



Appendix E6

Landscaping – Crewe (Willaston) Source Testing

Document ref: R/14656/018

6 July 2016

Lend Lease
North Wales Prison
Wrexham Industrial Estate
Wrexham
North Wales
LL13 9PS

For the attention of Sam Peck, Project Manager

Dear Sam,

Re: Proposed Topsoil Source - Willaston

Please find below our assessment of the Topsoil recently sampled and analysed from the site at Eastern Road, Willaston.

1.0 Introduction

On 30th June 2016, Hydrock, under instruction from Lend Lease (email from Sam Peck of Lend Lease to Eric Cooper of Hydrock, dated 27th June 2016) attended the site of an ongoing residential development off Eastern Road, Willaston, Nantwich.

Prior to the residential development, the site was grassed fields with a residential property in the western corner. There is no history of any other development on site.

The purpose of the site visit was to sample a stockpile of topsoil resulting from the pre-construction site strip. It is understood that it is the intention of Lend Lease to import up to 40 lorry loads (c.400m³) of the soil for use in the landscaped areas at the North Wales Prison development site.

2.0 Description of the Stockpile

At the time of the site visit, the stockpile was located within the central area of the development. The topsoil comprises brown to dark brown sandy clay, locally slightly gravelly. No evidence of man-made materials was noted in the stockpile.

3.0 Sampling and Testing

Three representative soil samples were recovered from various points across the faces of the stockpile. The samples were then dispatched to the laboratories of i2 Analytical, where they were tested for the Hydrock Default Soil Suite of determinands and Level 2 speciated petroleum hydrocarbons (aromatic / aromatic split).

4.0 **Results**

The chemical testing results have been assessed against the Generic Assessment Criteria (GAC) for the CLEA Public Open Space (Residential) land use scenario, as these were felt to be the most appropriate screening criteria for the proposed end use.

The results of the assessment are summarised in Table 4.1. It should be noted that only those determinands which were recorded at detectable concentrations are considered below. The full assessment results are included at Annex B.

Table 4.1 Abermorddu Topsoil Stockpile - Chemical Testing Results and Assessment

Determinand	GAC (mg/kg)	Range of Concentrations (mg/kg)	No. of Exceedances
Arsenic	79	7.4 – 8.0	0
Beryllium	92	0.44 – 0.50	0
Chromium (III)	1,500	8.6 - 12	0
Copper	12,000	20 - 25	0
Lead	630	36 - 50	0
Nickel	290	8.5 – 9.1	0
Vanadium	440	15 - 17	0
Zinc	81,000	37 - 53	0

It can be seen from Table 4.1 that there are no exceedances of the GAC for a Public Open Space (Residential) end use.

Asbestos screening was also carried out on all samples by the laboratory, and was found to be absent.

5.0 **Summary and Conclusions**

Three representative samples of the topsoil currently stockpiled at the ongoing residential development at Eastern Road, Willaston have been sampled at source prior to importation and chemically tested.

The results of the testing, when assessed against GAC appropriate to a Public Open Space (Residential) end use, did not identify any exceedances of the GAC, with both samples also proven to be free of asbestos fibres.

It is therefore concluded that the soils are chemically suitable for their intended landscaping use at the North Wales Prison development at Wrexham.



We trust that the above meets your current requirements.

Yours sincerely
for **Hydrock**

A handwritten signature in black ink, appearing to read 'K Dale'.

Karen Dale MGeol FGS
Geo-environmental Consultant

karendale@hydrock.com



Annex A

Chemical Soil Testing Certificates

**Karen Dale**

Hydrock Consultants Ltd
4 Lakeside
Festival Park
Stoke on Trent
ST1 5RY

t: 01782 261919
f: 01782 262020
e: Karendale@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 16-21519

Project / Site name:	Wrexham Prison	Samples received on:	30/06/2016
Your job number:	C14656	Samples instructed on:	30/06/2016
Your order number:	C14656-S16139	Analysis completed by:	05/07/2016
Report Issue Number:	1	Report issued on:	05/07/2016
Samples Analysed:	3 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant 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.

Analytical Report Number: 16-21519

Project / Site name: Wrexham Prison

Your Order No: C14656-S16139

Lab Sample Number				595405	595406	595407		
Sample Reference				Willaston Sample	Willaston Sample	Willaston Sample		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				None Supplied	None Supplied	None Supplied		
Date Sampled				27/06/2016	27/06/2016	27/06/2016		
Time Taken				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		
Moisture Content	%	N/A	NONE	17	15	14		
Total mass of sample received	kg	0.001	NONE	0.43	0.44	0.40		

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		
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General Inorganics

pH	pH Units	N/A	MCERTS	6.0	5.9	5.5		
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Water Soluble Sulphate (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.019	0.018	0.018		
Water Soluble Sulphate (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	19.0	17.5	18.0		
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.026	0.024	0.021		

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	1.1	< 1.0		
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60		
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.0	7.9	7.4		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.48	0.50	0.44		
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2		
Chromium (III)	mg/kg	1	NONE	11	12	8.6		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11	12	8.6		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23	25	20		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	45	50	36		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	0.4	0.4		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	8.5	9.1	8.6		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.2		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	15	17	15		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	53	48	37		

Analytical Report Number: 16-21519
Project / Site name: Wrexham Prison
Your Order No: C14656-S16139

Lab Sample Number	595405	595406	595407		
Sample Reference	Willaston Sample	Willaston Sample	Willaston Sample		
Sample Number	None Supplied	None Supplied	None Supplied		
Depth (m)	None Supplied	None Supplied	None Supplied		
Date Sampled	27/06/2016	27/06/2016	27/06/2016		
Time Taken	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		
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC16 - EC35	mg/kg	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	14	< 8.4	< 8.4		

Analytical Report Number : 16-21519

Project / Site name: Wrexham Prison

* 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 topsoil/loam 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 *
595405	Willaston Sample 1	None Supplied	None Supplied	Brown loam and clay with fibres and vegetation.
595406	Willaston Sample 2	None Supplied	None Supplied	Brown loam and clay with fibres and vegetation.
595407	Willaston Sample 3	None Supplied	None Supplied	Brown loam and clay with fibres and vegetation.

Analytical Report Number : 16-21519

Project / Site name: Wrexham Prison

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

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
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon 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	L023-PL	D	NONE
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in soil (Lower Level)	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 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	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
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
TPH Chromatogram	TPH Chromatogram.	In-house method	L064-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS



Analytical Report Number : 16-21519

Project / Site name: Wrexham Prison

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

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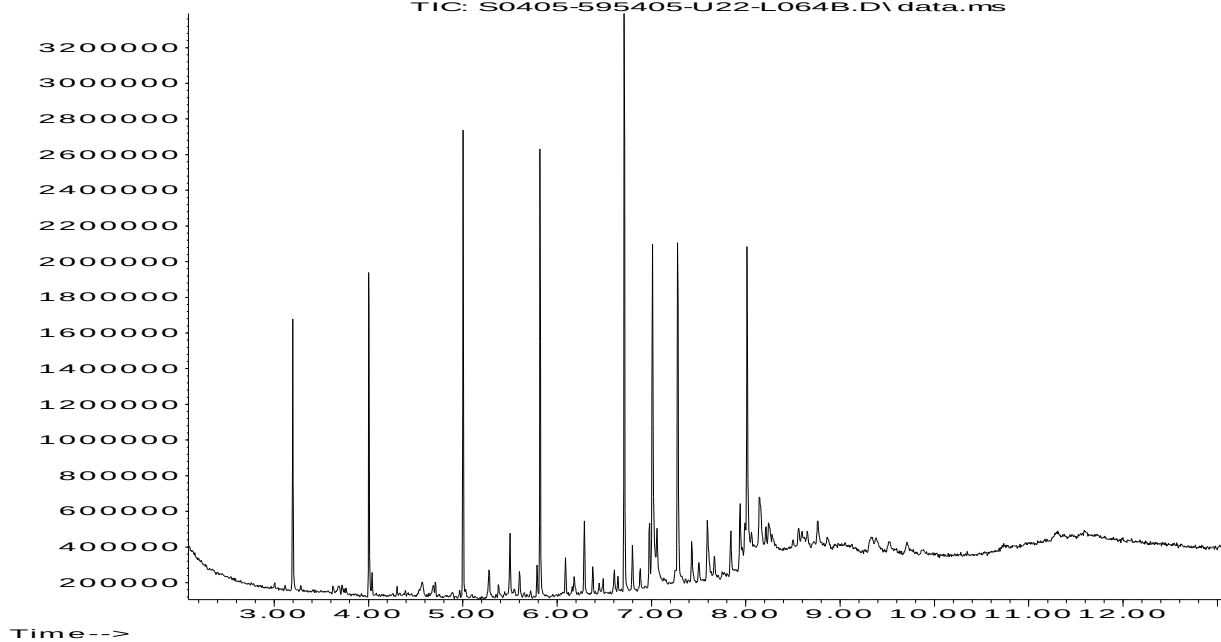
For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

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.

Abundance

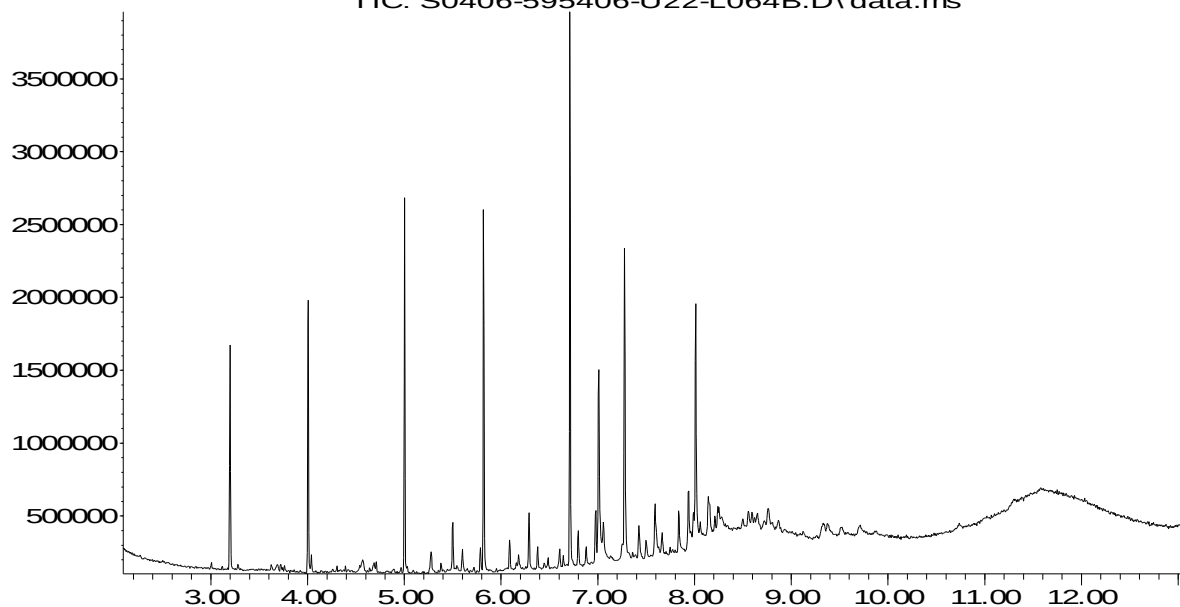
TIC: S0405-595405-U22-L064B.D\data.ms



Time-->

Abundance

TIC: S0406-595406-U22-L064B.D\data.ms



Time-->

Abundance

TIC: S0407-595407-U22-L064B.D\data.ms

