



Llwyn Onn WTW: Laboratory Results Analysis

**[Note to Accompany Phase I
Contamination Desk Study]**

November 2010



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**LLWYN ONN WATER TREATMENT WORKS: LABORATORY RESULTS ANALYSIS
[NOTE TO ACCOMPANY PHASE I CONTAMINATION DESK STUDY]****CONTENTS**

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Details of document preparation and issue:

Version no.	Prepared by	Reviewed by	Authorised for issue	Issue date	Issue status
0	Heulwen Baughn	Mark Buckley	Mark Buckley	Nov 2010	Final Draft
1	Heulwen Baughn	Mark Billing (DVW)	Heulwen Baughn	Nov 2010	Final Issue

B&V project no. 121620

Client's reference no.

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LLWYN ONN WATER TREATMENT WORKS: LABORATORY RESULTS ANALYSIS [NOTE TO ACCOMPANY PHASE I CONTAMINATION DESK STUDY]

1. INTRODUCTION

It is the intention of Dee Valley Water to submit a planning application for the construction of a new water treatment building at the existing Llwyn Onn Water Treatment Works (WTW) site, Wrexham (Grid Reference: 335757, 348880). A Phase I contamination desk study has been undertaken for the site (B&V 2010) which provides information on the site layout, site history and preliminary qualitative risk assessment. The Phase I report should be read in conjunction with this laboratory results analysis. A site location and layout plan is also provided within Appendix A.

During a geotechnical ground investigation at the site, a limited number of samples (five) were submitted for contamination testing. Test suites included pH, total organic carbon, total sulphate, water soluble sulphate, asbestos, phenols, cyanide, heavy metals (As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Se and Zn), petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Laboratory results are shown in Appendix B.

The samples tested were taken from trial pits (TP) dug in and around the location of the proposed new water treatment building within areas of made ground and natural subsoil. Two of the trial pits sampled (TP5 and TP7) were undertaken through an area of above ground material storage. Trial pit logs and location plan are shown in Appendix C. A summary of type and location of samples is provided in Table 1.

Table 1: Soil sample summary

Location	Depth (m)	Description	Other Information
TP1	1.0	Made Ground: Brown silty very gravelly fine to medium sand with occasional cobbles. Pieces of pipe and a fibreglass water drum noted.	This sample is taken from an area of made ground containing foreign debris.
TP5	1.0	Made Ground: Dark reddish brown silty gravelly fine to medium sand. Pockets of laminated filter cake noted.	This sample is taken from a pile of storage material within the south west of the site.
TP5	2.5	Firm brown slightly sandy gravelly clay.	This sample is taken from natural subsoil located beneath made ground.
TP7	1.0	Made Ground: Brown silty gravelly fine to coarse sand with occasional pockets of clay.	This sample is taken from a pile of storage material within the southwest of the site.
TP8	0.5	Made Ground: Dark brown silty gravelly fine to coarse sand and gravel.	This sample is taken from shallow made ground adjacent to the existing site haul route.

2. SCREENING CRITERIA

The Phase 1 Risk Assessment identified made ground present on site as a potential source of contamination. It also identified one potential source-pathway-receptor linkage which was the generation of dust from areas of potentially contaminated made ground on site posing a risk to off site residents and livestock.

The laboratory test results for samples taken from made ground on site were compared to available screening criteria. The screening criteria are generic values used as a first level of assessment to indicate if significant contamination is likely.

The screening criteria are presented within Table 2. These criteria were obtained from the following sources:

- The Environment Agency's Soil Guideline Values (SGV), 2009, as available from their website: <http://www.environment-agency.gov.uk/research/planning/33734.aspx>.
- The Land Quality Management (LQM) / Chartered Institute of Environmental Health (CIEH) Generic Assessment Criteria for Human Health Risk Assessment, 2nd Edition, Land Quality Press, 2009.

The site itself is a commercial site, however there are a number of offsite residential receptors as identified within the Phase I Desk Study. For this reason the assessment criteria for the more conservative residential scenario have been shown alongside those for a commercial scenario, for comparison purposes.

Some screening criteria are available for a range of soil organic matter (SOM) contents. The average SOM content for the samples taken was 2.5% however the SOM varied from 0.3% to 6.5% with three of the five samples being around the 1% SOM content. The assumed SOM for each screening criteria is noted in Table 2.

Screening criteria were not available for every contaminant; however the criteria that are available from the EA and LQM/CIEH provide an indication of whether there is likely to be any significant contamination present within the made ground on site.

Table 2: Screening Criteria

Contaminant	Publication Source	Commercial (mg/kg)	Residential (mg/kg)
Metals *			
Arsenic	EA	640	32
Cadmium	EA	230	10
Inorganic Mercury	EA	3600	170
Nickel	EA	1800	130
Selenium	EA	13000	350
Boron	LQM/CIEH	192000	291
Chromium 3+	LQM/CIEH	30400	3000
Chromium 6+ (hexavalent)	LQM/CIEH	35	4.3
Copper	LQM/CIEH	71700	2330
Vanadium	LQM/CIEH	3160	75
Zinc	LQM/CIEH	66500	3750
Petroleum Hydrocarbons **			
Benzene	EA	28	0.08
Toluene	EA	870	120
Ethylbenzene	EA	520	65
Xylenes	EA	475	42
Aliphatic EC >12-16	LQM/CIEH	61000	740
Aliphatic EC >16-35	LQM/CIEH	1600000	45000
Aliphatic EC >35-44	LQM/CIEH	1600000	45000
Aromatic EC >12-16	LQM/CIEH	36000	140
Aromatic EC >16-21	LQM/CIEH	28000	250
Aromatic EC >21-35	LQM/CIEH	28000	890
Aromatic EC >35-44	LQM/CIEH	28000	890
PAHs **			
Acenaphthene	LQM/CIEH	85000	210
Acenaphthylene	LQM/CIEH	84000	170
Anthracene	LQM/CIEH	530000	2300
Benzo(a)anthracene	LQM/CIEH	90	3.1
Benzo(a)pyrene	LQM/CIEH	14	0.83
Benzo(b)fluoranthene	LQM/CIEH	100	5.6
Benzo(ghi)perylene	LQM/CIEH	650	44
Benzo(k)fluoranthene	LQM/CIEH	140	8.5
Chrysene	LQM/CIEH	140	6
Dibenzo(ah)anthracene	LQM/CIEH	13	0.76
Fluoranthene	LQM/CIEH	23000	260
Fluorene	LQM/CIEH	64000	160
Indeno(123-cd)pyrene	LQM/CIEH	60	3.2
Naphthalene	LQM/CIEH	200	1.5
Phenanthrene	LQM/CIEH	22000	92
Pyrene	LQM/CIEH	54000	560
Other *			
Phenol	EA	3200	420

Notes on Table:

* Based on a soil organic matter (SOM) content of 6% (no range available)

** Based on a SOM of 1% (from a range of 1%, 2.5% or 6%; with 1% being the most conservative)

3. ANALYSIS RESULTS

Heavy Metals:

Screening criteria are available for arsenic, cadmium, chromium, copper, mercury, nickel, selenium, zinc and boron from Environment Agency Soil Guideline Values (SGV) and LQM/CIEH General Assessment Criteria (GAC). The SGV and GAC for commercial and residential scenarios are outlined in Table 2 above. All of the five samples were analysed for heavy metals and were found to be below the SGV/GAC for commercial and residential scenarios.

Organics:

The available screening criteria included Aliphatic and Aromatic splits, Benzene/Toluene/Ethylbenzene/Xylene (BTEX) and Polycyclic Aromatic Hydrocarbons (PAH), as shown in Table 2. It is noted that the laboratory results shown in Appendix B for the organic contaminants are given in micrograms per kilogram ($\mu\text{g/kg}$); however the screening criteria in Table 2 are shown in milligrams per kilogram (mg/kg), where 1mg is equal to $1000\mu\text{g}$. All of the samples tested were below the screening criteria for both a commercial and residential scenario for these compounds.

Environment Agency SGV is available for phenol. All of the five samples tested were below SGV for both commercial and residential scenarios.

Other:

No asbestos was found in the one sample tested.

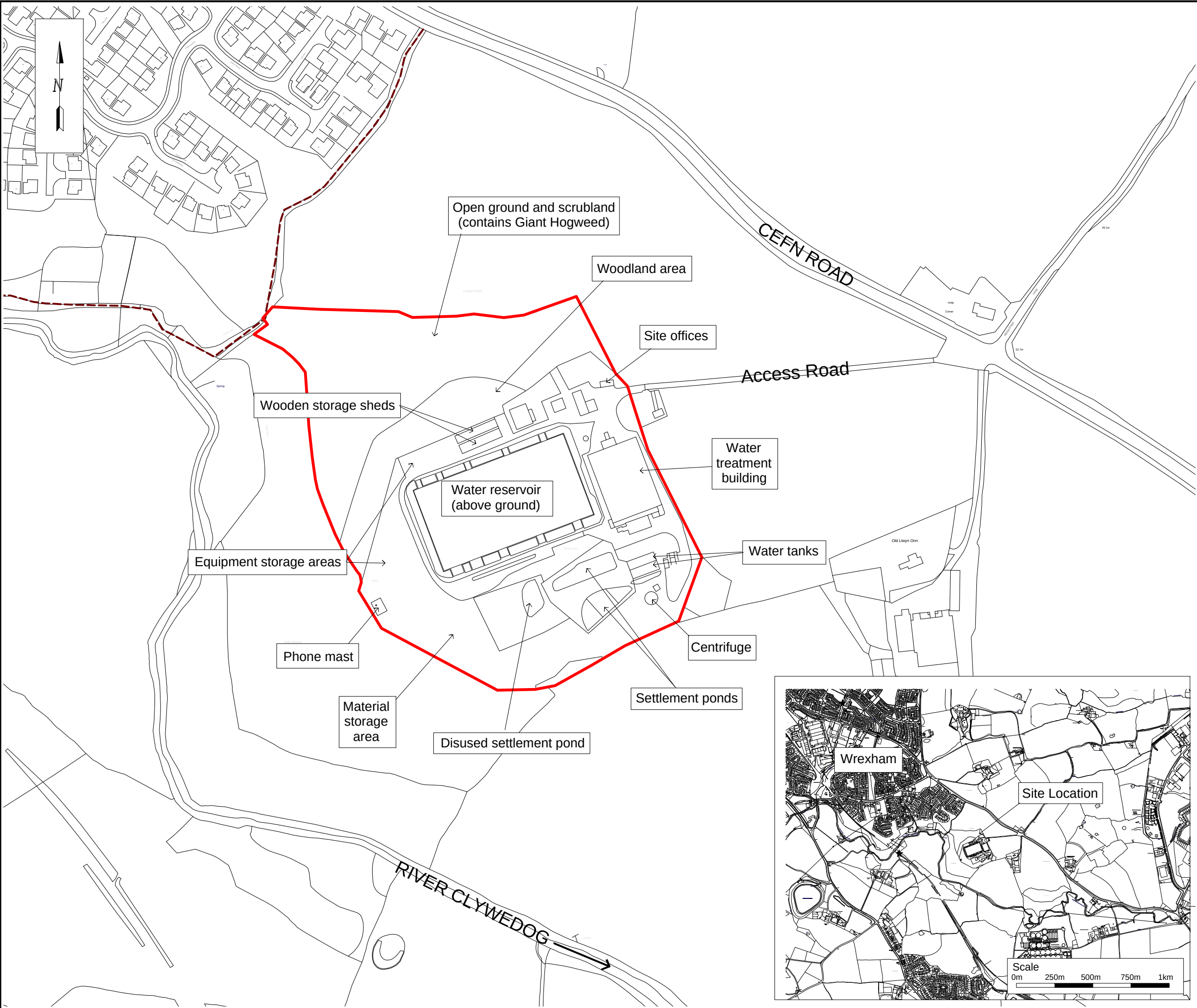
4. CONCLUSION

The comparison of laboratory results with SGV and GAC shows that all of the contaminants tested (for which there are SGV or GAC available) are below the SGV/GAC levels. This would indicate that there is no significant contamination within the made ground in the areas tested, and that the risk to identified receptors is low.

This assessment does not constitute a full Phase II Assessment of potential contamination risk at the site, nor does it cover the whole site area. However it is a useful source of supplementary information to the Phase I contamination report. It is concluded that there is unlikely to be a significant risk to off site receptors from dust generation within areas of made ground at the site.

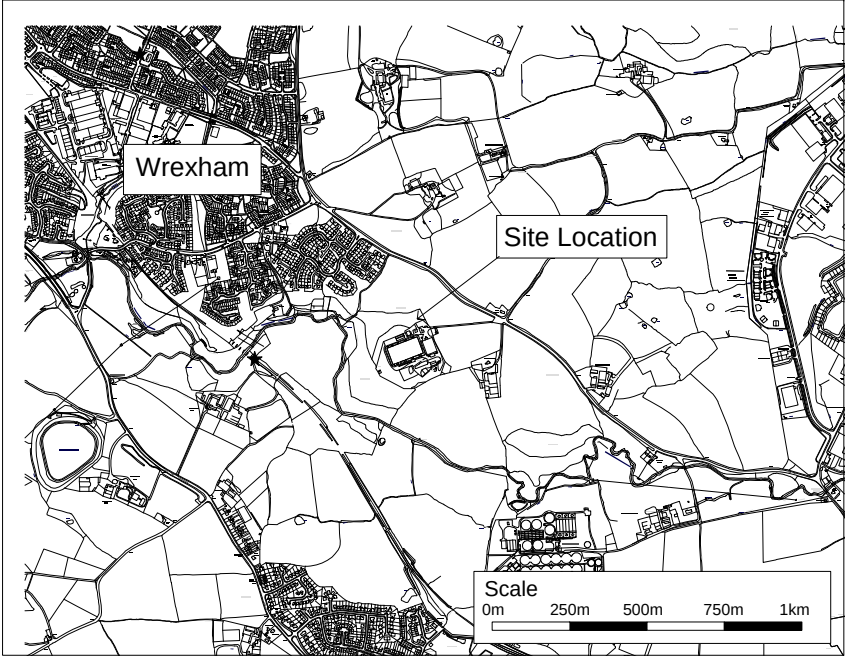
APPENDIX A: FIGURE 1 - SITE LAYOUT PLAN

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© Copyright Black & Veatch 2010					
Designed		HB		Date: May 10	
Checked				Date:	
Drawn		JP		Date: May 10	
Checked		HB		Date: May 10	
Reviewed		ES		Date: May 10	
Rev.	Nature of Revision	Drawn	Chkd.	Rwtd.	Appd.

- Key**
- Site Boundary
 - - - Public Right of Way Footpath



**LLWYN ONN
WATER TREATMENT WORKS**

Site Layout Plan



Contract no. 121620	Approved: ES	Date: May 10
		Scale : 1:2,500 (at A3)
BLACK & VEATCH		Drawing no. Figure 1

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APPENDIX B: LABORATORY RESULTS

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Geotechnics Ltd
The Geotechnical Centre, Unit 1
Borders Industrial Estate, River Lane
Saltney
Chester
Cheshire
CH4 8RJ

Attention: Mark Davies

CERTIFICATE OF ANALYSIS

Date: 06 August 2010
Customer: H_GEOTECHLT_CHE-67
Sample Delivery Group (SDG): 100726-71
Your Reference:
Location: LLWYN-ONN WTW
Report No.: 92805

We received 6 samples on Monday July 26, 2010 and 5 of these samples were scheduled for analysis which was completed on Friday August 06, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Operations Director - Land UK & Ireland



SDG:	100726-71	Customer:	Geotechnics Ltd
Job:	H_GEOTECHLT_CHE-67	Attention:	Mark Davies
Client Reference:		Order No.:	
Location:	LLWYN-ONN WTW	Report No:	92805

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
1873360	TP1	ES	1.00	14/07/2010
1873050	TP5	ES	1.00	14/07/2010
1873363	TP5	ES	1.60	14/07/2010
1873364	TP5	ES	2.50	14/07/2010
1873365	TP7	ES	1.00	14/07/2010
1873366	TP8	ES	0.50	14/07/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Reference:
Location: LLWYN-ONN WTW

Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

SOLID

Results Legend	Lab Sample No(s)	1873360	1873360	1873364	1873365	1873366	Total
	Customer Sample Ref.	TP5	TP1	TP5	TP7	TP8	
	AGS Ref.	ES	ES	ES	ES	ES	
	Depth (m)	1.00	1.00	2.50	1.00	0.50	
	Container	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	
		1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	1kg TUB 250g Amber Jar	
Ammonium Soil by Titration	All	X	X	X	X	X	0 5
Asbestos Containing Material Screen	All				X		0 1
Boron Water Soluble	All	X	X	X	X	X	0 5
Cyanide Comp/Free/Total/Thiocyanate	All	X	X	X	X	X	0 5
EPH CWG (Aliphatic) GC (S)	All	X	X	X	X	X	0 5
EPH CWG (Aromatic) GC (S)	All	X	X	X	X	X	0 5
GRO BTEX MTBE GC (S)	All		X	X	X	X	0 5
Hexavalent Chromium (s)	All	X	X	X	X	X	0 5
Metals by iCap-OES (Soil)	Arsenic	X	X	X	X	X	0 5
	Cadmium	X	X	X	X	X	0 5
	Chromium	X	X	X	X	X	0 5
	Copper	X	X	X	X	X	0 5
	Lead	X	X	X	X	X	0 5
	Manganese	X	X	X	X	X	0 5
	Mercury	X	X	X	X	X	0 5
	Nickel	X	X	X	X	X	0 5
	Selenium	X	X	X	X	X	0 5
	Zinc	X	X	X	X	X	0 5
		X	X	X	X	X	0 5
		X	X	X	X	X	0 5
PAH by GCMS	All	X	X	X	X	X	0 5

SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Reference:
Location: LLWYN-ONN WTW

Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

		Total									
		1873366	TP8	ES	0.90	60g VOC	250g Amber Jar	1g TLB	60g VOC	250g Amber Jar	1g TLB
		1873365	TP7	ES	1.00	60g VOC	250g Amber Jar	1g TLB	60g VOC	250g Amber Jar	1g TLB
		1873364	TP6	ES	2.90	60g VOC	250g Amber Jar	1g TLB	60g VOC	250g Amber Jar	1g TLB
		1873360	TP1	ES	1.00	60g VOC	250g Amber Jar	1g TLB	60g VOC	250g Amber Jar	1g TLB
		1873050	TP5	ES	1.00	60g VOC	250g Amber Jar	1g TLB	60g VOC	250g Amber Jar	1g TLB
pH	All										
Phenols by HPLC (S)	All										
Sample description	All										
Total Organic Carbon	All										
Total Sulphate	All										
TPH CWG GC (S)	All										
Water Soluble Sulphate 2:1	All										

SDG:	100726-71	Customer:	Geotechnics Ltd
Job:	H_GEOTECHLT_CHE-67	Attention:	Mark Davies
Client Reference:		Order No.:	
Location:	LLWYN-ONN WTW	Report No:	92805

Sample Descriptions

Grain Sizes:

<0.063mm very fine,
0.063mm - 0.1mm fine,
0.1mm - 2mm medium,
2mm - 10mm coarse,
>10mm very coarse

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions
1873050	TP5	1.00	Dark Brown	Peat	0.063 - 0.1 mm	N/A
1873360	TP1	1.00	Dark Brown	Sand	0.1 - 2 mm	Stones
1873364	TP5	2.50	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	Stones
1873365	TP7	1.00	Dark Brown	Loamy Sand	0.1 - 2 mm	Vegetation
1873366	TP8	0.50	Dark Brown	Loamy Sand	0.1 - 2 mm	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

SDG:	100726-71	Customer:	Geotechnics Ltd
Job:	H_GEOTECHLT_CHE-67	Attention:	Mark Davies
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Location:	LLWYN-ONN WTW	Report No:	92805

Test Completion dates

SDG reference: 100726-71

Lab Sample No(s) Customer Sample Ref. Depth Type	1873050		1873360		1873364		1873365		1873366	
	TP5	TP5-ES	TP1	TP1-ES	TP5	TP5-ES	TP7	TP7-ES	TP8	TP8-ES
	1.00	1.00	1.00	1.00	2.50	2.50	1.00	1.00	0.50	0.50
	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Ammonium Soil by Titration		28/07/2010		28/07/2010		28/07/2010		28/07/2010		28/07/2010
Asbestos Containing Material Screen							27/07/2010			
Boron Water Soluble		29/07/2010		29/07/2010		29/07/2010		29/07/2010		29/07/2010
Cyanide Comp/Free/Total/Thiocyanate		28/07/2010		28/07/2010		28/07/2010		28/07/2010		28/07/2010
EPH CWG (Aliphatic) GC (S)		29/07/2010		02/08/2010		02/08/2010		29/07/2010		29/07/2010
EPH CWG (Aromatic) GC (S)		29/07/2010		02/08/2010		02/08/2010		29/07/2010		29/07/2010
GRO by GC-FID (S)	05/08/2010		05/08/2010		05/08/2010		05/08/2010		05/08/2010	
Hexavalent Chromium (s)		29/07/2010		29/07/2010		29/07/2010		30/07/2010		30/07/2010
Metals by iCap-OES (Soil)		29/07/2010		29/07/2010		29/07/2010		29/07/2010		29/07/2010
PAH by GCMS		28/07/2010	29/07/2010		29/07/2010			28/07/2010		28/07/2010
pH		27/07/2010		27/07/2010		27/07/2010		27/07/2010		27/07/2010
Phenols by HPLC (S)		28/07/2010		28/07/2010		28/07/2010		28/07/2010		28/07/2010
Sample description	27/07/2010		27/07/2010		27/07/2010		27/07/2010		27/07/2010	
Total Organic Carbon		28/07/2010		29/07/2010		29/07/2010		28/07/2010		28/07/2010
Total Sulphate		29/07/2010		29/07/2010		29/07/2010		29/07/2010		29/07/2010
TPH CWG GC (S)	06/08/2010		05/08/2010		05/08/2010		06/08/2010		06/08/2010	
Water Soluble Sulphate 2:1		29/07/2010		29/07/2010		29/07/2010		29/07/2010		29/07/2010

SDG	100726-71	Customer:	Geotechnics Ltd
Job:	H_GEOTECHLT_CHE-67	Attention:	Mark Davies
Client Reference:		Order No.:	
Location:	LLWYN-ONN WTW	Report No:	92805

Results Legend		Customer Sample Ref.	TP1	TP5	TP5	TP7	TP8	
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
		Depth (m)						
		Sample Type						
		Date Sampled						
		Date Received						
		SDG Ref						
		Lab Sample No.(s)						
		AGS Reference						
Component	LOD/Units	Method						
Asbestos Containing Material Screen	-	TM001				No ACM Detected		
Ammoniacal Nitrogen as N	<15 mg/kg	TM024	<15	51.1	<15	<15	<15	
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)	<0.025 M	<0.025 #	<0.025 M	<0.025 M	<0.025 M	
Sulphate, 2:1 water soluble	<0.003 g/l	TM098	0.107 M	0.279 #	0.0181 M	0.0508 M	0.0404 M	
Organic Carbon, Total	<0.2 %	TM132	0.8 #	3.88 #	<0.2 #	0.83 #	1.54 #	
pH	1 pH Units	TM133	8.13 M	7.19 #	6.57 M	8.22 M	8.02 M	
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #	<1.2 #	<0.6 #	<0.6 #	<0.6 #	
Cyanide, Total	<1 mg/kg	TM153	<1 M	<1 #	<1 M	<1 M	<1 M	
Cyanide, Free	<1 mg/kg	TM153	<1	<1	<1	<1	<1	
Thiocyanate	<1 mg/kg	TM153	<1 M	6.74 #	<1 M	<1 M	<1 M	
Arsenic	<0.6 mg/kg	TM181	9.73 M	12.4 #	3.53 M	5.16 M	6.39 M	
Cadmium	<0.02 mg/kg	TM181	0.534 M	0.163 #	0.168 M	0.799 M	0.585 M	
Chromium	<0.9 mg/kg	TM181	14.1 M	10.1 #	9.97 M	57 M	22.3 M	
Copper	<1.4 mg/kg	TM181	16.8 M	20.3 #	9.63 M	16.2 M	13 M	
Lead	<0.7 mg/kg	TM181	34.1 M	44 #	13.7 M	99 M	55.7 M	
Manganese	<0.13 mg/kg	TM181	943 M	731 #	202 M	767 M	676 M	
Mercury	<0.14 mg/kg	TM181	<0.14 M	<0.14 #	<0.14 M	<0.14 M	<0.14 M	
Nickel	<0.2 mg/kg	TM181	17.9 M	13.5 #	11.2 M	11.3 M	12.8 M	
Selenium	<1 mg/kg	TM181	1.11 #	3.46 #	<1 #	<1 #	<1 #	
Zinc	<1.9 mg/kg	TM181	76.2 M	150 #	24.5 M	274 M	155 M	
Sulphate, Total	<100 mg/kg	TM221	1880 M	13800 #	<100 M	466 M	578 M	
Boron, water soluble	<1 mg/kg	TM222	<1 M	<1 #	<1 M	<1 M	<1 M	

SDG	100726-71	Customer:	Geotechnics Ltd
Job:	H_GEOTECHLT_CHE-67	Attention:	Mark Davies
Client Reference:		Order No.:	
Location:	LLWYN-ONN WTW	Report No:	92805

EPH CWG (Aromatic) GC (S)											
Results Legend		Customer Sample Ref.	TP1	TP5	TP5	TP7	TP8				
#	ISO17025 accredited.										
M	mCERTS accredited.										
aq	Aqueous / settled sample.										
diss.filt	Dissolved / filtered sample.										
tot.unfilt	Total / unfiltered sample.										
*	subcontracted test.										
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.										
		Depth (m)	1.00	1.00	2.50	1.00	0.50				
		Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid				
		Date Sampled	14/07/2010	14/07/2010	14/07/2010	14/07/2010	14/07/2010				
		Date Received	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010				
		SDG Ref	100726-71	100726-71	100726-71	100726-71	100726-71				
		Lab Sample No.(s)	1873360	1873050	1873364	1873365	1873366				
		AGS Reference	ES	ES	ES	ES	ES				
Component		LOD/Units	Method								
Aromatics >EC12-EC16		<100 µg/kg	TM173	<100	2860	<100	2650	4150			
Aromatics >EC16-EC21		<100 µg/kg	TM173	<100	2930	<100	4090	4880			
Aromatics >EC21-EC35		<100 µg/kg	TM173	7910	34400	<100	17100	23600			
Aromatics >EC35-EC44		<100 µg/kg	TM173	4310	10700	<100	6560	14400			
Aromatics >EC40-EC44		<100 µg/kg	TM173	1300	3620	<100	2570	6190			
Total Aromatics >EC12-EC44		<100 µg/kg	TM173	12200	50900	<100	30400	46900			
Aromatics >EC35-EC40		<100 µg/kg	TM173	3020	7040	<100	3990	8160			
Total Aromatics >EC12-EC35		<100 µg/kg	TM173	7910	40200	<100	23900	32600			
Total Aromatics >EC12-EC40		<100 µg/kg	TM173	10900	47300	<100	27900	40800			

Table of Results - Appendix

SDG Number : 100726-71

Client : Geotechnics Ltd

Client Ref :

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10⁻⁷

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample ¹
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM024	Method 4500A & B, AWWA/APHA, 20th Ed., 1999	Determination of Exchangeable Ammonium and Ammoniacal Nitrogen as N by titration on solids	Wet
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	Dry
TM132	In - house Method	ELTRA CS800 Operators Guide	Dry
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser	Wet
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	Wet
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID	Dry
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer	Dry
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer	Dry

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

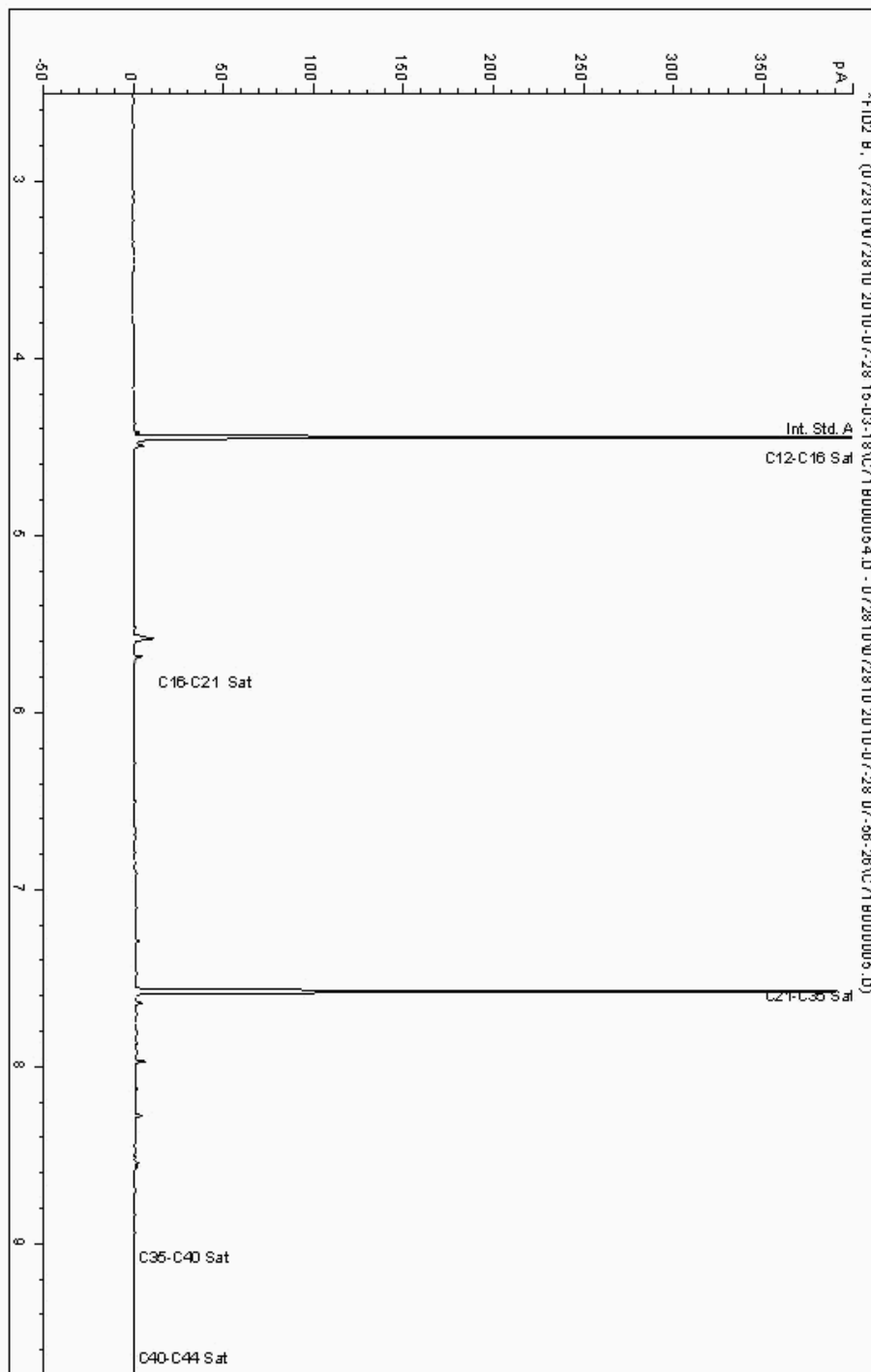
Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No 1875827
Sample ID TP5-ES
Depth 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 1983378-1875827
Date Acquired : 29/07/10 01:17:04
Units : ppb
Dilution :
CF : 1
Multiplier : 1.045



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

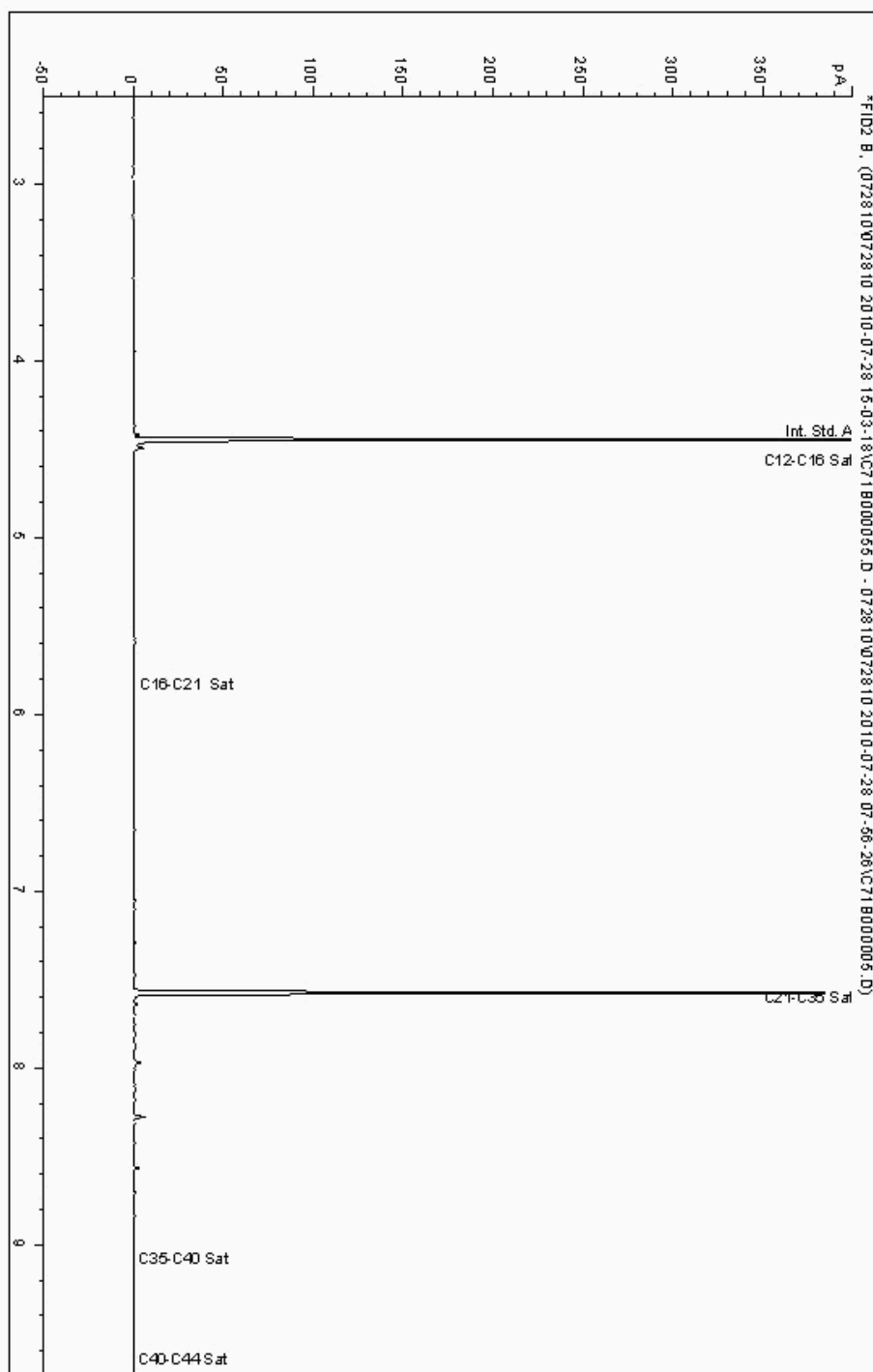
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No 1876054
Sample ID TP8-ES
Depth 0.50

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 1983442-1876054
Date Acquired : 29/07/10 01:36:07
Units : ppb
Dilution :
CF : 1
Multiplier : 0.954



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

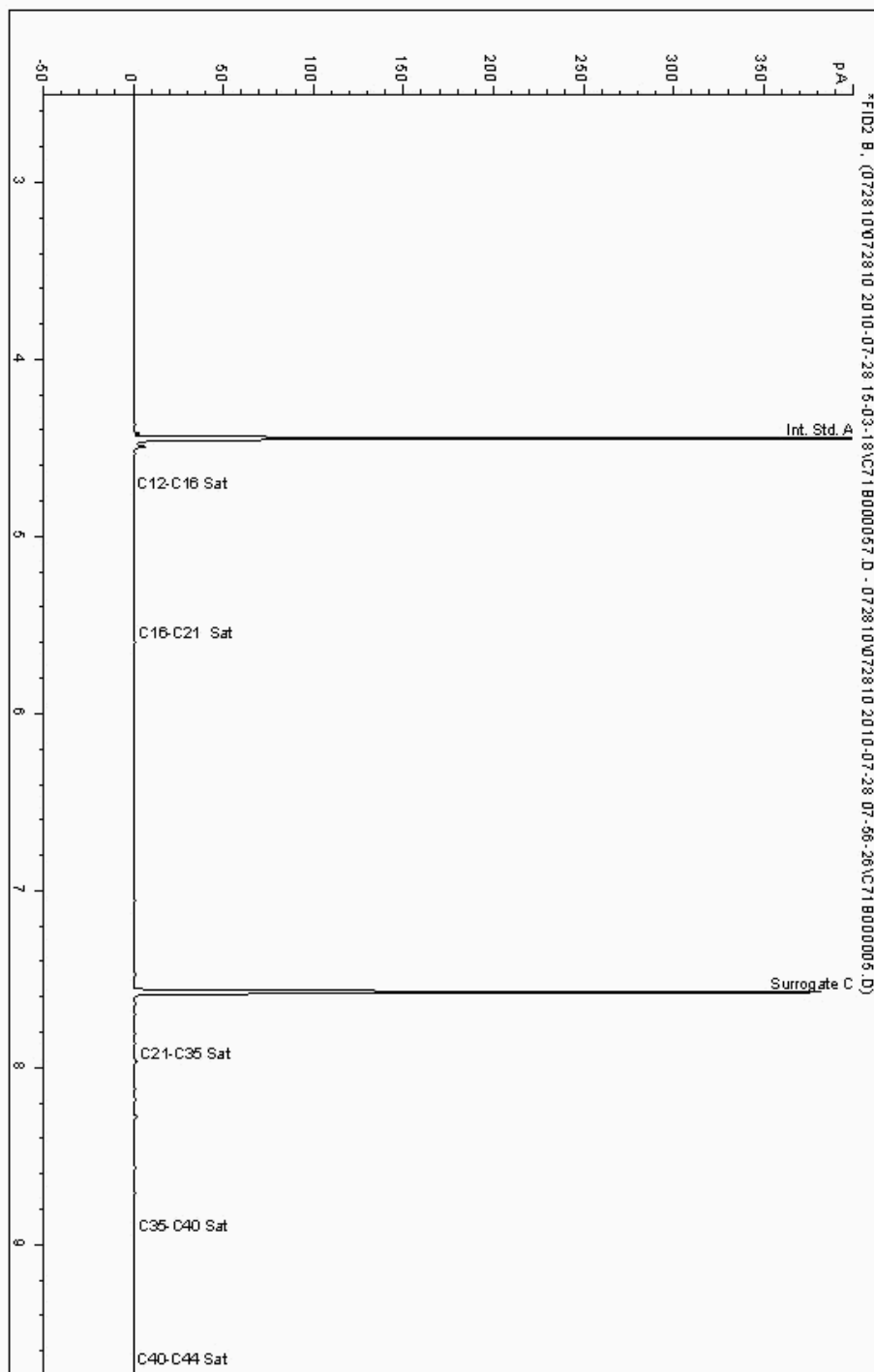
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No 1876068
Sample ID TP7-ES
Depth 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 1983420-1876068
Date Acquired : 29/07/10 02:10:08
Units : ppb
Dilution :
CF : 1
Multiplier : 1.042



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

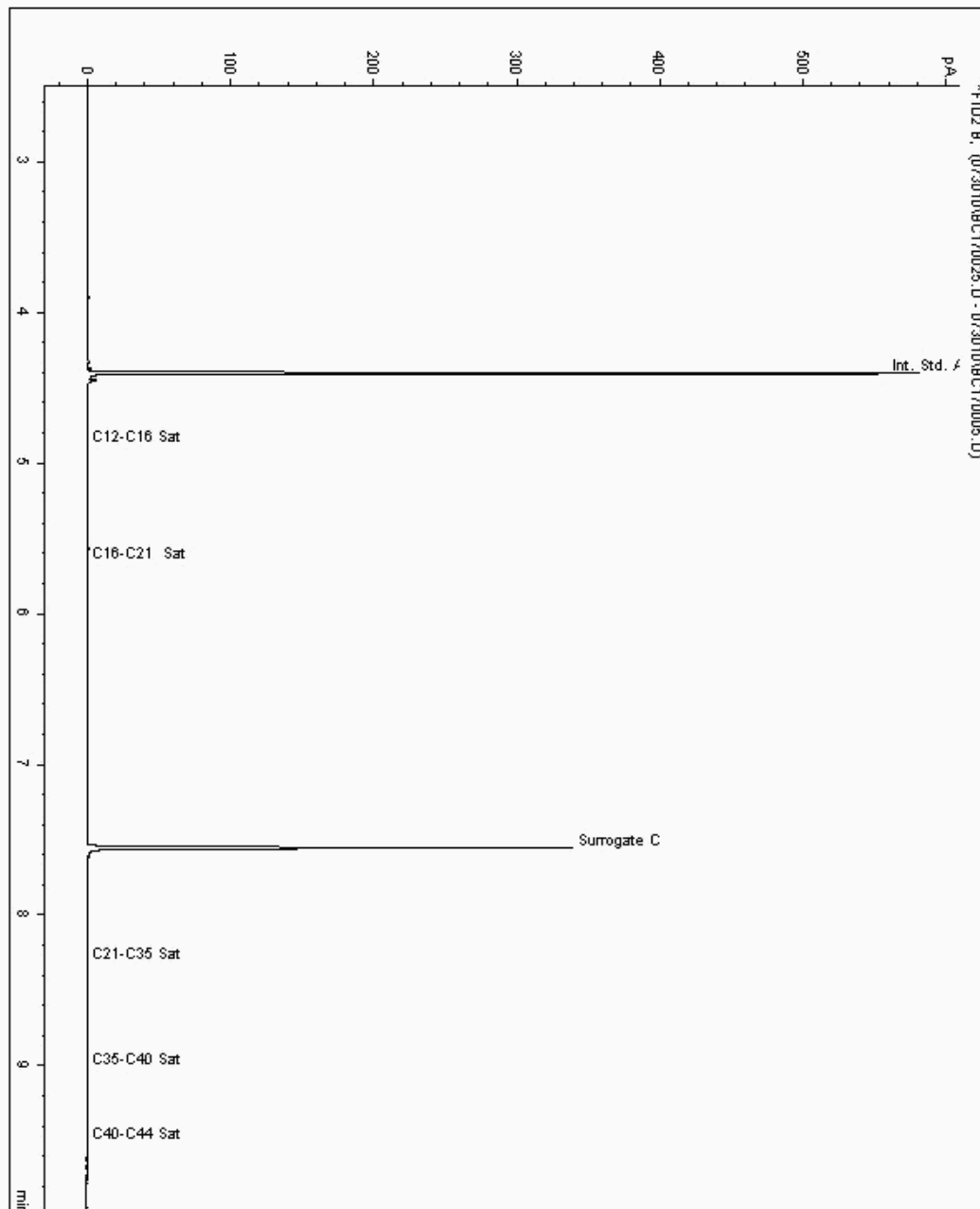
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No 1887683
Sample ID TP5-ES
Depth 2.50

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 1998018-1887683
Date Acquired : 30/07/10 17:24:03 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.990



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

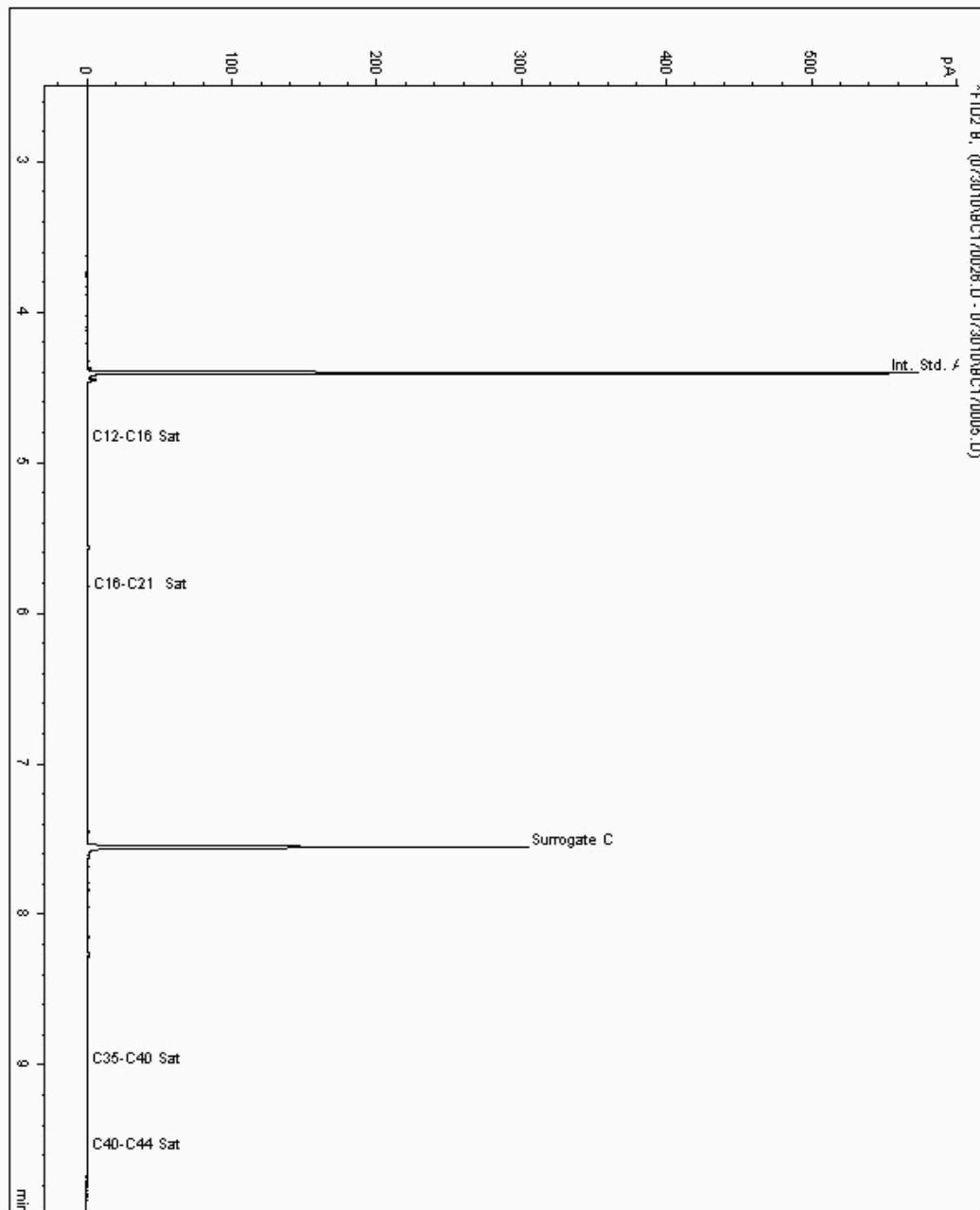
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No 1887695
Sample ID TP1-ES
Depth 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 1998022-1887695
Date Acquired : 30/07/10 17:43:09 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.997



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

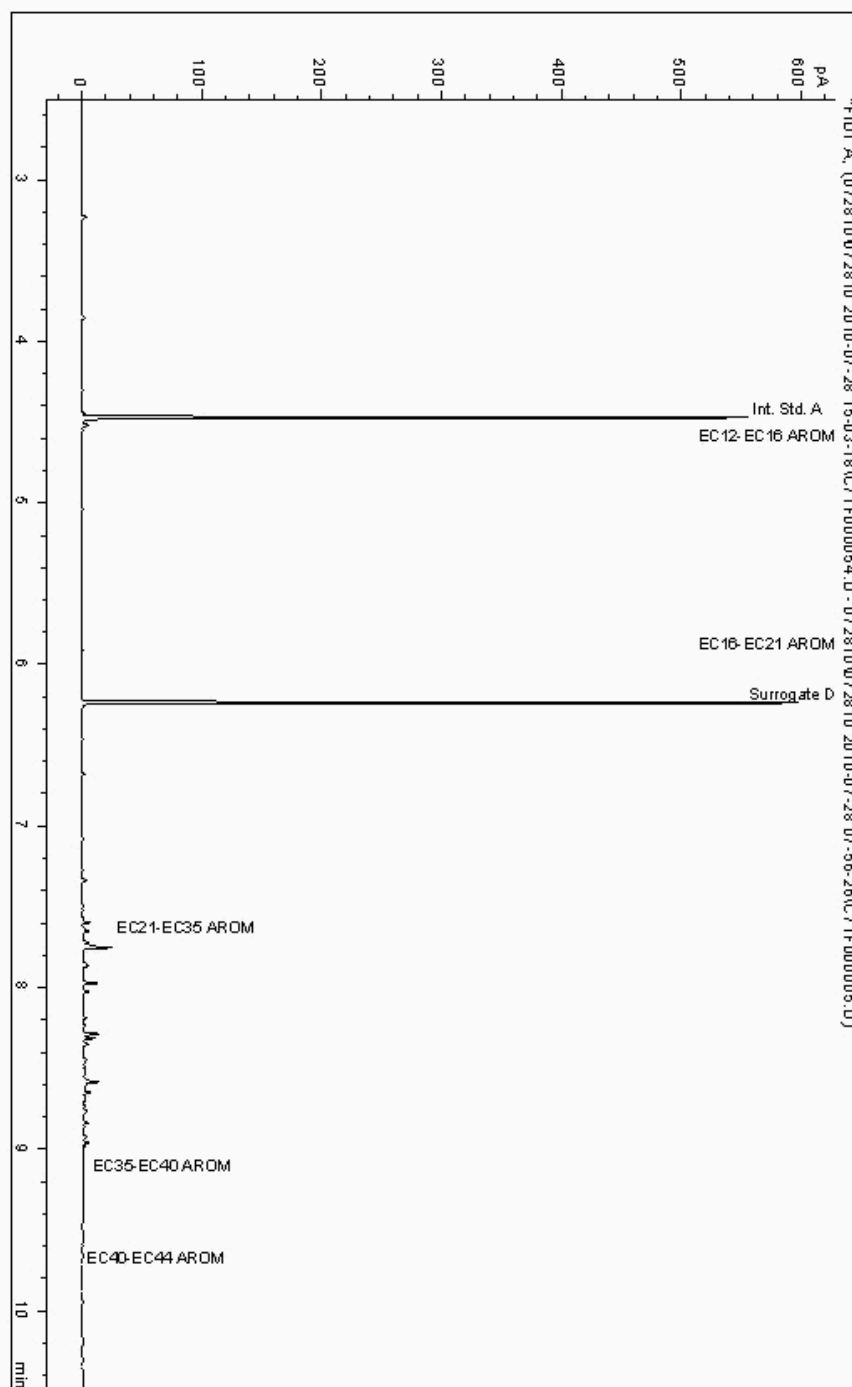
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aromatic) GC (S)

Sample No 1875827
Sample ID TP5-ES
Depth 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 1983379-1875827
Date Acquired : 29/07/10 01:17:04
Units : ppb
Dilution :
CF : 1
Multiplier : 1.045



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

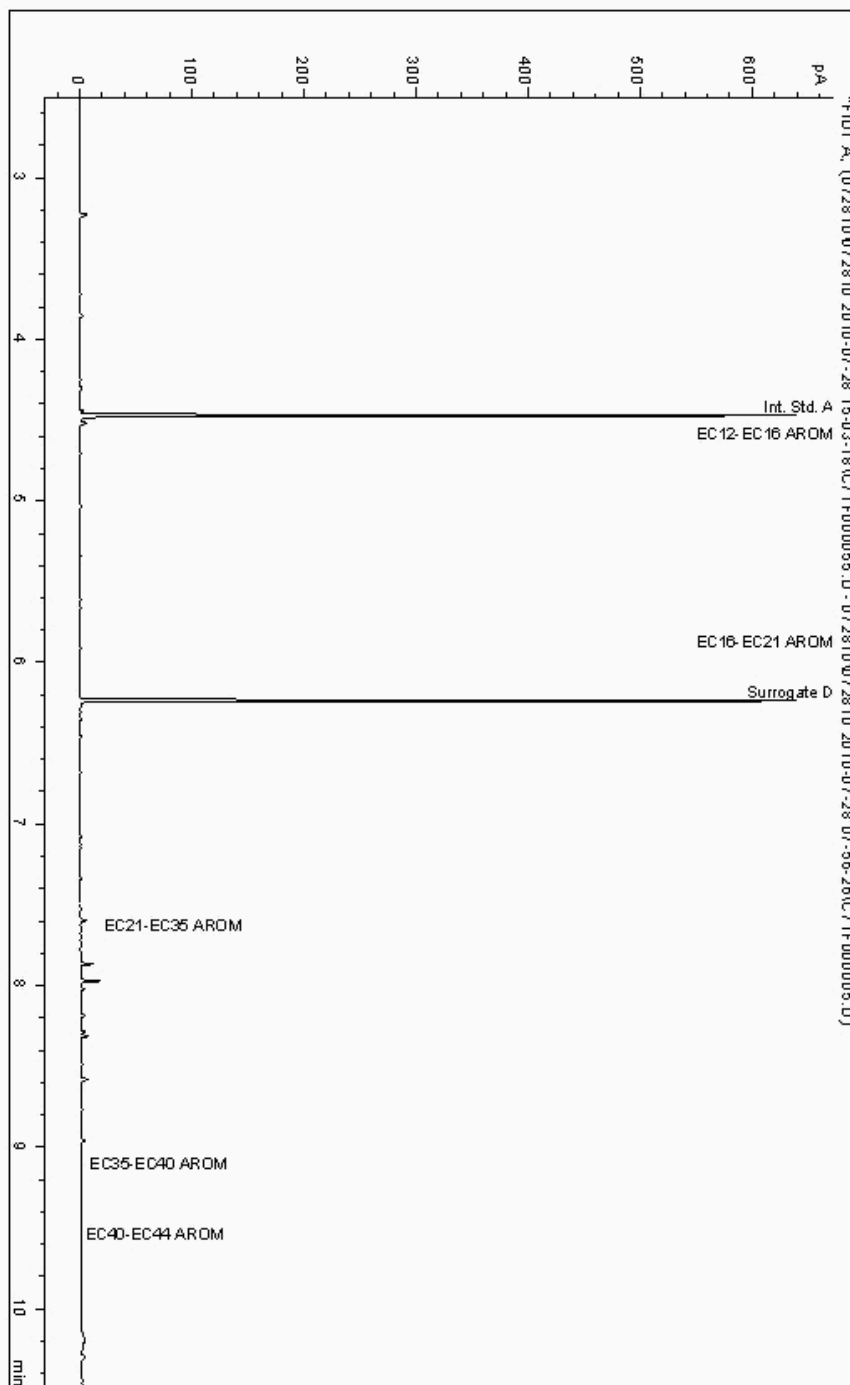
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aromatic) GC (S)

Sample No 1876054
Sample ID TP8-ES
Depth 0.50

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 1983443-1876054
Date Acquired : 29/07/10 01:36:07
Units : ppb
Dilution :
CF : 1
Multiplier : 0.954



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

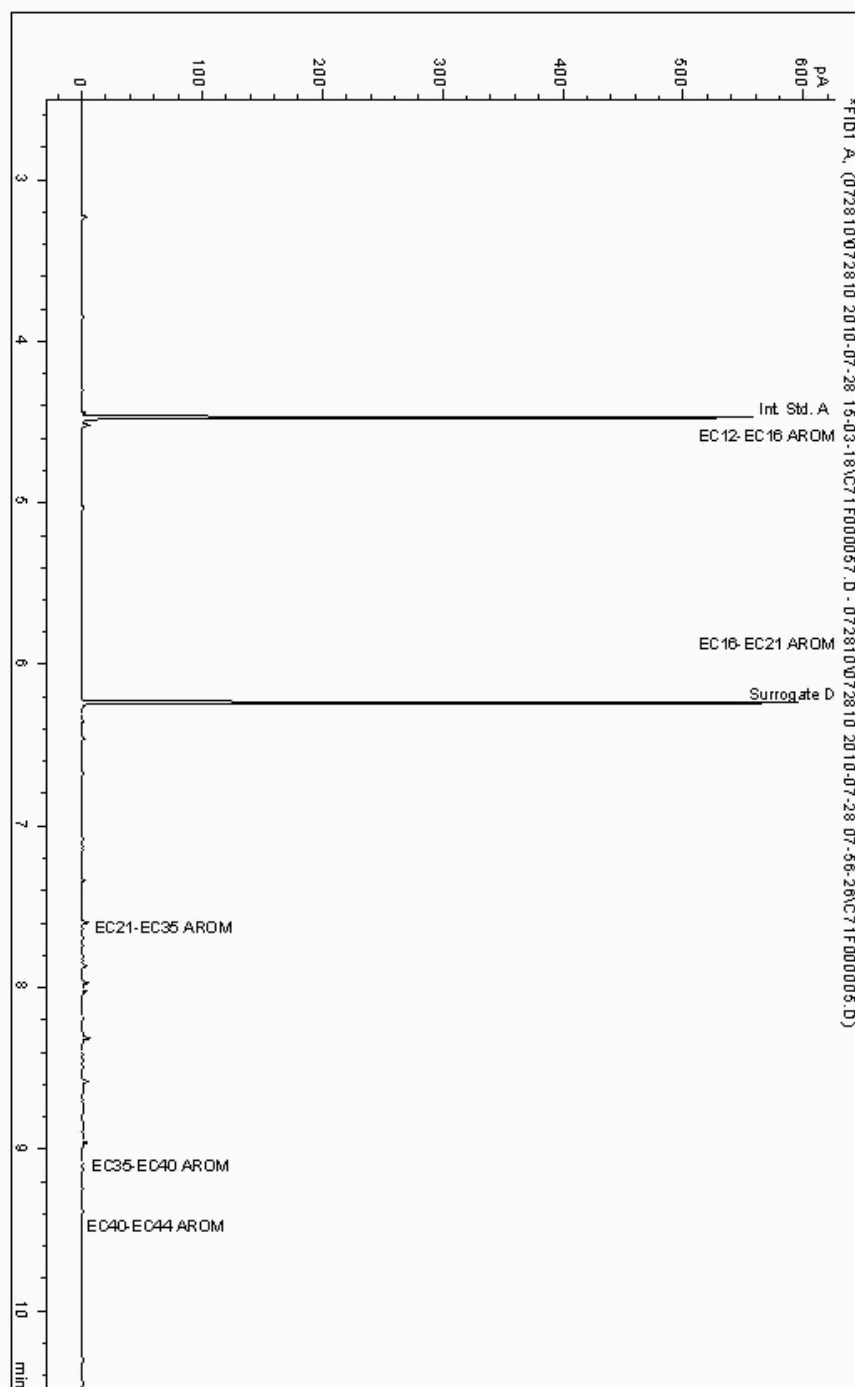
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aromatic) GC (S)

Sample No 1876068
Sample ID TP7-ES
Depth 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 1983421-1876068
Date Acquired : 29/07/10 02:10:08
Units : ppb
Dilution :
CF : 1
Multiplier : 1.042



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

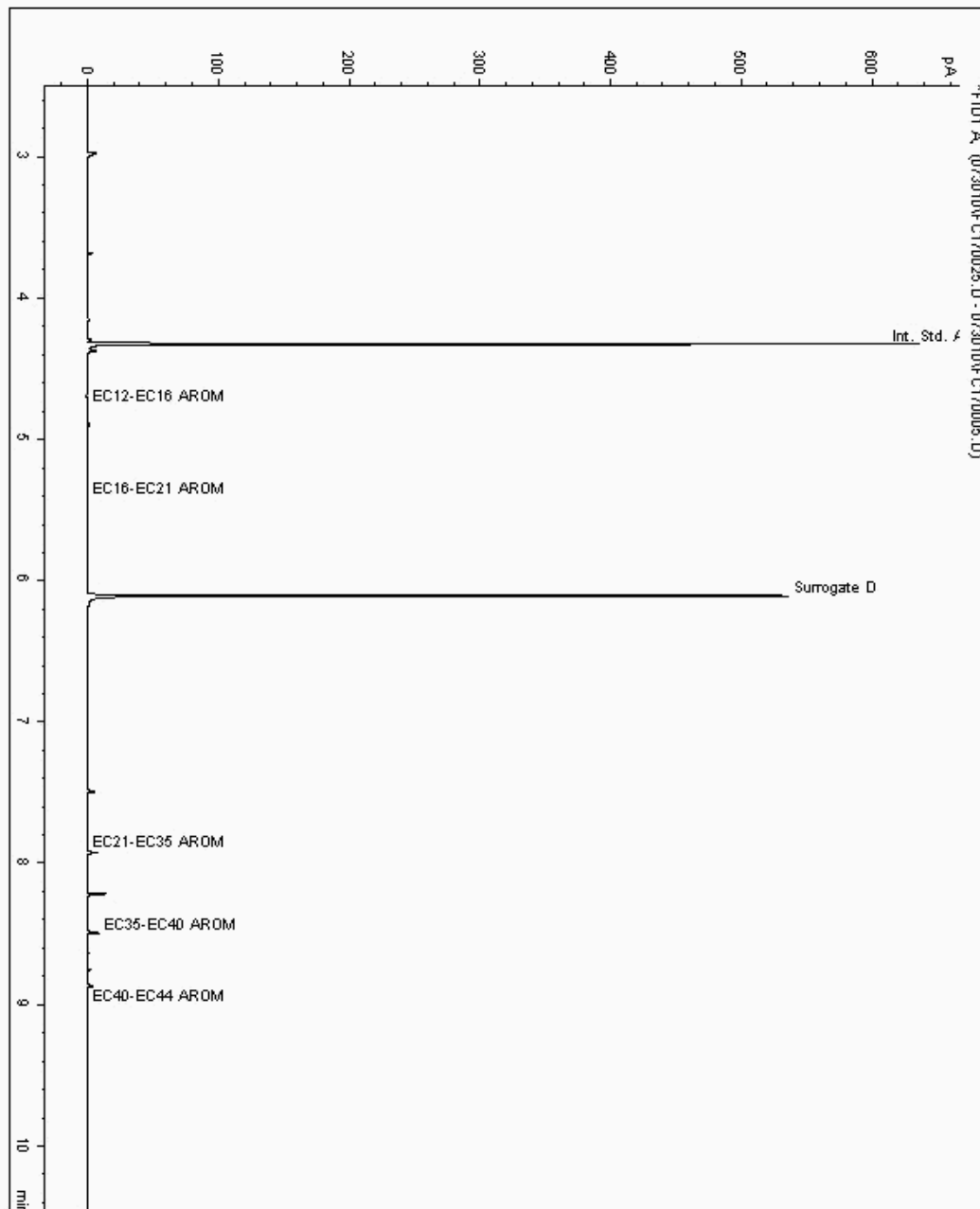
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aromatic) GC (S)

Sample No 1887683
Sample ID TP5-ES
Depth 2.50

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 1998017-1887683
Date Acquired : 30/07/10 17:24:03 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.990



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

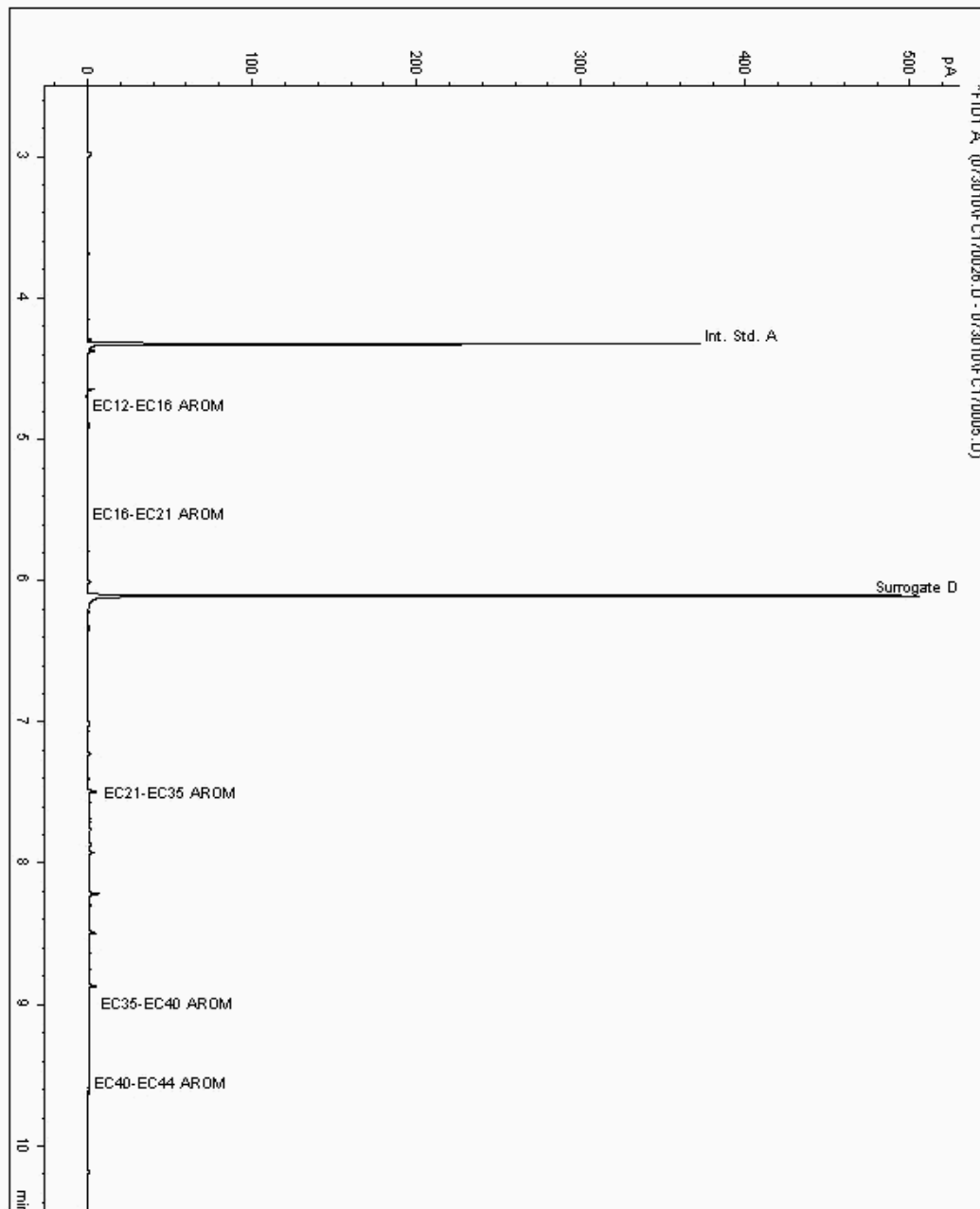
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: EPH CWG (Aromatic) GC (S)

Sample No 1887695
Sample ID TP1-ES
Depth 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 1998021-1887695
Date Acquired : 30/07/10 17:43:09 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.997



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

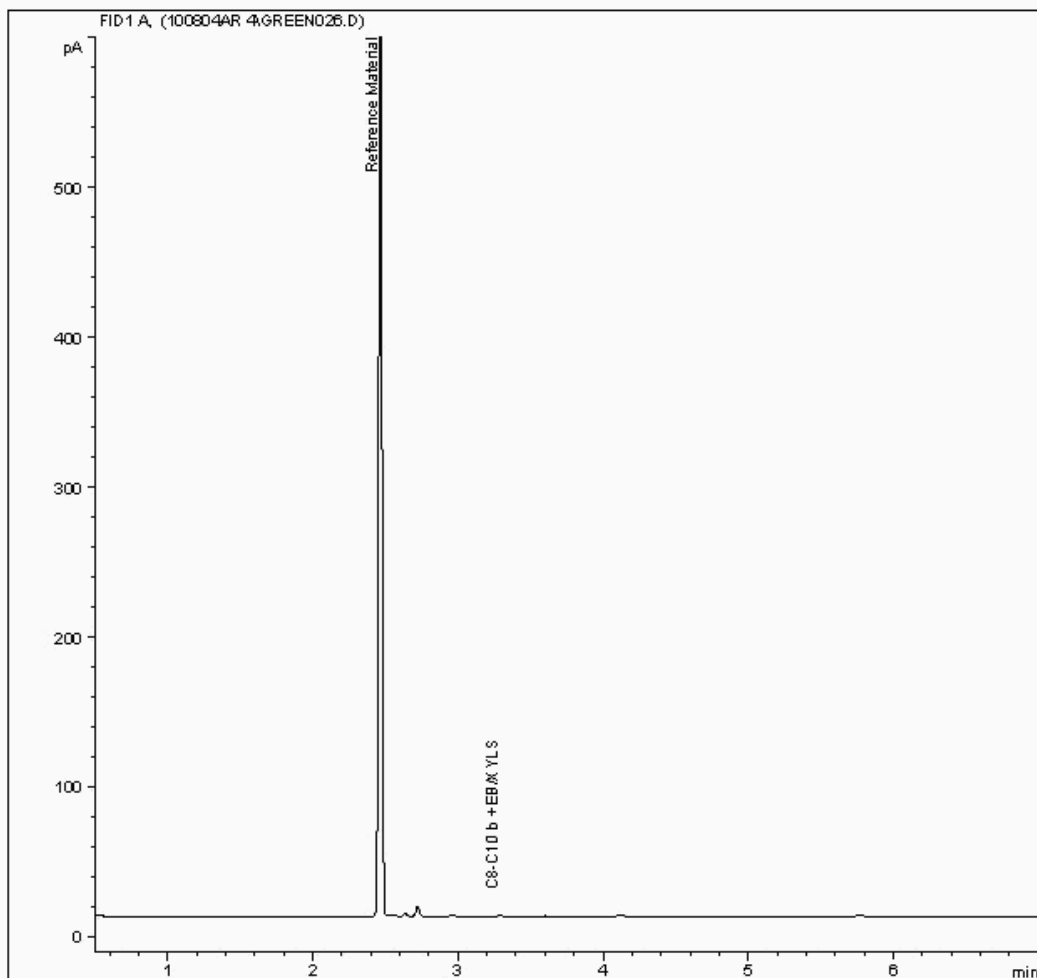
Analysis: GRO by GC-FID (S)

Sample No 1868318
Sample ID TP1
Depth 1.00

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 1983360-1868318
Date Acquired : 04/08/10 23:14:17
Units : ppb
Dilution : 1

#	Compound Name	Amount
1	C4-C6+MTBE	0
2	C6-C7+BENZENE	0
3	C7-C8+TOLUENE	0
4	C8-C10 a	0
5	Reference Material	9247
6	C8-C10 b +EB/XYLs	549
7	C10-C12	0



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

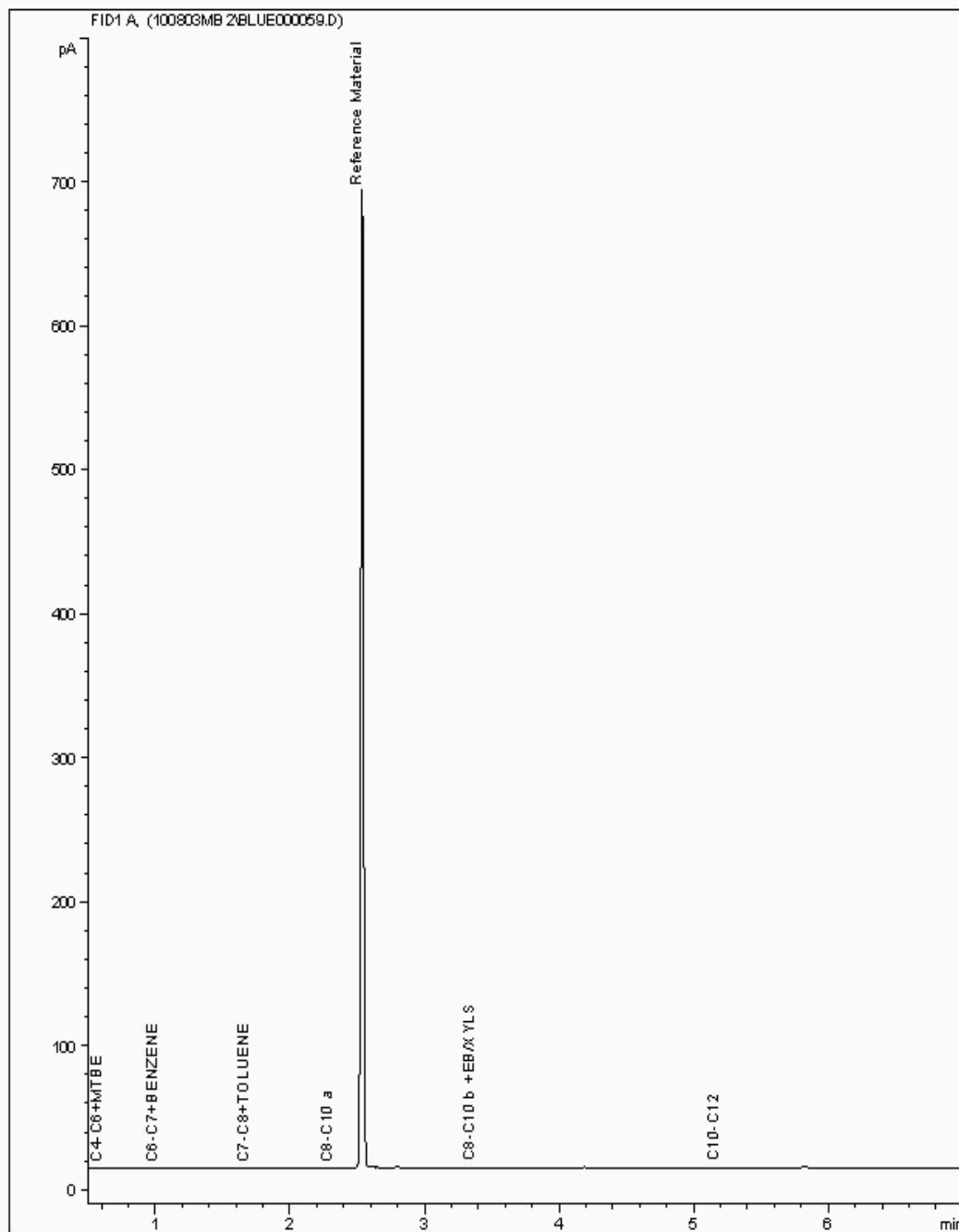
Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

Analysis: GRO by GC-FID (S)

Sample No 1868394
Sample ID TP5
Depth 2.50

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 1983402-1868394
Date Acquired : 04/08/10 06:07:10
Units : ppb
Dilution : 1



SDG: 100726-71
Job: H_GEOTECHLT_CHE-67
Client Ref.:
Location: LLWYN-ONN WTW

Customer: Geotechnics Ltd
Attention: Mark Davies
Order No.:
Report No: 92805

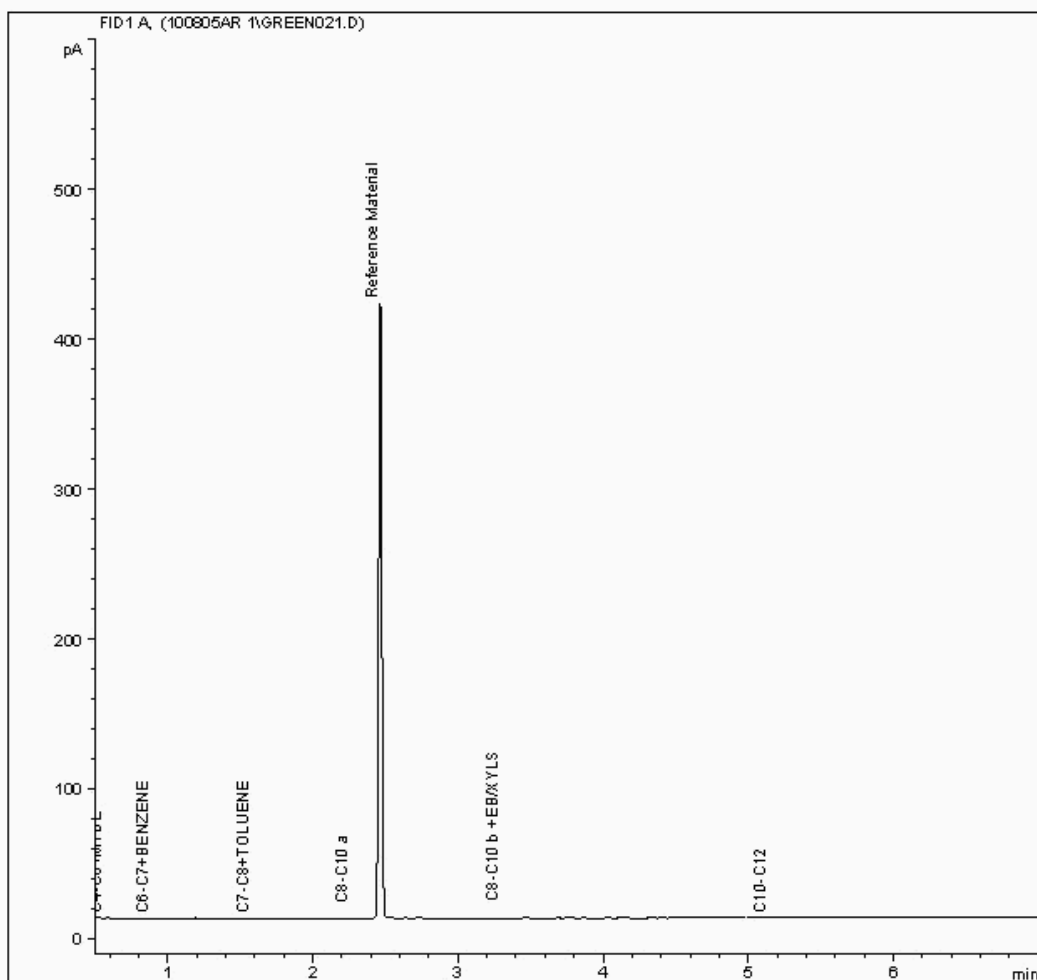
Analysis: GRO by GC-FID (S)

Sample No 1868442
Sample ID TP8
Depth 0.50

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 1983445-1868442
Date Acquired : 05/08/10 15:15:14
Units : ppb
Dilution : 1

#	Compound Name	Amount
1	C4-C6+MTBE	59
2	C6-C7+BENZENE	33
3	C7-C8+TOLUENE	67
4	C8-C10 a	52
5	Reference Material	5885
6	C8-C10 b +EB/XYLS	277
7	C10-C12	593



APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following:
NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported.
For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as $\mu\text{g/kg}$ or $\mu\text{g/l}$. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

<u>Asbestos Type</u>	<u>Common Name</u>
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

APPENDIX C: TRIAL PIT LOGS AND TRIAL PIT LOCATION PLAN

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DATA SHEET - Symbols and Abbreviations used on Records

Sample Types	
B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered
Insitu Testing / Properties	
S	Standard Penetration Test (SPT)
C	SPT with cone
VN	Strength from Insitu Vane
HV	Strength from Hand Vane
PP	Strength from Pocket Penetrometer
(All other strengths from undrained triaxial testing)	
w%	Water content
N	SPT Result
-/-	Blows/penetration (mm) after 150mm seating.
-* /- (mm)	Total blows/penetration
()	Extrapolated value
Rotary Core	
RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX Fractures/metre	
FRACTURE SPACING (mm)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
(where core recovery is unknown it is assumed to be at the base of the run)	
Groundwater	
Water Strike	
Depth Water Rose To	
Instrumentation	
Seal	
Filter	
Seal	
Strata	
Made Ground Type 1	
Type 2	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	
Note: Composite soil types shown by combined symbols	
Chalk	
Limestone	
Sandstone	
Coal	
Strata, Continued	
Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Backfill Materials	
Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

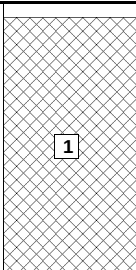
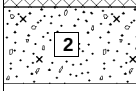
Trial Pit
Project No

TP1
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335724.58 E
348779.23 N

Ground Level 71.41 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20- 0.50 0.20 0.50	B ES ES			MADE GROUND: Brown silty very gravelly fine to medium sand with occasional cobbles. Gravel is fine to coarse angular to rounded of limestone, mudstone, brick and pottery fragments. At 0.60m: Redundant water piping and plastic cable. Below 0.70m: Many pieces of fibre glass water drums.	G.L.		71.41
1.00- 1.70 1.00 1.00	B D ES						
1.50	ES						
1.70- 2.20 1.70	B ES			Light brown silty very gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded of various lithologies.	1.70		69.71
				End of Excavation	2.20		69.21

Excavation				Groundwater		
Plant JCB 3CX	Width (B) 0.80	Depth Observed	Depth of Pit	Details		
Date 14/07/2010	Length (C) 3.50			None encountered.		
Shoring None.	Date Backfilled 14/07/2010					
Stability Stable during excavation.						

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars. The Trial Pit was terminated at a depth of 2.20m on the instruction of the Engineer. Spoil containing fibre glass fragments removed not used in backfilling of pit.	Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.		Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999	

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

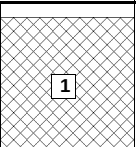
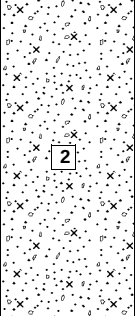
Trial Pit
Project No

TP2
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335710.2 E
348768.67 N

Ground Level 71.11 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20 0.30- 0.70 0.50	ES B ES			Rough grass over MADE GROUND: Brown silty gravelly to very gravelly fine to medium sand with occasional cobbles. Gravel is fine to coarse subangular to subrounded of various lithologies, brick and pottery fragments.	G.L.		71.11
1.00- 1.50 1.00	B ES			Light brown silty very gravelly fine to coarse SAND. Gravel is fine to medium subangular to rounded of mudstone, sandstone and occasional coal traces.	0.90		70.21
2.00- 2.50 2.00	B D		mc=9.6%	At 2.00m: Becoming gravelly. At 2.10m: Occasional pockets (up to 60mm) of clay.			
3.00	D			End of Excavation	3.00		68.11

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	3.40			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars. The Trial Pit was terminated at a depth of 3.00m on the instruction of the Engineer.					Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999					

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

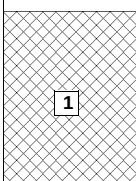
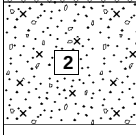
Trial Pit
Project No

TP3
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335722.98 E
348771.13 N

Ground Level 71.29 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Brown silty very sandy fine to coarse subangular to rounded gravel of various lithologies, brick and clay pipe fragments.	G.L.		71.29
0.50 - 1.00	B		mc=10%				
0.50	ES						
1.20	ES			Light brown silty gravelly fine to coarse SAND with occasional pockets (up to 60mm) of clay. Gravel is fine to coarse subangular to rounded of various lithologies.	1.20		70.09
1.50 - 2.00	B		mc=8.9%				
1.50	D						
				End of Excavation	2.00		69.29

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	3.40			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars The Trial Pit was terminated at a depth of 2.00m on the instruction of the Engineer.					Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999					

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

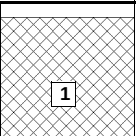
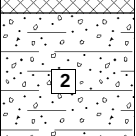
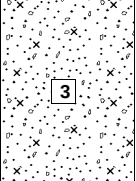
Trial Pit
Project No

TP4
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335745.49 E
348753.7 N

Ground Level 70.50 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20 0.30- 0.70 0.50	ES B ES		mc=18%	MADE GROUND: Brown mottled orange and black gravelly very silty fine to coarse sand with frequent cobbles. Gravel is fine to coarse angular to subrounded of mudstone, sandstone, brick, concrete and clay pipe fragments.	G.L.		70.50
1.00	ES			Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone, sandstone and coal traces.	1.00		69.50
1.50- 1.90 1.50	B D			Light brown silty gravelly fine to medium SAND. Gravel is fine to coarse subangular to rounded of various lithologies.	1.90		68.60
2.50- 3.20	B						
3.00	D						
				End of Excavation	3.20		67.30

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	3.40			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars The Trial Pit was terminated at a depth of 3.20m on the instruction of the Engineer.					Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999					

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

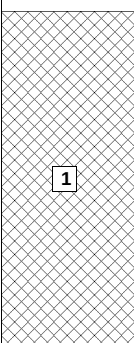
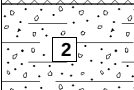
Trial Pit
Project No

TP5
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335746.22 E
348748.29 N

Ground Level 71.55 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20 0.30- 0.70 0.50	ES B ES			Rough grass over MADE GROUND: Dark reddish brown slightly silty to silty gravelly fine to medium sand with occasional cobbles and pockets (up to 200mm) of laminated filter cake. Gravel is fine to coarse angular to subrounded of various lithologies, brick and clay pipe fragments.	G.L.		71.55
1.00- 1.50 1.00	B ES						
1.60	ES						
2.00- 2.20	B			Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of various lithologies.	2.20		69.35
2.50	ES						
2.80	D			End of Excavation	2.80		68.75

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	3.30			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars The Trial Pit was terminated at a depth of 2.80m on the instruction of the Engineer.					Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999					

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

Trial Pit
Project No

TP6
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335727.23 E
348742.83 N

Ground Level 68.58 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			Rough vegetation and saplings over: Brown very clayey very gravelly fine to coarse SAND. Gravel is fine to medium subangular to subrounded of mudstone, sandstone and occasional coal traces.	G.L.		68.58
0.50	ES						
1.00- 2.00 1.00	B ES						
				End of Excavation	2.10		66.48

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	1.80			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars The Trial Pit was terminated at a depth of 2.10m on the instruction of the Engineer.					Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999					

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

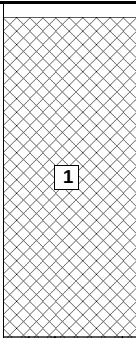
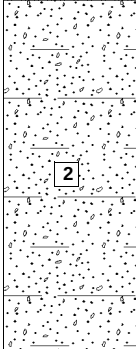
Trial Pit
Project No

TP7
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335729.37 E
348747.4 N

Ground Level 70.30 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Brown silty gravelly fine to coarse sand with occasional pockets (up to 200mm) of clay. Gravel is fine to coarse angular to subrounded of mudstone, brick and concrete. At 0.90m: Redundant cable casing.	G.L.		70.30
0.50 - 1.00	B						
0.50	ES						
1.00	ES						
1.50 - 2.00	B			Light reddish brown clayey gravelly fine to coarse SAND. Gravel is fine to coarse subangular to rounded of various lithologies.			
2.00	ES				2.10		68.20
2.50 - 3.00	B						
2.50	ES						
3.50 - 4.00	B			Below 4.10m: Becoming light greyish brown and silty.			
3.50	D						
4.10	D			End of Excavation	4.40		65.90

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	3.40			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars. The Trial Pit was terminated at a depth of 4.40m on the instruction of the Engineer.					Logged by	MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure	1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999						

TRIAL PIT RECORD

Trial Pit

Project LLWYN ONN WTW, WREXHAM

Engineer

BLACK & VEATCH LIMITED

Trial Pit
Project No

TP8
PN102275

Client DEE VALLEY WATER

National Grid
Coordinates 335736.67 E
348771.16 N

Ground Level 71.22 m OD

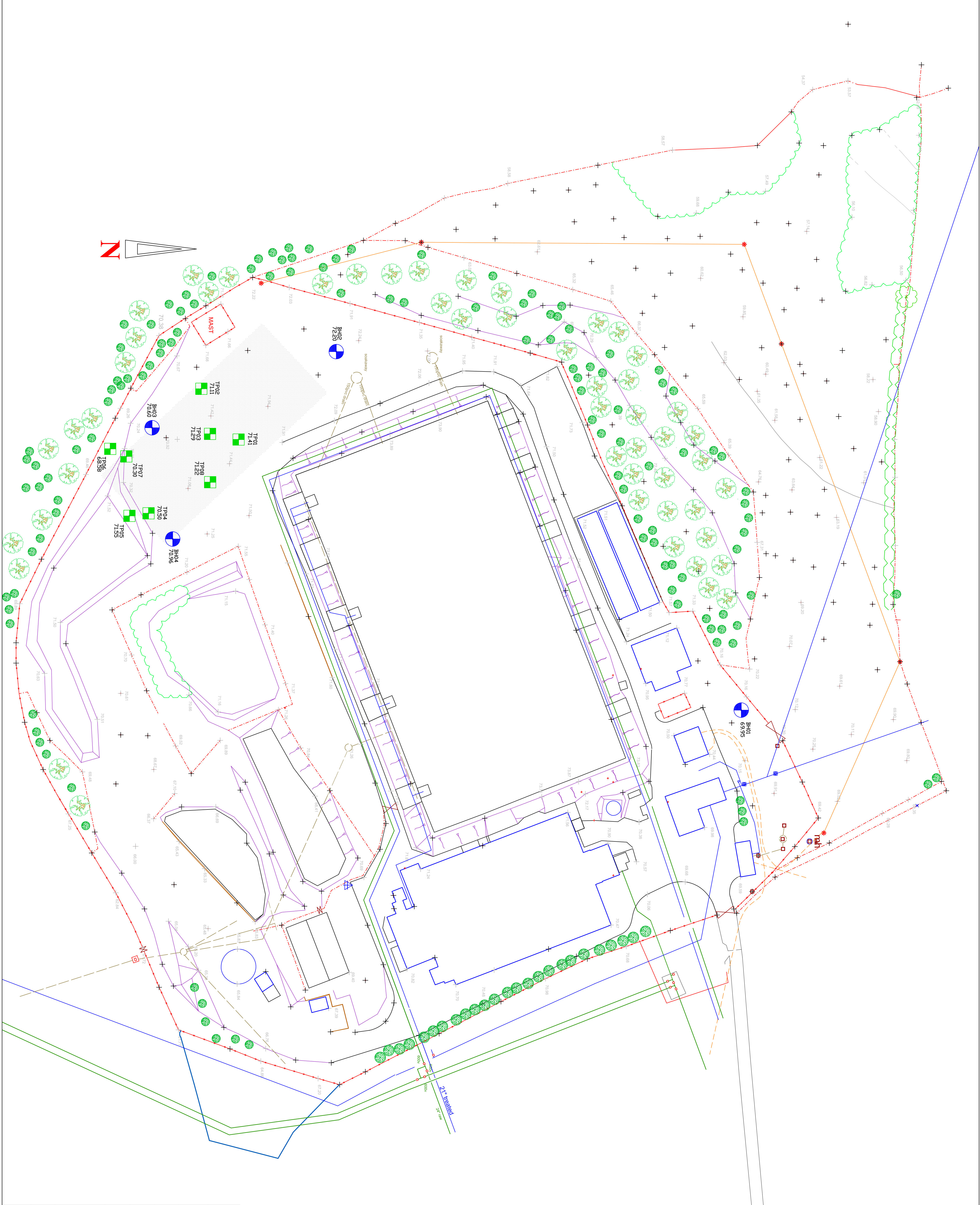
Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20 - 0.70	B		mc=17%	MADE GROUND: Grey slightly silty very sandy fine to coarse angular to subrounded gravel of limestone and sandstone (hardcore).	G.L.		71.22
0.20	ES				0.05		71.17
0.30 - 0.70	B			MADE GROUND: Dark brown silty gravelly fine to coarse sand and gravel. Gravel is fine to coarse subangular to rounded of various lithologies.			
0.50	ES						
1.00	ES						
1.50 - 2.00	B			Light yellowish brown slightly gravelly to gravelly silty fine to medium SAND with occasional pockets (up to 60mm) of clay.	1.20		70.02
1.50	ES						
				End of Excavation	2.00		69.22

Excavation				Groundwater		
Plant	JCB 3CX	Width (B)	0.80	Depth Observed	Depth of Pit	Details
Date	14/07/2010	Length (C)	3.60			
Shoring	None.	Date Backfilled	14/07/2010			None encountered.
Stability	Stable during excavation.					

Remarks	ES Sample = 1 x 60ml VOC vials, 1 x 1kg plastic tub and 1 x 258ml amber jars. The Trial Pit was terminated at a depth of 4.40m on the instruction of the Engineer.					Logged by MD
Symbols and abbreviations are explained on the accompanying key sheet.						Figure 1 of 1 09/08/2010
All dimensions are in metres.	Logged in accordance with Amendment 1 published December 2007 to BS5930:1999					geotechnics

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	Easting	Northing	Level
BH01	335801.27	348921.73	69.95
BH02	335699.66	348806.92	72.20
BH03	335721.24	348754.70	70.60
BH04	335752.77	348760.54	70.96
TP01	335724.58	348779.23	71.41
TP02	335710.20	348768.67	71.11
TP03	335722.98	348771.13	71.29
TP04	335745.49	348753.70	70.50
TP05	335746.22	348748.29	71.55
TP06	335727.23	348742.83	68.58
TP07	335729.37	348747.40	70.30
TP08	335736.67	348771.16	71.22



- LEGEND
- BOREHOLE
 - TRIAL PTT

– BENCH MARK INFORMATION –
BM Attached to OSDB2 grid and level via GPS/GPRS Smartnet system

geotechnics

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www.geotechnics.co.uk

Engineer:
BLACK AND VEATCH LTD

Client:
DEE VALLEY WATER

Project:
LWYN ONN WTW, WREXHAM

Drawing Title:

Exploratory Hole Location Plan

Taken from a drawing supplied by the client

Scale: 1:500@A1

Date:
July 2010

Project No:
PNI02275

File Name:
Geo-PNI02275-001