

SOIL CONTAMINATION REPORT

ECOBAT, WEDNESBURY



Date	3rd & 5th October 2023
Client	Ecobat Solutions Ltd.
Site Address	Crescent Works Industrial Park, Willenhall Road, Darlaston Road, WS10 8JR
Shire Reference	G-23-383 G2-1



Report prepared by: Rob Ray BSc(Hons) Env Eng

ENGINEERING INNOVATION

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1.0 INTRODUCTION

Shire Geotechnical were appointed by Ecobat Solutions Ltd. to carry out a soil investigation. The investigation was required to determine the levels of contamination in the soils below the site.

The work included drill cores through the existing concrete yard slab/tarmac areas and contamination testing of the subsoils.

The report is carried out generally in accordance with BS 10175 (2011) and Land Contamination Risk Management (LCRM, 2020), and presents full factual records of the site work, the ground conditions encountered and laboratory test results.

A Ground Investigation Report carried out by Shire Geotechnical (Ref G-23-383G1-1) indicates made ground to depths of between 3.8m and 4.5m below the site, and also indicated the site is on the Coalfield.

The recommendations and opinions expressed in this report are based on the strata observed in the exploratory holes. No responsibility is taken for conditions that have not been revealed by the exploratory holes, or which occur between them. Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative, and liability cannot be accepted for its accuracy.

2.0 FIELDWORK

2.1 **General:**

The fieldwork was scheduled and carried out by Shire Geotechnical on Tuesday 3rd & Thursday 5th October 2023.

The fieldwork was carried out generally in accordance with BS10175 (2011) and Eurocode 7 (BS EN 1997) *Geotechnical Design*. The exploratory hole locations are shown approximately on the Site Location Plan, included in the Appendices.

All exploratory hole locations were scanned for buried services using a Cable Avoidance Tool (CAT) and excavated in accordance with Health & Safety Executive document HSG47.

2.2 **Drill Cores**

Four drill cores were conducted through the existing concrete yard slab/tarmac areas and samples of the subsoil were taken for contamination testing. The holes were backfilled and reinstated on completion.

Samples were taken at the following depths:

Core1 - 0.5m and 1.5m

Core 2 - 0.6m and 1.9m

Core 3 - 0.4m and 1.5m

Core 4 - 0.7m and 1.8m

3.0 LABORATORY WORK AND MONITORING

3.1 **General:**

Selected disturbed samples of soil were taken and returned to MCERTS accredited laboratories for testing. The tests were carried out in accordance with the methods outlined in BS 1377, "Method of Test Soils for Civil Engineering Purposes" 1990.

Copies of the laboratory soil test results are included in Appendix C.

3.2 **Environmental Tests:**

Chemical analysis was carried out in accordance with LCRM (2020). The samples were submitted for the following suite of determinants:

Arsenic, Cadmium (total), Chromium (total), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide (total), Sulphate (SO₄), Sulphide, pH, Sulphur, Speciated Polyaromatic Hydrocarbons (PAH) and Speciated Total Petroleum Hydrocarbons (TPH), Soil Organic Matter Content.

It is emphasised that only a limited number of tests for contamination have been carried out and that the possibility of further contamination existing elsewhere on the site cannot be ruled out. Shire Geotechnical does not accept any liability for contamination.

The CLEA model indicates Soil Guideline Values (SGVs) for various parameters (shown in the table below). A direct comparison was made between the soils results and the CLEA SGVs for residential, allotment, and commercial end use. For contaminants not covered by the CLEA assessment criteria, reference is made to the soil screening values derived using the LQM/CIEH S4ULs for Human Health Risk Assessment.

Category 4 Screening Levels (C4SL) were used for Arsenic, Benzo(a)pyrene, Cadmium and Lead, in accordance with the DEFRA Report SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. – March 2014.

The LQM values are based on a 1% Soil Organic Matter Content (SOM). The CLEA Soil Guideline Values for metals and the Category 4 Screening Levels used are not sensitive to Soil Organic Matter (SOM).

Copper and Zinc are not generally considered to represent a significant risk to Human Health, however they are phytotoxic and harmful to plants.

3.3 Generic Soil Comparison with Assessment Criteria:

Determinand	Assessment Criteria (mg/kg)			No. of Samples	Min. (mg/kg)	Max. (mg/kg)	No. of Exceedances
	Residential with home - grown produce (A)	Residential without home-grown produce (B)	Commercial (C)				
Arsenic	37	49	640	8	18.3	126	3 (A, B)
Cadmium	22	150	410	8	< 0.5	7.0	0
Chromium	130	130	5000	8	30.1	881	3 (A, B)
Lead	200	310	2330	8	57.5	680	5(A), 3(B)
Mercury	1.2	1.2	58	8	< 0.5	1.1	1 (A), (B)
Nickel	180	180	980	8	92.1	1670	3 (A, B), 1 (C)
Selenium	250	430	120000	8	< 1.0	1.4	0
Total TPH (C ₈ -C ₁₀)	27	27	2000	8	< 1.0	< 1.0	0
Total TPH (C ₁₀ -C ₁₂)	74	130	9700	8	< 1.0	1.5	0
Total TPH (C ₁₂ -C ₁₆)	140	1100	36000	8	< 1.0	3.5	0
Total TPH (C ₁₆ -C ₂₁)	260	1900	28000	8	< 1.0	52.1	0
Total TPH (C ₂₁ -C ₄₀)	1100	1900	28000	8	17.3	1105	1(A)
Naphthalene	2.3	2.3	190	8	< 0.1	3.0	1 (A, B)
Benzo(a)pyrene	5.0	5.3	76	8	< 0.1	1.0	0
Copper	2400	7100	68000	8	102	2160	0
Zinc	3750	40000	730000	8	150	2090	0

4.0 CONCLUSIONS

The soil test results indicate one elevated levels of nickel, above the recommended assessment criteria for a commercial site. This was found in Core 3 at 1.5m.

All other samples tested were below the recommended assessment criteria for a commercial site.

There are some levels of arsenic, chromium, lead, mercury, nickel and naphthalene that exceed the recommended assessment criteria for a residential site. However, these levels are acceptable where there is no containment-receptor pathway such as below foundations or hardstanding. Any proposed growing areas would require a minimum depth 600mm layer of clean imported topsoil.

Any material leaving the site should be disposed of at a licensed tip.

Due diligence is required during the construction period, and should any evidence of contamination be found, appropriate investigation and/or action should be taken.

As with all construction sites, personnel working on the site during the construction period should be encouraged to maintain a high standard of personal hygiene and on-site washing facilities should be available.

APPENDIX A

Exploratory Hole Location Plan



CORE 2

CORE 3

CORE 4

CORE 1

Crescent Works Industrial

UK

APPENDIX B

Laboratory Test Results



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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 23-50457

Issue: 1

Date of Issue: 12/10/2023

Contact: Jack Stokes

Customer Details: Shire Consulting
The Chapel
Bromsgrove
Worcestershire B61 0SZ

Quotation No: Q22-03508

Order No: Not Supplied

Customer Reference: G-23-383

Date Received: 09/10/2023

Date Approved: 12/10/2023

Details: Ecobat Wenesbury

Approved by:

Ben Rees, Customer Services Assistant

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Sample Summary

Report No.: 23-50457, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
341556	Core 1 0.50	05/10/2023	09/10/2023	Silty loam	
341557	Core 2 0.60	05/10/2023	09/10/2023	Sandy silty loam	
341558	Core 3 0.40	03/10/2023	09/10/2023	Silty loam	
341559	Core 4 0.70	05/10/2023	09/10/2023	Silty loam	
341560	Core 1 1.50	05/10/2023	09/10/2023	Sandy silty loam	
341561	Core 2 1.90	05/10/2023	09/10/2023	Sandy silty loam	
341562	Core 3 1.50	05/10/2023	09/10/2023	Silty loam	
341563	Core 4 1.80	05/10/2023	09/10/2023	Sandy silty loam	



Results Summary

Report No.: 23-50457, issue number 1

	ELAB Reference	341556	341557	341558	341559	341560 *	341561	341562	341563 *		
Customer Reference											
Sample ID											
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sample Location	Core 1	Core 2	Core 3	Core 4	Core 1	Core 2	Core 3	Core 4			
Sample Depth (m)	0.50	0.60	0.40	0.70	1.50	1.90	1.50	1.80			
Sampling Date	05/10/2023	05/10/2023	03/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023		
Determinand	Codes	Units	LOD								
Soil sample preparation parameters											
Moisture Content	N	%	0.1	14.2	9.1	7.8	14.9	12.3	8.3	13.7	15.7
Material removed	N	%	0.1	29.0	24.7	37.7	33.1	35.1	17.2	30.0	27.3
Description of Inert material removed	N		0	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Metals											
Arsenic	M	mg/kg	1	33.8	22.7	28.7	36.8	61.8	18.3	55.7	126
Cadmium	M	mg/kg	0.5	< 0.5	0.9	5.2	2.4	< 0.5	< 0.5	0.6	7.0
Chromium	M	mg/kg	5	35.9	64.9	153	55.8	42.0	30.1	881	290
Copper	M	mg/kg	5	112	102	167	288	317	127	316	2160
Lead	M	mg/kg	5	190	166	353	281	363	57.5	258	680
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	2.8	< 0.5	< 0.5	0.7	1.1
Nickel	M	mg/kg	5	92.1	119	356	120	111	69.4	1670	410
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	248	296	324	920	183	150	347	2090
Anions											
Water Soluble Sulphate	M	g/l	0.02	0.11	0.21	1.39	0.21	1.04	0.16	0.18	0.51
Miscellaneous											
pH	M	pH units	0.1	8.2	7.8	8.9	10.0	6.4	7.0	7.8	7.4
Soil Organic Matter	U	%	0.1	1.9	2.6	1.8	4.5	3.7	1.8	10	4.4
Organics											
>C8-C10 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	1.5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 BCB (EH_1D_Total)	N	mg/kg	1	1.2	2.9	2.9	< 1.0	2.3	< 1.0	3.5	1.3
>C16-C21 BCB (EH_1D_Total)	N	mg/kg	1	4.0	2.4	6.9	2.9	14.1	< 1.0	24.3	52.1
>C21-C35 BCB (EH_1D_Total)	N	mg/kg	1	30.7	30.1	95.3	41.3	257	10.5	408	882
>C35-C40 BCB (EH_1D_Total)	N	mg/kg	1	3.1	5.0	26.7	9.0	35.8	6.8	145	223
Total (>C8-C40) BCB (EH_1D_Total)	N	mg/kg	1	39.0	42.0	132	53.2	309	17.4	580	1160

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The Environmental Laboratory Ltd. Reg. No. 3882193



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Results Summary

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ELAB Reference	341556	341557	341558	341559	341560 *	341561	341562	341563 *
Customer Reference								
Sample ID								
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	Core 1	Core 2	Core 3	Core 4	Core 1	Core 2	Core 3	Core 4
Sample Depth (m)	0.50	0.60	0.40	0.70	1.50	1.90	1.50	1.80
Sampling Date	05/10/2023	05/10/2023	03/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023

Determinand	Codes	Units	LOD								
Polyaromatic hydrocarbons											
Naphthalene	N	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	< 0.1	3.0	n/t
Acenaphthylene	N	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	< 0.1	0.2	n/t
Acenaphthene	N	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	< 0.1	1.1	n/t
Fluorene	N	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	< 0.1	0.3	n/t
Phenanthrene	N	mg/kg	0.1	0.3	0.1	0.3	0.5	n/t	< 0.1	2.2	n/t
Anthracene	N	mg/kg	0.1	< 0.1	< 0.1	0.1	0.2	n/t	< 0.1	0.2	n/t
Fluoranthene	N	mg/kg	0.1	0.4	0.1	0.8	1.2	n/t	< 0.1	2.1	n/t
Pyrene	N	mg/kg	0.1	0.3	< 0.1	0.7	1.1	n/t	< 0.1	1.9	n/t
Benzo(a)anthracene	N	mg/kg	0.1	0.1	< 0.1	0.4	0.6	n/t	< 0.1	0.5	n/t
Chrysene	N	mg/kg	0.1	0.2	0.1	0.6	0.8	n/t	< 0.1	0.6	n/t
Benzo(b)fluoranthene	N	mg/kg	0.1	0.2	0.2	0.7	1.0	n/t	< 0.1	0.7	n/t
Benzo(k)fluoranthene	N	mg/kg	0.1	0.3	0.2	0.7	1.0	n/t	< 0.1	0.7	n/t
Benzo(a)pyrene	N	mg/kg	0.1	0.2	< 0.1	0.6	1.0	n/t	< 0.1	0.6	n/t
Indeno(1,2,3-cd)pyrene	N	mg/kg	0.1	0.2	0.2	0.6	0.8	n/t	< 0.1	0.7	n/t
Dibenzo(a,h)anthracene	N	mg/kg	0.1	< 0.1	< 0.1	0.1	0.1	n/t	< 0.1	0.3	n/t
Benzo[g,h,i]perylene	N	mg/kg	0.1	0.2	0.2	0.4	0.7	n/t	< 0.1	0.7	n/t
Total PAH(16)	N	mg/kg	0.4	2.8	1.6	6.3	9.2	n/t	< 0.4	15.8	n/t



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ELAB Reference	341556	341557	341558	341559	341560 *	341561	341562	341563 *
Customer Reference								
Sample ID								
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	Core 1	Core 2	Core 3	Core 4	Core 1	Core 2	Core 3	Core 4
Sample Depth (m)	0.50	0.60	0.40	0.70	1.50	1.90	1.50	1.80
Sampling Date	05/10/2023	05/10/2023	03/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023	05/10/2023

Determinand	Codes	Units	LOD								
Naphthalene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.06	n/t	n/t	0.05
Acenaphthylene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.02	n/t	n/t	0.01
Acenaphthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.01	n/t	n/t	< 0.01
Fluorene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.02	n/t	n/t	0.01
Phenanthrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.49	n/t	n/t	0.12
Anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.05	n/t	n/t	0.01
Fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.29	n/t	n/t	0.13
Pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.26	n/t	n/t	0.18
Benzo(a)anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.15	n/t	n/t	0.06
Chrysene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.34	n/t	n/t	0.27
Benzo(b)fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.13	n/t	n/t	0.09
Benzo(k)fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.09	n/t	n/t	0.07
Benzo(a)pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.08	n/t	n/t	0.09
Indeno(1,2,3-cd)pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.06	n/t	n/t	0.07
Dibenzo(a,h)anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.03	n/t	n/t	0.02
Benzo(g,h,i)perylene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t	0.08	n/t	n/t	0.11
Total PAH(16) GCMS	N	mg/kg	0.04	n/t	n/t	n/t	n/t	2.16	n/t	n/t	1.29
Total PAH(17) GCMS	N	mg/kg	0.04	n/t	n/t	n/t	n/t	2.18	n/t	n/t	1.32

* PAH by GCMS due to the presence of interferences



Method Summary

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Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
PAH (GC-MS)	N	As submitted sample	12/10/2023		GC-MS
pH	M	Air dried sample	10/10/2023	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	10/10/2023	300	ICPMS
PAH (GC-FID)	N	As submitted sample	10/10/2023	133	GC-FID
Water soluble anions	M	Air dried sample	10/10/2023	172	Ion Chromatography
Basic carbon banding in soil	N	As submitted sample	10/10/2023	218	GC-FID
Soil organic matter	U	Air dried sample	10/10/2023	BS1377:P3	Titrimetry

Tests marked N are not UKAS accredited

Report Information

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Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

LOD LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.
Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the sample received.
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request
Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry