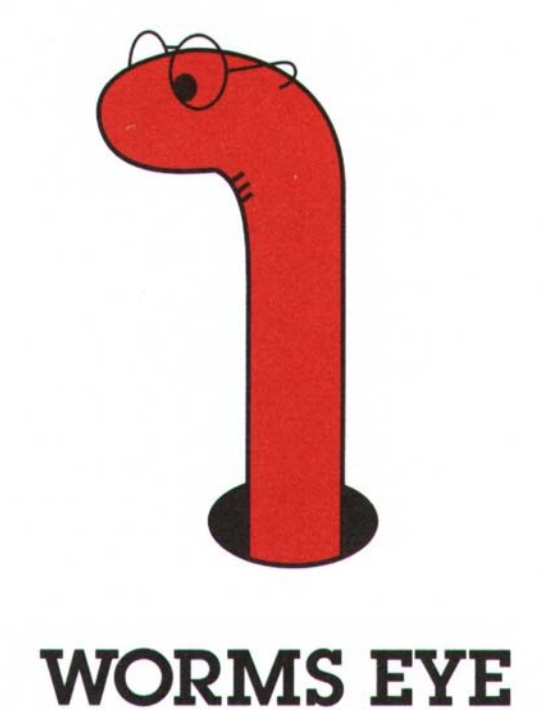
Electronic Report



WORMS EYE

52 Bank Parade
Burnley
BB11 1TS
Phone
01282 414649 / 458410

Our Ref: Windmill Street/M2 3GX/2018
Date: 14 December 2018

Conlon Construction Ltd
Charnley Fold Lane
Bamber Bridge
PRESTON
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PROPOSED MONUMENT AT MANCHESTER CENTRAL CONVENTION CENTRE WINDMILL STREET, MANCHESTER, M2 3GX SITE INVESTIGATION REPORT

INTRODUCTION

It is proposed to build a masonry monument, to commemorate the Peterloo Massacre. Instructions were to carry out boreholes and tests to investigate ground conditions.

SITE LOCATION

The site is on a wide pedestrian pavement plaza, off Windmill Street in Manchester, at OS Grid Reference 383796, 397784. This pavement is in front of the conference centre (former railway station), which is a few steps up, at a higher level.

The area is used for pedestrian crowds during conferences and by vans during set up.

The area is level and paved with sandstone flags.

PROPOSED DEVELOPMENT

It is proposed to build a conical masonry monument about 12 metres diameter.

GEOLOGY OF SITE

The geology map indicates that the underlying solid rocks are a narrow band of Manchester Marl, with sandstone of the Chester Formation lying to the northwest and southwest.

Surface drift is shown as glacial till (boulder clay) of unknown thickness.

BRIEF HISTORY

Old photographs have been viewed and show this to have been the concourse/yard to the station. Circa 1970 the station was altered to a conference centre.

NEARBY BOREHOLES

The following information, and enclosed borehole logs, contain British Geological Survey materials © NERC (2018).

The BGS hold records for two nearby boreholes.

Borehole SJ 89 NW 2389 is to the northwest and shows drift deposits to 4.5 metres overlying marl (rock).

Borehole SJ 89 NW 560 is to the southeast and shows made ground to 1.0 metre, overlying clay before sandstone was seen at 7.0 metres deep.

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GROUND INVESTIGATIONS

A series of three boreholes and two dynamic probes was drilled on the site. Details are given on the location plan, borehole logs and dynamic probe logs enclosed with this report.

At shallow depth, the boreholes showed similar conditions having a sandstone flag, overlying weak concrete and then strong concrete, before made ground (sand, gravel, brick, clay, hardcore) was seen to about 0.45 metres deep.

BH1 refused in madeground at 2 metres deep. BH1A was drilled close by and found madeground to 3.2 metres, overlying stiff clay.

BH2 showed madeground to 3.2 metres deep over firm/stiff clay.

The dynamic probes went deeper, with generally increasing strength, refusing at between 6.9 and 8.9 metres, which may be rock.

The dynamic probes in the madeground, down to 1.5 to 2 metres, suggesting good compaction, this approximating to a medium strength ground. Below this level to about 3.5 metres, the madeground was less compact (low to medium strength).

The following approximates to a section looking northwest.

Findings	Strength	BH2/PrB (m)	BH1 (m)	BH1A/Pr A (m)
Sandstone flag		0.0 - 0.07	0.0 - 0.07	0.0 - 0.08
Weak concrete		0.07 - 0.13	0.07 - 0.12	0.08 - 0.15
Stronger concrete		0.13 - 0.42	0.12 - 0.46	0.15 - 0.42
Madeground	medium	0.42 - 1.5	0.46 - >2.0 (refusal)	0.42 - 2.0
Madeground	low/medium	1.5 - 3.7		2.0 - 3.2
Clay	high strength	3.7 - >5.0 (refusal)	-	3.2 - >4.0 (refusal)
Probe	very high strength	5.1 - 9.0+	-	4.3 - 7.0+
Water		1.6	1.6	Damp only

CONTAMINATION TESTING

Two samples (BH1A and BH2 at 0.5 metres) were tested for a range of common contaminants. Sulphate tests were carried out on four additional samples. The results are included in table form with this report. Abbreviations and acronyms for chemical compounds are given after the appendix list.

CONTAMINATION COMPARISONS - INITIAL SCREENING

For a conservative assessment the maximum contamination values have been compared with residential C4Ls and soil guideline values provided by CLEA. Where these are not available, values are based on the CLEA derived LQM/CIEH Generic Assessment Criteria. In accordance with guidance provided by the AGS, threshold values from other sources have been used for screening purposes. This information has been brought together on the Comparison Table included with this report.

Asbestos

No asbestos fibres were detected.

Inorganics (metals etc.)

Levels of inorganic contaminants were low and below residential thresholds.

Sulphate

Water soluble sulphate levels at shallow depth were below the BRE action level for buried concrete.

Hydrocarbons

Tests for phenols, TPHs and PAHs a showed low levels, below their respective thresholds.

CONCLUSION

Contamination

Contamination tests show low levels, below stringent residential thresholds.

Bearing in mind the following:

- Levels of contaminants are low.
- The proposal is for a monument with no landscaping.
- There are no enclosed buildings or similar
- The site is a very small part of a much larger paved area.
- The site will be fully hard surfaced on completion.

It is considered there are no risks to member of the public and no remedial works are required.

Water Soluble Sulphate levels at shallow depth are low and below the BRE Action level for buried concrete. Sulphate resistant concrete is not required.

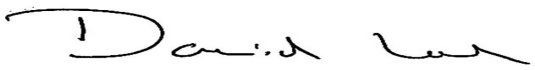
Foundations

No information has been supplied on loading. However, for a masonry structure, on a wide 12 metres diameter base, it would seem likely that loadings would not be high. Subject to confirmation of loading, it should be possible for it to be built off the stronger deeper concrete slabs, after removal of the flags and weak concrete.

Alternatively, the concrete could be removed, the madeground rolled and compacted, and a pad foundation laid, using an allowable bearing capacity of 50Kn/m^2.

If high loadings are anticipated, piling down to the high strength ground below between 5 and 9 metres should be suitable. The 'N' values on the dynamic probe can be used in pile design.

Yours faithfully
on behalf of Worms Eye Ltd



David Lord
BSc (Hons)
FGS, MIEnvSc, AIEMA

PROPOSED MONUMENT AT MANCHESTER CENTRAL CONVENTION CENTRE

WINDMILL STREET, MANCHESTER, M2 3GX

SITE INVESTIGATION REPORT

LIST OF APPENDICES – SITE INVESTIGATION REPORT

List of Acronyms

Location Plan

Existing site plan - 1: 200 showing borehole, movement plan and probe locations

Borehole Logs

Dynamic Probe Logs

Contamination Test Results

Contamination Comparison

CONTAMINATION TEST UNITS

Conversion factor	Name	Symbol	Numerical Value	Alternative description	Commonly used for:
	per cent	%	1 in 100 (10^2)		total sulphur, hazardous waste
% x10	parts per thousand	‰	1 in 1000 (10^3)	g/l (grams per litre)	water soluble sulphate test
‰ x 1,000	parts per million	ppm	1 in 1,000,000 (10^6)	mg/kg (milligrams per kilogram)	most soil tests
				mg/l (milligrams per litre)	water tests
ppm x 1,000	parts per billion	ppb	1 in 1,000,000,000 (10^9)	μg/kg (micrograms per kilogram)	PAH soil tests
				μg/l (micrograms per litre)	water/leachate tests
ppb x 1,000	parts per trillion	ppt	1 in 1,000,000,000,000 (10^{12})	ng/kg (nanograms per kilogram)	PAH soil tests
				ng/l (nanograms per litre)	water/leachate tests

ABBREVIATIONS

Chemical	BAP	Benzo(a)pyrene
	BTEX	Benzene, toluene, ethylbenzene, xylene
	DAHA	Dibenzo(ah)anthracene
	MTBE	Methyl tertiaryt-butyl ether (additive to petrol)
	EPH	Extractable petroleum hydrocarbons (formerly diesel range organics – DRO)
	NFD	No fibres detected (asbestos test)
	PAH	Polycyclic aromatic hydrocarbons
	PCB	Polychlorinated biphenyls
	PCE	Perchloroethylene or tetrachloroethylene
	PID	Photo ionisation detector (screen for VOC)
	PRO/GRO	Petrol range organics/gasoline range organics
	SVOC	Semi-volatile organic compounds
	TCE	Trichloroethylene
	TPH	Total petroleum hydrocarbons
	VOC	Volatile organic compounds
Other	AGS	Association of Geotechnical Specialists
	BGS	British Geological Survey
	BRE	Building Research Establishment
	CBR	California Bearing Ratio
	CIEH	Chartered Institute of Environmental Health
	CIRIA	Construction Industry Research and Information Association
	CLEA	Contaminated Land Exposure Assessment (Environment Agency/DEFRA)
	CLR 8	Contaminated Land Research Report 8 (Environment Agency/DEFRA)
	DWQ	Drinking water quality
	EA	Environment Agency
	EQS	Environmental quality standards (for rivers etc.)
	ICRCL	Inter-departmental Commission for the Reclamation of Contaminated Land
	LQM	Land Quality Management Ltd (Land and Environmental Consultancy).
	NHBC	National House Builders Council
	SGV	Soil Guideline Values
	SPT	Standard penetration test
	TPHWG	TPH Working Group

1. This report should be considered in relation to the objectives agreed between Worms Eye and the Client, outlined in the introduction.

2. For the work, reliance has been placed on publicly available data, obtained from the sources identified in the report. The information is not exhaustive and further information may be available from other sources. When using the information it has been assumed it is correct, and no attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and guidelines, for land and groundwater contamination, enforced by the Local Authority and the Environment Agency.

4. During the site walkover, reasonable effort was made to obtain an overview of the site. However, no attempt was made to enter areas that are unsafe, a risk to health and safety, locked, barricaded, overgrown, or areas not made accessible.

5. Access, the presence of services and activities on the site, limited locations where sampling could be carried out and the techniques that could be used.

6. Assessments are based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. The conclusions and recommendations provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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9. New information, revised practices, or changes in legislation, may necessitate the re-interpretation of the report, in whole or in part.

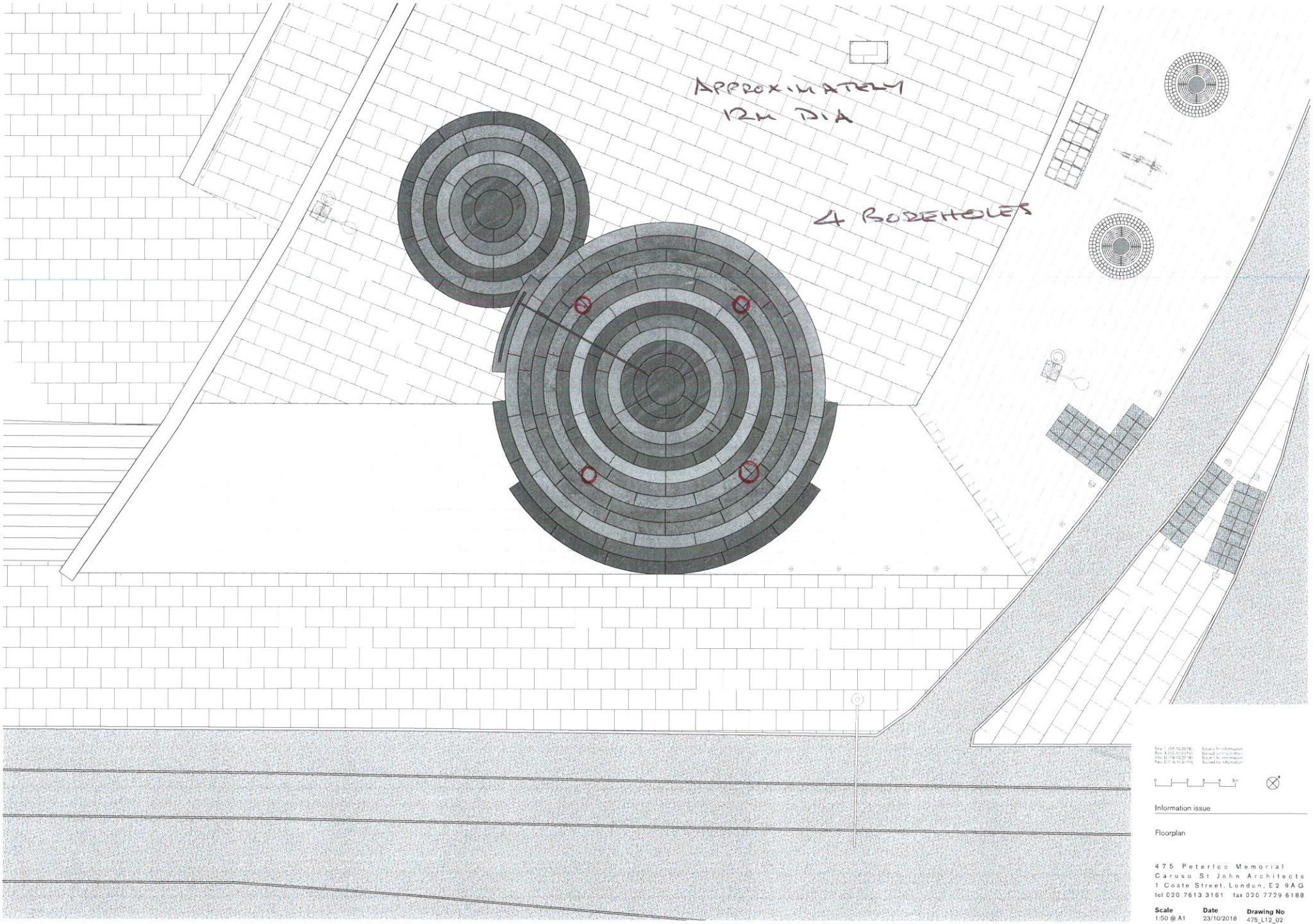


Information issue

Siteplan

475 Peterloo Memorial
Caruso St John Architects
1 Coate Street, London, E2 9AG
tel 020 7613 3161 fax 020 7729 6188

Scale	Date	Drawing No
1:500 @ A1	23/10/2018	475_L11_01



Rev. 1 04.10.2018 Issued for information
Rev. A 17.10.2018 Issued for information
Rev. B 19.10.2018 Issued for information
Rev. C 19.10.2018 Issued for information

0 1 2 3 4 5m

Information issue

Floorplan

475 Peterloo Memorial
Caruso St John Architects
1 Coate Street, London, E2 9AG
tel 020 7613 3161 fax 020 7729 6188

Scale	Date	Drawing No
1:50 @ A1	23/10/2018	475_L12_02

WORMS EYE GEOTECHNICAL	Cannon House, 52 Bank Parade Burnley, Lancashire, BB11 1TS	Site Manchester Central, Windmill Street, Manchester	Borehole Number BH1
Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client	Job Number M23GX
	Location Northwest of sign	Dates 03/12/2018- 04/12/2018	Engineer HH	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.07)	Sandstone Flag		
					0.07			
					(0.05)	Weak Concrete		
					0.12			
					(0.34)	Strong CONCRETE Core (no steel found)		
					0.46			
			(assessed as medium strength by Probe A)		(1.54)	Brown, sand, gravel and brick (MADE GROUND)		
					2.00			
						Complete at 2.00m		

Remarks
Borehole wet at 1.6m, refusal at 2.0m, see Probe A

Scale (approx)	Logged By
1:25	HH/JSH

Figure No.
M23GX.BH1

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WORMS EYE GEOTECHNICAL	Cannon House, 52 Bank Parade Burnley, Lancashire, BB11 1TS	Site Manchester Central, Windmill Street, Manchester	Borehole Number BH2
Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client	Job Number M23GX
	Location Southwest of sign	Dates 03/12/2018- 04/12/2018	Engineer HH	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.07)	Sandstone Flag		
					0.07			
					(0.06)	Weak Concrete		
					0.13			
					(0.29)	Strong CONCRETE Core (no steel found)		
					0.42	Brown sand, gravel, brick, clay and cinders (MADE GROUND)		
			(assessed as medium strength by Probe B)					
					(3.28)			
			(assessed as low/very low strength by Probe B)					
					3.70	Firm to stiff brown (high strength) CLAY		
			PEN 90kN/m2		(0.30)			
					4.00	Stiff brown (high strength) CLAY		
					(1.00)			
			PEN 130kN/m2					
			Complete at 5.0m		5.00			

Remarks
Borehole wet at 1.6m, difficult to drill below 5.0m, see Probe B

Scale (approx)	Logged By
1:25	HH/JSH

Figure No.
M23GX.BH2

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WORMS EYE GEOTECHNICAL	Cannon House, 52 Bank Parade Burnley, Lancashire, BB11 1TS	Site Manchester Central, Windmill Street, Manchester	Borehole Number BH1A
Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client	Job Number M23GX
	Location Northwest of sign, alongside BH1	Dates 03/12/2018-04/12/2018	Engineer HH	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.08)	Sandstone Flag		
					0.08			
					(0.07)	Weak Concrete		
					0.15			
					(0.27)	Strong CONCRETE Core (no steel found)		
					0.42			
						Brown limestone aggregate, sand, brick and gravel (MADE GROUND)		
					(0.58)			
					1.00			
						Brown sand, brick and gravel (MADE GROUND)		
			(assessed as medium strength by Probe A)		(1.00)			
					2.00			
						brown clay, sand and brick (MADE GROUND)		
			(assessed as low/medium strength by Probe A)		(1.20)			
					3.20			
						Firm to stiff brown (high strength) CLAY		
			PEN 90kN/m2		(0.80)			
					4.00			
						Complete at 4.00m		

Remarks
Borehole damp, difficult ti drill below 4.0m

Scale (approx)	Logged By
1:25	HH/JSH

Figure No.
M23GX.BH1A

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WORMS EYE LTD

DYNAMIC PROBE LOG

Site: Windmill Street, Manchester. M2 3GX

Probe: PRA

Location: Northwest corner of sign, by BH1

Date: 3rd December 2018

Method: 63.5KG Weight with 750mm drop.

JSH

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram (0 5 10 15 20 25 30 35 40)	Strength
0		0		(core)
0.5	5	11	***** ******	
1	6 5 5 3 2	13 10	***** ***** *** ** ****	
1.5	4 4 4 4 6	14	**** **** **** **** ******	medium (made ground)
2	7 7 7 7 7	21 19	******* ******* ******* ******* *****	
2.5	5 2 2 2 2	6 7	** ** ** ** ***	
3	3 2 3 2 3	8	** *** ** *** ***	low/medium (made ground)
3.5	3 3 2 3 3	8 10	*** *** ** *** ***	
3.9	4 8 9 9	26	**** ******** ********* *********	(clay)

Continued

Dynamic Probe Log Continued

Probe: PRA

Site: Windmill Street, Manchester. M2 3GX

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram 0 5 10 15 20 25 30 35 40	Strength
3.9	---------			
4	11		**********	
	9	30	*********	
	10		**********	high
	11		**********	
	12	35	**********	
4.5	12		**********	
	13		**********	
	13	40	**********	
	14		**********	
	26		**********	
5	27	70	**********	
	17		**********	
	18		**********	
	19	56	**********	
	19		**********	
5.5	19		**********	
	18	59	**********	very high
	22		**********	
	22		**********	
	24	71	**********	
6	25		**********	
	23		**********	
	26	75	**********	
	26		**********	
	27		**********	
6.5	27	82	**********	
	28		**********	
	29		**********	
	32	97	**********	
	36		**********	
7	38		**********	

WORMS EYE LTD

DYNAMIC PROBE LOG

Site: Windmill Street, Manchester. M2 3GX — Probe: PRB

Location: Southwest corner of sign, by BH2 — Date: 3rd December 2018

Method: 63.5KG Weight with 750mm drop. — JSH

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram (0 5 10 15 20 25 30 35 40)	Strength
0		0		(core)
0.5	6	11	****** *****	
1	5 5 5 4 4	14	***** ***** ****	medium (made ground)
	4 4 4	12	**** **** ****	
1.5	2 3	9	** ***	
2	2 1 1 0 1	4 2	** * * * *	
2.5	1 0 1 0 1	1 2	* * *	low (made ground)
3	1 0 1 0 1	2 2	* * * *	
3.5	1 1 1 2 1	3 4	* * * ** *	
3.9	1 1 1 2	4	* * **	(clay)

Continued

Dynamic Probe Log Continued

Probe: PRB

Site: Windmill Street, Manchester. M2 3GX

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram 0 5 10 15 20 25 30 35 40	Strength
3.9	---------			
4	3	12	***	
	4		****	
	5		*****	medium
	5	16	*****	
	5		*****	
4.5	6		******	
	7	22	*******	
	7		*******	
	8		********	
	9	27	*********	
5	9		*********	
	9		*********	high
	11	35	**********	
	12		**********	
	12		**********	
5.5	12	38	**********	
	13		**********	
	13		**********	
	13	43	**********	
	15		**********	
6	15		**********	
	14	47	**********	
	15		**********	
	18		**********	
	17	54	**********	
6.5	18		**********	
	19	59	**********	
	19		**********	
	20		**********	very high
	20		**********	
7	21	65	**********	
	22		**********	
	22		**********	
	23	71	**********	
	24		**********	
7.5	24		**********	
	25	78	**********	
	26		**********	
	27		**********	
	27	80	**********	
8	27		**********	
8.1	26		**********	

Continued

Dynamic Probe Log Continued

Probe: PRB

Site: Windmill Street, Manchester. M2 3GX

Depth (m)	Blows/ 100mm	Blows/ 300mm (N value)	Diagram 0 5 10 15 20 25 30 35 40	Strength
8.1	--------			
	26	80	**********	
	27		**********	
	27		**********	
8.5	28	86	**********	very high
	29		**********	
	29		**********	
	30	99	**********	
	32		**********	
9	37		**********	

CONCEPT LIFE SCIENCES
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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 788870-1 Interim

Date of Report: 18-Dec-2018

Customer: Worms Eye Ltd
Cannon House
52
Bank Parade
Burnley
Lancashire
BB11 1TS

Customer Contact: Mr Stuart Hartley

Customer Job Reference:
Customer Purchase Order: 50719-1
Customer Site Reference: Windmill Street Manchester
Date Job Received at Concept: 10-Dec-2018
Date Analysis Started: 11-Dec-2018
Date Analysis Completed: 17-Dec-2018

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

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

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

Produced and
authorised by :
Chloe Kitto
Customer Service Advisor

Concept Reference: 788870
Project Site: Windmill Street Manchester
Customer Reference:

Soil Analysed as Soil
Asbestos ID

				Concept Reference	**788870 001**	**788870 002**
				Customer Sample Reference	**BH1A**	**BH2**
				Depth	**0.50**	**0.50**
				Top Depth	**0.50**	**0.50**
				Date Sampled	**07-DEC-2018**	**07-DEC-2018**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Asbestos	T27	AR			N.D.	N.D.

Concept Reference: 788870
Project Site: Windmill Street Manchester
Customer Reference:

Soil Analysed as Soil
Worms Eye Suite

				Concept Reference	**788870 001**	**788870 002**
				Customer Sample Reference	**BH1A**	**BH2**
				Depth	**0.50**	**0.50**
				Top Depth	**0.50**	**0.50**
				Date Sampled	**07-DEC-2018**	**07-DEC-2018**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Arsenic	T6	A40	1	mg/kg	**7**	**18**
Cadmium	T6	A40	1	mg/kg	<1	<1
Chromium	T6	A40	1	mg/kg	**12**	**23**
Copper	T6	A40	1	mg/kg	**24**	**56**
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1
Cyanide(free)	T4	AR	1	mg/kg	<1	<1
Lead	T6	A40	1	mg/kg	**57**	**130**
Mercury	T6	A40	1	mg/kg	<1	<1
Nickel	T6	A40	1	mg/kg	**18**	**27**
pH	T7	A40			**10.1**	**9.2**
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1
Selenium	T6	A40	3	mg/kg	<3	<3
Soil Organic Matter	T287	A40	0.1	%	**1.7**	**21**
SO4(Total)	T102	A40	0.01	%	**0.09**	**0.35**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	**0.18**	**0.25**
Sulphide	T4	A40	10	mg/kg	<10	<10
Sulphur(Free)	T2	AR	500	mg/kg	<500	<500
Thiocyanate	T4	A40	10	mg/kg	<10	<10
Total Organic Carbon	T21	A40	0.1	%	**0.8**	**12**
Zinc	T6	A40	1	mg/kg	**47**	**71**

Concept Reference: 788870
Project Site: Windmill Street Manchester
Customer Reference:

Soil Analysed as Soil
Wormseye TPH (CWG)

Concept Reference	**788870 001**	**788870 002**
Customer Sample Reference	**BH1A**	**BH2**
Depth	**0.50**	**0.50**
Top Depth	**0.50**	**0.50**
Date Sampled	**07-DEC-2018**	**07-DEC-2018**

Determinand	Method	Test Sample	LOD	Units		
Benzene	T54	AR	1	µg/kg	**1**(13)	**7**(13)
Toluene	T54	AR	1	µg/kg	**4**	**17**
EthylBenzene	T54	AR	1	µg/kg	<1	**2**
M/P Xylene	T54	AR	1	µg/kg	**5**	**13**
O Xylene	T54	AR	1	µg/kg	**2**	**8**
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	<1	<2(110)
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.020(110)
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.020(110)
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.020(110)
TPH (C10-C12 aliphatic)	T909	M105	1	mg/kg	<1(13)	**5**(13)
TPH (C12-C16 aliphatic)	T909	M105	1	mg/kg	<1(13)	**15**(13)
TPH (C16-C21 aliphatic)	T909	M105	1	mg/kg	**2**(13)	**31**(13)
TPH (C21-C35 aliphatic)	T909	M105	2	mg/kg	**44**(13)	**510**(13)
TPH (Aliphatic) total	T85	M105		mg/kg	**46**(13)	**560**(13)
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.020(110)
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.020(110)
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	**0.016**	**0.041**
TPH (C10-C12 aromatic)	T909	M105	2	mg/kg	<2(13)	**10**(13)
TPH (C12-C16 aromatic)	T909	M105	1	mg/kg	**3**(13)	**38**(13)
TPH (C16-C21 aromatic)	T909	M105	1	mg/kg	**5**(13)	**46**(13)
TPH (C21-C35 aromatic)	T909	M105	1	mg/kg	**6**(13)	**80**(13)
TPH (Aromatic) total	T85	M105		mg/kg	**14**(13)	**170**(13)
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	**60.0**(13)	**735**(13)

Concept Reference: 788870
Project Site: Windmill Street Manchester
Customer Reference:

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

Concept Reference	**788870 001**	**788870 002**
Customer Sample Reference	**BH1A**	**BH2**
Depth	**0.50**	**0.50**
Top Depth	**0.50**	**0.50**
Date Sampled	**07-DEC-2018**	**07-DEC-2018**

Determinand	Method	Test Sample	LOD	Units		
Acenaphthylene	T149	AR	0.01	mg/kg	<0.01	**0.14**
Acenaphthene	T149	AR	0.01	mg/kg	<0.01	**0.12**
Anthracene	T149	AR	0.01	mg/kg	**0.01**	**0.30**
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	**0.05**	**0.39**
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	**0.04**	**0.32**
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	**0.06**	**0.40**
Benzo(b)fluoranthene	T149	AR	0.01	mg/kg	**0.03**	**0.21**
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	**0.03**	**0.17**
Benzo(k)fluoranthene	T149	AR	0.01	mg/kg	**0.03**	**0.18**
Chrysene	T149	AR	0.01	mg/kg	**0.05**	**0.43**
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	**0.01**	**0.06**
Fluoranthene	T149	AR	0.01	mg/kg	**0.06**	**0.79**
Fluorene	T149	AR	0.01	mg/kg	<0.01	**0.24**
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	**0.02**	**0.13**
Naphthalene	T149	AR	0.01	mg/kg	**0.01**	**1.4**
Phenanthrene	T149	AR	0.01	mg/kg	**0.03**	**1.5**
Pyrene	T149	AR	0.01	mg/kg	**0.08**	**0.83**
PAH(total)	T149	AR	0.01	mg/kg	**0.45**	**7.2**

Index to symbols used in 788870-1 Interim

Value	Description
A40	Assisted dried < 40C
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
AR	As Received
N.D.	Not Detected
110	LOD raised due to low internal standard recovery.
13	Results have been blank corrected.
S	Analysis was subcontracted
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Please note interim results are considered preliminary and are subject to change.
Asbestos testing was subcontracted.

Method Index

Value	Description
T54	GC/MS (Headspace)
T149	GC/MS (SIR)
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T6	ICP/OES
T287	Calc TOC/0.58
T7	Probe
T909	GCxGC
T2	Grav
T27	PLM
T102	ICP/OES (HCl extract)
T4	Colorimetry
T21	OX/IR
T85	Calc

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Asbestos	T27	AR			SU	001-002
Arsenic	T6	A40	1	mg/kg	U	001-002
Cadmium	T6	A40	1	mg/kg	U	001-002
Chromium	T6	A40	1	mg/kg	U	001-002
Copper	T6	A40	1	mg/kg	U	001-002
Cyanide(Total)	T4	AR	1	mg/kg	U	001-002
Cyanide(free)	T4	AR	1	mg/kg	U	001-002
Lead	T6	A40	1	mg/kg	U	001-002
Mercury	T6	A40	1	mg/kg	U	001-002
Nickel	T6	A40	1	mg/kg	U	001-002
pH	T7	A40			U	001-002
Phenols(Mono)	T4	AR	1	mg/kg	U	001-002
Selenium	T6	A40	3	mg/kg	U	001-002
Soil Organic Matter	T287	A40	0.1	%	N	001-002
SO4(Total)	T102	A40	0.01	%	U	001-002
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	U	001-002
Sulphide	T4	A40	10	mg/kg	N	001-002
Sulphur(Free)	T2	AR	500	mg/kg	N	001-002
Thiocyanate	T4	A40	10	mg/kg	N	001-002
Total Organic Carbon	T21	A40	0.1	%	N	001-002
Zinc	T6	A40	1	mg/kg	U	001-002
Benzene	T54	AR	1	µg/kg	U	001-002
Toluene	T54	AR	1	µg/kg	U	001-002
EthylBenzene	T54	AR	1	µg/kg	U	001-002
M/P Xylene	T54	AR	1	µg/kg	U	001-002
O Xylene	T54	AR	1	µg/kg	U	001-002
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	001-002
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	001-002

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	001-002
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	001-002
TPH (C10-C12 aliphatic)	T909	M105	1	mg/kg	U	001-002
TPH (C12-C16 aliphatic)	T909	M105	1	mg/kg	U	001-002
TPH (C16-C21 aliphatic)	T909	M105	1	mg/kg	U	001-002
TPH (C21-C35 aliphatic)	T909	M105	2	mg/kg	U	001-002
TPH (Aliphatic) total	T85	M105		mg/kg	N	001-002
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	001-002
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	001-002
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	001-002
TPH (C10-C12 aromatic)	T909	M105	2	mg/kg	U	001-002
TPH (C12-C16 aromatic)	T909	M105	1	mg/kg	U	001-002
TPH (C16-C21 aromatic)	T909	M105	1	mg/kg	U	001-002
TPH (C21-C35 aromatic)	T909	M105	1	mg/kg	U	001-002
TPH (Aromatic) total	T85	M105		mg/kg	N	001-002
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	N	001-002
Acenaphthylene	T149	AR	0.01	mg/kg	U	001-002
Acenaphthene	T149	AR	0.01	mg/kg	U	001-002
Anthracene	T149	AR	0.01	mg/kg	U	001-002
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	U	001-002
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	U	001-002
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	U	001-002
Benzo(b)fluoranthene	T149	AR	0.01	mg/kg	U	001-002
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	U	001-002
Benzo(k)fluoranthene	T149	AR	0.01	mg/kg	U	001-002
Chrysene	T149	AR	0.01	mg/kg	U	001-002
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	U	001-002
Fluoranthene	T149	AR	0.01	mg/kg	U	001-002
Fluorene	T149	AR	0.01	mg/kg	U	001-002
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	U	001-002
Naphthalene	T149	AR	0.01	mg/kg	U	001-002
Phenanthrene	T149	AR	0.01	mg/kg	U	001-002
Pyrene	T149	AR	0.01	mg/kg	U	001-002
PAH(total)	T149	AR	0.01	mg/kg	U	001-002

PROPOSED MONUMENT AT MANCHESTER CENTRAL CONVENTION CENTRE

WINDMILL STREET, MANCHESTER, M2 3GX

Comparison of Contamination Test Results with Various Thresholds

RESIDENTIAL WITH HOMEGROWN VEGETABLES

Hydrocarbons at 1% SOM

Contaminant	Max Value	Threshold	Pass/ Fail	SSAC	Pass/ Fail	Failed Samples
HEAVY METALS						
- Arsenic	18	37*	P			
- Cadmium	<1	11*	P			
- Chromium III	23	910*	P			
- Chromium VI		6*				
- Copper	56	2400*	P			
- Lead	130	200▲	P			
- Inorganic Mercury	<1	40*	P			
- Methyl Mercury	<1	11*	P			
- Nickel	27	180*	P			
- Selenium	<3	350#	P			
- Zinc	71	3700*	P			
OTHER INORGANICS						
- Asbestos	None Detected		P			
- Cyanide (total)	<1.0	20 (D)	P			
- pH range	9.2 – 10.1		-			
- Sulphate (g/l)	0.25	0.5 (B)	P			
- Sulphide	<10	250 (E)	P			
-TOC range (%)	0.8 – 12		-			
-SOM Range	1.7 – 21		-			

All units mg/kg (parts per million/ppm) unless shown otherwise

Metals & inorganic values derived using 6% SOM (soil organic mater)

Sources

- Soil Guideline Values ▲ - C4SL

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(D) – Dutch (B) - BRE – Building Research Establishment (E) - EA Disposal Threshold 2002

® - CLEA 1.06 Software

SSAC – Site Specific Assessment Criteria (derived with CLEA 1.06 software)

PROPOSED MONUMENT AT MANCHESTER CENTRAL CONVENTION CENTRE

WINDMILL STREET, MANCHESTER, M2 3GX

Comparison of Contamination Test Results with Various Thresholds

RESIDENTIAL WITH HOMEGROWN VEGETABLES

Hydrocarbons at 1% SOM

Contaminant	Max Value	Threshold	Pass/ Fail	SSAC	Pass/ Fail	Failed Samples
PAHs						
- Acenapthene	0.12	210*	P			
- Acenapthylene	0.14	170*	P			
- Anthracene	0.3	2400*	P			
- Benz(a)anthracene	0.39	7.2*	P			
- Benzo(a)pyrene (BAP)*	0.32	2.2*	P			
- Benzo(b)fluoranthene	0.21	2.6*	P			
- Benzo(ghi)perylene	0.17	320*	P			
- Benzo(k)fluoranthene	0.18	77*	P			
- Chrysene	0.43	15*	P			
- Dibenz(ah)anthracene (DBA)	0.06	0.24*	P			
- Fluoranthene	0.79	280*	P			
- Fluorene	0.24	170*	P			
- Indene (123-cd) pyrene	0.13	27*	P			
- Naphthalene	1.4	2.3*	P			
- Phenanthrene	1.5	95*	P			
- Pyrene	0.83	620*	P			
OTHER COMPOUNDS						
Phenols	<1.0	280*	P			
MTBE	<0.002		P			

All units mg/kg (parts per million/ppm) unless shown otherwise

Hydrocarbon values derived using 1% SOM

BAP is a marker for genotoxic PAHs

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PROPOSED MONUMENT AT MANCHESTER CENTRAL CONVENTION CENTRE

WINDMILL STREET, MANCHESTER, M2 3GX

Comparison of Contamination Test Results with Various Thresholds

RESIDENTIAL WITH HOMEGROWN VEGETABLES

Hydrocarbons at 1% SOM

Contaminant	Max Value	Threshold	Pass/ Fail	SSAC	Pass/ Fail	Failed Samples
BTEX COMPOUNDS						
- Benzene	0.007	0.087*	P			
- Toluene	0.017	130*	P			
- Ethyl-benzene	0.002	47*	P			
- Xylene - O	0.008	60*	P			
- M/P	0.013	56*	P			
TPHs						
Aliphatics						
$C_5 – C_6$	<0.02	42*	P			
$C_6 – C_8$	<0.02	100*	P			
$C_8 – C_{10}$	<0.02	27*	P			
$C_{10} – C_{12}$	5	130 (48 vap)*	P			
$C_{12} – C_{16}$	38	1100 (24 sol)*	P			
$C_{16} – C_{35}$	541	65000 (8.48 sol)*	P			
Aromatics						
$C_5 – C_7$	<0.02	70*	P			
$C_7 – C_8$	<0.02	130*	P			
$C_8 – C_{10}$	0.041	34*	P			
$C_{10} – C_{12}$	10	74*	P			
$C_{12} – C_{16}$	38	140*	P			
$C_{16} – C_{21}$	46	260*	P			
$C_{21} – C_{35}$	80	1100*	P			
TPH Sum	735	1,000 (H)	P			

All units mg/kg (parts per million/ppm) unless shown otherwise

Hydrocarbon values derived using 1% SOM

Vap – vapour saturation limit Soil – solubility saturation limit

Sources

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(H) – Hazardous Waste

® - CLEA 1.06 Software

SSAC – Site Specific Assessment Criteria (derived with CLEA 1.06 software)