

Buildex Construction Limited
Unit 6 Stanley Court
Edison Road
Quedgeley
Gloucester
GL2 2HE

Our Ref: 5021/RS

15 May 2023

FAO Jason Hayes, Director

Dear Jason,

RE: 64-68 HIGH STREET, TREDWORTH, GLOUCESTER, GL1 4SR

At your instruction we have recently undertaken a routine soil sampling and contamination risk assessment for the proposed residential re-development at the above site. Having now received all laboratory results I report as follows. It is understood that this is required purely for 'due diligence' purposes and that there is no planning condition relating to ground contamination.

This report has been prepared in accordance with quotation reference Q22149 dated 27th May 2022 with your instruction confirmed 1st June 2022 (although the works were subsequently delayed). Reliance on this report is presently restricted to Buildex Construction Limited.

Background Setting

Centred on National Grid Reference 383432, 217437 the site is located in the Tredworth district of Gloucester c1.3km south-east of the city centre as shown on drawing 5021/1. At the time of our investigation the former workshop building had been demolished (photos shown in Appendix 1 and annotated on drawing 5021/2). The site surface almost entirely comprises concrete hardstand and it is bounded by residential/retail buildings on all sides. Topographic data derived from the Google Earth mapping suite indicates that it is essentially flat at an elevation of 17m above Ordnance Datum (AOD). There were no obvious visual sources of potentially significant contamination such as residual oil impaction from the workshop usage, and we understand that there are/were no above/below ground fuel storage tanks.

Geologically the site is underlain by bedrock of the Charmouth Mudstone Formation (ChM), usually encountered as weak dark blueish-grey weak mudstone, which weathers near surface to

firm to stiff greyish-brown plastic clay. This is entirely overlain by the superficial Cheltenham Sand and Gravel (ChSG) which initially comprises clay grading rapidly with depth into non-cohesive sand. There are no areas of mapped made ground or geological faulting shown either on or within likely influencing distance of the site, although the former is likely given the developed setting. The site is not affected by any active or closed landfills and is not in a radon-affected area.

Site Works and Laboratory Testing

Five holes were excavated by you the client to between 0.63m and 0.76m depth (TP1-TP5) at positions selected by this Practice in order to achieve overall site coverage and target areas of proposed private gardens/soft landscaping as shown on drawing 5021/2. On 28th April 2023 this Practice attended site to log the pits (as attached in Appendix 2 and shown on drawing 5021/2) from surface in accordance with Eurocode 7 (BS EN ISO 14688-1:2002 and 14688-2:2004), and obtain representative soil samples for contamination testing. Ground conditions were found to be commensurate with expectation, generally comprising concrete and sub-base underlain by generally cohesive made ground. Neither the natural ChSG or ChM were encountered.

Five representative samples of near-surface made ground were taken; those soils to be scheduled for organic analysis were sealed within opaque amber glass jars to prevent loss of any volatiles during transit, whilst those for inorganic testing were placed in plastic tubs, all with chain of custody labelling. All samples were sent to UKAS accredited i2 Analytical Ltd where analysis selectively comprised the following:

- Toxic and phytotoxic metals
- pH
- Total Petroleum Hydrocarbons (TPH)
- Speciated Polyaromatic Hydrocarbons (PAH)
- Asbestos Screen and ID
- Soil organic matter

Risk to controlled waters was determined by leachate analysis on a representative sample of made ground (TP1/0.25-0.72m) to determine leachable toxic/phytotoxic metals and PAH content. The certified laboratory test results are attached in Appendix 3 and for convenience these have also been summarised to facilitate comparison against assessment criteria.

Contamination Risk Assessment

The contamination risk assessment has been carried out in general accordance with the methodology described within Appendix 3. Testing has included samples of the near-surface made ground to assess its suitability for retention within a proposed development. Tier 1 risk modelling has adopted the '***Residential with Plant Uptake***' land use scenario, including the pathway of direct ingestion via vegetables grown for consumption, and the 'critical receptor' is taken as a female child of age class 1-6. Whilst site observations suggested a generally low risk

to any proposed residential re-development, a generally targeted sampling approach with a 'medium' sampling density was considered appropriate to target areas of proposed private gardens/soft landscaping, whilst also achieving overall site coverage.

The test results are presented in full in Appendix 3, and for ease of reference Table 1 below provides a summary of the maximum measured concentration of each determinant against respective Tier 1 generic assessment criteria - the published 'Suitable for Use Levels' (S4ULs).

TABLE 1: SUMMARY OF SOIL CONTAMINATION TEST RESULTS

Determinant	Maximum Measured Concentration (mg/kg)	LQM/CIEH S4UL Residential – with Plant Uptake (mg/kg) \$	Tests Undertaken (No.)	Exceedances (No.)	Notes
Arsenic	32	37	5	0	
Cadmium	1.7	11	5	0	
Chromium III	36	910	5	0	
Chromium VI	<1.2	6	5	0	
Copper	120	2,400	5	0	
Lead	410	200*	5	20	TP1/0.25-0.72m and TP3/0.28-0.69m
Mercury	1.2	40	5	0	
Nickel	44	130	5	0	
Selenium	<1.0	250	5	0	
Zinc	690	3,700	5	0	
PAH compounds	27.9	Various	5	0	
Total Petroleum Hydrocarbons (C6-C40)	130	Various	5	0	
Asbestos Screen & ID	ND	0.001%	3	0	
Notes:					
*C4SL used in absence of S4UL					
\$ based on soil organic matter = 6.0%					

Determinant	Maximum Measured Concentration (mg/kg)	LQM/CIEH S4UL Residential – with Plant Uptake (mg/kg) \$	Tests Undertaken (No.)	Exceedances (No.)	Notes
ND = Non-Detect					

The findings presented in Table 1 above and within Appendix 3 indicate that all concentrations of phytotoxic metals, PAH and TPH compounds are acceptable, and additionally no loose fibres of asbestos were detected. It is noted however that two elevations of the toxic metal lead were locally encountered in near surface made ground. These may pose a risk to the health of future site users so have been considered in more detail below.

Tier 1 risk assessment has identified 410mg/kg and 400mg/kg of lead in TP1/0.25-0.72m and TP3/0.28-0.69m respectively which exceed the 'residential' C4SL threshold of 200mg/kg. Statistical Analysis using the CIEH Statistical Calculator determines neither of these elevations to be outliers to the main population of results, therefore suggesting a potentially site wide issue, so either further investigation or more likely remedial action is required as discussed below.

Given the moderate elevations and relatively low volume of contaminated material likely to be generated during remedial works, the provisionally recommended remedial option is to selectively remove the offending material from within/beneath proposed private gardens/soft landscaping. Such arisings can potentially be retained on site as long as they are placed beneath hardstand or buildings, alternatively such arisings can be disposed of off-site at a suitably licensed landfill. Replacement soil will need to be uncontaminated and suitable for a residential development and (if imported) ideally come with pre-certification confirming its uncontaminated status and suitability for use within a residential end use.

An alternative to the foregoing would be the simple application onto the existing ground of a clean cover capping system across proposed private gardens/soft landscaping to break the potential exposure pathways. Using the BRE BR465 "Clean Cover System" software, based upon the aforementioned elevations a provisional minimum thickness of 410mm has been calculated to remove the risk to human health. A reduced thickness may be possible subject to assessment of contamination data for the proposed cover soils. Clearly if it is necessary to maintain existing ground levels, prior removal of the offending material may be necessary.

Were hardstand cover such as a paved patio to be proposed this should act as a barrier between any contaminants and future site users, effectively breaking the potential pollutant linkages and exposure pathways thus negating any possible health risks, in which case no removal or clean cover would be needed.

Consistent with the soil phase results it will be seen that there are no significant elevations exceeding WFD, EQS or UK DWS levels, on which basis the site is not considered to pose a

significant risk to controlled waters or groundwater resources, thus pre-construction remedial action in this respect is not currently considered necessary.

Conclusions and Recommendations

Contamination testing has identified localised elevations of the toxic metal lead which may pose a health risk to future site users within any 'soft' gardens as part of the proposed residential re-development. This can however be easily mitigated either by selective removal of the offending materials or through the application of a clean cover capping system across proposed private gardens/soft landscaping (or alternatively hardstand to break potential exposure pathways). There is no perceived risk to controlled waters and no identified requirement for either radon or landfill gas protection. Should the site be subject to any planning consent the LPA may require a formal Remediation Strategy to confirm the proposed methodology etc, and for post-remedial verification; we can assist in both cases as required.

I trust that this suitably addresses the requirements, however please do not hesitate to contact me should you require anything further. This report is subject to our standard terms and conditions.

Yours sincerely,



RICHARD J STOKES BSc (Hons) FGS
SENIOR GEO-ENVIRONMENTAL ENGINEER
For
WILSON ASSOCIATES (CONSULTING) LIMITED

Encl.

64-68 HIGH STREET, TREDWORTH, GLOUCESTER GL1 4SR



SITE LOCATION (based on Microsoft Bing Mapping)

Job No.

5021

Drawing No.

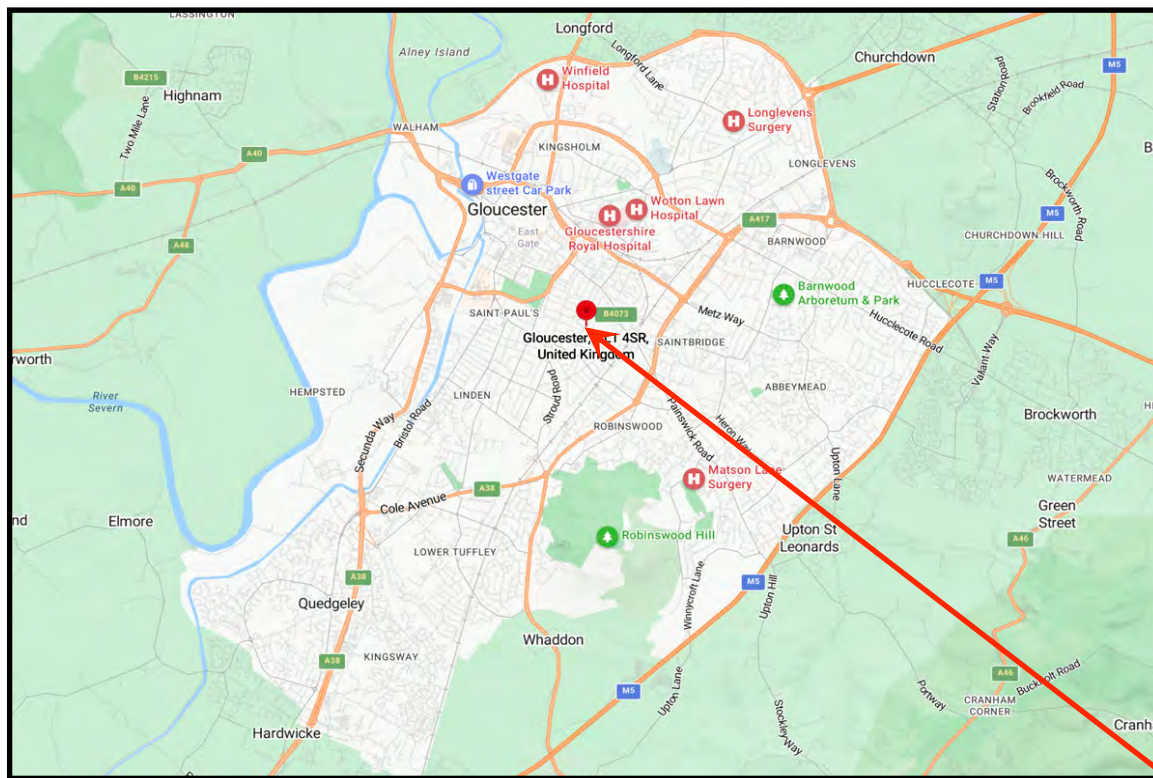
5021/1

Scale:

NTS

Date:

02-05-23



THE
SITE



PROPOSED DEVELOPMENT LAYOUT (based on Coombes : Everitt drg. 16.20.037 PL003 C, dated April 2017)
 SHOWING WALKOVER PHOTOS & INVESTIGATION LOCATIONS

Job No.

5021

Drawing No.

5021/2

Scale:

c1:200 @ A4

Date:

02-05-2023



P1

Number and direction of
 photograph (Appendix 1)



APPENDIX 1

SITE PHOTOGRAPHS



Photograph P1

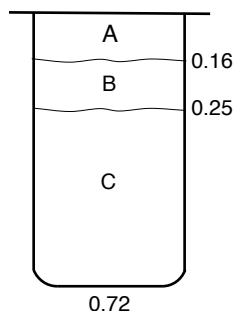


Photograph P2

APPENDIX 2

TRIAL PIT LOGS WITH PHOTOGRAPHS

Site: 64-68 HIGH STREET, TREDWORTH, GLOUCESTER GL1 4SR				TRIAL PIT No. TP1
Job No. 5021	Date 28-04-23	Ground Level (c.m, AOD) 17m	Co-Ordinates (c.) E 383,843 N 217,435	



DETAILS OF SUBSOIL

- A MADE GROUND: light grey CONCRETE with membrane at base
- B MADE GROUND: probable medium dense, pinkish-brown, sandy, fine to coarse, angular GRAVEL of granite
- C MADE GROUND (dark earth): probable soft, dark brown, organic, slightly gravelly, slightly sandy, silty plastic CLAY. Gravel is fine to coarse, angular mixture of lithologies and brick, concrete, ceramics

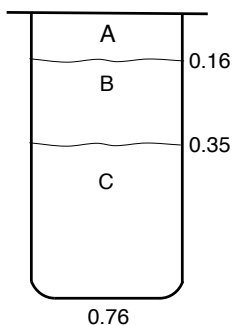


NOTES

- 1 Pit logged from surface
- 2 Pit dry and stable
- 3 Soil sample taken at 0.25-0.72m depth

Scale: 1:20	Client Buildex Construction Limited	Logged By: RS
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Site: 64-68 HIGH STREET, TREDWORTH, GLOUCESTER GL1 4SR				TRIAL PIT No. TP2
Job No. 5021	Date 28-04-23	Ground Level (c.m, AOD) 17m	Co-Ordinates (c.) E 383,840 N 217,437	



DETAILS OF SUBSOIL

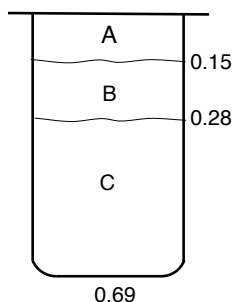
- A MADE GROUND: light grey CONCRETE with membrane at base
- B MADE GROUND: probable medium dense, yellowish-brown, sandy, fine to coarse, angular GRAVEL of limestone and occasional glass
- C MADE GROUND (dark earth): probable soft, dark brown with brown mottling, organic, slightly gravelly, slightly sandy, silty plastic CLAY. Gravel is fine to coarse angular mixture of lithologies and brick, concrete, ceramics

NOTES

- 1 Pit logged from surface
- 2 Pit dry and stable
- 3 Soil sample taken at 0.16-0.35m depth

Scale: 1:20	Client Buildex Construction Limited	Logged By: RS
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Site: 64-68 HIGH STREET, TREDWORTH, GLOUCESTER GL1 4SR				TRIAL PIT No. TP3
Job No. 5021	Date 28-04-23	Ground Level (c.m, AOD) 17m	Co-Ordinates (c.) E 383,837 N 217,439	



DETAILS OF SUBSOIL

- A MADE GROUND: light grey CONCRETE with membrane at base
- B MADE GROUND: probable medium dense, yellowish-brown, sandy, fine to coarse, angular GRAVEL of limestone and occasional glass
- C MADE GROUND (dark earth): probable soft, dark brown, organic, slightly gravelly, slightly sandy, silty plastic CLAY. Gravel is fine to coarse, angular mixture of lithologies and brick, concrete, ceramics

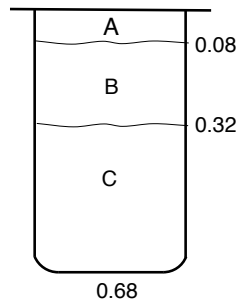


NOTES

- 1 Pit logged from surface
- 2 Pit dry and stable
- 3 Soil sample taken at 0.28-0.69m depth

Scale: 1:20	Client Buildex Construction Limited	Logged By: RS
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Site: 64-68 HIGH STREET, TREDWORTH, GLOUCESTER GL1 4SR				TRIAL PIT No. TP4
Job No. 5021	Date 28-04-23	Ground Level (c.m, AOD) 17m	Co-Ordinates (c.) E 383,842 N 217,445	



DETAILS OF SUBSOIL

- A MADE GROUND: light grey CONCRETE with membrane at base
- B MADE GROUND: probable soft, grey, slightly gravelly, slightly sandy, silty friable CLAY, with cobbles of brick and concrete. Gravel is fine to coarse, angular mixture of lithologies, brick and concrete
- C MADE GROUND (dark earth): probable soft, dark brown with brown mottling, organic, slightly gravelly, slightly sandy, silty plastic CLAY. Gravel is fine to coarse, angular mixture of lithologies and brick, concrete, ceramics

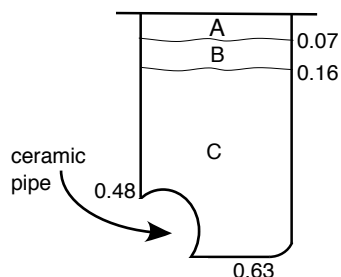


NOTES

- 1 Pit logged from surface
- 2 Pit dry and stable
- 3 Soil sample taken at 0.08-0.32m depth

Scale: 1:20	Client Buildex Construction Limited	Logged By: RS
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Site: 64-68 HIGH STREET, TREDWORTH, GLOUCESTER GL1 4SR				TRIAL PIT No. TP5
Job No. 5021	Date 28-04-23	Ground Level (c.m, AOD) 17m	Co-Ordinates (c.) E 383,846 N 217,443	



DETAILS OF SUBSOIL

- A MADE GROUND: light grey CONCRETE with membrane at base
- B MADE GROUND: probable medium dense, yellowish-brown, sandy, fine to coarse, angular GRAVEL of limestone and occasional glass
- C MADE GROUND (dark earth): probable soft, dark brown with brown mottling, organic, slightly gravelly, slightly sandy, silty plastic CLAY. Gravel is fine to coarse, angular mixture of lithologies and brick, concrete, ceramics

NOTES

- 1 Pit logged from surface
- 2 Pit dry and stable
- 3 Soil sample taken at 0.16-0.63m depth

Scale: 1:20	Client Buildex Construction Limited	Logged By: RS
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APPENDIX 3

CONTAMINATION STATUTORY FRAMEWORK/METHODOLOGY AND CERTIFIED CONTAMINATION TEST RESULTS

SUMMARY OF CONTAMINATION TEST RESULTS

		SOILS					TIER 1: GENERIC ASSESSMENT CRITERIA						TIER 2: SITE SPECIFIC												
Sample Ref		TP1	TP2	TP3	TP4	TP5	S4UL (Residential with plant uptake)		S4UL (Residential without plant uptake)	S4UL (Allotments)	S4UL (Commercial)	S4UL (Public Open Space - Residential)	S4UL (Public Open Space - Park)	Upper Confidence Limit [on true mean concentration, u] (CIEH Statistical Calculator)	Site-Specific Assessment Criteria (SSAC's) residential with homegrown produce			TP1	WFD "Water Framework Directive Standards & Classification (England & Wales)" 2015 (Groundwater)	WFD "Water Framework Directive Standards & Classification (England & Wales)" 2015 (Fresh Surface Water)	EA EQS "River Basin Districts Typology, Standards & Groundwater Threshold Values (Water Framework Directive) (England & Wales) Directions 2010"	UK Drinking Water Standards "The Water Supply (Water Quality) Regulations 2000"	WHO Guidelines		
Sample Depth (m)		0.25-0.72	0.16-0.35	0.28-0.69	0.08-0.32	0.16-0.63												0.25-0.72							
Sample of		MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND												MADE GROUND							
DETERMINAND																									
TOXIC METALS	Arsenic	29	7.8	32	15	16	37	40	43	640	79	170						4.3	7.5	37.5	50	10			
	Cadmium	1.7	< 0.2	2.2	1.2	0.9	11	85	1.9	190	120	532						<0.08	3.8	0.08	0.08-0.25	5			
	Chromium VI	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	6	6	1.8	33	8	220						<5.0							
	Chromium	36	12	32	20	22	910	910	18,000	8,600	1,500	33,000						2	37.5	3.4	4.7	50			
	Lead	410	24	400	95	130	200 ♣	310 ♣	80 ♣	2330 ♣	630 ♣	1300 ♣						8.2	7.5	7.2	7.2	10			
	Mercury	1.2	< 0.3	0.8	< 0.3	0.4	40	56	19	1100	120	240						<0.5	0.8	0.07	0.07	1			
	Nickel	44	8	44	21	22	180	180	53	980	230	800						1.7	15	<1	20	20			
	Selenium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	250	430	88	12000	1100	1800						<4.0	75			10			
PHYTOTOXIC METALS	Copper	120	16	120	48	45	2,400	7,100	520	68,000	12,000	44,000						14	1,500	1	1-28	8-125			
	Zinc	550	53	690	440	210	3,700	40,000	620	730,000	81,000	170,000						22		12.3	8-125	5,000			
		Moisture Content	22	9	19	15	23																		
		Stone Content	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1																		
		Soil Organic	5.7	-	-	3	-																		
		pH	7.9	11.6	7.6	7.6	7.7																		
		Asbestos Screen	Not-detected	-	Not-detected	Not-detected	-																		
SPECIATED POLYAROMATIC HYDROCARBONS (PAH)	Total PAH	27.9	0.8	26.1	1.76	1.58												<0.2							
	Naphthalene	0.12	< 0.05	0.15	< 0.05	< 0.05	13	13	24	1,100(432)s	4,900	3,000						<0.01	0.075	1.03-4.24	2.4	0.1			
	Acenaphthylene	0.13	< 0.05	0.15	< 0.05	< 0.05	920	6,000 (506)s	160	100,000	15,000	30,000						<0.01				0.1			
	Acenaphthene	0.12	< 0.05	0.07	< 0.05	< 0.05	1,100	6,000 (336)s	200	100,000	15,000	30,000						<0.01				0.1			
	Fluorene	0.14	< 0.05	0.07	< 0.05	< 0.05	860	4,500 (183)s	160	71,000	9,900	20,000						<0.01	0.075	0.0033-0.0122		0.1			
	Phenanthrene	2.8	0.1	2.2	0.19	0.1	440	1,500	90	23,000	3,100	6,300						<0.01				0.1			
	Anthracene	0.4	< 0.05	0.3	< 0.05	< 0.05	11,000	37,000	2,200	540,000	74,000	150,000						<0.01		0.052-0.193		0.1			
	Fluoranthene	5.5	0.16	4.9	0.26	0.22	890	1600	290	23,000	3,100	6,400						<0.01		0.0033-0.0122		0.1			
	Pyrene	4.7	0.14	4.5	0.24	0.2	2,000	3,800	620	54,000	7,400	15,000						<0.01				0.1			
	Benzo(a)anthracene	2.3	0.1	2.3	0.16	0.19	13	15	13	180	29	62						<0.01			0.016-0.058	0.03	0.1		
	Chrysene	2.6	0.1	2.3	0.2	0.19	27	32	19	350	57	120						<0.01				0.1			
	Benzo(b)fluoranthene	3.2	0.1	3	0.18	0.21	3.7	4	3.9	45	7.2	16						<0.01				0.1			
	Benzo(k)fluoranthene	0.97	< 0.05	1.4	0.14	0.11	100	110	130	1200	190	440						<0.01				0.1			
	Benzo(a)pyrene	2.3	0.05	2	0.15	0.15	3.0	3.2	3.5	36	5.7	13						<0.01				0.05	0.01		
	Indeno(1,2,3-cd)pyrene	1.1	< 0.05	1.1	0.1	0.07	41	46	39	510	82	180						<0.01					0.1		
	Dibenz(a,h)anthracene	0.23	< 0.05	0.3	< 0.05	< 0.05	0.3	0.32	0.43	3.6	0.58	1.4						<0.01				Sum of = 0.002	0.1		
	Benzo(ghi)perylene	1.3	0.05	1.4	0.14	0.14	350	360	640	4000	640	1,600						<0.01					0.1		
TOTAL PETROLEUM HYDROCARBONS (BANDED)	C6 - C8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	530	530	17,000	40,000	620,000	320,000													
	C8 - C10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	150	150	51	11,000	5,000	10,000													
	C10 - C12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	380	760	74	34,000	5,000	10,000													
	C12 - C16	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	660	2,500	130	38,000	5,000	10,000													
	C16 - C21	< 10	< 10	< 10	< 10	< 10	930	1,900	260	28,000	3,800	7,800													
	C21-C40	< 10	< 10	< 10	130	< 10																			
	C6 - C40	14	< 10	13	130	< 10																			

CIEH/LQM s= GAC/S4UL presented exceeds the solubility saturation limit, which is presented in brackets

CIEH/LQM v= GAC/S4UL presented exceeds the vapour saturation limit, which is presented in brackets

CIEH/LQM S4UL d= S4UL based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only)

S4UL LQM/CIEH published Suitable for use levels (2015)

DEFRA ♣= C4SL (2014)

ND= None detected

Based on Soil Organic Matter of 6% (all levels expressed as mg/kg)

WFD (groundwater) WFD "Water Framework Directive Standards & Classification (England & Wales)" 2015

WFD (fresh surface water) WFD "Water Framework Directive Standards & Classification (England & Wales)" 2015

EA EQS River Basin Districts Typology, Standards & Groundwater Threshold Values (Water Framework Directive) (England & Wales) Directions 2010

UK DWS UK Drinking Water Standards "The Water Supply (Water Quality) Regulations 2000"

WHO World Health Organisation Guidelines

Richard Stokes

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e: richard@wilsonac.co.uk

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Watford,
Herts,
WD18 8YS

t: 01923 225404

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e: reception@i2analytical.com

Analytical Report Number : 23-31205

Project / Site name: Tredworth, Gloucester

Samples received on: 28/04/2023

Your job number: 5021

**Samples instructed on/
Analysis started on:** 28/04/2023

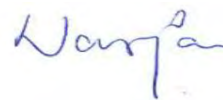
Your order number: 5021 RS

Analysis completed by: 09/05/2023

Report Issue Number: 1

Report issued on: 10/05/2023

Samples Analysed: 1 leachate sample - 5 soil samples



Signed:

Dominika Warjan
Junior Reporting Specialist
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: 23-31205
Project / Site name: Tredworth, Gloucester
Your Order No: 5021 RS

Lab Sample Number				2664384	2664385	2664386	2664387	2664388
Sample Reference				TP1	TP2	TP3	TP4	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25-0.72	0.16-0.35	0.28-0.69	0.08-0.32	0.16-0.63
Date Sampled				28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
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	%	0.01	NONE	22	9	19	15	23
Total mass of sample received	kg	0.001	NONE	0.6	0.6	0.6	0.6	0.6

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	KSZ	N/A	KSZ	KSZ	N/A

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	11.6	7.6	7.6	7.7
Organic Matter (automated)	%	0.1	MCERTS	5.7	-	-	3	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.12	< 0.05	0.15	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.13	< 0.05	0.15	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.12	< 0.05	0.07	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.14	< 0.05	0.07	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2.8	0.1	2.2	0.19	0.1
Anthracene	mg/kg	0.05	MCERTS	0.4	< 0.05	0.3	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	5.5	0.16	4.9	0.26	0.22
Pyrene	mg/kg	0.05	MCERTS	4.7	0.14	4.5	0.24	0.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.3	0.1	2.3	0.16	0.19
Chrysene	mg/kg	0.05	MCERTS	2.6	0.1	2.3	0.2	0.19
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.2	0.1	3	0.18	0.21
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.97	< 0.05	1.4	0.14	0.11
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.3	0.05	2	0.15	0.15
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.1	< 0.05	1.1	0.1	0.07
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.23	< 0.05	0.3	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.3	0.05	1.4	0.14	0.14

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	27.9	0.8	26.1	1.76	1.58
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	29	7.8	32	15	16
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.7	< 0.2	2.2	1.2	0.9
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	36	12	32	20	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120	16	120	48	45
Lead (aqua regia extractable)	mg/kg	1	MCERTS	410	24	400	95	130
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.2	< 0.3	0.8	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	44	8	44	21	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	550	53	690	440	210

Analytical Report Number: 23-31205
 Project / Site name: Tredworth, Gloucester
 Your Order No: 5021 RS

Lab Sample Number				2664384	2664385	2664386	2664387	2664388
Sample Reference				TP1	TP2	TP3	TP4	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25-0.72	0.16-0.35	0.28-0.69	0.08-0.32	0.16-0.63
Date Sampled				28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH Texas (C6 - C8) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH Texas (C8 - C10) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH Texas (C10 - C12) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH Texas (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
TPH Texas (C16 - C21) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Texas (C21 - C40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	130	< 10
TPH Texas (C6 - C40) EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	14	< 10	13	130	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



4041



Analytical Report Number: 23-31205
Project / Site name: Tredworth, Gloucester

Your Order No: 5021 RS

Lab Sample Number				2664389
Sample Reference				TP1
Sample Number				None Supplied
Depth (m)				0.25-0.72
Date Sampled				28/04/2023
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status	

Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	4.3
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	2
Copper (dissolved)	µg/l	0.7	ISO 17025	14
Lead (dissolved)	µg/l	1	ISO 17025	8.2
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.7
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	22

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-31205

Project / Site name: Tredworth, Gloucester

* 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 *
2664384	TP1	None Supplied	0.25-0.72	Brown sand with gravel.
2664385	TP2	None Supplied	0.16-0.35	Brown sand with gravel.
2664386	TP3	None Supplied	0.28-0.69	Brown sand with gravel.
2664387	TP4	None Supplied	0.08-0.32	Brown sand with gravel.
2664388	TP5	None Supplied	0.16-0.63	Brown clay and sand with gravel.

Analytical Report Number : 23-31205

Project / Site name: Tredworth, Gloucester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	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
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
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
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
TPH Texas (Soil)	TPH Texas bands C6-C10 by HS/GC-MS & C10-C40 by GC-FID	In-house method	L088/L076	D	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
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	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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.

Analytical Report Number : 23-31205

Project / Site name: Tredworth, Gloucester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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- 1 Wilson Associates (Consulting) Limited ("the Consultant") shall carry out the Services, including any proposal, report or other document, as detailed in any relevant correspondence, which forms part of this Agreement, for the Client with reasonable skill, care and diligence. The Consultant shall use reasonable endeavours to adhere to any agreed programme. Each instruction or acceptance of a quotation shall be deemed to be an offer to purchase the services subject to the conditions laid out in this document.
- 2 An interim invoice will normally be submitted upon completion of the site works, to include all disbursements and fees to date, and for contracts extending over a long period, monthly invoices will be submitted for payment. The final report will not be issued until payment of the first interim invoice has been received, unless agreed with this Practice beforehand. Invoices are not to be assigned to a third party without prior agreement. Should the contract be cancelled after either preparatory or fieldwork has commenced then a claim will be made for work completed to that date.
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- 5 Unless expressly stipulated to the contrary, payment of the account(s) is not dependent upon the Client achieving regulatory approval for or discharge of a planning condition relating to the project, nor is it dependent upon the Client's securing of funding for the development where this may be conditional upon the prior granting of planning or building regulations approval, nor the Client's onward sale of the site to another party. In the case of provision of services to another consultant, payment of our account is not dependent upon the prior settlement of their own account by their Client.
- 6 No work will commence until an official written order or completed Quote Acceptance form has been received by post or email. Such order will be deemed to constitute acceptance of the quotation and these terms and conditions. Where the instruction to undertake the Services may have been issued by an intermediary on behalf of the Client, full Client details including confirmation of and contact details for the person responsible for authorising payment must be provided to the Consultant. In the event that the Client defaults or otherwise fails to pay the due account, the Consultant reserves the right to pursue and recover any unpaid amount from the instructing intermediary.
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