

6th October 2022

Mr R Sedden
Lovell Partnership Ltd
St Johns House
Barrington Road
Altrincham
WA14 1JY



Dear Richard,

Response to Further Comments - CDN/22/0602 EDGE LANE– Condition 6 (Ground Conditions)

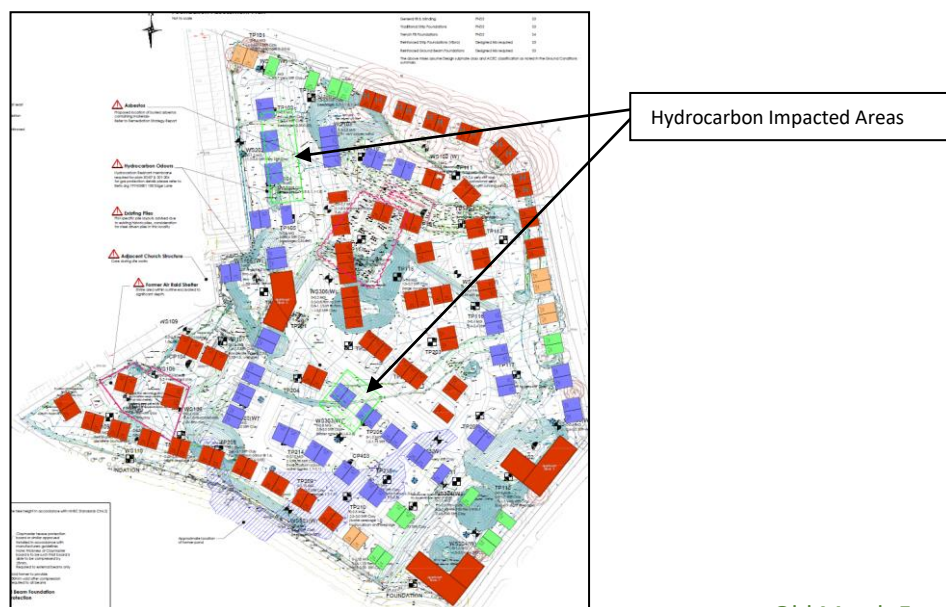
Following on from the email dated 5th October, 2022 from the EHO - please find below our comments:

'The submitted 'Foundation Assessment Plan' indicates that not all dwellings located in the vicinity of VOC/HC impacted exploratory locations (TP104, TP105, TP112, TP116 and TP118 as per section 15 of Betts Geo Pre-Construction Remediation Verification Report, ref. 19YHG001/VR, April 2021) were to receive hydrocarbon vapour protection measures (HC/VOC membrane plus ventilated void). This point should be clarified before we can recommend the discharge of part a of condition 6, and before any validation details can be reviewed.'

The Betts Geo Verification Report detailed that naphthalene and TPH levels were encountered during the site investigation within TP104, TP105, TP112, TP116 and TP118 and plots within the vicinity may require a hydrocarbon resistant membrane.

During the earthworks, Betts Geo undertook additional PID screening. Whilst the PID showed some previously identified hotspots encountering elevated occurrences, others showed negligible results as a result of the site clearance/earthworks. As a result the area recommended for hydrocarbon membranes was reduced to that shown in section 15 of the verification report and on the FZP.

An extract is provided below showing the hydrocarbon impacted ground in green.



Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 288179
www.betts-associates.co.uk

In summary, Betts Geo can confirm that the following plots require a hydrocarbon vapor resistant membrane:

- Plots 82 – 87; and
- Plots 201 – 204.

To date, Betts Geo have inspected gas membranes on plots 82 – 87. The gas validation report has been appended to the back of this letter.

‘Regarding the submitted Betts Geo letter (ref. 21/LPL/083/MJF/SP/FP01, 29th September 2022), gas membrane validations would not fully satisfy the condition as imported materials / clean cover system verification is also required, consisting of 600mm cover thickness in gardens (with geotextile where recommended in the VR), and 450mm cover in soft landscaped areas’

Betts Geo can confirm that to date, the following plots have been tested for clean cover system verifications and relevant validation letter reports produced as a result (600mm thickness with no dig layer at base). These reports have been appended to the back of this letter.

- Plots 19 – 22 & 89 – 90
- Plots 91 – 101
- Plot 88
- Plots 102 – 109

We trust that this is sufficient for your immediate requirements.

Yours sincerely



Jenny Skues
Senior Geo-Environmental Engineer
BETTS GEO ENVIRONMENTAL



Constructionline

House Types: HT-102 (AS)
Construction Type: Beam and Block Precast Floor
Protection Anticipated: CS2 / Amber 1 – Telescopic Venting

Floor Type	1. Precast beam and block with minimal service penetrations.
Installation Quality	2. Good level of workmanship in line with good practice to CQA.
Testing Regime 1	3. Independent validation of all plots by Betts Geo Environmental Ltd.
Membrane type	4. Powerbase VOC Hydrocarbon chemical resistant barrier membrane
Extent of coverage	5. All.
Underside of membrane	6. Onto block and beam
Slab/membrane condition	7. Precast beam and block with minimal service penetrations via sealed top hats. Membrane in V good condition
Laps and joints	8. Very good – Double seals top and bottom throughout.
Damp-proof course	9. Yes.
Service entries and seals	10. Good seals: Top-hats / taped.
Cavity inspection	11. Good.
Remarks	

This plot has PASSED inspection.

Photographs taken by Betts Geo

An additional inspection visit IS NOT required for this plot.



House Types: HT-113 (OP)
Construction Type: Beam and Block Precast Floor
Protection Anticipated: CS2 / Amber 1 – Telescopic Venting

Floor Type	1. Precast beam and block with minimal service penetrations.
Installation Quality	2. Good level of workmanship in line with good practice to CQA.
Testing Regime 1	3. Independent validation of all plots by Betts Geo Environmental Ltd.
Membrane type	4. Powerbase VOC Hydrocarbon chemical resistant barrier membrane
Extent of coverage	5. All.
Underside of membrane	6. Onto block and beam
Slab/membrane condition	7. Precast beam and block with minimal service penetrations via sealed top hats. Membrane in V good condition
Laps and joints	8. Very good – Double seals top and bottom throughout.
Damp-proof course	9. Yes.
Service entries and seals	10. Good seals: Top-hats / taped.
Cavity inspection	11. Good.
Remarks	

This plot has PASSED inspection.

Photographs taken by Betts Geo

An additional inspection visit IS NOT required for this plot.



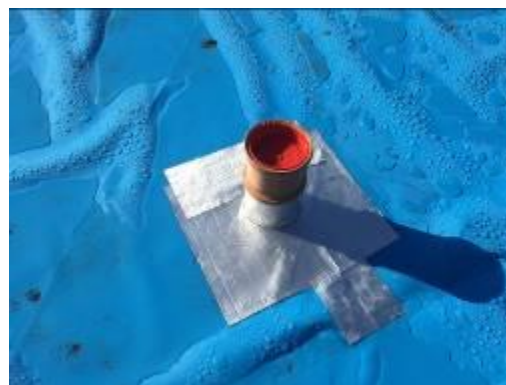
House Types: HT-102 (OP)
Construction Type: Beam and Block Precast Floor
Protection Anticipated: CS2 / Amber 1 – Telescopic Venting

Floor Type	1. Precast beam and block with minimal service penetrations.
Installation Quality	2. Good level of workmanship in line with good practice to CQA.
Testing Regime 1	3. Independent validation of all plots by Betts Geo Environmental Ltd.
Membrane type	4. Powerbase VOC Hydrocarbon chemical resistant barrier membrane
Extent of coverage	5. All.
Underside of membrane	6. Onto block and beam
Slab/membrane condition	7. Precast beam and block with minimal service penetrations via sealed top hats. Membrane in V good condition
Laps and joints	8. Very good – Double seals top and bottom throughout.
Damp-proof course	9. Yes.
Service entries and seals	10. Good seals: Top-hats / taped.
Cavity inspection	11. Good.
Remarks	

This plot has PASSED inspection.

Photographs taken by Betts Geo

An additional inspection visit IS NOT required for this plot.



21LPL083/SV/GC/01

27th July 2022

FAO Richard Sedden @ Lovell
(Via Email: richard.sedden@Lovell.co.uk)



Dear Richard,

Edge Lane, Openshaw – Soil Cover System Assessment – Plots 19 – 22 & 89 – 90

Please find below our clean-cover system validation data at the above-mentioned site / plots.

Overview

Betts Geo Ltd were instructed to validate the clean cover system applied within residential gardens at the above site as per the recommendations within the Remediation Statement undertaken by Betts Geo Ltd in May 2020 (Ref; 19YHG001/RS/REVD) and the Verification Report undertaken by Betts Geo Ltd in April 2021 (19YHG001/VR).

The report recommends;

- A 600mm cover system with no dig layer is required. This will comprise of:

150mm Topsoil (anticipated to be imported)
450mm Subsoil (anticipated to be imported)
Geotextile membrane

The cover system is likely to be made up using imported topsoil and subsoil.

Physical Suitability of the Topsoil and Subsoil

The composition of the topsoil and subsoil materials on site were visually inspected in-situ during sampling on 15th June 2022. Inspection confirms that the topsoil is debris free dark brown slightly sandy CLAY and subsoil material is brown sandy CLAY, both topsoil and subsoil are physically suitable for their proposed end use.

Topsoil Source – Handley Hill, Winsford CW7 1EW.

Subsoil Source – Goldfinch Close, Congleton CW12 3FB.

Cover System Depth Validation

Trial holes undertaken in the rear garden of plots 19-22 & 89-90 on 20th July 2022 confirm that the topsoil thickness was greater than 150mm; the subsoil was a typical thickness greater than 450mm and a geotextile membrane was in place completing the required 600mm clean cover system.



Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
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Chemical Validation of Topsoil and Subsoil

The topsoil and subsoil were chemically tested in-situ (0.10mbgl topsoil and 0.40mbgl subsoil) in the rear garden area of plots 19, 21 & 89 on 15th June 2022 on a sample ratio of 1:3 garden basis in accordance with NHBC guidance.

Samples were taken in-situ at a sample rate of 1:3 garden areas per strata i.e. 6 samples were taken.

Analysis has been scheduled for the standard 'CLEA' Metals (including Chromium VI), speciated TPH to CWG and Speciated PAH's.

No visual or olfactory evidence of contamination was noted within any of the samples.

These results were screened against the same criteria i.e. EA/CIEH/LQM residential guidance for suitability.

All results fall below relevant standard guidance levels.

Summary

Betts Geo Environmental confirms that the soil is acceptable for use within gardens as such the capping requirements for plots 19-22 & 89-90 are complete.

We trust that this information is satisfactory for your further assessment to release the conditions.

Should you require any further clarification please do not hesitate in giving us a call.

Yours Sincerely,



Graham Clark
BETTS GEO ENVIRONMENTAL LIMITED

Encl –
Evidentiary Photographs
Topsoil & Subsoil testing data





Plot 19



Plot 20



Plot 21



Plot 22



Plot 89



Plot 90



SUMMARY OF CONTAMINATION ANALYSIS: METALS

Project Name Edge Lane, Openshaw
Project No 21LPL083
Date 15/06/2022

SOIL TYPE	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	Plot 19	Plot 19	Plot 21	Plot 21	Plot 89	Plot 89
DEPTH (m)	0.10	0.40	0.10	0.40	0.10	0.40
pH	7.76	8.05	7.95	7.81	7.65	8.05
Sulphate (water sol 2:1)	0.1	0.11	0.09	0.03	0.15	0.07
Organic matter	1.8	1.3	2.3	0.6	6.1	0.5
Arsenic	5	5	6	2	8	2
Cadmium	<0.5	0.7	<0.5	0.7	0.8	0.6
Copper	15	18	16	15	40	19
Chromium (hexavalent)	<1	<1	<1	<1	<1	<1
Lead	31	19	35	9	71	11
Mercury	0.33	0.26	0.47	<0.17	0.42	0.43
Nickel	9	21	11	25	18	24
Selenium	2	<1	2	<1	2	<1
Zinc	40	50	42	39	69	37
Asbestos in Soil	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos Matrix	N/A	N/A	N/A	N/A	N/A	N/A
Quantification	NAD	NAD	NAD	NAD	NAD	NAD
Organic matter	1.8	1.3	2.3	0.6	6.1	0.5

Metals	Mean Value Test *	Range		AtRisk 2017 (mg/kg)	AtRisk 2017 (mg/kg)	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	With Homegrown Produce (1% SOM)	With Homegrown Produce (6% SOM)	
pH	8.01	8.05	7.65			-
Sulphate (water sol 2:1)	0.12	0.15	0.03			-
Organic matter	3.81	6.10	0.50			
Arsenic	6.59	8.00	2.00	32	32	37
Cadmium	0.73	0.80	<0.5	10	10	22.1
Copper	28.47	40.00	15.00	4730	4790	-
Chromium (hexavalent)	1.00	<1	<1	3.62	3.63	20.5
Lead	48.19	71.00	9.00			200
Mercury	0.44	0.47	<0.17	8.81	15.8	-
Nickel	23.51	25.00	9.00	EA/AtRisk withdrawn Aug 2015		
Selenium	1.95	2.00	<1	375	375	-
Zinc	56.09	69.00	37.00	20000	20300	-

NOTE:

Any individual results and mean value tests above SGVs are shown RED highlighted.

Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers

** - Results for this determinand are assessed with no background levels taken into account

Results are expressed as mg/kg unless otherwise stated

Asbestos Quantification is expressed in %w/w.

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGVs which are taken from AtRisk 2015. Category 4 screening levels have been adopted by the EA and have been included as new guidance.

Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021/Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGVs for inorganic mercury can normally be compared with chemical analysis for total mercury content...'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used

NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

SUMMARY OF CONTAMINATION ANALYSIS: TPH

Project Name Edge Lane, Openshaw
Project No 21LPL083
Date 15/06/2022

SOIL TYPE	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	Plot 19	Plot 19	Plot 21	Plot 21	Plot 89	Plot 89
DEPTH (m)	0.10	0.40	0.10	0.40	0.10	0.40
Ali >C5-C6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C6-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C8-C10	<1	<1	<1	<1	<1	<1
Ali >C10-C12	<1	<1	<1	<1	<1	<1
Ali >C12-C16	<1	<1	<1	<1	<1	<1
Ali >C16-C21	<1	<1	<1	<1	<1	<1
Ali >C21-C35	10	3	7	5	9	5
Total Aliphatics	10	3	7	5	9	5
Aro >C5-C7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C7-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C8-C10	<1	<1	<1	<1	<1	<1
Aro >C10-C12	<1	<1	<1	<1	<1	<1
Aro >C12-C16	6	<1	2	<1	<1	<1
Aro >C16-C21	4	<1	3	<1	3	<1
Aro >C21-C35	10	1	12	<1	7	<1
Total Aromatics	20	1	17	<1	10	<1
TPH (Ali & Aro)	30	5	24	5	20	5
BTEX - Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Ethyl Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - m & p Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - o Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MTBE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Matter	1.8	1.3	2.3	0.6	6.1	0.5

TPH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Ali >C5-C6	0.01	<0.01	<0.01	42.7	369	-
Ali >C6-C8	0.01	<0.01	<0.01	99.3	1240	-
Ali >C8-C10	1.00	<1	<1	13.9	204	-
Ali >C10-C12	1.00	<1	<1	81.7	1180	-
Ali >C12-C16	1.00	<1	<1	385	4130	-
Ali >C16-C21	1.00	<1	<1	210000	210100	-
Ali >C21-C35	8.69	10.00	3.00			
Total Aliphatics	8.69	10.00	3.00			
Aro >C5-C7	0.01	<0.01	<0.01	0.137	0.871	-
Aro >C7-C8	0.01	<0.01	<0.01	113	780	-
Aro >C8-C10	1.00	<1	<1	20.5	232	-
Aro >C10-C12	1.00	<1	<1	70	468	-
Aro >C12-C16	3.65	6.00	<1	165	830	-
Aro >C16-C21	3.26	4.00	<1	319	1040	-
Aro >C21-C35	9.45	12.00	<1	1120	1710	-
Total Aromatics	15.46	20.00	<1			
TPH (Ali & Aro)	24.07	30.00	5.00			
BTEX - Benzene	0.01	<0.01	<0.01	0.0493	0.33	0.871
BTEX - Toluene	0.01	<0.01	<0.01	113	780	-
BTEX - Ethyl Benzene	0.01	<0.01	<0.01	50.7	453	-
BTEX - m & p Xylene	0.01	<0.01	<0.01	24	312	-
BTEX - o Xylene	0.01	<0.01	<0.01	26.4	336	-
MTBE	0.01	<0.01	<0.01	27.6	220	

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

UU Drinking Water Guidelines	
PE Threshold	
Total BTEX & MTBE	0.1
EC5-EC10 Ali-Aro	2
EC10-EC16 Ali-Aro	10
EC16-EC40 Ali-Aro	500

SUMMARY OF CONTAMINATION ANALYSIS: PAH

Project Name Edge Lane, Openshaw
Project No 21LPL083
Date 15/06/22

SOIL TYPE	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	Plot 19	Plot 19	Plot 21	Plot 21	Plot 89	Plot 89
DEPTH (m)	0.10	0.40	0.10	0.40	0.10	0.40
Acenaphthene	0.02	<0.01	<0.01	<0.01	0.09	0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	0.04	<0.02	0.02	<0.02	0.16	0.03
Benzo(a)anthracene	0.14	<0.04	0.08	<0.04	0.33	<0.04
Benzo(a)pyrene	0.15	<0.04	0.09	<0.04	0.29	<0.04
Benzo(b)fluoranthene	0.19	<0.05	0.12	<0.05	0.37	<0.05
Benzo(ghi)perylene	0.08	<0.05	0.05	<0.05	0.15	<0.05
Benzo(k)fluoranthene	<0.07	<0.07	<0.07	<0.07	0.15	<0.07
Chrysene	0.18	<0.06	0.11	<0.06	0.4	<0.06
Dibenzo(ah)anthracene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	0.33	<0.08	0.2	<0.08	0.85	0.12
Fluorene	0.01	<0.01	<0.01	<0.01	0.06	0.01
Indeno(123-cd)pyrene	0.11	<0.03	0.08	<0.03	0.21	<0.03
Naphthalene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	0.14	<0.03	0.07	<0.03	0.55	0.1
Pyrene	0.31	<0.07	0.18	<0.07	0.77	0.11
Organic Matter	1.8	1.3	2.3	0.6	6.1	0.5

PAH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA's C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Acenaphthene	0.05	0.09	<0.01	608	2760	-
Acenaphthylene	0.01	<0.01	<0.01			-
Anthracene	0.09	0.16	<0.02	10200	26200	-
Benzo(a)anthracene	0.21	0.33	<0.04	4.52	8.54	-
Benzo(a)pyrene	0.19	0.29	<0.04	1.51	2.05	4.95
Benzo(b)fluoranthene	0.24	0.37	<0.05	7.72	9.86	-
Benzo(ghi)perylene	0.10	0.15	<0.05	96.2	103	-
Benzo(k)fluoranthene	0.11	0.15	<0.07	84.4	100	-
Chrysene	0.25	0.40	<0.06	585	927	-
Dibenzo(ah)anthracene	0.04	<0.04	<0.04	0.838	1	-
Fluoranthene	0.52	0.85	<0.08	983	2980	-
Fluorene	0.04	0.06	<0.01	735	2610	-
Indeno(123-cd)pyrene	0.14	0.21	<0.03	7.31	9.75	-
Naphthalene	0.03	<0.03	<0.03	0.829	12.2	-
Phenanthrene	0.32	0.55	<0.03			-
Pyrene	0.47	0.77	<0.07	668	2120	-

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

21LPL083/SV/GC/02

19th August 2022

FAO Richard Sedden @ Lovell
(Via Email: richard.sedden@Lovell.co.uk)



Dear Richard,

Edge Lane, Openshaw – Soil Cover System Assessment – Plots 91-101

Please find below our clean-cover system validation data at the above-mentioned site / plots.

Overview

Betts Geo Ltd were instructed to validate the clean cover system applied within residential gardens at the above site as per the recommendations within the Remediation Statement undertaken by Betts Geo Ltd in May 2020 (Ref; 19YHG001/RS/REVD) and the Verification Report undertaken by Betts Geo Ltd in April 2021 (19YHG001/VR).

The report recommends;

- A 600mm cover system with no dig layer is required. This will comprise of:

150mm Topsoil (anticipated to be imported)
450mm Subsoil (anticipated to be imported)
Geotextile membrane

The cover system is likely to be made up using imported topsoil and subsoil.

Physical Suitability of the Topsoil and Subsoil

The composition of the topsoil and subsoil materials on site were visually inspected in-situ during sampling on 10th August 2022. Inspection confirms that the topsoil is debris free dark brown slightly sandy CLAY and subsoil material is brown sandy CLAY, both topsoil and subsoil are physically suitable for their proposed end use.

Topsoil Source – Handley Hill, Winsford CW7 1EW.

Subsoil Source – Goldfinch Close, Congleton CW12 3FB.

Cover System Depth Validation

Trial holes undertaken in the rear garden of plots 91-101 on 10th August 2022 confirmed that the topsoil thickness was greater than 150mm; the subsoil was a typical thickness greater than 450mm and a geotextile membrane was in place at the base completing the required 600mm clean cover system.



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Chemical Validation of Topsoil and Subsoil

The topsoil and subsoil were chemically tested in-situ (0.10mbgl topsoil and 0.40mbgl subsoil) in the rear garden area of plots 92, 95, 98 & 101 on 10th August 2022 on a sample ratio of 1:3 garden basis in accordance with NHBC guidance.

Samples were taken in-situ at a sample rate of 1:3 garden areas per strata i.e. 8 samples were taken.

Analysis has been scheduled for the standard 'CLEA' Metals (including Chromium VI), speciated TPH to CWG and Speciated PAH's.

No visual or olfactory evidence of contamination was noted within any of the samples.

These results were screened against the same criteria i.e. EA/CIEH/LQM residential guidance for suitability.

All results fall below relevant standard guidance levels.

Summary

Betts Geo Environmental confirms that the soil is acceptable for use within gardens as such the capping requirements for plots 91-101 are complete.

We trust that this information is satisfactory for your further assessment to release the conditions.

Should you require any further clarification please do not hesitate in giving us a call.

Yours Sincerely,



Graham Clark
BETTS GEO ENVIRONMENTAL LIMITED

Encl –
Evidentiary Photographs
Topsoil & Subsoil testing data





Plot 91

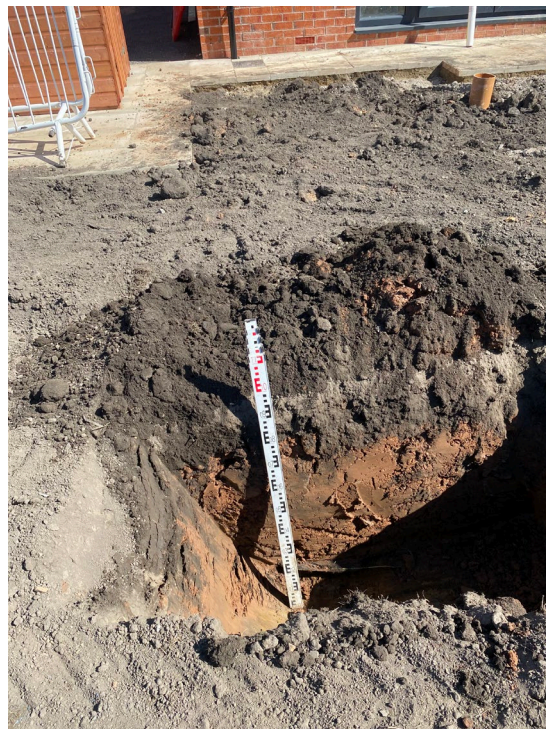


Plot 92



Plot 93





Plot 94



Plot 95



Plot 96



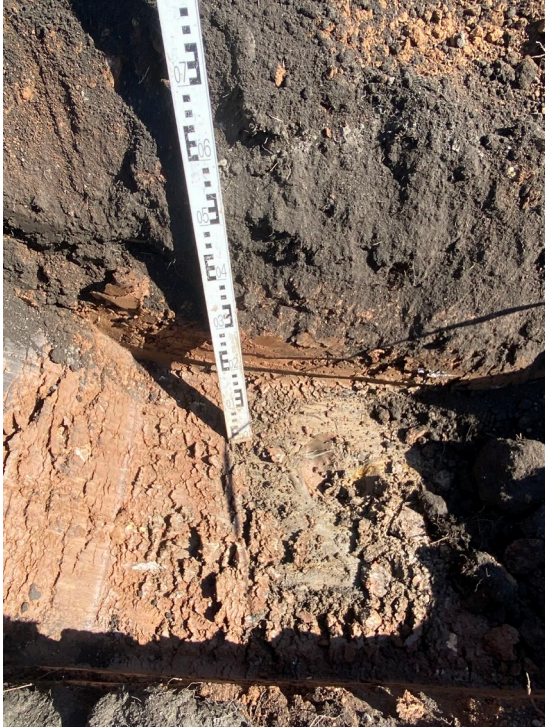
Plot 97



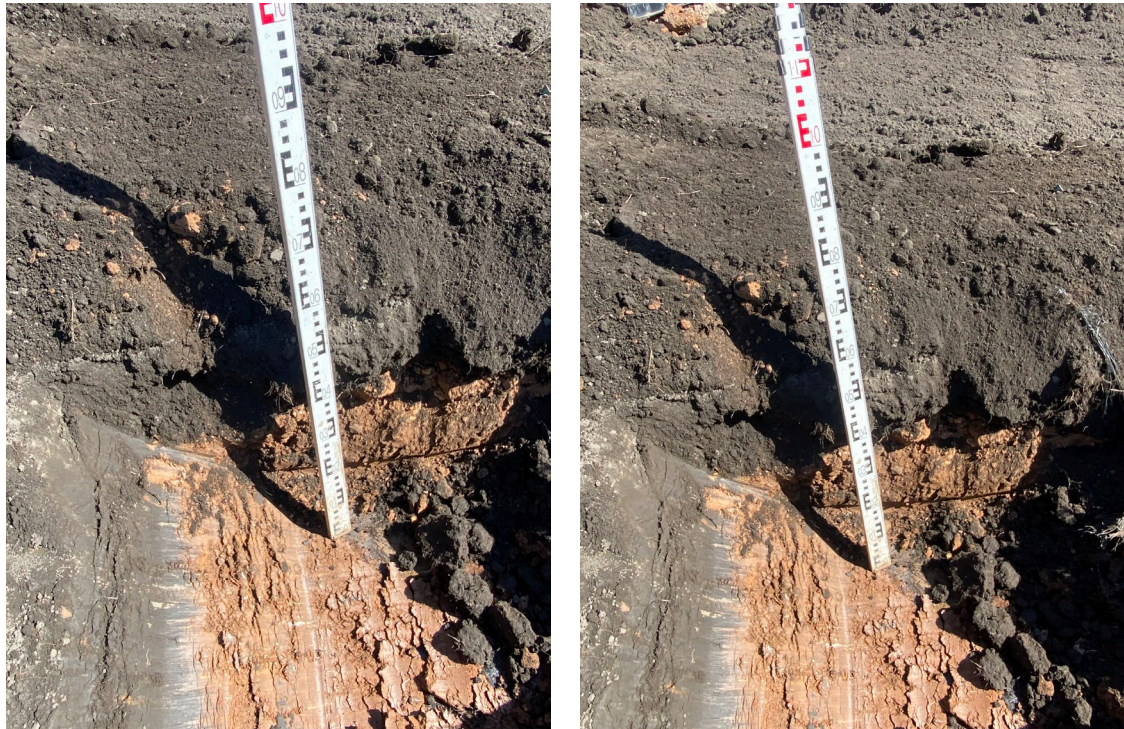
Plot 98



Plot 99



Plot 100



Plot 101

SUMMARY OF CONTAMINATION ANALYSIS: SOIL

SUMMARY OF CONTAMINATION ANALYSIS: METALS

Project Name Edge Lane
Project No 21LPL083
Date 10/08/2022

SOIL TYPE	TS	SS	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	Plot 92	Plot 92	Plot 95	Plot 95	Plot 98	Plot 98	Plot 101	Plot 101
DEPTH (m)	0.10	0.40	0.10	0.40	0.10	0.40	0.10	0.40
pH	6.93	7.98	6.42	8.43	6.44	8.08	6.74	8.25
Sulphate (water sol 2:1)	0.03	0.07	0.02	0.08	0.03	0.07	0.02	0.07
Organic matter	10.9	1.5	10.8	0.5	11.5	0.4	9.8	0.7
Arsenic	17	<1	19	<1	18	<1	14	<1
Cadmium	1.3	1	1.5	0.8	1.4	0.8	1.3	0.8
Copper	49	18	48	13	47	15	44	17
Chromium (hexavalent)	<1	<1	<1	<1	<1	<1	<1	<1
Lead	114	12	113	7	113	10	102	15
Mercury	0.19	<0.17	<0.17	<0.17	<0.17	<0.17	0.24	<0.17
Nickel	21	26	22	21	21	23	19	23
Selenium	<1	<1	<1	<1	1	<1	<1	<1
Zinc	95	54	100	43	96	37	93	47
Asbestos in Soil	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos Matrix	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Quantification	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Organic matter	10.9	1.5	10.8	0.5	11.5	0.4	9.8	0.7

Metals	Mean Value Test *	Range		AtRisk 2017 (mg/kg)		DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	With Homegrown Produce (1% SOM)	With Homegrown Produce (6% SOM)	
pH	7.98	8.43	6.42			-
Sulphate (water sol 2:1)	0.07	0.08	0.02			-
Organic matter	9.35	11.50	0.40			
Arsenic	14.81	19.00	<1	32	32	37
Cadmium	1.31	1.50	0.80	10	10	22.1
Copper	42.65	49.00	13.00	4730	4790	-
Chromium (hexavalent)	1.00	<1	<1	3.62	3.63	20.5
Lead	96.49	114.00	7.00			200
Mercury	0.20	0.24	0.19	8.81	15.8	-
Nickel	23.39	26.00	<0.17	EA/AtRisk withdrawn Aug 2015		
Selenium	1.00	1.00	<1	375	375	-
Zinc	89.11	100.00	37.00	20000	20300	-

NOTE:

Any individual results and mean value tests above SGVs are shown RED highlighted.
Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers

** - Results for this determinand are assessed with no background levels taken into account

Results are expressed as mg/kg unless otherwise stated

Asbestos Quantification is expressed in %w/w.

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGVs which are taken from AtRisk 2015. Category 4 screening levels have been adopted by the EA and have been included as new guidance.

Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021 /Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGV's for inorganic mercury can normally be compared with chemical analysis for total mercury content...'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used

NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

SUMMARY OF CONTAMINATION ANALYSIS: SOIL

SUMMARY OF CONTAMINATION ANALYSIS: TPH

Project Name Edge Lane
Project No 21LPL083
Date 10/08/2022

SOIL TYPE	TS	SS	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	Plot 92	Plot 92	Plot 95	Plot 95	Plot 98	Plot 98	Plot 101	Plot 101
DEPTH (m)	0.10	0.40	0.10	0.40	0.10	0.40	0.10	0.40
Alii >C5-C6	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Alii >C6-C8	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Alii >C8-C10	<1	<1	<1	<1	<1	<1	<1	<1
Alii >C10-C12	<1	<1	<1	<1	<1	<1	<1	<1
Alii >C12-C16	<1	<1	1	<1	<1	<1	1	<1
Alii >C16-C21	3	<1	2	<1	3	<1	2	<1
Alii >C21-C35	32	2	30	3	22	<1	22	2
Total Aliphatics	27	2	27	3	19	<1	22	2
Aro >C5-C7	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Aro >C7-C8	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Aro >C8-C10	<1	<1	<1	<1	<1	<1	2	<1
Aro >C10-C12	<1	<1	<1	<1	<1	<1	1	<1
Aro >C12-C16	4	<1	4	<1	4	<1	5	<1
Aro >C16-C21	10	1	15	2	14	<1	13	<1
Aro >C21-C35	32	2	40	5	38	2	35	2
Total Aromatics	36	3	47	7	43	2	48	2
TPH (Alii & Aro)	63	5	74	10	62	2	70	4
BTEX - Benzene	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
BTEX - Toluene	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
BTEX - Ethyl Benzene	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
BTEX - m & p Xylene	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
BTEX - o Xylene	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
MTBE	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Organic Matter	10.9	1.5	10.8	0.5	11.5	0.4	9.8	0.7

TPH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Alii >C5-C6	0.03	<0.05	<0.01	42.7	369	-
Alii >C6-C8	0.03	<0.05	<0.01	99.3	1240	-
Alii >C8-C10	1.00	<1	<1	13.9	204	-
Alii >C10-C12	1.00	<1	<1	81.7	1180	-
Alii >C12-C16	1.00	1.00	<1	385	4130	-
Alii >C16-C21	2.34	3.00	<1	210000	210100	-
Alii >C21-C35	23.33	32.00	<1			
Total Aliphatics	20.86	27.00	<1			
Aro >C5-C7	0.03	<0.05	<0.01	0.137	0.871	-
Aro >C7-C8	0.03	<0.05	<0.01	113	780	-
Aro >C8-C10	1.36	2.00	<1	20.5	232	-
Aro >C10-C12	1.00	1.00	<1	70	468	-
Aro >C12-C16	3.81	5.00	<1	165	830	-
Aro >C16-C21	11.44	15.00	<1	319	1040	-
Aro >C21-C35	31.61	40.00	2.00	1120	1710	-
Total Aromatics	38.06	48.00	2.00			
TPH (Alii & Aro)	58.64	74.00	2.00			
BTEX - Benzene	0.03	<0.05	<0.01	0.0493	0.33	0.871
BTEX - Toluene	0.03	<0.05	<0.01	113	780	-
BTEX - Ethyl Benzene	0.03	<0.05	<0.01	50.7	453	-
BTEX - m & p Xylene	0.03	<0.05	<0.01	24	312	-
BTEX - o Xylene	0.03	<0.05	<0.01	26.4	336	-
MTBE	0.03	<0.05	<0.01	27.6	220	

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

UU Drinking Water Guidelines	
PE Threshold	
Total BTEX & MTBE	0.1
EC5-EC10 Alii Aro	2
EC10-EC16 Alii-Aro	10
EC16-EC40 Alii-Aro	500

SUMMARY OF CONTAMINATION ANALYSIS: PAH

Project Name Edge Lane
 Project No 21LPL083
 Date 10/08/22

SOIL TYPE	TS	SS	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	Plot 92	Plot 92	Plot 95	Plot 95	Plot 98	Plot 98	Plot 101	Plot 101
DEPTH (m)	0.10	0.40	0.10	0.40	0.10	0.40	0.10	0.40
Acenaphthene	0.13	<0.01	0.04	0.07	0.05	<0.01	0.05	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	0.17	<0.02	0.05	0.13	0.09	<0.02	0.07	<0.02
Benzo(a)anthracene	0.55	<0.04	0.24	0.39	0.37	<0.04	0.28	<0.04
Benzo(a)pyrene	0.43	<0.04	0.24	0.4	0.37	<0.04	0.27	<0.04
Benzo(b)fluoranthene	0.56	<0.05	0.3	0.44	0.49	<0.05	0.35	<0.05
Benzo(ghi)perylene	0.23	<0.05	0.12	0.2	0.2	<0.05	0.15	<0.05
Benzo(k)fluoranthene	0.19	<0.07	0.1	0.15	0.16	<0.07	0.12	<0.07
Chrysene	0.62	<0.06	0.31	0.46	0.49	<0.06	0.36	<0.06
Dibenzo(ah)anthracene	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	1.13	<0.08	0.49	0.86	0.8	<0.08	0.59	<0.08
Fluorene	0.09	<0.01	0.01	0.04	0.04	<0.01	0.02	<0.01
Indeno(123-cd)pyrene	0.28	<0.03	0.15	0.22	0.24	<0.03	0.16	<0.03
Naphthalene	0.27	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	0.83	<0.03	0.25	0.54	0.42	<0.03	0.32	<0.03
Pyrene	1.02	<0.07	0.47	0.8	0.76	<0.07	0.57	<0.07
Organic Matter	10.9	1.5	10.8	0.5	11.5	0.4	9.8	0.7

PAH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA's C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Acenaphthene	0.07	0.13	<0.01	608	2760	-
Acenaphthylene	0.01	<0.01	<0.01			-
Anthracene	0.11	0.17	<0.02	10200	26200	-
Benzo(a)anthracene	0.37	0.55	<0.04	4.52	8.54	-
Benzo(a)pyrene	0.34	0.43	<0.04	1.51	2.05	4.95
Benzo(b)fluoranthene	0.43	0.56	<0.05	7.72	9.86	-
Benzo(ghi)perylene	0.18	0.23	<0.05	96.2	103	-
Benzo(k)fluoranthene	0.15	0.19	<0.07	84.4	100	-
Chrysene	0.45	0.62	<0.06	585	927	-
Dibenzo(ah)anthracene	0.04	0.05	<0.04	0.838	1	-
Fluoranthene	0.79	1.13	<0.08	983	2980	-
Fluorene	0.05	0.09	<0.01	735	2610	-
Indeno(123-cd)pyrene	0.21	0.28	<0.03	7.31	9.75	-
Naphthalene	0.12	0.27	<0.03	0.829	12.2	-
Phenanthrene	0.50	0.83	<0.03			-
Pyrene	0.73	1.02	<0.07	668	2120	-

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

21LPL083/SV/GC/03

16th September 2022

FAO Richard Sedden @ Lovell
(Via Email: richard.sedden@Lovell.co.uk)



Dear Richard,

Edge Lane, Openshaw – Soil Cover System Assessment – Plot 88

Please find below our clean-cover system validation data at the above-mentioned site / plots.

Overview

Betts Geo Ltd were instructed to validate the clean cover system applied within residential gardens at the above site as per the recommendations within the Remediation Statement undertaken by Betts Geo Ltd in May 2020 (Ref; 19YHG001/RS/REVD) and the Verification Report undertaken by Betts Geo Ltd in April 2021 (19YHG001/VR).

The report recommends;

- A 600mm cover system with no dig layer is required. This will comprise of:

150mm Topsoil (anticipated to be imported)
450mm Subsoil (anticipated to be imported)
Geotextile membrane

The cover system is likely to be made up using imported topsoil and subsoil.

Physical Suitability of the Topsoil and Subsoil

The composition of the topsoil and subsoil materials on site were visually inspected in-situ during sampling on 1st September 2022. Inspection confirms that the topsoil is debris free dark brown slightly sandy CLAY and subsoil material is brown sandy CLAY, both topsoil and subsoil are physically suitable for their proposed end use.

Topsoil Source – Handley Hill, Winsford CW7 1EW.

Subsoil Source – Goldfinch Close, Congleton CW12 3FB.

Cover System Depth Validation

Trial holes undertaken in the rear garden of plot 88 on 1st September 2022 confirmed that the topsoil thickness was greater than 150mm; the subsoil was a typical thickness greater than 450mm and a geotextile membrane was in place at the base completing the required 600mm clean cover system.



Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 288179
www.betts-associates.co.uk

Chemical Validation of Topsoil and Subsoil

The topsoil and subsoil were chemically tested in-situ (0.10mbgl topsoil and 0.40mbgl subsoil) in the rear garden area of plot 88 on 1st September 2022 on a sample ratio of 1:3 garden basis in accordance with NHBC guidance.

Samples were taken in-situ at a sample rate of 1:3 garden areas per strata i.e. 2 samples were taken.

Analysis has been scheduled for the standard 'CLEA' Metals (including Chromium VI), speciated TPH to CWG and Speciated PAH's.

No visual or olfactory evidence of contamination was noted within any of the samples.

These results were screened against the same criteria i.e. EA/CIEH/LQM residential guidance for suitability.

All results fall below relevant standard guidance levels.

Summary

Betts Geo Environmental confirms that the soil is acceptable for use within gardens as such the capping requirements for plot 88 is complete.

We trust that this information is satisfactory for your further assessment to release the conditions.

Should you require any further clarification please do not hesitate in giving us a call.

Yours Sincerely,



Graham Clark
BETTS GEO ENVIRONMENTAL LIMITED

Encl –
Evidentiary Photographs
Topsoil & Subsoil testing data





Plot 88



SUMMARY OF CONTAMINATION ANALYSIS: METALS

Project Name Edge Lane
 Project No 21LPL083
 Date 01/09/2022

SOIL TYPE	TS	SS
SAMPLE LOCATION	Plot 88	Plot 88
DEPTH (m)	0.1	0.4
pH	7.86	8.28
Sulphate (water sol 2:1)	0.05	0.08
Organic matter	2.9	0.7
Arsenic	5	4
Cadmium	0.5	0.7
Copper	20	17
Chromium (hexavalent)	<1	<1
Lead	28	10
Mercury	<0.17	0.17
Nickel	16	25
Selenium	<1	<1
Zinc	39	35
Asbestos in Soil	NAD	NAD
Asbestos Matrix	-	-
Quantification	-	-
Organic matter	2.9	0.7

Metals	Mean Value Test *	Range		AtRisk 2017 (mg/kg)	AtRisk 2017 (mg/kg)	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	With Homegrown Produce (1% SOM)	With Homegrown Produce (6% SOM)	
pH	-	8.28	7.86			-
Sulphate (water sol 2:1)	-	0.08	0.05			-
Organic matter	-	2.90	0.70			
Arsenic	-	5.00	4.00	32	32	37
Cadmium	-	0.70	0.50	10	10	22.1
Copper	-	20.00	17.00	4730	4790	-
Chromium (hexavalent)	-	<1	<1	3.62	3.63	20.5
Lead	-	28.00	10.00			200
Mercury	-	0.17	<0.17	8.81	15.8	-
Nickel	-	25.00	16.00	EA/AtRisk withdrawn Aug 2015		
Selenium	-	<1	<1	375	375	-
Zinc	-	39.00	35.00	20000	20300	-

NOTE:

Any individual results and mean value tests above SGVs are shown RED highlighted.
 Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers

** - Results for this determinand are assessed with no background levels taken into account

Results are expressed as mg/kg unless otherwise stated

Asbestos Quantification is expressed in %w/w.

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGVs which are taken from AtRisk 2015. Category 4 screening levels have been adopted by the EA and have been included as new guidance.

Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021 /Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGV's for inorganic mercury can normally be compared with chemical analysis for total mercury content...'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used

NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

SUMMARY OF CONTAMINATION ANALYSIS: TPH

Project Name Edge Lane
Project No 21LPL083
Date 01/09/2022

SOIL TYPE	TS	SS
SAMPLE LOCATION	Plot 88	Plot 88
DEPTH (m)	0.1	0.4
Ali >C5-C6	<0.01	<0.01
Ali >C6-C8	<0.01	<0.01
Ali >C8-C10	<1	<1
Ali >C10-C12	<1	<1
Ali >C12-C16	<1	<1
Ali >C16-C21	<1	<1
Ali >C21-C35	9	1
Total Aliphatics	12	1
Aro >C5-C7	<0.01	<0.01
Aro >C7-C8	<0.01	<0.01
Aro >C8-C10	<1	<1
Aro >C10-C12	<1	<1
Aro >C12-C16	3	<1
Aro >C16-C21	13	<1
Aro >C21-C35	25	2
Total Aromatics	49	2
TPH (Ali & Aro)	61	3
BTEX - Benzene	<0.01	<0.01
BTEX - Toluene	<0.01	<0.01
BTEX - Ethyl Benzene	<0.01	<0.01
BTEX - m & p Xylene	<0.01	<0.01
BTEX - o Xylene	<0.01	<0.01
MTBE	<0.01	<0.01
Organic Matter	2.9	0.7

TPH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Ali >C5-C6	-	<0.01	<0.01	42.7	369	-
Ali >C6-C8	-	<0.01	<0.01	99.3	1240	-
Ali >C8-C10	-	<1	<1	13.9	204	-
Ali >C10-C12	-	<1	<1	81.7	1180	-
Ali >C12-C16	-	<1	<1	385	4130	-
Ali >C16-C21	-	<1	<1	210000	210100	-
Ali >C21-C35	-	9.00	1.00			
Total Aliphatics	-	12.00	1.00			
Aro >C5-C7	-	<0.01	<0.01	0.137	0.871	-
Aro >C7-C8	-	<0.01	<0.01	113	780	-
Aro >C8-C10	-	<1	<1	20.5	232	-
Aro >C10-C12	-	<1	<1	70	468	-
Aro >C12-C16	-	3.00	<1	165	830	-
Aro >C16-C21	-	13.00	<1	319	1040	-
Aro >C21-C35	-	25.00	2.00	1120	1710	-
Total Aromatics	-	49.00	2.00			
TPH (Ali & Aro)	-	61.00	3.00			
BTEX - Benzene	-	<0.01	<0.01	0.0493	0.33	0.871
BTEX - Toluene	-	<0.01	<0.01	113	780	-
BTEX - Ethyl Benzene	-	<0.01	<0.01	50.7	453	-
BTEX - m & p Xylene	-	<0.01	<0.01	24	312	-
BTEX - o Xylene	-	<0.01	<0.01	26.4	336	-
MTBE	-	<0.01	<0.01	27.6	220	

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

UU Drinking Water Guidelines	
PE Threshold	
Total BTEX & MTBE	0.1
EC5-EC10 Ali-Aro	2
EC10-EC16 Ali-Aro	10
EC16-EC40 Ali-Aro	500

SUMMARY OF CONTAMINATION ANALYSIS: PAH

Project Name Edge Lane
 Project No 21LPL083
 Date 01/09/22

SOIL TYPE	TS	SS
SAMPLE LOCATION	Plot 88	Plot 88
DEPTH (m)	0.1	0.4
Acenaphthene	0.03	<0.01
Acenaphthylene	<0.01	<0.01
Anthracene	0.04	<0.02
Benzo(a)anthracene	0.12	<0.04
Benzo(a)pyrene	0.11	<0.04
Benzo(b)fluoranthene	0.15	<0.05
Benzo(ghi)perylene	0.05	<0.05
Benzo(k)fluoranthene	<0.07	<0.07
Chrysene	0.15	<0.06
Dibenzo(ah)anthracene	<0.04	<0.04
Fluoranthene	0.33	<0.08
Fluorene	0.02	<0.01
Indeno(123-cd)pyrene	0.05	<0.03
Naphthalene	<0.03	<0.03
Phenanthrene	0.19	<0.03
Pyrene	0.31	<0.07
Organic Matter	2.9	0.7

PAH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA's C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Acenaphthene	-	0.03	<0.01	608	2760	-
Acenaphthylene	-	<0.01	<0.01			-
Anthracene	-	0.04	<0.02	10200	26200	-
Benzo(a)anthracene	-	0.12	<0.04	4.52	8.54	-
Benzo(a)pyrene	-	0.11	<0.04	1.51	2.05	4.95
Benzo(b)fluoranthene	-	0.15	<0.05	7.72	9.86	-
Benzo(ghi)perylene	-	0.05	<0.05	96.2	103	-
Benzo(k)fluoranthene	-	<0.07	<0.07	84.4	100	-
Chrysene	-	0.15	<0.06	585	927	-
Dibenzo(ah)anthracene	-	<0.04	<0.04	0.838	1	-
Fluoranthene	-	0.33	<0.08	983	2980	-
Fluorene	-	0.02	<0.01	735	2610	-
Indeno(123-cd)pyrene	-	0.05	<0.03	7.31	9.75	-
Naphthalene	-	<0.03	<0.03	0.829	12.2	-
Phenanthrene	-	0.19	<0.03			-
Pyrene	-	0.31	<0.07	668	2120	-

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

21LPL083/SV/GC/04

23rd September 2022

FAO Richard Sedden @ Lovell
(Via Email: richard.sedden@Lovell.co.uk)



Dear Richard,

Edge Lane, Openshaw – Soil Cover System Assessment – Plots 102-109

Please find below our clean-cover system validation data at the above-mentioned site / plots.

Overview

Betts Geo Ltd were instructed to validate the clean cover system applied within residential gardens at the above site as per the recommendations within the Remediation Statement undertaken by Betts Geo Ltd in May 2020 (Ref; 19YHG001/RS/REVD) and the Verification Report undertaken by Betts Geo Ltd in April 2021 (19YHG001/VR).

The report recommends;

- A 600mm cover system with no dig layer is required. This will comprise of:

150mm Topsoil (anticipated to be imported)
450mm Subsoil (anticipated to be imported)
Geotextile membrane

The cover system is likely to be made up using imported topsoil and subsoil.

Physical Suitability of the Topsoil and Subsoil

The composition of the topsoil and subsoil materials on site were visually inspected in-situ during sampling on 15th September 2022. Inspection confirms that the topsoil is debris free dark brown slightly sandy CLAY and subsoil material is brown sandy CLAY, both topsoil and subsoil are physically suitable for their proposed end use.

Topsoil Source – Handley Hill, Winsford CW7 1EW.

Subsoil Source – Goldfinch Close, Congleton CW12 3FB.

Cover System Depth Validation

Trial holes undertaken in the rear garden of plots 102-109 on 15th September 2022 confirmed that the topsoil thickness was greater than 150mm; the subsoil was a typical thickness greater than 450mm and a geotextile membrane was in place at the base completing the required 600mm clean cover system.



Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 288179
www.betts-associates.co.uk

Chemical Validation of Topsoil and Subsoil

The topsoil and subsoil were chemically tested in-situ (0.10mbgl topsoil and 0.40mbgl subsoil) in the rear garden area of plots 103, 106 and 109 on 15th September 2022 on a sample ratio of 1:3 garden basis in accordance with NHBC guidance.

Samples were taken in-situ at a sample rate of 1:3 garden areas per strata i.e. 6 samples were taken.

Analysis has been scheduled for the standard 'CLEA' Metals (including Chromium VI), speciated TPH to CWG and Speciated PAH's.

No visual or olfactory evidence of contamination was noted within any of the samples.

These results were screened against the same criteria i.e. EA/CIEH/LQM residential guidance for suitability.

All results fall below relevant standard guidance levels.

Summary

Betts Geo Environmental confirms that the soil is acceptable for use within gardens as such the capping requirements for plots 102-109 are complete.

We trust that this information is satisfactory for your further assessment to release the conditions.

Should you require any further clarification please do not hesitate in giving us a call.

Yours Sincerely,



Graham Clark
BETTS GEO ENVIRONMENTAL LIMITED

Encl –
Evidentiary Photographs
Topsoil & Subsoil testing data





Plot 102





Plot 103



Plot 104





Plot 105





Plot 106



Plot 107





Plot 108





Plot 109

SUMMARY OF CONTAMINATION ANALYSIS: SOIL

SUMMARY OF CONTAMINATION ANALYSIS: METALS

Project Name Edge Lane
Project No 22LPL083
Date 15/09/2022

SOIL TYPE	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	PLOT 103	PLOT 103	PLOT 106	PLOT 106	PLOT 109	PLOT 109
DEPTH (m)	0.1	0.4	0.1	0.4	0.1	0.4
pH	6.63	7.95	6.74	7.44	6.81	8.04
Sulphate (water sol 2:1)	0.03	0.15	0.04	0.08	0.05	0.1
Organic matter	8.3	0.6	7.6	0.5	7.2	1.5
Arsenic	17	4	17	<1	18	5
Cadmium	0.9	0.6	0.9	0.6	0.8	0.6
Copper	39	18	39	15	41	19
Chromium (hexavalent)	<1	<1	<1	<1	<1	<1
Lead	80	10	77	8	93	16
Mercury	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Nickel	19	26	18	25	18	23
Selenium	<1	<1	<1	<1	<1	<1
Zinc	78	118	75	35	80	40
Asbestos in Soil	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos Matrix	-	-	-	-	-	-
Quantification	-	-	-	-	-	-
Organic matter	8.3	0.6	7.6	0.5	7.2	1.5

Metals	Mean Value Test *	Range		AtRisk 2017 (mg/kg)	AtRisk 2017 (mg/kg)	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	With Homegrown Produce (1% SOM)	With Homegrown Produce (6% SOM)	
pH	7.79	8.04	6.63			-
Sulphate (water sol 2:1)	0.11	0.15	0.03			-
Organic matter	7.39	8.30	0.50			
Arsenic	16.74	18.00	<1	32	32	37
Cadmium	0.86	0.90	0.60	10	10	22.1
Copper	38.64	41.00	15.00	4730	4790	-
Chromium (hexavalent)	1.00	<1	<1	3.62	3.63	20.5
Lead	80.15	93.00	8.00			200
Mercury	<0.17	<0.17	<0.17	8.81	15.8	-
Nickel	24.48	26.00	18.00	EA/AtRisk withdrawn Aug 2015		
Selenium	<1	<1	<1	375	375	-
Zinc	95.98	118.00	35.00	20000	20300	-

NOTE:

Any individual results and mean value tests above SGVs are shown RED highlighted.
Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers

** - Results for this determinand are assessed with no background levels taken into account

Results are expressed as mg/kg unless otherwise stated

Asbestos Quantification is expressed in %w/w.

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGV's which are taken from AtRisk 2015. Category 4 screening levels have been adopted by the EA and have been included as new guidance.

Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021 /Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGV's for inorganic mercury can normally be compared with chemical analysis for total mercury content....'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used

NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

SUMMARY OF CONTAMINATION ANALYSIS: TPH

Project Name Edge Lane
Project No 22LPL083
Date 15/09/2022

SOIL TYPE	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	PLOT 103	PLOT 103	PLOT 106	PLOT 106	PLOT 109	PLOT 109
DEPTH (m)	0.1	0.4	0.1	0.4	0.1	0.4
Ali >C5-C6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C6-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ali >C8-C10	<1	<1	<1	<1	<1	<1
Ali >C10-C12	<1	<1	<1	<1	<1	<1
Ali >C12-C16	<1	<1	<1	<1	<1	<1
Ali >C16-C21	1	<1	<1	<1	1	<1
Ali >C21-C35	19	2	15	2	24	2
Total Aliphatics	20	2	15	2	26	2
Aro >C5-C7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aro >C7-C8	<0.01	<0.01	<0.01	<0.01	0.04	<0.01
Aro >C8-C10	1	<1	1	<1	3	<1
Aro >C10-C12	<1	<1	<1	<1	<1	<1
Aro >C12-C16	3	<1	1	<1	3	<1
Aro >C16-C21	8	1	5	<1	6	4
Aro >C21-C35	23	4	16	1	18	6
Total Aromatics	35	5	24	1	30	10
TPH (Ali & Aro)	55	7	39	3	55	12
BTEX - Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - Toluene	<0.01	<0.01	<0.01	<0.01	0.04	<0.01
BTEX - Ethyl Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - m & p Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX - o Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MTBE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organic Matter	8.3	0.6	7.6	0.5	7.2	1.5

TPH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Ali >C5-C6	<0.01	<0.01	<0.01	42.7	369	-
Ali >C6-C8	<0.01	<0.01	<0.01	99.3	1240	-
Ali >C8-C10	<1	<1	<1	13.9	204	-
Ali >C10-C12	<1	<1	<1	81.7	1180	-
Ali >C12-C16	<1	<1	<1	385	4130	-
Ali >C16-C21	1.00	1.00	<1	210000	210100	-
Ali >C21-C35	18.82	24.00	2.00			
Total Aliphatics	19.91	26.00	2.00			
Aro >C5-C7	<0.01	<0.01	<0.01	0.137	0.871	-
Aro >C7-C8	0.03	0.04	<0.01	113	780	-
Aro >C8-C10	2.01	3.00	<1	20.5	232	-
Aro >C10-C12	1.00	0.00	<1	70	468	-
Aro >C12-C16	2.52	3.00	<1	165	830	-
Aro >C16-C21	6.46	8.00	<1	319	1040	-
Aro >C21-C35	18.61	23.00	1.00	1120	1710	-
Total Aromatics	29.07	35.00	1.00			
TPH (Ali & Aro)	48.31	55.00	3.00			
BTEX - Benzene	<0.01	<0.01	<0.01	0.0493	0.33	0.871
BTEX - Toluene	0.03	0.04	<0.01	113	780	-
BTEX - Ethyl Benzene	<0.01	<0.01	<0.01	50.7	453	-
BTEX - m & p Xylene	<0.01	<0.01	<0.01	24	312	-
BTEX - o Xylene	<0.01	<0.01	<0.01	26.4	336	-
MTBE	<0.01	<0.01	<0.01	27.6	220	

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

UU Drinking Water Guidelines	
PE Threshold	
Total BTEX & MTBE	0.1
EC5-EC10 Ali-Aro	2
EC10-EC16 Ali-Aro	10
EC16-EC40 Ali-Aro	500

SUMMARY OF CONTAMINATION ANALYSIS: PAH

Project Name Edge Lane
Project No 22LPL083
Date 15/09/22

SOIL TYPE	TS	SS	TS	SS	TS	SS
SAMPLE LOCATION	PLOT 103	PLOT 103	PLOT 106	PLOT 106	PLOT 109	PLOT 109
DEPTH (m)	0.1	0.4	0.1	0.4	0.1	0.4
Acenaphthene	0.27	<0.01	0.08	<0.01	0.13	0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	0.43	<0.02	0.13	<0.02	0.26	<0.02
Benzo(a)anthracene	0.77	<0.04	0.35	<0.04	0.61	0.1
Benzo(a)pyrene	0.7	<0.04	0.34	<0.04	0.59	0.08
Benzo(b)fluoranthene	0.81	<0.05	0.43	<0.05	0.71	0.11
Benzo(ghi)perylene	0.32	<0.05	0.16	<0.05	0.3	<0.05
Benzo(k)fluoranthene	0.29	<0.07	0.13	<0.07	0.27	<0.07
Chrysene	0.84	<0.06	0.43	<0.06	0.66	0.11
Dibenzo(ah)anthracene	0.06	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	1.87	<0.08	0.87	<0.08	1.33	0.22
Fluorene	0.18	<0.01	0.05	<0.01	0.09	<0.01
Indeno(123-cd)pyrene	0.36	<0.03	0.17	<0.03	0.34	<0.03
Naphthalene	0.05	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	1.79	<0.03	0.6	0.05	0.98	0.11
Pyrene	1.71	<0.07	0.8	<0.07	1.2	0.21
Organic Matter	8.3	0.6	7.6	0.5	7.2	1.5

PAH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA's C4SL 2017
	US ₉₅	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Acenaphthene	0.17	0.27	<0.01	608	2760	-
Acenaphthylene	<0.01	<0.01	<0.01			-
Anthracene	0.29	0.43	<0.02	10200	26200	-
Benzo(a)anthracene	0.58	0.77	<0.04	4.52	8.54	-
Benzo(a)pyrene	0.54	0.70	<0.04	1.51	2.05	4.95
Benzo(b)fluoranthene	0.64	0.81	<0.05	7.72	9.86	-
Benzo(ghi)perylene	0.26	0.32	<0.05	96.2	103	-
Benzo(k)fluoranthene	0.24	0.29	<0.07	84.4	100	-
Chrysene	0.64	0.84	<0.06	585	927	-
Dibenzo(ah)anthracene	0.05	0.06	<0.04	0.838	1	-
Fluoranthene	1.36	1.87	<0.08	983	2980	-
Fluorene	0.11	0.18	<0.01	735	2610	-
Indeno(123-cd)pyrene	0.29	0.36	<0.03	7.31	9.75	-
Naphthalene	0.04	0.05	<0.03	0.829	12.2	-
Phenanthrene	1.17	1.79	<0.03			-
Pyrene	1.24	1.71	<0.07	668	2120	-

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed against **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**