

Mr T Lee
Gleeson Homes
6 Europa Court
Sheffield Business Park
Sheffield
S9 1XE

JMW/KLG/008/34041

26 October 2011

Dear Tony

Barnburgh Lane, Goldthorpe – Additional PBET testing

As part of our site investigation (report ref: 34041/05, dated September 2011) chemical testing was undertaken on samples of topsoil and natural clay. Arsenic was found to exceed its assessment value, related to a residential end use with plant uptake, of 32 mg/kg in two samples of topsoil from TP1 at 58 mg/kg and TP2 at 39 mg/kg. These results are enclosed in Chemtest Report 119537. No other metals were found to exceed their relevant assessment concentrations within the topsoil or natural ground on site.

Soil Guideline Values (SGVs) are based on a comparison of predicted human exposure against a Health Criteria Value (HCV). The HCV for arsenic is based on epidemiological studies of people exposed via drinking water. Sequestration as a result of adsorption, partitioning, and/or chemical bonding as well as its potential presence in discrete mineral phases is likely to mean that the arsenic will be more tightly bound within the soil in comparison to the medium of the exposure study. The SGV for arsenic also assumes that all of the contaminant is bioavailable referring to the fraction of the arsenic that can be absorbed by the human body through the gastrointestinal system, the pulmonary system and the skin. In reality, this is generally not the case and bioaccessibility testing would be expected to demonstrate that the concentrations recorded would be unlikely to present significant risks.

A Physiologically Based Extraction Test (PBET) can be used to determine the amount of arsenic that is bioaccessible, which is the fraction of a contaminant released into solution from the soil during digestion. The PBET is a laboratory based test that mimics the conditions of the gut. It stimulates leaching of a solid matrix to determine the total fraction of

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S R Ellis, BEng, CEng, MStructE, AMICE K R Pursall BEng, CEng MStructE
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C A Wood BSc, CEng, MStructE, AMICE C A Topliss BSc, CEnv, CSci, CGeol, AMICE, FGS



arsenic available for absorption during transit through the gastrointestinal tract. The bioavailable fraction will generally be lower than the bioaccessible fraction as there is likely to be incomplete absorption during transit through the gastrointestinal tract in reality.

After reviewing the chemical results, PBETs were requested on the sample with the highest concentration of arsenic (TP1 at 58 mg/kg). The results of the PBETS are attached (Chemtest Report 140241). A maximum bioaccessibility of 1.6% was recorded.

Taking a bioaccessibility of 1.6% for bioavailability, and inputting this into the CLEA Software Version 1.06, a Site Specific Assessment Concentration (SSAC) of 160 mg/kg is derived. A copy of the printout is attached. The modified mean of 41.15 mg/kg is well below this and the bioavailability would need to be over 35 times higher before the maximum recorded concentration exceeds the SSAC (a bioaccessibility of 50% would give an SSAC of the order of 55 mg/kg).

As the concentrations of arsenic recorded are significantly below the SSAC, unacceptable risks are not expected to be posed to human health. It is therefore considered that the topsoil is suitable for re-use at the development.

In summary, we consider the topsoil is suitable for re-use. This will however need to be confirmed by the NHBC and the Local Authority.

Yours Sincerely

Martin Wood

Enc Chemtest Reports (119537 and 140241)

CLEA calculations

Eastwood & Partners
St. Andrews House
23 Kingfield Road
Sheffield
S11 9AS

FAO Karen Green
08 September 2011

Dear Karen Green

Test Report Number 119537

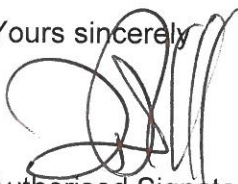
Your Project Reference Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001

Please find enclosed the results of analysis for the samples received 6 September 2011.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely


Authorised Signatory

☒ Darrell Hall	Director
☐ Phil Hellier	Director
☐ Keith Jones	Technical Manager
☐ John Crawford	Quality Manager
☐ Malcolm Avis	Director



2183



Notes to accompany report:

- The sign < means 'less than'
- Tests marked 'U' hold UKAS accreditation
- Tests marked 'M' hold MCertS (and UKAS) accreditation
- Tests marked 'N' do not currently hold UKAS accreditation
- Tests marked 'S' were subcontracted to an approved laboratory
- n/e means 'not evaluated'
- i/s means 'insufficient sample'
- u/s means 'unsuitable sample'
- Comments or interpretations are outside of the scope of UKAS accreditation
- The results relate only to the items tested
- Stones represent the quantity of material removed prior to analysis
- All results are expressed on a dry weight basis
- The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, phenols
- For all other tests the samples were dried at < 37°C prior to analysis
- Uncertainties of measurement for the determinands tested are available upon request
- Soil descriptions, including colour and texture, are beyond the scope of MCertS accreditation
- None of the test results included in this report have been recovery corrected

Test Report 119537 Cover Sheet

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 6 September 2011

Report Date
08 September 2011

FAO Karen Green

Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001

Login Batch No

Chemtest LIMS ID

Sample ID

Sample No

Sampling Date

Depth

Matrix

SOP↓ Determinand↓

CAS No↓

Units↓

*

					119537					
					AG43110	AG43111	AG43112	AG43113	AG43114	AG43115
					TP1	TP2	TP6	TP8	TP9	TP12
					05/09/2011	05/09/2011	05/09/2011	05/09/2011	05/09/2011	05/09/2011
					0.1m	0.2m	0.1m	0.1m	0.1m	0.1m
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
2175	Sulfur (total TRL report 447)		%	M						
2120	Sulfate (2:1 water soluble) as SO ₄	14808798	g l ⁻¹	M						
2490	Chromium (hexavalent)	18540299	mg kg ⁻¹	N	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2430	Sulfate (total BS1377 HCl extract)	14808798	%							
2450	Arsenic	7440382	mg kg ⁻¹	M	58	39	15	10	17	15
	Cadmium	7440439	mg kg ⁻¹	M	0.44	0.52	0.22	0.20	0.24	0.25
	Chromium	7440473	mg kg ⁻¹	M	45	36	16	15	15	17
	Copper	7440508	mg kg ⁻¹	M	120	49	17	16	18	19
	Mercury	7439976	mg kg ⁻¹	M	0.53	0.36	0.14	0.12	0.14	0.12
	Nickel	7440020	mg kg ⁻¹	M	47	53	23	20	21	25
	Lead	7439921	mg kg ⁻¹	M	85	47	21	20	24	23
	Selenium	7782492	mg kg ⁻¹	M	1.1	1.4	<0.20	0.22	0.46	0.35
	Zinc	7440666	mg kg ⁻¹	M	170	130	72	68	69	76
2800	Naphthalene	91203	mg kg ⁻¹	M	0.6	0.3	0.1	<0.1	0.1	<0.1
	Acenaphthylene	208968	mg kg ⁻¹	N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Acenaphthene	83329	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Fluorene	86737	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Phenanthrene	85018	mg kg ⁻¹	M	1.1	0.2	0.3	0.2	<0.1	<0.1
	Anthracene	120127	mg kg ⁻¹	M	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Fluoranthene	206440	mg kg ⁻¹	M	2.3	0.3	0.6	0.2	<0.1	<0.1
	Pyrene	129000	mg kg ⁻¹	M	2.1	0.3	0.5	0.1	<0.1	<0.1
	Benzo[a]anthracene	56553	mg kg ⁻¹	M	1	<0.1	0.2	<0.1	<0.1	<0.1
	Chrysene	218019	mg kg ⁻¹	M	1	<0.1	0.2	<0.1	<0.1	<0.1
	Benzo[b]fluoranthene	205992	mg kg ⁻¹	M	1.5	0.1	0.3	<0.1	<0.1	<0.1
	Benzo[k]fluoranthene	207089	mg kg ⁻¹	N	0.3	<0.1	<0.1	<0.1	<0.1	<0.1
	Benzo[a]pyrene	50328	mg kg ⁻¹	M	0.9	<0.1	<0.1	<0.1	<0.1	<0.1
	Dibenzo[a,h]anthracene	53703	mg kg ⁻¹	N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

All tests undertaken between 07/09/2011 and 08/09/2011

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Column page 1

Report page 1 of 2

LIMS sample ID range AG43110 to AG43119

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 6 September 2011

Report Date
08 September 2011

FAO Karen Green

Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001

Login Batch No

Chemtest LIMS ID

Sample ID

Sample No

Sampling Date

Depth

Matrix

SOP↓ Determinand↓

CAS No↓

Units↓

119537

AG43116

AG43117

AG43118

AG43119

TP1

TP3

TP7

TP9

05/09/2011

05/09/2011

05/09/2011

05/09/2011

0.4m

0.4m

0.9m

1m

SOIL

SOIL

SOIL

SOIL

2175	Sulfur (total TRL report 447)		%	M	0.020	0.010	0.010	0.020
2120	Sulfate (2:1 water soluble) as SO ₄	14808798	g l ⁻¹	M	0.01	<0.01	<0.01	<0.01
2490	Chromium (hexavalent)	18540299	mg kg ⁻¹	N	<0.5	<0.5	<0.5	<0.5
2430	Sulfate (total BS1377 HCl extract)	14808798	%		0.01	0.02	0.01	0.03
2450	Arsenic	7440382	mg kg ⁻¹	M	17	13	13	18
	Cadmium	7440439	mg kg ⁻¹	M	<0.10	0.21	0.13	0.20
	Chromium	7440473	mg kg ⁻¹	M	25	19	35	14
	Copper	7440508	mg kg ⁻¹	M	27	18	39	16
	Mercury	7439976	mg kg ⁻¹	M	0.11	0.12	0.16	<0.10
	Nickel	7440020	mg kg ⁻¹	M	61	38	52	23
	Lead	7439921	mg kg ⁻¹	M	15	18	31	19
	Selenium	7782492	mg kg ⁻¹	M	0.33	0.32	0.91	0.49
	Zinc	7440666	mg kg ⁻¹	M	130	82	130	63
2800	Naphthalene	91203	mg kg ⁻¹	M	0.2	<0.1	<0.1	<0.1
	Acenaphthylene	208968	mg kg ⁻¹	N	<0.1	<0.1	<0.1	<0.1
	Acenaphthene	83329	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1
	Fluorene	86737	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1
	Phenanthrene	85018	mg kg ⁻¹	M	0.2	<0.1	<0.1	<0.1
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	Benzo[b]fluoranthene	205992	mg kg ⁻¹	M	0.2	<0.1	<0.1	<0.1
	Benzo[k]fluoranthene	207089	mg kg ⁻¹	N	<0.1	<0.1	<0.1	<0.1
	Benzo[a]pyrene	50328	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1
	Dibenzo[a,h]anthracene	53703	mg kg ⁻¹	N	<0.1	<0.1	<0.1	<0.1

Eastwood & Partners
St. Andrews House
23 Kingfield Road
Sheffield
S11 9AS

FAO Karen Green

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 6 September 2011

Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001



Report Date
08 September 2011

					119537					
					AG43110	AG43111	AG43112	AG43113	AG43114	AG43115
					TP1	TP2	TP6	TP8	TP9	TP12
					05/09/2011	05/09/2011	05/09/2011	05/09/2011	05/09/2011	05/09/2011
					0.1m	0.2m	0.1m	0.1m	0.1m	0.1m
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
2800	Indeno[1,2,3-cd]pyrene	193395	mg kg ⁻¹	M	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
	Benzo[g,h,i]perylene	191242	mg kg ⁻¹	M	0.3	<0.1	<0.1	<0.1	<0.1	<0.1
	Total (of 16) PAHs		mg kg ⁻¹	N	12	<2	2.1	<2	<2	<2
2010	pH			M	7.2	7.5	7.4	7.5	7.5	7.5
2030	Moisture		%	n/a	18.5	16.7	15	12.5	11.6	16.7
	Stones content (>50mm)		%	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			n/a	brown	brown	brown	brown	brown	brown
	Soil texture			n/a	sand	sand	sand	sand	sand	sand
	Other material			n/a	roots	roots	roots	roots	roots	roots

All tests undertaken between 07/09/2011 and 08/09/2011

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Column page 1

Report page 2 of 2

LIMS sample ID range AG43110 to AG43119

Eastwood & Partners
St. Andrews House
23 Kingfield Road
Sheffield
S11 9AS

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 6 September 2011



Report Date
08 September 2011

FAO Karen Green

Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001

					119537			
					AG43116	AG43117	AG43118	AG43119
					TP1	TP3	TP7	TP9
					05/09/2011	05/09/2011	05/09/2011	05/09/2011
					0.4m	0.4m	0.9m	1m
					SOIL	SOIL	SOIL	SOIL
2800	Indeno[1,2,3-cd]pyrene	193395	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1
	Benzo[g,h,i]perylene	191242	mg kg ⁻¹	M	<0.1	<0.1	<0.1	<0.1
	Total (of 16) PAHs		mg kg ⁻¹	N	<2	<2	<2	<2
2010	pH			M	8.0	8.0	5.9	7.4
2030	Moisture		%	n/a	13.5	10.6	10.7	9.11
	Stones content (>50mm)		%	n/a	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			n/a	brown	brown	brown	brown
	Soil texture			n/a	sand	sand	sand	sand
	Other material			n/a	roots	none	none	none

Eastwood & Partners
St. Andrews House
23 Kingfield Road
Sheffield
S11 9AS

FAO K Edwards/M Wood/P Smith
14 October 2011

Dear K Edwards/M Wood/P Smith

Test Report Number 140241

Your Project Reference Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001

Please find enclosed the results of analysis for the samples received 6 October 2011.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely



Authorised Signatory

☐ Darrell Hall	Director
☒ Phil Hellier	Director
☐ Keith Jones	Technical Manager
☐ John Crawford	Quality Manager
☐ Malcolm Avis	Director



2183



Notes to accompany report:

- The sign < means 'less than'
- Tests marked 'U' hold UKAS accreditation
- Tests marked 'M' hold MCertS (and UKAS) accreditation
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- Comments or interpretations are beyond the scope of UKAS accreditation
- The results relate only to the items tested

Test Report 140241 Cover Sheet

Eastwood & Partners
St. Andrews House
23 Kingfield Road
Sheffield
S11 9AS

LABORATORY TEST REPORT



Results of analysis of 1 sample
received 6 October 2011

Report Date
14 October 2011

FAO K Edwards/M Wood/P Smith

Barnburgh Lane, Goldthorpe - JMW/KLG/34041/001

Login Batch No

Chemtest LIMS ID

Sample ID

Sample No

Sampling Date

Depth

Matrix

SOP↓	Determinand↓	CAS No↓	Units↓	*	
2630	As Stomach Bioaccessibility	7440382	mg kg ⁻¹	N	0.55
	As Intestinal Bioaccessibility 1	7440382	mg kg ⁻¹	N	0.67
	As Intestinal Bioaccessibility 2	7440382	mg kg ⁻¹	N	0.95
	Arsenic - Bioaccessible Fraction	7440382	%	N	1.6
2450	Arsenic	7440382	mg kg ⁻¹	M	58

140241

AG55617

TP1

05/10/2011

0.1m

SOIL

All tests undertaken between 06/10/2011 and 14/10/2011

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Column page 1

Report page 1 of 1

LIMS sample ID range AG55617 to AG55617

CLEA Software Version 1.06

Page 1 of 11

Report generated 26-Oct-11

Report title Site Specific Assessment Concentration for Arsenic

Created by Catherine Skinner at Eastwood & Partners (Consulting Engineers) Ltd



RESULTS

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