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Ref: 13-500-V12
Date: 19th April 2022

Antony Miller
Elan Homes
Oak House
Lloyd Drive
Cheshire Oaks Business Park
Ellesmere Port
CH65 9HQ

By email

Dear Antony,

COVER SYSTEM VALIDATION – BOOTHROYDEN ROAD RIVER EMBANKMENT

An E3P engineer attended the above site to validate the thickness of the cover system that had been placed along the river embankment at the site off Boothroyden Road in Middleton.

In total 6 No. hand excavated trial pits were advanced with the resulting strata detailed to the rear of this letter.

The trial pits were completed to highlight the required cover system of 200 mm topsoil with geocell over the underlying geotextile membrane.

TOPSOIL

Topsoil was imported from Landgate Farm off Landgate Lane in Wigan. Three topsoil samples were analysed in accordance with the E3P Remediation Strategy. Chemical analysis results are included within lab report 21-62730 (attached to this letter).

Chemical analysis confirmed the absence of any contaminant exceedances; therefore, it has been determined that the topsoil is suitable for utilisation.

Cover system validation photographs are enclosed within this letter.

I trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.



Boothroyden Road, Middleton
Elan Homes
April 2022

Yours sincerely,

For and on behalf of E3P Ltd

Nicola Sellars
Senior Geo-Environmental Consultant



Site: Boothroyden Road

Date: 13-04-2022	Project Number: 13-500
Project Manager: N. Sellars	E3P Engineer: R. Webster
Plot Numbers Validated: River Embankment	

Chemical Laboratory Analysis

Analysis for topsoil and subsoil undertaken by I2 Analytical Laboratory using UKAS accredited methods where applicable.

Chemical analysis suite comprises heavy metals, sulphates, phenols, speciated Polycyclic Aromatic Hydrocarbons (PAHs), speciated and total Petroleum Hydrocarbons (TPH) and asbestos.

Sampling frequency in accordance with the agreed Remediation Strategy. Laboratory analysis certificates attached to this validation certificate.

	Topsoil
<i>Chemical analysis confirmed materials suitable?</i>	Pass
<i>Further Comments</i>	N/A



Plot No: Embankment – Trial Hole 1

Depth of Strata (m bgl)	0.00-0.20	Validated TOPSOIL
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Depth of Cover System Materials



Depth of Cover System at Ground Level

Depth of Cover System Materials



Depth of Cover System in Relation to Plot



Plot No: Embankment – Trial Hole 2

Depth of Strata (m bgl)	0.00-0.20	Validated TOPSOIL
Depth of Cover System Materials		Depth of Cover System Materials
		
Depth of Cover System at Ground Level		Depth of Cover System in Relation to Plot
		



Plot No: Embankment – Trial Hole 3

Depth of Strata (m bgl)	0.00-0.20	Validated TOPSOIL
Depth of Cover System Materials		Depth of Cover System Materials
		
Depth of Cover System at Ground Level		Depth of Cover System in Relation to Plot
		



Plot No: Embankment – Trial Hole 4

Depth of Strata (m bgl)	0.00-0.20	Validated TOPSOIL
Depth of Cover System Materials		Depth of Cover System Materials
		
Depth of Cover System at Ground Level		Depth of Cover System in Relation to Plot
		

Plot No: Embankment – Trial Hole 5

Depth of Strata (m bgl)	0.00-0.20	Validated TOPSOIL
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Depth of Cover System Materials	Depth of Cover System Materials
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Depth of Cover System at Ground Level

Depth of Cover System in Relation to Plot



Plot No: Embankment – Trial Hole 6

Depth of Strata (m bgl)	0.00-0.20	Validated TOPSOIL
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Depth of Cover System Materials	Depth of Cover System Materials
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Depth of Cover System at Ground Level	Depth of Cover System in Relation to Plot
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**Nicola Sellars**

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Analytical Report Number : 21-62730

Project / Site name:	Boothroyden	Samples received on:	15/03/2021
Your job number:	13-500	Samples instructed on/ Analysis started on:	15/03/2021
Your order number:	13500-NS-C	Analysis completed by:	22/03/2021
Report Issue Number:	1	Report issued on:	22/03/2021
Samples Analysed:	3 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
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.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-62730
Project / Site name: Boothroyden
Your Order No: 13500-NS-C

Lab Sample Number				1803703	1803704	1803705
Sample Reference				Bank TS101	Bank TS102	Bank TS103
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				12/03/2021	12/03/2021	12/03/2021
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	%	0.01	NONE	23	21	24
Total mass of sample received	kg	0.001	NONE	0.50	0.50	0.50

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

pH - Automated	pH Units	N/A	MCERTS	8.3	8.5	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	500	370	230
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.12	0.073	0.032
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	240	150	64
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	119	73.0	32.2
Sulphide	mg/kg	1	MCERTS	2.9	2.2	< 1.0
Total Sulphur	mg/kg	50	MCERTS	460	350	290
Organic Matter	%	0.1	MCERTS	3.8	2.6	4.5

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.62	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.17	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.62	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.59	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.30	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.29	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.31	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.11	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.25	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	3.26	< 0.80
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Analytical Report Number: 21-62730

Project / Site name: Boothroyden

Your Order No: 13500-NS-C

Lab Sample Number				1803703	1803704	1803705
Sample Reference				Bank TS101	Bank TS102	Bank TS103
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				12/03/2021	12/03/2021	12/03/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	4.9	4.9	3.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	13	13
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42	53	19
Lead (aqua regia extractable)	mg/kg	1	MCERTS	16	16	15
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	11	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	70	46	41

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	7.5	5.2	10
TPH (C21 - C35)	mg/kg	1	MCERTS	13	4.6	10
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	23	12	22

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-62730

Project / Site name: Boothroyden

* 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 *
1803703	Bank TS101	None Supplied	None Supplied	Brown clay and sand with gravel and vegetation.
1803704	Bank TS102	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
1803705	Bank TS103	None Supplied	None Supplied	Brown clay and sand with gravel and vegetation.

Analytical Report Number : 21-62730

Project / Site name: Boothroyden

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	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
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
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
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	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
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total 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
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS



Analytical Report Number : 21-62730
Project / Site name: Boothroyden

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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.