contamination Results – Plot 5, First Street, Mancheser M15 4FN

Please find attached the results of the broad range contamination testing carried out to the two number soil samples submitted by yourselves on the 13th June 2018.

Please find attached the i2 Analytical Ltd certificate of test. Our sample numbers relate to your site references as follows:

77287	Sample 1
77288	Sample 2
77289	Sample 3
77290	Sample 4
77291	Sample 5

We have assessed the contamination results found for the various determinands against the latest Generic Assessment Criteria (GAC) from the Land Quality Management Ltd / Chartered Institute of Environmental Health (LQM/CIEH) S4UL values.

The results of this assessment find that Sample 1 (77287) is suitable for a Residential with homegrown produce end use, Samples 2 (77288), 3 (77289), 4 (77290) and 5 (77291) are suitable for Commercial end use due to high levels of various PAHs when compared to the Generic Assessment Criteria (GAC) from the Land Quality Management Ltd / Chartered Institute of Environmental Health (LQM/CIEH) S4UL values.



33C, Vauxhall Industrial Estate, Greg Street, Reddish, Stockport SK5 7BR Tel: 0161 475 0870 Fax: 0161 475 0871
Email: steve@mr-uk.com Website: www.murrayrix.com

Also at: London: 020 8523 1999

Murray Rix is the trading name of Murray Rix (Northern) Limited. Registered in England 2878361

The results of the Waste Acceptance Criteria Testing (WAC Test) show that all the samples are classified as Stable Non-reactive Hazardous waste in non-hazardous Landfill.

The asbestos identification shows that Sample 1 has no asbestos present. Samples 2 – 5 all have Chrysotile asbestos present.

We trust the above and attached are satisfactory to yourselves. Should you require any further assistance please do not hesitate to contact us.

Yours Faithfully
For Murray Rix

A handwritten signature in dark ink, appearing to be 'O.P. Davies', written over a horizontal line.

O.P. Davies



Environmental Science

Steve Hutchings

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e: MurrayRix

Analytical Report Number : 18-88965

Project / Site name:	Plot 5, First Street, Manchester	Samples received on:	13/06/2018
Your job number:		Samples instructed on:	14/06/2018
Your order number:	18-126	Analysis completed by:	20/06/2018
Report Issue Number:	1	Report issued on:	20/06/2018
Samples Analysed:	5 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Iss No 18-88965-1 Plot 5, First Street, Manchester

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 18-88965

Project / Site name: Plot 5, First Street, Manchester

Your Order No: 18-126

Lab Sample Number				981413	981414	981415	981416	981417
Sample Reference				77287 Sample 1	77288 Sample 2	77289 Sample 3	77290 Sample 4	77291 Sample 5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2018	13/06/2018	13/06/2018	13/06/2018	13/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	9.3	9.8	3.7	8.7	16
Total mass of sample received	kg	0.001	NONE	2.0	2.0	2.0	2.0	2.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025		Chrysotile- Loose Fibrous Debris	Chrysotile- Loose Fibres	Chrysotile- Loose Fibres	Chrysotile- Loose Fibres
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Detected	Detected	Detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	10.3	10.5	10.3	9.1
Organic Matter	%	0.1	MCERTS	1.5	2.2	2.0	1.9	2.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	2.7	3.0	1.4	2.0
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.74	1.7	0.64	0.99
Acenaphthene	mg/kg	0.05	MCERTS	0.28	3.5	2.2	2.3	1.3
Fluorene	mg/kg	0.05	MCERTS	0.32	2.9	2.9	1.8	1.3
Phenanthrene	mg/kg	0.05	MCERTS	2.5	19	21	15	11
Anthracene	mg/kg	0.05	MCERTS	0.55	4.7	5.4	4.0	2.8
Fluoranthene	mg/kg	0.05	MCERTS	3.5	20	23	21	15
Pyrene	mg/kg	0.05	MCERTS	3.4	19	22	21	15
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.1	11	14	11	9.4
Chrysene	mg/kg	0.05	MCERTS	1.7	9.5	12	10	7.7
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.0	9.9	14	12	9.1
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.91	5.7	5.7	4.9	4.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.8	10	13	10	8.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.86	4.5	5.5	4.9	4.4
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.99	1.4	1.2	1.1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	5.6	6.9	6.0	5.4

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	21.1	130	153	128	100
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.9	7.4	13	13	14
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.95	0.65	0.86	0.76	0.92
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	3.8	3.7	3.3	2.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	0.4	< 0.2	0.5	0.4
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	22	16	17	18	18
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	16	17	18	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	39	34	32	36	45
Lead (aqua regia extractable)	mg/kg	1	MCERTS	47	80	75	100	95
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	< 0.3	< 0.3	< 0.3	0.9
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	14	16	16	19
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.4	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	21	21	22	22	24
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	89	74	90	100

Analytical Report Number: 18-88965

Project / Site name: Plot 5, First Street, Manchester

Your Order No: 18-126

Lab Sample Number				981413	981414	981415	981416	981417
Sample Reference				77287 Sample 1	77288 Sample 2	77289 Sample 3	77290 Sample 4	77291 Sample 5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2018	13/06/2018	13/06/2018	13/06/2018	13/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	7.9	7.1	4.9	10
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	32	23	33	23
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	32	260	160	240	110
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	36	300	190	280	140

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	3.0	4.6	8.3	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	7.2	42	41	53	28
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	38	190	200	190	190
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	89	770	560	410	530
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	130	1000	800	670	740

Analytical Report Number : 18-88965

Project / Site name: Plot 5, First Street, Manchester

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
981413	77287 Sample 1	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
981414	77288 Sample 2	None Supplied	None Supplied	Brown loam and clay with gravel and brick.
981415	77289 Sample 3	None Supplied	None Supplied	Brown sand with gravel.
981416	77290 Sample 4	None Supplied	None Supplied	Brown sand with gravel and vegetation.
981417	77291 Sample 5	None Supplied	None Supplied	Brown sandy clay with gravel.

Analytical Report Number : 18-88965

Project / Site name: Plot 5, First Street, Manchester

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests"	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and Internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



4441



Environmental Science

Steve Hutchings

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e: MurrayRix

Analytical Report Number : 18-88967

Project / Site name:	Plot 5, First Street, Manchester	Samples received on:	13/06/2018
Your job number:		Samples instructed on:	14/06/2018
Your order number:	18-126	Analysis completed by:	22/06/2018
Report Issue Number:	1	Report issued on:	22/06/2018
Samples Analysed:	5 WAC 10:1 Samples		

Signed:

Dr Claire Stone
Quality Manager

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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The results included within the report are representative of the samples submitted for analysis.

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Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.

This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results							
Report No:	18-88967						
				Client: MURRAYRIX			
Location	Plot 5, First Street, Manchester						
Lab Reference (Sample Number)	981437 / 981438			Landfill Waste Acceptance Criteria			
Sampling Date	13/06/2018			Limits			
Sample ID	77288 Sample 2			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Depth (m)							
Solid Waste Analysis							
TOC (%)**	1.2			3%	5%	6%	
Loss on Ignition (%) **	3.0			--	--	10%	
BTEX (µg/kg) **	< 10			6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007			1	--	--	
Mineral Oil (mg/kg)	380			500	--	--	
Total PAH (WAC-17) (mg/kg)	130			100	--	--	
pH (units)**	9.6			--	>6	--	
Acid Neutralisation Capacity (mol / kg)	77			--	To be evaluated	To be evaluated	
Eluate Analysis				Limit values for compliance leaching test			
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1		10:1	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
	mg/l		mg/kg				
Arsenic *	0.0073		0.0588	0.5	2	25	
Barium *	0.0371		0.299	20	100	300	
Cadmium *	< 0.0001		< 0.0008	0.04	1	5	
Chromium *	0.037		0.29	0.5	10	70	
Copper *	0.014		0.11	2	50	100	
Mercury *	< 0.0005		< 0.0050	0.01	0.2	2	
Molybdenum *	0.0039		0.0311	0.5	10	30	
Nickel *	0.0030		0.024	0.4	10	40	
Lead *	0.0017		0.014	0.5	10	50	
Antimony *	0.013		0.10	0.06	0.7	5	
Selenium *	< 0.0040		< 0.040	0.1	0.5	7	
Zinc *	0.0032		0.025	4	50	200	
Chloride *	3.0		24	800	4000	25000	
Fluoride	0.47		3.8	10	150	500	
Sulphate *	230		1800	1000	20000	50000	
TDS*	300		2400	4000	60000	100000	
Phenol Index (Monhydric Phenols) *	< 0.010		< 0.10	1	-	-	
DOC	9.45		76.1	500	800	1000	
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	90						
Moisture (%)	9.8						
Results are expressed on a dry weight basis, after correction for moisture content where applicable. ** = UKAS accredited (liquid eluate analysis only)							
Stated limits are for guidance only and I2 cannot be held responsible for any discrepancies with current legislation ** = MCERTS accredited							
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.							
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.							

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Waste Acceptance Criteria Analytical Results								
Report No:			18-88967					
						Client: MURRAYRIX		
Location			Plot 5, First Street, Manchester					
Lab Reference (Sample Number)			981439 / 981440			Landfill Waste Acceptance Criteria		
Sampling Date			13/06/2018			Limits		
Sample ID			77289 Sample 3			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)								
Solid Waste Analysis								
TOC (%)**			1.1			3%	5%	6%
Loss on Ignition (%) **			2.8			--	--	10%
BTEX (µg/kg) **			< 10			6000	--	--
Sum of PCBs (mg/kg) **			< 0.007			1	--	--
Mineral Oil (mg/kg)			310			500	--	--
Total PAH (WAC-17) (mg/kg)			120			100	--	--
pH (units)**			9.6			--	>6	--
Acid Neutralisation Capacity (mol / kg)			58			--	To be evaluated	To be evaluated
Eluate Analysis			10:1		10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)			mg/l		mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *			0.0092		0.0797	0.5	2	25
Barium *			0.0273		0.237	20	100	300
Cadmium *			< 0.0001		< 0.0008	0.04	1	5
Chromium *			0.0039		0.034	0.5	10	70
Copper *			0.013		0.12	2	50	100
Mercury *			< 0.0005		< 0.0050	0.01	0.2	2
Molybdenum *			0.0048		0.0415	0.5	10	30
Nickel *			0.0026		0.023	0.4	10	40
Lead *			0.0016		0.014	0.5	10	50
Antimony *			0.028		0.24	0.06	0.7	5
Selenium *			< 0.0040		< 0.040	0.1	0.5	7
Zinc *			0.0034		0.029	4	50	200
Chloride *			2.4		21	800	4000	25000
Fluoride			0.48		4.2	10	150	500
Sulphate *			120		1100	1000	20000	50000
TDS*			200		1700	4000	60000	100000
Phenol Index (Monhydric Phenols) *			< 0.010		< 0.10	1	-	-
DOC			9.26		80.3	500	800	1000
Leach Test Information								
Stone Content (%)			< 0.1					
Sample Mass (kg)			2.0					
Dry Matter (%)			96					
Moisture (%)			3.7					
Results are expressed on a dry weight basis, after correction for moisture content where applicable.						**= UKAS accredited (liquid eluate analysis only)		
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation						** = MCERTS accredited		

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	18-88967					
				Client: MURRAYRIX		
Location	Plot 5, First Street, Manchester					
Lab Reference (Sample Number)	981441 / 981442			Landfill Waste Acceptance Criteria		
Sampling Date	13/06/2018			Limits		
Sample ID	77290 Sample 4			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)						
Solid Waste Analysis						
TOC (%)**	1.1			3%	5%	6%
Loss on Ignition (%) **	3.2			--	--	10%
BTEX (µg/kg) **	< 10			6000	--	--
Sum of PCBs (mg/kg) **	< 0.007			1	--	--
Mineral Oil (mg/kg)	450			500	--	--
Total PAH (WAC-17) (mg/kg)	120			100	--	--
pH (units)**	9.7			--	>6	--
Acid Neutralisation Capacity (mol / kg)	43			--	To be evaluated	To be evaluated
Eluate Analysis				Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1		10:1	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
	mg/l		mg/kg			
Arsenic *	0.0084		0.0689	0.5	2	25
Barium *	0.0291		0.238	20	100	300
Cadmium *	< 0.0001		< 0.0008	0.04	1	5
Chromium *	0.0049		0.040	0.5	10	70
Copper *	0.013		0.11	2	50	100
Mercury *	< 0.0005		< 0.0050	0.01	0.2	2
Molybdenum *	0.0061		0.0497	0.5	10	30
Nickel *	0.0025		0.020	0.4	10	40
Lead *	< 0.0010		< 0.010	0.5	10	50
Antimony *	0.031		0.25	0.06	0.7	5
Selenium *	< 0.0040		< 0.040	0.1	0.5	7
Zinc *	0.0029		0.024	4	50	200
Chloride *	3.0		24	800	4000	25000
Fluoride	0.46		3.7	10	150	500
Sulphate *	94		770	1000	20000	50000
TDS*	180		1500	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.010		< 0.10	1	-	-
DOC	8.90		72.6	500	800	1000
Leach Test Information						
Stone Content (%)	< 0.1					
Sample Mass (kg)	2.0					
Dry Matter (%)	91					
Moisture (%)	8.7					
Results are expressed on a dry weight basis, after correction for moisture content where applicable.				* = UKAS accredited (liquid eluate analysis only)		
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation				** = MCERTS accredited		

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.



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Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.

This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.



4441



Environmental Science

Analytical Report Number : 18-88967**Project / Site name: Plot 5, First Street, Manchester**

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
981435	77287 Sample 1	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
981437	77288 Sample 2	None Supplied	None Supplied	Brown loam and clay with gravel and brick.
981439	77289 Sample 3	None Supplied	None Supplied	Brown sand with gravel.
981441	77290 Sample 4	None Supplied	None Supplied	Brown sand with gravel and vegetation.
981443	77291 Sample 5	None Supplied	None Supplied	Brown sandy clay with gravel.



4041



Environmental Science

Analytical Report Number : 18-88967

Project / Site name: Plot 5, First Street, Manchester

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance"	L046-UK	W	NONE
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil"	L039-PL	W	ISO 17025
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests"	L009-PL	D	MCERTS

Iss No 18-88967-1 Plot 5, First Street, Manchester

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The results included within the report are representative of the samples submitted for analysis.

Page 8 of 9



Analytical Report Number : 18-88967

Project / Site name: Plot 5, First Street, Manchester

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

**Steve Hutchings**

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Analytical Report Number : 18-88965

Replaces Analytical Report Number : 18-88965, issue no. 1

Project / Site name:	Plot 5, First Street, Manchester	Samples received on:	13/06/2018
Your job number:		Samples instructed on:	14/06/2018
Your order number:	18-126	Analysis completed by:	27/07/2018
Report Issue Number:	2	Report issued on:	27/07/2018
Samples Analysed:	5 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 18-88965

Project / Site name: Plot 5, First Street, Manchester

Your Order No: 18-126

Lab Sample Number	981413	981414	981415	981416	981417
Sample Reference	77287 Sample 1	77288 Sample 2	77289 Sample 3	77290 Sample 4	77291 Sample 5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	13/06/2018	13/06/2018	13/06/2018	13/06/2018	13/06/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	9.3	9.8
Total mass of sample received	kg	0.001	NONE	2.0	2.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	Chrysotile	Chrysotile	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Detected	Detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	< 0.001	< 0.001	< 0.001	< 0.001

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	10.3	10.5	10.3	9.1
Organic Matter	%	0.1	MCERTS	1.5	2.2	2.0	1.9	2.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	2.7	3.0	1.4	2.0
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.74	1.7	0.64	0.99
Acenaphthene	mg/kg	0.05	MCERTS	0.28	3.5	2.2	2.3	1.3
Fluorene	mg/kg	0.05	MCERTS	0.32	2.9	2.9	1.8	1.3
Phenanthrene	mg/kg	0.05	MCERTS	2.5	19	21	15	11
Anthracene	mg/kg	0.05	MCERTS	0.55	4.7	5.4	4.0	2.8
Fluoranthene	mg/kg	0.05	MCERTS	3.5	20	23	21	15
Pyrene	mg/kg	0.05	MCERTS	3.4	19	22	21	15
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.1	11	14	11	9.4
Chrysene	mg/kg	0.05	MCERTS	1.7	9.5	12	10	7.7
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.0	9.9	14	12	9.1
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.91	5.7	5.7	4.9	4.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.8	10	13	10	8.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.86	4.5	5.5	4.9	4.4
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.99	1.4	1.2	1.1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	5.6	6.9	6.0	5.4

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	21.1	130	153	128	100
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.9	7.4	13	13	14
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.95	0.65	0.86	0.76	0.92
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	3.8	3.7	3.3	2.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	0.4	< 0.2	0.5	0.4
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	22	16	17	18	18
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	16	17	18	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	39	34	32	36	45
Lead (aqua regia extractable)	mg/kg	1	MCERTS	47	80	75	100	95
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	< 0.3	< 0.3	< 0.3	0.9
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	14	16	16	19
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.4	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	21	21	22	22	24
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	89	74	90	100

Analytical Report Number: 18-88965

Project / Site name: Plot 5, First Street, Manchester

Your Order No: 18-126

Lab Sample Number	981413	981414	981415	981416	981417
Sample Reference	77287 Sample 1	77288 Sample 2	77289 Sample 3	77290 Sample 4	77291 Sample 5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	13/06/2018	13/06/2018	13/06/2018	13/06/2018	13/06/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	7.9	7.1	4.9	10
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	32	23	33	23
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	32	260	160	240	110
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	36	300	190	280	140

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	3.0	4.6	8.3	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	7.2	42	41	53	28
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	38	190	200	190	190
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	89	770	560	410	530
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	130	1000	800	670	740



Analytical Report Number: 18-88965
Project / Site name: Plot 5, First Street, Manchester
Your Order No: 18-126

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
981414	77288 Sample 2		139	Loose Fibrous Debris	Chrysotile	< 0.001	< 0.001
981415	77289 Sample 3		149	Loose Fibres	Chrysotile	< 0.001	< 0.001
981416	77290 Sample 4		141	Loose Fibres	Chrysotile	< 0.001	< 0.001
981417	77291 Sample 5		142	Loose Fibres	Chrysotile	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.



Analytical Report Number : 18-88965

Project / Site name: Plot 5, First Street, Manchester

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
981413	77287 Sample 1	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
981414	77288 Sample 2	None Supplied	None Supplied	Brown loam and clay with gravel and brick.
981415	77289 Sample 3	None Supplied	None Supplied	Brown sand with gravel.
981416	77290 Sample 4	None Supplied	None Supplied	Brown sand with gravel and vegetation.
981417	77291 Sample 5	None Supplied	None Supplied	Brown sandy clay with gravel.

Analytical Report Number : 18-88965

Project / Site name: Plot 5, First Street, Manchester

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



TIM O'HARE ASSOCIATES

SOIL & LANDSCAPE CONSULTANCY

Alan Draper
R. Draper Ltd
Barrow Nook Lane
Bickerstaffe
Nr. Ormskirk
Lancashire
L39 0ET

13th July 2018
Our Ref: TOHA/18/7658/SS
Your Ref: as below

Dear Sirs

Topsoil Analysis Report – Topsoil

We have completed the analysis of the topsoil sample recently submitted, referenced *Topsoil*, and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil (*BS3882:2015 Specification for Topsoil – Multipurpose Topsoil*).

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the topsoil source. The report and results should therefore not be used by third parties as a means of verification or validation testing or waste designation purposes, especially after the topsoil has left the R Draper Ltd site.

SAMPLE EXAMINATION

The sample was described as a very dark brown (Munsell Colour 10YR 2/2) slightly moist, friable, very slightly calcareous LOAMY SAND with a single grain and occasionally weakly developed, fine granular structure*. The sample was slightly stony. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of disturbed sample(s). Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

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ANALYTICAL SCHEDULE

The sample was submitted to a UKAS and MCERTS accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the concentration of selected potential contaminants. The following parameters were determined:

- particle size analysis (sand, silt, clay);
- stone content (2-20mm, 20-50mm, >50mm);
- pH and electrical conductivity values;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX);
- asbestos screen.

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *loamy sand* texture class, which is usually considered suitable for general landscape applications provided the soil's physical condition is satisfactory.

- ✱ The stone content of the sample was low and, as such, stones should not restrict the use of the soil for general landscape purposes. The sample contained stones greater than 20mm in size. This exceeds the maximum recommended stone size for informal and formal recreation end uses given in Annex A.4 (Stones) of the British Standard for Topsoil (BS3882:2015). It may be prudent to remove any larger stones by raking, picking, burying or screening, should the soil be used for these purposes.

pH and Electrical Conductivity Values

The sample was slightly acid in reaction (pH 6.1), with a pH value that would be considered ideal for general landscape purposes.

The electrical conductivity (salinity) value (water extract) was low, which indicates that soluble salts were not present at levels that would be harmful to plants.

The electrical conductivity value by CaSO₄ extract (BS3882 requirement) fell below the maximum specified value (3300 µS/cm) given in BS3882:2015 – Table 1.

Organic Matter and Fertility Status

The sample was adequately supplied with organic matter and all major plant nutrients.

The C:N ratio was slightly high (21:1) and exceeded the maximum upper limit set by BS3882:2015 - Table 1 (20:1). This could cause 'nitrogen lock up' and result in growth restriction in sensitive plants in particular. This can be addressed through an appropriate fertiliser application.

Potential Contaminants

With reference to BS3882:2015 - Table 1: Notes 3 and 4, there is a recommendation to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. In the absence of site-specific assessment criteria, the concentrations that affect human health have been compared with the *residential with home grown produce* land use in the Suitable For Use Levels (S4ULs) presented in *The LQM/CIEH S4ULs for*

Human Health Risk Assessment (2015) and the DEFRA SP1010: Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination – Policy Companion Document (2014).

Of the potential contaminants determined, none was found at levels that exceeded their guideline values.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels specified in *BS3882:2015 – Table 1*.

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine compliance with the requirements of the British Standard for Topsoil (*BS3882:2015 Specification for Topsoil – Multipurpose Topsoil*).

From the soil examination and laboratory analysis, the sample was described as a slightly acidic, non-saline, very slightly calcareous loamy sand with a weakly developed structure and low stone content. The organic matter content and major plant nutrients were well supplied. The C:N ratio was slightly elevated. Of the potential contaminants determined, none exceeded their respective guideline values.

To conclude, based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes (trees, shrubs and lower performance amenity grass), provided the following conditions are met:

- the slightly elevated C:N ratio is addressed through appropriate fertiliser application;
- the proportion of larger stones (>20mm) is reduced by raking, picking, burying or screening;
- the physical condition of the soil is satisfactory.

The organic matter content of the topsoil would probably be considered acceptable for lower foot traffic amenity grass areas (e.g. road verges). However, the high organic matter content of the topsoil may lead to variable settlement and a soft, uneven surface if used for higher performance amenity grass establishment, e.g. sports pitches or formal lawns.

The sample was largely compliant with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil*) with the exception of the slightly elevated C:N ratio. On this occasion, this non-compliance is considered minor when reviewed in the context of all the other results as the C:N ratio can be remedied through appropriate fertiliser application.

RECOMMENDATIONS

Fertiliser for Planting

To address the C:N imbalance and to help promote effective plant establishment, we recommend applying and incorporating the compound, controlled release fertiliser *ICL Osmocote PrePlant* (17%N:9%P₂O₅:10%K₂O:2%MgO+TE) at a rate of 70 g/m² for planting beds and/or 180 g/tree pit, and to a depth of 200mm.

Fertiliser for Amenity Grass Establishment

To address the C:N imbalance and to help promote effective grass establishment, we recommend applying and incorporating the pre-seeding grass fertiliser *ICL Sportsmaster Pre-seeder* (8%N:12%P₂O₅:8%K₂O+3%MgO) prior to seeding or turfing at a rate of 35 g/m² and to a depth of 100mm.

Stone Removal

To reduce the stone content for *informal* and *formal recreation* end uses (Annex A.4 of BS3882:2015), it may be prudent to remove a portion of the larger stones (>20mm) by intensive picking, raking, burying or screening prior to seeding or turfing.

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, resspreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is reasonably dry and non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

Further details on soil handling are provided in Annex A of BS3882:2015.

Further guidance on the management, preparation and handling of soils is provided in the DEFRA publication *Construction code of practice for the sustainable use of soils on construction sites*, 2009.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully

Matthew Lowry

Matthew Lowry
BSc MSc
Graduate Soil Scientist

Laura Hathaway-Jenkins

Laura Hathaway-Jenkins
BSc MSc EngD MISOilSci
Senior Associate

For & on behalf of Tim O'Hare Associates LLP

 To conform to our Grade 1 top soil, we screen to 10mm 



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	R Draper Ltd
Project:	Topsoil
Job:	Topsoil Analysis - BS3882:2015
Date:	13/07/2018
Job Ref No:	TOHA/18/7658/SS

Sample Reference		
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.063mm)	%	UKAS
Sand (0.063-2.0mm)	%	UKAS
Texture Class (UK Classification)	—	UKAS
Stones (2-20mm)	% DW	GLP
Stones (20-50mm)	% DW	GLP
Stones (>50mm)	% DW	GLP

pH Value (1:2.5 water extract)	units	UKAS
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS
Electrical Conductivity (1:2 CaSO ₄ extract)	uS/cm	UKAS
Exchangeable Sodium Percentage	%	UKAS
Organic Matter (LOI)	%	UKAS
Total Nitrogen (Dumas)	%	UKAS
C : N Ratio	ratio	UKAS
Extractable Phosphorus	mg/l	UKAS
Extractable Potassium	mg/l	UKAS
Extractable Magnesium	mg/l	UKAS

Total Arsenic (As)	mg/kg	MCERTS
Total Cadmium (Cd)	mg/kg	MCERTS
Total Chromium (Cr)	mg/kg	MCERTS
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS
Total Copper (Cu)	mg/kg	MCERTS
Total Lead (Pb)	mg/kg	MCERTS
Total Mercury (Hg)	mg/kg	MCERTS
Total Nickel (Ni)	mg/kg	MCERTS
Total Selenium (Se)	mg/kg	MCERTS
Total Zinc (Zn)	mg/kg	MCERTS
Water Soluble Boron (B)	mg/kg	MCERTS
Total Cyanide (CN)	mg/kg	MCERTS
Total (mono) Phenols	mg/kg	MCERTS

Naphthalene	mg/kg	MCERTS
Acenaphthylene	mg/kg	MCERTS
Acenaphthene	mg/kg	MCERTS
Fluorene	mg/kg	MCERTS
Phenanthrene	mg/kg	MCERTS
Anthracene	mg/kg	MCERTS
Fluoranthene	mg/kg	MCERTS
Pyrene	mg/kg	MCERTS
Benzo(a)anthracene	mg/kg	MCERTS
Chrysene	mg/kg	MCERTS
Benzo(b)fluoranthene	mg/kg	MCERTS
Benzo(k)fluoranthene	mg/kg	MCERTS
Benzo(a)pyrene	mg/kg	MCERTS
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS
Dibenz(a,h)anthracene	mg/kg	MCERTS
Benzo(g,h,i)perylene	mg/kg	MCERTS
Total PAHs (sum USEPA16)	mg/kg	MCERTS

Aliphatic TPH >C5 - C6	mg/kg	MCERTS
Aliphatic TPH >C6 - C8	mg/kg	MCERTS
Aliphatic TPH >C8 - C10	mg/kg	MCERTS
Aliphatic TPH >C10 - C12	mg/kg	MCERTS
Aliphatic TPH >C12 - C16	mg/kg	MCERTS
Aliphatic TPH >C16 - C21	mg/kg	MCERTS
Aliphatic TPH >C21 - C35	mg/kg	MCERTS
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS
Aromatic TPH >C5 - C7	mg/kg	MCERTS
Aromatic TPH >C7 - C8	mg/kg	MCERTS
Aromatic TPH >C8 - C10	mg/kg	MCERTS
Aromatic TPH >C10 - C12	mg/kg	MCERTS
Aromatic TPH >C12 - C16	mg/kg	MCERTS
Aromatic TPH >C16 - C21	mg/kg	MCERTS
Aromatic TPH >C21 - C35	mg/kg	MCERTS
Aromatic TPH (C5 - C35)	mg/kg	MCERTS

Benzene	mg/kg	MCERTS
Toluene	mg/kg	MCERTS
Ethylbenzene	mg/kg	MCERTS
p & m-xylene	mg/kg	MCERTS
Xylene	mg/kg	MCERTS
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS

Asbestos Screen	NND	ISO 17025
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LS = LOAMY SAND

Visual Examination

The sample was described as a very dark brown (Munsell Colour 10YR 2/2) slightly moist, friable, very slightly calcareous LOAMY SAND with a single grain and occasionally weakly developed, fine granular structure. The sample was slightly stony. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

Results of analysis should be read in conjunction with the report they were issued with.

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Topsoil

6
9
85
LS
1
1
3

6.1
348
2126
0.8
14.8
0.42
21
33
163
76

7.3
< 0.2
9.3
< 4.0
29
41
0.7
10
< 1.0
54
0.6
< 1
< 1.0

< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
0.30
0.28
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.80

< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 8.0
48
53
< 0.001
< 0.001
< 0.001
1.5
7.4
34
83
130

< 0.001
< 0.001
< 0.001
< 0.001
< 0.001
< 0.001

Not-detected

Matthew Lowry

Matthew Lowry
BSc MSc
Graduate Soil Scientist