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**Environmental Site Assessment Report  
Simonside Service Station (200886)  
Newcastle Road  
South Shields  
Tyne and Wear  
NE34 9QE**

**April 2011  
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## Executive Summary

<b>Background</b>	ARCADIS (UK) Limited (ARCADIS) was commissioned by ABB Limited (ABB), on behalf of Esso Petroleum Company Limited (Esso) to carry out an Environmental Site Assessment of Simonside Service Station (The Site).
<b>Previous Environmental Works</b>	<p>The following works have previously been undertaken by ARCADIS:</p> <ul style="list-style-type: none"> <li><i>Preliminary Risk Assessment Report</i>, Simonside Service Station, Newcastle Road, South Shields, Tyne and Wear, NE34 9QE, ARCADIS Ref. 937490003_01, September 2010. (ARCADIS, 2010).</li> </ul> <p>The name Simonside Service Station used during previous phases of works refers to The Site (petroleum filling station) and also the Land Adjacent to Simonside Service Station, as at the time of these works, these two were considered together. For the purposes of this phase of works the petroleum filling station and the Land Adjacent to Simonside Service Station are reported separately. This report applies to the Simonside Service Station.</p>
<b>Objectives</b>	The objectives of this Environmental Site Assessment were to identify potentially active pollutant linkages, from desk study information, warranting further consideration. An intrusive investigation was then carried out to gather soil, groundwater and soil gas data to compare measured concentrations of the potential contaminants of concern (CoC) to ARCADIS Generic Assessment Criteria (GAC), or alternative applicable assessment criteria, and assess the significance of the findings
<b>Intrusive Investigation</b>	<p>An intrusive investigation was carried out between 27 January and 22 February 2011 with the progression of five boreholes to a maximum depth of 6.3m bgl (BH105). The boreholes were positioned in order to give good coverage of The Site and targeting potential soil and groundwater impacts associated with The Site's fuel storage and distribution network.</p> <p>Groundwater monitoring and sampling of the monitoring well network was undertaken between 2 and 4 March 2011 and 22 March 2011.</p> <p>Soil gas installation points and soil gas sampling was undertaken on 1 March 2011.</p>
<b>Quantitative Risk Assessment Results</b>	<p>Results from laboratory analyses of soil and groundwater samples were compared to ARCADIS GAC protective of human health and water resource receptors, summarised below:</p> <ul style="list-style-type: none"> <li>Soil GAC protective of water resource receptors were exceeded in samples from boreholes BH101, BH102, BH104 to BH106; and</li> <li>Groundwater GAC protective of water resource receptors were exceeded in samples from boreholes BH102, BH104, BH105 and BH106(D).</li> </ul> <p>Measured concentrations of CoC in soil gas were evaluated using the software model CLEA 1.06 and site-specific input parameters. Hazard indices were calculated using the maximum concentrations of the CoC in soil gas. The results indicate that none of the Hazard Indices exceed 0.00.</p>
<b>Updated Conceptual Site Model</b>	<p>No concentrations of CoC in excess of GAC protective of human health were identified in either soil or groundwater samples. In addition the risk presented to on-site commercial workers <i>via</i> inhalation pathways (calculated based on the soil gas data) was considered acceptable. As such the risk to human health receptors associated with The Site is not considered to be significant.</p> <p>There were exceedances of the ARCADIS GAC protective of water resource receptors in both soil and groundwater for PAH compounds. Aromatic hydrocarbons and ethylbenzene concentrations measured in soils (but not in groundwater) sampled from beneath The Site were found to exceed ARCADIS GAC protective of water resource receptors along with aliphatic hydrocarbons in groundwater sampled from BH106(S).</p>

	<p>The primary route of the risk to water resources is <i>via</i> leaching and off site migration of potentially contaminated groundwater. The nature of the impacts in groundwater is considered limited with only Diesel Range Organic (DRO) hydrocarbon compounds and six PAH compounds measured above ARCADIS GAC protective of water resource receptors. This provides evidence that CoC leaching into groundwater is limited.</p> <p>The shallow drift deposits encountered beneath The Site are considered to be of low permeability, based on the material encountered during the intrusive works and the results of the rising head tests. Furthermore, the drift deposits have been encountered to a depth of at least 6.3m bgl and as such, it is considered unlikely that the dissolved phase impacts will migrate significantly either vertically or laterally and therefore the risk to water resource receptors associated with The Site is considered to be low.</p>
<b>Suitability For End Use</b>	<p>Following completion of the investigation and assessment as undertaken by ARCADIS in accordance with the current UK risk-based assessment methodology, ARCADIS considers the identified impacts to soil and groundwater beneath The Site, at the time of assessment, not to present an unacceptable level of risk to the identified off site receptors or to future site occupiers based on continued petroleum use. If The Site is to be redeveloped the assessment should be reviewed.</p>

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## List of Abbreviations that may be used in this report

AOD	Above Ordnance Datum
ARCADIS	ARCADIS (UK) Limited
ABB	ABB Limited
Alcontrol	Alcontrol Laboratories
BTEX	Benzene, Toluene, Ethylbenzene, total Xylenes.
CLR	Contaminated Land Report
CoC	Contaminants of Concern
CPU	Continued Petroleum Use
CSM	Conceptual Site Model
DEFRA	Department for Environment, Food and Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
EA	Environment Agency of England and Wales
ESA	Environmental Site Assessment
ESSO	ESSO Petroleum Co. Ltd
ETBE	Ethyl Tertiary Butyl Ether
GAC	Generic Assessment Criteria
GC-FID	Gas Chromatography-Flame Ionisation Detector
GC-MS	Gas Chromatography Mass Spectrometry
GRO	Gasoline Range Organics
HDPE	High Density Polyethylene
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectroscopy
LNAPL	Light Non-Aqueous Phase Liquid
MCertS	Monitoring Certification Scheme
m bgl	Metres Below Ground Level
MDL	Method Detection Limit
MTBE	Methyl Tertiary Butyl Ether
ORP	Oxidation Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon
PFS	Petrol Filling Station
PID	Photo-Ionisation Detector
QA	Quality Assurance
QC	Quality Control
SPZ	Source Protection Zone
SSAC	Site Specific Assessment Criteria
SVOC	Semi Volatile Organic Compound
TBA	Tertiary Butyl Alcohol
TIC	Tentatively Identified Compound
TPH	Total Petroleum Hydrocarbons (C5-C35)
TPH CWG	Total Petroleum Hydrocarbons Criteria Working Group



## List of Abbreviations that may be used in this report

UKAS	United Kingdom Accreditation Service
UST	Underground Storage Tank
VOC	Volatile Organic Compound

## 1 INTRODUCTION

ARCADIS (UK) Limited (ARCADIS) was commissioned by ABB Limited (ABB), on behalf of Esso Petroleum Company Limited (Esso) to carry out an Environmental Site Assessment of Simonside Service Station, Newcastle Road, South Shields, Tyne and Wear, NE34 9QE (The Site). A site location plan is presented as Figure 1 at a scale of 1:50,000.

The work was carried out in accordance with the Terms and Conditions of Consultancy Services Agreement No. S2010/001 dated 8 June 2010 and with reference to English legislation and regulatory guidance for the assessment of land contamination, a summary of which is presented in Appendix A.

### 1.1 Objectives

The objectives of this Environmental Site Assessment were:

- to examine whether there have been potentially contaminative uses on The Site or on nearby land and identify potential areas of concern through review of desk top study information;
- to carry out a site walkover prior to undertaking intrusive works to provided additional information to support the development of the conceptual site model. This included the status of site equipment and structures in terms of potential releases to the environment;
- to develop the initial conceptual model of The Site to identify potentially active pollutant linkages warranting further consideration;
- to assess the concentrations of contaminants of concern (CoC) in soil and groundwater beneath The Site in the area of data gaps identified during the desk study review and site walkover; and
- to compare measured concentrations of the potential CoC to ARCADIS Generic Assessment Criteria (GAC) to assess the significance of the findings of the investigation.

### 1.2 Scope of Work

The proposed scope of works comprised:

- Review of desk study report to identify data gaps;
- Review of utility trace data to identify safe locations of boreholes;
- Site walkover to confirm potential areas of concern (PAOC);
- Drilling of 5 proposed boreholes (BH101, BH102, BH104 to BH106) to a maximum target depth of 6m below ground level (bgl) to investigate PAOC;
- Installation of groundwater monitoring wells in each drilled borehole;
- Collection of soil samples from boreholes for visual inspection and laboratory chemical analysis;
- Logging of soils and field headspace screening with a Photo-Ionisation Detector (PID);
- Aquifer permeability testing;
- Monitoring and sampling of groundwater from newly installed monitoring wells;
- Collection of soil gas samples;
- Laboratory analysis of selected soil, groundwater and soil gas samples for potential CoC;
- Reporting of works; and
- Risk evaluation.

The scope of work was developed in accordance with the Environment Agency of England and Wales and Department for Environment Food and Rural Affairs (DEFRA) document '*Model Procedures for the Management of Land Contamination*' Contaminated Land Report (CLR) 11, dated 2004.

### **1.3 Reliability of Information / Limitations**

ARCADIS' liability, pursuant to the terms of the appointment of ARCADIS by Esso, is strictly limited to the work undertaken and the matters contained and specifically referred to in this report.

A copy of ARCADIS' study limitations is presented in Appendix B.

### **1.4 Reliance**

It is understood that the current report will be prepared for the use of Esso. The contents of this report may not be used or relied upon by any person other than this party without the express written consent and authorisation of ARCADIS.

## 2 PRELIMINARY RISK ASSESSMENT – SUMMARY

### 2.1 Introduction

Desktop information is used to develop an outline conceptual model and identify pollutant linkages at The Site.

A pollutant linkage exists only when a source, pathway and receptor are linked together.

- A **source** is a substance that has potential to cause harm or adversely affect controlled waters.
- A **receptor** is something such as human health, an ecological system, animals or crops, buildings or controlled waters that could be adversely affected by a contaminant.
- A **pathway** is a route or means by which a receptor can be exposed to, or affected by a contaminant.

### 2.2 Previous Environmental Works on Site

The following environmental works have previously been undertaken by ARCADIS and the findings of which are presented in the following report:

- *Preliminary Risk Assessment Report, Simonside Service Station, Newcastle Road, South Shields, Tyne and Wear, NE34 9QE, ARCADIS Ref. 937490003\_01, September 2010. (ARCADIS, 2010).*

This report should be read in conjunction with the above environmental report as the information presented therein provides the basis for the conceptual understanding of The Site. For the purposes of this report, “The Site” refers to the petrol filling station known as Simonside Service Station. However, it is noted that the *Preliminary Risk Assessment Report* detailed above uses the terms “Simonside Service Station” and “the Site” to refer to both the petrol filling station and the land adjacent to the petrol filling station.

The following subsections provide a brief summary of the findings of the desk study (ARCADIS, 2010)

### 2.3 Description of Site

Item	Details
Site status	Active Petrol Filling Station
Intended end use	Petrol Filling Station
OS National Grid Coordinates	435230, 564710
Elevation	Approximately 4 m AOD
Site size	Approximately 3,500m <sup>2</sup>

A site layout plan is presented as Figure 2.

### 2.4 Environmental Setting

Item	Details
Geology*	Made Ground and Upper (Pelaw) Clay over Pennine Middle Coal Measures Formation.

Item	Details
Groundwater depth and flow*	1.9m bgl (NZ35SE415). The groundwater flow beneath The Site may be limited due to presence of cohesive drift deposits.
Aquifer classification	Made Ground – Unknown (lakes and landslip). Upper (Pelaw) Clay – Unproductive Strata. Pennine Middle Coal Measures Formation – Secondary (A) Aquifer.
Source Protection Zones	Site not located in an SPZ.

\* Details of two historical borehole logs were obtained from the BGS. The first (NZ35SE415) is located on The Site to the southwest of the shop building. The ground conditions encountered comprised made ground to a depth of 0.45 m below ground level (bgl) underlain by firm dark brown sandy clay, likely representing the Upper (Pelaw) Clay, proven to a depth of 6.00 m bgl.

The second (NZ35SE70.c) is located approximately 18 m northeast of The Site. The ground conditions encountered comprised made ground to a depth of 1.60 m bgl. This is underlain by soft to firm sandy clay with varying silt and gravel content proven to a maximum depth of 23.50 m bgl.

Limited groundwater was encountered within the regional boreholes, with no resting groundwater in borehole NZ35SE415. Groundwater was encountered at 1.9 m bgl (2.01 m AOD) in borehole NZ35SE70.c three days after the drilling, suggesting that the hydraulic conductivity of the Upper (Pelaw) Clay is low.

## 2.5 Receptors

Item	Details
Unnamed pond	Approximately 333 m to the southeast of The Site.
River Don	An open culvert section of the River Don approximately 370 m northwest of The Site.
Licensed potable abstractions	None within 1 km.
Residential Development	Approximately 140m to the southwest of The Site.
Ecological Receptor	Primrose Local Nature Reserve located approximately 1,900 m southeast of The Site boundary.  Station Burn Local Nature Reserve located approximately 1,900 m to the south of The Site boundary.

## 2.6 Ground Gas

A registered and historical landfill is present approximately 90 m to the north of The Site. This landfill is associated within the partial infilling of Tyne Dock during the late seventies/early eighties and the remaining part of Tyne Dock currently being infilled as part of the current development works of the Second Tyne Tunnel Crossing.

However, it was outside the scope of the assessment to investigate or assess risks from bulk ground gases. The CIRIA C665 guidance document "Assessing risks posed by hazardous ground gases to buildings" (Wilson et al, 2007) highlights that subsurface contamination from petroleum sites has the potential to act as sources of the bulk ground gases carbon dioxide and methane. This is primarily due to the biological degradation of petroleum hydrocarbons, resulting in the presence of such gases.

For these gases to present a risk to occupants of buildings, it requires not only their presence in the ground but also flow towards the surface. Certain land uses, such as municipal landfills, have the potential to generate these gases to such an extent that a significant flow is recorded between the source and the ground surface. Typically, the rate of generation of these gases is much lower when created by the degradation of petroleum hydrocarbons within subsurface soils or groundwater, meaning that a significant flow of bulk ground gases to the surface is usually absent. The presence of ground gases from a petroleum hydrocarbon source combined with a low flow rate typically results in petroleum sites being classified as either Green or Amber 1 (for a Situation A development) or a Characteristic Situation 1 or 2 (for a Situation B development), requiring limited or low-level gas protection measures.

## 2.7 Potential Areas of Concern

### 2.7.1 On-Site

Location	PAOC
On-site (current usage)	Fuel storage and distribution network
	Interceptors
	Surface spillages
	Imported made ground
On-site (historical usage)	Gas Works

### 2.7.2 Off-Site

Location	PAOC
Current usage	Electricity Substation approximately 15 m to the south
	Tyne Dock
	Waste transfer station approximately 175 m to the east
	Registered landfill 90 m to the north
	Workshop approximately 10 m to the east
Historical usage	Railway Sidings approximately 75 m to the east
	Tyne Dock approximately 90 m to the north
	Garage Workshop approximately 10 m to the east

## 2.8 Contaminants of Concern

Contaminants of Concern (CoC) for The Site have been selected on the basis of the current and historical on- and off- site PAOC and reference to DoE industry profiles.

PAOC	Potential CoC <sup>1</sup>
<b>On-site</b>	
Fuel storage and distribution network	Hydrocarbons
Interceptors	
Surface spillages	
Imported made ground	Heavy metals, asbestos

<sup>1</sup> Sourced from DoE Industry Profiles

<b>Off-site</b>	
Electricity Sub Station	Hydrocarbons, PCBs**
Workshop	Hydrocarbons, heavy metals, asbestos
Tyne Dock	Metals, hydrocarbons, PCBs**, landfill type gases, pesticides, sulphides, sulphates, cyanides
Railway Sidings	Hydrocarbons, metals, PCBs**, ethylene glycol, ash, sulphates.
Gas works	Hydrocarbons, cyanides, ammoniacal liquors, metals, glycols, asbestos
Registered Landfill	CoC dependant on nature of backfill, ground gas*.

\* Since The Site is a petrol filling station, it should be noted that according to CIRIA report C665 (2007), petroleum hydrocarbons have the potential to act as sources of bulk ground gases such as methane or carbon dioxide.

\*\* Due to the anticipated low mobility of PCBs, the risk posed to The Site by this CoC is considered to be low.

### 3 PRELIMINARY RISK ASSESSMENT - SITE RECONNAISSANCE

The property was inspected on 17 August 2010 to identify potential areas of concern with regard to the environmental conditions in the subsurface.

#### 3.1 Site Facilities

The Site is an active petrol filling station. The main on-site features from inspection of The Site include:

- Shop building located in the eastern part of the petrol filling station;
- Disused carwash located adjacent to The Site's southwestern boundary;
- Forecourt and carwash interceptors in the northeastern and southwestern corners of The Site respectively;
- Five known USTs and associated distribution lines located southwest of the shop and south of the pump islands with off-set fill points;
- A canopy extending west from the shop building over four pump islands in the centre of The Site.

Details of the tanks as determined during from The Site walkover are listed below.

Tank	Capacity (Litres)	Contents	Construction Type	Approximate Date of Installation
1	35,340	Unleaded Petrol	Unknown	Unknown
2	17,580	Unleaded Petrol	Unknown	Unknown
3	17,760	Premium Unleaded Petrol	Unknown	Unknown
4	35,340	Diesel	Unknown	Unknown
5	21,970	Diesel	Unknown	Unknown

#### 3.2 Site Setting

The immediate land-use surrounding The Site is as follows:

Direction	Land Use
North	Newcastle Road and railway line with industrial properties beyond
East	Vehicle workshop with railway line and commercial properties beyond
South	Car show room with industrial estate beyond
West	Newcastle Road and car show room with workshop

#### 3.3 Visual and Olfactory Evidence of Contamination

Visual Evidence	Olfactory Evidence
Some patches of black staining were noted around the pump islands.	No obvious olfactory evidence of contamination was encountered.

#### 3.4 Waste Management

Type of Waste	Storage Method and Observations
General waste	One 660 litre wheelie bin on concrete hardstanding.
Waste oil	None
Cardboard	One 660 litre wheelie bin on concrete hardstanding.



### 3.5 Japanese Knotweed

No obvious visible evidence of Japanese Knotweed (JK) was identified on The Site. However, it is not always possible to confirm the presence of, or identify, this plant, particularly in the early stages of growth. We are unable to confirm that JK rhizomes do not exist beneath The Site.

### 3.6 Potential Areas of Concern

Potential Areas of Concern (PAOC) identified during The Site inspection are:

Location	PAOC
On-site	Fuel storage and distribution network
	Interceptors
	Surface spillages
Off-site	Workshop

Potential preferential pathways as identified during the desk study and The Site inspection are:

- Made ground;
- Site services;
- Granular fill surrounding site services.

#### 3.6.1 Additional Contaminants of Concern

No CoC in addition to those in Section 2.8 were identified during The Site reconnaissance.

#### **4 DEVELOPMENT OF THE CONCEPTUAL SITE MODEL**

Following completion of the desk study and site reconnaissance, an Outline Conceptual Site Model (CSM) was produced for a continued petroleum end use and is presented as Figure 3. The Outline CSM details potentially active pollutant linkages associated with human health receptors (chronic exposure), water resource receptors or ecological receptors.

Based on the findings of ARCADIS' 2010 Preliminary Risk Assessment, ARCADIS considers that there are potential risks to the identified human health and water resource receptors associated with The Site.

Therefore, an intrusive site investigation and Generic Quantitative Risk Assessment have been completed, the results of which are documented in the following sections.

## 5 SITE INVESTIGATION – METHODOLOGY

### 5.1 Rationale

The rationale behind the investigation locations is shown in the table below:

Investigation Location	Rationale
BH101	Located northwest of the pump islands
BH102	Located northeast of the pump islands
BH104	Located southeast of the know USTs
BH105	Located south of the known USTs
BH106	Located southwest of the known USTs
SG101	Located around the current on site shop building, between the building and the current fuel infrastructure.
SG102	
SG103	

### 5.2 Borehole Drilling and Soil Sampling Methodology

Data	Information
Date of investigation:	Between 27 January and 22 February 2011
Utility Clearance:	Inspection of available plans, site-wide service tracing and use of vacuum excavation to 1.5mbgl at borehole locations prior to drilling.
Drilling Method:	Boreholes BH101, BH102 and BH104 to BH106 were drilled using percussive and rotary techniques. Borehole BH101A was terminated due to obstruction at shallow depth.
Maximum drilled depth (m)	6.3m bgl (BH105)
Soil logging:	Soil samples logged with reference to BS 5930:1999 (revision 2)
Field Screening:	<ul style="list-style-type: none"> <li>• Soil samples collected at approximately 0.5m intervals, where possible, and placed into two polythene bags;</li> <li>• First bag sealed to enclose as much air as possible around the soil sample;</li> <li>• Soil sample gently broken up and left for approximately fifteen minutes;</li> <li>• Polythene bag pierced and Photo-Ionisation Detector (PID) fitted with a 10.6eV UV lamp was inserted to test for ionisable VOCs<sup>1</sup>;</li> <li>• PID readings recorded and presented on the borehole logs in Appendix C; and</li> <li>• Second bag of unsaturated soil samples was sealed with minimal air space contained; soil samples for laboratory analysis were taken from the second bag only.</li> </ul>

<sup>1</sup> The PID screening is a semi-quantitative method that results in a representation of the presence of VOCs in the soil. The numerical output cannot be directly compared to measured soil concentrations of CoC. Nevertheless, PID readings are a useful field tool for assessing potential volatile organic impacts in soil.

Data	Information
Other Recorded Parameters:	<ul style="list-style-type: none"> <li>• Depth to Non-Aqueous Phase Liquid (NAPL), if present;</li> <li>• Depth to groundwater; and</li> <li>• Depth to base of monitoring well.</li> </ul>
Waste Disposal	Waste soil arisings were taken to an ExxonMobil Approved licensed landfill by a registered waste carrier under duty of care. Waste disposal documentation details are provided in Appendix D.

### 5.3 Groundwater Monitoring Well Installation and Surveying

Data	Information
Monitoring well type:	Groundwater (permanent), High Density Polyethylene (HDPE)
Monitoring well installation:	See Appendix C.
Well Covers:	Covers and security casing installed flush with the ground surface and lockable expanding Torquer well plugs were fitted on top of the well pipe.
Surveying:	The monitoring wells installed during the works and summarised in this report were levelled using a theodolite level relative to an arbitrary site datum of 100.00m at borehole BH104.
Well Development:	Up to 10 saturated well volumes were removed following installation.

### 5.4 Groundwater Monitoring and Sampling Methodology

Groundwater monitoring comprises a groundwater elevation survey, and groundwater sampling.

#### 5.4.1 Groundwater Monitoring

The methodology and process followed during the groundwater elevation survey is summarised below:

Data	Information
Dates of monitoring:	Between 2 and 4 March 2011 and 22 March 2011
Equipment used:	Interface probe
Details recorded:	<ul style="list-style-type: none"> <li>• Depth to Non-Aqueous Phase Liquid (NAPL), if present;</li> <li>• Depth to groundwater;</li> <li>• Depth to base of monitoring well.</li> </ul>

#### 5.4.2 Groundwater Sampling

The methodology and process followed during the collection of groundwater samples is summarised below:

Data	Information
Date sampled:	Between 2 and 4 March 2011 and 22 March 2011
Sampling Method:	Peristaltic pump, set to a low flow rate. Sampling from approximate mid-point in water column. Minimal drawdown sampling technique, reduces turbidity and thus variability in results.
Data recorded:	Water quality parameters, Dissolved Oxygen (DO), Oxidation Reduction Potential (ORP), electrical conductivity and pH, were measured using a multi-parameter meter. Readings were taken at approximately five minute intervals until the electrical conductivity, DO, and ORP from three readings differed by less than 10%. Once the readings had stabilised, the water passing through the low flow pump was considered to be representative of the surrounding aquifer and the groundwater samples were collected.

### 5.5 Soil Gas Monitoring Point Installation and Sampling Methodology

#### 5.5.1 Soil Gas Monitoring Point Installation

Data	Information
Date of investigation:	1 March 2011
Utility Clearance:	Not required as points only penetrate through concrete slab.
Drilling Method:	<p>Near-slab soil gas sampling points were installed through the overlying hardstanding using a 110v handheld drill. A 12mm diameter guide hole was advanced until the whole thickness of the slab was defined. The 12mm diameter hole was then over drilled with a 16mm diameter drill bit to a depth equivalent to ½ of the thickness of the hard standing slab.</p> <p>Subsequently the 16mm hole was over drilled with a 20mm diameter drill bit to a depth equivalent to 1/3 thickness of the hard standing slab. A 6mm pipe was then inserted into the drilled hole. A 13mm rubber bung was used to prevent debris entering the monitoring point.</p> <p>A quick dry cement solution was then applied around the 6mm sampling pipe and inside the drilled hole. As a last step the 6mm pipe was checked for blockages with the push rod. A well cap and security casing were installed flush with the ground surface. An air-tight seal was created between the sampling port and the surrounding hardstanding, such that atmospheric air is not drawn through the ports during sampling, creating a 'short-circuiting' effect.</p>

## 5.6 Soil Gas Sampling Methodology

Data	Information
Dates of monitoring:	1 March 2011
Equipment used:	Landfill gas analyser, and 1.4L SiloCans with sample trains and 200 mL/min flow restrictors
Tests Performed:	Monitoring point installation leak test conducted with use of a landfill gas analyser to check that there was no significant atmospheric air entrainment through a surface leak. The landfill gas analyser was used to measure concentrations of oxygen, carbon dioxide and methane within the soil gas. Depleted concentrations of oxygen in relation to ambient air provide reasonable evidence that the soil gas monitoring point installation is leak-tight at surface and as such no ambient air entrainment would be expected to occur during the soil gas monitoring.
Details Recorded	<ul style="list-style-type: none"> <li>• Oxygen, carbon dioxide and methane levels;</li> <li>• SiloCans and flow restrictors serial numbers used at each location; and</li> <li>• SiloCans pressure at the start and finish of each test.</li> </ul>

## 5.7 Storage, Preservation and Transport of Samples

The measures that were taken to ensure the quality of the samples from collection to receipt of the samples by the laboratory is summarised below.

Task	Soil	Groundwater	Soil Gas
Storage:	Glass jars / bottles and vials supplied by the laboratory were used for the collection of soil samples to be analysed for volatile compounds. Plastic one-litre tubs were used to collect soil samples for metals analysis.	Glass vials supplied by the laboratory used for the collection of samples to be analysed for volatile compounds. Samples to be analysed for lower volatility compounds were stored in laboratory prepared glass bottles.	1.4L SiloCans supplied by the laboratory
Preservation:	Filling of sample containers as far as practicable to minimise headspace and low storage temperature to minimise the potential for volatilisation and biodegradation of petroleum hydrocarbon compounds prior to analysis.		Not required
Decontamination:	Disposable gloves were worn and changed between sample collection to prevent cross-contamination.	Groundwater samples were collected using dedicated disposable tubing / bailers, which was changed between monitoring well locations in order to prevent cross-contamination.	Disposable gloves were worn and changed between sample collection to prevent cross-contamination.
Transport:	Samples stored in dedicated sample boxes provided by the laboratory. Sample details and analytical requests were recorded on the laboratory chain of custody form included with samples, prior to dispatching to laboratory for analysis. Samples were, as far as practicable, dispatched to the laboratory on the day of sampling.		

## 5.8 Analytical Strategy

Data	Information
Laboratory:	ALcontrol (Chester)
Accreditation:	UKAS & MCerts (for selected chemical analysis) and ARCADIS Approved Supplier
Chemical analyses (soil):	<ul style="list-style-type: none"> <li>• Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) by Gas Chromatography-Flame Ionisation Detection (GC-FID);</li> <li>• Polycyclic Aromatic Hydrocarbon compounds (PAH) by Gas Chromatography-Mass Spectrometry (GC-MS);</li> <li>• Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX) and Methyl Tertiary Butyl Ether (MTBE) GC-MS;</li> <li>• Ethyl tertiary butyl ether (ETBE) by GC-MS Tentatively Identified Compounds (TICs);</li> <li>• Tert-butyl Alcohol (TBA);</li> <li>• Metals by ICP-OES including As, Be, Cd, Cr, Cu, Pb, Hg, Ni, V, Zn;</li> <li>• Asbestos;</li> <li>• pH; and</li> <li>• Total organic carbon (TOC).</li> </ul>
Chemical analyses (groundwater):	<ul style="list-style-type: none"> <li>• TPH CWG by GC-FID;</li> <li>• PAH by GC-MS;</li> <li>• BTEX and MTBE by GC-MS;</li> <li>• Dissolved metals by ICP-OES including As, Be, Cd, Cr, Cu, Pb, Hg, Ni, V, Zn;</li> <li>• Dissolved mercury;</li> <li>• pH;</li> <li>• ETBE as a VOC-TIC;</li> <li>• TBA by GC-FID; and</li> <li>• Volatile Organic Compounds (VOCs) by GC-MS.</li> </ul>
Chemical analysis (soil gas)	<ul style="list-style-type: none"> <li>• Speciated TPH CWG by GC-MS; and</li> <li>• MTBE, BTEX compounds and naphthalene by GC-MS.</li> </ul>

## 5.9 Quality Assurance and Quality Control (QA/QC)

The following measures were taken in order to ensure the quality of the laboratory data received from the laboratory:

Data	Information
Transportation:	A copy of the full chain of custody documentation was included with the samples as detailed in Appendix E.
Duplicate Sample:	Duplicate groundwater sample collected from BH104 and named BH200 and duplicate soil gas sample collected from S103 and named SG104.
Laboratory QA/QC:	Details of the ARCADIS laboratory quality assurance and quality control policy are given in Appendix F.

## 5.10 Hydraulic Conductivity Tests

Rising head permeability tests were performed in monitoring wells BH104 and BH106(D) to provide an estimate of the hydraulic conductivity of the underlying aquifer. The rising head tests were conducted in a manner whereby a slug of water was removed from the well and the groundwater recharge time was recorded at regular time intervals using a dip meter.

The recovery data was used to estimate the hydraulic conductivity by using the Bouwer and Rice method for a partially penetrating well in an unconfined aquifer.

The detailed methodology for the hydraulic conductivity tests and the results are presented in Appendix G.



## 6 SITE INVESTIGATION – RESULTS

### 6.1 Geology

Detailed borehole logs are presented in Appendix C.

Soil type/geologic unit	Maximum Depth (mbgl)	Description and Interpretation
Made Ground	0.9 (BH106)	Made ground comprises a mixture of sands, gravels and clay.
Upper (Pelaw) Clay	6.3 (BH105)	Sandy / gravelly CLAY.

The Pennine Middle Coal Measure Formation identified in the desk study (ARCADIS 2010) to underlie the Upper (Pelaw) Clay was not encountered beneath The Site.

### 6.2 Hydrogeology

Data	Findings
Range in depth to groundwater:	Groundwater depths are presented in Table 1.  Groundwater resting at depths of between 0.06m bgl (BH106(D)) and 3.1m bgl (BH101) on 2 March 2011 and between 0.36m bgl (BH105) and 2.87m bgl (BH101) on 22 March 2011.
Groundwater flow direction:	A groundwater elevation contour plot is provided as Figure 2.  The groundwater flow is interpreted to the northwest, towards the River Don.

### 6.3 Soil Quality

Data	Findings
Visual or Olfactory Evidence:	Black staining and hydrocarbon odour were noted on soils from borehole BH101A (0.4m-1m bgl). No other visual or olfactory evidence of hydrocarbon impact was identified during the drilling works. The visual and olfactory evidence is presented on borehole logs included in Appendix C.
NAPL:	No NAPL was identified during the drilling works.
Laboratory Analysis:	Results are presented in Table 2 to 4. Data from the laboratory is presented in Appendix H.

### 6.4 Groundwater Quality

Data	Findings
Visual or Olfactory Evidence:	No visual or olfactory evidence of hydrocarbon impact was identified during the groundwater monitoring works.

NAPL:	No measurable thickness of NAPL was observed within the monitoring well network during the groundwater monitoring visit.
Laboratory Analysis:	Results are presented in Table 5 to 8. Data from the laboratory is presented in Appendix H.
Duplicate Analysis:	The results of the laboratory analysis undertaken on the duplicate groundwater sample taken from borehole BH104 were comparable with the original sample.

## 6.5 Soil Gas Quality

Data	Findings
Monitoring Point Installation Leak Test Results:	The results of the monitoring point installation leak tests indicated drop in oxygen concentration. In addition, detectable concentrations of methane and carbon dioxide were recorded throughout the leak tests indicating that there is good evidence that the soil gas monitoring point installations are leak-tight at surface with limited potential for ambient air entrainment during soil gas sampling.
Laboratory Analysis:	Results are presented in Table 10. Data from the laboratory is presented in Appendix H.
Duplicate Analysis	The results of the laboratory analysis undertaken on the duplicate soil gas sample taken from soil gas point SG103 were comparable with the original sample.

## 6.6 Biogeochemical and Hydrogeochemical Parameters

The stabilised hydrogeochemical parameters are presented in Table 9.

## 6.7 Hydraulic Conductivity Testing

Hydraulic conductivities were calculated using Bouwer and Rice's method for a partially penetrating well in an unconfined aquifer. Rising head tests were conducted within monitoring wells BH104 and BH106(D).

The results of the rising head tests and details of the methodology, including data interpretation, are presented as Appendix G.

The groundwater recharge within monitoring well BH104 occurred before the first measurement of groundwater depth was taken. Therefore it is considered that the majority of the recharge was missed in this monitoring well, and as such the hydraulic conductivity could not be calculated.

The hydraulic conductivities estimated from the rising head tests conducted in monitoring well BH106(D) ranged between 0.11m/day and 0.12m/day.

## 7 GENERIC QUANTITATIVE RISK ASSESSMENT

### 7.1 Generic Assessment Criteria

The derivation of the ARCADIS GAC, to which the concentrations of the potential contaminants have been compared, is presented as Appendix I and the ARCADIS GAC for continued petroleum use (CPU) are presented as Appendix J.

Consideration has been given to comparison of the measured concentrations of CoC in soil and groundwater to the water resource GAC. The argument against comparison to the water resource GAC is that:

- The Site is located in an area of apparently limited water resource value, due to classification of Upper (Pelaw) Clay as an Unproductive Strata (proven to a depth of approximately 6.3m bgl); and,
- There is an absence of a surface water feature in close proximity to The Site.

However, it is noted that:

- The underlying aquifer has a measured hydraulic conductivity of approximately 0.1m/day, suggesting that groundwater migration could be occurring; and,
- The groundwater elevation data can be interpreted as showing a groundwater flow direction to northwest.

Given the arguments outlined above, ARCADIS considers that as a conservative measure, the measured CoC concentrations in soil and groundwater should be compared with the Set 1 water resource GAC but with further consideration given during the risk evaluation and updating of the CSM.

### 7.2 Comparison of Soil Analysis Results to GAC

The results of the soil generic quantitative risk assessment are detailed in Tables 2 to 4 and summarised below.

Receptor:	Boreholes with measured concentrations in excess of the GAC
Commercial workers	None identified
Neighbouring resident	None identified
Water resources	BH101, BH102, BH104 to BH106

### 7.3 Comparison of Groundwater Analysis Results to GAC

The results of the groundwater generic quantitative risk assessment are detailed in Tables 5 to 8 and summarised below.

Receptor:	Monitoring Wells with measured concentrations in excess of the GAC
Commercial workers	None identified
Neighbouring resident	None identified
Water resources *	BH102, BH104, BH104 Duplicate, BH105, BH106(S) and BH106(D).

\* With the exception of BH102 and BH106(S), the only identified exceedances of the GAC in groundwater were for metals. Metals were also measured at concentrations above the laboratory MDL in soil.

Generally metals exhibit low volatility and as such are unlikely to present an unacceptable level of risk *via* inhalation of vapours. On this basis, metals have not been considered to pose a significant risk to the human health receptors associated with The Site.

In groundwater, the results indicated exceedance of the low end of range value EQS for chromium, copper and zinc. However, none of the metal concentrations exceed the high end of range value EQS. Moreover, the measured concentrations of chromium, copper and zinc were at least an order of magnitude lower than the adopted high end of range EQS. On this basis the risk to water resources from measured metal concentrations in groundwater is not considered unacceptable.

## 7.4 Soil Gas Results and Evaluation

The results of the soil gas analyses are detailed in Table 10. Concentrations of petroleum hydrocarbon CoC were measured above their respective laboratory MDLs in each of the three soil gas samples (including the duplicate) collected during the soil gas monitoring visit.

There are no GAC for the assessment of the soil gas results; therefore further assessment of the results is required as detailed in the following sections.

### 7.4.1 Methodology

Following collection of soil gas quality data, it is possible to further assess the potential risk presented via vapour pathways. The focus of this assessment is on the vapour intrusion pathway (indoor air), as this is the critical pathway for vapour inhalation. Use of soil gas data removes some of the uncertainty when assessing vapour intrusion, as the partitioning/volatilisation from soil/groundwater to soil gas does not need to be modelled.

The non-statutory regulatory guidance consulted in undertaking this assessment, methodology and available modelling tools are presented in Appendix K.

The CLEA v1.06 model has been used to further assess the potential risks to the commercial workers within the on-site shop building, based on the CoC concentrations measured in soil gas. CLEA v1.06 can be used to determine the level of risk (Hazard Index) presented by the contaminant concentrations measured in different source media (including soil gas). Hazard indices above 1.0 indicate the potential for adverse health effects and suggest the need to undertake a further level of investigation or action. This form of “forward prediction” was incorporated in the soil gas risk assessment.

### 7.4.2 Model Input Parameters

#### Toxicological

Key chemical and toxicological properties for the CoC are presented in Appendix L.

Where possible toxicological data published by the EA and Department for Environment Food and Rural Affairs (DEFRA) has been used. In the absence of a suitable TOX report, ARCADIS has used the general method of selection outlined in EA (2009a)<sup>3</sup> to find a suitable alternative.

#### Physical and Building

Based on site data collected from beneath The Site, the unsaturated zone through which soil gas will migrate has been conceptualised as sand. Physical parameter values suitable for a sandy soil from EA (2009b) have been adopted. These are presented within Appendix M.

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<sup>3</sup> Environment Agency, 2009a. Human health toxicological assessment of contaminants in soil. Science Report SC050021/SR2.

The physical parameters of the on-site shop building have been calculated from site plans, and are also presented in Appendix M.

#### 7.4.3 Exposure

Exposure data has been derived to represent an on-site commercial worker (16-65 year-old female), selected in line with the Contaminated Land Exposure Assessment (CLEA) methodology.

A full listing of the exposure parameter values used in the risk assessment is presented in Appendix N. The exposure data are taken from guidance by the EA (2009b).

#### 7.4.4 Forward Prediction

The maximum on-site concentrations measured during sampling of all soil gas monitoring points were input into the CLEA v. 1.06 model and the associated Hazard Index calculated. The results are presented in Table 11, and indicate that none of the Hazard Indices exceed 0.00. As such, the results of the soil gas assessment are considered to indicate that the potential risk presented to on-site commercial workers via inhalation pathways is acceptable.

The CLEA output for the CPU model is presented as Appendix O.

### 7.5 Updated Conceptual Site Model

No concentrations of CoC in excess of GAC protective of human health were identified in either soil or groundwater samples. In addition the risk presented to on-site commercial workers *via* inhalation pathways (calculated based on the soil gas data) was considered acceptable. As such the risk to human health receptors associated with The Site is not considered to be significant.

There were exceedances of the ARCADIS GAC protective of water resource receptors in both soil and groundwater for aromatic hydrocarbons and PAH compounds. Ethylbenzene concentrations measured in soils (but not in groundwater) sampled from beneath The Site were also found to exceed ARCADIS GAC protective of water resource receptors along with aliphatic hydrocarbons in groundwater sampled from BH106(S). However, the primary route of the risk to water resources is *via* leaching and off-site migration of potentially contaminated groundwater. Given the limited potential for off-site migration of CoC in groundwater to result in impact to water resource receptors, as discussed in Section 7.1, and the fact that only Diesel Range Organic (DRO) hydrocarbon compounds and six PAH compounds with low solubility and mobility were identified in groundwater above the water resource GAC in two monitoring well locations, the risk to water resource receptors is not considered significant.

In addition, the shallow drift deposits encountered beneath The Site are considered to be of low permeability, based on the material encountered during the intrusive works and the results of the rising head tests. Furthermore, the drift deposits have been encountered to a depth of at least 6.3m bgl and as such, it is considered unlikely that the dissolved phase impacts will migrate significantly either vertically or laterally. This provides additional evidence to support the view that the risk to water resource receptors associated with The Site is low.

The updated Conceptual Site Model is presented as Figure 4.

## 7.6 Suitability For End Use

Following completion of the investigation and assessment as undertaken by ARCADIS in accordance with the current UK risk-based assessment methodology, ARCADIS considers the identified impacts to soil and groundwater beneath The Site, at the time of assessment, not to present an unacceptable level of risk to the identified off site receptors or to future site occupiers based on continued petroleum use. If The Site is to be redeveloped the assessment should be reviewed.

# TABLES

**Table 1  
Ground Level and  
Groundwater Elevations**

Monitoring Well	Surface Elevation (m ASD)	Depth to Groundwater (m bgl)	Depth to LNAPL (m bgl)	LNAPL Thickness (m)	Depth to Base (m bgl)	Groundwater Elevation (m ASD)
<b>Date</b>						
<b>02 March 2011</b>						
BH101	98.44	3.10	-	-	3.96	95.34
BH102	98.80	1.96	-	-	5.83	96.84
BH104	100.00	0.36	-	-	5.69	99.64
BH105	99.56	0.28	-	-	5.46	99.28
BH106 (S)	99.33	-	-	-	1.75	-
BH106 (D)	99.33	0.06	-	-	5.86	99.27
<b>Date</b>						
<b>22 March 2011</b>						
BH101	98.44	2.87	-	-	3.96	95.56
BH102	98.80	Monitoring well not dipped.				
BH104	100.00	0.48	-	-	5.94	99.52
BH105	99.56	0.36	-	-	4.23	99.20
BH106 (S)	99.33	0.76	-	-	1.87	98.57
BH106 (D)	99.33	0.76	-	-	5.61	98.57

**Notes:**

Boreholes surveyed relative to BH104 (March 2011).

- bgl      Below ground level.
- ASD      Above site datum.
- LNAPL      Light Non Aqueous Phase Liquid
- Not observed.
- (S)      Shallow well installation
- (D)      Deep well installation



Table 2  
Comparison of TPH, BTEX and Fuel Additive Concentrations in Soil (mg/kg) with ARCADIS Generic Assessment Criteria for CPU

Sample Identity Sample depth mbgl Sample date	Generic Assessment Criteria - CPU		Water Resources Set 1	February 2011													
	Human Health Petrol Filling Station Worker - Inhalation mg/kg	Neighbouring Resident mg/kg		BH101 1.25	BH101 5.5	BH102 1.5	BH102 2.5	BH104 0.5-0.7	BH104 1.5-1.6	BH105 1.8-1.9	BH105 2.8-2.9	BH106 3					
<b>Aliphatics</b>																	
C5-C6	212	ND	2.6	0.0161	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C6-C8	285	ND	5.3	0.0449	<0.01	<0.01	<0.01	0.0115	0.0173	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C8-C10	37	ND	22	0.0196	<0.01	<0.01	<0.01	<0.01	0.0127	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C10-C12	144	ND	144	0.0127	<0.01	<0.01	<0.01	<0.01	0.0138	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C12-C16	658	ND	ND	11.5	7.87	7.12	8.51	7.14	8.86	12.4	8.86	12.4	8.86	12.4	8.86	12.4	8.86
>C16-C35	NR	NR	ND	18.53	16.18	15.81	17.2	16.9	14.6	16.71	19.15	16.71	19.15	14.6	16.71	19.15	14.6
Total Aliphatics	NA	NA	NA	30.03	24.05	22.93	25.72	24.08	23.46	29.11	27.68	29.11	27.68	23.46	29.11	27.68	23.46
<b>Aromatics</b>																	
>EC8-EC10	51	144	0.9	0.0242	<0.01	<0.01	0.0242	0.015	0.0181	0.0125	<0.01	0.0181	0.0125	<0.01	0.0181	0.0125	<0.01
>EC10-EC12	268	ND	1.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC12-EC16	1,348	ND	2.6	3.54	7.17	7.01	5.21	4.77	38.3	10.7	7.52	38.3	10.7	7.52	38.3	10.7	7.52
>EC16-EC21	NR	NR	8.1	11.1	9.62	11.8	8.67	9.48	26.8	9.28	14.3	26.8	9.28	14.3	26.8	9.28	14.3
>EC21-EC35	NR	NR	ND	26.3	23.5	33.4	25.6	26.7	37	25.2	39.6	37	25.2	39.6	37	25.2	39.6
Total Aromatics	NA	NA	NA	6.52	40.29	52.21	39.50	40.97	102.12	45.19	61.42	102.12	45.19	61.42	102.12	45.19	61.42
TPH	NA	NA	NA	12.99	64.34	75.14	65.23	65.05	125.58	74.30	89.10	125.58	74.30	89.10	125.58	74.30	89.10
PRO	NA	NA	NA	0.14	<0.044	<0.044	0.0311	106.0138	<0.01	<0.01	<0.044	<0.01	<0.01	<0.044	<0.01	<0.01	<0.044
MTBE*	270	355	0.018	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
ETBE*	12	40	0.019	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TBA	3060	1080	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzene*	1.2	1.40	0.056	<0.009	<0.009	0.0106	0.0135	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Toluene*	2100	ND	0.16	0.0575	0.0114	0.0276	0.028	0.00951	0.0111	0.0145	0.0231	0.0111	0.0145	0.0231	0.0111	0.0145	0.0231
Ethylbenzene*	487	ND	0.11	0.00825	0.0346	0.143	0.0852	<0.004	0.017	0.0209	0.0682	0.017	0.0209	0.0682	0.017	0.0209	0.0682
Total Xylenes*	175	ND	0.17	0.1111	<0.014	<0.014	0.0235	<0.014	<0.014	<0.014	0.023	<0.014	<0.014	0.023	<0.014	<0.014	0.023

**Notes:**  
 Petrol Filling Station  
 Continued Petroleum Use  
 Petroleum Range Organics (C5-C12)  
 Total Petroleum Hydrocarbons. The sum of Aliphatics and Aromatics (C5-C35)  
 Methyl *tert*-Butyl Ether  
 Ethyl *tert*-Butyl Ether  
*tert* butanol  
 Benzene, Toluene, Ethylbenzene, Xylenes  
 metres below ground level  
 Analysed by Gas Chromatography Mass Spectrometry (GC-MS)  
 Less than the method detection limit, it is assumed that there is no significant risk  
 Results of modelling indicates pathway not considered to present a significant risk  
 Not applicable, multiple contaminants therefore no Generic Assessment Criteria derived  
 No appropriate inhalation reference dose identified during review of toxicological data  
 Target exceeds theoretical soil saturation limit. Concentrations above the soil saturation limit may indicate the presence of separate phase in soil, but does not necessarily present a risk  
 Exceeds the Generic Assessment Criteria for protection of water resources receptors

Table 3  
Comparison of PAHs Concentrations (mg/kg) in Soil with ARCADIS Generic Assessment Criteria for CPU

Sample Identify Sample depth mbgl	Generic Assessment Criteria - CPU									
	Human Health					Water Resources				
	Petrol Filling Station Worker - Inhalation		Neighbouring Resident			Set 1		CPU		
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Naphthalene	51	25	0.0421	0.131	0.042	0.0635	0.0631	0.0664	0.0789	0.0667
Acenaphthylene	2,838	ND	0.0152	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Acenaphthene	1.03E+04	ND	0.01	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Fluorene	9.61E+04	ND	0.0128	0.0254	<0.01	<0.01	0.0164	0.0214	0.0196	0.022
Phenanthrene	3.25E+05	ND	0.236	0.13	0.093	0.0853	0.0871	0.0933	0.121	0.103
Anthracene	7.21E+05	ND	0.0713	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
Fluoranthene	7.68E+04	ND	0.143	0.0359	0.0389	0.0371	0.0408	0.0399	0.0487	0.0384
Pyrene	4.55E+05	ND	0.1	0.04	0.0383	0.0411	0.0437	0.0479	0.058	0.0442
Benzo(a)anthracene	86	ND	0.0519	0.026	<0.014	0.0181	0.0231	0.0284	0.0414	0.0259
Chrysene	4,657	ND	0.074	0.0245	0.0166	0.0189	0.0223	0.0217	0.028	0.0224
Benzo(b)fluoranthene	1,162	ND	0.11	0.0366	0.0343	0.0405	0.0343	0.0378	0.0565	0.0386
Benzo(k)fluoranthene	1,733	ND	0.0315	<0.014	<0.014	<0.014	<0.014	<0.014	0.0197	<0.014
Benzo(a)pyrene	753	ND	0.038	0.0202	0.0183	0.0247	0.0282	0.0279	0.0417	0.027
Indeno(1,23cd)pyrene	997	ND	0.022	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Dibenz(o,ah)anthracene	93	ND	<0.023	<0.023	<0.023	<0.023	<0.023	<0.023	<0.023	<0.023
Benzo(g,h,i)perylene	1.0E+06	ND	0.0556	0.0365	0.0308	0.036	0.0383	0.0412	0.0539	0.0501
Total	NA	NA	1.02	0.51	0.31	0.37	0.40	0.43	0.57	0.44

Notes:

- PAH Polycyclic aromatic hydrocarbons
- CPU Continued Petroleum Use
- m bgl metres below ground level
- < Less than the method detection limit, it is assumed that there is no significant risk
- No water quality standard identified as suitable for deriving generic assessment criteria
- ND Results of modelling indicates pathway not considered to present a significant risk
- Italic Target exceeds theoretical soil saturation limit. Concentrations above the soil saturation limit may indicate the presence of separate phase in soil, but does not necessarily present a risk
- 1.23 Exceeds the Generic Assessment Criteria for protection of water resource receptors
- NA Not applicable, multiple contaminants therefore no Generic Assessment Criteria derived

Table 4  
Metal Concentrations (mg/kg), Asbestos, pH and TOC (%)

Sample Identity Sample depth mbl	Generic Assessment Criteria - CPU		Water Resources		February 2011												
	Human Health Neighbouring Resident	Water Resources	Set 1	Set 1	BH102	BH104	BH104	BH104	BH104	BH104	BH105	BH105	BH105	BH105	BH106	BH106	BH106
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Asenic	NVP	NA	NA	NA	3.63	4.5	4.5	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97
Barium	NVP	NA	NA	NA	283	199	199	214	214	214	214	214	214	214	214	214	214
Beryllium	NVP	NA	NA	NA	0.132	0.717	0.717	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium	NVP	NA	NA	NA	29.9	16.1	28.3	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9
Chromium	NVP	NA	NA	NA	19.2	22.5	17.8	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Copper	NVP	NA	NA	NA	19.2	22.5	17.8	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Lead	NVP	NA	NA	NA	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
Mercury	NVP	NA	NA	NA	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
Molybdenum	NVP	NA	NA	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	NVP	NA	NA	NA	33.5	17	30.6	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7
Vanadium	NVP	NA	NA	NA	30.5	27.5	28	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6
Zinc	NVP	NA	NA	NA	61.1	84.4	45.3	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5
Asbestos	NA	NA	NA	NA	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected
pH	NA	NA	NA	NA	8.45	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66
TOC	NA	NA	NA	NA	1.77	2.02	1.49	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Total Cyanide	NA	NA	NA	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Free Cyanide	NA	NA	NA	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:  
 CPU  
 NVP  
 m bgl  
 NA  
 ACM  
 TOC  
 Not applicable, no Generic Assessment Criteria derived.  
 not tested

Continued Petroleum Use  
 Contaminant has only a low vapour pressure in soil  
 Does not apply to elemental and organic mercury compounds  
 Metres below ground level  
 Less than the method detection limit  
 Not applicable, no Generic Assessment Criteria derived.  
 Not applicable, no Generic Assessment Criteria derived.  
 Not applicable, no Generic Assessment Criteria derived.  
 Not tested

Table 5  
Comparison of TPH, BTEX and Fuel Additive Concentrations in Groundwater (µg/l) with ARCADIS Generic Assessment Criteria for CPU

Sample Identity	Generic Assessment Criteria - CPU				BH102	BH104	Duplicate BH104	BH105	BH106(S)	BH106(D)
	Human Health		Water Resources							
	Petrol Filling Station Worker- Inhalation	Neighbouring Resident	Set 1							
Units	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	
<b>Aliphatics</b>										
C5-C6	>SOL	>SOL	50	<10	<10	<10	<10	<10	<10	<10
>C6-C8	>SOL	>SOL	50	<10	<10	<10	<10	<10	<10	<10
>C8-C10	>SOL	>SOL	50	<10	<10	<10	<10	<10	<10	<10
>C10-C12	>SOL	>SOL	50	<10	<10	<10	<10	<10	<10	<10
>C12-C16	>SOL	>SOL	50	<10	<10	<10	<10	<10	2,150	<10
>C16-C35	NR	NR	50	<10	<10	<10	<10	<10	3,128	<10
Total Aliphatics	NA	NA	NA	<10	<10	<10	<10	<10	5278	<10
<b>Aromatics</b>										
>EC8-EC10	>SOL	8.5E+03	50	<10	<10	<10	<10	<10	<10	<10
>EC10-EC12	>SOL	1.09E+04	50	<10	<10	<10	<10	<10	<10	<10
>EC12-EC16	>SOL	>SOL	50	<10	<10	<10	<10	<10	102	<10
>EC16-EC21	NR	NR	50	<10	<10	<10	<10	<10	225	<10
>EC21-EC35	NR	NR	50	<10	<10	<10	<10	<10	429	<10
Total Aromatics	NA	NA	NA	<10	<10	<10	<10	<10	756	<10
TPH	NA	NA	NA	<10	<10	<10	<10	<10	6,050	<10
PRO	NA	NA	NA	<10	<10	<10	<10	<10	<10	<10
MTBE*	5,500,000	3.1E+05	15	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
ETBE*	490,000	2.7E+04	13	<1	<1	<1	<1	<1	<1	<1
Terf-Butyl Alcohol	22,000,000	9.1E+05	12	<10	<10	<10	<10	<10	<10	<10
Benzene*	13,000	774	30	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
Toluene*	>SOL	>SOL	50	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
Ethylbenzene*	>SOL	1.55E+05	20	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Total Xylenes*	>SOL	4.1E+04	30	<5	<5	<5	<5	<5	<5	<5

**Notes:**

- PFS Petrol Filling Station
- CPU Continued Petroleum Use
- PRO Petroleum Range Organics (C5-C12)
- TPH Total Petroleum Hydrocarbons. The sum of Aliphatics and Aromatics (C5-C35)
- MTBE Methyl *tert*-butyl ether
- ETBE Ethyl *tert*-butyl ether
- BTEX Benzene, Toluene, Ethylbenzene, Xylenes
- \* Analysed by Gas Chromatography Mass Spectrometry (GC-MS)
- < Less than the method detection limit, it is assumed that there is no significant risk
- ND Results of modelling indicates pathway not considered to present a significant risk
- NR No appropriate inhalation reference dose identified during review of toxicological data
- >SOL Target acceptable risk not exceeded at theoretical solubility concentration
- NA Not applicable, multiple contaminants therefore no Generic Assessment Criteria derived.
- 1.23 Exceeds the Generic Assessment Criteria for protection of water resources.

Table 6  
 Comparison of PAH Concentrations in Groundwater (µg/l) with ARCADIS Generic Assessment Criteria for CPU

Sample Identify	Generic Assessment Criteria - CPU			Water Resources	BH102	BH104	Duplicate BH104	BH105	BH106 (S)	BH106 (D)
	On-site Commercial Worker	Neighbouring Resident	Set 1							
Sample date	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Naphthalene	>SOL	3.44E+03	10	0.702	0.148	0.111	<0.1	<0.1	25.1	0.274
Acenaphthylene	>SOL	>SOL	-	0.0582	<0.015	<0.015	<0.015	<0.015	16.8	0.0217
Acenaphthylene	>SOL	>SOL	-	0.0209	<0.011	<0.011	<0.011	<0.011	1.16	<0.011
Fluoranthene	>SOL	>SOL	-	0.354	<0.017	<0.017	0.0206	0.0206	56.5	0.0638
Anthracene	>SOL	>SOL	-	0.0914	<0.015	<0.015	<0.015	<0.015	14.2	<0.015
Phenanthrene	>SOL	>SOL	-	0.744	<0.022	<0.022	<0.022	<0.022	91.2	0.134
Fluorene	>SOL	>SOL	-	0.177	<0.014	<0.014	<0.014	<0.014	19.9	0.0575
Chrysene	>SOL	>SOL	-	0.211	<0.013	<0.013	<0.013	<0.013	31.9	0.0302
Pyrene	>SOL	>SOL	-	0.282	<0.015	<0.015	0.0177	0.0177	43.4	0.056
Benzo(a)anthracene	>SOL	>SOL	-	0.175	<0.017	<0.017	0.018	0.018	29	0.0254
Benzo(b)fluoranthene	>SOL	>SOL	0.025	0.139	<0.023	<0.023	<0.023	<0.023	37.2	<0.023
Benzo(k)fluoranthene	>SOL	>SOL	0.025	0.0965	<0.027	<0.027	<0.027	<0.027	30.9	<0.027
Benzo(a)pyrene	>SOL	>SOL	0.7	0.122	<0.009	<0.009	<0.009	<0.009	32.9	0.0159
Dibenzof(a,h)anthracene	>SOL	>SOL	-	0.0208	<0.016	<0.016	<0.016	<0.016	7.32	<0.016
Benzo(g,h,i)perylene	>SOL	>SOL	0.025	0.102	<0.016	<0.016	<0.016	<0.016	22.4	<0.016
Indeno(1,2,3-cd)pyrene	>SOL	>SOL	0.025	0.0707	<0.014	<0.014	<0.014	<0.014	19.1	<0.014
Total	NA	NA	NA	3.37	0.148	0.111	<0.1	<0.1	479	0.678

Notes:

- CPU Continued Petroleum Use
- PAH Polycyclic Aromatic Hydrocarbons
- < Less than the method detection limit, it is assumed that there is no significant risk
- No water quality standard identified as suitable for deriving generic assessment criteria
- >SOL Target acceptable risk not exceeded at theoretical solubility concentration
- NA Not applicable, multiple contaminants therefore no Generic Assessment Criteria derived.
- 1.23 Exceeds the Generic Assessment Criteria for protection of water resources.

Table 7  
Comparison of Metals Concentrations in Groundwater (µg/l) with  
ARCADIS Generic Assessment Criteria for CPU and pH Results

Sample Identity	Generic Assessment Criteria - CPU						BH102	BH104	Duplicate BH104	BH105	BH106 (S)	BH106 (D)
	Human Health			Water Resources								
	Petrol Filling Station Inhalation	Neighbouring Resident	Set 1									
Units	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Mercury	NA	NA	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	NVP	NVP	50	1.23	1.18	1.33	4.7	1.77	4.7	1.77	0.659	0.659
Beryllium	NA	NA	NA	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Cadmium	NVP	NVP	5	<0.1	<0.1	<0.1	<0.1	0.13	<0.1	0.13	<0.1	<0.1
Chromium	NVP	NVP	5 - 250	16.8	10.5	9.17	11	10.7	11	10.7	9.41	9.41
Copper	NVP	NVP	1 - 28	1.77	6.13	7.12	2.47	4.96	2.47	4.96	6.92	6.92
Lead	NVP	NVP	4 - 250	0.107	<0.02	<0.02	0.099	0.185	0.099	0.185	0.084	0.084
Molybdenum	NVP	NVP	70	37.2	4.32	5.46	14	nt	14	nt	9.07	9.07
Nickel	NVP	NVP	50 - 200	10.9	12.3	13.6	5.19	5.51	5.19	5.51	10.6	10.6
Vanadium	NVP	NVP	20 - 60	5.63	3.06	2.83	7.86	4.71	7.86	4.71	2.89	2.89
Zinc	NVP	NVP	8 - 500	3.02	37.5	37.4	1.43	6.93	1.43	6.93	6.94	6.94
pH	NA	NA	NA	8.35	8.64	8.63	8.66	8.09	8.66	8.09	8.52	8.52
Total Cyanide	NA	NA	NA	<50	<50	<50	<50	nt	<50	nt	<50	<50
Free Cyanide	NA	NA	NA	<50	<50	<50	<50	nt	<50	nt	<50	<50

**Notes:**

- 1.23 Exceeds the Generic Assessment Criteria for protection of water resources
- NVP Contaminant has only a low vapour pressure in soil
- NA Not applicable, all measured CoC concentrations below laboratory MDL.
- NA Not applicable, measured pH values considered to represent normal conditions.
- CPU Continued Petroleum Use
- < Less than the method detection limit, it is assumed that there is no significant risk
- nt not tested

Table 8  
Comparison of VOC Concentrations in Groundwater (µg/l) with  
ARCADIS Generic Assessment Criteria for CPU

Sample Identity	Generic Assessment Criteria - CPU			BH102	BH104	Duplicate BH104	BH105	BH106(D)
	Commercial Worker - Combined	Neighbouring Resident	Water Resources Set 1					
Units	µg/l	µg/l	µg/l	March 2011				
µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Dichlorodifluoromethane				<7	<7	<7	<7	<7
Chloromethane				<9	<9	<9	<9	<9
Vinyl chloride	1,300	93	0.5	<1.2	<1.2	<1.2	<1.2	<1.2
Bromomethane				<2	<2	<2	<2	<2
Chloroethane				<2.5	<2.5	<2.5	<2.5	<2.5
Trichlorofluoromethane				<1.3	<1.3	<1.3	<1.3	<1.3
1,1-Dichloroethene	200,000	14,000	30	<1.2	<1.2	<1.2	<1.2	<1.2
Carbon disulphide				<3.7	<3.7	<3.7	<3.7	<3.7
Dichloromethane				<3.7	<3.7	<3.7	<3.7	<3.7
1,1-Dichloroethane	560,000	34,000	2.4	<1.2	<1.2	<1.2	<1.2	<1.2
cis-1,2-Dichloroethene	46,000	2,800		<2.3	<2.3	<2.3	<2.3	<2.3
trans-1,2-Dichloroethene	93,000	5,700	50	<1.9	<1.9	<1.9	<1.9	<1.9
2,2-Dichloropropane				<3.8	<3.8	<3.8	<3.8	<3.8
Bromochloromethane				<1.9	<1.9	<1.9	<1.9	<1.9
Chloroform	150,000	8,400	12	<1.8	<1.8	<1.8	<1.8	<1.8
1,1,1-Trichloroethane	>SOL	220,000	100	<1.3	<1.3	<1.3	<1.3	<1.3
1,1,1-Dichloropropene				<1.3	<1.3	<1.3	<1.3	<1.3
Carbontetrachloride				<1.4	<1.4	<1.4	<1.4	<1.4
1,2-Dichloroethane	860	51	10	<3.3	<3.3	<3.3	<3.3	<3.3
Trichloroethene	31,000	1,800	10	<2.5	<2.5	<2.5	<2.5	<2.5
Tetrachloroethene	>SOL	23,000		<1.5	<1.5	<1.5	<1.5	<1.5
1,2-Dichloropropane				<3	<3	<3	<3	<3
Dibromomethane				<2.7	<2.7	<2.7	<2.7	<2.7
Bromodichloromethane				<0.9	<0.9	<0.9	<0.9	<0.9
cis-1,3-Dichloropropene				<1.9	<1.9	<1.9	<1.9	<1.9
trans-1,3-Dichloropropene				<3.5	<3.5	<3.5	<3.5	<3.5
1,1,2-Trichloroethane				<2.2	<2.2	<2.2	<2.2	<2.2
1,3-Dichloropropane				<2.2	<2.2	<2.2	<2.2	<2.2
Dibromochloromethane				<1.7	<1.7	<1.7	<1.7	<1.7
1,2-Dibromoethane				<2.3	<2.3	<2.3	<2.3	<2.3
Chlorobenzene				<3.5	<3.5	<3.5	<3.5	<3.5
1,1,1,2-Tetrachloroethane	43,000	4,800	20	<1.3	<1.3	<1.3	<1.3	<1.3
Styrene				<1.2	<1.2	<1.2	<1.2	<1.2
Bromoform				<3	<3	<3	<3	<3
Isopropylbenzene				<1.4	<1.4	<1.4	<1.4	<1.4
1,1,2,2-Tetrachloroethane				<5.2	<5.2	<5.2	<5.2	<5.2
1,2,3-Trichloropropane				<7.8	<7.8	<7.8	<7.8	<7.8
Bromobenzene				<2	<2	<2	<2	<2
Propylbenzene				<2.6	<2.6	<2.6	<2.6	<2.6
2-Chlorotoluene				<1.9	<1.9	<1.9	<1.9	<1.9
1,3,5-Trimethylbenzene				<1.8	<1.8	<1.8	<1.8	<1.8
4-Chlorotoluene				<1.9	<1.9	<1.9	<1.9	<1.9
tert-Butylbenzene				<2	<2	<2	<2	<2
1,2,4-Trimethylbenzene				<1.7	<1.7	<1.7	<1.7	<1.7
sec-Butylbenzene				<1.7	<1.7	<1.7	<1.7	<1.7
4-iso-Propyltoluene				<2.6	<2.6	<2.6	<2.6	<2.6
1,3-Dichlorobenzene				<2.2	<2.2	<2.2	<2.2	<2.2
1,4-Dichlorobenzene				<2.7	<2.7	<2.7	<2.7	<2.7
n-Butylbenzene				<2	<2	<2	<2	<2
1,2-Dichlorobenzene				<3.7	<3.7	<3.7	<3.7	<3.7
1,2-Dibromo-3-chloropropane				<9.8	<9.8	<9.8	<9.8	<9.8
1,2,4-Trichlorobenzene				<2.3	<2.3	<2.3	<2.3	<2.3
Hexachlorobutadiene				<2.5	<2.5	<2.5	<2.5	<2.5
tert-Amyl methyl ether (TAME)				<1	<1	<1	<1	<1
Naphthalene	>SOL	3.44E+03	10	<3.5	<3.5	<3.5	<3.5	<3.5
1,2,3-Trichlorobenzene				<3.1	<3.1	<3.1	<3.1	<3.1
1,3,5-Trichlorobenzene				<10	<10	<10	<10	<10

Notes:

GPU	Continued Petroleum Use
<	Less than the method detection limit, it is assumed that there is no significant risk
1.23	Exceeds the Generic Assessment Criteria for protection
>SOL	Target acceptable risk not exceeded at theoretical solubility concentration
	Generic Assessment Criteria has not been derived.

**Table 9  
Stabilised  
Hydrogeochemical Parameters In Groundwater**

Sample Identity	BH101	BH102	BH104	BH105	BH106 (S)	BH106 (D)
<b>Sample date</b>	<b>March 2011</b>					
Temperature (°C)		7.74	8.38	8.32		8.04
Conductivity (µScm <sup>3</sup> )		1,150	874	3,517		1,105
Dissolved Oxygen (mg/l)	*	0.45	0.22	3.38	*	0.39
pH		8.16	7.19	7.40		9.04
Oxygen Reducing Potential		-271.0	-143.5	-141.3		-281.2

\* Parameters not recorded as grab sample taken due to poor recharge



**Table 10**  
**Summary of TPH and BTEX Concentrations in Soil Gas ( $\mu\text{g}/\text{m}^3$ )**

Sample Identity	SG101	SG102	SG103	Duplicate SG103
Sample Date	March 2011			
Units	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Aliphatic >C4-C6	<33	<33	<33	<33
Aliphatic >C6-C8	<41	<41	<41	<41
Aliphatic >C8-C10	<53	<53	<53	<53
Aliphatic >C10-C12	<65	<65	<65	<65
Aromatic >C8-C10	64	79	98	69
Aromatic >C10-C12	186	335	239	245
Naphthalene	<52	<52	<52	<52
Methyl tertiary butyl ether	<5.4	296	<5.4	<5.4
Benzene	<4.8	8.9	<4.8	<4.8
Toluene	186.1	374.9	378.7	248.7
Ethylbenzene	11.3	12.2	13	10.4
Sum Xylenes	47.8	59.1	78.6	51.2

**Table 11  
Soil Gas Assessment  
Results**

Simonside Service Station  
Environmental Site Assessment Report  
937490203\_01 / April 2011

Sample Identity	Maximum Measured Concentration	Hazard Indices
Sample date	March 2011	
	$\mu\text{g}/\text{m}^3$	
<b>Aliphatics</b>		
>C4-C6	<33	-
>C6-C8	<41	-
>C8-C10	<53	-
>C10-C12	<65	-
<b>Aromatic</b>		
>EC8-EC10	98	0.00
>EC10-EC12	335	0.00
MTBE	296	0.00
Benzene	8.9	0.00
Toluene	378.7	0.00
Ethylbenzene	13	0.00
Total Xylenes	78.6	0.00
Naphthalene	<52	-

**Notes:**

- < Less than laboratory method detection limit
- CoC not measured above laboratory method detection limit, therefore no hazard indice calculated.

# FIGURES



**Site Location**

VEHICLE FERRY FROM NEWCASTLE  
Amsterdam 16

REPRODUCED FROM OS 1:50,000 SCALE BY PERMISSION OF ORDNANCE SURVEY® ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 100020449. CONTACT ARCADIS UK IN CASE ANY QUERY

TITLE : **SITE LOCATION PLAN**

SITE : **SIMONSIDE SERVICE STATION**

CLIENT : **ESSO PETROLEUM COMPANY LTD**

PROJECT : **93749.02**      **FIGURE 1**

DATE : 17/03/11      DRAWN BY : ASZ

DRG No : 937490206.apr / SLP

SCALE : 1 : 50,000      PRINT : A4

**LEGEND**

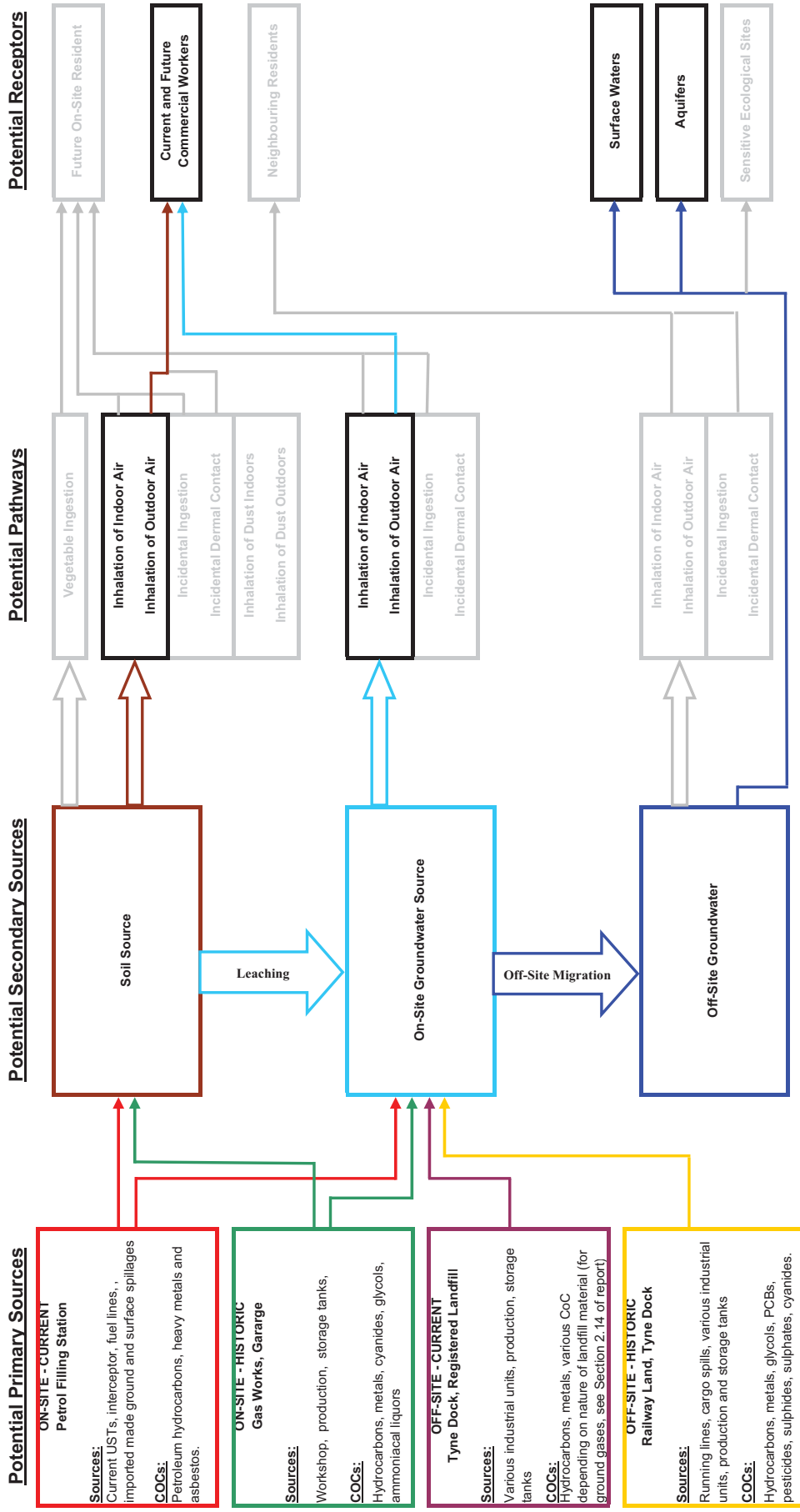
- SITE LOCATION

**NOTES**



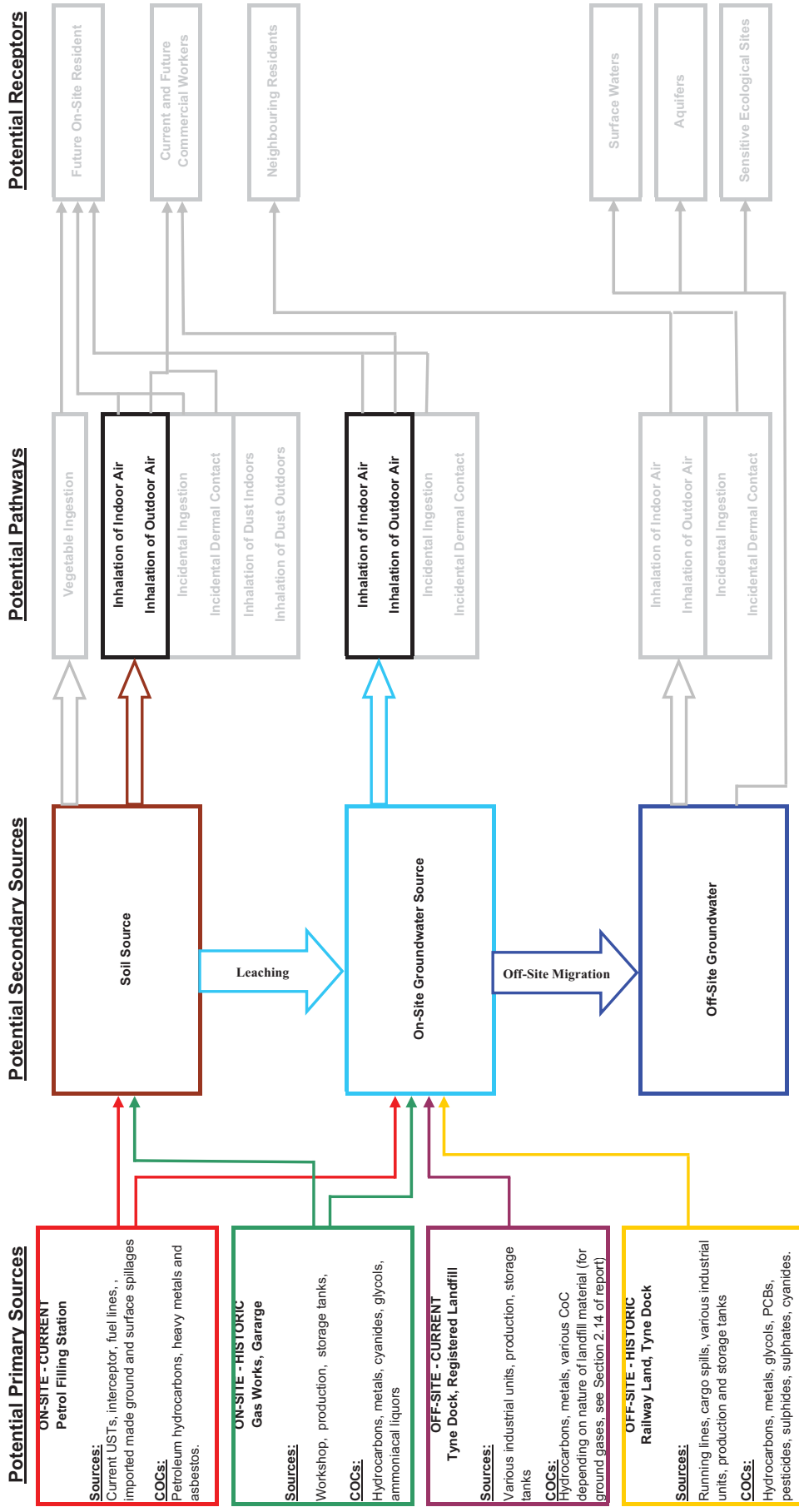
DISCLAIMER	NOTES	KEY	REV	DATE	COMMENT	CAD
<p>NOTE: THE LOCATIONS OF ANY UNDERGROUND SERVICES SHOWN ON THIS DRAWING HAVE BEEN DETERMINED USING ELECTRO-MAGNETIC TECHNIQUES AND VISUAL OBSERVATIONS. THIS DRAWING HAS BEEN CREATED FROM AN ELECTRONICALLY SURVEYED BASE PLAN. THE LIMITATIONS OF THIS DRAWING SHOULD BE RECALSED AND NO GUARANTEE CAN BE GIVEN THAT ALL SERVICES HAVE BEEN IDENTIFIED. ANY AMENDMENTS TO THE SITE LAYOUT AFTER THE ISSUE OF THIS DRAWING WILL MAKE THIS DRAWING INVALID. THIS DRAWING SHOULD BE CROSS CHECKED AGAINST UTILITY SERVICE PROVIDER PLANS IF USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TANKS, PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE.</p> <p>CONTACT ARCHDES UNLESS IN CASE OF ANY QUERY</p>	<p><b>NOTES</b></p> <p>BASED ON DRAWING BY AMETHYST SURVEYS LTD. DRAWING No: 7998-REVA DATE: 31/08/10</p>	<p><b>KEY</b></p> <p>  PILLAR   DO NOT DRILL   CRITICAL AREA   SCAR OUTLINE   TANK * - W=WATER F=FOAM P=PRODUCT   BOREHOLE LOCATION   SOIL GAS MONITORING POINTS   GROUNDWATER ELEVATION (mASD) - 99.99   GROUNDWATER ELEVATION (mASD) - 99.99   INFERRED GROUNDWATER FLOW DIRECTION </p>				
					<p>TITLE: SITE LAYOUT, BOREHOLE LOCATION AND GROUNDWATER ELEVATION PLAN</p> <p>SITE: SIMONSDIE SERVICE STATION</p>	
					<p>PROJECT: 93749.02</p> <p>CLIENT: ESSO PETROLEUM COMPANY LTD</p> <p>FIGURE 2</p>	
					<p>DATE: 17/03/11</p> <p>DRAWN BY: BNB</p> <p>DRG.No.: 937490205-CAD</p>	
					<p>PRINT: A3</p> <p>REV: -</p>	
					<p><b>ARCADIS</b> Infrastructure · Water · Environment · Buildings Tel +44 (0) 1638 674767 www.arcadis-uk.com</p>	

Figure 3  
 Outline Conceptual Site Model - Continued Petroleum End-use



Key: — Pollutant linkage not considered to present a significant level of risk

Figure 4  
 Updated Conceptual Site Model - Continued Petroleum End-use



Key: — Pollutant linkage not considered to present a significant level of risk

# APPENDICES



Appendix A  
Legislative Context and Regulatory Guidance

## APPENDIX A Legislative Context and Regulatory Guidance

Land contamination is generally dealt with by the following types of regulation:

- Acts of Parliament to investigate and remedy harm caused by land contamination;
- Conditions placed upon Planning Permissions for the redevelopment of land; and,
- Acts of Parliament and Regulations for the control of waste.

In England land contamination is identified and dealt with through Acts / Regulations including:

- [The Contaminated Land \(England\) Regulations \(2006\)](#);
- [Part IIA of the Environmental Protection Act \(1990\)](#);
- [The Environment Act 1995](#);
- [The Town and Country Planning Act \(1990\)](#);
- [The Environmental Permitting \(England and Wales\) Regulations \(2007\)](#);
- [The Water Resources Act \(1991\)](#);
- [The Water Act \(2003\)](#);
- [The Environmental Damage \(Prevention and Remediation\) Regulations 2009](#); and,
- [The Groundwater \(England and Wales\) Regulations \(2009\)](#).

### Part IIA of the Environmental Protection Act 1990

Part IIA of the Environmental Protection Act 1990 (which was inserted by Section 57 of the Environment Act 1995) created a regime for the identification and remediation of contaminated land. Section 78A(2) of the Environmental Protection Act 1990 defines contaminated land for the purposes of Part IIA as:

*'any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that;*

- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or*  
*(b) pollution of controlled waters is being, or is likely to be caused.'*<sup>4</sup>

Harm is defined under section 78A of the Environmental Protection Act as meaning 'harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property'. Types of harm are related to specific receptors in order to determine whether they can be regarded as "significant", as defined in Table A of Annex 3 of the DEFRA (2006)<sup>5</sup> statutory guidance.

Part IIA sets the definition of contaminated land within the context of the 'suitable for use' approach. The legal definition of contaminated land is also discussed within Statutory Guidance released by DEFRA (2008)<sup>6</sup>.

The government has recognised the following objectives with regard to contaminated land for England (DEFRA, 2006):

- *to identify and remove unacceptable risks to human health and the environment from contaminated land,*
- *to reduce the pressure on green field land and to encourage the reuse of land that may have been subject to potentially contaminative uses, and*
- *to seek to ensure a proportionate, manageable and economically sustainable approach to the cost burdens faced by individuals, companies and society as a whole.'*

<sup>4</sup> Definition to be amended to "significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused" under the Water Act 2003

<sup>5</sup> [Environmental Protection Act 1990: Part 2A. Contaminated Land. DEFRA Circular 01/2006](#)

<sup>6</sup> [Guidance on the legal definition of contaminated land. DEFRA July 2008](#)

The 'suitable for use' approach underlies these objectives, and is based on the principles of risk assessment, including the concept of the 'pollutant linkage'.

In the event that there are unacceptable levels of risk posed by a site, a remediation notice can be served under the contaminated land regime introduced under Part IIA of the Environmental Protection Act 1990.

### **Regulation of Development on Land Affected by Contamination**

Management of risks from contamination in development of land is also regulated in the England under the Town and Country Planning Act 1990. Land contamination is a material planning consideration within this planning regime. The Local Planning Authority may impose conditions on the development during planning that include preliminary risk assessment, site investigation, risk assessment and remediation. The Environment Agency may use its role as a statutory consultee to provide the Local Planning Authority with advice.

Assessment of risk is again based on the pollutant linkage concept. The aim of risk management in the development should be to render the land suitable for the proposed use and, therefore, to prevent consideration of The Site under Part IIA.

ODPM Planning Policy Statement 23 (PPS23): Planning and Pollution Control and its Annex 2: Development on Land Affected by Contamination provides guidance on the relationship between development and the management of risks from land contamination caused by historical use. The Building Regulations 2000, made under the Building Act 1984, also require measures to be taken to protect new buildings and their occupants from the effects of contamination. Guidance on the requirements is provided in Approved Document C - Site preparation and resistance to contaminants and moisture, published by ODPM in 2004.

### **Voluntary Remediation Action**

Voluntary remediation action on contamination resulting from historical activities can often anticipate future remediation requirements, such as through the Planning regime, and is encouraged (DEFRA, 2006), especially where The Site is not being assessed under Part IIA.

### **Environmental Damage**

The Environmental Damage (Prevention and Remediation) Regulations 2009 came into force on 1<sup>st</sup> March 2009 to implement EC Directive 2004/35 on environmental liability with regard to the prevention and remedying of environmental damage.

These Regulations do not apply retrospectively; environmental damage that took place before the Regulations came into force (1<sup>st</sup> March 2009), or damage that takes place (or is likely to take place) after that date but is caused by an incident, event or emission that occurred before that date are exempt from the requirements of the Regulations.

The Regulation is concerned with preventing environmental damage. It requires that all operators of activities that cause an imminent threat of environmental damage to take all reasonably practical steps to prevent the damage. Where damage has already been caused, the operator must take all reasonably practical steps to prevent further damage from occurring.

### Non-statutory regulatory technical guidance documents

The non-statutory regulatory technical guidance for England on the assessment of land contamination, primarily released as part of the Contaminated Land Exposure Assessment (CLEA) methodology (DEFRA and EA) has recently been updated. The following documents currently present guiding principles in investigating and assessing potentially contaminated land, which are generally adopted in considering sites within any of the legal frameworks discussed above, or when considering voluntary remediation action:

- *Investigation of potentially contaminated sites – Code of Practice* (British Standard 10175: 2001).
- *Contaminated Land Report CLR11 Model Procedures for the Management of Land Contamination*. (DEFRA and EA, 2004).
- *Human health toxicological assessment of contaminants in soil* Environment Agency Science Report SC050021/SR2 (EA, 2009)
- *Updated technical background to the CLEA model* Environment Agency Science Report SC050021/SR3 (EA, 2009)
- *Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values* Environment Agency Science Report SC050021/SR7 (EA, 2008)
- *An ecological risk assessment framework for contaminants in soil*. Environment Agency Science Report SC070009/SR1 and related reports S2a-e
- *Groundwater Protection: Policy and Practice*, Environment Agency GP3 Parts 1-4
- *Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination* (EA of England and Wales, 2006) developed in consultation with the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Heritage and Environment Service.
- *Assessing risks posed by hazardous ground gases to buildings* Report C665 (CIRIA, 2007)
- *BS 8485:2007 Code of practice for the characterization and remediation from ground gas in affected developments*(British Standards Institution, 2007)
- *Risk Based Corrective Action (RBCA) Methodology* (ASTM designation E1739-95, E2081-00).
- *DoE Industry Profiles*

Appendix B  
ARCADIS' Study Limitations

## APPENDIX B ARCADIS' Study Limitations

**IMPORTANT.** This appendix should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

- 1 This report has been prepared by ARCADIS (UK) Limited ('ARCADIS'), with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with Esso Petroleum Company Limited (the 'Client'). ARCADIS does not accept responsibility for any matters outside the agreed scope.
- 2 This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.
- 3 Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. ARCADIS are unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.
- 4 All work carried out in preparing this report has used, and is based on, ARCADIS' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which ARCADIS is aware, have been considered. Following delivery of the report, ARCADIS have no obligation to advise the Client or any other party of such changes or their repercussions.
- 5 This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.
- 6 Whilst this report and the opinions made are correct to the best of ARCADIS' belief, ARCADIS cannot guarantee the accuracy or completeness of any information provided by third parties.
- 7 This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have been received.
- 8 This report refers, within the limitations stated, to the condition of The Site at the time of the inspections. No warranty is given as to the possibility of changes in the condition of The Site since the time of the investigation.
- 9 The content of this report represents the professional opinion of experienced environmental consultants. ARCADIS does not provide specialist legal or other professional advice. The advice of other professionals may be required.
- 10 Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of The Site have not been investigated.
- 11 If below ground intrusive investigations have been conducted as part of the scope, safe location of exploratory holes has been carried out with reference to the Esso Subsurface Clearance Procedure. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on Site."
- 12 Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

Appendix C  
Borehole Logs

Site: Simonside Service Station	Location: Newcastle Road, South Shields	Ground Level (mASD):98.44	Hole Diameter (mm): 300	Scale 1:40
Client: Esso Petroleum Company Ltd		Easting: 435230 Northing: 564710	Well Diameter (mm): 50 Filter Material: Sand	Logged by: CM
Project: 93749.02	Date: 16/02/2011	Method: Vacuum Excavation / Percussive Sampling (Commacchio)		Checked by: B Raine







STRATA RECORD		IN SITU TESTS / SAMPLES							Sheet 1 of 1	
Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	PPT (kPa)	SPT N Value	Well Details	Water Level
MADE GROUND: Block paving		0.08	98.36							
MADE GROUND: Light brown gravelly SAND.		0.14	98.30							
MADE GROUND: Yellow brown sandy GRAVEL. Gravel included some cobbles.		0.45	97.99							
Stiff brown slightly gravelly CLAY. Gravel included some cobbles. Boulder at 0.8mbgl.				D	1.00	<1				1
				D	1.25	<1				
Very stiff at 1.5 mbgl.										2
				D	2.50	<1				
Occasional coal fragments at 2.5mbgl.										
				D	3.50	<1				
				D	4.50	<1				
				D	5.50	<1				
End of Borehole at 6.00 m		6.00	92.44							6

- Key:
- D Disturbed Sample      PPT Pocket Penetrometer Test
  - B Bulk Sample            PID Photoionisation Detector
  - U Undisturbed Sample   SPT Standard Penetration Test (Uncorrected)
  - J Jar Sample
  - ∇ Water Strike
  - ▼ Standing Water Level

Remarks: No groundwater encountered during drilling. Hole Diameter 300mm to 0.4m then 100mm to 6.0m. Groundwater resting at 3.10m bgl on 02/03/11.



Site: Simonside Service Station	Location: Newcastle Road, South Shields	Ground Level (mASD):	Hole Diameter (mm): 300	Scale 1:40
Client: Esso Petroleum Company Ltd		Easting: 435230 Northing: 564710	Well Diameter (mm):	Logged by: CM
Project: 93749.02	Date: 27/01/2011	Method: Vacuum Excavation		Checked by: B Raine














































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Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	PPT (kPa)	SPT N Value	Well Details	Water Level
MADE GROUND: Block paving		0.08								
MADE GROUND: Brown medium to coarse SAND		0.11								
MADE GROUND: Light brown medium to coarse sandy GRAVEL. Gravel is angular to subrounded quartz brick concrete.		0.30		D	0.40	4.8				
MADE GROUND: Yellow brown clayey sandy GRAVEL. Gravel included some cobbles. Black staining and hydrocarbon odour noted.		0.40								
Yellow brown clayey sandy GRAVEL. Gravel included some cobbles. Black staining and hydrocarbon odour noted.		1.00		D	0.90-1.00	130				1
Yellow brown clayey sandy GRAVEL with cobble. Black stained hydrocarbon odour. Black very clayey GRAVEL with some crushed clay pipe with occasional brick fragments. Lead pipe at 0.9m, steel fragments at 1.0m. Borehole backfilled.										2
End of Borehole at 1.00 m										3
										4
										5
										6
										7



Key:

D	Disturbed Sample	PPT	Pocket Penetrometer Test
B	Bulk Sample	PID	Photoionisation Detector
U	Undisturbed Sample	SPT	Standard Penetration Test
J	Jar Sample		(Uncorrected)
∇	Water Strike		
▼	Standing Water Level		




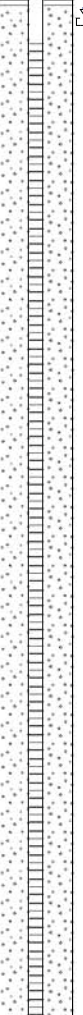




Remarks: Borehole terminated due to drilling refusal. Borehole backfilled and made safe.

Site: Simonside Service Station	Location: Newcastle Road, South Shields	Ground Level (mASD): 98.80	Hole Diameter (mm): 300	Scale 1:40
Client: Esso Petroleum Company Ltd		Easting: 435230 Northing: 564710	Well Diameter (mm): 50 Filter Material: Sand	Logged by: CM
Project: 93749.02	Date: 27/01/2011	Method: Vacuum Excavation / Percussive Sampling (Commacchio)		Checked by: B Raine



STRATA RECORD		IN SITU TESTS / SAMPLES							Sheet 1 of 1	
Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	PPT (kPa)	SPT N Value	Well Details	Water Level
MADE GROUND: Block paving		0.08	98.72							
MADE GROUND: Brown medium to coarse SAND		0.11	98.69							
MADE GROUND: Light brown, medium to coarse sandy GRAVEL. Gravel is angular to subrounded quartz concrete and rare brick		0.30	98.50	D	0.30-0.45	<1				
MADE GROUND: Yellow brown slightly clayey sandy GRAVEL with cobbles.		0.45	98.35							
Firm to soft brown gravelly CLAY.										
				D	1.50	<1				1
										
				D	2.50	<1				2
										
				D	3.50	<1				3
										
Poor sample recovery from 3.50 to 4.70 mbgl.				D	4.50	<1				4
										
				D	5.50	<1				5
										
				D	6.00	<1				6
End of Borehole at 6.00 m										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										
										

<b>Key:</b> D Disturbed Sample    PPT Pocket Penetrometer Test B Bulk Sample        PID Photoionisation Detector U Undisturbed Sample    SPT Standard Penetration Test (Uncorrected) J Jar Sample  Water Strike  Standing Water Level	<b>Remarks:</b> No obvious groundwater strike during drilling. Hole Diameter 300mm to 0.7m then 100mm to 6.0m. Groundwater resting at 1.96m bgl on 02/03/11.
---	--

Site: Simonside Service Station	Location: Newcastle Road, South Shields	Ground Level (mASD):100.00	Hole Diameter (mm): 300	Scale 1:40
Client: Esso Petroleum Company Ltd		Easting: 435230 Northing: 564710	Well Diameter (mm): 50 Filter Material: Sand	Logged by: JF
Project: 93749.02	Date: 13/02/2011	Method: Vacuum Excavation / Percussive Sampling and Rock Coring (Commacchio)		Checked by: B Raine

STRATA RECORD		IN SITU TESTS / SAMPLES							Sheet 1 of 1	
Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	PPT (kPa)	SPT N Value	Well Details	Water Level
MADE GROUND: Soft to firm brown sandy CLAY with some roots		0.00	99.70	D	0.00-0.30					
MADE GROUND: Yellow firm to coarse SAND.		0.30	99.50	D	0.30-0.50					
Firm to stiff brown gravelly CLAY with occasional cobble. Gravel is fine to coarse, rounded.		0.50			0.50-0.70					1
Firm grey slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded.		1.50	98.50	D	1.50-1.60					2
					1.80-2.00					3
					2.50-2.60				4	
Firm grey gravelly CLAY. Gravel is fine to coarse with occasional sandstone cobbles.		5.80	94.20						5	
End of Borehole at 6.00 m		6.00	94.00						6	
									7	

Key:

D	Disturbed Sample	PPT	Pocket Penetrometer Test
B	Bulk Sample	PID	Photoionisation Detector
U	Undisturbed Sample	SPT	Standard Penetration Test
J	Jar Sample		(Uncorrected)
	Water Strike		
	Standing Water Level		

Remarks: Groundwater strike at 0.4m bgl during vacuum excavation. Hole Diameter 300mm to 4.0m then 100mm to 6.0m. Groundwater resting at 0.36m bgl on 02/03/11.

Site: Simonside Service Station	Location: Newcastle Road, South Shields	Ground Level (mASD):99.56	Hole Diameter (mm): 300	Scale 1:40
Client: Esso Petroleum Company Ltd		Easting: 435230 Northing: 564710	Well Diameter (mm): 50 Filter Material: Sand	Logged by: CM
Project: 93749.02	Date: 27/01/2011	Method: Vacuum Excavation / Percussive Sampling (Commacchio)		Checked by: B Raine



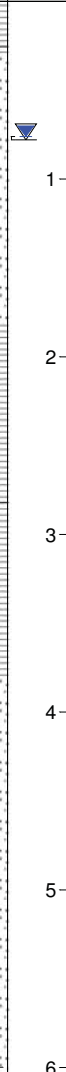




STRATA RECORD		IN SITU TESTS / SAMPLES							Sheet 1 of 1	
Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	PPT (kPa)	SPT N Value	Well Details	Water Level
MADE GROUND: Bituminous surfacing		0.08	99.48							
MADE GROUND: Concrete		0.18	99.38	D	0.25-0.40	<1				
MADE GROUND: Light brown yellow sandy GRAVEL. Gravel is subangular to subrounded quartz and brick. Sand is medium to coarse.		0.38	99.18	D	0.40-0.60	<1				
Stiff brown slightly gravelly CLAY. Gravel included some cobbles.										
Firm to stiff grey slightly gravelly CLAY.		1.50	98.06	D	1.80-1.90					
				D	2.80-2.90					
Firm to stiff grey gravelly CLAY. Gravel is fine to coarse subrounded to subangular sandstone with occasional coal fragments.		3.00	96.56	D	3.80-4.00					
Firm to stiff grey gravelly CLAY. Gravel is medium to coarse sandstone with occasional sandstone cobbles.		5.30	94.26							
End of Borehole at 6.30 m		6.30	93.26							

Key:



D	Disturbed Sample	PPT	Pocket Penetrometer Test
B	Bulk Sample	PID	Photoionisation Detector
U	Undisturbed Sample	SPT	Standard Penetration Test
J	Jar Sample		(Uncorrected)
	Water Strike		
	Standing Water Level		

Remarks: Groundwater strike at 0.78m bgl during vacuum excavation. Hole Diameter 300mm to 3.0m then 100mm to 6.0m. Groundwater resting at 0.28m bgl on 02/03/11.

Site: Simonside Service Station	Location: Newcastle Road, South Shields	Ground Level (mASD): 99.33	Hole Diameter (mm): 300	Scale 1:40
Client: Esso Petroleum Company Ltd		Easting: 435230 Northing: 564710	Well Diameter (mm): - Filter Material: Sand	Logged by: CM / GC
Project: 93749.02	Date: 27/01/2011	Method: Vacuum Excavation / Percussive Sampling (Commacchio)		Checked by: B Raine

STRATA RECORD		IN SITU TESTS / SAMPLES							Sheet 1 of 1	
Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	PPT (kPa)	SPT N Value	Well Details	Water Level
MADE GROUND: Block paving		0.08	99.25							
MADE GROUND: Light brown medium to coarse SAND.		0.10	99.23	D	0.20-0.60	<1				
MADE GROUND: Light brown yellow medium to coarse sandy GRAVEL. Gravel is angular to subrounded brick, concrete and quartz.		0.60	98.73	D	0.60-0.80					
MADE GROUND: Yellow brown sandy GRAVEL with cobbles.		0.90	98.43	D	1.00-1.25	<1				
Stiff brown slightly gravelly CLAY. Gravel includes some cobbles.				D	2.00	<1				
				D	3.00	<1				
Cobbles encountered at 3.35mbgl.				D	4.00	<1				
Becoming very stiff from 4.00mbgl.				D	5.50	<1				
Cobbles encountered at 5.10mbgl.				D						
End of Borehole at 6.00 m		6.00	93.33							

Key:

D	Disturbed Sample	PPT	Pocket Penetrometer Test
B	Bulk Sample	PID	Photoionisation Detector
U	Undisturbed Sample	SPT	Standard Penetration Test
J	Jar Sample		(Uncorrected)
	Water Strike		
	Standing Water Level		

Remarks: No groundwater encountered during drilling. Hole Diameter 300mm to 0.9m then 100mm to 6.0m. Groundwater resting in both shallow and deep wells at 0.76m bgl on 22/03/11.

Appendix D  
Waste Disposal Documentation

**APPENDIX D**  
**Waste Disposal Documentation**

Waste transfer documentation is provided on the following page. Documentation from the receiver of the waste will be kept on file.

2074161

000002492 130 1000002492 130  
000002492 130 1000002492 130  
000002492 130 1000002492 130  
000002492 130 1000002492 130  
000002492 130 1000002492 130

# ALEX SMILES LTD.

## WASTE RECYCLING LOGISTICS

[Booking No] 1000002492131

DEPTFORD TERRACE, DEPTFORD, SUNDERLAND, SK4 6DD  
E-MAIL: SALES@ALEXSMILES.CO.UK

TEL: (0181) 567 4658 FAX: (0181) 567 0847  
WEB SITE: WWW.ALEXSMILES.CO.UK

### Duty of Care - Skip Delivery Note / Waste Transfer Note

Duty of Care valid from 28/01/2011 to 28/01/2012  
Quantity of less than 1000 tonnes per annum

Order No: 4101645

Account No: SK001

Delivery Date: 28/01/2011

Head Office:  
Skippy Nationwide Ltd.

Broker:

Delivery Address:

Nationwide House  
Stafford Park 7  
Tel: [redacted]  
Shropshire

Arcadis UK Ltd  
Simonside Service Station  
Newcastle Road  
South Shields  
NE34 9QE

No Permit

Booking Ref	Operation	Approx Weight	Qty	Skip Type	Waste Type
249213	Del	0	1	Mini Skip	Mixed Construction & Dem 17-09-04

Special instructions:

Description	Code	Description	Code	Description	Code
Bricks	17-01-02	Mixed Con & Demo	17-09-04	Property Maintenance	20-03-07
Bulky Waste	20-03-07	Mixed Metals	17-04-07	Shop Fit & Wood Man	03-01-05
Canteen Waste	20-01-08	Mixed Packaging	15-01-06	Soils & Stones	17-05-04
Cardboard Const	15-01-01	Plasterboard	17-08-02	Iarmac	17-03-02
Green Waste	20-02-01	Plastic Packaging	15-01-02	Timber-Construction	17-02-01
Hardcore	17-01-07	Private Household	20-03-00	Trade Waste	20-03-01

Driver Signature

Waste Carriers No: TWR 836494

Print Name *Tom Pugh*

Customer Signature

Print Name *John Pugh*

Date *28/01/11*

Disposer Signature

Waste Disposal Point:

Alex Smiles Ltd EAWML 64044

Print Name *Kevin Cobb*

Refer to conditions overleaf

INVOICE 3061788



2074161

000002492 1301000002492 1301  
000002492 1301000002492 1301  
000002492 1301000002492 1301  
000002492 1301000002492 1301  
000002492 1301000002492 1301

# ALEX SMILES LTD.

## WASTE RECYCLING LOGISTICS

(Booking No) 100000249213)

DEPT FORD TERRACE, DEPT FORD, SUNDERLAND, SR4 6DD  
E-MAIL: SALES@ALEXSMILES.CO.UK

TEL: (0191) 567 4058 FAX: (0191) 567 0847  
WEB SITE: WWW.ALEXSMILES.CO.UK

### Duty of Care - Skip Delivery Note / Waste Transfer Note

Duty of Care valid from 28/01/2011 to 28/01/2012  
Quantity of less than 1000 tonnes per annum

Order No: 4101545

Account No: SK001

Delivery Date: 28/01/2011

Head Office:  
Skippy Nationwide Ltd.  
Nationwide House  
Stafford Park 7  
Tel: 0191 567 4058  
Shropshire

Broker:

Delivery Address:  
Arcadis UK Ltd  
Simonside Service Station  
Newcastle Road  
South Shields  
NE34 9QE

No Permit

Booking Ref	Operation	Approx Weight	Qty	Skip Type	Waste Type
249213	Del		0 1	Mini Skip	Mixed Construction & Dem 17-09-04

Special instructions:

Description	Code	Description	Code	Description	Code
Bricks	17-01-02	Mixed Con & Demo	17-09-04	Property Maintenance	20-03-07
Bulky Waste	20-03-07	Mixed Metals	17-04-07	Shop Fit & Wood Man	03-01-05
Canteen Waste	20-01-08	Mixed Packaging	15-01-06	Soils & Stones	17-05-04
Cardboard Const	15-01-01	Plasterboard	17-08-02	Pharmac	17-03-02
Green Waste	20-02-01	Plastic Packaging	15-01-02	Timber-Construction	17-02-01
Hardcore	17-01-07	Private Household	20-03-00	Trade Waste	20-03-01

Driver Signature: *[Signature]* Waste Carriers No: TWR 836494  
 Print Name: *Tom [Signature]*

Customer Signature: *[Signature]*  
 Print Name: *[Signature]*  
 Date: *[Signature]*

Disposer Signature: *[Signature]* Waste Disposal Point: Alex Smiles Ltd FAWML 64044  
 Print Name: *Kevin Cobb*

Refer to conditions overleaf

Invoice 3061788

Appendix E  
Laboratory Chain of Custody Documentation (includes data for Land Adjacent to  
Simonside Service Station)











GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET

QF.5.7.1 Issue 7 Date 22/7/10

<p><b>Alcontrol Laboratories</b>                  Units 7-8 Hawarden Business Park, Manor Lane,                  Hawarden, Deeside, CH5 3US                  email: chester.schedulers@alcontrol.com                  Courier Collection Tel : 0845 1241715</p>		<p><b>Client: Arcadis - EXXONMOBIL</b>                  Office: Warrington (23097) <input type="checkbox"/> Leeds (23095) <input type="checkbox"/> Newmarket (23035) <input checked="" type="checkbox"/> Other: _____                  Tel: _____ Fax: _____                  Site Name / Code: 13749.02 5 month                  Office / PM Contact: Neil Demuth                  Office / PM Email: neil.demuth@Arcadis-UK.com</p>		<p>Date Samples sent: 4/3/11                  Quotation - Yes                  Quotation Number: See Brackets                  Job Continuation - yes / no                  Site Contact Name / Mobile: MW 0777340459                  Site Contact Email: m.watson@Arcadis-UK.com</p>		<p>Sheet.....                  of.....                  Only one project per sheet please.</p>																		
Date of Sampling:	Sample Ref. ID	Depth in metres	Number of containers	Sample Preservation Y/N	(S)oil or (W)ater (specify if other)	Suite Name/AL control line item												Turnaround	Report format	Samplers Signature				
						EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Sulfite	WAC A - Leachate				COD	BOD	BTEX/MS/Hex	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100
3/3/11	B1110	1	11	N	M	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Sulfite	WAC A - Leachate	COD	BOD	BTEX/MS/Hex	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100	156	124	Standard - AGS Crosstab Equis
4/3/11	B1102	1	11	N	M	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Sulfite	WAC A - Leachate	COD	BOD	BTEX/MS/Hex	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100	156	124	Standard - AGS Crosstab Equis
4/3/11	B1106	1	12	N	M	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Sulfite	WAC A - Leachate	COD	BOD	BTEX/MS/Hex	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100	156	124	Standard - AGS Crosstab Equis
4/3/11	B1105	1	11	N	M	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Sulfite	WAC A - Leachate	COD	BOD	BTEX/MS/Hex	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100	156	124	Standard - AGS Crosstab Equis
<p>Special Instructions: (inc known hazards eg asbestos, high concentrations of contaminants and overseas source)</p>																								
Date Received:												Signature:			Shipping Method:		P.O. Number		ALcontrol Job No.					



CS  
7H3

## Alcontrol Laboratories Sample Logging Sheet

Courier	Echo/Other (Specify)
Consignment No	3003364208

Liquid/Seal/ID/Product/Asbestos/Other (Delete as appropriate)
--

SDG	110307-3
Customer	ARCADIS-NMK
Date of Receipt	05/03/2011
Time of Receipt	07:00
Coolbox Temperature on Arrival	4.4
Number of Boxes	1
Number of Ice Packs	6

Location	93749-02 SIMONSIDE
Exxon Project?	Y / N
Turnaround	SDAY
Paperwork Attached?	Y / N
Logged in by	G. EDWARDS
Crate Number(s)	216539
Crate Number(s)	

Sample Number	Comment

Sample Number	Comment
Contract Review and Scheduling	
Scheduled by	Y / N
Detection Limits Checked?	Y / N
Tests assigned?	Y / N
Tests released?	Y / N
Schedule Sent?	Y / N
Schedule Checked by/date	

2139

**GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET**

**Client:** Arcadis - EXXONMOBIL  
**Office:** Warrington (23097)  Leeds (23095)  Newmarket (23035)   
**Other:** \_\_\_\_\_  
**Tel:** \_\_\_\_\_ **Fax:** \_\_\_\_\_  
**Site Name / Code:** 937-02-02 Simonside  
**Office / PM Contact:** Neil Beavish @Arcadis-JK.com  
**Office / PM Email:** neil.beavish@Arcadis-JK.com

**Date Samples sent:** 4/3/11  
**Quotation - Yes**  **Quotation Number:** See Brackets  
**Job Continuation - yes / no** \_\_\_\_\_  
**Site Contact Name / Mobile:** Mw 07717 240452  
**Site Contact Email:** mark.wilset@Arcadis-UK.com

**Sheet:** 3 of 3  
 Only one project per sheet please.

Date of Sampling:	Sample Ref. ID	Depth in metres	Number of containers	Sample Preservation Y/N	(Soil or (Water) specify if other)	Suite Name/ALcontrol line item													Turnaround	Report format	Samplers Signature																
						135	65	225	104	119	126	235	238	11	154	156	n/a	n/a				124	126	BOD	WAC A - Leachate	Waste Suite	Solid WAC - Exxon	pH	PCB - Total	Asbestos	TOC	EM Metals	PAH16	SVOC	TPH CWG	EM Suite	
4/2/11	BH107	1	1	N	N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	5 day	Standard	[Signature]	
4/2/11	BH200	1	1	N	N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	4 day	Crosstab	[Signature]

**Comments:**   
 VOCs ✓   
 PCBs ✓   
 PAHs ✓   
 EM Suite ✓   
 TOC ✓   
 Asbestos ✓   
 BOD ✓   
 WAC A ✓

**Shipping Method:** \_\_\_\_\_ **P.O. Number:** \_\_\_\_\_  
**Date Received:** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **ALcontrol Job No.:** \_\_\_\_\_

Special Instructions: (inc known hazards eg asbestos, high concentrations of contaminants and overseas source)

CS  
3  
2/5/11

### Alcontrol Laboratories Sample Logging Sheet

Courier	
Consignment No	ECHO
Echo/Other (Specify)	3003349600

Liquid/Solid/Product/Asbestos/Other (Delete as appropriate)
--

SDG	110225-30
Customer	ARCADIS EXXON
Date of Receipt	25/2
Time of Receipt	6:00
Coolbox Temperature on Arrival	16
Number of Boxes	1
Number of Ice Packs	5

Location	9374902 SIMONSD
Exxon Project?	Y/N
Turnaround	
Paperwork Attached?	Y/N
Logged in by	MW
Crate Number(s)	190268, 205030.
Crate Number(s)	

Sample Number	Comment

Sample Number	Comment
Contract Review and Scheduling	
Scheduled by	Y/N
Detection Limits Checked?	Y/N
Tests assigned?	Y/N
Tests released?	Y/N
Schedule Sent?	Y/N
Schedule Checked by/date	[Signature] 28/2/11

GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET

EXXON 1876

**Client:** Arcadis - Exxon  
**Office:** Newmarket  Leads  Warrington  
**Tel:**  
**Site Name / Code:** 9374907 Simonside  
**Project Manager Name:** Neil Bennett  
**Project Manager Email:** neil.bennett@arcadis.com

**Date Samples Despatched:** 16.2.11  
**Sampler:** CM  
**Job Continuation - Yes/ no:** Yes  
**Continuation of ALcontrol job:**  
**Administration Contact:** L Kennelly  
**Administration Email:** labadmin@arcadisgmi.com

**Number of boxes dispatched to lab:**  
 Sheet: ..... of .....  
 Only one project per sheet please.

Date of Sampling:	Sample Ref. ID	Depth in metres	Number sample containers	(Soil or Water) (specify if other)	Fast / a must confirm with lab				Turnaround Required				waste	Exxon metals - As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, V, Be Exxon waste suite: TOC, LOI, BTEX, PCB(7), Min Oil, pH, ANC, flash point Exxon waste suite less BTEX and Min Oil: TOC, LOI, PCB(7), pH, ANC, flash GRO and GRO-CWG include BTEX EPH CWG and TPH CWG include Min Oil	Samplers Signature	
					GRO CWG (3hr)	EZF (11hr)	GRO CWG (11hr)	PAH 16 MS (3 day)	EPH (detailed) (3 day)	TPHCWG	PAH 16 MS	BTEX/MTBE-MS				Exxon metals
23-2-11 08:10	04	4.50	5	S												10 [Signature]
23-2-11 08:10	05	8.00	5	S												

**Special Instructions:** (including known hazards, eg asbestos, high concentrations)  
 labadmin@arcadisgmi.com to be copied in on all email correspondence

**Date Received:** 18.01.10 V2  
**ALcontrol Job No.**

**Time:**  
**Signature:**

CS  
24/2

## Alcontrol Laboratories Sample Logging Sheet

<b>Courier</b>	Echo/Other (Specify) <i>Echo</i>	<b>Liquid/Solid/Product/Asbestos/Other</b> (Delete as appropriate)
<b>Consignment No</b>	<i>3003346110</i>	

<b>SDG</b>	<i>110224-25</i>
<b>Customer</b>	<i>ARADIS</i>
<b>Date of Receipt</b>	<i>24/02/11</i>
<b>Time of Receipt</b>	<i>06:00</i>
<b>Coolbox Temperature on Arrival</b>	<i>7.4</i>
<b>Number of Boxes</b>	<i>1</i>
<b>Number of Ice Packs</b>	<i>3</i>

<b>Location</b>	<i>SMIA Snow side (9374902)</i>
<b>Exxon Project?</b>	<i>Y/N</i>
<b>Turnaround</b>	<i>5D</i>
<b>Paperwork Attached?</b>	<i>Y/N</i>
<b>Logged in by</b>	<i>AP</i>
<b>Crate Number(s)</b>	<i>166215, 185007, 233122</i>
<b>Crate Number(s)</b>	<i>233166</i>

Sample Number	Comment

Sample Number	Comment
Contract Review and Scheduling	
Scheduled by	Y / N
Detection Limits Checked?	Y / N
Tests assigned?	Y / N
Tests released?	Y / N
Schedule Sent?	Y / N
Schedule Checked by/date	<i>[Signature] 17/05/11</i>

*Pinned OK NND*  
*no 30m*

GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET

EXXON 1955

**Alcontrol Laboratories**  
 Units 7 & 8 Hawarden Business Park,  
 Manor Lane, Hawarden, Chester, CH5 3US  
 email: chester.schedulers@alcontrol.co.uk  
 Tel: 01244 528 700  
 Courier Collection: 0845 1241715

**Client:** Arcadis - Exxon  
**Office:** Newmarket  Leeds  Warrington   
**Tel:** 01639674767  
**Site Name / Code:** SIMON BORG 9374902  
**Project Manager Name:** Neil Bennett  
**Project Manager Email:** Neil.bennett@arcadis.com

**Date Samples Despatched:** 23.2.11  
**Sampler:** CM  
**Job Continuation:** Yes/ no  
**Continuation of ALcontrol job:**  
**Administration Contact:** L. Kennedy  
**Administration Email:** labadmin@arcadisgmi.com

Sheet... of .....  
 Only one project per sheet please.  
 Number of boxes dispatched to lab .....

Date of Sampling	Sample Ref. ID	Depth in metres	Number sample containers	(Soil or Water (specify if other))	Fast 1/2 must confirm with lab				Turnaround Required				waste	Exxon metals - As, Cd, Cr, Cu, Pb, Ni, Zn, Hq, V, Be Exxon waste suite: TOC, LOI, BTEX, PCB(7), Min Oil, pH, ANC, flash point Exxon waste suite less BTEX and Min Oil: TOC, LOI, PCB(7), pH, ANC, flash GRO and GRO-CWG include BTEX EPH CWG and TPH CWG include Min Oil	Samplers Signature					
					GRO CWG (3hr)	EZF (11hr)	GRO CWG (11hr)	PAH 16 MS (3 day)	EPH (detailed) (3 day)	TPHCWG	PAH 16 MS	BTEX/MTBE-MS				Exxon metals	pH	TOC	Bas Metals suite	Asbestos
21-02-11	BH101	5.50m	5	S																
22-02-11	BH106	1.00-1.26	5	S																
	BH102	3.00m	5	S																
		5.50	5	S																
		1.50	5	S																
		2.50	5	S																
		3.50	5	S																
		4.50	5	S																
22-2-11	BH110	0.5-0.6	4	S																
22-2-11	BH110	1.4-1.5	3	S																

7.4

**Special Instructions:** (including known hazards, eg asbestos, high concentrations)  
 labadmin@arcadisgmi.com to be copied in on all email correspondence

EPH(detailed)-C10-12, 12-16, 16-21, 21-28, 28-35, 35-40 by GC-FID  
 EZF=TPH 6-8,8-10,10-12,12-16,16-21,21-40 by GC-EZ Flash

18.01.10 V2  
 ALcontrol Job No.

Date Received:  
 Time:

Signature:

YX  
22/12

# Alcontrol Laboratories Sample Logging Sheet

<b>Courier</b>	Echo/Other (Specify)	Liquid/Solid/Product/Asbestos/Other (Delete as appropriate)
<b>Consignment No</b>	3003344276	

<b>SDG</b>	110222-21
<b>Customer</b>	ARCADIS - EXXON
<b>Date of Receipt</b>	22/12/11
<b>Time of Receipt</b>	6:00
<b>Coolbox Temperature on Arrival</b>	4.8
<b>Number of Boxes</b>	1
<b>Number of Ice Packs</b>	2

<b>Location</b>	93749.02
<b>Exxon Project?</b>	Y / N
<b>Turnaround</b>	
<b>Paperwork Attached?</b>	Y / N
<b>Logged in by</b>	MWD
<b>Crate Number(s)</b>	186047, 172653
<b>Crate Number(s)</b>	

Sample Number	Comment
	D1, D2, D3, ETC: ON
	SAMPLES, BUT DON'T
	THINK ITS ASS. AS
	DISCUSSED WITH
	TONY NEWMAN

Sample Number	Comment
	Contract Review and Scheduling
<b>Scheduled by</b>	Y / N
<b>Detection Limits Checked?</b>	Y / N
<b>Tests assigned?</b>	Y / N
<b>Tests released?</b>	N
<b>Schedule Sent?</b>	Y / N
<b>Schedule Checked by/date</b>	[Signature] 24/12/11

Should be 3 TOCS

EXXON 1874

GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET

**Alcontrol Laboratories**  
 Units 7 & 8 Hawarden Business Park,  
 Manor Lane, Hawarden, Chester, CH5 3US  
 email: chester.schedulers@alcontrol.co.uk  
 Tel: 01244 528 700  
 Courier Collection: 0845 1241715

**Client:** Arcadis - Exxon  
**Office:** Newmarket Warrington  
 Leads

**Site Name / Code:** SNOWSLOE  
**Project Manager Name:** Neil Bewick  
**Project Manager Email:** neil.bewick@arcadis-uk.com

**Date Samples Despatched:** 21.02.11  
**Sampler:** CM  
**Job Continuation:** yes/no  
**Continuation of ALcontrol job:**  
**Administration Contact:** L Kennelly  
**Administration Email:** labadmin@arcadisgmi.com

Sheet..... of.....  
 Only one project per sheet please.  
 Number of boxes dispatched to lab

Date of Sampling:	Sample Ref. ID	Depth in metres	Number sample containers	(Soil or (Water) specify if other)	Fast t/a must confirm with lab				Turnaround Required				waste	Exxon metals - As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, V, Be Exxon waste suite: TOC, LOI, BTEX, PCB(7), Min Oil, pH, ANC, flash point Exxon waste suite less BTEX and Min Oil: TOC, LOI, PCB(7), pH, ANC, flash GRO and GRO-CWG include BTEX EPH CWG and TPH CWG include Min Oil	Samplers Signature		
					GRO CWG (3hr)	EZF (1hr)	GRO CWG (11hr)	PAH 16 MS (3 day)	EPH (detailed) (3 day)	TPHCWG	PAH 16 MS	BTEX/MTBE-MS				Exxon metals	pH
20.2.11	BH108	2.00 - 2.20	6	S	X	X	X	X	X	X	X						ON HOLD
	BH109	2.50	5	S	X	X	X	X	X	X	X						ON HOLD
21.2.11	BH101	4.50	5	S	X	X	X	X	X	X	X						ON HOLD
	BH102	6.50	5	S	X	X	X	X	X	X	X						ON HOLD
	BH103	4.25	5	S	X	X	X	X	X	X	X						ON HOLD
	BH104	2.50	5	S	X	X	X	X	X	X	X						ON HOLD

**Special Instructions:** (including known hazards, eg asbestos, high concentrations)  
 labadmin@arcadisgmi.com to be copied in on all email correspondence

EPH(detailed)-C10-12, 12-16, 16-21, 21-28, 28-35, 35-40 by GC-FID  
 EZF=TPH 6-8,8-10,10-12,12-16,16-21,21-40 by GC-EZ Flash

Date Received: \_\_\_\_\_ Time: \_\_\_\_\_  
 Signature: \_\_\_\_\_

18.01.10 V2  
 ALcontrol Job No.



CS  
2/12

# Alcontrol Laboratories Sample Logging Sheet

Courier	Echo/Other (Specify)
Consignment No	8003341437

Liquid/Solid/Product/Asbestos/Other  
(Delete as appropriate)

SDG	110219-41
Customer	Acadus
Date of Receipt	19/02/11
Time of Receipt	8:20
Coolbox Temperature on Arrival	3.2
Number of Boxes	1
Number of Ice Packs	3

Location	Simonside
Exxon Project?	Y/N
Turnaround	5
Paperwork Attached?	Y/N
Logged in by	AM
Crate Number(s)	
Crate Number(s)	

Sample Number	Comment

Sample Number	Comment
Contract Review and Scheduling	
Scheduled by	Y/N
Detection Limits Checked?	Y/N
Tests assigned?	Y/N
Tests released?	Y/N
Schedule Sent?	Y/N
Schedule Checked by/date	AM 22/2/11

GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET

EXXON 1873

<b>Alcontrol Laboratories</b> Units 7 & 8 Hawarden Business Park, Manor Lane, Hawarden, Chester, CH5 3US email:chester.schedulers@alcontrol.co.uk Tel: 01244 528 700 Courier Collection: 0845 1241715	Client: Arcadis - Exxon Office: <input checked="" type="checkbox"/> Newmarket <input type="checkbox"/> Leeds <input type="checkbox"/> Warrington	Date Samples Despatched: 18-2-11 Sampler: CM Job Continuation - <input checked="" type="checkbox"/> yes <input type="checkbox"/> no Continuation of ALcontrol job:	Sheet..... of..... Only one project per sheet please.	
	Tel: Site Name / Code: SIMONSONG 91374902 Project Manager Name: Neil Ipswich Project Manager Email: neil-ipswich@arcadisgmi.com	Administration Contact: L Kennelly Administration Email: labadmin@arcadisgmi.com	Number of boxes dispatched to lab	

Date of Sampling:	Sample Ref. ID	Depth in metres	Number sample containers	(Soil or Water) (specify if other)	Fast / must confirm with lab.				Turnaround Required				waste			Samplers Signature																			
					GRO CWG (3hr)	EZF (11hr)	GRO CWG (11hr)	PAH 16 MS (3 day)	EPH (detailed) (3 day)	TPHCWG	PAH 16 MS	BTEX/MTBE/MS	Exxon metals	pH	TOC		5 Day	3 Day	11 Hr	3 Hr	WAC 2 batch	Exxon waste inc Flash point	Exxon waste inc Flash point (less BTEX and Min Oil)												
18-2-11	BH 1 07 01	1.50 - 1.60	4	S	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>															
	BH 1 07 02	2.00 - 2.25	5	S	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>														

Special Instructions: (including known hazards, eg asbestos, high concentrations)  
 labadmin@arcadisgmi.com to be copied in on all email correspondence

EPH(detailed)=C10-12, 12-16, 16-21, 21-28, 28-35, 35-40 by GC-FID  
 EZF=TPH 6-8-10, 10-12, 12-16, 16-21, 21-40 by GC-EZ Flash

Date Received: 18.01.10 V2  
 Signature: [Signature]  
 Time: [Time]

ALcontrol Job No. 18.01.10 V2

CS  
X(7) 2  
(17) 2

# Alcontrol Laboratories Sample Logging Sheet

Courier	Echo/Other (Specify)
Consignment No	3003337874

Liquid/Solid/Product/Asbestos/Other (Delete as appropriate)
--

SDG	110217-3
Customer	ARCADIS.
Date of Receipt	17-02-11
Time of Receipt	6:00
Coolbox Temperature on Arrival	2.4
Number of Boxes	2
Number of Ice Packs	6.

Location	SIMONSDIE.
Exxon Project?	YES.
Turnaround	5D.
Paperwork Attached?	Y/N
Logged in by	NS.
Crate Number(s)	G 23340 W163190
Crate Number(s)	W185047

Sample Number	Comment

Sample Number	Comment
Contract Review and Scheduling	
Scheduled by	X / N
Detection Limits Checked?	X / N
Tests assigned?	X / N
Tests released?	X / N
Schedule Sent?	X / N
Schedule Checked by/date	DR 22/2/11

Checked DR  
apv

2226

**GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET**

Client: **Arcadis - EXXONMOBIL**  
 Office: Warrington (23097)  Leeds (23095)   
 Newmarket (23035) Other: \_\_\_\_\_  
 Date Samples sent: \_\_\_\_\_  
 Quotation Number: See Brackets  
 Job Continuation - yes / no

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Site Name / Code: **Simon's Ldg 97769-02**  
 Office / PM Contact: **SAALY PLANT Neil Bewick**  
 Office / PM Email: **Neil.Bewick@Arcadis-UK.com**  
 Site Contact Name / Mobile: \_\_\_\_\_  
 Site Contact Email: **@Arcadis-UK.com**

Date of Sampling:	Sample Ref. ID	Depth in metres	Number of containers	Sample Preservation Y/N	Suite Name/AL control line item														Turnaround			Report format						
					EM Suite	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	BOD	COD	Soil analysis line no.	Water analysis line no.							
16/2/11	BH101	38-40	3	Y	EM Suite	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	BOD	COD	Soil analysis line no.	Water analysis line no.	5 day	4 day	3 day	Other	Standard AGS Crosstab Equis	Sampers Signature	
	BH106	0-2-0.6		N																								
	BH109	16-20-8		Y																								

Special Instructions: (inc known hazards eg asbestos, high concentrations of contaminants and overseas source)

P.O. Number \_\_\_\_\_ Shipping Method: \_\_\_\_\_  
 Date Received: \_\_\_\_\_ Signature: \_\_\_\_\_  
 ALcontrol Job No. \_\_\_\_\_

CS  
X  
17/12

## Alcontrol Laboratories Sample Logging Sheet

<b>Courier</b>	<b>Echd/Other (Specify)</b>
<b>Consignment No</b>	3603333846
<b>SDG</b>	110215 - 6
<b>Customer</b>	ARCADIS - EXXONMOBIL
<b>Date of Receipt</b>	15/2/11
<b>Time of Receipt</b>	06.00
<b>Coolbox Temperature on Arrival</b>	3
<b>Number of Boxes</b>	2
<b>Number of Ice Packs</b>	5

<b>Location</b>	SIMONSIDE 93749.02	
<b>Exxon Project?</b>	Y N	
<b>Turnaround</b>	5 DAY	
<b>Paperwork Attached?</b>	Y N	
<b>Logged in by</b>	(GS)	
<b>Grate Number(s)</b>	190402, 163433, 144962,	
<b>Grate Number(s)</b>	224176, 227667, 228327	

Liquid/Solid/Product/Asbestos/Other (Delete as appropriate)
--

Sample Number	Comment

Sample Number	Comment
XB4107 @ 1-15 X	
4104 @ 1.5-1.6 only 100L	
<b>Contract Review and Scheduling</b>	
<b>Scheduled by</b>	
<b>Detection Limits Checked?</b>	Y N
<b>Tests assigned?</b>	Y/N
<b>Tests released?</b>	Y/N
<b>Schedule Sent?</b>	Y/N
<b>Schedule Checked by/date</b>	

TOCS?  
Are

27/2/11

QF. 5.7.1 Issue 7 Date 22/7/10

**GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET**

 <p><b>Alcontrol Laboratories</b> Units 7-8 Hawarden Business Park, Manor Lane, Hawarden, Deeside, CH5 3US email: chester.schedulers@alcontrol.com Courier Collection Tel : 0845 1241715</p>		<p><b>Client: Arcadis - EXXONMOBIL</b> <b>Office:</b> Warrington (23097) <input type="checkbox"/> Leeds (23095) <input type="checkbox"/> Newmarket (23035) <input checked="" type="checkbox"/> Other: _____</p> <p><b>Tel:</b> 01688 676767 <b>Fax:</b> _____ <b>Site Name / Code:</b> SIMONSIDE 93749.02 <b>Office / PM Contact:</b> BARRY PLANE <b>Office / PM Email:</b> barry.plane@Arcadis-UK.com</p>		<p>Date Samples sent: 14/2/11 Quotation - Yes <input type="checkbox"/> Quotation Number: See Brackets Job Continuation - yes / no _____ Site Contact Name / Mobile: _____ Site Contact Email: @Arcadis-UK.com</p>		<p>Sheet... of ..... Only one project per sheet please.</p>	
---	--	--	--	---	--	---	--

Date of Sampling:	Sample Ref. ID	Depth in metres	Number of containers	Sample Preservation Y/N	(S)oil or (W)ater (specify if other)	Suite Name/AL control line item													Turnaround	Report format	Samplers Signature	
						EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD				BOD
12/2/11	BH109	0.3-0.612	1	N	S	EM Suite	Hold	PAH16	✓	EM Metals	✓	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	5 day	Standard - AGS
	BH103	1.5-1.6	1	N	W	EM Suite	Hold	PAH16	✓	EM Metals	✓	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	4 day	Crosstab
	BH107			N	W	EM Suite	Hold	PAH16	✓	EM Metals	✓	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	3 day	Equis
						EM Suite	Hold	PAH16	✓	EM Metals	✓	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	Other	

**Special instructions:** (inc known hazards eg asbestos, high concentrations of contaminants and overseas source)

P.O. Number \_\_\_\_\_

Shipping Method: \_\_\_\_\_

Date Received: \_\_\_\_\_

Signature: \_\_\_\_\_

ALcontrol Job No. \_\_\_\_\_

QF. 5.7.1 Issue 7 Date 22/7/10

**GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET**

**Alcontrol Laboratories**  
 Units 7-8 Hawarden Business Park, Manor Lane,  
 Hawarden, Deeside, CH5 3US  
 email: chester.schedulers@alcontrol.com  
 Courier Collection Tel : 0845 1241715

**Client: Arcadis - EXXONMOBIL**  
**Office: Warrington (23097)**  Leeds (23095)   
 Newmarket (23035)  Other: \_\_\_\_\_  
**Tel: 01636 74767** **Fax:** \_\_\_\_\_  
**Site Name / Code:** \_\_\_\_\_  
**Office / PM Contact: Barry Plaine**  
**Office / PM Email: barry.plaine** @Arcadis-UK.com

Date Samples sent: 14/2/11  
 Quotation - Yes   
 Quotation Number: See Brackets  
 Job Continuation - yes / no \_\_\_\_\_  
 Site Contact Name / Mobile: \_\_\_\_\_  
 Site Contact Email: \_\_\_\_\_ @Arcadis-UK.com

Date of Sampling:	Sample Ref. ID	Depth in metres	Number of containers	Sample Preservation Y/N	(Soil or Water) (specify if other)	Suite Name/ALcontrol line item													Turnaround	Report format	Samplers Signature	
						EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	PH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD				BOD
13/2/11	BH104	0-0.3	4	N	S	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	PH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	5 day	Standard - AGS	<i>[Signature]</i>
	BH108	0.5-0.7	8	↓	↓	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	PH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	4 day	Crosstab	
	BH105	0-0.1	2	↓	↓	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	PH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	3 day	Equis	
						EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	PH	Solid WAC - Exxon	Waste Suite	WAC A - Leachate	COD	BOD	Other		Comments

**Special Instructions: (inc known hazards eg asbestos, high concentrations of contaminants and overseas source)**

P.O. Number \_\_\_\_\_  
 Shipping Method: \_\_\_\_\_  
 Date Received: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 ALcontrol Job No. \_\_\_\_\_





GF. 5.7.1 Issue 7 Date 22/7/10 **GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET**

**Alcontrol Laboratories**  
 Units 7-8 Hawarden Business Park, Manor Lane,  
 Hawarden, Deeside, CH5 3US  
 email: chester.schedulers@alcontrol.com  
 Courier Collection Tel: 0845 1241715

Client: Arcadis - EXXONMOBIL  
 Office: Warrington (23097)  Leeds (23095)   
 Newmarket (23035)  Other:   
 Date Samples sent: 15/2/11  
 Quotation - Yes   
 Quotation Number: See Brackets  
 Job Continuation - yes / no   
 Site Contact Name / Mobile:  
 Site Contact Email: @Arcadis-UK.com

Site Name / Code: Simonside Slm 93743.c2  
 Office / PM Contact: Neil Berwick / Benny Aore  
 Office / PM Email: @Arcadis-UK.com

Sample Ref. ID	Depth in metres	Number of containers	Sample Preservation Y/N	(Soil or Water) (specify if other)	EM Suite	TPH CWG	SVOC	PAH16	EM Metals	TOC	Asbestos	PCB - Total	pH	Solid WAC - Exxon	Waste Sulfide	WAC A - Leachate	COD	BOD	Gaswork link	RTX + MTE (cm)	ETBE
----------------	-----------------	----------------------	-------------------------	------------------------------------	----------	---------	------	-------	-----------	-----	----------	-------------	----	-------------------	---------------	------------------	-----	-----	--------------	----------------	------

15/2/11	1.5-1.6	6	Y	5	X	X	X	X	X	X	X								X	X	X	X
↓	2.5-2.6	5	Y	5	X	X	X	X	X	X	X								X	X	X	X
	1.8-1.9	7	Y	5	X	X	X	X	X	X	X								X	X	X	X
	2.8-2.9	3	Y	5	X	X	X	X	X	X	X								X	X	X	X

Turnarounds: Soil analysis line no.  Water analysis line no.   
 5 day   
 4 day   
 3 day   
 Other   
 Report format: Standard   
 AGS   
 Crosstab   
 Equis   
 Comments: **0.4**

Special Instructions: (inc known hazards eg asbestos, high concentrations of contaminants and overseas source)  
 Shipping Method:  
 P.O. Number  
 Signature: *ALcontrol Job No.*  
 Date Received:

Only one project per sheet please.

Appendix F  
Laboratory Data Quality Assurance / Quality Control Policy

## APPENDIX F Laboratory Data Quality Assurance / Quality Control Policy

ARCADIS is committed to providing our clients and regulators with investigative or monitoring results that are of the highest standard within the confines of the project. We recognise that a report is only as good as the data that is used to draw conclusions and thus it is important that the consultant and the client be able to have full confidence in data provided by laboratories that we use for analysis.

The first step in assuring said confidence is to ensure that our consultants on site are using appropriate sampling methodologies and are storing collected samples in the appropriate sample containers under correct conditions.

All samples are shipped to the laboratory on day of collection in sealed cold boxes with a Chain of Custody attached. The Chain of Custody identifies ARCADIS as the client, the ARCADIS Project Number, the Consultant/Project Manager, the type of sample i.e. water or soil and the parameters to be tested. Samples boxes are either hand delivered to the laboratory, picked up directly by the laboratory or picked up by a courier sent by the laboratory.

### *QA/QC of Laboratories*

ARCADIS has a preferred suppliers program, all services sub-contracted out, including laboratory services undergo an initial H&S and Financial Audit followed by a service specific audit. All contract laboratories are expected to have UKAS accreditation and use the MCERTs standard.

The MCERTs accreditation was developed for the analysis of soils and is required by the EA for all sites that are within the regulatory process i.e. Part IIa designated contaminated land sites. For sites in which work is being undertaken Voluntarily or through Planning it is recommended that the analysis be conducted following the MCERTs standard. The MCERTs standard is an application of ISO 17025:2000 specifically for the chemical testing of soil and covers:

- the selection and validation of methods;
- sampling pre-treatment and preparation;
- the estimation of measurement uncertainty;
- participation in proficiency testing schemes; and
- the reporting of results and information.

It is expected by ARCADIS that any laboratory used by ARCADIS for the analysis of samples should be working to the ISO17025:2000 standard, regardless of MCERTs accreditation.

Once accepted as a potential supplier, a laboratory is subjected to an audit and a QA/QC review by the ARCADIS Analytical Assessment Team. The audit is a detailed inspection of the laboratory, including review of staff and staff training, analytical methodologies used, QA/QC procedures and QA data and manuals, sample log in, sample storage and prep areas, instrument rooms and instrument maintenance logs, instrument run logs, laboratory management and laboratory hygiene. Additionally, the laboratory is blind sample tested and the audit team follow the blind sample through the analysis process during an inspection visit. Once finally accepted as a supplier the laboratory is subjected to an annual audit.

Data quality control is extremely important to ARCADIS because we must be able to rely on the data in order to make our interpretations and recommendations. The data submitted by the laboratory are reviewed by an analytical chemist in order to check the laboratory QA results. However, we have also instituted our own quality control testing program using blind samples to monitor laboratory performance. This includes the submission of blind duplicates, trip blanks and or spiked samples to laboratories as part of routine project work and the submission of either certified reference materials or prepared QC samples to all of the laboratories for interlab comparison. This internal program helps us to increase the confidence of the data received from the laboratories.

Appendix G  
Rising Head Tests

## APPENDIX G Rising Head Tests

The aim of the rising head test is to determine an estimate for the hydraulic conductivity within the screened interval of a monitoring well. The estimated value for hydraulic conductivity in this unit will be used in determining parameter values in The Site specific risk assessment.

### Methodology

In a rising head test, a small volume of water is suddenly removed from a well, after which the rate of rise of the water level in the well is measured. From these measurements, the aquifer's transmissivity or hydraulic conductivity can be determined. In the rising head tests it is only possible to determine the characteristics of a small volume of aquifer material surrounding the well, and this volume may have been disturbed during well installation. Nevertheless some authors state that fairly accurate transmissivity values can be obtained from rising head tests.

The methodology used at Simonside Service Station involved the removal of a full bailer of water using a bailer of known dimensions. The water level was measured using a dip meter and the difference in head between the static water level and the rising head of water calculated.

The rising head tests were undertaken on monitoring wells BH104 and BH106(D).

### Data Interpretation – Bouwer-Rice

To determine the hydraulic conductivity of an unconfined aquifer from a rising head test, Bouwer and Rice (1976) presented a method that is based on Thiem's equation. Using this methodology the data collected from the field is plotted on a graph showing natural logarithm of head versus time. The best-fit line of this graph defines the head change at time zero ( $h_0$ ) and the head at an arbitrary time  $t$  ( $h_t$ ). From this data and the specific monitoring well parameters hydraulic conductivity is calculated.

### Field Rising Head Test Results

Rising head tests were performed on monitoring wells during the monitoring visit, to provide an estimate of the hydraulic conductivity of the aquifer unit beneath The Site. The technique used was to remove a bailer of water from each well and monitor water level recovery using a dip meter.

From this data the depths to water were calculated and combined with data on the physical properties of the well, calculations for the derivation of the value for hydraulic conductivities were calculated using Bouwer and Rice's method for a partially penetrating well in an unconfined aquifer.

The groundwater recharge within monitoring well BH104 occurred before the first measurement of groundwater depth was taken. Therefore it is considered that the majority of the recharge was missed in this monitoring well, and as such the hydraulic conductivity could not be calculated.

The hydraulic conductivities estimated from the rising head tests conducted in monitoring well BH106(D) ranged between 0.11m/day and 0.12m/day.

Appendix G

Rising Head Tests

Table G1 Rising Head Test Calculations			
Calculations using Bouwer & Rice assuming a partially penetrating well.			
<b>Well ID</b>	BH106(D) T1	BH106(D) T2	BH106(D) T3
Value from equation when t=0	-0.6706	-0.6726	-0.6636
$h_0$	0.511401645	0.510379864	0.514994015
Value from equation at selected t	-0.6731	-0.6754	-0.6664
$h_t$	0.510124737	0.508952799	0.513554049
Selected t	1	1	1
$1/t \ln h_0/h_t$	0.0025	0.0028	0.0028
d	1.86	1.86	1.86
$r_w$	0.05	0.05	0.05
$d/r_w$	37.2	37.2	37.2
A	2.8	2.8	2.8
B	0.5	0.5	0.5
D	5.72	5.676	5.654
b	5.2	5.16	5.14
$1.1/(\ln(b/r_w))$	0.236844836	0.237239284	0.237438154
$A+B(\ln((D-b)/r_w))$	3.970902903	3.96704188	3.96510013
$\ln R_e/r_w$	2.910449507	2.907989511	2.906749724
$r_c$	0.025	0.025	0.025
$r_c$	0.000625	0.000625	0.000625
K (m/sec)	1.2E-06	1.4E-06	1.4E-06
K (m/day)	0.11	0.12	0.12
$h_0$	Head in the well at time t= $t_0$ (m)		
d	Length of the well screen or open section of the well (m)		
t	Time (seconds)		
$r_w$	Horizontal distance from well centre to undisturbed aquifer (metres)		
A	Dimensionless parameter (function of $d/r_w$ )		
B	Dimensionless parameter (function of $d/r_w$ )		
D	Saturated aquifer thickness (m)		
b	Water column in well before test commences (metres)		
$R_e$	Radial distance over which the difference in head, $h_0$ , is dissipated in the aquifer		
$r_c$	Radius of the well (metres)		
K	Hydraulic Conductivity		

Appendix H  
Laboratory Certificate of Analysis (includes data for Land Adjacent to Simonside  
Service Station)



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Neil Beswick

## CERTIFICATE OF ANALYSIS

**Date:** 30 March 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110323-11  
**Your Reference:** 93749.02.  
**Location:**  
**Report No:** 123110

We received 3 samples on Wednesday March 23, 2011 and 3 of these samples were scheduled for analysis which was completed on Wednesday March 30, 2011. 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:

**Sonia McWhan**

Operations Manager





SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3135512	BH106 (S)			22/03/2011
3135510	BH108 (S)			22/03/2011
3135511	BH110 (S)			21/03/2011

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

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

LIQUID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test  <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	3135512	3135510	3135511	
	Customer Sample Reference	BH106 (S)	BH108 (S)	BH110 (S)	
	AGS Reference				
	Depth (m)				
	Container	11 green glass bottle 500ml Plastic Vial	11 green glass bottle 500ml Plastic Vial	11 green glass bottle 500ml Plastic Vial	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 3	X	X	X
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 3	X	X	X
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 3	X	X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 3	X	X	X
Mercury Dissolved	All	NDPs: 0 Tests: 3	X	X	X
Oxygenates (W)	All	NDPs: 0 Tests: 3	X	X	X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 3	X	X	X
pH Value	All	NDPs: 0 Tests: 3	X	X	X
TPH CWG (W)	All	NDPs: 0 Tests: 3	X	X	X
VOC MS (W)	All	NDPs: 0 Tests: 3	X	X	X

SDG: 110323-11
Job: H\_ARCADIS\_NMK-373
Client Reference: 93749.02

Location:
Customer: ARCADIS Geraghty & Miller
Attention: Barry Plane

Order Number:
Report Number: 123110
Superseded Report:

Table with columns: Results Legend, Customer Sample R, BH106 (S), BH108 (S), BH110 (S), Component, LOD/Units, Method, and numerical data for various elements like Arsenic, Beryllium, Cadmium, etc.

**SDG:** 110323-11  
**Job:** H\_ARCADIS\_NMK-373  
**Client Reference:** 93749.02

**Location:**  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 123110  
**Superseded Report:**
**PAH Spec MS - Aqueous (W)**

Results Legend			Customer Sample R					
#	ISO17025 accredited. mCERTS accredited. Non-conforming work.		Customer Sample R					
M	Aqueous / settled sample.		Depth (m)					
S	Dissolved / filtered sample.		Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)		
aq	Total / unfiltered sample.		Date Sampled	22/03/2011	22/03/2011	21/03/2011		
diss.filt	subcontracted test.		Date Received	23/03/2011	23/03/2011	23/03/2011		
tot.unfilt	% 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.		SDG Ref	110323-11	110323-11	110323-11		
*			Lab Sample No.(s)	3135512	3135510	3135511		
**			AGS Reference					
			Method					
Component	LOD/Units	Method						
Naphthalene (aq)	<0.1 µg/l	TM178	<0.1 #	25.1 #	0.509 #			
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015 #	16.8 #	0.327 #			
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011 #	1.16 #	0.348 #			
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017 #	56.5 #	14.2 #			
Anthracene (aq)	<0.015 µg/l	TM178	<0.015 #	14.2 #	2.38 #			
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022 #	91.2 #	4.51 #			
Fluorene (aq)	<0.014 µg/l	TM178	<0.014 #	19.9 #	0.666 #			
Chrysene (aq)	<0.013 µg/l	TM178	<0.013 #	31.9 #	11.6 #			
Pyrene (aq)	<0.015 µg/l	TM178	<0.015 #	43.4 #	12.5 #			
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017 #	29 #	11.7 #			
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	<0.023 #	37.2 #	15.3 #			
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027 #	30.9 #	13.9 #			
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	<0.009 #	32.9 #	16.5 #			
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016 #	7.32 #	4.32 #			
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	<0.016 #	22.4 #	12.3 #			
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	<0.014 #	19.1 #	11.5 #			
PAH, Total Detected USEPA 16 (aq)	<0.17 µg/l	TM178	<0.17	479	133			

SDG: 110323-11  
Job: H\_ARCADIS\_NMK-373  
Client Reference: 93749.02

Location:  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

Order Number:  
Report Number: 123110  
Superseded Report:

TPH CWG (W)

Results Legend			Customer Sample R			BH106 (S)	BH108 (S)	BH110 (S)			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference								
M	mCERTS accredited.			Water(GW/SW)							
S	Non-conforming work.										
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.										
Component	LOD/Units	Method									
GRO Surrogate % recovery**	%	TM245	95	91	91						
GRO >C5-C12	<50 µg/l	TM245	<50 #	<50 #	182 #						
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3 #	<3 #	<3 #						
Benzene	<7 µg/l	TM245	<7 #	<7 #	<7 #						
Toluene	<4 µg/l	TM245	<4 #	<4 #	<4 #						
Ethylbenzene	<5 µg/l	TM245	<5 #	<5 #	<5 #						
m,p-Xylene	<8 µg/l	TM245	<8 #	<8 #	<8 #						
o-Xylene	<3 µg/l	TM245	<3 #	<3 #	<3 #						
m,p,o-Xylene	<10 µg/l	TM245	<10	<10	<10						
BTEX, Total	<10 µg/l	TM245	<10	<10	<10						
Aliphatics >C5-C6	<10 µg/l	TM245	<10	<10	<10						
Aliphatics >C6-C8	<10 µg/l	TM245	<10	<10	<10						
Aliphatics >C8-C10	<10 µg/l	TM245	<10	<10	21						
Aliphatics >C10-C12	<10 µg/l	TM245	<10	<10	81						
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10	2150	123						
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10	418	346						
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	<10	2710	6350						
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	<10	5280	6820						
Aromatics >EC5-EC7	<10 µg/l	TM245	<10	<10	<10						
Aromatics >EC7-EC8	<10 µg/l	TM245	<10	<10	<10						
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	<10	14						
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10	54						
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10	102	38						
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10	225	139						
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	<10	429	2270						
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	<10	756	2440						
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	<10	6050	9450						

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

VOC MS (W)

Results Legend		Customer Sample R	BH106 (S)	BH108 (S)	BH110 (S)
#	ISO17025 accredited.		Depth (m)		
M	mCERTS accredited.	Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
S	Non-conforming work.	Date Sampled	22/03/2011	22/03/2011	21/03/2011
aq	Aqueous / settled sample.	Date Received	23/03/2011	23/03/2011	23/03/2011
diss.filt	Dissolved / filtered sample.	SDG Ref	110323-11	110323-11	110323-11
tot.unfilt	Total / unfiltered sample.	Lab Sample No.(s)	3135512	3135510	3135511
*	subcontracted test.	AGS Reference			
**	% 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.				
Component	LOD/Units	Method			
Toluene-d8**	%	TM208	95.8	95.8	95.4
Methyl tertiary butyl ether (MTBE)	<1.6 µg/l	TM208	<1.6 #	<1.6 #	<1.6 #
Benzene	<1.3 µg/l	TM208	<1.3 #	<1.3 #	<1.3 #
Toluene	<1.4 µg/l	TM208	<1.4 #	<1.4 #	<1.4 #
Ethylbenzene	<2.5 µg/l	TM208	<2.5 #	<2.5 #	<2.5 #
m,p-Xylene	<2.5 µg/l	TM208	<2.5 #	<2.5 #	<2.5 #
o-Xylene	<1.7 µg/l	TM208	<1.7 #	<1.7 #	<1.7 #
Total Xylenes	<5 µg/l	TM208	<5	<5	<5

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

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 <sup>1</sup>	Surrogate Corrected
TM061	Method for the Determination of EPH, Massachusetts Dept. of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM289				

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

**SDG:** 110323-11  
**Job:** H\_ARCADIS\_NMK-373  
**Client Reference:** 93749.02.

**Location:**  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 123110  
**Superseded Report:**

### Test Completion Dates

Lab Sample No(s)	3135512	3135510	3135511
Customer Sample Ref.	BH106 (S)	BH108 (S)	BH110 (S)
AGS Ref.			
Depth			
Type	LIQUID	LIQUID	LIQUID
Dissolved Metals by ICP-MS	24-Mar-2011	24-Mar-2011	24-Mar-2011
EPH CWG (Aliphatic) Aqueous GC (W)	29-Mar-2011	29-Mar-2011	29-Mar-2011
EPH CWG (Aromatic) Aqueous GC (W)	29-Mar-2011	29-Mar-2011	29-Mar-2011
GRO by GC-FID (W)	30-Mar-2011	30-Mar-2011	30-Mar-2011
Mercury Dissolved	25-Mar-2011	24-Mar-2011	24-Mar-2011
Oxygenates (W)	29-Mar-2011	29-Mar-2011	29-Mar-2011
PAH Spec MS - Aqueous (W)	27-Mar-2011	27-Mar-2011	27-Mar-2011
pH Value	24-Mar-2011	24-Mar-2011	24-Mar-2011
TPH CWG (W)	30-Mar-2011	30-Mar-2011	30-Mar-2011
VOC MS (W)	28-Mar-2011	28-Mar-2011	28-Mar-2011



SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

## ASSOCIATED AQC DATA

### Dissolved Metals by ICP-MS

Component	Method Code	QC 34
Aluminium	TM152	<b>104.05</b> 85.00 : 115.00
Antimony	TM152	<b>106.49</b> 85.00 : 115.00
Arsenic	TM152	<b>102.95</b> 85.00 : 115.00
Barium	TM152	<b>102.88</b> 85.00 : 115.00
Beryllium	TM152	<b>104.99</b> 85.00 : 115.00
Bismuth	TM152	<b>103.24</b> 85.00 : 115.00
Boron	TM152	<b>104.20</b> 85.00 : 115.00
Cadmium	TM152	<b>108.92</b> 85.00 : 115.00
Chromium	TM152	<b>104.41</b> 85.00 : 115.00
Cobalt	TM152	<b>104.69</b> 85.00 : 115.00
Copper	TM152	<b>105.24</b> 85.00 : 115.00
Lead	TM152	<b>104.75</b> 85.00 : 115.00
Lithium	TM152	<b>106.60</b> 85.00 : 115.00
Manganese	TM152	<b>103.27</b> 85.00 : 115.00
Molybdenum	TM152	<b>105.36</b> 85.00 : 115.00
Nickel	TM152	<b>103.95</b> 85.00 : 115.00
Phosphorus	TM152	<b>105.00</b> 85.00 : 115.00
Selenium	TM152	<b>104.84</b> 85.00 : 115.00
Silver	TM152	<b>106.53</b> 85.00 : 115.00
Strontium	TM152	<b>105.76</b> 85.00 : 115.00
Tellurium	TM152	<b>108.81</b> 85.00 : 115.00
Thallium	TM152	<b>103.44</b> 85.00 : 115.00
Tin	TM152	<b>107.56</b> 85.00 : 115.00
Titanium	TM152	<b>107.39</b> 85.00 : 115.00
Uranium	TM152	<b>104.64</b> 85.00 : 115.00

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

Dissolved Metals by ICP-MS

		QC 34
Vanadium	TM152	<b>104.43</b> 85.00 : 115.00
Zinc	TM152	<b>103.96</b> 85.00 : 115.00

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 34
Total Aliphatics >C12-C35	TM174	<b>93.43</b> 77.43 : 102.04

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 35
Total Aromatics >EC12-EC35	TM174	<b>95.67</b> 70.83 : 112.31

GRO by GC-FID (W)

Component	Method Code	QC 38
Benzene by GC	TM245	<b>101.25</b> 67.00 : 133.00
Ethylbenzene by GC	TM245	<b>97.75</b> 67.00 : 133.00
m & p Xylene by GC	TM245	<b>96.00</b> 67.00 : 133.00
MTBE GC-FID	TM245	<b>104.30</b> 67.00 : 133.00
o Xylene by GC	TM245	<b>97.85</b> 67.00 : 133.00
QC	TM245	<b>110.94</b> 67.00 : 133.00
Toluene by GC	TM245	<b>101.40</b> 67.00 : 133.00

Mercury Dissolved

Component	Method Code	QC 37	QC 35
Mercury Dissolved (CVAF)	TM183	<b>106.00</b> 74.58 : 114.26	<b>108.00</b> 85.87 : 123.88

PAH Spec MS - Aqueous (W)

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

PAH Spec MS - Aqueous (W)

Component	Method Code	QC 38	QC 36
Acenaphthene by GCMS	TM178	<b>97.77</b> 85.48 : 106.23	<b>93.72</b> 82.69 : 106.11
Acenaphthylene by GCMS	TM178	<b>100.45</b> 80.12 : 106.77	<b>93.12</b> 82.16 : 104.82
Anthracene by GCMS	TM178	<b>96.29</b> 77.85 : 105.75	<b>90.59</b> 77.85 : 105.75
Benz(a)anthracene by GCMS	TM178	<b>97.46</b> 78.50 : 107.21	<b>87.02</b> 75.32 : 108.18
Benzo(a)pyrene by GCMS	TM178	<b>108.61</b> 82.45 : 122.13	<b>98.66</b> 86.69 : 118.58
Benzo(b)fluoranthene by GCMS	TM178	<b>108.62</b> 87.25 : 114.25	<b>98.77</b> 87.25 : 114.25
Benzo(ghi)perylene by GCMS	TM178	<b>100.82</b> 82.05 : 112.05	<b>96.82</b> 82.05 : 112.05
Benzo(k)fluoranthene by GCMS	TM178	<b>109.33</b> 87.20 : 122.40	<b>101.20</b> 87.20 : 122.40
Chrysene by GCMS	TM178	<b>102.93</b> 85.32 : 108.58	<b>96.02</b> 83.22 : 112.82
Dibenzo(ah)anthracene by GCMS	TM178	<b>96.20</b> 72.40 : 118.55	<b>93.26</b> 72.40 : 118.55
Fluoranthene by GCMS	TM178	<b>95.89</b> 87.00 : 105.75	<b>95.72</b> 87.00 : 105.75
Fluorene by GCMS	TM178	<b>98.05</b> 83.15 : 107.63	<b>96.05</b> 83.12 : 110.71
Indeno(123cd)pyrene by GCMS	TM178	<b>103.83</b> 82.25 : 114.75	<b>94.68</b> 82.25 : 114.75
Naphthalene by GCMS	TM178	<b>100.17</b> 84.63 : 104.92	<b>95.18</b> 84.07 : 108.07
Phenanthrene by GCMS	TM178	<b>99.32</b> 86.86 : 107.20	<b>93.18</b> 86.79 : 108.29
Pyrene by GCMS	TM178	<b>101.59</b> 84.55 : 108.55	<b>96.12</b> 84.55 : 108.55
Volume	TM178	<b>15000.00</b>	<b>15000.00</b>

pH Value

Component	Method Code	QC 38
pH	TM256	<b>100.00</b> 99.23 : 100.44

VOC MS (W)

Component	Method Code	QC 36
1,1,1,2-Tetrachloroethane	TM208	<b>101.27</b> 68.73 : 146.05
1,1,1-Trichloroethane	TM208	<b>94.12</b> 67.74 : 143.94
1,1-Dichloroethane	TM208	<b>90.36</b> 69.64 : 147.98

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

## VOC MS (W)

		QC 36
1,2-Dichloroethane	TM208	<b>101.38</b> 72.61 : 154.30
2-Chlorotoluene	TM208	<b>102.12</b> 69.04 : 146.72
4-Chlorotoluene	TM208	<b>102.85</b> 69.11 : 146.84
Benzene	TM208	<b>91.74</b> 71.02 : 150.91
Bromomethane	TM208	<b>102.83</b> 70.23 : 149.23
Carbontetrachloride	TM208	<b>101.24</b> 67.97 : 144.44
Chlorobenzene	TM208	<b>100.06</b> 69.74 : 148.19
Chloroform	TM208	<b>98.19</b> 69.97 : 148.69
Chloromethane	TM208	<b>104.04</b> 70.81 : 150.46
Cis-1,2-Dichloroethene	TM208	<b>95.83</b> 70.79 : 150.42
Dichloromethane	TM208	<b>97.08</b> 70.82 : 150.49
Ethylbenzene	TM208	<b>94.09</b> 67.32 : 143.07
Hexachlorobutadiene	TM208	<b>105.81</b> 70.40 : 149.63
o-Xylene	TM208	<b>95.03</b> 68.68 : 145.93
p/m-Xylene	TM208	<b>95.90</b> 68.11 : 144.74
Tert-butyl methyl ether	TM208	<b>76.96</b> 64.65 : 137.39
Tetrachloroethene	TM208	<b>106.81</b> 67.78 : 144.04
Toluene	TM208	<b>94.98</b> 68.79 : 146.18
Trichloroethene	TM208	<b>96.78</b> 68.83 : 146.25
Vinyl Chloride	TM208	<b>101.87</b> 72.07 : 153.15

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Chromatogram

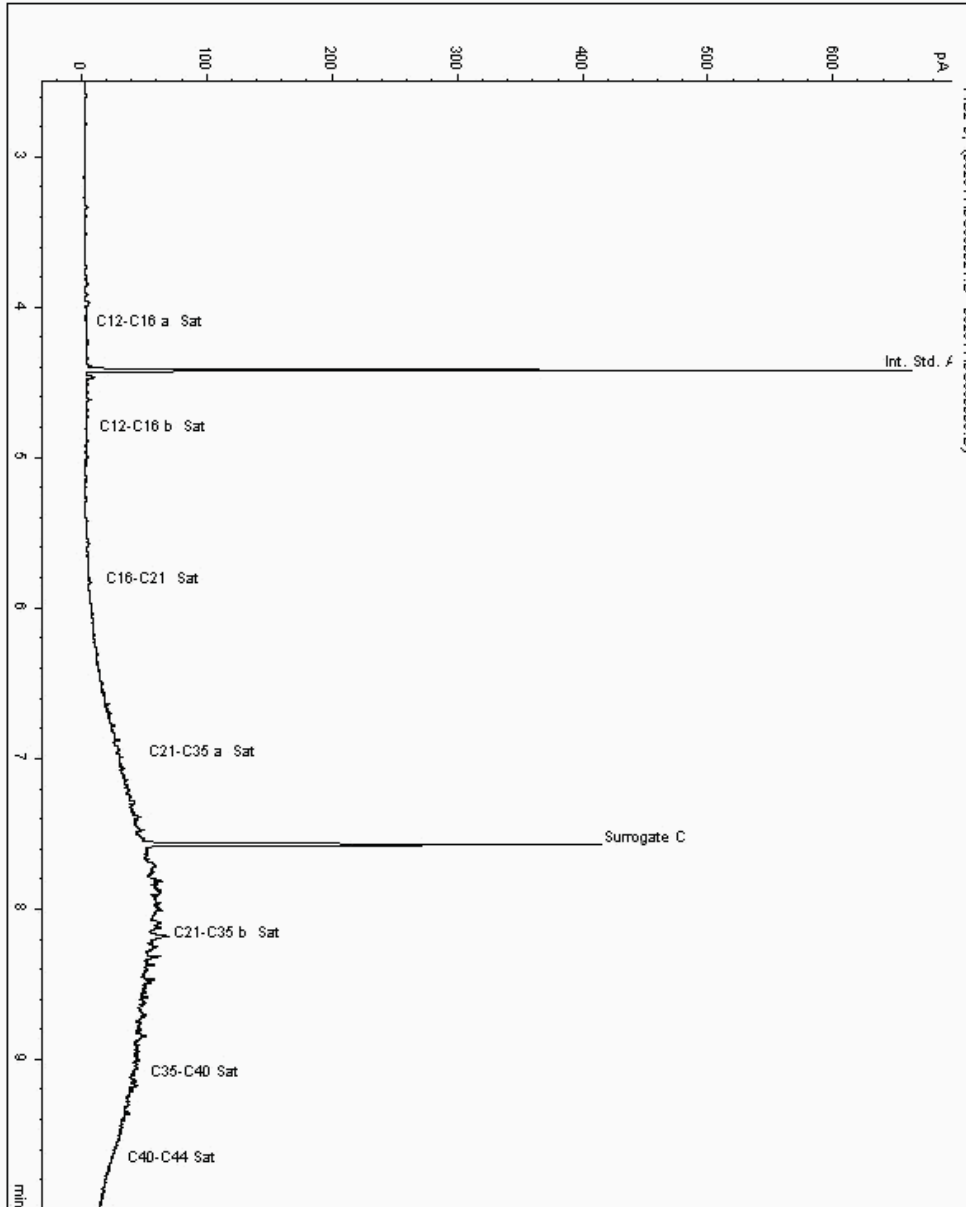
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3140596  
 Sample ID : BH110 (S)

Depth :

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

Sample Identity: 3188970-3140596  
 Date Acquired : 28/03/11 23:52:32 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Chromatogram

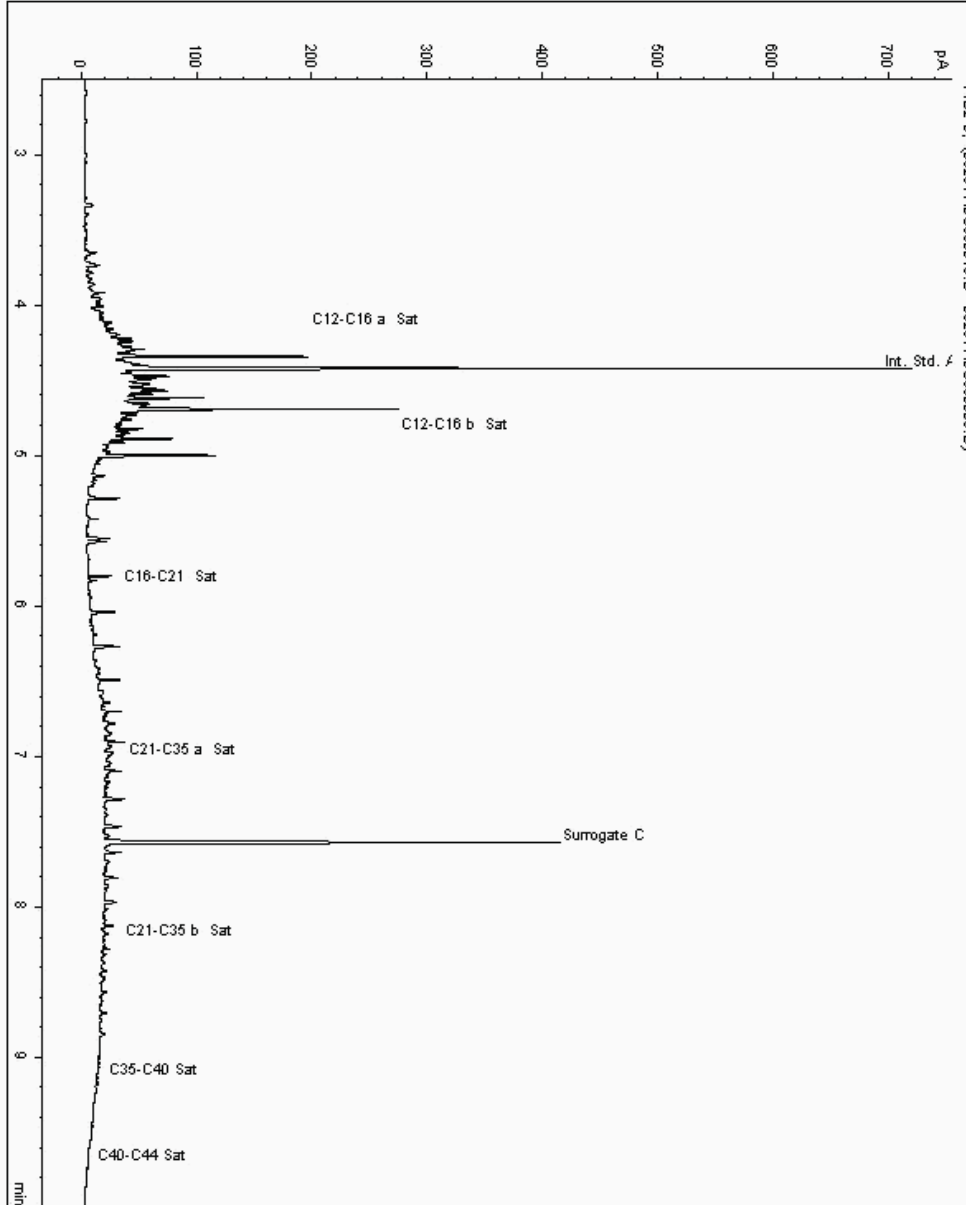
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3140629  
 Sample ID : BH108 (S)

Depth :

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

Sample Identity: 3188958-3140629  
 Date Acquired : 28/03/11 23:21:48 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location: ARCADIS Geraghty & Miller  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number: 123110  
 Report Number: 123110  
 Superseded Report:

### Chromatogram

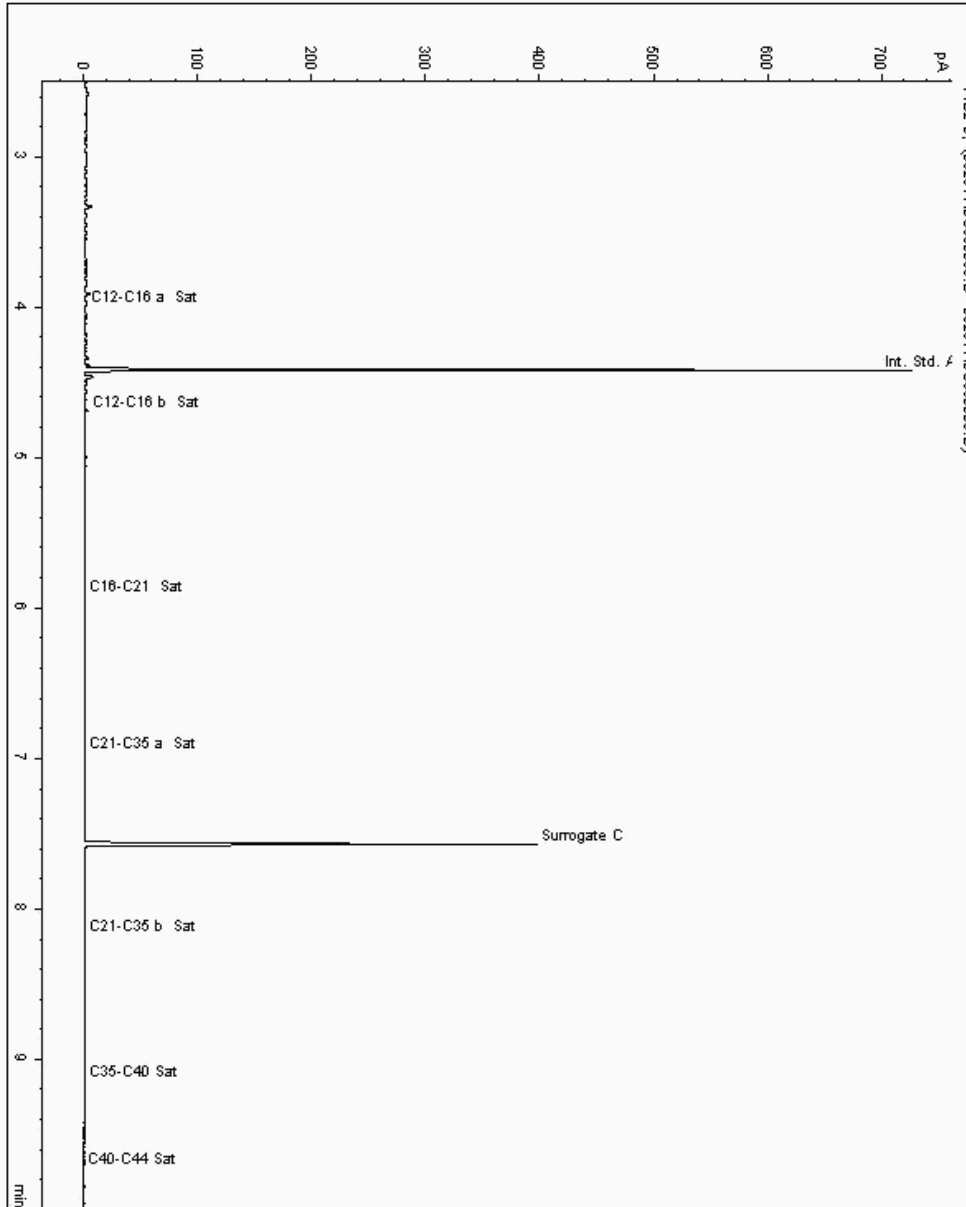
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3140927  
 Sample ID : BH106 (S)

Depth :

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

Sample Identity: 3188983-3140927  
 Date Acquired : 29/03/11 03:42:39 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02.

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Chromatogram

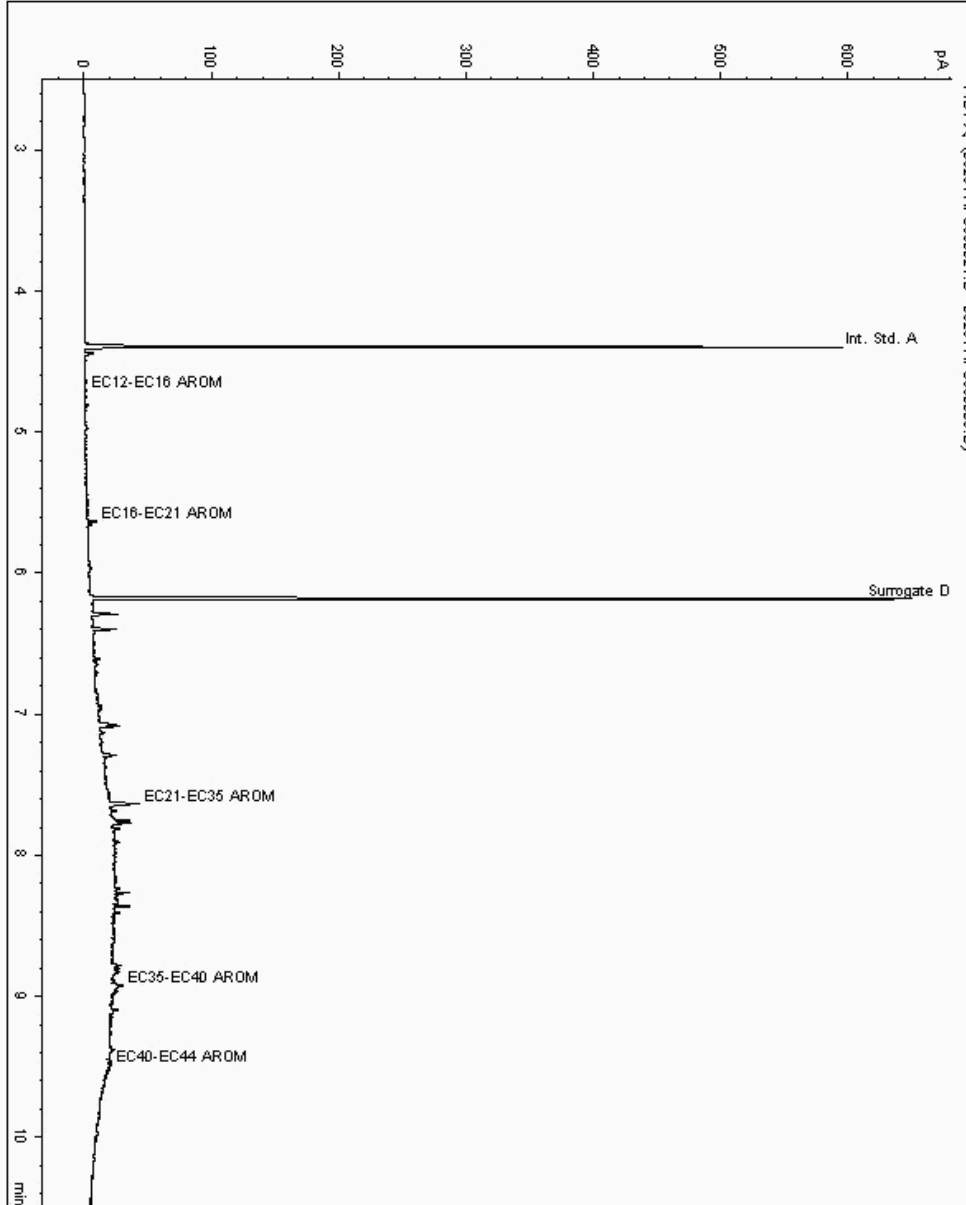
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 3140596  
 Sample ID : BH110 (S)

Depth :

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

Sample Identity: 3188971-3140596  
 Date Acquired : 28/03/11 23:52:32 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008





SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Chromatogram

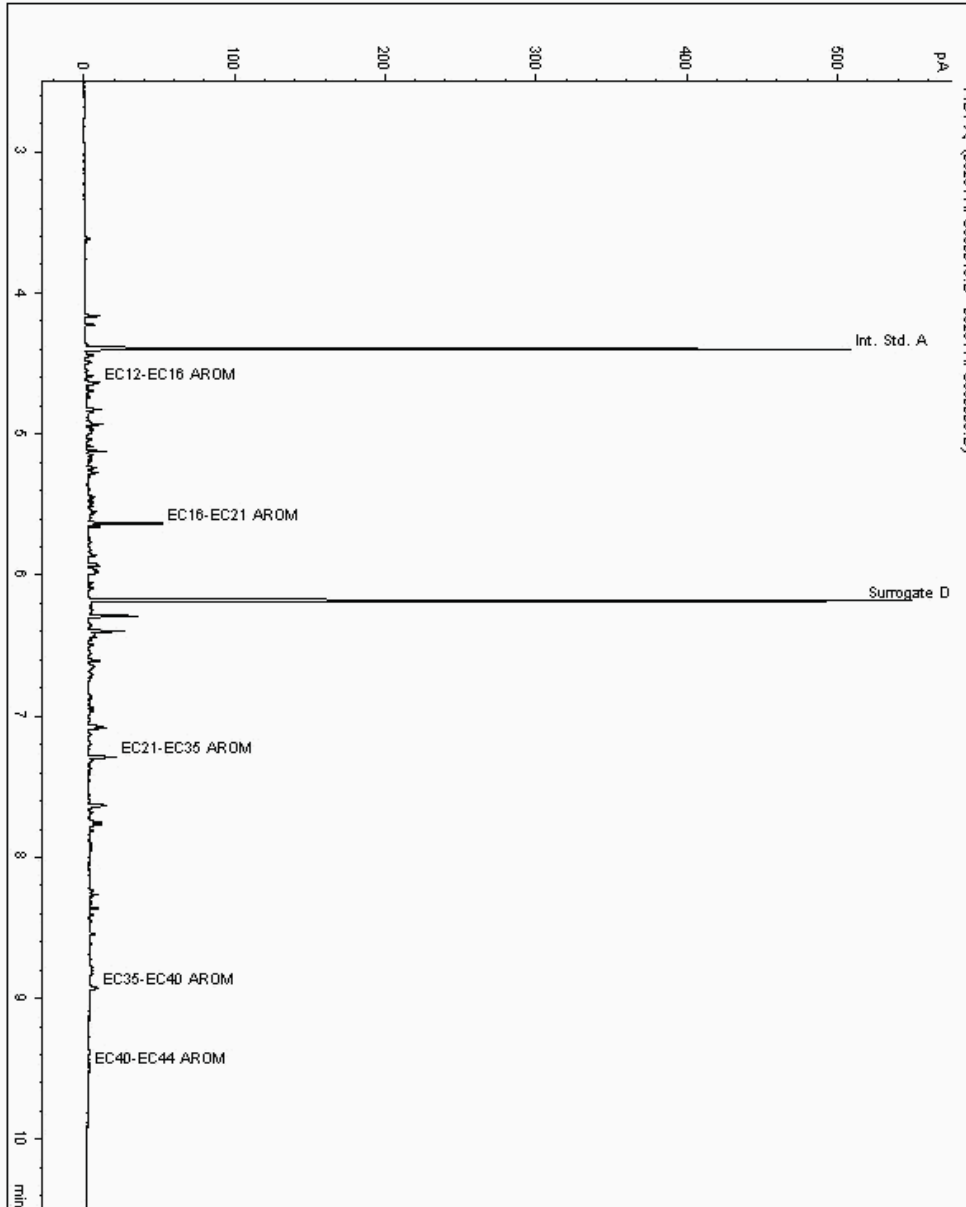
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 3140629  
 Sample ID : BH108 (S)

Depth :

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

Sample Identity: 3188959-3140629  
 Date Acquired : 28/03/11 23:21:48 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110323-11  
 Job: H\_ARCADIS\_NMK-373  
 Client Reference: 93749.02

Location:  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 123110  
 Superseded Report:

### Chromatogram

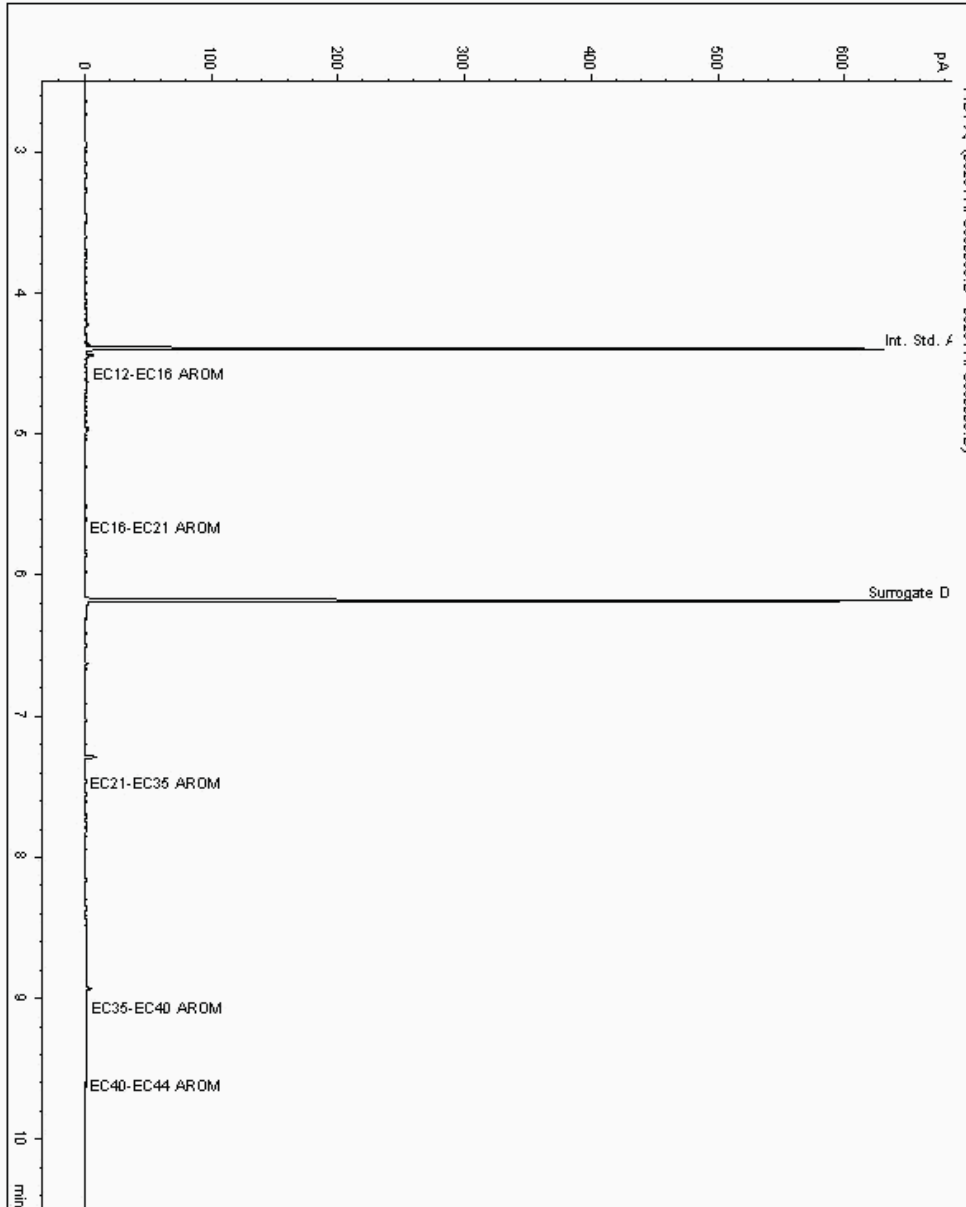
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 3140927  
 Sample ID : BH106 (S)

Depth :

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

Sample Identity: 3188984-3140927  
 Date Acquired : 29/03/11 03:42:39 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110323-11  
Job: H\_ARCADIS\_NMK-373  
Client Reference: 93749.02.

Location:  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

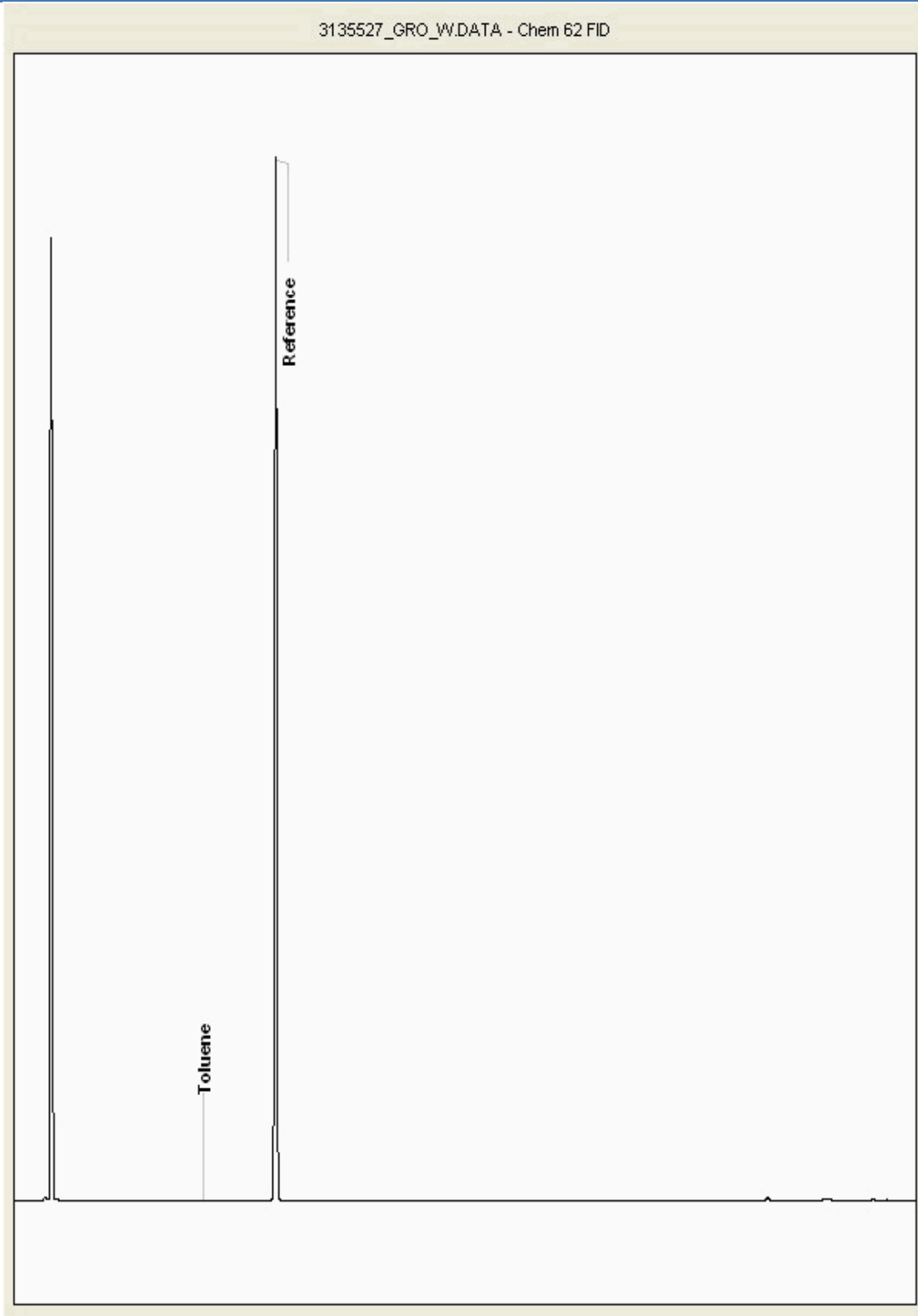
Order Number:  
Report Number: 123110  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3135527  
Sample ID : BH108 (S)

Depth :



SDG: 110323-11  
Job: H\_ARCADIS\_NMK-373  
Client Reference: 93749.02.

Location:  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

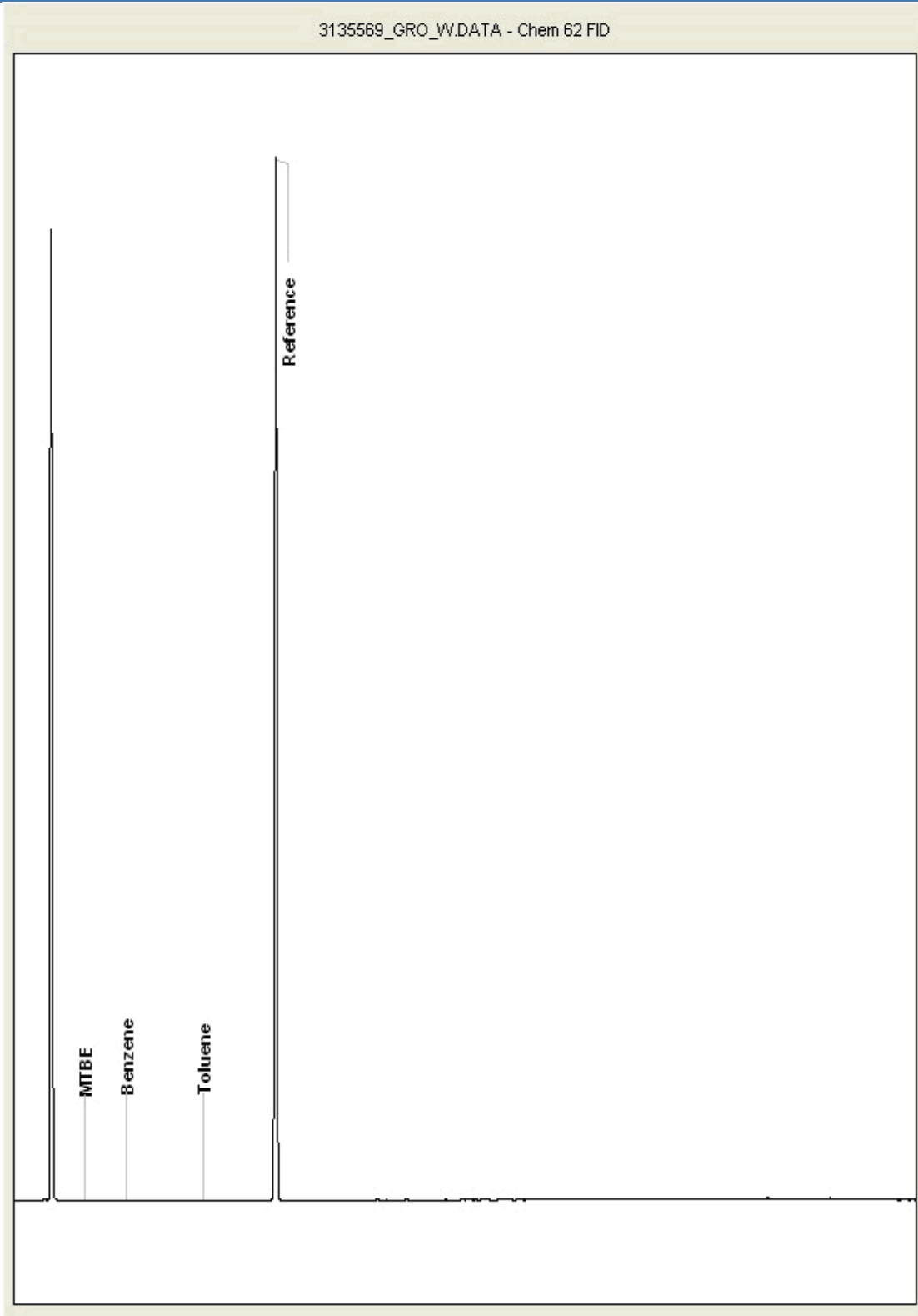
Order Number:  
Report Number: 123110  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3135569  
Sample ID : BH110 (S)

Depth :



SDG: 110323-11  
Job: H\_ARCADIS\_NMK-373  
Client Reference: 93749.02.

Location:  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

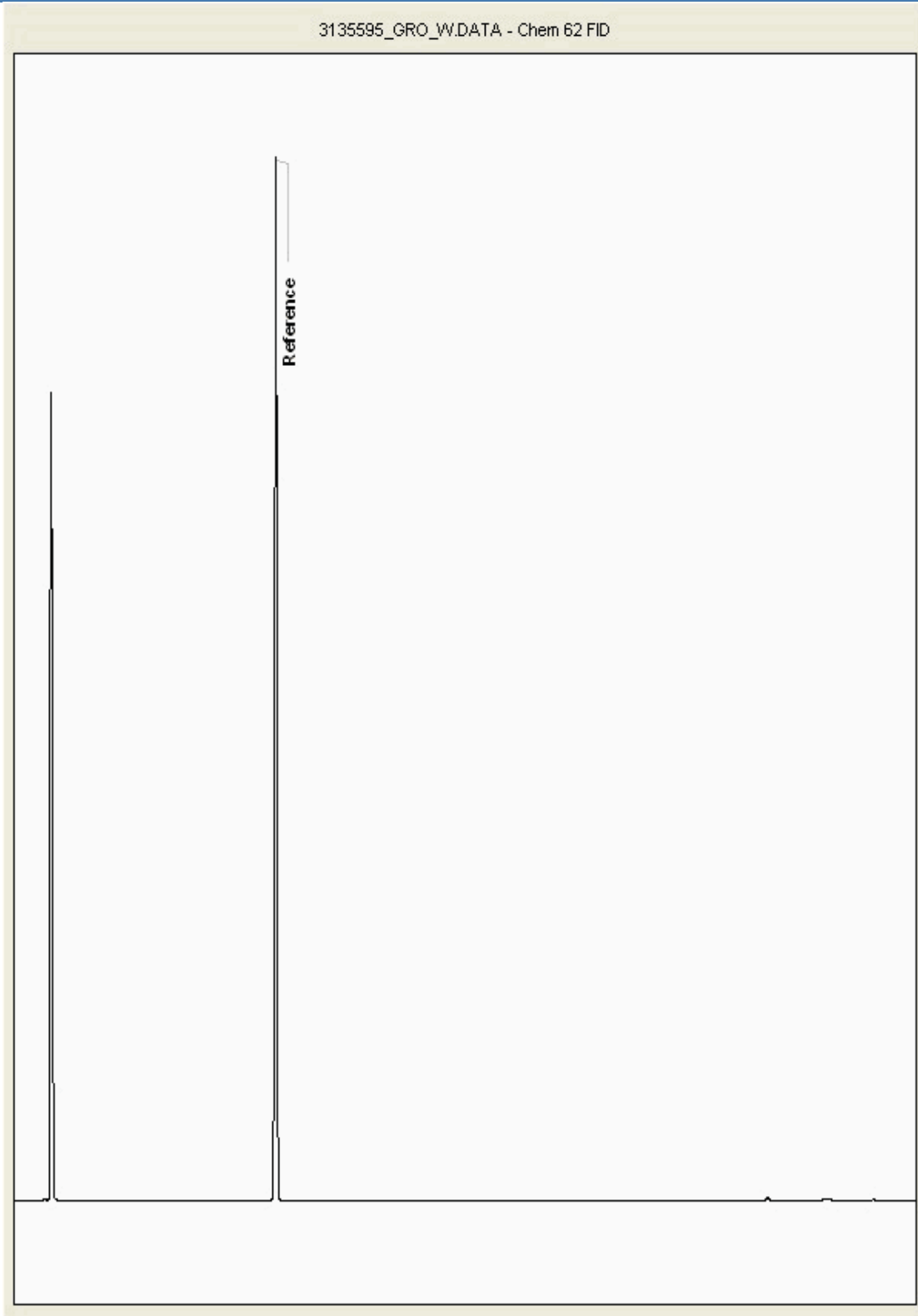
Order Number:  
Report Number: 123110  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3135595  
Sample ID : BH106 (S)

Depth :



**SDG:** 110323-11  
**Job:** H\_ARCADIS\_NMK-373  
**Client Reference:** 93749.02.

**Location:**  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 123110  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOX THERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOX THERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOX THERM	HFLC
PHENOLS BY GCMS	WET	DOM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOX THERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (W/G BY GC)	D&C	HEXANE/ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM28.	GCMS
C8-C10 (G/C10) EZ FLASH	WET	HEXANE/ACETONE	SHAWER	GC/EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAWER	GC/EZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH (W/G)	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 COGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HFLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HFLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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 HSG 264.

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.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 10 March 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110307-34  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 120104

We received 4 samples on Saturday March 05, 2011 and 4 of these samples were scheduled for analysis which was completed on Thursday March 10, 2011. 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:

**Sonia McWhan**

Operations Manager



**SDG:** 110307-34  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120104  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3012568	BH103			03/03/2011
3012567	BH107			03/03/2011
3012564	BH108			03/03/2011
3012569	BH109			03/03/2011

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



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

LIQUID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test  <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)		3012568	3012567	3012564	3012569
	Customer Sample Reference		BH103	BH107	BH108	BH109
	AGS Reference					
	Depth (m)					
	Container		1l green glass bottle Vial 1l plastic NaOH	1l green glass bottle Vial 1l plastic NaOH	1l green glass bottle Vial 1l plastic NaOH	1l green glass bottle Vial 1l plastic NaOH
Anions by Kone (w)	All	NDPs: 0 Tests: 4	X	X	X	X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 4	X	X	X	X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 4	X	X	X	X
Easily Liberated Sulphide	All	NDPs: 0 Tests: 4	X	X	X	X
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 4	X	X	X	X
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 4	X	X	X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 4		X	X	X
Mercury Dissolved	All	NDPs: 0 Tests: 4	X	X	X	X
Oxygenates (W)	All	NDPs: 0 Tests: 4		X	X	X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 4	X	X	X	X
pH Value	All	NDPs: 0 Tests: 4	X	X	X	X
Phenols by HPLC (W)	All	NDPs: 0 Tests: 4	X	X	X	X
Sulphide	All	NDPs: 0 Tests: 4	X	X	X	X
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 4	X	X	X	X
TPH CWG (W)	All	NDPs: 0 Tests: 4	X	X	X	X

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

<b>LIQUID</b> Results Legend X Test N No Determination Possible	Lab Sample No(s)	3012568	3012567	3012564	3012569													
	Customer Sample Reference	BH103	BH107	BH108	BH109													
	AGS Reference																	
	Depth (m)																	
	Container	1l green glass bottle	Vial	1l green glass bottle	Vial	Vial	1l green glass bottle	1l plastic	NaOH	Vial	1l green glass bottle	1l plastic	NaOH	Vial	1l green glass bottle	1l plastic	NaOH	Vial
VOC MS (W)	All	NDPs: 0 Tests: 4		X	X	X	X											

**SDG:** 110307-34  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120104  
**Superseded Report:**

Results Legend		Customer Sample R	BH103	BH107	BH108	BH109		
#	ISO17025 accredited.		Depth (m)	Water (GW/SW)	Water (GW/SW)	Water (GW/SW)	Water (GW/SW)	
M	mCERTS accredited.	Sample Type	03/03/2011	03/03/2011	03/03/2011	03/03/2011		
S	Non-conforming work.	Date Sampled	05/03/2011	05/03/2011	05/03/2011	05/03/2011		
aq	Aqueous / settled sample.	Date Received	110307-34	110307-34	110307-34	110307-34		
diss.filt	Dissolved / filtered sample.	SDG Ref	3012568	3012567	3012564	3012569		
tot.unfilt	Total / unfiltered sample.	Lab Sample No.(s)						
*	subcontracted test.	AGS Reference						
**	% 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.							
Component	LOD/Units	Method						
Organic Carbon, Total	<3000 µg/l	TM090	11100 #	5270 #	6200 #	12800 #		
Sulphide	<10 µg/l	TM101	<10 #	<10 #	<10 #	<10 #		
Arsenic (diss.filt)	<0.12 µg/l	TM152	1.28 #	0.985 #	1.3 #	3.55 #		
Beryllium (diss.filt)	<0.07 µg/l	TM152	<0.07 #	<0.07 #	<0.07 #	<0.07 #		
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #	<0.1 #	0.264 #	<0.1 #		
Chromium (diss.filt)	<0.22 µg/l	TM152	11.5 #	4.17 #	9.21 #	21.6 #		
Copper (diss.filt)	<0.85 µg/l	TM152	4.53 #	1.23 #	13.6 #	<0.85 #		
Lead (diss.filt)	<0.02 µg/l	TM152	<0.02 #	<0.02 #	0.031 #	0.212 #		
Molybdenum (diss.filt)	<0.24 µg/l	TM152	2.95 #	24.4 #	13.2 #	3.26 #		
Nickel (diss.filt)	<0.15 µg/l	TM152	9.43 #	5.62 #	10.1 #	8.24 #		
Vanadium (diss.filt)	<0.24 µg/l	TM152	3.7 #	1.48 #	3.05 #	7.16 #		
Zinc (diss.filt)	<0.41 µg/l	TM152	2.89 #	0.455 #	34 #	8.48 #		
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	<0.01 #	<0.01 #	<0.01 #		
Sulphate	<2000 µg/l	TM184	238000 #	160000 #	87800 #	23400 #		
Cyanide, Total	<50 µg/l	TM227	<50 #	<50 #	<50 #	<50 #		
Cyanide, Free	<50 µg/l	TM227	<50 #	<50 #	<50 #	<50 #		
Sulphide, Easily liberated	<100 µg/l	TM239	<100 #	<100 #	<100 #	<100 #		
pH	<1 pH Units	TM256	8.22 #	8.37 #	8.58 #	8.26 #		
Phenol	<2 µg/l	TM259	<2 #	<2 #	<2 #	<2 #		
tert Butanol	<10 µg/l	TM289	<10 #	<10 #	<10 #	<10 #		
tert-butyl ethyl ether	<1 µg/l	TM289	<1 #	<1 #	<1 #	<1 #		

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

PAH Spec MS - Aqueous (W)

Results Legend		Customer Sample R	BH103	BH107	BH108	BH109			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.		Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)			
S	Non-conforming work.		03/03/2011	03/03/2011	03/03/2011	03/03/2011			
aq	Aqueous / settled sample.		05/03/2011	05/03/2011	05/03/2011	05/03/2011			
diss.filt	Dissolved / filtered sample.		110307-34	110307-34	110307-34	110307-34			
tot.unfilt	Total / unfiltered sample.		3012568	3012567	3012564	3012569			
*	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.								
Component	LOD/Units		Method						
Naphthalene (aq)	<0.1 µg/l		TM178	0.373 #	1.84 #	0.201 #	0.377 #		
Acenaphthene (aq)	<0.015 µg/l	TM178	0.0494 #	0.155 #	0.0446 #	0.619 #			
Acenaphthylene (aq)	<0.011 µg/l	TM178	0.02 #	0.0426 #	0.0193 #	0.0902 #			
Fluoranthene (aq)	<0.017 µg/l	TM178	0.493 #	0.955 #	0.35 #	1.25 #			
Anthracene (aq)	<0.015 µg/l	TM178	0.0733 #	0.207 #	0.0442 #	0.23 #			
Phenanthrene (aq)	<0.022 µg/l	TM178	0.487 #	1.85 #	0.239 #	0.664 #			
Fluorene (aq)	<0.014 µg/l	TM178	0.127 #	0.427 #	0.0566 #	0.684 #			
Chrysene (aq)	<0.013 µg/l	TM178	0.303 #	0.676 #	0.243 #	0.497 #			
Pyrene (aq)	<0.015 µg/l	TM178	0.403 #	0.788 #	0.301 #	1.02 #			
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	0.252 #	0.464 #	0.199 #	0.474 #			
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	0.289 #	0.461 #	0.314 #	0.388 #			
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	0.205 #	0.323 #	0.233 #	0.359 #			
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	0.276 #	0.407 #	0.273 #	0.487 #			
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	0.065 #	0.0827 #	0.0614 #	0.123 #			
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	0.22 #	0.383 #	0.257 #	0.407 #			
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	0.161 #	0.243 #	0.217 #	0.34 #			
Polyaromatic hydrocarbons, Total	<0.1 µg/l	TM178	3.8 #	9.31 #	3.05 #	8.01 #			

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

TPH CWG (W)

Results Legend		Customer Sample R	BH103	BH107	BH108	BH109			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.		Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)			
S	Non-conforming work.		03/03/2011	03/03/2011	03/03/2011	03/03/2011			
aq	Aqueous / settled sample.		05/03/2011	05/03/2011	05/03/2011	05/03/2011			
diss.filt	Dissolved / filtered sample.		110307-34	110307-34	110307-34	110307-34			
tot.unfilt	Total / unfiltered sample.		3012568	3012567	3012564	3012569			
*	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.								
Component	LOD/Units		Method						
GRO Surrogate % recovery**	%		TM245	87	94	94	92		
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3 #	<3 #	<3 #	<3 #			
Benzene	<7 µg/l	TM245	<7 #	<7 #	<7 #	<7 #			
Toluene	<4 µg/l	TM245	<4 #	<4 #	<4 #	<4 #			
Ethylbenzene	<5 µg/l	TM245	<5 #	<5 #	<5 #	<5 #			
m,p-Xylene	<8 µg/l	TM245	<8 #	<8 #	<8 #	<8 #			
o-Xylene	<3 µg/l	TM245	<3 #	<3 #	<3 #	<3 #			
m,p,o-Xylene	<10 µg/l	TM245	<10	<10	<10	<10			
BTEX, Total	<10 µg/l	TM245	<10	<10	<10	<10			
Aliphatics >C5-C6	<10 µg/l	TM245	<10	<10	<10	<10			
Aliphatics >C6-C8	<10 µg/l	TM245	<10	<10	<10	<10			
Aliphatics >C8-C10	<10 µg/l	TM245	<10	<10	<10	<10			
Aliphatics >C10-C12	<10 µg/l	TM245	<10	<10	<10	<10			
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Aromatics >EC5-EC7	<10 µg/l	TM245	<10	<10	<10	<10			
Aromatics >EC7-EC8	<10 µg/l	TM245	<10	<10	<10	<10			
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	<10	<10	<10			
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10	<10	<10			
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aliphatics >C5-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aromatics >C6-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aliphatics & Aromatics >C12-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10			
Total Aliphatics >C5-C12	<10 µg/l	TM245	<10	<10	<10	<10			
Total Aromatics >EC5-EC12	<10 µg/l	TM245	<10	<10	<10	<10			

**SDG:** 110307-34  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120104  
**Superseded Report:**

**VOC MS (W)**

Results Legend		Customer Sample R	BH103	BH107	BH108	BH109		
#	ISO17025 accredited.		Water (GW/SW)	Water (GW/SW)	Water (GW/SW)	Water (GW/SW)		
M	mCERTS accredited.	Depth (m)	03/03/2011	03/03/2011	03/03/2011	03/03/2011		
S	Non-conforming work.	Sample Type	05/03/2011	05/03/2011	05/03/2011	05/03/2011		
aq	Aqueous / settled sample.	Date Sampled	110307-34	110307-34	110307-34	110307-34		
diss.filt	Dissolved / filtered sample.	Date Received	3012568	3012567	3012564	3012569		
tot.unfilt	Total / unfiltered sample.	SDG Ref						
*	subcontracted test.	Lab Sample No.(s)						
**	% 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.	AGS Reference						
Component	LOD/Units	Method						
Dibromofluoromethane**	%	TM208	110	113	110	111		
Toluene-d8**	%	TM208	98.5	98	98.8	99.1		
4-Bromofluorobenzene**	%	TM208	96.5	95.3	96.3	96.4		
Dichlorodifluoromethane	<7 µg/l	TM208	<7	<7	<7	<7	#	#
Chloromethane	<9 µg/l	TM208	<9	<9	<9	<9	#	#
Vinyl chloride	<1.2 µg/l	TM208	<1.2	<1.2	<1.2	<1.2	#	#
Bromomethane	<2 µg/l	TM208	<2	<2	<2	<2	#	#
Chloroethane	<2.5 µg/l	TM208	<2.5	<2.5	<2.5	<2.5	#	#
Trichlorofluoromethane	<1.3 µg/l	TM208	<1.3	<1.3	<1.3	<1.3	#	#
1,1-Dichloroethene	<1.2 µg/l	TM208	<1.2	<1.2	<1.2	<1.2	#	#
Carbon disulphide	<1.3 µg/l	TM208	<1.3	<1.3	<1.3	<1.3	#	#
Dichloromethane	<3.7 µg/l	TM208	<3.7	<3.7	<3.7	<3.7	#	#
Methyl tertiary butyl ether (MTBE)	<1.6 µg/l	TM208	<1.6	<1.6	<1.6	<1.6	#	#
trans-1,2-Dichloroethene	<1.9 µg/l	TM208	<1.9	<1.9	<1.9	<1.9	#	#
1,1-Dichloroethane	<1.2 µg/l	TM208	<1.2	<1.2	<1.2	<1.2	#	#
cis-1,2-Dichloroethene	<2.3 µg/l	TM208	<2.3	<2.3	<2.3	<2.3	#	#
2,2-Dichloropropane	<3.8 µg/l	TM208	<3.8	<3.8	<3.8	<3.8	#	#
Bromochloromethane	<1.9 µg/l	TM208	<1.9	<1.9	<1.9	<1.9	#	#
Chloroform	<1.8 µg/l	TM208	<1.8	<1.8	<1.8	<1.8	#	#
1,1,1-Trichloroethane	<1.3 µg/l	TM208	<1.3	<1.3	<1.3	<1.3	#	#
1,1-Dichloropropene	<1.3 µg/l	TM208	<1.3	<1.3	<1.3	<1.3	#	#
Carbontetrachloride	<1.4 µg/l	TM208	<1.4	<1.4	<1.4	<1.4	#	#
1,2-Dichloroethane	<3.3 µg/l	TM208	<3.3	<3.3	<3.3	<3.3	#	#
Benzene	<1.3 µg/l	TM208	<1.3	<1.3	<1.3	<1.3	#	#
Trichloroethene	<2.5 µg/l	TM208	<2.5	<2.5	<2.5	<2.5	#	#
1,2-Dichloropropane	<3 µg/l	TM208	<3	<3	<3	<3	#	#
Dibromomethane	<2.7 µg/l	TM208	<2.7	<2.7	<2.7	<2.7	#	#
Bromodichloromethane	<0.9 µg/l	TM208	<0.9	<0.9	<0.9	<0.9	#	#
cis-1,3-Dichloropropene	<1.9 µg/l	TM208	<1.9	<1.9	<1.9	<1.9	#	#
Toluene	<1.4 µg/l	TM208	<1.4	<1.4	<1.4	<1.4	#	#
trans-1,3-Dichloropropene	<3.5 µg/l	TM208	<3.5	<3.5	<3.5	<3.5	#	#
1,1,2-Trichloroethane	<2.2 µg/l	TM208	<2.2	<2.2	<2.2	<2.2	#	#
1,3-Dichloropropane	<2.2 µg/l	TM208	<2.2	<2.2	<2.2	<2.2	#	#
Tetrachloroethene	<1.5 µg/l	TM208	<1.5	<1.5	<1.5	<1.5	#	#
Dibromochloromethane	<1.7 µg/l	TM208	<1.7	<1.7	<1.7	<1.7	#	#

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number: 120104  
 Report Number:  
 Superseded Report:

VOC MS (W)

Results Legend			Customer Sample R	BH103	BH107	BH108	BH109			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water (GW/SW)	Water (GW/SW)	Water (GW/SW)	Water (GW/SW)			
M	mCERTS accredited.			03/03/2011	03/03/2011	03/03/2011	03/03/2011			
S	Non-conforming work.			05/03/2011	05/03/2011	05/03/2011	05/03/2011			
aq	Aqueous / settled sample.			110307-34	110307-34	110307-34	110307-34			
diss.filt	Dissolved / filtered sample.			3012568	3012567	3012564	3012569			
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.									
Component	LOD/Units	Method								
1,2-Dibromoethane	<2.3 µg/l	TM208			<2.3 #	<2.3 #	<2.3 #	<2.3 #		
Chlorobenzene	<3.5 µg/l	TM208		<3.5 #	<3.5 #	<3.5 #	<3.5 #			
1,1,1,2-Tetrachloroethane	<1.3 µg/l	TM208		<1.3 #	<1.3 #	<1.3 #	<1.3 #			
Ethylbenzene	<2.5 µg/l	TM208		<2.5 #	<2.5 #	<2.5 #	<2.5 #			
m,p-Xylene	<2.5 µg/l	TM208		<2.5 #	<2.5 #	<2.5 #	<2.5 #			
o-Xylene	<1.7 µg/l	TM208		<1.7 #	<1.7 #	<1.7 #	<1.7 #			
Styrene	<1.2 µg/l	TM208		<1.2 #	<1.2 #	<1.2 #	<1.2 #			
Bromoform	<3 µg/l	TM208		<3 #	<3 #	<3 #	<3 #			
Isopropylbenzene	<1.4 µg/l	TM208		<1.4 #	<1.4 #	<1.4 #	<1.4 #			
1,1,1,2,2-Tetrachloroethane	<5.2 µg/l	TM208		<5.2 #	<5.2 #	<5.2 #	<5.2 #			
1,2,3-Trichloropropane	<7.8 µg/l	TM208		<7.8 #	<7.8 #	<7.8 #	<7.8 #			
Bromobenzene	<2 µg/l	TM208		<2 #	<2 #	<2 #	<2 #			
Propylbenzene	<2.6 µg/l	TM208		<2.6 #	<2.6 #	<2.6 #	<2.6 #			
2-Chlorotoluene	<1.9 µg/l	TM208		<1.9 #	<1.9 #	<1.9 #	<1.9 #			
1,3,5-Trimethylbenzene	<1.8 µg/l	TM208		<1.8 #	<1.8 #	<1.8 #	<1.8 #			
4-Chlorotoluene	<1.9 µg/l	TM208		<1.9 #	<1.9 #	<1.9 #	<1.9 #			
tert-Butylbenzene	<2 µg/l	TM208		<2 #	<2 #	<2 #	<2 #			
1,2,4-Trimethylbenzene	<1.7 µg/l	TM208		<1.7 #	<1.7 #	<1.7 #	<1.7 #			
sec-Butylbenzene	<1.7 µg/l	TM208		<1.7 #	<1.7 #	<1.7 #	<1.7 #			
4-iso-Propyltoluene	<2.6 µg/l	TM208		<2.6 #	<2.6 #	<2.6 #	<2.6 #			
1,3-Dichlorobenzene	<2.2 µg/l	TM208		<2.2 #	<2.2 #	<2.2 #	<2.2 #			
1,4-Dichlorobenzene	<2.7 µg/l	TM208		<2.7 #	<2.7 #	<2.7 #	<2.7 #			
n-Butylbenzene	<2 µg/l	TM208		<2 #	<2 #	<2 #	<2 #			
1,2-Dichlorobenzene	<3.7 µg/l	TM208		<3.7 #	<3.7 #	<3.7 #	<3.7 #			
1,2-Dibromo-3-chloropropane	<9.8 µg/l	TM208		<9.8 #	<9.8 #	<9.8 #	<9.8 #			
1,2,4-Trichlorobenzene	<2.3 µg/l	TM208		<2.3 #	<2.3 #	<2.3 #	<2.3 #			
Hexachlorobutadiene	<2.5 µg/l	TM208		<2.5 #	<2.5 #	<2.5 #	<2.5 #			
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #			
Naphthalene	<3.5 µg/l	TM208		<3.5 #	<3.5 #	<3.5 #	<3.5 #			
1,2,3-Trichlorobenzene	<3.1 µg/l	TM208		<3.1 #	<3.1 #	<3.1 #	<3.1 #			
1,3,5-Trichlorobenzene	<10 µg/l	TM208		<10 #	<10 #	<10 #	<10 #			

<b>SDG:</b> 110307-34	<b>Location:</b> Simonside	<b>Order Number:</b>
<b>Job:</b> H_ARCADIS_NMK-340	<b>Customer:</b> ARCADIS Geraghty & Miller	<b>Report Number:</b> 120104
<b>Client Reference:</b> 93749.02	<b>Attention:</b> Neil Beswick	<b>Superseded Report:</b>

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	<b>#</b>	ISO 17025 Accredited	*	Subcontracted Test	<b>M</b>	MCERTS Accredited
<b>NFD</b>	No Fibres Detected	<b>PFD</b>	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	<b>EC</b>	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 <sup>1</sup>	Surrogate Corrected
TM061	Method for the Determination of EPH, Massachusetts Dept. of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM239	Sulphide in Waters and Effluents 1983 (Tentative Methods) HMSO 1983, ISBN 011 7517186	Determination of Easily Liberated Sulphide in Waste waters		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		
TM289				

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



**SDG:** 110307-34  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120104  
**Superseded Report:**

### Test Completion Dates

Lab Sample No(s)	3012568	3012567	3012564	3012569
Customer Sample Ref.	BH103	BH107	BH108	BH109
AGS Ref.				
Depth				
Type	LIQUID	LIQUID	LIQUID	LIQUID
Anions by Kone (w)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
Cyanide Comp/Free/Total/Thiocyanate	07-Mar-2011	07-Mar-2011	07-Mar-2011	07-Mar-2011
Dissolved Metals by ICP-MS	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
Easily Liberated Sulphide	10-Mar-2011	10-Mar-2011	10-Mar-2011	10-Mar-2011
EPH CWG (Aliphatic) Aqueous GC (W)	10-Mar-2011	10-Mar-2011	10-Mar-2011	09-Mar-2011
EPH CWG (Aromatic) Aqueous GC (W)	10-Mar-2011	10-Mar-2011	10-Mar-2011	09-Mar-2011
GRO by GC-FID (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
Mercury Dissolved	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
Oxygenates (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
PAH Spec MS - Aqueous (W)	08-Mar-2011	10-Mar-2011	10-Mar-2011	08-Mar-2011
pH Value	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
Phenols by HPLC (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
Sulphide	09-Mar-2011	10-Mar-2011	10-Mar-2011	09-Mar-2011
Total Organic and Inorganic Carbon	07-Mar-2011	08-Mar-2011	08-Mar-2011	09-Mar-2011
TPH CWG (W)	10-Mar-2011	10-Mar-2011	10-Mar-2011	09-Mar-2011
VOC MS (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

**ASSOCIATED AQC DATA**

Anions by Kone (w)

Component	Method Code	QC 32	QC 34
Chloride	TM184	<b>99.80</b> 95.90 : 105.20	<b>102.00</b> 95.90 : 105.20
Nitrite as NO2	TM184	<b>97.80</b> 92.92 : 105.47	<b>97.40</b> 92.92 : 105.47
Phosphate (Ortho as PO4)	TM184	<b>102.92</b> 96.98 : 107.09	<b>104.04</b> 96.98 : 107.09
Sulphate (soluble)	TM184	<b>101.60</b> 95.09 : 105.03	<b>102.04</b> 95.09 : 105.03
TON as NO3	TM184	<b>102.19</b> 93.27 : 107.89	<b>100.14</b> 93.27 : 107.89

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 30
Free Cyanide (W)	TM227	<b>92.25</b> 87.13 : 117.88
Thiocyanate (W)	TM227	<b>98.05</b> 84.79 : 114.71
Total Cyanide (W)	TM227	<b>98.93</b> 87.76 : 118.74

Dissolved Metals by ICP-MS

Component	Method Code	QC 33	QC 37
Aluminium	TM152	<b>106.29</b> 85.00 : 115.00	<b>97.36</b> 85.00 : 115.00
Antimony	TM152	<b>96.03</b> 85.05 : 115.00	<b>101.60</b> 85.05 : 115.00
Arsenic	TM152	<b>92.24</b> 85.05 : 115.00	<b>99.61</b> 85.05 : 115.00
Barium	TM152	<b>96.52</b> 85.05 : 115.00	<b>100.09</b> 85.05 : 115.00
Beryllium	TM152	<b>101.51</b> 85.05 : 115.00	<b>98.88</b> 85.05 : 115.00
Bismuth	TM152	<b>92.93</b> 85.05 : 115.00	<b>98.53</b> 85.05 : 115.00
Boron	TM152	<b>97.53</b> 85.05 : 115.00	<b>99.19</b> 85.05 : 115.00
Cadmium	TM152	<b>92.91</b> 85.05 : 115.00	<b>99.99</b> 85.05 : 115.00
Chromium	TM152	<b>102.27</b> 85.05 : 115.00	<b>102.07</b> 85.05 : 115.00
Cobalt	TM152	<b>103.88</b> 85.05 : 115.00	<b>104.41</b> 85.05 : 115.00
Copper	TM152	<b>99.69</b> 85.05 : 115.00	<b>99.79</b> 85.05 : 115.00
Lead	TM152	<b>96.97</b> 85.05 : 115.00	<b>100.67</b> 85.05 : 115.00
Lithium	TM152	<b>101.25</b> 85.05 : 115.00	<b>102.43</b> 85.05 : 115.00
Manganese	TM152	<b>103.39</b> 85.05 : 115.00	<b>101.99</b> 85.05 : 115.00

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

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 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
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Dissolved Metals by ICP-MS

		QC 33	QC 37
Molybdenum	TM152	<b>96.59</b> 85.05 : 115.00	<b>89.95</b> 85.05 : 115.00
Nickel	TM152	<b>95.47</b> 85.05 : 115.00	<b>100.53</b> 85.05 : 115.00
Phosphorus	TM152	<b>102.11</b> 85.00 : 115.00	<b>97.56</b> 85.00 : 115.00
Selenium	TM152	<b>92.79</b> 85.00 : 115.00	<b>99.56</b> 85.00 : 115.00
Silver	TM152	<b>88.59</b> 85.00 : 115.00	<b>92.97</b> 85.00 : 115.00
Strontium	TM152	<b>100.21</b> 85.05 : 115.00	<b>102.19</b> 85.05 : 115.00
Tellurium	TM152	<b>92.25</b> 85.05 : 115.00	<b>102.13</b> 85.05 : 115.00
Thallium	TM152	<b>97.56</b> 85.05 : 115.00	<b>99.63</b> 85.05 : 115.00
Tin	TM152	<b>98.83</b> 85.05 : 115.00	<b>100.71</b> 85.05 : 115.00
Titanium	TM152	<b>97.60</b> 85.05 : 115.00	<b>100.08</b> 85.05 : 115.00
Uranium	TM152	<b>98.41</b> 85.05 : 115.00	<b>97.69</b> 85.05 : 115.00
Vanadium	TM152	<b>106.03</b> 85.05 : 115.00	<b>101.51</b> 85.05 : 115.00
Zinc	TM152	<b>94.57</b> 85.00 : 115.00	<b>103.11</b> 85.00 : 115.00

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 34	QC 30
Total Aliphatics >C12-C35	TM174	<b>90.10</b> 71.03 : 104.04	<b>90.22</b> 70.81 : 104.42

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 39	QC 36
Total Aromatics >EC12-EC35	TM174	<b>84.32</b> 65.00 : 117.38	<b>101.59</b> 73.09 : 118.04

GRO by GC-FID (W)

Component	Method Code	QC 37
Benzene by GC	TM245	<b>90.75</b> 79.00 : 121.00
Ethylbenzene by GC	TM245	<b>86.95</b> 79.00 : 121.00
m & p Xylene by GC	TM245	<b>87.05</b> 79.00 : 121.00

SDG: 110307-34  
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Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
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 Superseded Report:

GRO by GC-FID (W)

		QC 37
MTBE GC-FID	TM245	<b>93.85</b> 79.00 : 121.00
o Xylene by GC	TM245	<b>85.85</b> 79.00 : 121.00
QC	TM245	<b>98.76</b> 79.00 : 121.00
Toluene by GC	TM245	<b>96.45</b> 79.00 : 121.00

Mercury Dissolved

Component	Method Code	QC 35	QC 34
Mercury Dissolved (CVAF)	TM183	<b>93.00</b> 74.58 : 114.26	<b>98.80</b> 85.87 : 123.88

PAH Spec MS - Aqueous (W)

Component	Method Code	QC 34
Acenaphthene by GCMS	TM178	<b>94.05</b> 82.64 : 105.96
Acenaphthylene by GCMS	TM178	<b>88.66</b> 77.40 : 104.05
Anthracene by GCMS	TM178	<b>90.77</b> 77.85 : 105.75
Benz(a)anthracene by GCMS	TM178	<b>91.02</b> 74.75 : 107.36
Benzo(a)pyrene by GCMS	TM178	<b>103.24</b> 82.57 : 113.60
Benzo(b)fluoranthene by GCMS	TM178	<b>102.64</b> 87.25 : 114.25
Benzo(ghi)perylene by GCMS	TM178	<b>106.82</b> 82.05 : 112.05
Benzo(k)fluoranthene by GCMS	TM178	<b>111.64</b> 87.20 : 122.40
Chrysene by GCMS	TM178	<b>103.02</b> 83.43 : 107.48
Dibenzo(ah)anthracene by GCMS	TM178	<b>104.28</b> 72.40 : 118.55
Fluoranthene by GCMS	TM178	<b>94.34</b> 80.63 : 107.61
Fluorene by GCMS	TM178	<b>94.36</b> 81.74 : 107.56
Indeno(123cd)pyrene by GCMS	TM178	<b>106.69</b> 82.25 : 114.75
Naphthalene by GCMS	TM178	<b>94.67</b> 82.31 : 107.48
Phenanthrene by GCMS	TM178	<b>96.10</b> 84.10 : 107.63
Pyrene by GCMS	TM178	<b>95.33</b> 80.69 : 107.02

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PAH Spec MS - Aqueous (W)

		QC 34
Volume	TM178	<b>15000.00</b>

pH Value

Component	Method Code	QC 38	QC 30
pH	TM256	<b>99.57</b> 98.87 : 100.69	<b>99.43</b> 98.87 : 100.69

Phenols by HPLC (W)

Component	Method Code	QC 36	QC 37
2,3,5 Trimethyl-Phenol by HPLC (W)	TM259	<b>94.00</b> 79.66 : 113.07	<b>105.00</b> 93.62 : 109.26
2-Isopropyl Phenol by HPLC (W)	TM259	<b>98.00</b> 93.26 : 108.31	<b>104.00</b> 95.28 : 108.84
Cresols by HPLC (W)	TM259	<b>91.67</b> 68.30 : 98.81	<b>104.33</b> 93.83 : 110.08
Naphthol by HPLC (W)	TM259	<b>93.00</b> 88.14 : 112.45	<b>99.00</b> 90.45 : 109.21
Phenol by HPLC (W)	TM259	<b>95.00</b> 87.02 : 102.59	<b>96.00</b> 93.02 : 105.72
Xylenols by HPLC (W)	TM259	<b>97.33</b> 96.73 : 108.07	<b>105.17</b> 94.65 : 107.41

Sulphide

Component	Method Code	QC 21	QC 34
Sulphide	TM101	<b>104.93</b> 77.08 : 135.77	<b>104.47</b> 77.08 : 135.77

Total Organic and Inorganic Carbon

Component	Method Code	QC 33	QC 38	QC 37
Total Inorganic Carbon	TM090	<b>103.54</b> 88.46 : 104.55	<b>96.66</b> 88.46 : 104.55	<b>94.48</b> 88.34 : 103.31
Total Organic Carbon	TM090	<b>106.91</b> 90.80 : 116.75	<b>107.69</b> 90.80 : 116.75	<b>106.82</b> 90.45 : 112.34

VOC MS (W)

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 Job: H\_ARCADIS\_NMK-340  
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 Customer: ARCADIS Geraghty & Miller  
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Order Number:  
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## VOC MS (W)

Component	Method Code	QC 36
1,1,1,2-Tetrachloroethane	TM208	<b>115.33</b> 68.73 : 146.05
1,1,1-Trichloroethane	TM208	<b>115.04</b> 67.74 : 143.94
1,1-Dichloroethane	TM208	<b>119.48</b> 69.64 : 147.98
1,2-Dichloroethane	TM208	<b>118.61</b> 72.61 : 154.30
2-Chlorotoluene	TM208	<b>111.43</b> 69.05 : 146.72
4-Chlorotoluene	TM208	<b>113.88</b> 69.11 : 146.84
Benzene	TM208	<b>119.57</b> 71.02 : 150.91
Bromomethane	TM208	<b>112.40</b> 70.23 : 149.23
Carbontetrachloride	TM208	<b>116.43</b> 67.97 : 144.44
Chlorobenzene	TM208	<b>116.00</b> 69.74 : 148.19
Chloroform	TM208	<b>117.12</b> 69.97 : 148.69
Chloromethane	TM208	<b>127.65</b> 70.80 : 150.46
Cis-1,2-Dichloroethene	TM208	<b>110.99</b> 70.79 : 150.42
Dichloromethane	TM208	<b>113.21</b> 70.82 : 150.49
Ethylbenzene	TM208	<b>109.57</b> 67.32 : 143.07
Hexachlorobutadiene	TM208	<b>101.56</b> 70.40 : 149.63
o-Xylene	TM208	<b>109.14</b> 68.68 : 145.93
p/m-Xylene	TM208	<b>110.73</b> 68.12 : 144.74
Tert-butyl methyl ether	TM208	<b>90.89</b> 64.65 : 137.39
Tetrachloroethene	TM208	<b>114.26</b> 67.78 : 144.04
Toluene	TM208	<b>113.94</b> 68.79 : 146.18
Trichloroethene	TM208	<b>114.83</b> 68.83 : 146.25
Vinyl Chloride	TM208	<b>130.86</b> 72.07 : 153.15

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

### Chromatogram

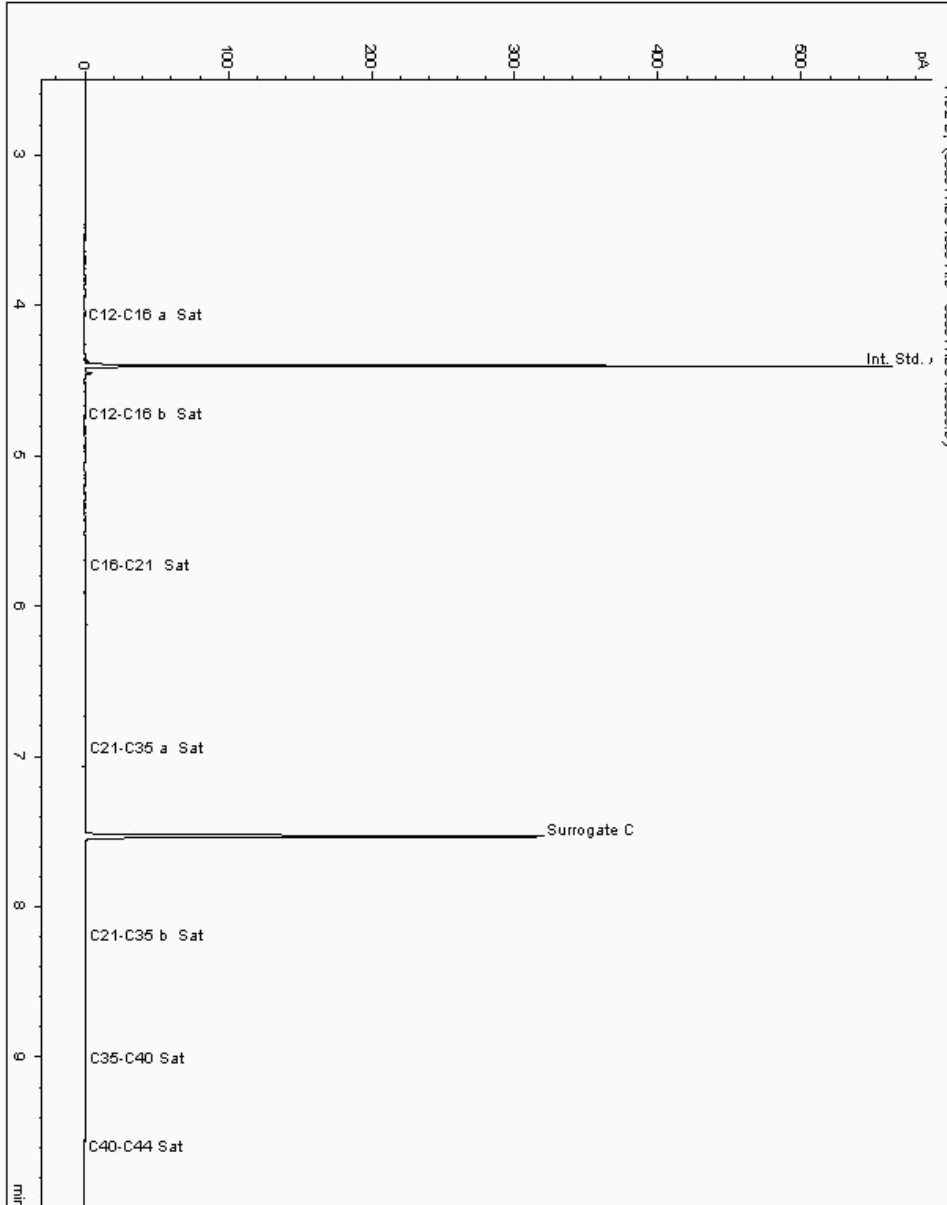
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No: 3013081  
 Sample ID: BH103

Depth :

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

Sample Identity: 3071383-3013081  
 Date Acquired : 10/03/11 11:32:19 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

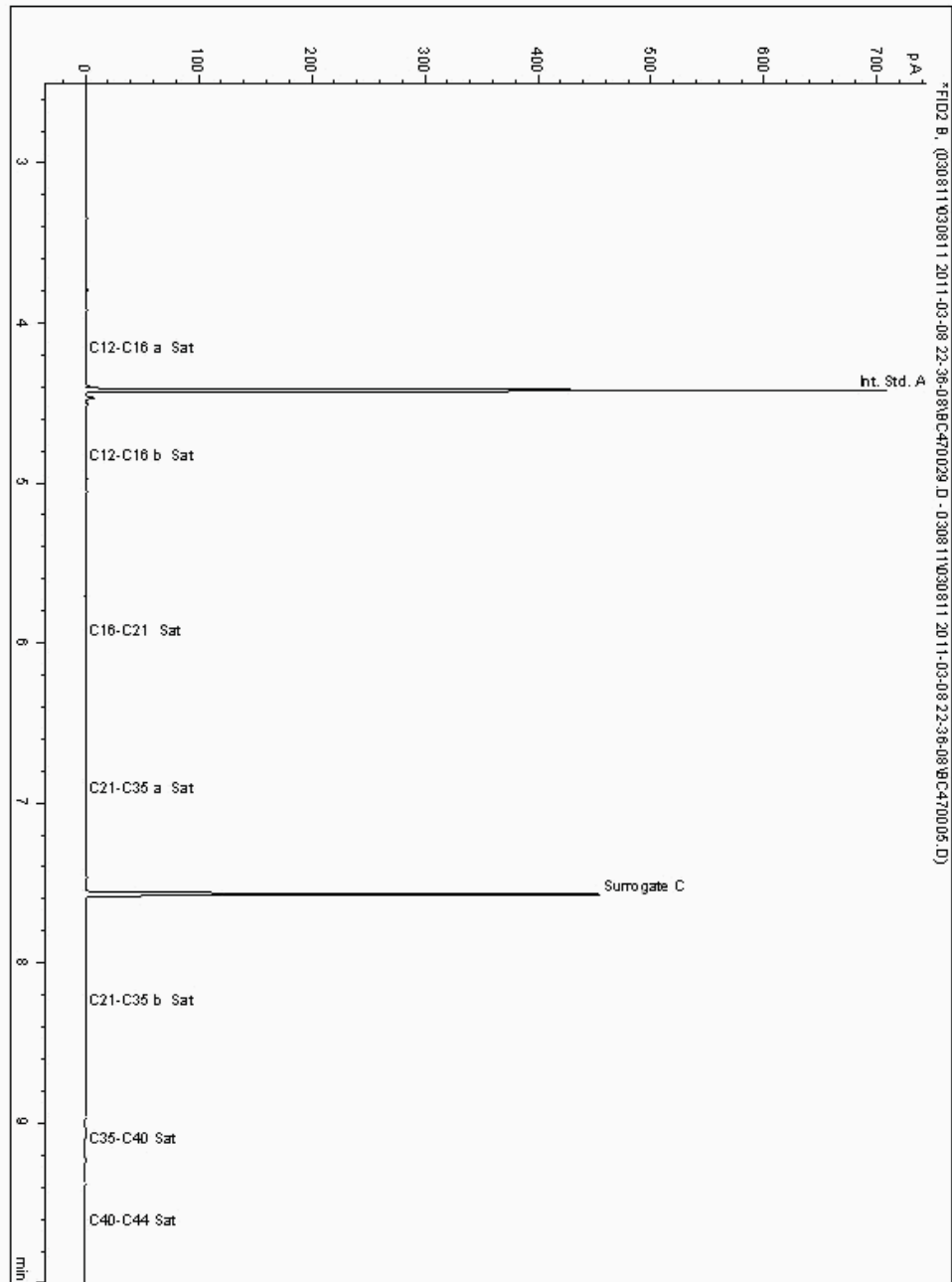
Order Number:  
 Report Number: 120104  
 Superseded Report:

### Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)      Sample No : 3013156      Depth :  
 Sample ID : BH109

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

Sample Identity: 3071404-3013156  
 Date Acquired : 09/03/11 07:20:24  
 Units :  
 Dilution :  
 CF : 1  
 Multiplier : 0.008





SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

### Chromatogram

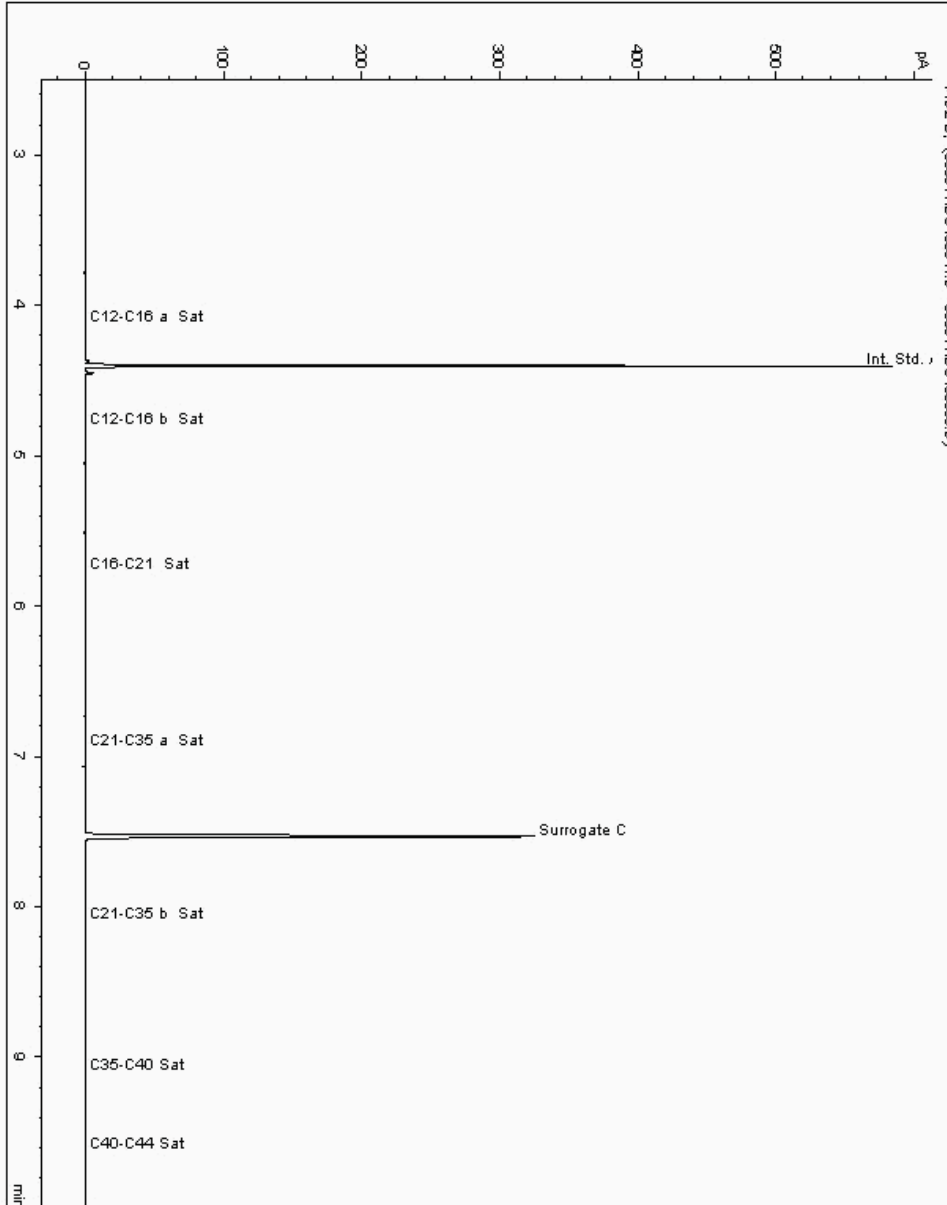
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3014000  
 Sample ID : BH108

Depth :

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

Sample Identity: 3071338-3014000  
 Date Acquired : 10/03/11 10:37:04 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

### Chromatogram

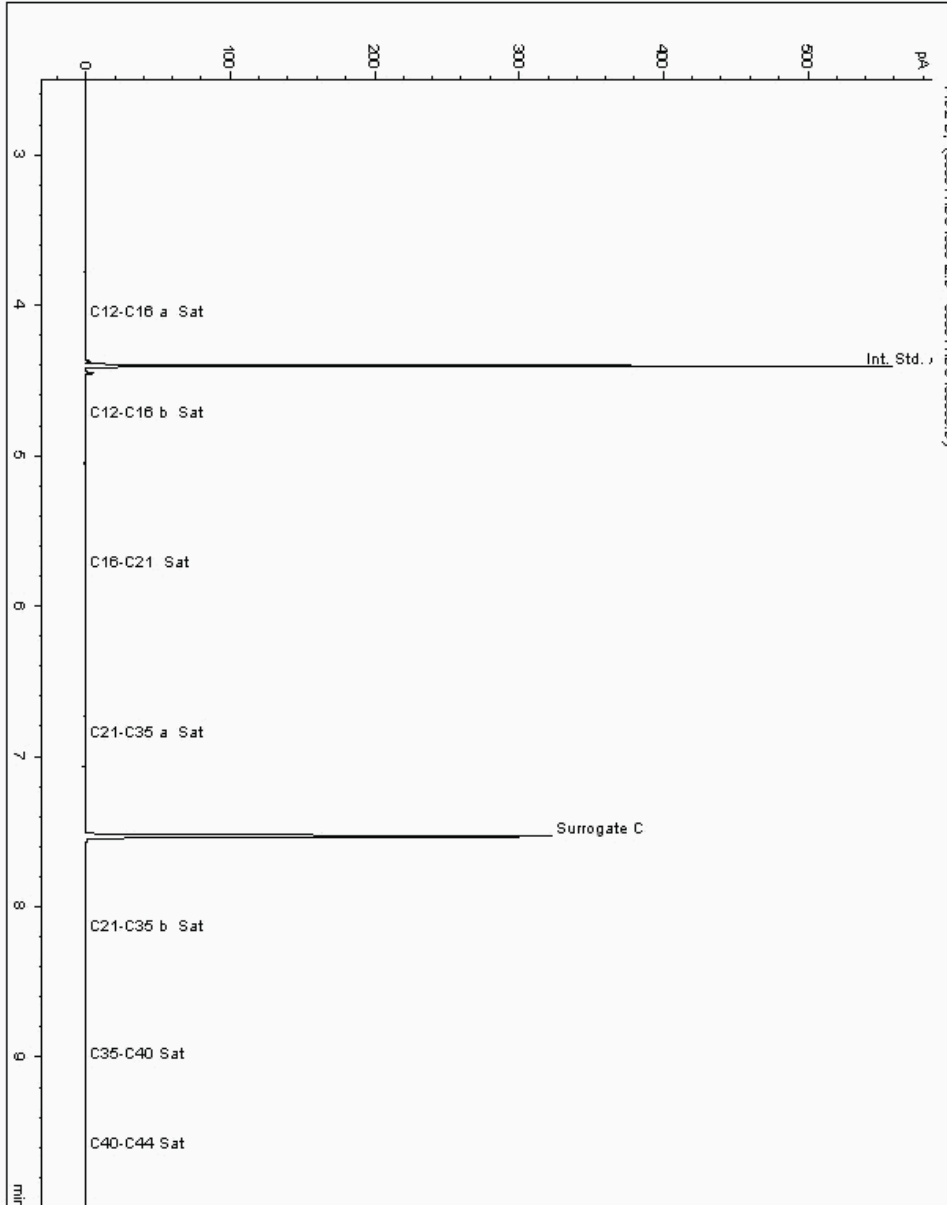
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3014060  
 Sample ID : BH107

Depth :

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

Sample Identity: 3071362-3014060  
 Date Acquired : 10/03/11 10:55:29 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

### Chromatogram

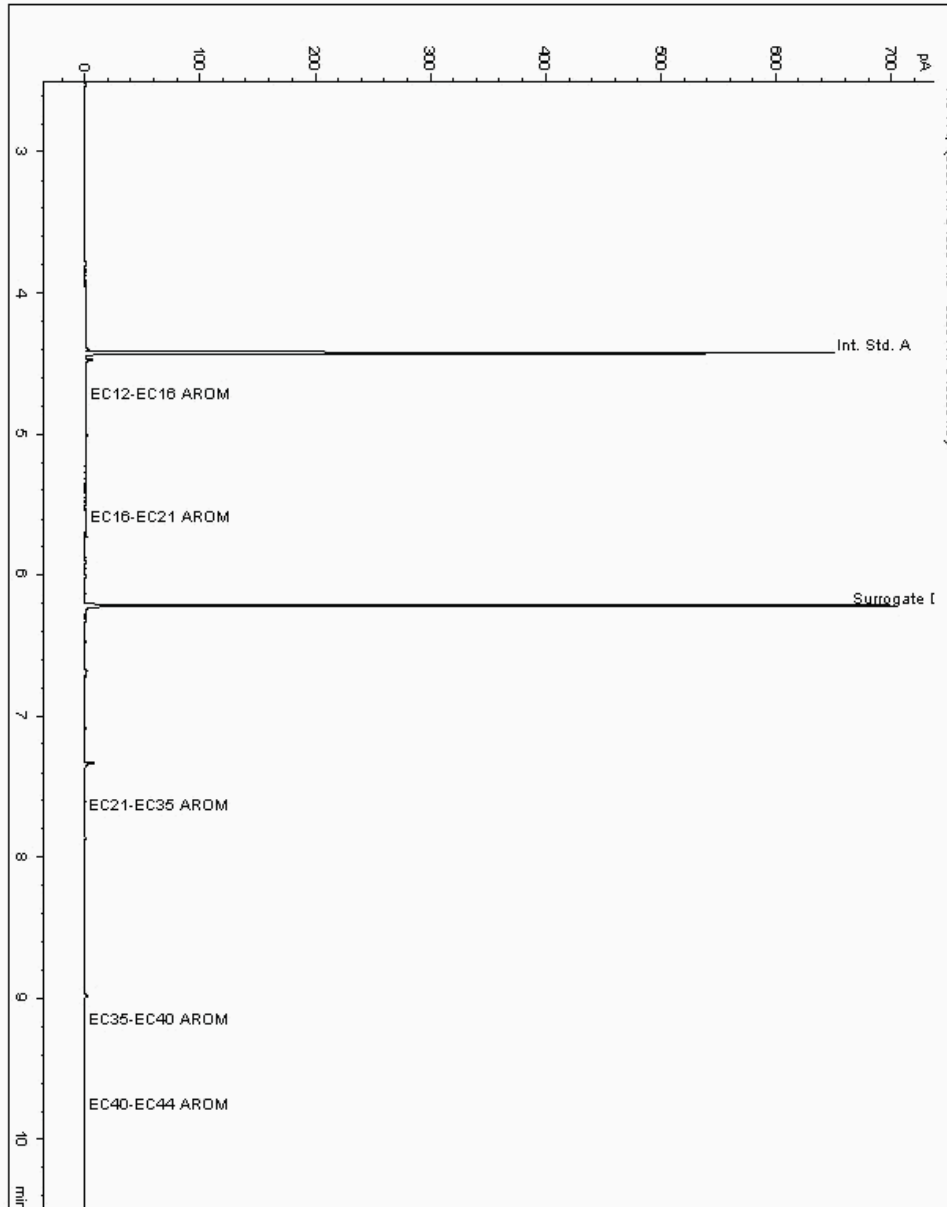
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3013081  
 Sample ID: BH103

Depth :

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

Sample Identity: 3071384-3013081  
 Date Acquired : 10/03/11 11:32:18 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

### Chromatogram

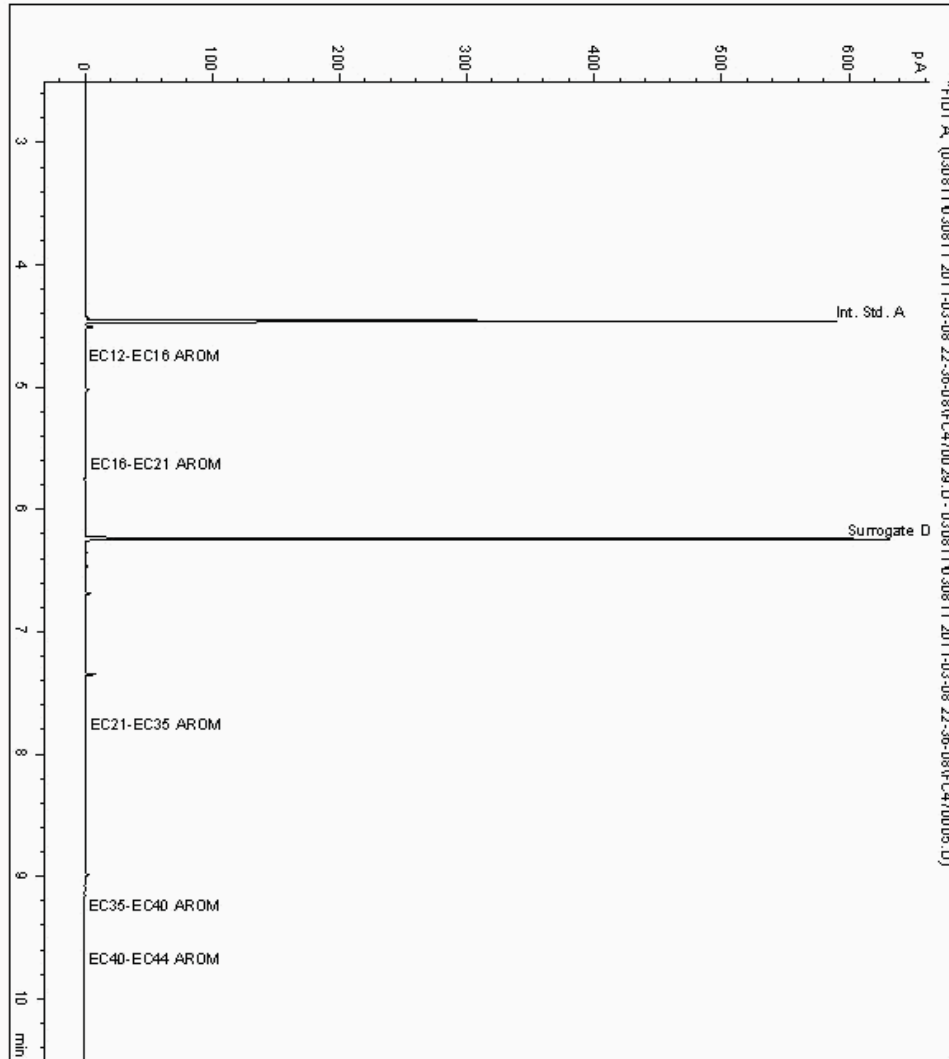
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3013156  
 Sample ID: BH109

Depth :

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

Sample Identity: 3071405-3013156  
 Date Acquired : 09/03/11 07:20:24  
 Units :  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
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# Chromatogram

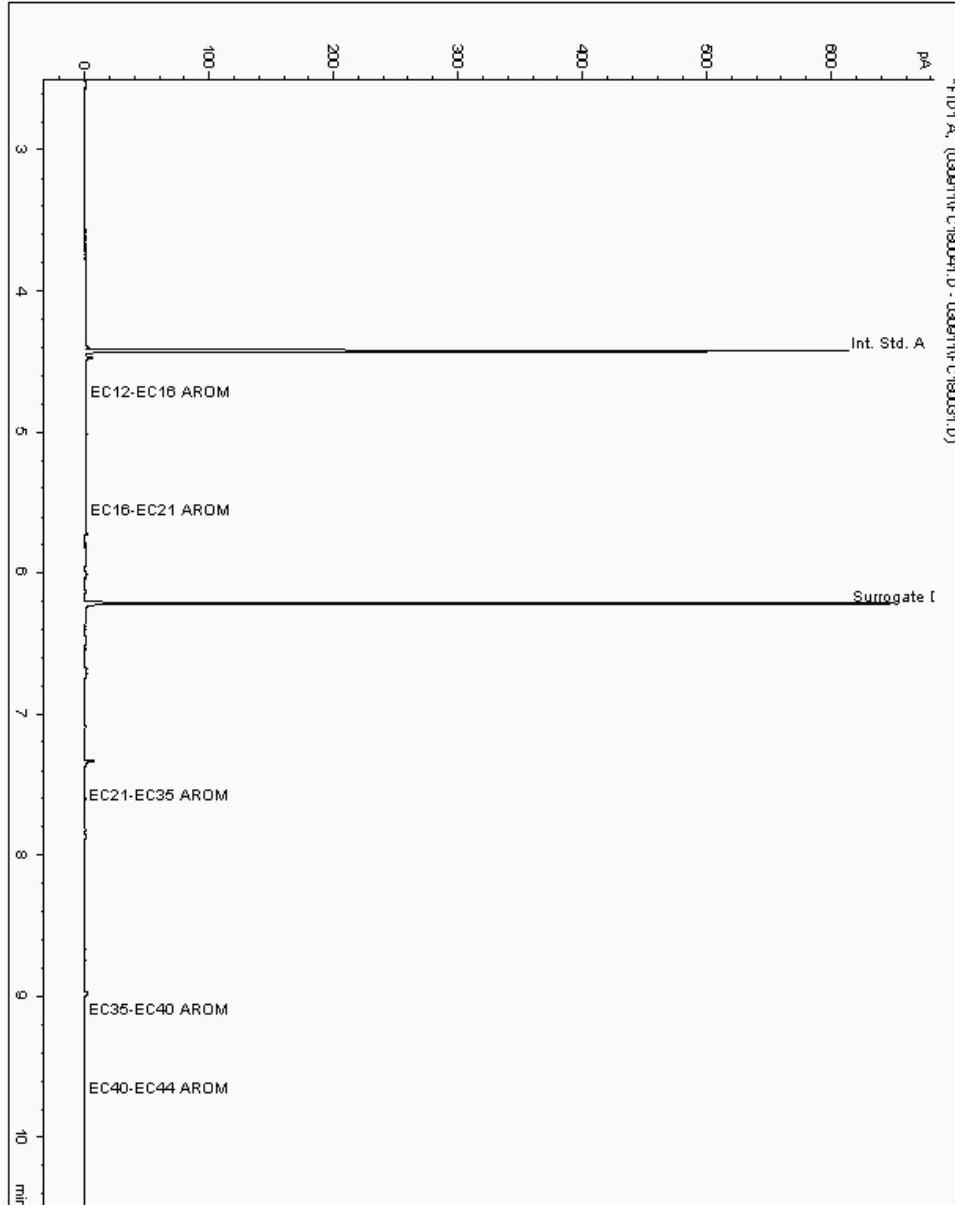
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3014000  
 Sample ID: BH108

Depth :

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

Sample Identity: 3071339-3014000  
 Date Acquired : 10/03/11 10:37:04 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120104  
 Superseded Report:

# Chromatogram

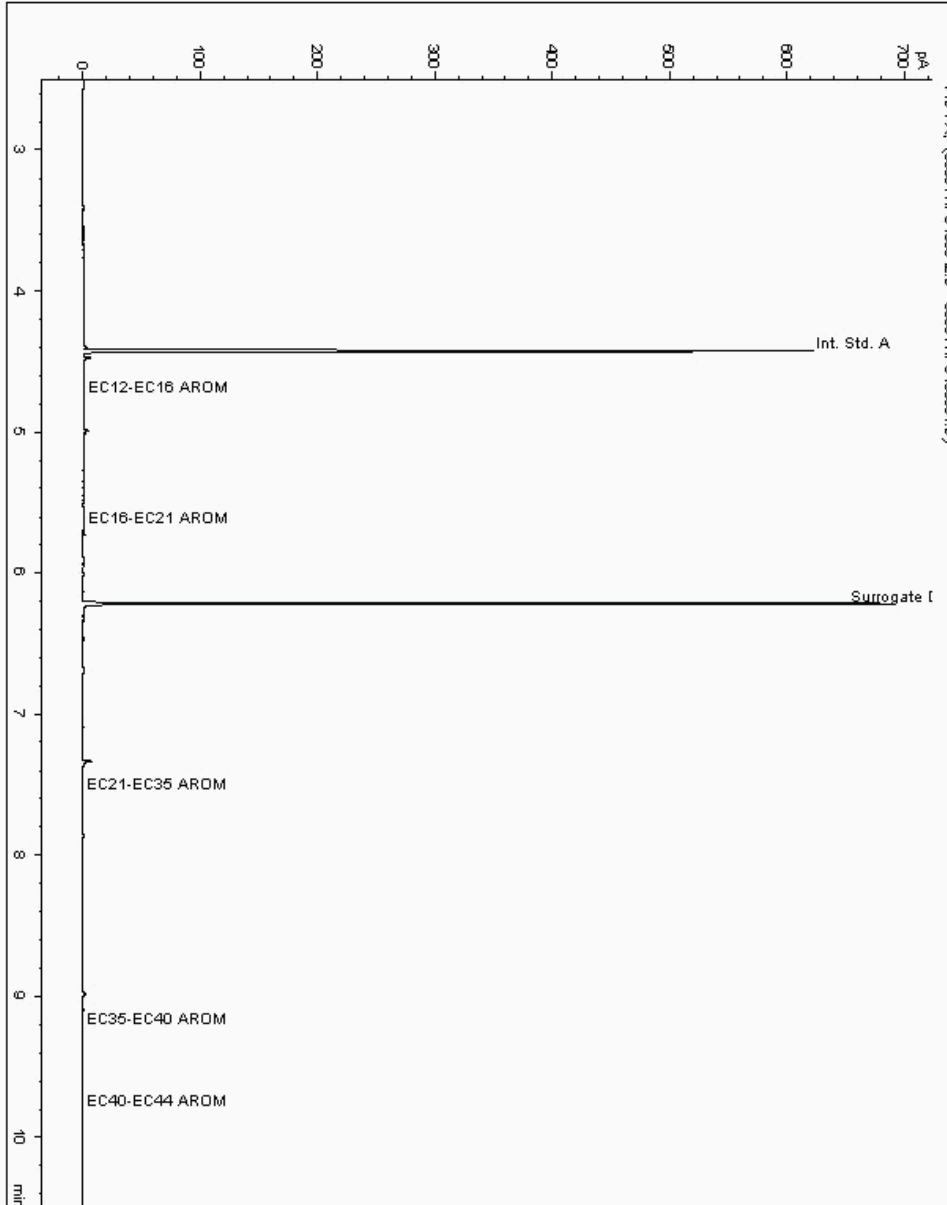
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3014060  
 Sample ID: BH107

Depth :

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

Sample Identity: 3071363-3014060  
 Date Acquired : 10/03/11 10:55:29 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-34  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

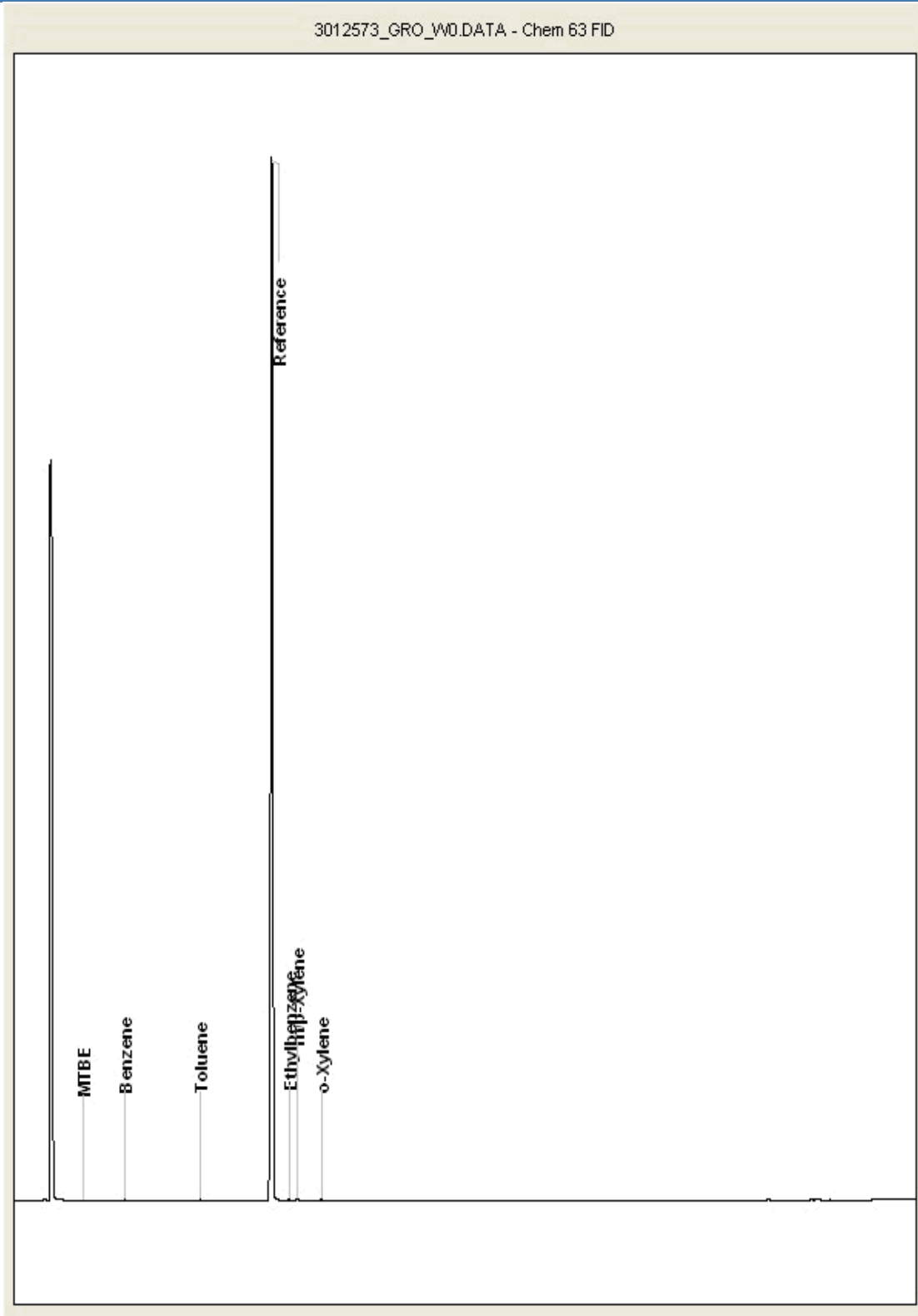
Order Number:  
Report Number: 120104  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3012573  
Sample ID : BH108

Depth :



SDG: 110307-34  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

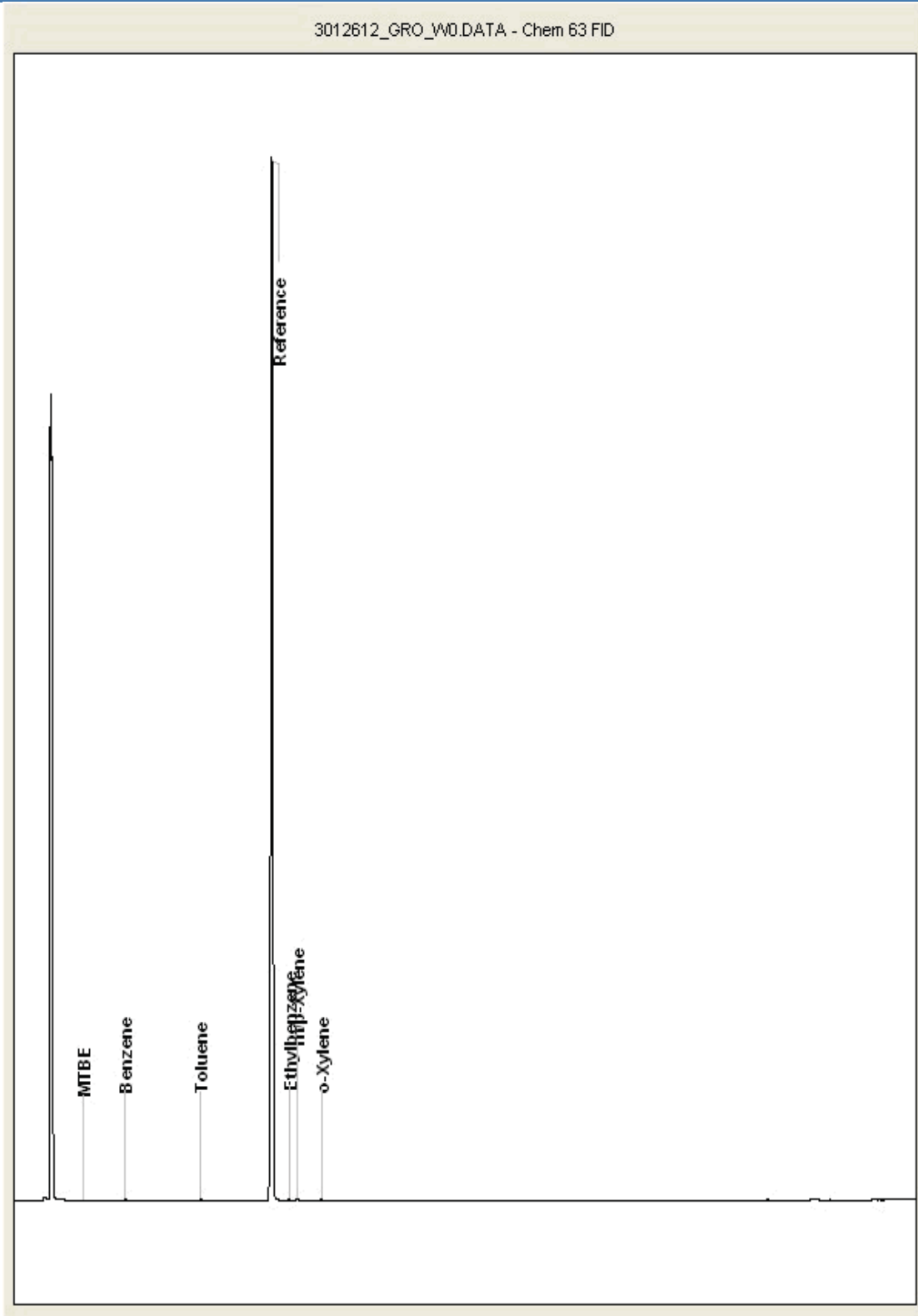
Order Number:  
Report Number: 120104  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3012612  
Sample ID : BH107

Depth :





SDG: 110307-34  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

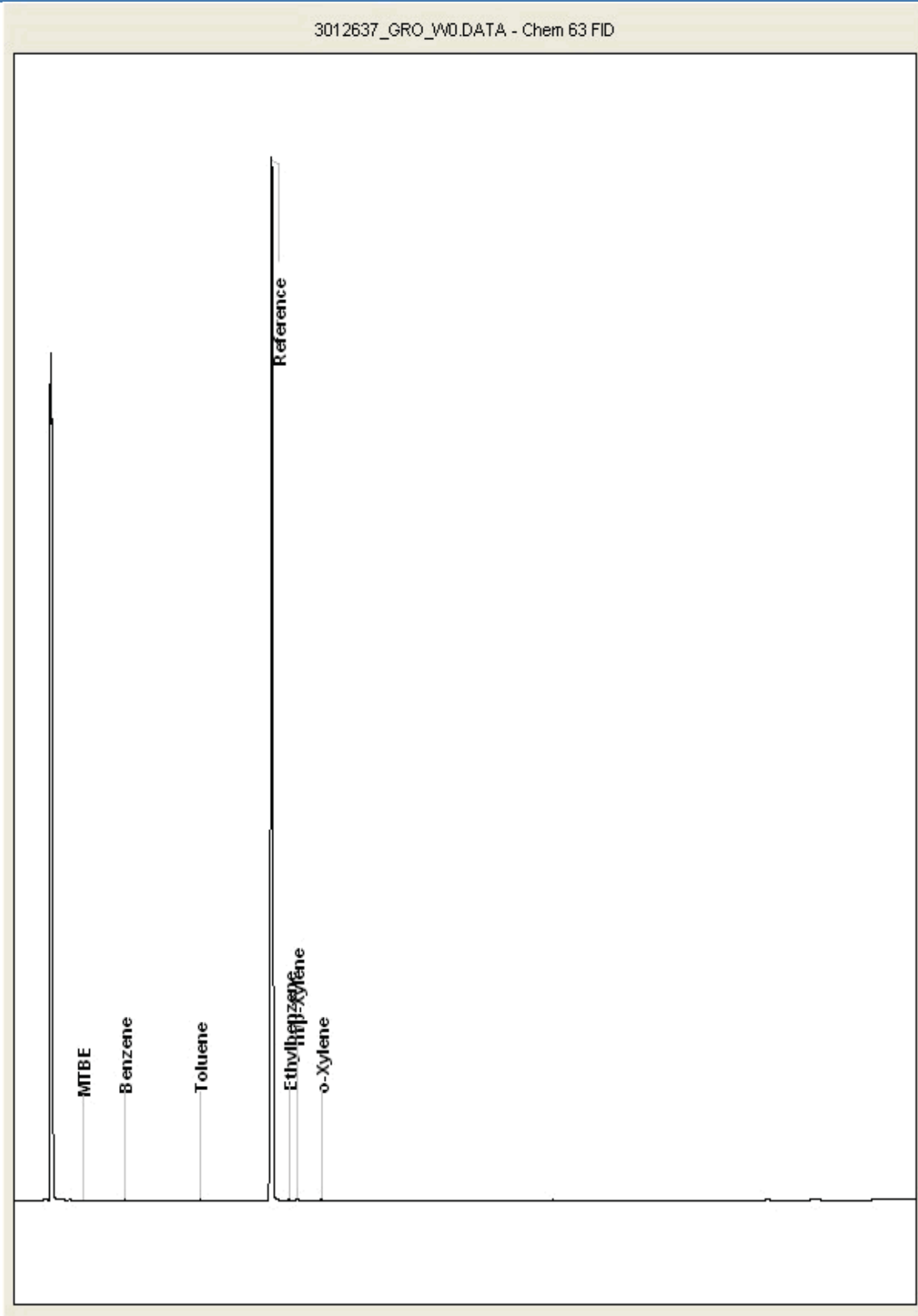
Order Number:  
Report Number: 120104  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3012637  
Sample ID : BH103

Depth :



SDG: 110307-34  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

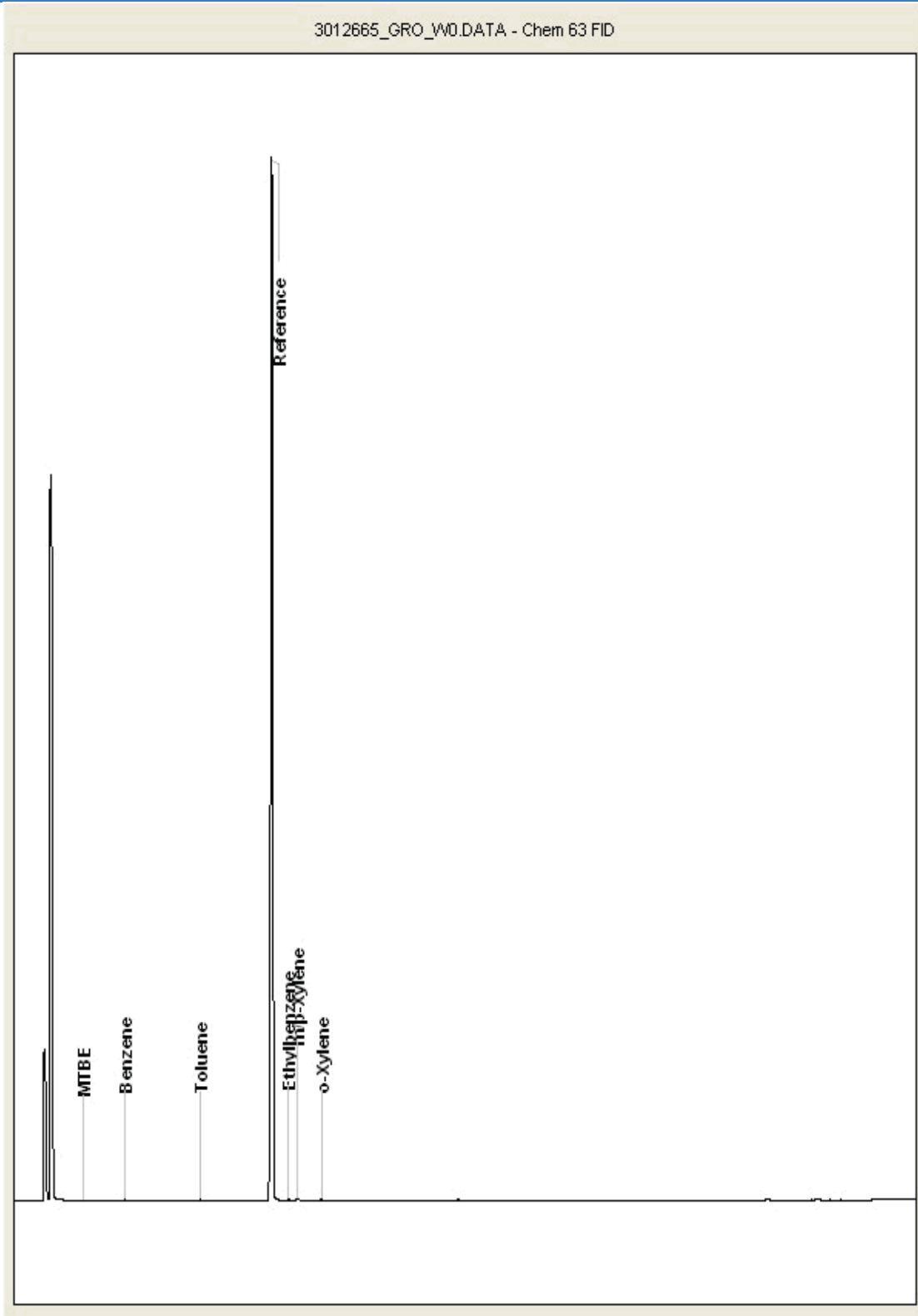
Order Number:  
Report Number: 120104  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3012665  
Sample ID : BH109

Depth :



**SDG:** 110307-34  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120104  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXTERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXTERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXTERM	HFLC
PHENOLS BY GCMS	WET	DOM	SOXTERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (W/G BY GC)	D&C	HEXANE/ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM28.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE/ACETONE	SHAWER	GC/EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAWER	GC/EZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
EPH (W/G)	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
PCB 7 COGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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 HSG 264.

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.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 11 March 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110307-16  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 120320

We received 4 samples on Saturday March 05, 2011 and 4 of these samples were scheduled for analysis which was completed on Friday March 11, 2011. 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:

**Sonia McWhan**

Operations Manager



**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3011564	BH102			04/03/2011
3011567	BH105			04/03/2011
3011566	BH106			04/03/2011
3011561	BH110			03/03/2011

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

SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

LIQUID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)		301 1564	301 1567	301 1566	301 1561											
	Customer Sample Reference		BH102	BH105	BH108	BH110											
	AGS Reference																
	Depth (m)																
	Container		1l green glass bottle	1l plastic	Vial	0.5l glass bottle	1l plastic	NaOH	Vial	1l green glass bottle	1l plastic	NaOH	Vial	1l green glass bottle	1l plastic	NaOH	Vial
Anions by Kone (w)	All	NDPs: 0 Tests: 4	X	X	X	X											
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 4	X	X	X	X											
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 4	X	X	X	X											
Easily Liberated Sulphide	All	NDPs: 0 Tests: 4	X	X	X	X											
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 4	X	X	X	X											
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 4	X	X	X	X											
GRO by GC-FID (W)	All	NDPs: 0 Tests: 4		X	X	X											X
Mercury Dissolved	All	NDPs: 0 Tests: 4	X	X	X	X											
Oxygenates (W)	All	NDPs: 0 Tests: 4		X	X	X											X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 4	X	X	X	X											
pH Value	All	NDPs: 0 Tests: 4	X	X	X	X											
Phenols by HPLC (W)	All	NDPs: 0 Tests: 4		X	X	X											
Sulphide	All	NDPs: 0 Tests: 4	X	X	X	X											
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 4	X	X	X	X											
TPH CWG (W)	All	NDPs: 0 Tests: 4	X	X	X	X											

SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

<b>LIQUID</b> Results Legend X Test N No Determination Possible	Lab Sample No(s)	3011564	3011567	3011566	3011561	
	Customer Sample Reference	BH102	BH105	BH108	BH110	
	AGS Reference					
	Depth (m)					
	Container	1l green glass bottle	1l plastic	NaOH 1l plastic 0.5l glass bottle	Vial NaOH 1l plastic	Vial NaOH 1l plastic 1l green glass bottle
VOC MS (W)	All	NDPs: 0 Tests: 4	X	X	X	X

### CERTIFICATE OF ANALYSIS

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

Results Legend		Customer Sample Ref.	BH102	BH105	BH106	BH110		
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No(s) AGS Reference	Water(GW/SW) 04/03/2011 05/03/2011 110307-16 3011564	Water(GW/SW) 04/03/2011 05/03/2011 110307-16 3011567	Water(GW/SW) 04/03/2011 05/03/2011 110307-16 3011566	Water(GW/SW) 03/03/2011 05/03/2011 110307-16 3011561		
M	mCERTS accredited.							
S	Non-conforming work.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
**	% 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.							
Component	LOD/Units	Method						
Organic Carbon, Total	<3000 µg/l	TM090	8480 #	7980 #	6100 #	14600 #		
Sulphide	<10 µg/l	TM101	<10 #	<10 #	<10 #	<10 #		
Arsenic (diss.filt)	<0.12 µg/l	TM152	1.23 #	4.7 #	0.659 #	1.23 #		
Beryllium (diss.filt)	<0.07 µg/l	TM152	<0.07 #	<0.07 #	<0.07 #	<0.07 #		
Cadmium (diss.filt)	<0.1 µg/l	TM152	0.121 #	<0.1 #	<0.1 #	<0.1 #		
Chromium (diss.filt)	<0.22 µg/l	TM152	9.65 #	11 #	9.41 #	29.1 #		
Copper (diss.filt)	<0.85 µg/l	TM152	9.27 #	2.47 #	6.92 #	2.53 #		
Lead (diss.filt)	<0.02 µg/l	TM152	<0.02 #	0.099 #	0.084 #	<0.02 #		
Molybdenum (diss.filt)	<0.24 µg/l	TM152	37.2 #	14 #	9.07 #	5.58 #		
Nickel (diss.filt)	<0.15 µg/l	TM152	10.4 #	5.19 #	10.6 #	7.67 #		
Vanadium (diss.filt)	<0.24 µg/l	TM152	2.77 #	7.86 #	2.89 #	8.48 #		
Zinc (diss.filt)	<0.41 µg/l	TM152	2.44 #	1.43 #	6.94 #	0.744 #		
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	<0.01 #	<0.01 #	<0.01 #		
Sulphate	<2000 µg/l	TM184	228000 #	164000 #	241000 #	270000 #		
Cyanide, Total	<50 µg/l	TM227	<50 #	<50 #	<50 #	<50 #		
Cyanide, Free	<50 µg/l	TM227	<50 #	<50 #	<50 #	<50 #		
Sulphide, Easily liberated	<100 µg/l	TM239	<100 #	<100 #	<100 #	<100 #		
pH	<1 pH Units	TM256	8.35 #	8.66 #	8.52 #	8.39 #		
Phenol	<2 µg/l	TM259	<2 #	<2 #	<2 #	20 #		
tert Butanol	<10 µg/l	TM289	<10 #	<10 #	<10 #	<10 #		
tert-butyl ethyl ether	<1 µg/l	TM289	<1 #	<1 #	<1 #	<1 #		



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

PAH Spec MS - Aqueous (W)

Results Legend			Customer Sample Ref.	BH102	BH105	BH106	BH110		
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No(s) AGS Reference	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)		
M	mCERTS accredited.			04/03/2011	04/03/2011	04/03/2011	03/03/2011		
S	Non-conforming work.			05/03/2011	05/03/2011	05/03/2011	05/03/2011		
aq	Aqueous / settled sample.			110307-16	110307-16	110307-16	110307-16		
diss.filt	Dissolved / filtered sample.			3011564	3011567	3011566	3011561		
tot.unfilt	Total / unfiltered sample.								
**	% 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.								
Component	LOD/Units	Method							
Naphthalene (aq)	<0.1 µg/l	TM178		0.702	<0.1	0.274	1.52	#	#
Acenaphthene (aq)	<0.015 µg/l	TM178		0.0582	<0.015	0.0217	0.565	#	#
Acenaphthylene (aq)	<0.011 µg/l	TM178		0.0209	<0.011	<0.011	0.381	#	#
Fluoranthene (aq)	<0.017 µg/l	TM178		0.354	0.0206	0.0638	13.8	#	#
Anthracene (aq)	<0.015 µg/l	TM178		0.0914	<0.015	<0.015	2.7	#	#
Phenanthrene (aq)	<0.022 µg/l	TM178		0.744	<0.022	0.134	5.46	#	#
Fluorene (aq)	<0.014 µg/l	TM178		0.177	<0.014	0.0575	0.972	#	#
Chrysene (aq)	<0.013 µg/l	TM178		0.211	<0.013	0.0302	11.5	#	#
Pyrene (aq)	<0.015 µg/l	TM178		0.282	0.0177	0.056	11.8	#	#
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		0.175	0.018	0.0254	11.1	#	#
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		0.139	<0.023	<0.023	12.7	#	#
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		0.0965	<0.027	<0.027	14	#	#
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.122	<0.009	0.0159	15.6	#	#
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		0.0208	<0.016	<0.016	3.98	#	#
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.102	<0.016	<0.016	12.4	#	#
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.0707	<0.014	<0.014	11.2	#	#
Polyaromatic hydrocarbons, Total USEPA 16 (aq)	<0.1 µg/l	TM178		3.37	<0.1	0.678	130	#	#

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attender:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

**TPH CWG (W)**

Results Legend			Customer Sample Ref.	BH102	BH105	BH106	BH110			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.			Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)			
S	Non-conforming work.			04/03/2011	04/03/2011	04/03/2011	03/03/2011			
aq	Aqueous / settled sample.			05/03/2011	05/03/2011	05/03/2011	05/03/2011			
diss.fit	Dissolved / filtered sample.			110307-16	110307-16	110307-16	110307-16			
tot.unfilt	Total / unfiltered sample.			3011564	3011567	3011566	3011561			
*	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.									
Component	LOD/Units	Method								
GRO Surrogate % recovery**	%	TM245		95	94	95	87			
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3 #	<3 #	<3 #	<3 #				
Benzene	<7 µg/l	TM245	<7 #	<7 #	<7 #	601 #				
Toluene	<4 µg/l	TM245	<4 #	<4 #	<4 #	<4 #				
Ethylbenzene	<5 µg/l	TM245	<5 #	<5 #	<5 #	<5 #				
m,p-Xylene	<8 µg/l	TM245	<8 #	<8 #	<8 #	<8 #				
o-Xylene	<3 µg/l	TM245	<3 #	<3 #	<3 #	<3 #				
m,p,o-Xylene	<10 µg/l	TM245	<10	<10	<10	<10				
BTEX, Total	<10 µg/l	TM245	<10	<10	<10	601				
Aliphatics >C5-C6	<10 µg/l	TM245	<10	<10	<10	<10				
Aliphatics >C6-C8	<10 µg/l	TM245	<10	<10	<10	<10				
Aliphatics >C8-C10	<10 µg/l	TM245	<10	<10	<10	<10				
Aliphatics >C10-C12	<10 µg/l	TM245	<10	<10	<10	<10				
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10	<10	<10	<10				
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10	<10	<10	<10				
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	225				
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	225				
Aromatics >EC5-EC7	<10 µg/l	TM245	<10	<10	<10	601				
Aromatics >EC7-EC8	<10 µg/l	TM245	<10	<10	<10	<10				
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	<10	<10	<10				
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10	<10	<10				
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10	<10	<10	<10				
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10	<10	<10	<10				
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10				
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	<10	<10	<10	<10				
Total Aliphatics >C5-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	233				
Total Aromatics >C6-C35 (aq)	<10 µg/l	TM174	<10	<10	<10	608				
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	<10	<10	<10	841				
Total Aliphatics & Aromatics >C12-C35 (Aqueous)	<10 µg/l	TM174	<10	<10	<10	225				
Total Aliphatics >C5-C12	<10 µg/l	TM245	<10	<10	<10	<10				
Total Aromatics >EC5-EC12	<10 µg/l	TM245	<10	<10	<10	608				

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attender:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

**VOC MS (W)**

Results Legend			Customer Sample Ref.	BH102	BH105	BH106	BH110			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No(s) AGS Reference							
M	mCERTS accredited.									
S	Non-conforming work.									
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.									
Component	LOD/Units	Method								
Dibromofluoromethane**	%	TM208		111	112	110	111			
Toluene-d8**	%	TM208		96.8	96.4	97.5	99			
4-Bromofluorobenzene**	%	TM208		97.1	98.6	102	93.6			
Dichlorodifluoromethane	<7 µg/l	TM208		<7	<7	<7	<7			
Chloromethane	<9 µg/l	TM208		<9	<9	<9	<9			
Vinyl chloride	<1.2 µg/l	TM208		<1.2	<1.2	<1.2	<1.2			
Bromomethane	<2 µg/l	TM208		<2	<2	<2	<2			
Chloroethane	<2.5 µg/l	TM208		<2.5	<2.5	<2.5	<2.5			
Trichlorofluoromethane	<1.3 µg/l	TM208		<1.3	<1.3	<1.3	<1.3			
1,1-Dichloroethene	<1.2 µg/l	TM208		<1.2	<1.2	<1.2	<1.2			
Carbon disulphide	<1.3 µg/l	TM208		<1.3	<1.3	<1.3	<1.3			
Dichloromethane	<3.7 µg/l	TM208		<3.7	<3.7	<3.7	<3.7			
Methyl tertiary butyl ether (MTBE)	<1.6 µg/l	TM208		<1.6	<1.6	<1.6	<1.6			
trans-1,2-Dichloroethene	<1.9 µg/l	TM208		<1.9	<1.9	<1.9	<1.9			
1,1-Dichloroethane	<1.2 µg/l	TM208		<1.2	<1.2	<1.2	<1.2			
cis-1,2-Dichloroethene	<2.3 µg/l	TM208		<2.3	<2.3	<2.3	<2.3			
2,2-Dichloropropane	<3.8 µg/l	TM208		<3.8	<3.8	<3.8	<3.8			
Bromochloromethane	<1.9 µg/l	TM208		<1.9	<1.9	<1.9	<1.9			
Chloroform	<1.8 µg/l	TM208		<1.8	<1.8	<1.8	<1.8			
1,1,1-Trichloroethane	<1.3 µg/l	TM208		<1.3	<1.3	<1.3	<1.3			
1,1-Dichloropropene	<1.3 µg/l	TM208		<1.3	<1.3	<1.3	<1.3			
Carbontetrachloride	<1.4 µg/l	TM208		<1.4	<1.4	<1.4	<1.4			
1,2-Dichloroethane	<3.3 µg/l	TM208		<3.3	<3.3	<3.3	16			
Benzene	<1.3 µg/l	TM208		<1.3	<1.3	<1.3	642			
Trichloroethene	<2.5 µg/l	TM208		<2.5	<2.5	<2.5	<2.5			
1,2-Dichloropropane	<3 µg/l	TM208		<3	<3	<3	<3			
Dibromomethane	<2.7 µg/l	TM208		<2.7	<2.7	<2.7	<2.7			
Bromodichloromethane	<0.9 µg/l	TM208		<0.9	<0.9	<0.9	<0.9			
cis-1,3-Dichloropropene	<1.9 µg/l	TM208		<1.9	<1.9	<1.9	<1.9			
Toluene	<1.4 µg/l	TM208		<1.4	<1.4	<1.4	<1.4			
trans-1,3-Dichloropropene	<3.5 µg/l	TM208		<3.5	<3.5	<3.5	<3.5			
1,1,2-Trichloroethane	<2.2 µg/l	TM208		<2.2	<2.2	<2.2	<2.2			
1,3-Dichloropropane	<2.2 µg/l	TM208		<2.2	<2.2	<2.2	<2.2			
Tetrachloroethene	<1.5 µg/l	TM208		<1.5	<1.5	<1.5	<1.5			
Dibromochloromethane	<1.7 µg/l	TM208		<1.7	<1.7	<1.7	<1.7			

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

**VOC MS (W)**

Results Legend		Customer Sample Ref.	BH102	BH105	BH106	BH110			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)			
M	mCERTS accredited.		04/03/2011	04/03/2011	04/03/2011	03/03/2011			
S	Non-conforming work.		05/03/2011	05/03/2011	05/03/2011	05/03/2011			
aq	Aqueous / settled sample.		110307-16	110307-16	110307-16	110307-16			
diss.filt	Dissolved / filtered sample.		3011564	3011567	3011566	3011561			
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.								
Component	LOD/Units		Method						
1,2-Dibromoethane	<2.3 µg/l		TM208	<2.3 #	<2.3 #	<2.3 #	<2.3 #		
Chlorobenzene	<3.5 µg/l	TM208	<3.5 #	<3.5 #	<3.5 #	<3.5 #			
1,1,1,2-Tetrachloroethane	<1.3 µg/l	TM208	<1.3 #	<1.3 #	<1.3 #	<1.3 #			
Ethylbenzene	<2.5 µg/l	TM208	<2.5 #	<2.5 #	<2.5 #	<2.5 #			
m,p-Xylene	<2.5 µg/l	TM208	<2.5 #	<2.5 #	<2.5 #	<2.5 #			
o-Xylene	<1.7 µg/l	TM208	<1.7 #	<1.7 #	<1.7 #	<1.7 #			
Styrene	<1.2 µg/l	TM208	<1.2 #	<1.2 #	<1.2 #	<1.2 #			
Bromoform	<3 µg/l	TM208	<3 #	<3 #	<3 #	<3 #			
Isopropylbenzene	<1.4 µg/l	TM208	<1.4 #	<1.4 #	<1.4 #	<1.4 #			
1,1,2,2-Tetrachloroethane	<5.2 µg/l	TM208	<5.2 #	<5.2 #	<5.2 #	<5.2 #			
1,2,3-Trichloropropane	<7.8 µg/l	TM208	<7.8 #	<7.8 #	<7.8 #	<7.8 #			
Bromobenzene	<2 µg/l	TM208	<2 #	<2 #	<2 #	<2 #			
Propylbenzene	<2.6 µg/l	TM208	<2.6 #	<2.6 #	<2.6 #	<2.6 #			
2-Chlorotoluene	<1.9 µg/l	TM208	<1.9 #	<1.9 #	<1.9 #	<1.9 #			
1,3,5-Trimethylbenzene	<1.8 µg/l	TM208	<1.8 #	<1.8 #	<1.8 #	<1.8 #			
4-Chlorotoluene	<1.9 µg/l	TM208	<1.9 #	<1.9 #	<1.9 #	<1.9 #			
tert-Butylbenzene	<2 µg/l	TM208	<2 #	<2 #	<2 #	<2 #			
1,2,4-Trimethylbenzene	<1.7 µg/l	TM208	<1.7 #	<1.7 #	<1.7 #	<1.7 #			
sec-Butylbenzene	<1.7 µg/l	TM208	<1.7 #	<1.7 #	<1.7 #	<1.7 #			
4-iso-Propyltoluene	<2.6 µg/l	TM208	<2.6 #	<2.6 #	<2.6 #	<2.6 #			
1,3-Dichlorobenzene	<2.2 µg/l	TM208	<2.2 #	<2.2 #	<2.2 #	<2.2 #			
1,4-Dichlorobenzene	<2.7 µg/l	TM208	<2.7 #	<2.7 #	<2.7 #	<2.7 #			
n-Butylbenzene	<2 µg/l	TM208	<2 #	<2 #	<2 #	<2 #			
1,2-Dichlorobenzene	<3.7 µg/l	TM208	<3.7 #	<3.7 #	<3.7 #	<3.7 #			
1,2-Dibromo-3-chloropropane	<9.8 µg/l	TM208	<9.8 #	<9.8 #	<9.8 #	<9.8 #			
1,2,4-Trichlorobenzene	<2.3 µg/l	TM208	<2.3 #	<2.3 #	<2.3 #	<2.3 #			
Hexachlorobutadiene	<2.5 µg/l	TM208	<2.5 #	<2.5 #	<2.5 #	<2.5 #			
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	<1 #	<1 #	<1 #	17.4 #			
Naphthalene	<3.5 µg/l	TM208	<3.5 #	<3.5 #	<3.5 #	<3.5 #			
1,2,3-Trichlorobenzene	<3.1 µg/l	TM208	<3.1 #	<3.1 #	<3.1 #	<3.1 #			
1,3,5-Trichlorobenzene	<10 µg/l	TM208	<10 #	<10 #	<10 #	<10 #			

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM239	Sulphide in Waters and Effluents 1983 (Tentative Methods) HMSO 1983, ISBN 011 7517186	Determination of Easily Liberated Sulphide in Waste waters		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		
TM289				

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

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

**Test Completion Dates**

Lab Sample No(s)	3011564	3011567	3011566	3011561
Customer Sample Ref.	BH102	BH105	BH106	BH110
AGS Ref.				
Depth				
Type	LIQUID	LIQUID	LIQUID	LIQUID
Anions by Kone (w)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
Cyanide Comp/Free/Total/Thiocyanate	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
Dissolved Metals by ICP-MS	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
Easily Liberated Sulphide	10-Mar-2011	10-Mar-2011	10-Mar-2011	10-Mar-2011
EPH CWG (Aliphatic) Aqueous GC (W)	10-Mar-2011	10-Mar-2011	10-Mar-2011	10-Mar-2011
EPH CWG (Aromatic) Aqueous GC (W)	10-Mar-2011	10-Mar-2011	10-Mar-2011	10-Mar-2011
GRO by GC-FID (W)	11-Mar-2011	11-Mar-2011	11-Mar-2011	11-Mar-2011
Mercury Dissolved	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
Oxygenates (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
PAH Spec MS - Aqueous (W)	10-Mar-2011	10-Mar-2011	10-Mar-2011	10-Mar-2011
pH Value	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
Phenols by HPLC (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011
Sulphide	10-Mar-2011	10-Mar-2011	10-Mar-2011	10-Mar-2011
Total Organic and Inorganic Carbon	08-Mar-2011	08-Mar-2011	08-Mar-2011	08-Mar-2011
TPH CWG (W)	11-Mar-2011	11-Mar-2011	11-Mar-2011	11-Mar-2011
VOC MS (W)	09-Mar-2011	09-Mar-2011	09-Mar-2011	11-Mar-2011

SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

**ASSOCIATED AQC DATA**

Anions by Kone (w)

Component	Method Code	QC 32	QC 34
Chloride	TM184	<b>99.80</b> 95.90 : 105.20	<b>102.00</b> 95.90 : 105.20
Nitrite as NO2	TM184	<b>97.80</b> 92.92 : 105.47	<b>97.40</b> 92.92 : 105.47
Phosphate (Ortho as PO4)	TM184	<b>102.92</b> 96.98 : 107.09	<b>104.04</b> 96.98 : 107.09
Sulphate (soluble)	TM184	<b>101.60</b> 95.09 : 105.03	<b>102.04</b> 95.09 : 105.03
TON as NO3	TM184	<b>102.19</b> 93.27 : 107.89	<b>100.14</b> 93.27 : 107.89

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 30
Free Cyanide (W)	TM227	<b>97.35</b> 87.13 : 117.88
Thiocyanate (W)	TM227	<b>103.25</b> 84.79 : 114.71
Total Cyanide (W)	TM227	<b>92.85</b> 87.76 : 118.74

Dissolved Metals by ICP-MS

Component	Method Code	QC 37	QC 35
Aluminium	TM152	<b>97.36</b> 85.00 : 115.00	<b>98.37</b> 85.00 : 115.00
Antimony	TM152	<b>101.60</b> 85.05 : 115.00	<b>99.36</b> 85.05 : 115.00
Arsenic	TM152	<b>99.61</b> 85.05 : 115.00	<b>98.27</b> 85.05 : 115.00
Barium	TM152	<b>100.09</b> 85.05 : 115.00	<b>99.52</b> 85.05 : 115.00
Beryllium	TM152	<b>98.88</b> 85.05 : 115.00	<b>100.72</b> 85.05 : 115.00
Bismuth	TM152	<b>98.53</b> 85.05 : 115.00	<b>99.60</b> 85.05 : 115.00
Boron	TM152	<b>99.19</b> 85.05 : 115.00	<b>101.96</b> 85.05 : 115.00
Cadmium	TM152	<b>99.99</b> 85.05 : 115.00	<b>99.04</b> 85.05 : 115.00
Chromium	TM152	<b>102.07</b> 85.05 : 115.00	<b>99.77</b> 85.05 : 115.00
Cobalt	TM152	<b>104.41</b> 85.05 : 115.00	<b>101.47</b> 85.05 : 115.00
Copper	TM152	<b>99.79</b> 85.05 : 115.00	<b>100.23</b> 85.05 : 115.00
Lead	TM152	<b>100.67</b> 85.05 : 115.00	<b>99.76</b> 85.05 : 115.00
Lithium	TM152	<b>102.43</b> 85.05 : 115.00	<b>103.03</b> 85.05 : 115.00
Manganese	TM152	<b>101.99</b> 85.05 : 115.00	<b>102.51</b> 85.05 : 115.00

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

Dissolved Metals by ICP-MS

		QC 37	QC 35
Molybdenum	TM152	<b>89.95</b> 85.05 : 115.00	<b>99.60</b> 85.05 : 115.00
Nickel	TM152	<b>100.53</b> 85.05 : 115.00	<b>98.76</b> 85.05 : 115.00
Phosphorus	TM152	<b>97.56</b> 85.00 : 115.00	<b>97.19</b> 85.00 : 115.00
Selenium	TM152	<b>99.56</b> 85.00 : 115.00	<b>99.09</b> 85.00 : 115.00
Silver	TM152	<b>92.97</b> 85.00 : 115.00	<b>93.35</b> 85.00 : 115.00
Strontium	TM152	<b>102.19</b> 85.05 : 115.00	<b>99.87</b> 85.05 : 115.00
Tellurium	TM152	<b>102.13</b> 85.05 : 115.00	<b>102.00</b> 85.05 : 115.00
Thallium	TM152	<b>99.63</b> 85.05 : 115.00	<b>101.27</b> 85.05 : 115.00
Tin	TM152	<b>100.71</b> 85.05 : 115.00	<b>99.45</b> 85.05 : 115.00
Titanium	TM152	<b>100.08</b> 85.05 : 115.00	<b>100.31</b> 85.05 : 115.00
Uranium	TM152	<b>97.69</b> 85.05 : 115.00	<b>98.79</b> 85.05 : 115.00
Vanadium	TM152	<b>101.51</b> 85.05 : 115.00	<b>100.41</b> 85.05 : 115.00
Zinc	TM152	<b>103.11</b> 85.00 : 115.00	<b>102.01</b> 85.00 : 115.00

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 30
Total Aliphatics >C12-C35	TM174	<b>90.22</b> 70.81 : 104.42

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 36
Total Aromatics >EC12-EC35	TM174	<b>101.59</b> 73.09 : 118.04

GRO by GC-FID (W)

Component	Method Code	QC 30
Benzene by GC	TM245	<b>83.70</b> 79.00 : 121.00
Ethylbenzene by GC	TM245	<b>81.10</b> 79.00 : 121.00
m & p Xylene by GC	TM245	<b>80.10</b> 79.00 : 121.00



**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
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**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

GRO by GC-FID (W)

		QC 30
MTBE GC-FID	TM245	<b>85.50</b> 79.00 : 121.00
o Xylene by GC	TM245	<b>79.95</b> 79.00 : 121.00
QC	TM245	<b>112.21</b> 79.00 : 121.00
Toluene by GC	TM245	<b>82.80</b> 79.00 : 121.00

Mercury Dissolved

Component	Method Code	QC 34
Mercury Dissolved (CVAF)	TM183	<b>98.80</b> 85.87 : 123.88

PAH Spec MS - Aqueous (W)

Component	Method Code	QC 34	QC 39
Acenaphthene by GCMS	TM178	<b>94.05</b> 82.64 : 105.96	<b>97.10</b> 82.64 : 105.96
Acenaphthylene by GCMS	TM178	<b>88.66</b> 77.40 : 104.05	<b>97.56</b> 77.40 : 104.05
Anthracene by GCMS	TM178	<b>90.77</b> 77.85 : 105.75	<b>95.73</b> 77.85 : 105.75
Benz(a)anthracene by GCMS	TM178	<b>91.02</b> 74.75 : 107.36	<b>99.06</b> 74.75 : 107.36
Benzo(a)pyrene by GCMS	TM178	<b>103.24</b> 82.57 : 113.60	<b>99.80</b> 82.57 : 113.60
Benzo(b)fluoranthene by GCMS	TM178	<b>102.64</b> 87.25 : 114.25	<b>98.94</b> 87.25 : 114.25
Benzo(ghi)perylene by GCMS	TM178	<b>106.82</b> 82.05 : 112.05	<b>101.25</b> 82.05 : 112.05
Benzo(k)fluoranthene by GCMS	TM178	<b>111.64</b> 87.20 : 122.40	<b>97.39</b> 87.20 : 122.40
Chrysene by GCMS	TM178	<b>103.02</b> 83.43 : 107.48	<b>100.39</b> 83.43 : 107.48
Dibenzo(ah)anthracene by GCMS	TM178	<b>104.28</b> 72.40 : 118.55	<b>98.39</b> 72.40 : 118.55
Fluoranthene by GCMS	TM178	<b>94.34</b> 80.63 : 107.61	<b>98.53</b> 80.63 : 107.61
Fluorene by GCMS	TM178	<b>94.36</b> 81.74 : 107.56	<b>99.94</b> 81.74 : 107.56
Indeno(123cd)pyrene by GCMS	TM178	<b>106.69</b> 82.25 : 114.75	<b>103.47</b> 82.25 : 114.75
Naphthalene by GCMS	TM178	<b>94.67</b> 82.31 : 107.48	<b>96.24</b> 82.31 : 107.48
Phenanthrene by GCMS	TM178	<b>96.10</b> 84.10 : 107.63	<b>98.06</b> 84.10 : 107.63
Pyrene by GCMS	TM178	<b>95.33</b> 80.69 : 107.02	<b>99.93</b> 80.69 : 107.02

**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

PAH Spec MS - Aqueous (W)

		QC 34	QC 39
Volume	TM178	<b>15000.00</b>	<b>15000.00</b>

pH Value

Component	Method Code	QC 38
pH	TM256	<b>99.57</b> 98.87 : 100.69

Phenols by HPLC (W)

Component	Method Code	QC 36
2,3,5 Trimethyl-Phenol by HPLC (W)	TM259	<b>94.00</b> 79.66 : 113.07
2-Isopropyl Phenol by HPLC (W)	TM259	<b>98.00</b> 93.26 : 108.31
Cresols by HPLC (W)	TM259	<b>91.67</b> 68.30 : 98.81
Napthol by HPLC (W)	TM259	<b>93.00</b> 88.14 : 112.45
Phenol by HPLC (W)	TM259	<b>95.00</b> 87.02 : 102.59
Xylenols by HPLC (W)	TM259	<b>97.33</b> 96.73 : 108.07

Sulphide

Component	Method Code	QC 34
Sulphide	TM101	<b>104.47</b> 77.08 : 135.77

Total Organic and Inorganic Carbon

Component	Method Code	QC 38
Total Inorganic Carbon	TM090	<b>96.66</b> 88.46 : 104.55
Total Organic Carbon	TM090	<b>107.69</b> 90.80 : 116.75

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

### Chromatogram

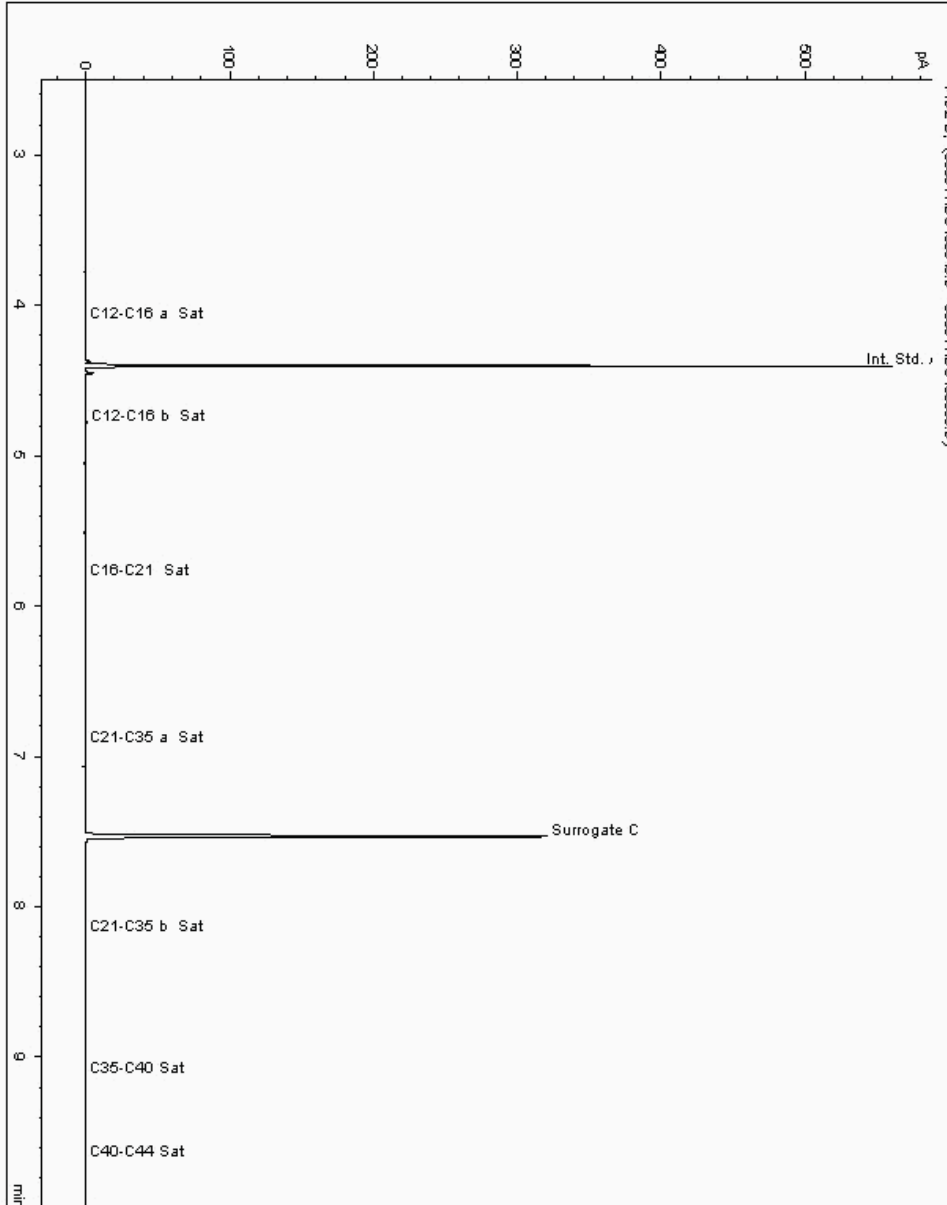
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3013230  
 Sample ID : BH106

Depth :

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

Sample Identity: 3071477-3013230  
 Date Acquired : 10/03/11 11:13:57 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

# Chromatogram

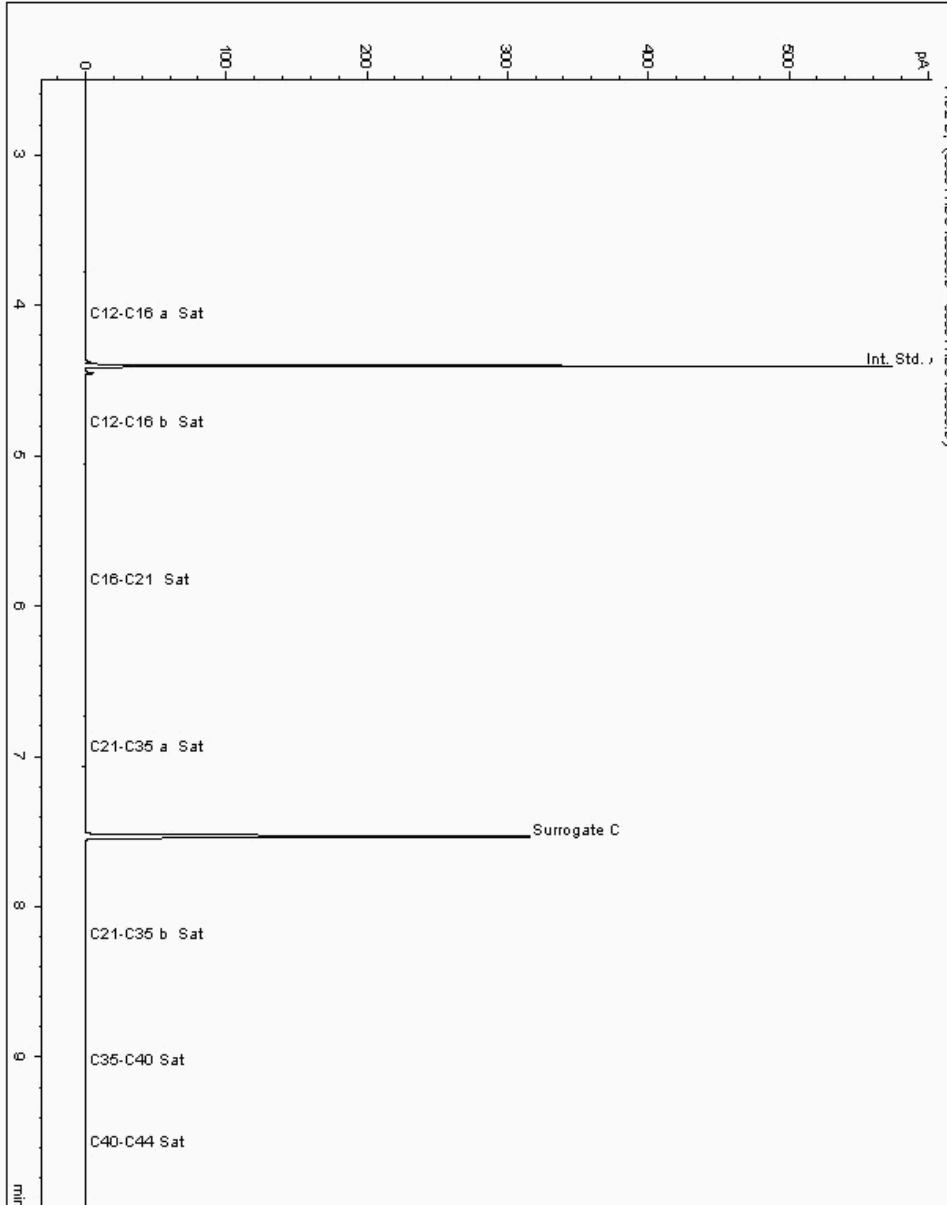
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3013254  
 Sample ID : BH105

Depth :

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

Sample Identity: 3071498-3013254  
 Date Acquired : 10/03/11 09:41:31 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

### Chromatogram

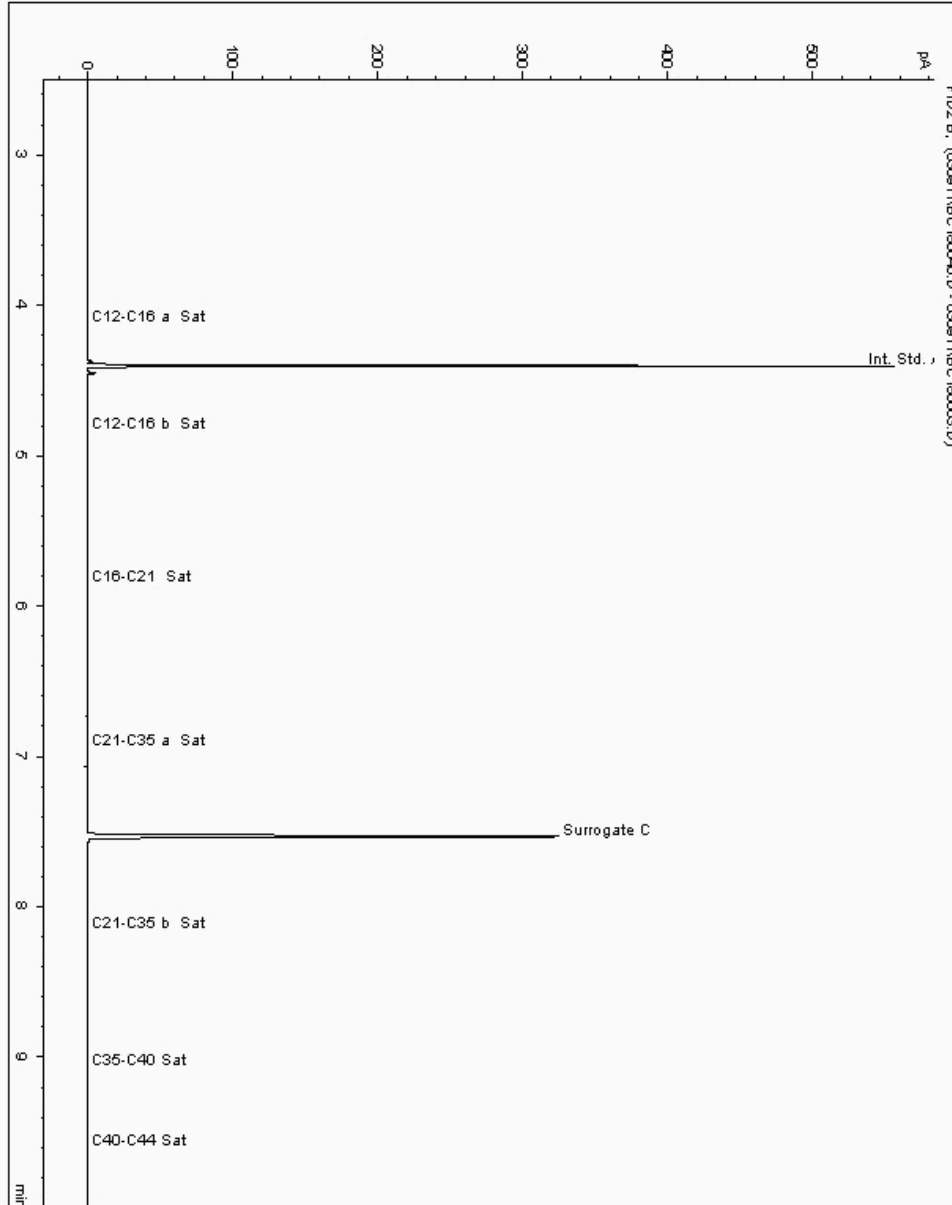
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3013265  
 Sample ID : BH102

Depth :

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

Sample Identity: 3071456-3013265  
 Date Acquired : 10/03/11 10:18:23 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

# Chromatogram

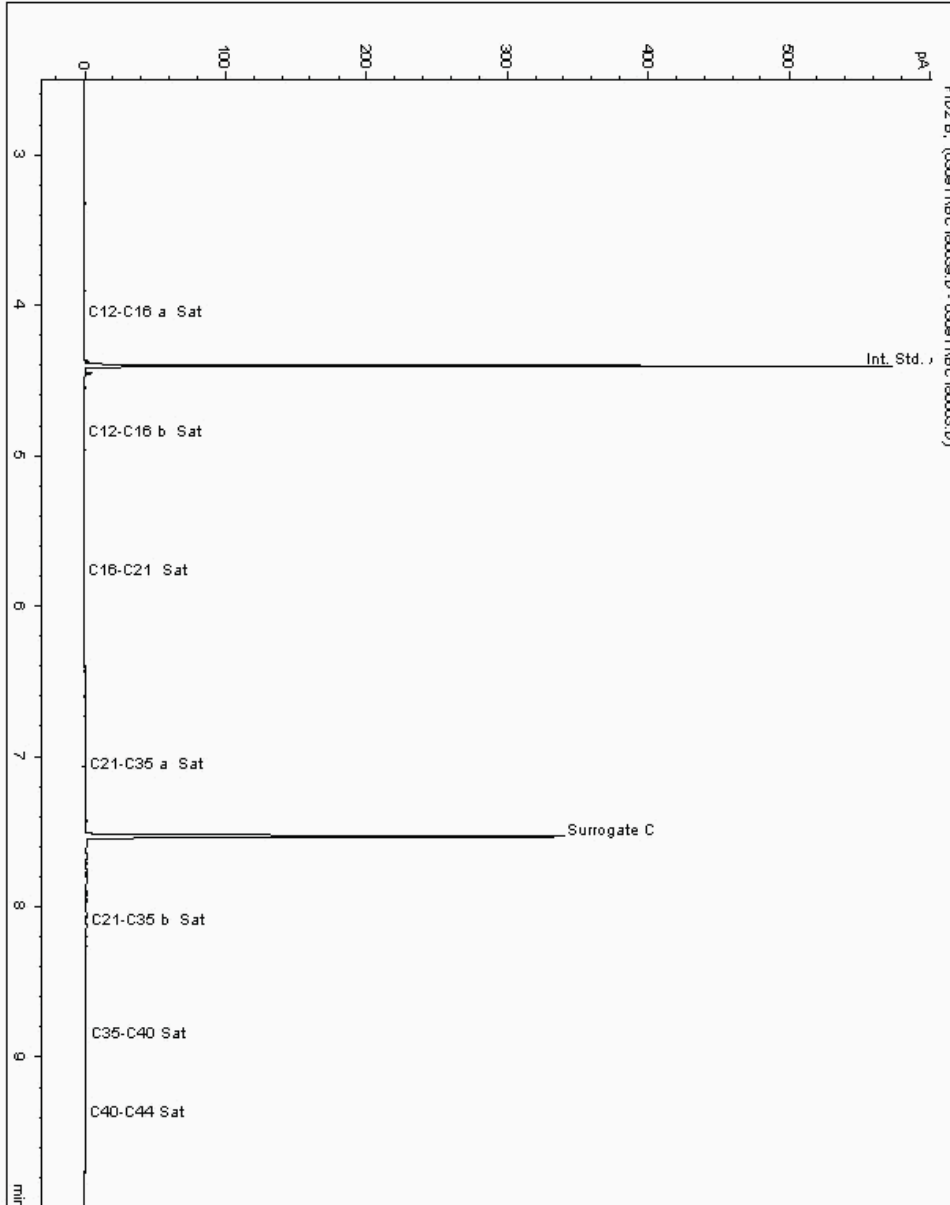
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 3013693  
 Sample ID : BH110

Depth :

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

Sample Identity: 3071434-3013693  
 Date Acquired : 10/03/11 09:59:58 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

### Chromatogram

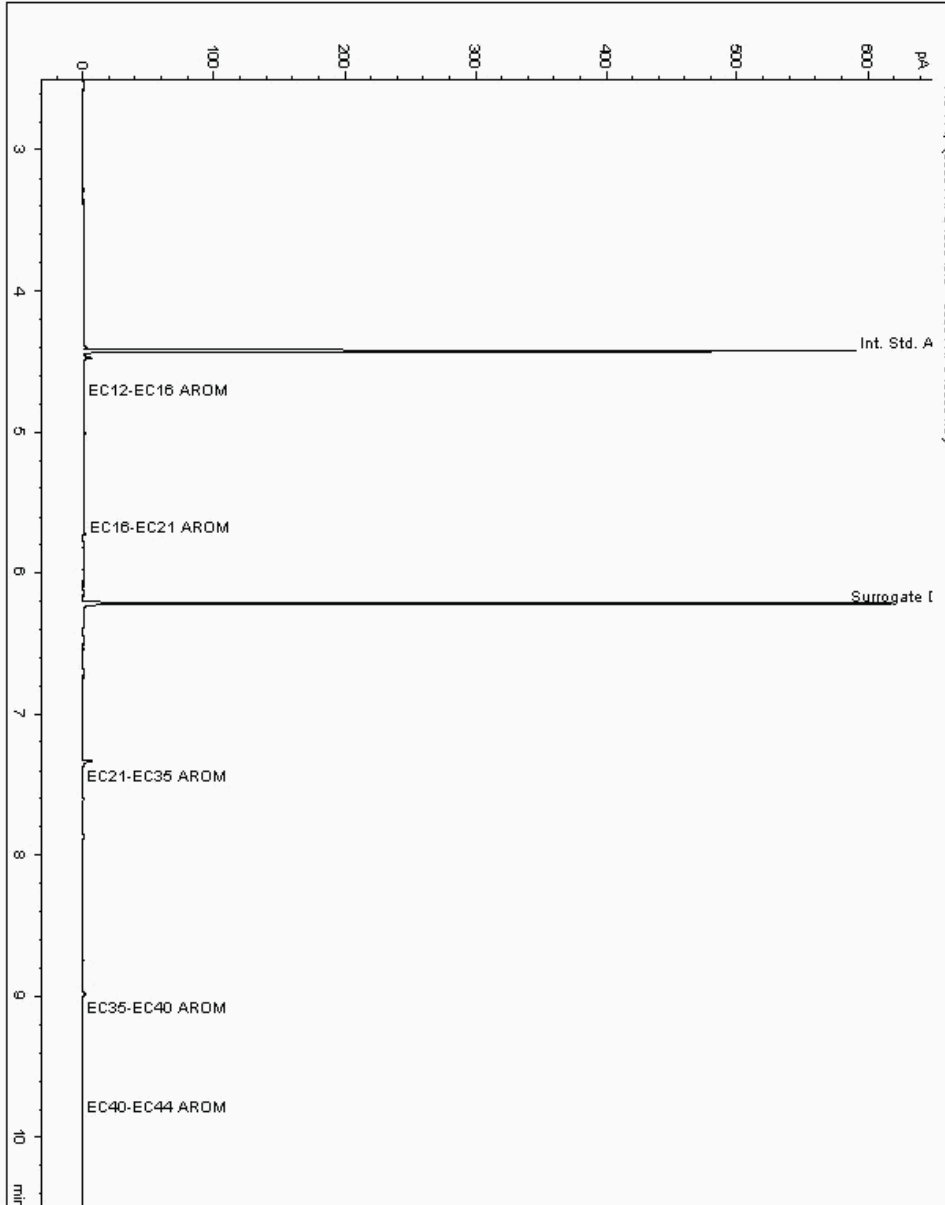
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3013230  
 Sample ID: BH106

Depth :

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

Sample Identity: 3071478-3013230  
 Date Acquired : 10/03/11 11:13:57 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

### Chromatogram

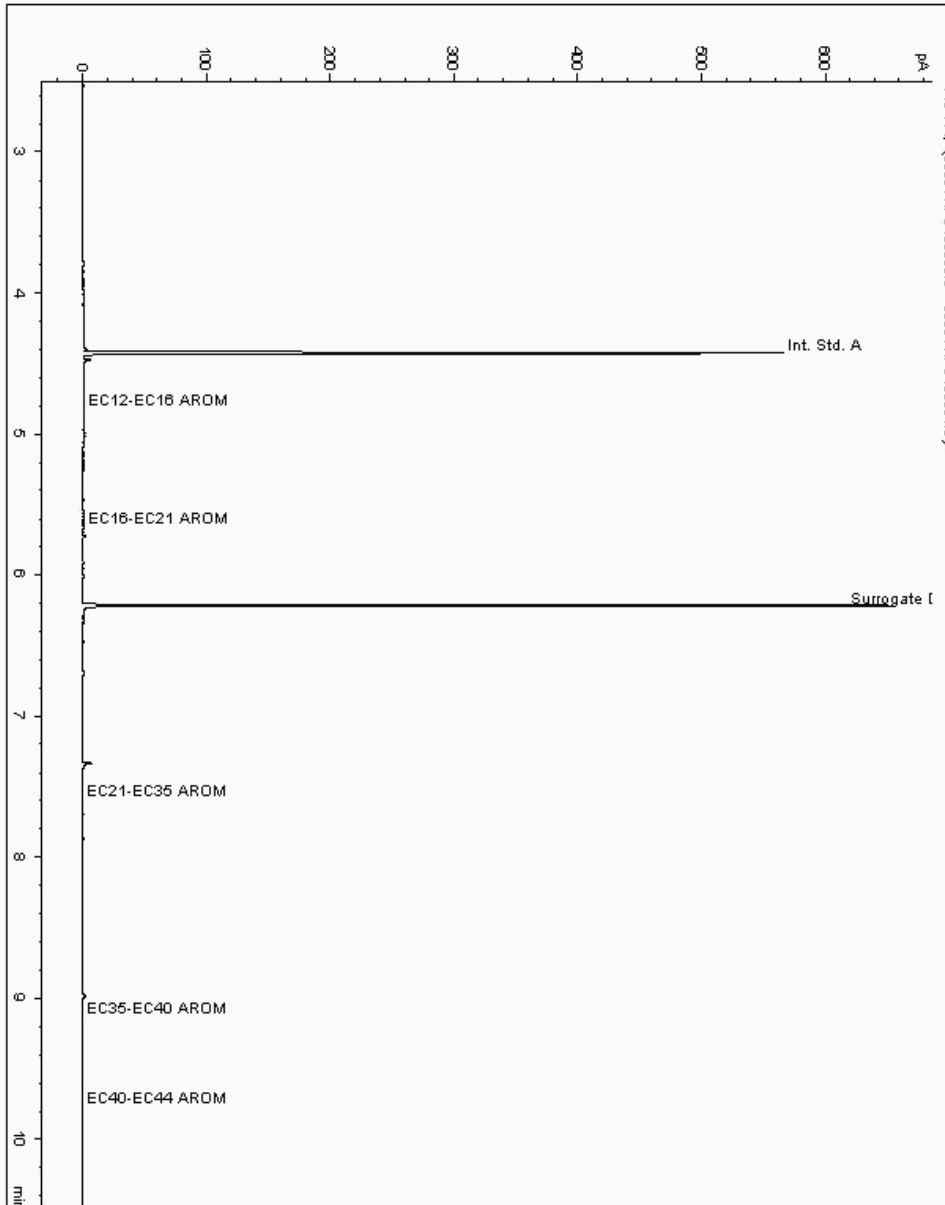
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3013254  
 Sample ID: BH105

Depth :

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

Sample Identity: 3071499-3013254  
 Date Acquired : 10/03/11 09:41:31 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008





SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

### Chromatogram

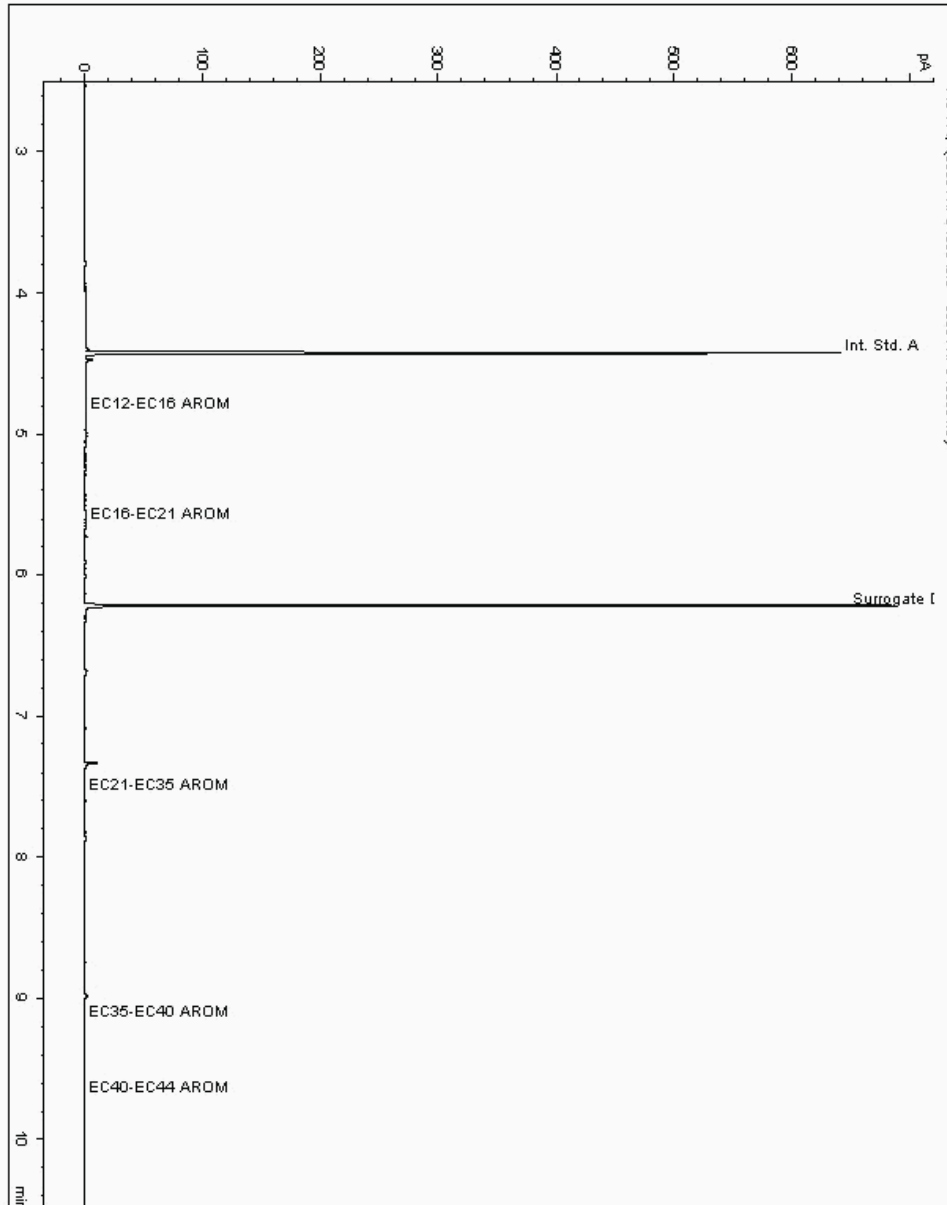
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3013265  
 Sample ID: BH102

Depth :

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

Sample Identity: 3071457-3013265  
 Date Acquired : 10/03/11 10:18:23 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Neil Beswick

Order Number:  
 Report Number: 120320  
 Superseded Report:

# Chromatogram

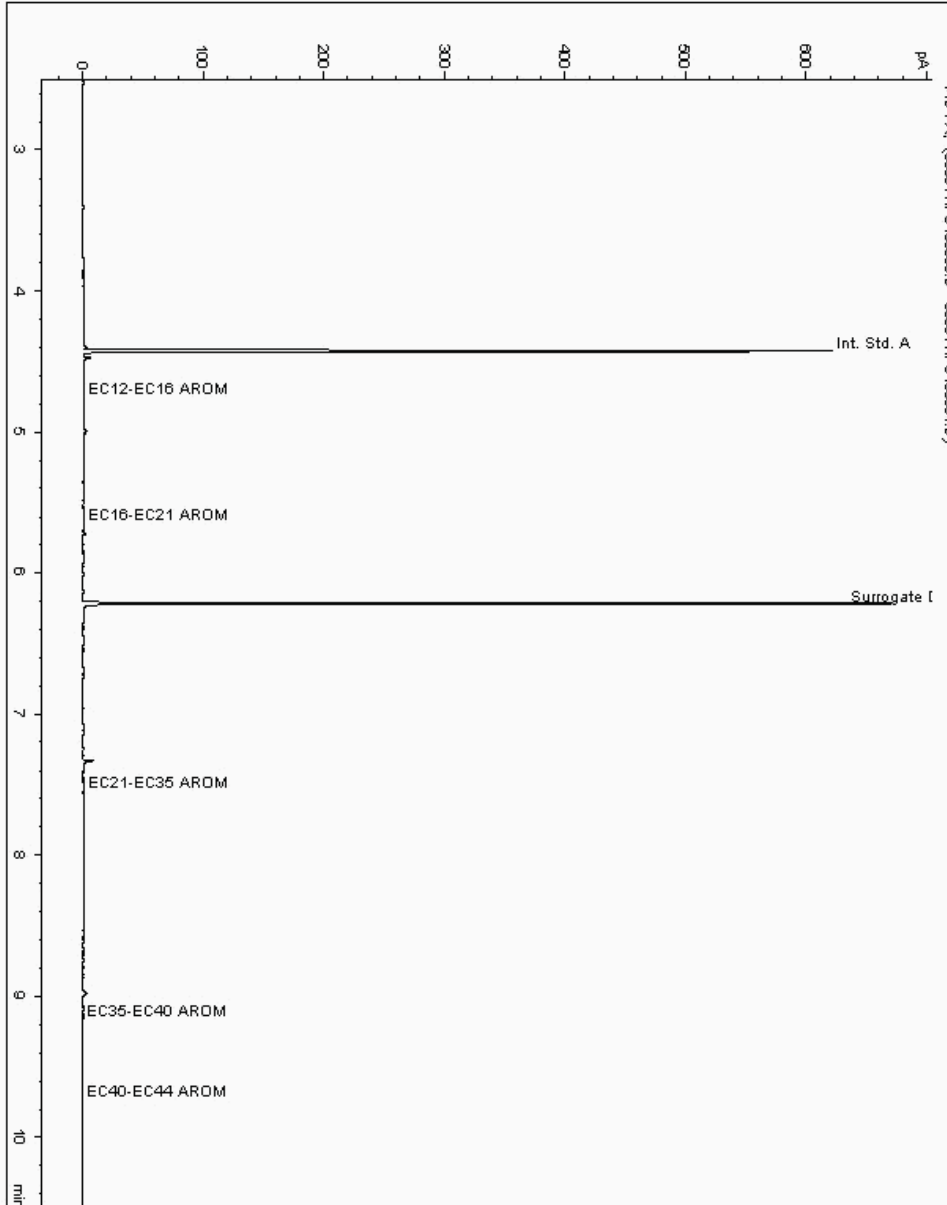
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 3013693  
 Sample ID : BH110

Depth :

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

Sample Identity: 3071435-3013693  
 Date Acquired : 10/03/11 09:59:58 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

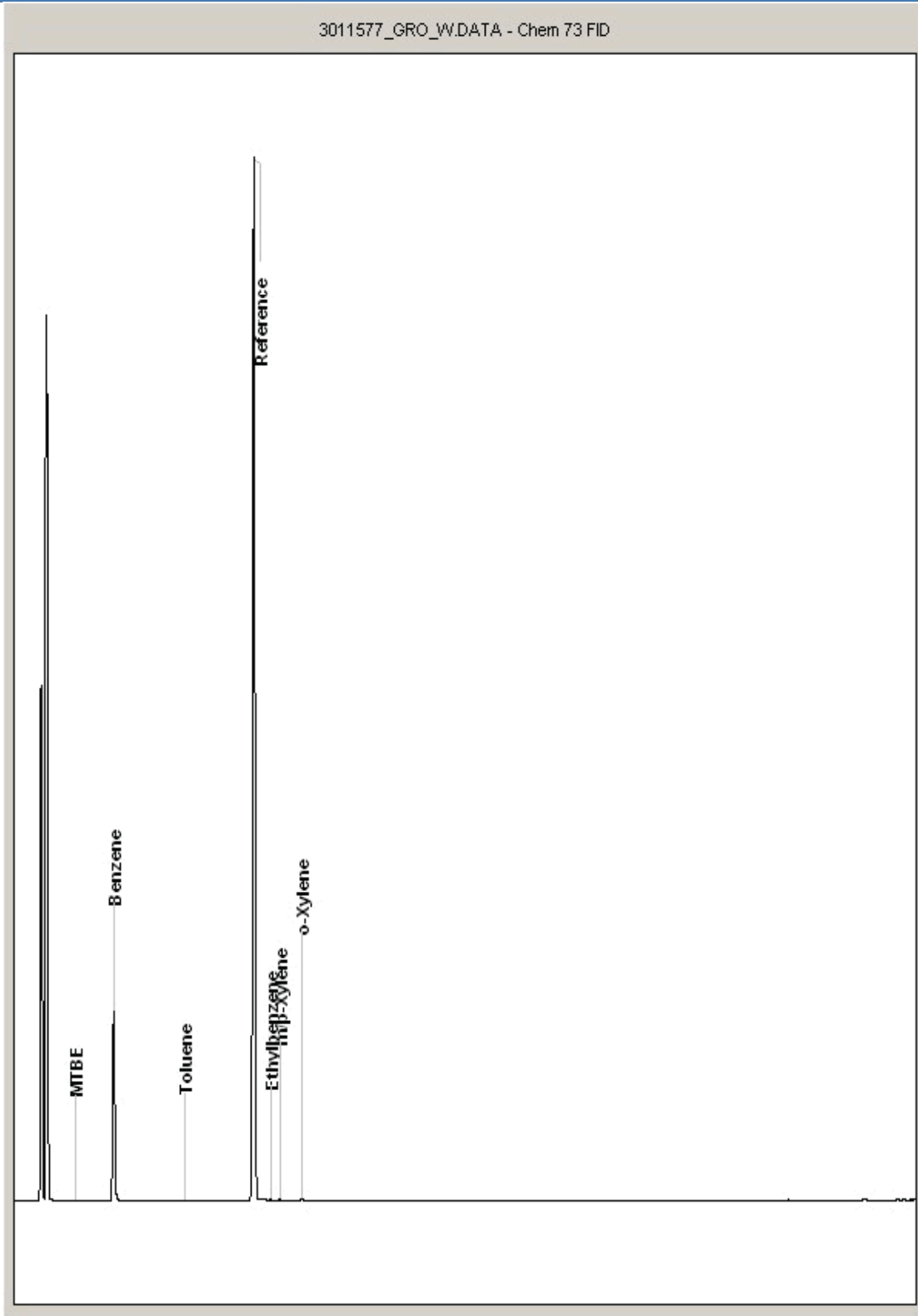
Order Number:  
Report Number: 120320  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3011577  
Sample ID : BH110

Depth :



SDG: 110307-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

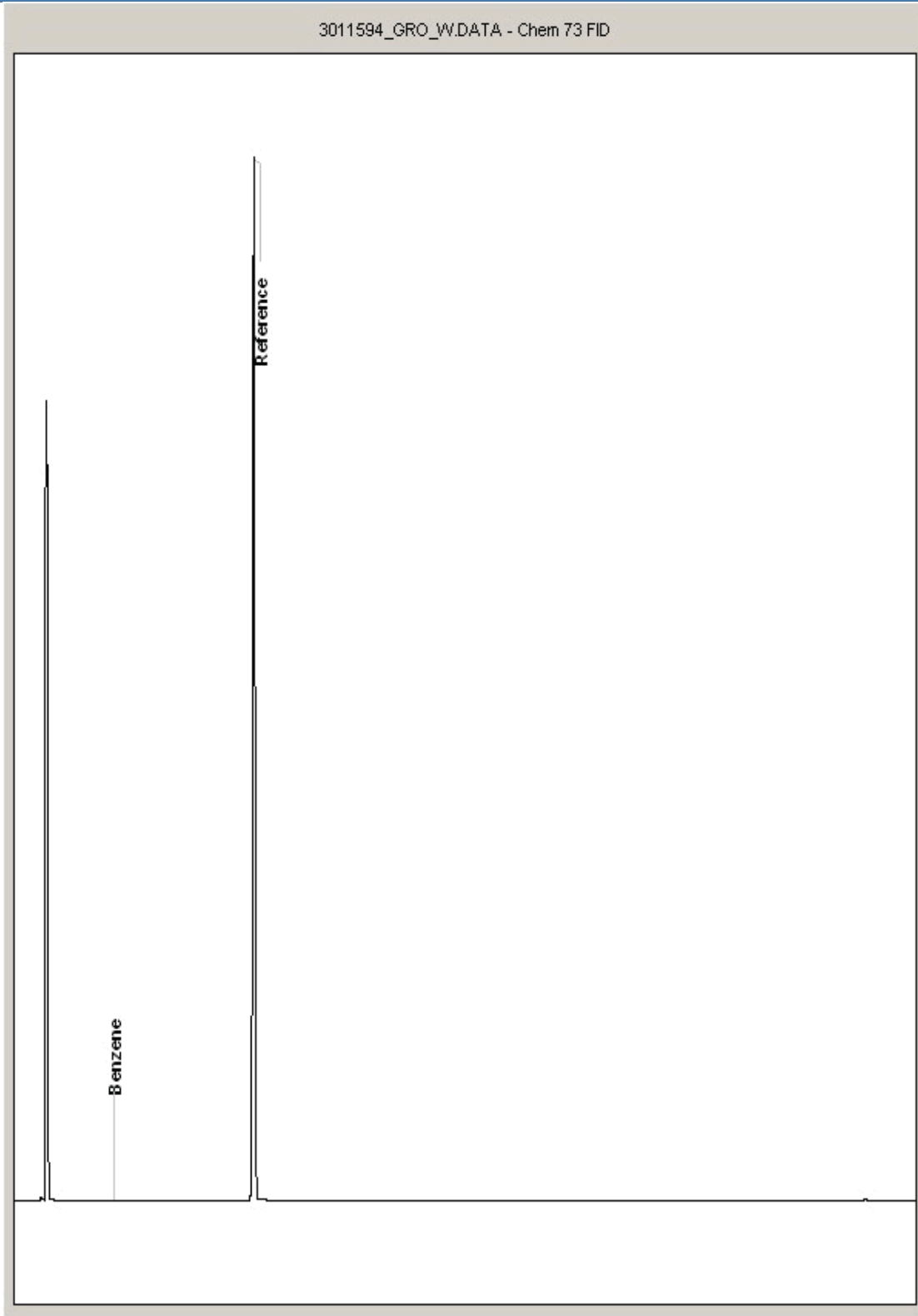
Order Number:  
Report Number: 120320  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3011594  
Sample ID : BH102

Depth :



SDG: 110307-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

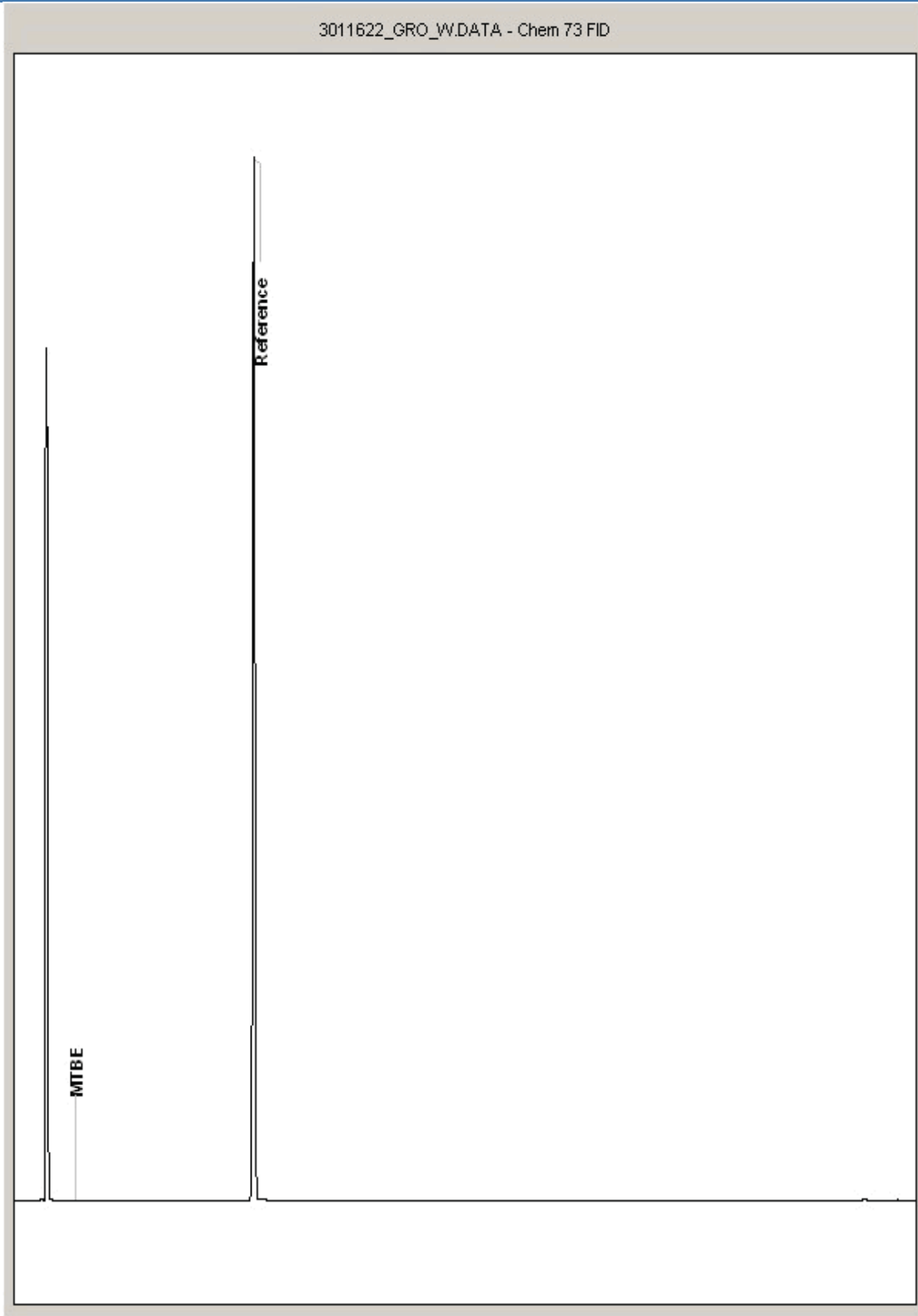
Order Number:  
Report Number: 120320  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3011622  
Sample ID : BH106

Depth :



SDG: 110307-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Neil Beswick

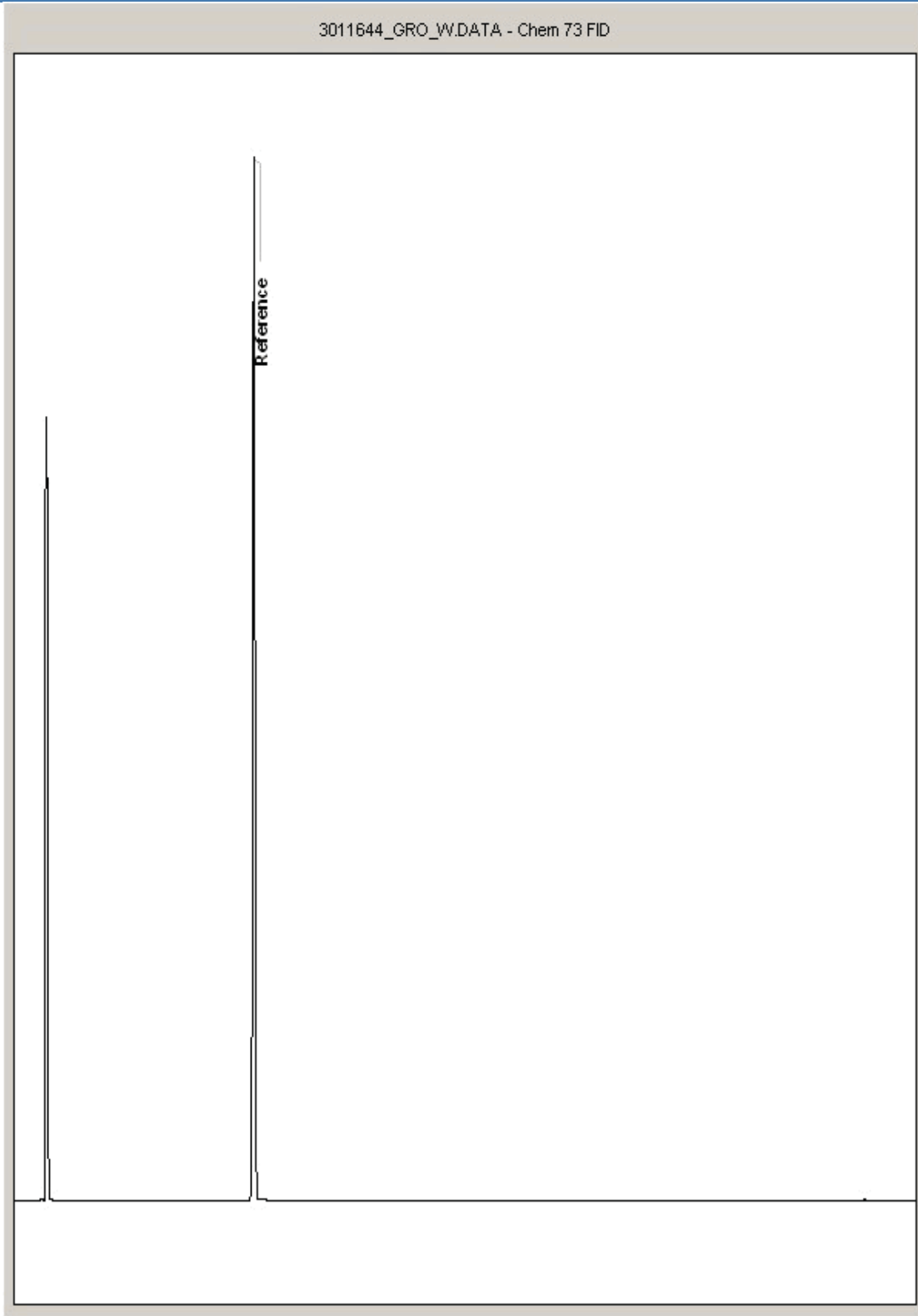
Order Number:  
Report Number: 120320  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3011644  
Sample ID : BH105

Depth :



**SDG:** 110307-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Neil Beswick

**Order Number:**  
**Report Number:** 120320  
**Superseded Report:**

## 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<sub>4</sub> 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 C<sub>4</sub>-C<sub>10</sub> range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOX THERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOX THERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOX THERM	HPLC
PHENOLSBYGCMS	WET	DCM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANEACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANEACETONE	SOX THERM	GCMS
EPH (DRO)	D&C	HEXANEACETONE	END OVEREND	GC-FD
EPH (MINO L)	D&C	HEXANEACETONE	END OVEREND	GC-FD
EPH (CLEANED UP)	D&C	HEXANEACETONE	END OVEREND	GC-FD
EPH CWG BYGC	D&C	HEXANEACETONE	END OVEREND	GC-FD
PCB TOT/ PCB CON	D&C	HEXANEACETONE	END OVEREND	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANEACETONE	MICRO WAVE TM218.	GCMS
C8-C10 (C8-C10) EZ FLASH	WET	HEXANEACETONE	SHAKER	GC-EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANEACETONE	SHAKER	GC-EZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR -BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR -BAR)	GC FD
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR -BAR)	GC FD
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR -BAR)	GC FD
PCB CONGENERIS	HEXANE	STIRRED EXTRACTION (STIR -BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR -BAR)	GCMS
SVOC	DCM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PESTICIDES/OPP	DCM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GCMS
PHENOL SMS	DCM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by R	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anorthophyllite	-
Fibrous Tremolite	-

### 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 HSG 264.

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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 11 March 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110307-3  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 120203

We received 2 samples on Saturday March 05, 2011 and 2 of these samples were scheduled for analysis which was completed on Friday March 11, 2011. 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:

**Sonia McWhan**

Operations Manager





**SDG:** 110307-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 120203  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3010963	BH104			04/03/2011
3010964	BH200			04/03/2011

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

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

LIQUID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test  <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)		3010963	3010964
	Customer Sample Reference		BH104	BH200
	AGS Reference			
	Depth (m)			
	Container		11 green glass bottle	11 plastic Vial
Anions by Kone (w)	All	NDPs: 0 Tests: 2	X	X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 2	X	X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2	X	X
Easily Liberated Sulphide	All	NDPs: 0 Tests: 2	X	X
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 2	X	X
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 2	X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 2		X
Mercury Dissolved	All	NDPs: 0 Tests: 2	X	X
Oxygenates (W)	All	NDPs: 0 Tests: 2		X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 2	X	X
pH Value	All	NDPs: 0 Tests: 2	X	X
Phenols by HPLC (W)	All	NDPs: 0 Tests: 2	X	X
Sulphide	All	NDPs: 0 Tests: 2	X	X
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 2	X	X
TPH CWG (W)	All	NDPs: 0 Tests: 2	X	X

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

<b>LIQUID</b> Results Legend <input checked="" type="checkbox"/> Test <input type="checkbox"/> No Determination Possible	<b>Lab Sample No(s)</b>	3010963	3010964
	<b>Customer Sample Reference</b>	BH104	BH200
	<b>AGS Reference</b>		
	<b>Depth (m)</b>		
	<b>Container</b>	11 green glass bottle	11 green glass bottle
VOC MS (W)	All	NDPs: 0 Tests: 2	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

Results Legend			Customer Sample R		BH104	BH200				
#	ISO17025 accredited.		Depth (m)	Sample Type	Water(GW/SW)	Water(GW/SW)				
M	mCERTS accredited.				04/03/2011	04/03/2011				
S	Non-conforming work.		Date Sampled	Date Received						
aq	Aqueous / settled sample.		Date Received	110307-3						
diss.filt	Dissolved / filtered sample.		SDG Ref	3010963						
tot.unfilt	Total / unfiltered sample.		Lab Sample No.(s)							
*	subcontracted test.		AGS Reference							
**	% 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.									
Component	LOD/Units	Method								
Organic Carbon, Total	<3000 µg/l	TM090			18100 #	16700 #				
Sulphide	<10 µg/l	TM101			12 #	26 #				
Arsenic (diss.filt)	<0.12 µg/l	TM152			1.18 #	1.33 #				
Beryllium (diss.filt)	<0.07 µg/l	TM152			<0.07 #	<0.07 #				
Cadmium (diss.filt)	<0.1 µg/l	TM152			<0.1 #	<0.1 #				
Chromium (diss.filt)	<0.22 µg/l	TM152			10.5 #	9.17 #				
Copper (diss.filt)	<0.85 µg/l	TM152			6.13 #	7.12 #				
Lead (diss.filt)	<0.02 µg/l	TM152			<0.02 #	<0.02 #				
Molybdenum (diss.filt)	<0.24 µg/l	TM152			4.32 #	5.46 #				
Nickel (diss.filt)	<0.15 µg/l	TM152			12.3 #	13.6 #				
Vanadium (diss.filt)	<0.24 µg/l	TM152			3.06 #	2.83 #				
Zinc (diss.filt)	<0.41 µg/l	TM152			37.5 #	37.4 #				
Mercury (diss.filt)	<0.01 µg/l	TM183			<0.01 #	<0.01 #				
Sulphate	<2000 µg/l	TM184			155000 #	162000 #				
Cyanide, Total	<50 µg/l	TM227			<50 #	<50 #				
Cyanide, Free	<50 µg/l	TM227			<50 #	<50 #				
Sulphide, Easily liberated	<100 µg/l	TM239			<100 #	<100 #				
pH	<1 pH Units	TM256			8.64 #	8.63 #				
Phenol	<2 µg/l	TM259			<2 #	<2 #				
tert Butanol	<10 µg/l	TM289			<10 #	<10 #				
tert-butyl ethyl ether	<1 µg/l	TM289			<1 #	<1 #				

**SDG:** 110307-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 120203  
**Superseded Report:**

**PAH Spec MS - Aqueous (W)**

Results Legend		Customer Sample R	BH104	BH200					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.		Water(GW/SW)	Water(GW/SW)					
S	Non-conforming work.								
aq	Aqueous / settled sample.		04/03/2011	04/03/2011					
diss.filt	Dissolved / filtered sample.		05/03/2011	05/03/2011					
tot.unfilt	Total / unfiltered sample.		110307-3	110307-3					
*	subcontracted test.		3010963	3010964					
**	% 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.								
Component	LOD/Units		Method						
Naphthalene (aq)	<0.1 µg/l		TM178	0.148 #	0.111 #				
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #					
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011 #	<0.011 #					
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017 #	<0.017 #					
Anthracene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #					
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022 #	<0.022 #					
Fluorene (aq)	<0.014 µg/l	TM178	<0.014 #	<0.014 #					
Chrysene (aq)	<0.013 µg/l	TM178	<0.013 #	<0.013 #					
Pyrene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #					
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017 #	<0.017 #					
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	<0.023 #	<0.023 #					
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027 #	<0.027 #					
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	<0.009 #	<0.009 #					
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016 #	<0.016 #					
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	<0.016 #	<0.016 #					
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	<0.014 #	<0.014 #					
Polyaromatic hydrocarbons, Total	<0.1 µg/l	TM178	0.148 #	0.111 #					

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

TPH CWG (W)

Results Legend			Customer Sample R		BH104	BH200				
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.			Water(GW/SW)	Water(GW/SW)					
S	Non-conforming work.									
aq	Aqueous / settled sample.			04/03/2011	04/03/2011					
diss.filt	Dissolved / filtered sample.			05/03/2011	05/03/2011					
tot.unfilt	Total / unfiltered sample.			110307-3	110307-3					
*	subcontracted test.			3010963	3010964					
**	% 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.									
Component	LOD/Units	Method								
GRO Surrogate % recovery**	%	TM245		90	96					
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3	<3	#	#				
Benzene	<7 µg/l	TM245	<7	<7	#	#				
Toluene	<4 µg/l	TM245	<4	<4	#	#				
Ethylbenzene	<5 µg/l	TM245	<5	<5	#	#				
m,p-Xylene	<8 µg/l	TM245	<8	<8	#	#				
o-Xylene	<3 µg/l	TM245	<3	<3	#	#				
m,p,o-Xylene	<10 µg/l	TM245	<10	<10						
BTEX, Total	<10 µg/l	TM245	<10	<10						
Aliphatics >C5-C6	<10 µg/l	TM245	<10	<10						
Aliphatics >C6-C8	<10 µg/l	TM245	<10	<10						
Aliphatics >C8-C10	<10 µg/l	TM245	<10	<10						
Aliphatics >C10-C12	<10 µg/l	TM245	<10	<10						
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10	<10						
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10	<10						
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	<10	<10						
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	<10	<10						
Aromatics >EC5-EC7	<10 µg/l	TM245	<10	<10						
Aromatics >EC7-EC8	<10 µg/l	TM245	<10	<10						
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	<10						
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10						
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10	<10						
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10	<10						
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	<10	<10						
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	<10	<10						
Total Aliphatics >C5-C35 (aq)	<10 µg/l	TM174	<10	<10						
Total Aromatics >C6-C35 (aq)	<10 µg/l	TM174	<10	<10						
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	<10	<10						
Total Aliphatics & Aromatics >C12-C35	<10 µg/l	TM174	<10	<10						
Total Aliphatics >C5-C12	<10 µg/l	TM245	<10	<10						
Total Aromatics >EC5-EC12	<10 µg/l	TM245	<10	<10						

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

VOC MS (W)

Results Legend		Customer Sample R	BH104	BH200				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference						
M	mCERTS accredited.		Water(GW/SW)	Water(GW/SW)				
S	Non-conforming work.		04/03/2011	04/03/2011				
aq	Aqueous / settled sample.		05/03/2011	05/03/2011				
diss.filt	Dissolved / filtered sample.		110307-3	110307-3				
tot.unfilt	Total / unfiltered sample.		3010963	3010964				
*	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.							
Component	LOD/Units		Method					
Dibromofluoromethane**	%		TM208	111	111			
Toluene-d8**	%	TM208	97.5	96.9				
4-Bromofluorobenzene**	%	TM208	97.1	98.3				
Dichlorodifluoromethane	<7 µg/l	TM208	<7	<7	#	#		
Chloromethane	<9 µg/l	TM208	<9	<9	#	#		
Vinyl chloride	<1.2 µg/l	TM208	<1.2	<1.2	#	#		
Bromomethane	<2 µg/l	TM208	<2	<2	#	#		
Chloroethane	<2.5 µg/l	TM208	<2.5	<2.5	#	#		
Trichlorofluoromethane	<1.3 µg/l	TM208	<1.3	<1.3	#	#		
1,1-Dichloroethene	<1.2 µg/l	TM208	<1.2	<1.2	#	#		
Carbon disulphide	<1.3 µg/l	TM208	<1.3	<1.3	#	#		
Dichloromethane	<3.7 µg/l	TM208	<3.7	<3.7	#	#		
Methyl tertiary butyl ether (MTBE)	<1.6 µg/l	TM208	<1.6	<1.6	#	#		
trans-1,2-Dichloroethene	<1.9 µg/l	TM208	<1.9	<1.9	#	#		
1,1-Dichloroethane	<1.2 µg/l	TM208	<1.2	<1.2	#	#		
cis-1,2-Dichloroethene	<2.3 µg/l	TM208	<2.3	<2.3	#	#		
2,2-Dichloropropane	<3.8 µg/l	TM208	<3.8	<3.8	#	#		
Bromochloromethane	<1.9 µg/l	TM208	<1.9	<1.9	#	#		
Chloroform	<1.8 µg/l	TM208	<1.8	<1.8	#	#		
1,1,1-Trichloroethane	<1.3 µg/l	TM208	<1.3	<1.3	#	#		
1,1-Dichloropropene	<1.3 µg/l	TM208	<1.3	<1.3	#	#		
Carbontetrachloride	<1.4 µg/l	TM208	<1.4	<1.4	#	#		
1,2-Dichloroethane	<3.3 µg/l	TM208	<3.3	<3.3	#	#		
Benzene	<1.3 µg/l	TM208	<1.3	<1.3	#	#		
Trichloroethene	<2.5 µg/l	TM208	<2.5	<2.5	#	#		
1,2-Dichloropropane	<3 µg/l	TM208	<3	<3	#	#		
Dibromomethane	<2.7 µg/l	TM208	<2.7	<2.7	#	#		
Bromodichloromethane	<0.9 µg/l	TM208	<0.9	<0.9	#	#		
cis-1,3-Dichloropropene	<1.9 µg/l	TM208	<1.9	<1.9	#	#		
Toluene	<1.4 µg/l	TM208	<1.4	<1.4	#	#		
trans-1,3-Dichloropropene	<3.5 µg/l	TM208	<3.5	<3.5	#	#		
1,1,2-Trichloroethane	<2.2 µg/l	TM208	<2.2	<2.2	#	#		
1,3-Dichloropropane	<2.2 µg/l	TM208	<2.2	<2.2	#	#		
Tetrachloroethene	<1.5 µg/l	TM208	<1.5	<1.5	#	#		
Dibromochloromethane	<1.7 µg/l	TM208	<1.7	<1.7	#	#		

**SDG:** 110307-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 120203  
**Superseded Report:**

**VOC MS (W)**

Results Legend		Customer Sample R	BH104	BH200				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water(GW/SW)	Water(GW/SW)				
M	mCERTS accredited.		04/03/2011	04/03/2011				
S	Non-conforming work.		05/03/2011	05/03/2011				
aq	Aqueous / settled sample.		110307-3	110307-3				
diss.filt	Dissolved / filtered sample.		3010963	3010964				
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.							
Component	LOD/Units		Method					
1,2-Dibromoethane	<2.3 µg/l		TM208	<2.3 #	<2.3 #			
Chlorobenzene	<3.5 µg/l	TM208	<3.5 #	<3.5 #				
1,1,1,2-Tetrachloroethane	<1.3 µg/l	TM208	<1.3 #	<1.3 #				
Ethylbenzene	<2.5 µg/l	TM208	<2.5 #	<2.5 #				
m,p-Xylene	<2.5 µg/l	TM208	<2.5 #	<2.5 #				
o-Xylene	<1.7 µg/l	TM208	<1.7 #	<1.7 #				
Styrene	<1.2 µg/l	TM208	<1.2 #	<1.2 #				
Bromoform	<3 µg/l	TM208	<3 #	<3 #				
Isopropylbenzene	<1.4 µg/l	TM208	<1.4 #	<1.4 #				
1,1,2,2-Tetrachloroethane	<5.2 µg/l	TM208	<5.2 #	<5.2 #				
1,2,3-Trichloropropane	<7.8 µg/l	TM208	<7.8 #	<7.8 #				
Bromobenzene	<2 µg/l	TM208	<2 #	<2 #				
Propylbenzene	<2.6 µg/l	TM208	<2.6 #	<2.6 #				
2-Chlorotoluene	<1.9 µg/l	TM208	<1.9 #	<1.9 #				
1,3,5-Trimethylbenzene	<1.8 µg/l	TM208	<1.8 #	<1.8 #				
4-Chlorotoluene	<1.9 µg/l	TM208	<1.9 #	<1.9 #				
tert-Butylbenzene	<2 µg/l	TM208	<2 #	<2 #				
1,2,4-Trimethylbenzene	<1.7 µg/l	TM208	<1.7 #	<1.7 #				
sec-Butylbenzene	<1.7 µg/l	TM208	<1.7 #	<1.7 #				
4-iso-Propyltoluene	<2.6 µg/l	TM208	<2.6 #	<2.6 #				
1,3-Dichlorobenzene	<2.2 µg/l	TM208	<2.2 #	<2.2 #				
1,4-Dichlorobenzene	<2.7 µg/l	TM208	<2.7 #	<2.7 #				
n-Butylbenzene	<2 µg/l	TM208	<2 #	<2 #				
1,2-Dichlorobenzene	<3.7 µg/l	TM208	<3.7 #	<3.7 #				
1,2-Dibromo-3-chloropropane	<9.8 µg/l	TM208	<9.8 #	<9.8 #				
1,2,4-Trichlorobenzene	<2.3 µg/l	TM208	<2.3 #	<2.3 #				
Hexachlorobutadiene	<2.5 µg/l	TM208	<2.5 #	<2.5 #				
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	<1 #	<1 #				
Naphthalene	<3.5 µg/l	TM208	<3.5 #	<3.5 #				
1,2,3-Trichlorobenzene	<3.1 µg/l	TM208	<3.1 #	<3.1 #				
1,3,5-Trichlorobenzene	<10 µg/l	TM208	<10 #	<10 #				



<b>SDG:</b> 110307-3	<b>Location:</b> Simonside	<b>Order Number:</b>
<b>Job:</b> H_ARCADIS_NMK-340	<b>Customer:</b> ARCADIS Geraghty & Miller	<b>Report Number:</b> 120203
<b>Client Reference:</b> 93749.02	<b>Attention:</b>	<b>Superseded Report:</b>

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
TM061	Method for the Determination of EPH, Massachusetts Dept. of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM239	Sulphide in Waters and Effluents 1983 (Tentative Methods) HMSO 1983, ISBN 011 7517186	Determination of Easily Liberated Sulphide in Waste waters		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		
TM289				

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

**SDG:** 110307-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 120203  
**Superseded Report:**

### Test Completion Dates

Lab Sample No(s) Customer Sample Ref.	3010963	3010964
	BH104	BH200
AGS Ref.		
Depth		
Type	LIQUID	LIQUID
Anions by Kone (w)	09-Mar-2011	09-Mar-2011
Cyanide Comp/Free/Total/Thiocyanate	09-Mar-2011	09-Mar-2011
Dissolved Metals by ICP-MS	08-Mar-2011	08-Mar-2011
Easily Liberated Sulphide	10-Mar-2011	10-Mar-2011
EPH CWG (Aliphatic) Aqueous GC (W)	09-Mar-2011	09-Mar-2011
EPH CWG (Aromatic) Aqueous GC (W)	09-Mar-2011	09-Mar-2011
GRO by GC-FID (W)	11-Mar-2011	11-Mar-2011
Mercury Dissolved	08-Mar-2011	08-Mar-2011
Oxygenates (W)	09-Mar-2011	09-Mar-2011
PAH Spec MS - Aqueous (W)	08-Mar-2011	08-Mar-2011
pH Value	08-Mar-2011	08-Mar-2011
Phenols by HPLC (W)	09-Mar-2011	09-Mar-2011
Sulphide	10-Mar-2011	10-Mar-2011
Total Organic and Inorganic Carbon	08-Mar-2011	08-Mar-2011
TPH CWG (W)	11-Mar-2011	11-Mar-2011
VOC MS (W)	09-Mar-2011	09-Mar-2011

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

## ASSOCIATED AQC DATA

### Anions by Kone (w)

Component	Method Code	QC 32
Chloride	TM184	<b>99.80</b> 95.90 : 105.20
Nitrite as NO2	TM184	<b>97.80</b> 92.92 : 105.47
Phosphate (Ortho as PO4)	TM184	<b>102.92</b> 96.98 : 107.09
Sulphate (soluble)	TM184	<b>101.60</b> 95.09 : 105.03
TON as NO3	TM184	<b>102.19</b> 93.27 : 107.89

### Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 30
Free Cyanide (W)	TM227	<b>97.35</b> 87.13 : 117.88
Thiocyanate (W)	TM227	<b>103.25</b> 84.79 : 114.71
Total Cyanide (W)	TM227	<b>92.85</b> 87.76 : 118.74

### Dissolved Metals by ICP-MS

Component	Method Code	QC 37
Aluminium	TM152	<b>97.36</b> 85.00 : 115.00
Antimony	TM152	<b>101.60</b> 85.05 : 115.00
Arsenic	TM152	<b>99.61</b> 85.05 : 115.00
Barium	TM152	<b>100.09</b> 85.05 : 115.00
Beryllium	TM152	<b>98.88</b> 85.05 : 115.00
Bismuth	TM152	<b>98.53</b> 85.05 : 115.00
Boron	TM152	<b>99.19</b> 85.05 : 115.00
Cadmium	TM152	<b>99.99</b> 85.05 : 115.00
Chromium	TM152	<b>102.07</b> 85.05 : 115.00
Cobalt	TM152	<b>104.41</b> 85.05 : 115.00
Copper	TM152	<b>99.79</b> 85.05 : 115.00
Lead	TM152	<b>100.67</b> 85.05 : 115.00
Lithium	TM152	<b>102.43</b> 85.05 : 115.00
Manganese	TM152	<b>101.99</b> 85.05 : 115.00

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

Dissolved Metals by ICP-MS

		QC 37
Molybdenum	TM152	<b>89.95</b> 85.05 : 115.00
Nickel	TM152	<b>100.53</b> 85.05 : 115.00
Phosphorus	TM152	<b>97.56</b> 85.00 : 115.00
Selenium	TM152	<b>99.56</b> 85.00 : 115.00
Silver	TM152	<b>92.97</b> 85.00 : 115.00
Strontium	TM152	<b>102.19</b> 85.05 : 115.00
Tellurium	TM152	<b>102.13</b> 85.05 : 115.00
Thallium	TM152	<b>99.63</b> 85.05 : 115.00
Tin	TM152	<b>100.71</b> 85.05 : 115.00
Titanium	TM152	<b>100.08</b> 85.05 : 115.00
Uranium	TM152	<b>97.69</b> 85.05 : 115.00
Vanadium	TM152	<b>101.51</b> 85.05 : 115.00
Zinc	TM152	<b>103.11</b> 85.00 : 115.00

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 34
Total Aliphatics >C12-C35	TM174	<b>90.10</b> 71.03 : 104.04

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 39
Total Aromatics >EC12-EC35	TM174	<b>84.32</b> 65.00 : 117.38

GRO by GC-FID (W)

Component	Method Code	QC 30
Benzene by GC	TM245	<b>83.70</b> 79.00 : 121.00
Ethylbenzene by GC	TM245	<b>81.10</b> 79.00 : 121.00
m & p Xylene by GC	TM245	<b>80.10</b> 79.00 : 121.00

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

## GRO by GC-FID (W)

		QC 30
MTBE GC-FID	TM245	<b>85.50</b> 79.00 : 121.00
o Xylene by GC	TM245	<b>79.95</b> 79.00 : 121.00
QC	TM245	<b>112.21</b> 79.00 : 121.00
Toluene by GC	TM245	<b>82.80</b> 79.00 : 121.00

## Mercury Dissolved

Component	Method Code	QC 34
Mercury Dissolved (CVAF)	TM183	<b>98.80</b> 85.87 : 123.88

## PAH Spec MS - Aqueous (W)

Component	Method Code	QC 37
Acenaphthene by GCMS	TM178	<b>99.04</b> 82.69 : 106.11
Acenaphthylene by GCMS	TM178	<b>96.60</b> 82.16 : 104.82
Anthracene by GCMS	TM178	<b>97.42</b> 77.85 : 105.75
Benz(a)anthracene by GCMS	TM178	<b>95.80</b> 75.32 : 108.18
Benzo(a)pyrene by GCMS	TM178	<b>105.97</b> 86.69 : 118.58
Benzo(b)fluoranthene by GCMS	TM178	<b>101.24</b> 87.25 : 114.25
Benzo(ghi)perylene by GCMS	TM178	<b>102.02</b> 82.05 : 112.05
Benzo(k)fluoranthene by GCMS	TM178	<b>101.36</b> 87.20 : 122.40
Chrysene by GCMS	TM178	<b>100.04</b> 83.22 : 112.82
Dibenzo(ah)anthracene by GCMS	TM178	<b>103.50</b> 72.40 : 118.55
Fluoranthene by GCMS	TM178	<b>97.86</b> 87.00 : 105.75
Fluorene by GCMS	TM178	<b>99.26</b> 83.12 : 110.71
Indeno(123cd)pyrene by GCMS	TM178	<b>104.65</b> 82.25 : 114.75
Naphthalene by GCMS	TM178	<b>100.03</b> 84.07 : 108.07
Phenanthrene by GCMS	TM178	<b>100.19</b> 86.79 : 108.29
Pyrene by GCMS	TM178	<b>98.28</b> 84.55 : 108.55

SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

PAH Spec MS - Aqueous (W)

		QC 37
Volume	TM178	<b>15000.00</b>

pH Value

Component	Method Code	QC 30
pH	TM256	<b>99.43</b> 98.87 : 100.69

Phenols by HPLC (W)

Component	Method Code	QC 36
2,3,5 Trimethyl-Phenol by HPLC (W)	TM259	<b>94.00</b> 79.66 : 113.07
2-Isopropyl Phenol by HPLC (W)	TM259	<b>98.00</b> 93.26 : 108.31
Cresols by HPLC (W)	TM259	<b>91.67</b> 68.30 : 98.81
Naphthol by HPLC (W)	TM259	<b>93.00</b> 88.14 : 112.45
Phenol by HPLC (W)	TM259	<b>95.00</b> 87.02 : 102.59
Xylenols by HPLC (W)	TM259	<b>97.33</b> 96.73 : 108.07

Sulphide

Component	Method Code	QC 34
Sulphide	TM101	<b>104.47</b> 77.08 : 135.77

Total Organic and Inorganic Carbon

Component	Method Code	QC 38
Total Inorganic Carbon	TM090	<b>96.66</b> 88.46 : 104.55
Total Organic Carbon	TM090	<b>107.69</b> 90.80 : 116.75

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110307-3  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 120203  
Superseded Report:

### Chromatogram

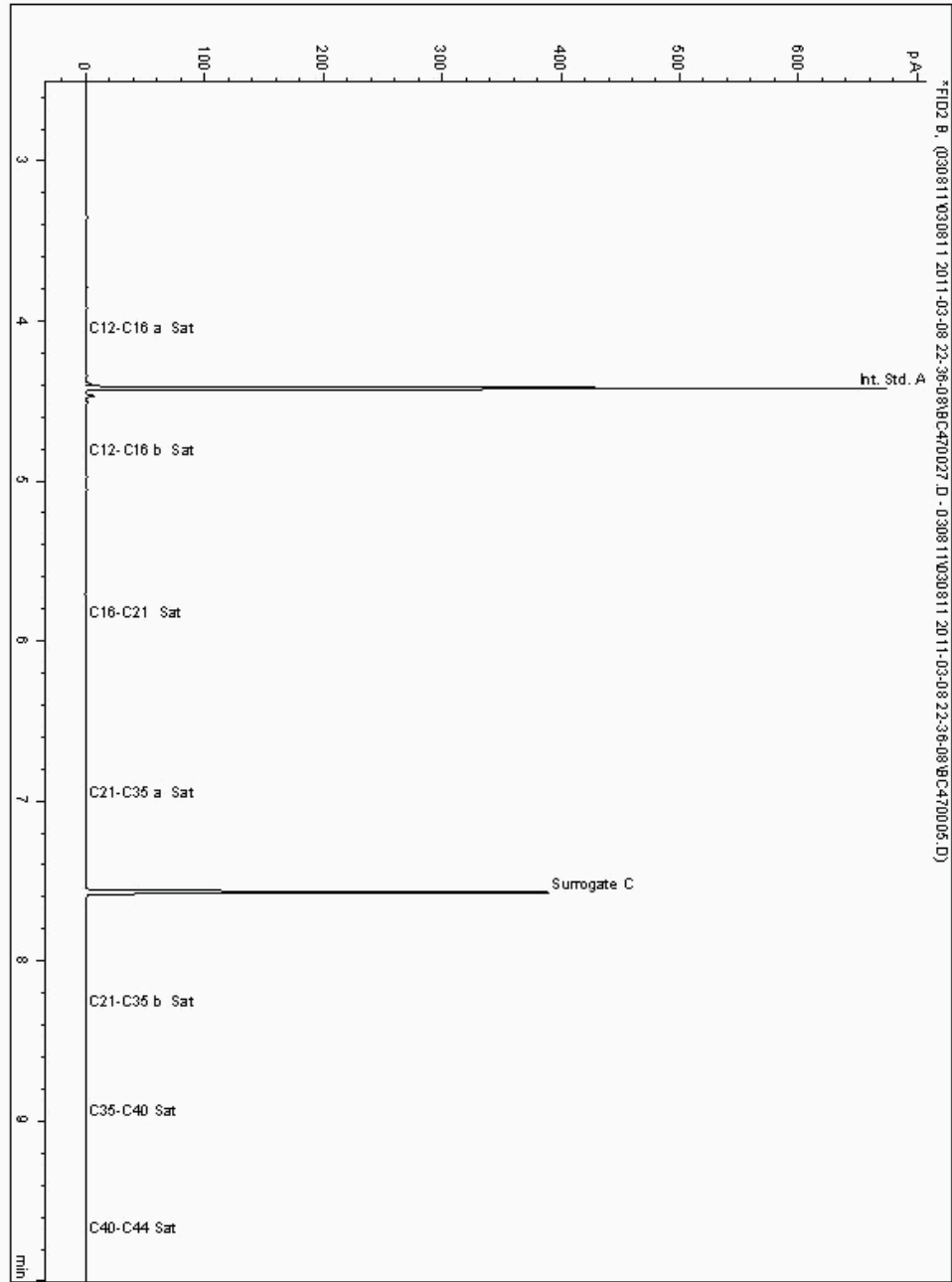
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No: 3012008  
Sample ID: BH104

Depth :

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

Sample Identity: 3070522-3012008  
Date Acquired : 09/03/11 06:43:22  
Units :  
Dilution :  
CF : 1  
Multiplier : 0.009



SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

# Chromatogram

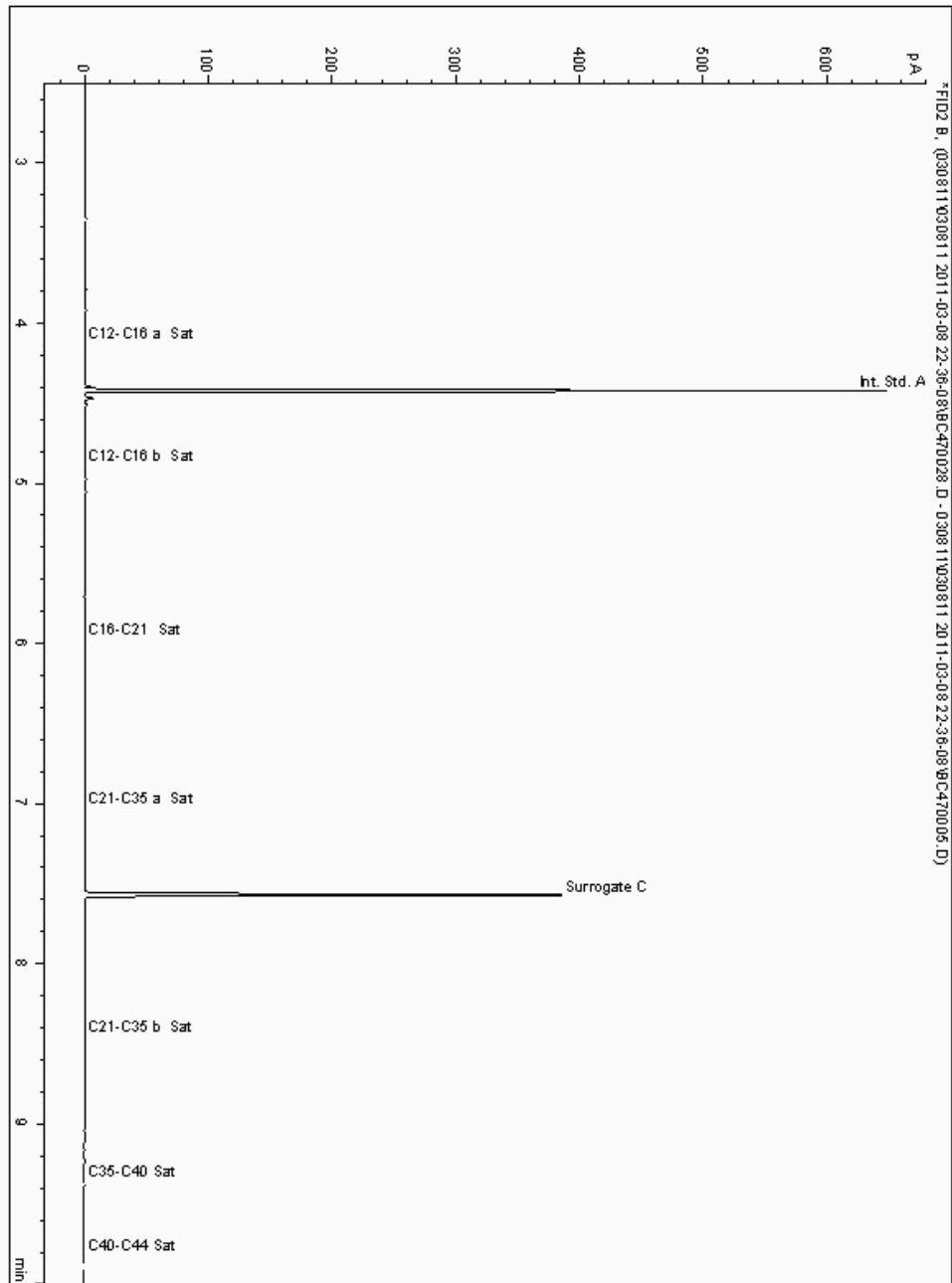
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No: 3012023  
 Sample ID: BH200

Depth :

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

Sample Identity: 3070543-3012023  
 Date Acquired : 09/03/11 07:01:47  
 Units :  
 Dilution :  
 CF : 1  
 Multiplier : 0.008





SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

### Chromatogram

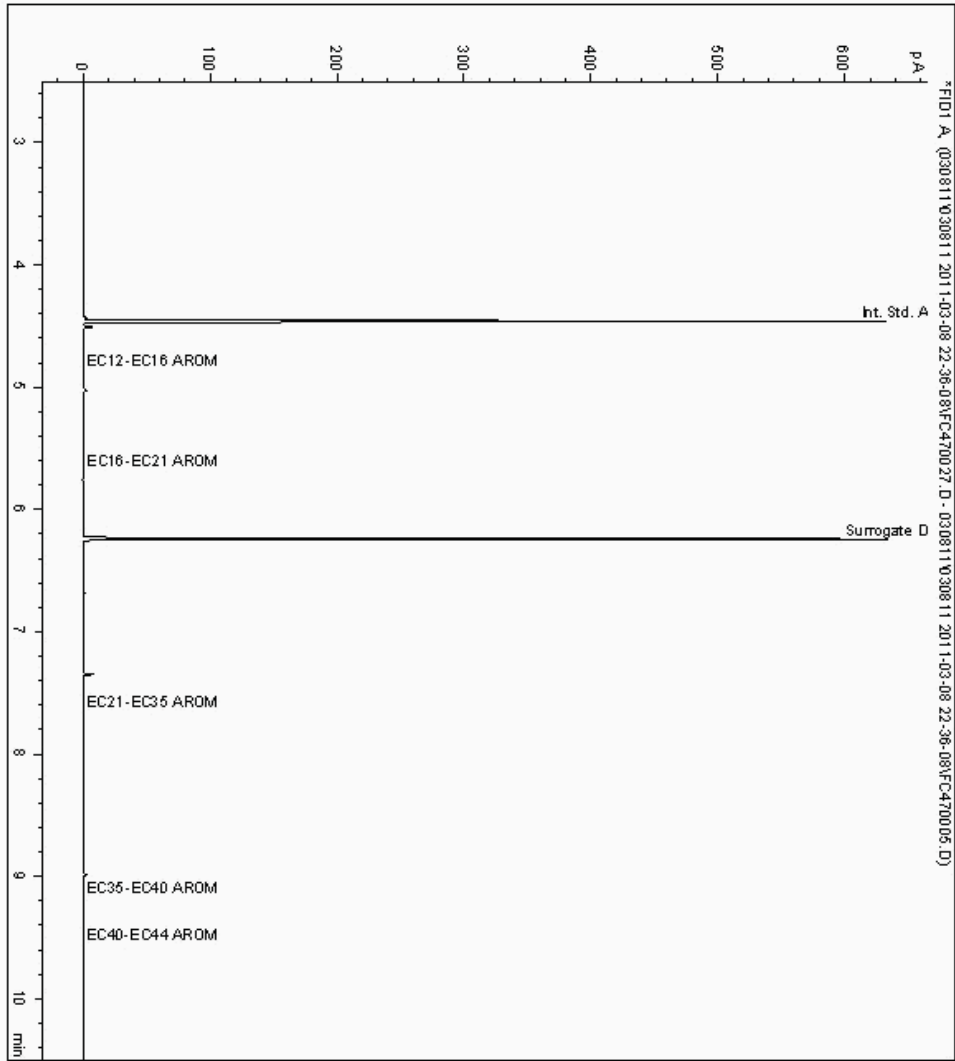
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No: 3012008  
 Sample ID: BH104

Depth :

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

Sample Identity: 3070523-3012008  
 Date Acquired : 09/03/11 06:43:22  
 Units :  
 Dilution :  
 CF : 1  
 Multiplier : 0.009



SDG: 110307-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 120203  
 Superseded Report:

### Chromatogram

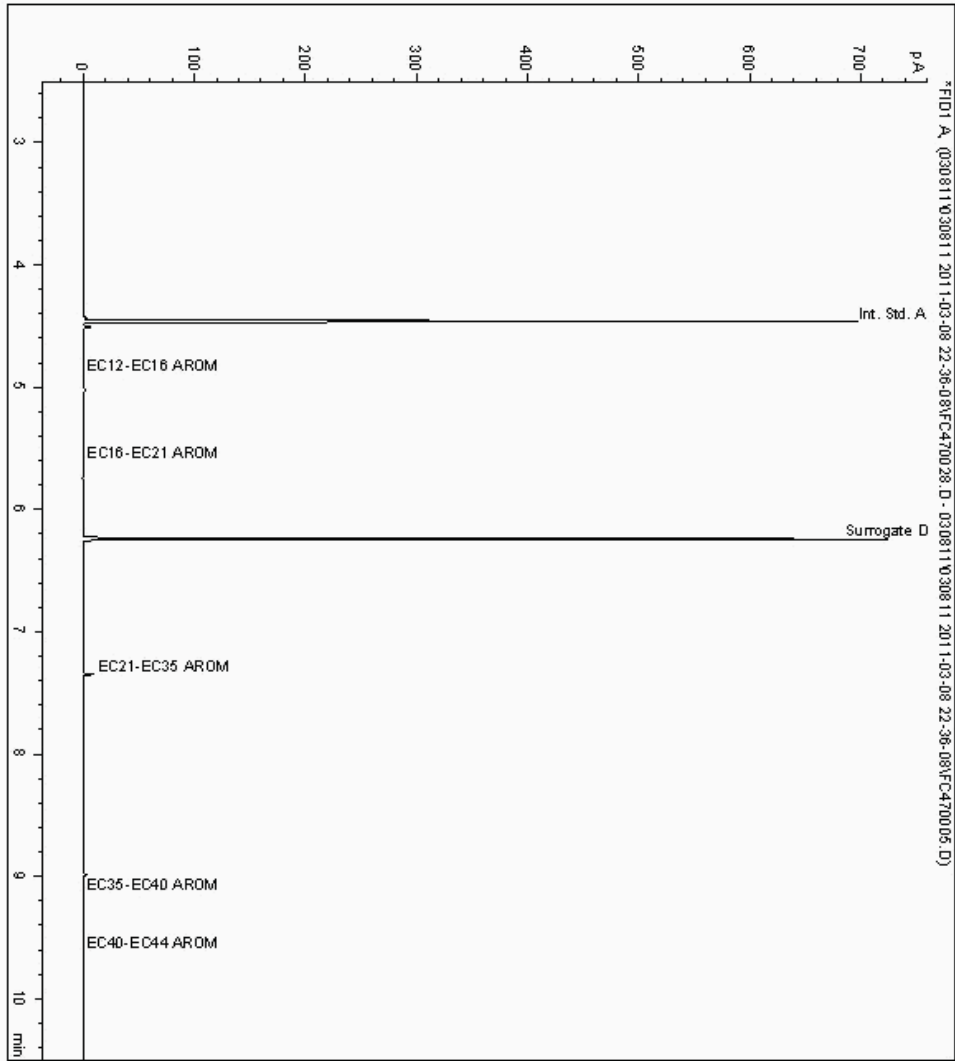
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 3012023  
 Sample ID : BH200

Depth :

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

Sample Identity: 3070544-3012023  
 Date Acquired : 09/03/11 07:01:47  
 Units :  
 Dilution :  
 CF : 1  
 Multiplier : 0.008



SDG: 110307-3  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

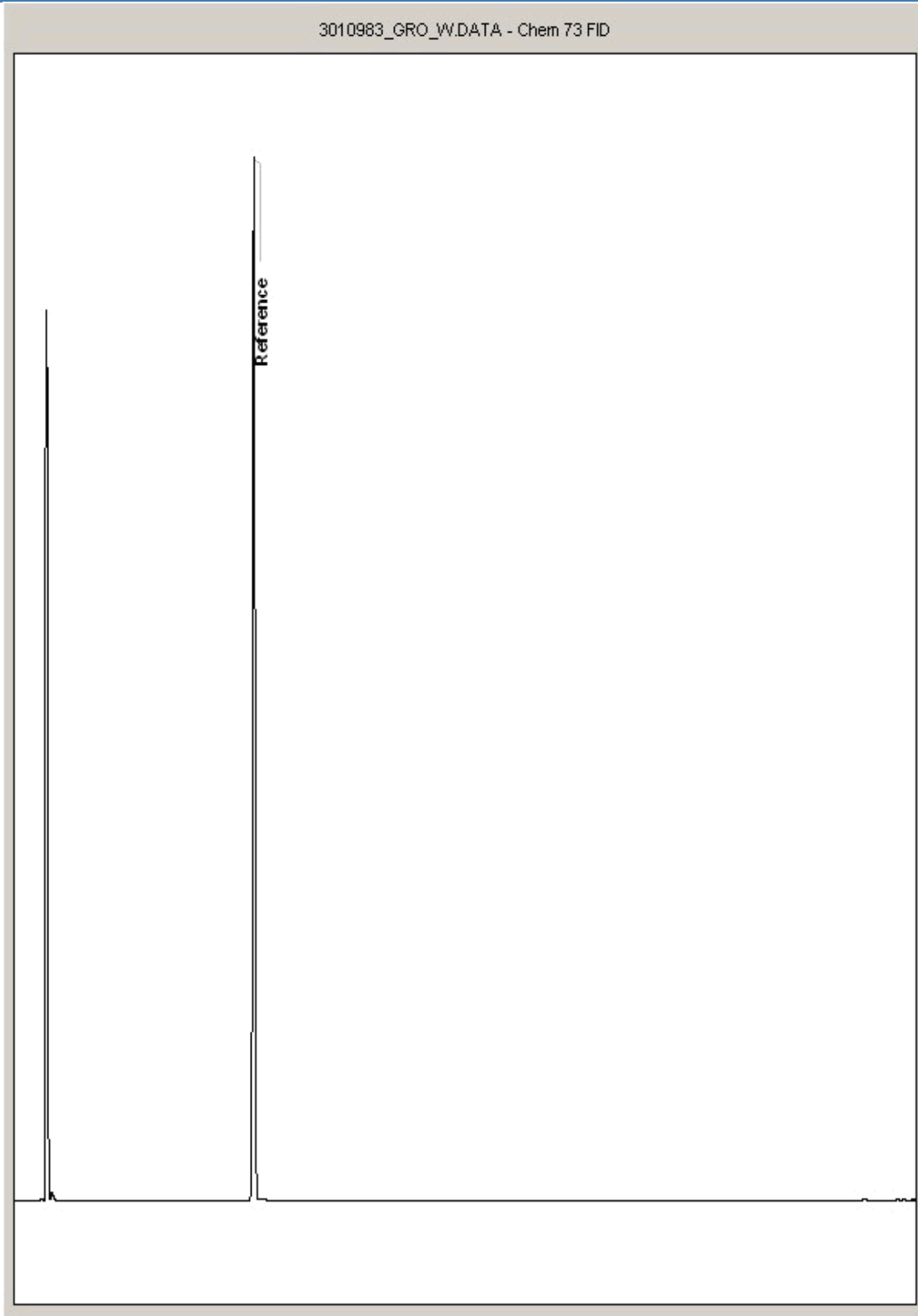
Order Number:  
Report Number: 120203  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3010983  
Sample ID : BH104

Depth :



SDG: 110307-3  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

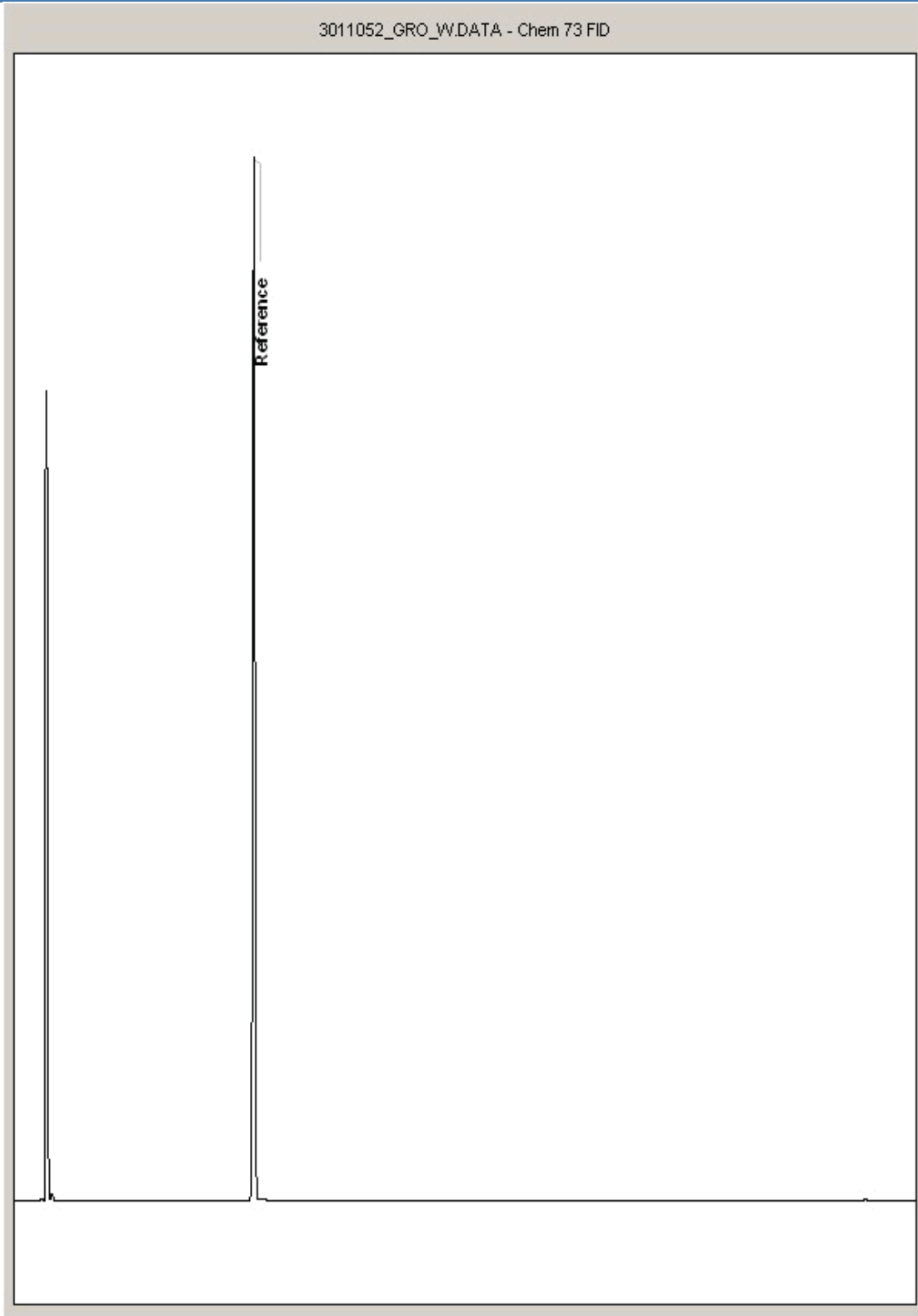
Order Number:  
Report Number: 120203  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 3011052  
Sample ID : BH200

Depth :



**SDG:** 110307-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Labadmin

**Order Number:**  
**Report Number:** 120203  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOX THERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOX THERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOX THERM	HFLC
PHENOLS BY GCMS	WET	DOM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOX THERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (W/G BY GC)	D&C	HEXANE/ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM28.	GCMS
C8-C10 (G/C10) EZ FLASH	WET	HEXANE/ACETONE	SHAWER	GC/EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAWER	GC/EZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH (W/G)	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 COGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### 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 HSG 264.

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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 28 February 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110225-30  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 118319

We received 2 samples on Friday February 25, 2011 and 1 of these samples were scheduled for analysis which was completed on Monday February 28, 2011. 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:

**Sonia McWhan**

Operations Manager



**SDG:** 110225-30  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 118319  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2948044	BH110	D5	8.00	23/02/2011

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

SDG: 110225-30  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 118319  
 Superseded Report:

<b>SOLID</b>  Results Legend X Test N No Determination Possible	<b>Lab Sample No(s)</b>		2948044
	<b>Customer Sample Reference</b>		BH110
	<b>AGS Reference</b>		D5
	<b>Depth (m)</b>		8.00
	<b>Container</b>		250g Amber Jar
pH	All	NDPs: 0 Tests: 1	X
Sample description	All	NDPs: 0 Tests: 1	X
Total Organic Carbon	All	NDPs: 0 Tests: 1	X



SDG: 110225-30  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 118319  
 Superseded Report:

### Sample Descriptions

**Grain Sizes**

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2948044	BH110	8.00	Light Brown	Silty Clay Loam	0.063 - 0.1 mm	Stones	None

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:** 110225-30  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 118319  
**Superseded Report:**

Results Legend		Customer Sample R		BH110				
#	ISO17025 accredited.			8.00				
M	mCERTS accredited.			Soil/Solid				
S	Non-conforming work.			23/02/2011				
aq	Aqueous / settled sample.			25/02/2011				
diss.filt	Dissolved / filtered sample.			110225-30				
tot.unfilt	Total / unfiltered sample.			2948044				
*	subcontracted test.			D5				
**	% 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.							
		<b>Depth (m)</b>						
		<b>Sample Type</b>						
		<b>Date Sampled</b>						
		<b>Date Received</b>						
		<b>SDG Ref</b>						
		<b>Lab Sample No.(s)</b>						
		<b>AGS Reference</b>						
<b>Component</b>	<b>LOD/Units</b>	<b>Method</b>						
Organic Carbon, Total	<0.2 %	TM132	1.81	#				
pH	1 pH Units	TM133	8.55	M				

SDG: 110225-30  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 118319  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	<b>#</b>	ISO 17025 Accredited	<b>*</b>	Subcontracted Test	<b>M</b>	MCERTS Accredited
<b>NFD</b>	No Fibres Detected	<b>PFD</b>	Possible Fibres Detected	<b>»</b>	Result previously reported (Incremental reports only)	<b>EC</b>	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 <sup>1</sup>	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		

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

**SDG:** 110225-30  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 118319  
**Superseded Report:**

### Test Completion Dates

<b>Lab Sample No(s)</b>	2948044
<b>Customer Sample Ref.</b>	BH110
<b>AGS Ref.</b>	D5
<b>Depth</b>	8.00
<b>Type</b>	SOLID
pH	25-Feb-2011
Sample description	25-Feb-2011
Total Organic Carbon	28-Feb-2011

SDG: 110225-30  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 118319  
 Superseded Report:

**ASSOCIATED AQC DATA**

**pH**

Component	Method Code	QC 27
pH	TM133	<b>98.49</b> 96.84 : 100.64

**Total Organic Carbon**

Component	Method Code	QC 29
Total Organic Carbon	TM132	<b>98.85</b> 88.75 : 104.70

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.  
 The figure detailed is the percentage recovery result for the AQC.  
 The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

**SDG:** 110225-30  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 118319  
**Superseded Report:**

**SDG:** 110225-30  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Labadmin

**Order Number:**  
**Report Number:** 118319  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXHERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXHERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXHERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXHERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXHERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH O/G BY GC	D&C	HEXANE/ACETONE	END OVER/END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER/END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRREXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRREXTRACTION (STIR-BAR)	GCFID
EPH O/G	HEXANE	STIRREXTRACTION (STIR-BAR)	GCFID
MINERAL OIL	HEXANE	STIRREXTRACTION (STIR-BAR)	GCFID
PCB 7 CONGENERS	HEXANE	STIRREXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRREXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### 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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:**

## CERTIFICATE OF ANALYSIS

**Date:** 04 March 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110224-38  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 119042

**This report directly supersedes report 118732 in its entirety.**

We received 2 samples on Thursday February 24, 2011 and 1 of these samples were scheduled for analysis which was completed on Friday March 04, 2011. 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:

**Sonia McWhan**

Operations Manager





**SDG:** 110224-38  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 119042  
**Superseded Report:** 118732

### Received Sample Overview


















Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2937265	BH102 [D5]		6.00	23/02/2011
2939027	BH110 [D3]		2.50	23/02/2011

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

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

<b>SOLID</b>  <b>Results Legend</b>   Test   No Determination Possible	<b>Lab Sample No(s)</b>		2899027
	<b>Customer Sample Reference</b>		BH110 [D3]
	<b>AGS Reference</b>		
	<b>Depth (m)</b>		2.50
	<b>Container</b>		60g VOC 250g Amber Jar
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 1	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1	
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1	
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1	
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1	
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 1	
	Barium	NDPs: 0 Tests: 1	
	Cadmium	NDPs: 0 Tests: 1	
	Chromium	NDPs: 0 Tests: 1	
	Copper	NDPs: 0 Tests: 1	
	Lead	NDPs: 0 Tests: 1	
	Mercury	NDPs: 0 Tests: 1	
	Molybdenum	NDPs: 0 Tests: 1	

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

<b>SOLID</b> Results Legend X Test N No Determination Possible	<b>Lab Sample No(s)</b>		2839027
	<b>Customer Sample Reference</b>		BH110 [D3]
	<b>AGS Reference</b>		
	<b>Depth (m)</b>		2.50
	<b>Container</b>		60g VOC 250g Amber Jar
Metals by iCap-OES (Soil)	Nickel	NDPs: 0 Tests: 1	X
	Vanadium	NDPs: 0 Tests: 1	X
	Zinc	NDPs: 0 Tests: 1	X
Oxygenates (S)	All	NDPs: 0 Tests: 1	X
PAH by GCMS	All	NDPs: 0 Tests: 1	X
pH	All	NDPs: 0 Tests: 1	X
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1	X
Sample description	All	NDPs: 0 Tests: 1	X
Total Sulphate	All	NDPs: 0 Tests: 1	X
TPH CWG GC (S)	All	NDPs: 0 Tests: 1	X
VOC MS (S)	All	NDPs: 0 Tests: 1	X

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

## Sample Descriptions

### Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2939027	BH110 [D3]	2.50	Light Brown	Silt Loam	0.063 - 0.1 mm	Stones	None

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: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

Results Legend		Customer Sample R		BH110 [D3]						
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	2.50 Soil/Solid 23/02/2011 24/02/2011 110224-38 2939027							
M	mCERTS accredited.									
S	Non-conforming work.									
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.									
Component	LOD/Units			Method						
Asbestos Containing Material Screen	-			TM001	No ACM Detected					
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)	<0.025	M						
pH	1 pH Units	TM133	8.31	M						
Cyanide, Total	<1 mg/kg	TM153	<1	M						
Cyanide, Free	<1 mg/kg	TM153	<1	M						
Sulphide, Easily liberated	<15 mg/kg	TM180	<15	#						
Arsenic	<0.6 mg/kg	TM181	6.19	M						
Barium	<0.6 mg/kg	TM181	200	#						
Cadmium	<0.02 mg/kg	TM181	<0.02	M						
Chromium	<0.9 mg/kg	TM181	24.8	M						
Copper	<1.4 mg/kg	TM181	19.7	M						
Lead	<0.7 mg/kg	TM181	17	M						
Mercury	<0.14 mg/kg	TM181	<0.14	M						
Molybdenum	<0.1 mg/kg	TM181	0.194	#						
Nickel	<0.2 mg/kg	TM181	29	M						
Vanadium	<0.2 mg/kg	TM181	27.6	#						
Zinc	<1.9 mg/kg	TM181	45.9	M						
Sulphate, Total	<48 mg/kg	TM221	689	M						
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243	0.0254	M						
tert Butanol	<0.01 mg/kg	TM288	<0.01							
tert-butyl ethyl ether	<0.001 mg/kg	TM288	<0.001							

**SDG:** 110224-38  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 119042  
**Superseded Report:** 118732

**PAH by GCMS**

Results Legend		Customer Sample R	BH110 [D3]						
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	2.50 Soil/Solid 23/02/2011 24/02/2011 110224-38 2939027						
M	mCERTS accredited.								
S	Non-conforming work.								
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.								
Component	LOD/Units			Method					
Naphthalene-d8 % recovery**	%			TM218	95.7				
Acenaphthene-d10 % recovery**	%	TM218	94.9						
Phenanthrene-d10 % recovery**	%	TM218	93.6						
Chrysene-d12 % recovery**	%	TM218	96.8						
Perylene-d12 % recovery**	%	TM218	102						
Naphthalene	<0.009 mg/kg	TM218	0.0424	M					
Acenaphthylene	<0.012 mg/kg	TM218	<0.012	M					
Acenaphthene	<0.008 mg/kg	TM218	<0.008	M					
Fluorene	<0.01 mg/kg	TM218	0.0133	M					
Phenanthrene	<0.015 mg/kg	TM218	0.179	M					
Anthracene	<0.016 mg/kg	TM218	0.0315	M					
Fluoranthene	<0.017 mg/kg	TM218	0.172	M					
Pyrene	<0.015 mg/kg	TM218	0.154	M					
Benz(a)anthracene	<0.014 mg/kg	TM218	0.122	M					
Chrysene	<0.01 mg/kg	TM218	0.116	M					
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	0.232	M					
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	0.0879	M					
Benzo(a)pyrene	<0.015 mg/kg	TM218	0.17	M					
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	0.112	M					
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	0.0423	M					
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	0.153	M					
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	1.63	M					

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

TPH CWG (S)

Results Legend		Customer Sample R	BH110 [D3]						
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	2.50 Soil/Solid 23/02/2011 24/02/2011 110224-38 2939027						
M	mCERTS accredited.								
S	Non-conforming work.								
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.								
Component	LOD/Units			Method					
GRO Surrogate % recovery**	%			TM089	27				
GRO >C5-C12	<0.044 mg/kg	TM089	0.36						
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg	TM089	<0.005	#					
Benzene	<0.01 mg/kg	TM089	<0.01	M					
Toluene	<0.002 mg/kg	TM089	<0.002	M					
Ethylbenzene	<0.003 mg/kg	TM089	<0.003	M					
m,p-Xylene	<0.006 mg/kg	TM089	<0.006	M					
o-Xylene	<0.003 mg/kg	TM089	<0.003	M					
m,p,o-Xylene	<0.01 mg/kg	TM089	<0.01						
BTEX, Total	<0.01 mg/kg	TM089	<0.01						
Aliphatics >C5-C6	<0.01 mg/kg	TM089	<0.01						
Aliphatics >C6-C8	<0.01 mg/kg	TM089	0.0281						
Aliphatics >C8-C10	<0.01 mg/kg	TM089	0.0647						
Aliphatics >C10-C12	<0.01 mg/kg	TM089	0.124						
Aliphatics >C12-C16	<0.1 mg/kg	TM173	15.6						
Aliphatics >C16-C21	<0.1 mg/kg	TM173	30.9						
Aliphatics >C21-C35	<0.1 mg/kg	TM173	548						
Aliphatics >C35-C44	<0.1 mg/kg	TM173	186						
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	781						
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01						
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	<0.01						
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	0.05						
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	0.083						
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	5.92						
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	18.3						
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	173						
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	76.8						
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	27.1						
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	274						
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	1060						
Total Aliphatics >C5-35	<0.1 mg/kg	TM173	595						
Total Aromatics >C5-35	<0.1 mg/kg	TM173	197						
Total Aliphatics & Aromatics >C5-35	<0.1 mg/kg	TM173	792						
Total Aliphatics >C5-C12	<0.01 mg/kg	TM089	0.0856						
Total Aromatics >EC5-EC12	<0.01 mg/kg	TM089	0.0554						





SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number: 119042  
 Report Number: 119042  
 Superseded Report: 118732

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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

**SDG:** 110224-38  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 119042  
**Superseded Report:** 118732

### Test Completion Dates

<b>Lab Sample No(s)</b>	2939027
<b>Customer Sample Ref.</b>	BH110 [D3]
<b>AGS Ref.</b>	
<b>Depth</b>	2.50
<b>Type</b>	SOLID
Anions by Kone (soil)	03-Mar-2011
Asbestos Containing Material Screen	01-Mar-2011
Cyanide Comp/Free/Total/Thiocyanate	03-Mar-2011
Easily Liberated Sulphide	02-Mar-2011
EPH CWG (Aliphatic) GC (S)	02-Mar-2011
EPH CWG (Aromatic) GC (S)	02-Mar-2011
GRO by GC-FID (S)	04-Mar-2011
Metals by iCap-OES (Soil)	04-Mar-2011
Oxygenates (S)	28-Feb-2011
PAH by GCMS	25-Feb-2011
pH	01-Mar-2011
Phenols by HPLC (S)	02-Mar-2011
Sample description	24-Feb-2011
Total Sulphate	03-Mar-2011
TPH CWG GC (S)	02-Mar-2011
VOC MS (S)	28-Feb-2011

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

## ASSOCIATED AQC DATA

### Anions by Kone (soil)

Component	Method Code	QC 20
Water Soluble Sulphate as SO4 2:1 Extract	TM243	<b>96.62</b> 89.98 : 116.12

### Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 22
Free Cyanide	TM153	<b>97.72</b> 87.04 : 107.05
Thiocyanate	TM153	<b>99.77</b> 90.22 : 111.93
Total Cyanide	TM153	<b>93.14</b> 77.00 : 112.12

### Easily Liberated Sulphide

Component	Method Code	QC 27
Easily Liberated Sulphide	TM180	<b>104.36</b> 44.43 : 127.23

### EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 26
Total Aliphatics >C12-C35	TM173	<b>89.03</b> 64.28 : 103.38

### GRO by GC-FID (S)

Component	Method Code	QC 26	QC 22
Benzene by GC (Moisture Corrected)	TM089	<b>112.80</b> 79.00 : 121.00	<b>111.10</b> 79.00 : 121.00
Ethylbenzene by GC (Moisture Corrected)	TM089	<b>112.35</b> 79.00 : 121.00	<b>107.50</b> 79.00 : 121.00
m & p Xylene by GC (Moisture Corrected)	TM089	<b>112.15</b> 79.00 : 121.00	<b>107.28</b> 79.00 : 121.00
MTBE GC-FID (Moisture Corrected)	TM089	<b>112.45</b> 79.00 : 121.00	<b>117.40</b> 79.00 : 121.00
o Xylene by GC (Moisture Corrected)	TM089	<b>112.85</b> 79.00 : 121.00	<b>110.45</b> 79.00 : 121.00
QC	TM089	<b>102.08</b> 79.00 : 121.00	<b>95.37</b> 79.00 : 121.00
Toluene by GC (Moisture Corrected)	TM089	<b>113.50</b> 79.00 : 121.00	<b>109.50</b> 79.00 : 121.00

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

Metals by iCap-OES (Soil)

Component	Method Code	QC 28
Aluminium	TM181	<b>119.22</b> 94.29 : 126.83
Antimony	TM181	<b>110.62</b> 80.62 : 119.38
Arsenic	TM181	<b>108.18</b> 93.78 : 118.04
Barium	TM181	<b>114.54</b> 92.15 : 121.48
Beryllium	TM181	<b>104.97</b> 93.37 : 106.63
Boron	TM181	<b>124.98</b> 71.45 : 144.21
Cadmium	TM181	<b>101.25</b> 83.47 : 108.02
Chromium	TM181	<b>105.77</b> 86.66 : 111.67
Cobalt	TM181	<b>110.39</b> 91.65 : 115.98
Copper	TM181	<b>104.64</b> 90.86 : 109.48
Iron	TM181	<b>111.82</b> 100.21 : 121.44
Lead	TM181	<b>102.05</b> 81.17 : 121.35
Manganese	TM181	<b>101.97</b> 88.94 : 103.43
Mercury	TM181	<b>109.05</b> 86.37 : 113.63
Molybdenum	TM181	<b>105.50</b> 83.94 : 116.06
Nickel	TM181	<b>104.43</b> 83.34 : 114.35
Phosphorus	TM181	<b>102.42</b> 85.62 : 116.58
Selenium	TM181	<b>114.62</b> 100.15 : 123.30
Strontium	TM181	<b>110.86</b> 89.82 : 110.49
Thallium	TM181	<b>110.82</b> 93.51 : 130.39
Tin	TM181	<b>102.89</b> 89.71 : 110.91
Titanium	TM181	<b>107.51</b> 78.57 : 125.05
Vanadium	TM181	<b>107.29</b> 91.61 : 110.18
Zinc	TM181	<b>97.70</b> 83.65 : 103.15

PAH by GCMS

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

## PAH by GCMS

Component	Method Code	QC 24
Acenaphthene	TM218	<b>93.63</b> 77.12 : 112.00
Acenaphthylene	TM218	<b>87.39</b> 67.85 : 104.34
Anthracene	TM218	<b>91.65</b> 70.38 : 106.86
Benz(a)anthracene	TM218	<b>102.64</b> 75.93 : 121.42
Benzo(a)pyrene	TM218	<b>104.02</b> 75.48 : 121.80
Benzo(b)fluoranthene	TM218	<b>100.95</b> 78.12 : 121.99
Benzo(ghi)perylene	TM218	<b>98.90</b> 78.41 : 115.87
Benzo(k)fluoranthene	TM218	<b>98.78</b> 77.71 : 116.48
Chrysene	TM218	<b>97.90</b> 78.09 : 115.69
Dibenzo(ah)anthracene	TM218	<b>100.85</b> 76.81 : 115.89
Fluoranthene	TM218	<b>92.70</b> 74.24 : 114.09
Fluorene	TM218	<b>92.88</b> 73.88 : 111.54
Indeno(123cd)pyrene	TM218	<b>100.64</b> 76.77 : 119.38
Naphthalene	TM218	<b>90.19</b> 76.04 : 107.88
Phenanthrene	TM218	<b>92.78</b> 74.34 : 113.46
Pyrene	TM218	<b>92.74</b> 74.69 : 113.49

## pH

Component	Method Code	QC 23
pH	TM133	<b>98.49</b> 96.84 : 100.64

## Phenols by HPLC (S)

Component	Method Code	QC 28
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>100.60</b> 85.13 : 105.17
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>95.81</b> 87.06 : 106.06
Catechol by HPLC (S)	TM062 (S)	<b>50.90</b> 27.40 : 94.47
Cresols by HPLC (S)	TM062 (S)	<b>90.02</b> 83.33 : 100.99

**SDG:** 110224-38  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 119042  
**Superseded Report:** 118732

Phenols by HPLC (S)

		QC 28
Napthol by HPLC (S)	TM062 (S)	<b>74.25</b> 55.65 : 110.94
Phenol by HPLC (S)	TM062 (S)	<b>95.81</b> 83.94 : 101.65
Resorcinol HPLC (S)	TM062 (S)	<b>97.60</b> 83.97 : 105.22
Xylenols by HPLC (S)	TM062 (S)	<b>97.50</b> 83.64 : 102.70

Total Sulphate

Component	Method Code	QC 23
Total Sulphate	TM221	<b>89.03</b> 76.23 : 96.92

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.  
 The figure detailed is the percentage recovery result for the AQC.  
 The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

### Chromatogram

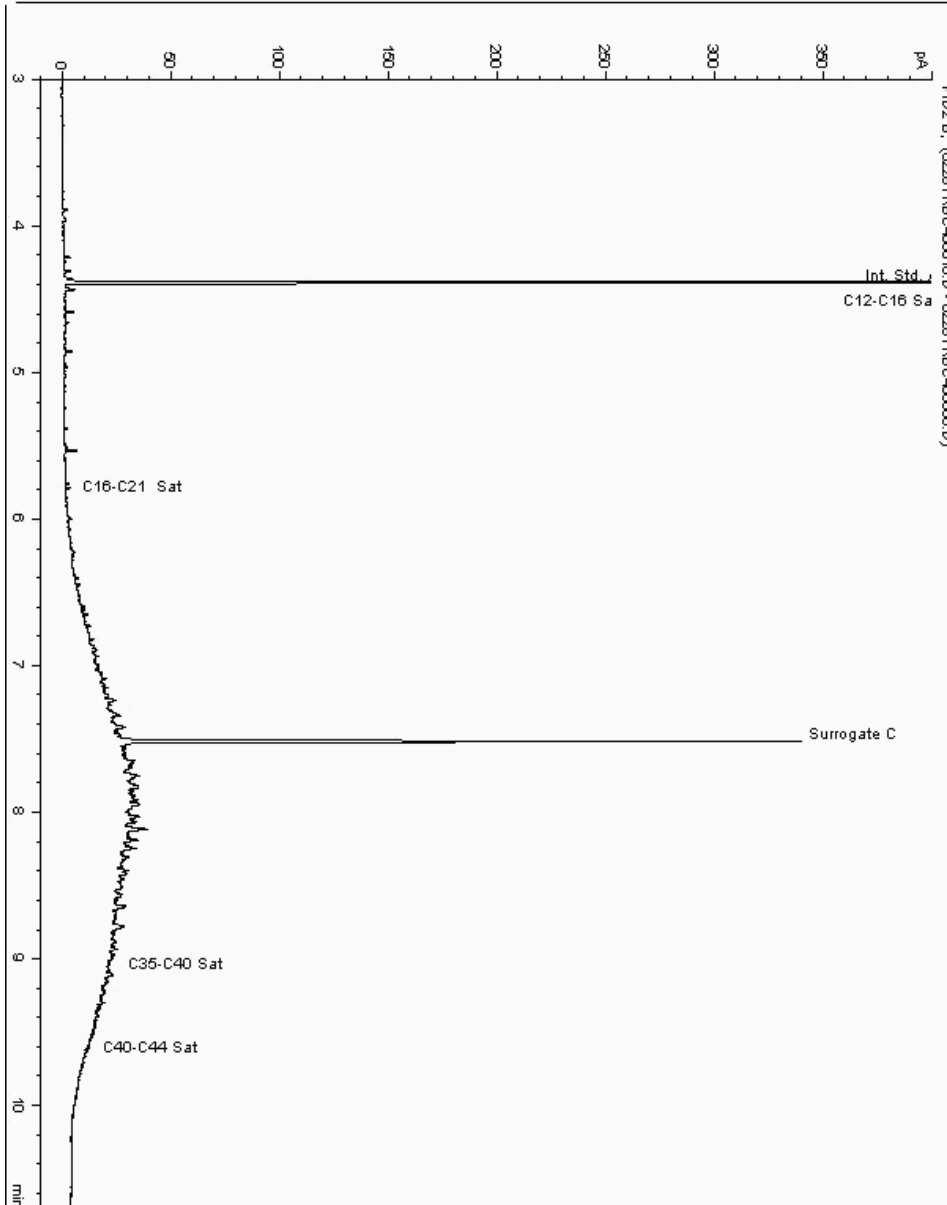
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 2954165  
 Sample ID : BH110 [D3]

Depth : 2.50

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

Sample Identity: 3005829-2954165  
 Date Acquired : 28/02/11 20:55:10 PM  
 Units : ppb  
 Dilution:



SDG: 110224-38  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 119042  
 Superseded Report: 118732

### Chromatogram

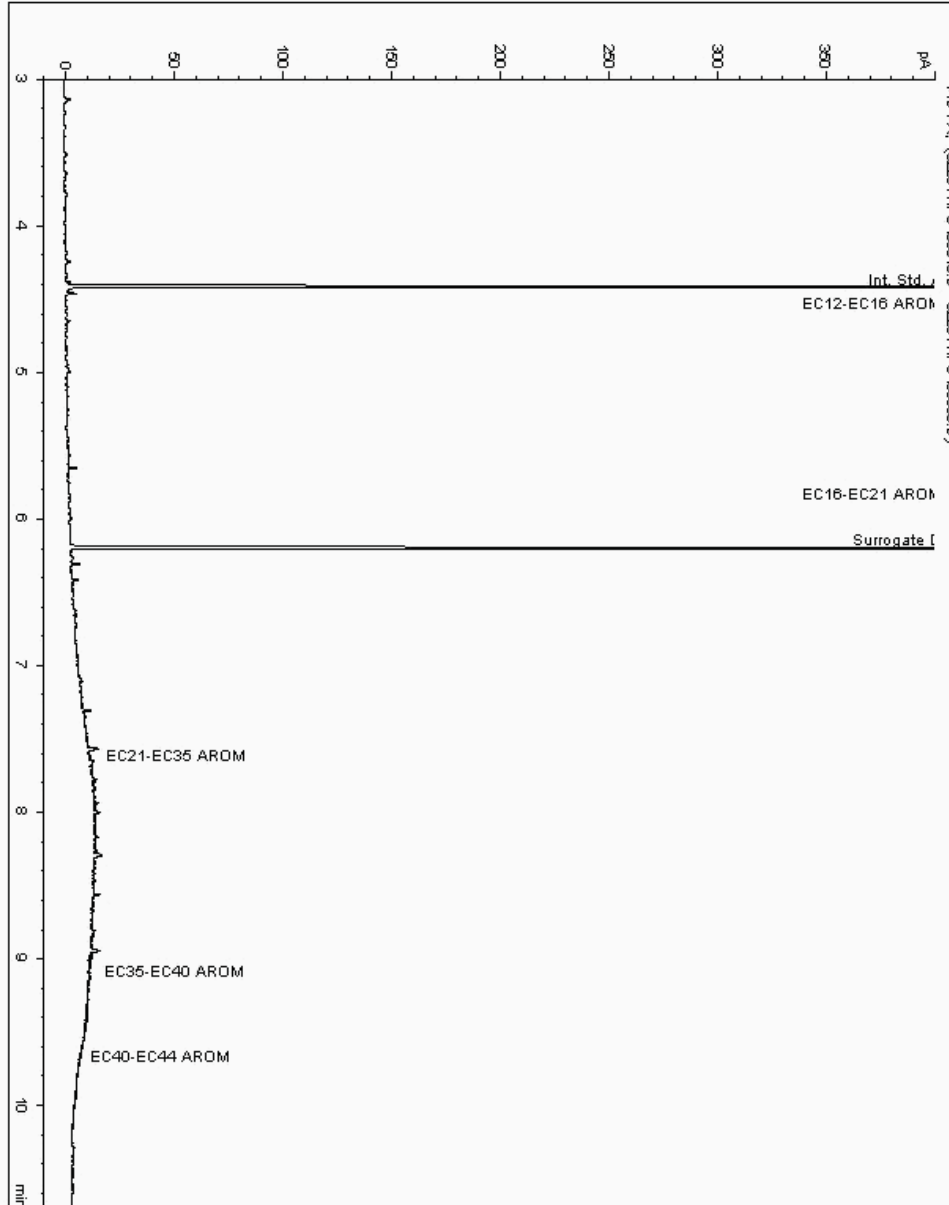
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2954165  
 Sample ID: BH110 [D3]

Depth: 2.50

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

Sample Identity: 3005830-2954165  
 Date Acquired : 28/02/11 20:55:09 PM  
 Units : ppb  
 Dilution:





SDG: 110224-38  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

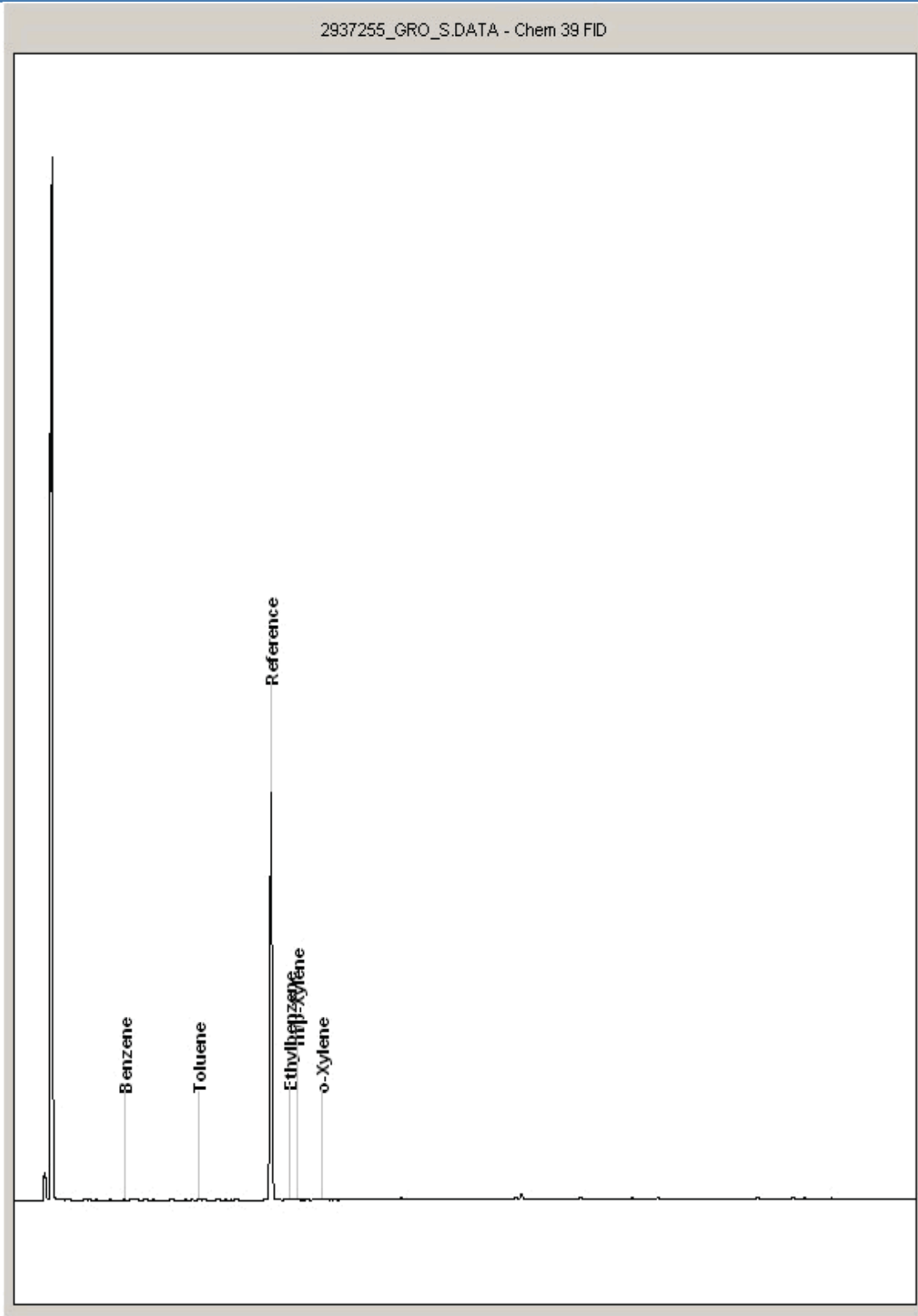
Order Number:  
Report Number: 119042  
Superseded Report: 118732

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2937255  
Sample ID : BH110 [D3]

Depth : 2.50



SDG: 110224-38  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

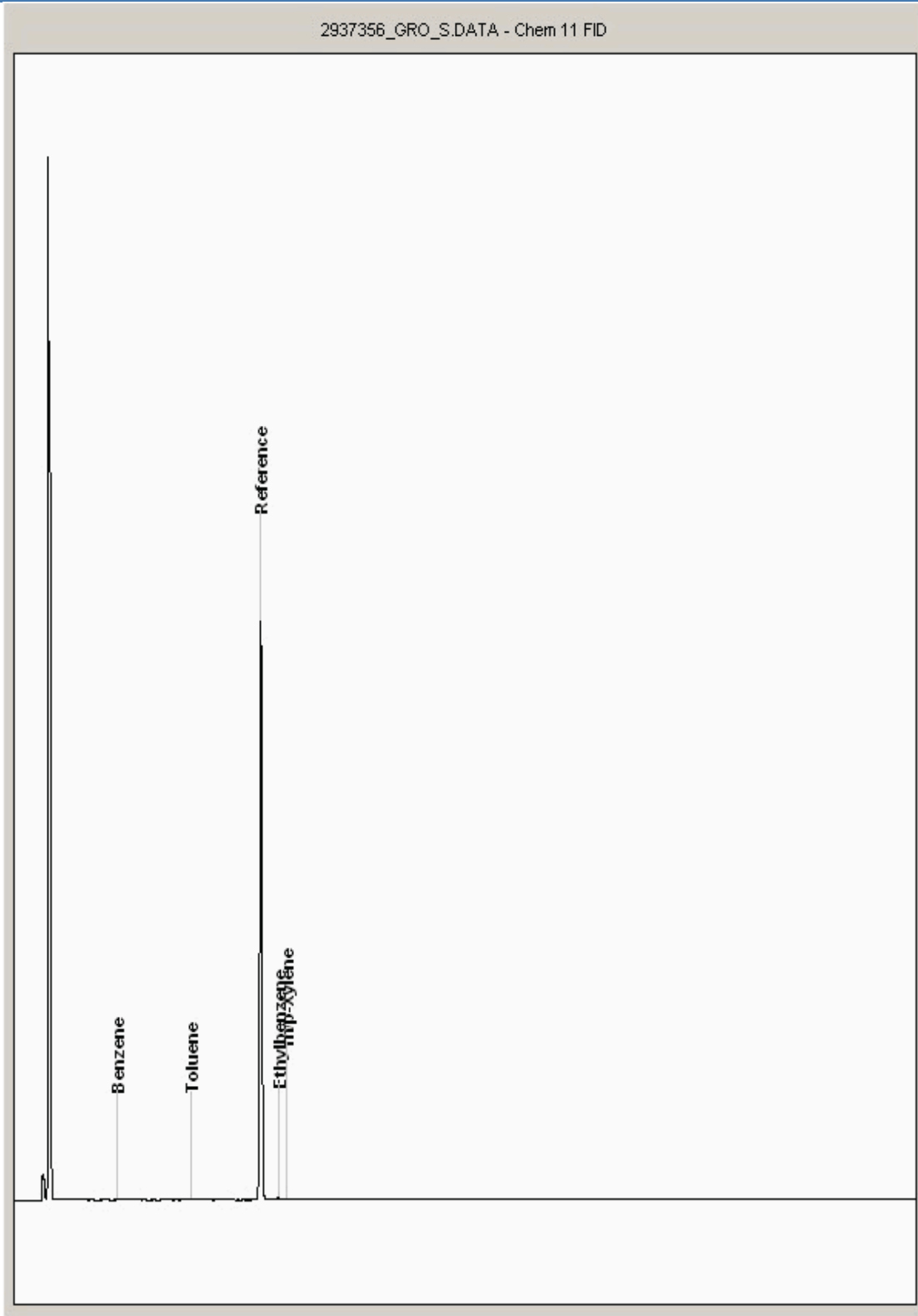
Order Number:  
Report Number: 119042  
Superseded Report: 118732

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2937356  
Sample ID : BH110 [D3]

Depth : 2.50



**SDG:** 110224-38  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 119042  
**Superseded Report:** 118732

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXTERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXTERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXTERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXTERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH O/G BY GC	D&C	HEXANE/ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
EPH O/G	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### 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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 04 March 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110224-25  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 119130

We received 10 samples on Thursday February 24, 2011 and 8 of these samples were scheduled for analysis which was completed on Friday March 04, 2011. 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:

**Sonia McWhan**

Operations Manager



1291  
GROUP

**SDG:** 110224-25  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 119130  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2936477	BH101		5.50	21/02/2011
2936481	BH102		1.50	22/02/2011
2936482	BH102		2.50	22/02/2011
2936483	BH102		3.50	22/02/2011
2936484	BH102		4.50	22/02/2011
2936478	BH106		1.00 - 1.25	22/02/2011
2936479	BH106		3.00	22/02/2011
2936480	BH106		5.50	22/02/2011
2936485	BH110		0.50 - 0.60	
2936486	BH110		1.40 - 1.50	

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

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

SOLID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	
		2936477	BH101		5.50	250g Amber Jar
		2936481	BH102		1.50	250g Amber Jar 1kg TUB 60g VOC
		2936482	BH102		2.50	250g Amber Jar 60g VOC
		2936484	BH102		4.50	250g Amber Jar 60g VOC
	2936480	BH106		3.00	250g Amber Jar 60g VOC	
	2936485	BH110		0.50 - 0.60	400g Tub	
	2936486	BH110		1.40 - 1.50	1kg TUB	
Anions by Kone (soil)	All	NDPs: 0 Tests: 1				
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 3				
Asbestos Identification	All	NDPs: 0 Tests: 1				
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1				
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1				
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 4				
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 4				
GRO by GC-FID (S)	All	NDPs: 0 Tests: 4				
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 2				
	Barium	NDPs: 0 Tests: 1				
	Beryllium	NDPs: 0 Tests: 1				
	Cadmium	NDPs: 0 Tests: 2				
	Chromium	NDPs: 0 Tests: 2				
	Copper	NDPs: 0 Tests: 2				
	Lead	NDPs: 0 Tests: 2				

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

SOLID Results Legend X Test N No Determination Possible	Lab Sample No(s)		2936477	2936481	2936482	2936484	2936485	2936486
	Customer Sample Reference		BH101	BH102	BH102	BH102	BH106	BH110
	AGS Reference							
	Depth (m)		5.50	1.50	2.50	4.50	3.00	0.50 - 0.60
	Container		250g Amber Jar 1kg TUB 60g VOC	250g Amber Jar 60g VOC	250g Amber Jar 60g VOC	250g Amber Jar 60g VOC	250g Amber Jar 60g VOC	400g Tub 1kg TUB
Metals by iCap-OES (Soil)	Mercury	NDPs: 0 Tests: 2		X				X
	Molybdenum	NDPs: 0 Tests: 1		X				
	Nickel	NDPs: 0 Tests: 2		X				X
	Vanadium	NDPs: 0 Tests: 2		X				X
	Zinc	NDPs: 0 Tests: 2		X				X
Oxygenates (S)	All	NDPs: 0 Tests: 4	X	X	X	X		
PAH by GCMS	All	NDPs: 0 Tests: 4	X	X	X	X		
pH	All	NDPs: 0 Tests: 3		X		X	X	
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1		X				
Sample description	All	NDPs: 0 Tests: 7	X	X	X	X	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 3		X		X	X	
Total Sulphate	All	NDPs: 0 Tests: 1		X				
TPH CWG GC (S)	All	NDPs: 0 Tests: 4	X	X	X	X		
VOC MS (S)	All	NDPs: 0 Tests: 4	X	X	X	X		

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

## Sample Descriptions

### Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2936477	BH101	5.50	Dark Brown	Clay	<0.063 mm	Stones	None
2936481	BH102	1.50	Dark Brown	Clay	<0.063 mm	Stones	None
2936482	BH102	2.50	Dark Brown	Clay	<0.063 mm	Stones	None
2936484	BH102	4.50	Dark Brown	Silty Clay	0.063 - 0.1 mm	Stones	None
2936479	BH106	3.00	Dark Brown	Clay	<0.063 mm	Stones	None
2936480	BH106	5.50	Dark Brown	Clay	<0.063 mm	Stones	None
2936485	BH110	0.50 - 0.60	Dark Brown	Clay	<0.063 mm	Stones	None

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: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

Results Legend			Customer Sample R	BH101	BH102	BH102	BH102	BH106	BH106
#	ISO17025 accredited.		Depth (m)	5.50	1.50	2.50	4.50	3.00	5.50
M	mCERTS accredited.		Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
S	Non-conforming work.		Date Sampled	21/02/2011	22/02/2011	22/02/2011	22/02/2011	22/02/2011	22/02/2011
aq	Aqueous / settled sample.		Date Received	24/02/2011	24/02/2011	24/02/2011	24/02/2011	24/02/2011	24/02/2011
diss.filt	Dissolved / filtered sample.		SDG Ref	110224-25	110224-25	110224-25	110224-25	110224-25	110224-25
tot.unfilt	Total / unfiltered sample.		Lab Sample No.(s)	2936477	2936481	2936482	2936484	2936479	2936480
*	subcontracted test.		AGS Reference						
**	% 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.								
Component	LOD/Units	Method							
Asbestos Containing Material Screen	-	TM001		No ACM Detected					
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)		<0.025	M				
Organic Carbon, Total	<0.2 %	TM132		1.77	#	2.02	#	1.64	#
pH	1 pH Units	TM133		8.45	M	8.67	M	8.73	M
Cyanide, Total	<1 mg/kg	TM153		<1	M				
Cyanide, Free	<1 mg/kg	TM153		<1	M				
Sulphide, Easily liberated	<15 mg/kg	TM180		<15	#				
Arsenic	<0.6 mg/kg	TM181		6.58	M				
Barium	<0.6 mg/kg	TM181		283	#				
Cadmium	<0.02 mg/kg	TM181		0.182	M				
Chromium	<0.9 mg/kg	TM181		29.9	M				
Copper	<1.4 mg/kg	TM181		19.2	M				
Lead	<0.7 mg/kg	TM181		12.6	M				
Mercury	<0.14 mg/kg	TM181		<0.14	M				
Molybdenum	<0.1 mg/kg	TM181		<0.1	#				
Nickel	<0.2 mg/kg	TM181		33.5	M				
Vanadium	<0.2 mg/kg	TM181		30.5	#				
Zinc	<1.9 mg/kg	TM181		61.1	M				
Sulphate, Total	<48 mg/kg	TM221		549	M				
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243		0.0752	M				
tert Butanol	<0.01 mg/kg	TM288	<0.01	<0.01		<0.01		<0.01	
tert-butyl ethyl ether	<0.001 mg/kg	TM288	<0.001	<0.001		<0.001		<0.001	

**SDG:** 110224-25  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 119130  
**Superseded Report:**

Results Legend		Customer Sample R		BH110	BH110				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.50 - 0.60	1.40 - 1.50					
M	mCERTS accredited.		Soil/Solid	Soil/Solid					
S	Non-conforming work.		-	-					
aq	Aqueous / settled sample.		24/02/2011	24/02/2011					
diss.filt	Dissolved / filtered sample.		110224-25	110224-25					
tot.unfilt	Total / unfiltered sample.		2936485	2936486					
-	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.								
Component	LOD/Units		Method						
Asbestos Containing Material Screen	-		TM001	No ACM Detected	Possible ACM Det				
Arsenic	<0.6 mg/kg	TM181	15 M						
Beryllium	<0.01 mg/kg	TM181	1.15 M						
Cadmium	<0.02 mg/kg	TM181	0.278 M						
Chromium	<0.9 mg/kg	TM181	28.3 M						
Copper	<1.4 mg/kg	TM181	96.5 M						
Lead	<0.7 mg/kg	TM181	76 M						
Mercury	<0.14 mg/kg	TM181	<0.14 M						
Nickel	<0.2 mg/kg	TM181	34.8 M						
Vanadium	<0.2 mg/kg	TM181	37 #						
Zinc	<1.9 mg/kg	TM181	307 M						

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

PAH by GCMS

Results Legend		Customer Sample R	BH101	BH102	BH102	BH106			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	5.50	1.50	2.50	3.00			
M	mCERTS accredited.		Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid			
S	Non-conforming work.		21/02/2011	22/02/2011	22/02/2011	22/02/2011			
aq	Aqueous / settled sample.		24/02/2011	24/02/2011	24/02/2011	24/02/2011			
diss.filt	Dissolved / filtered sample.		110224-25	110224-25	110224-25	110224-25			
tot.unfilt	Total / unfiltered sample.		2936477	2936481	2936482	2936479			
*	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.								
Component	LOD/Units		Method						
Naphthalene-d8 % recovery**	%		TM218	95.8	93	94.9	99.7		
Acenaphthene-d10 % recovery**	%	TM218	94.7	90.8	94.2	98.1			
Phenanthrene-d10 % recovery**	%	TM218	94.6	90.6	94.1	97.9			
Chrysene-d12 % recovery**	%	TM218	90.1	85.9	91.3	92.3			
Perylene-d12 % recovery**	%	TM218	91.3	88.8	95.6	92.7			
Naphthalene	<0.009 mg/kg	TM218	0.131 M	0.042 M	0.0535 M	0.0868 M			
Acenaphthylene	<0.012 mg/kg	TM218	<0.012 M	<0.012 M	<0.012 M	<0.012 M			
Acenaphthene	<0.008 mg/kg	TM218	<0.008 M	<0.008 M	<0.008 M	<0.008 M			
Fluorene	<0.01 mg/kg	TM218	0.0254 M	<0.01 M	<0.01 M	0.022 M			
Phenanthrene	<0.015 mg/kg	TM218	0.13 M	0.093 M	0.0953 M	0.111 M			
Anthracene	<0.016 mg/kg	TM218	<0.016 M	<0.016 M	<0.016 M	<0.016 M			
Fluoranthene	<0.017 mg/kg	TM218	0.0369 M	0.0389 M	0.0371 M	0.038 M			
Pyrene	<0.015 mg/kg	TM218	0.04 M	0.0383 M	0.0411 M	0.0422 M			
Benz(a)anthracene	<0.014 mg/kg	TM218	0.026 M	<0.014 M	0.0181 M	<0.014 M			
Chrysene	<0.01 mg/kg	TM218	0.0245 M	0.0166 M	0.0189 M	0.0129 M			
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	0.0366 M	0.0343 M	0.0405 M	0.0342 M			
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	<0.014 M	<0.014 M	<0.014 M	<0.014 M			
Benzo(a)pyrene	<0.015 mg/kg	TM218	0.0202 M	0.0183 M	0.0247 M	0.0195 M			
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	<0.018 M	<0.018 M	<0.018 M	<0.018 M			
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	<0.023 M	<0.023 M	<0.023 M	<0.023 M			
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	0.0365 M	0.0308 M	0.036 M	0.0397 M			
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	0.507 M	0.312 M	0.365 M	0.407 M			

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
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Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Address: ARCADIS Geraghty & Miller

Order Number:  
 Report Number: 119130  
 Superseded Report:

TPH CWG (S)

Results Legend			Customer Sample R			
#	ISO17025 accredited.		BH101	BH102	BH102	BH106
M	mCERTS accredited.					
S	Non-conforming work.					
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)	5.50	1.50	2.50	3.00
		Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
		Date Sampled	21/02/2011	22/02/2011	22/02/2011	22/02/2011
		Date Received	24/02/2011	24/02/2011	24/02/2011	24/02/2011
		SDG Ref	110224-25	110224-25	110224-25	110224-25
		Lab Sample No.(s)	2936477	2936481	2936482	2936479
		AGS Reference				
Component	LOD/Units	Method				
GRO Surrogate % recovery**	%	TM089	39		37	33
GRO >C5-C12	<0.044 mg/kg	TM089	0.14		<0.044	<0.044
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg	TM089	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Benzene	<0.01 mg/kg	TM089	<0.01 M	<0.01 M	<0.01 M	<0.01 M
Aliphatics >C16-C35	<0.1 mg/kg	TM173		16.2		
Toluene	<0.002 mg/kg	TM089	0.0127 M	0.00236 M	0.00226 M	0.00456 M
Ethylbenzene	<0.003 mg/kg	TM089	0.00805 M	0.0059 M	0.00678 M	<0.003 M
m,p-Xylene	<0.006 mg/kg	TM089	<0.006 M	<0.006 M	<0.006 M	<0.006 M
Total Aliphatics >C5-C44	<0.1 mg/kg	TM173		24.1		
o-Xylene	<0.003 mg/kg	TM089	0.00345 M	<0.003 M	<0.003 M	<0.003 M
m,p,o-Xylene	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01	<0.01
BTEX, Total	<0.01 mg/kg	TM089	0.0242	<0.01	<0.01	<0.01
Aliphatics >C5-C6	<0.01 mg/kg	TM089	0.0161	<0.01	<0.01	<0.01
Aliphatics >C6-C8	<0.01 mg/kg	TM089	0.0449	<0.01	<0.01	<0.01
Aliphatics >C8-C10	<0.01 mg/kg	TM089	0.0196	<0.01	<0.01	<0.01
Total Aromatics >C6-C44	<0.1 mg/kg	TM173		47.3		
Aliphatics >C10-C12	<0.01 mg/kg	TM089	0.0127	<0.01	<0.01	<0.01
Aliphatics >C12-C16	<0.1 mg/kg	TM173	11.5	7.87	7.12	8.53
Aliphatics >C16-C21	<0.1 mg/kg	TM173	7.73	5.88	5.41	6.85
Aliphatics >C21-C35	<0.1 mg/kg	TM173	10.8	10.3	10.4	12.3
Aliphatics >C35-C44	<0.1 mg/kg	TM173	<0.1	<0.1	<0.1	<0.1
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	30	24.1	23	27.7
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01	<0.01
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	0.0127	<0.01	<0.01	<0.01
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	0.0242	<0.01	<0.01	<0.01
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01	<0.01
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	11.6	7.17	7.01	7.52
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	11.1	9.62	11.8	14.3
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	26.3	23.5	33.4	39.6
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	8.72	6.94	10.8	12.8
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	3.3	2.68	4.05	4.73
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	57.7	47.3	63.1	74.2
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	87.9	71.3	86	102
Total Aliphatics >C5-35	<0.1 mg/kg	TM173	30.1		23	27.7
Total Aromatics >C5-35	<0.1 mg/kg	TM173	49		52.2	61.4

### CERTIFICATE OF ANALYSIS

<b>SDG:</b> 110224-25	<b>Location:</b> Simonside	<b>Order Number:</b>	
<b>Job:</b> H_ARCADIS_NMK-340	<b>Customer:</b> ARCADIS Geraghty & Miller	<b>Report Number:</b>	119130
<b>Client Reference:</b> 93749.02	<b>Attention:</b>	<b>Superseded Report:</b>	

**TPH CWG (S)**

Results Legend			Customer Sample R	BH101	BH102	BH102	BH106								
#	M	§		aq	diss.filt	tot.unfilt	*	**	Depth (m)	Sample Type	Date Sampled	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
									5.50	Soil/Solid	21/02/2011	24/02/2011	110224-25	2936477	
									1.50	Soil/Solid	22/02/2011	24/02/2011	110224-25	2936481	
									2.50	Soil/Solid	22/02/2011	24/02/2011	110224-25	2936482	
									3.00	Soil/Solid	22/02/2011	24/02/2011	110224-25	2936479	
<b>Component</b>			<b>LOD/Units</b>	<b>Method</b>											
Total Aliphatics & Aromatics >C5-35			<0.1 mg/kg	TM173	79.1		75.2	89.1							
Total Aliphatics >C5-C12			<0.01 mg/kg	TM089		<0.01									
Total Aromatics >EC5-EC12			<0.01 mg/kg	TM089		0.013									
Aromatics >EC35-EC40			<0.1 mg/kg	TM173		4.26									
Aliphatics >C35-C40			<0.1 mg/kg	TM173		<0.1									
Aliphatics >C40-C44			<0.1 mg/kg	TM173		<0.1									
Total Aromatics >EC12-EC35			<0.1 mg/kg	TM173		40.3									
Total Aliphatics >C12-C35			<0.1 mg/kg	TM173		24.1									
Total Aliphatics >C12-C40			<0.1 mg/kg	TM173		24.1									
Total Aromatics >EC12-EC40			<0.1 mg/kg	TM173		44.6									
Total Aliphatics & Aromatics >C12-C44			<0.1 mg/kg	TM173		71.4									



CERTIFICATE OF ANALYSIS

Validated

SDG: 110224-25
Job: H\_ARCADIS\_NMK-340
Client Reference: 93749.02

Location: Simonside
Customer: ARCADIS Geraghty & Miller
Attention:

Order Number:
Report Number: 119130
Superseded Report:

VOC MS (S)

Table with columns for Component, LOD/Units, Method, and four sample identifiers (BH101, BH102, BH102, BH106). Rows include Toluene-d8, Methyl Tertiary Butyl Ether, Benzene, Toluene, Ethylbenzene, p/m-Xylene, and o-Xylene.

**SDG:** 110224-25  
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**Order Number:**  
**Report Number:** 119130  
**Superseded Report:**

### Asbestos Identification

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Customer Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH110 NS Z 1.40 - 1.50 SOLID  24/02/2011 10:07:06 110224-25 2,936,486 TM048	28/02/11	Tomasz Pawlikowski	Typical of asbestos cement	Not Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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



SDG: 110224-25  
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 Report Number: 119130  
 Superseded Report:

**Test Completion Dates**

Lab Sample No(s)	2936477	2936481	2936482	2936484	2936479	2936480	2936485	2936486
Customer Sample Ref.	BH101	BH102	BH102	BH102	BH106	BH106	BH110	BH110
AGS Ref.								
Depth	5.50	1.50	2.50	4.50	3.00	5.50	0.50 - 0.60	1.40 - 1.50
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Anions by Kone (soil)		28-Feb-2011						
Asbestos Containing Material Screen		24-Feb-2011					24-Feb-2011	24-Feb-2011
Asbestos Identification								28-Feb-2011
Cyanide Comp/Free/Total/Thiocyanate		25-Feb-2011						
Easily Liberated Sulphide		28-Feb-2011						
EPH CWG (Aliphatic) GC (S)	02-Mar-2011	02-Mar-2011	02-Mar-2011		02-Mar-2011			
EPH CWG (Aromatic) GC (S)	02-Mar-2011	02-Mar-2011	02-Mar-2011		02-Mar-2011			
GRO by GC-FID (S)	04-Mar-2011	03-Mar-2011	03-Mar-2011		03-Mar-2011			
Metals by iCap-OES (Soil)		02-Mar-2011					02-Mar-2011	
Oxygenates (S)	03-Mar-2011	01-Mar-2011	01-Mar-2011		01-Mar-2011			
PAH by GCMS	25-Feb-2011	25-Feb-2011	25-Feb-2011		25-Feb-2011			
pH		28-Feb-2011		28-Feb-2011		28-Feb-2011		
Phenols by HPLC (S)		28-Feb-2011						
Sample description	24-Feb-2011	24-Feb-2011	24-Feb-2011	24-Feb-2011	24-Feb-2011	24-Feb-2011	24-Feb-2011	
Total Organic Carbon		28-Feb-2011		28-Feb-2011		25-Feb-2011		
Total Sulphate		02-Mar-2011						
TPH CWG GC (S)	04-Mar-2011	03-Mar-2011	03-Mar-2011		03-Mar-2011			
VOC MS (S)	02-Mar-2011	02-Mar-2011	02-Mar-2011		02-Mar-2011			

SDG: 110224-25  
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Location: Simonside  
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 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

**ASSOCIATED AQC DATA**

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 21
Free Cyanide	TM153	<b>102.13</b> 87.04 : 107.05
Thiocyanate	TM153	<b>104.54</b> 90.22 : 111.93
Total Cyanide	TM153	<b>104.23</b> 77.00 : 112.12

Easily Liberated Sulphide

Component	Method Code	QC 20
Easily Liberated Sulphide	TM180	<b>62.14</b> 44.43 : 127.23

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 26
Total Aliphatics >C12-C35	TM173	<b>87.75</b> 64.28 : 103.38

EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 26
Total Aromatics >EC12-EC35	TM173	<b>81.64</b> 66.16 : 121.82

GRO by GC-FID (S)

Component	Method Code	QC 21	QC 32
Benzene by GC (Moisture Corrected)	TM089	<b>110.05</b> 79.00 : 121.00	<b>110.80</b> 79.00 : 121.00
Ethylbenzene by GC (Moisture Corrected)	TM089	<b>113.65</b> 79.00 : 121.00	<b>112.60</b> 79.00 : 121.00
m & p Xylene by GC (Moisture Corrected)	TM089	<b>114.28</b> 79.00 : 121.00	<b>112.80</b> 79.00 : 121.00
MTBE GC-FID (Moisture Corrected)	TM089	<b>110.55</b> 79.00 : 121.00	<b>108.75</b> 79.00 : 121.00
o Xylene by GC (Moisture Corrected)	TM089	<b>114.45</b> 79.00 : 121.00	<b>112.45</b> 79.00 : 121.00
QC	TM089	<b>113.33</b> 79.00 : 121.00	<b>104.60</b> 79.00 : 121.00
Toluene by GC (Moisture Corrected)	TM089	<b>112.75</b> 79.00 : 121.00	<b>111.50</b> 79.00 : 121.00

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

Metals by iCap-OES (Soil)

Component	Method Code	QC 27
Aluminium	TM181	<b>119.12</b> 94.29 : 126.83
Antimony	TM181	<b>91.06</b> 80.62 : 119.38
Arsenic	TM181	<b>103.01</b> 93.78 : 118.04
Barium	TM181	<b>112.19</b> 92.15 : 121.48
Beryllium	TM181	<b>100.47</b> 93.37 : 106.63
Boron	TM181	<b>115.22</b> 71.45 : 144.21
Cadmium	TM181	<b>97.77</b> 83.47 : 108.02
Chromium	TM181	<b>100.86</b> 86.66 : 111.67
Cobalt	TM181	<b>105.24</b> 91.65 : 115.98
Copper	TM181	<b>103.23</b> 90.86 : 109.48
Iron	TM181	<b>105.76</b> 100.21 : 121.44
Lead	TM181	<b>89.52</b> 81.17 : 121.35
Manganese	TM181	<b>92.96</b> 88.94 : 103.43
Mercury	TM181	<b>97.98</b> 86.37 : 113.63
Molybdenum	TM181	<b>86.75</b> 83.94 : 116.06
Nickel	TM181	<b>93.05</b> 83.34 : 114.35
Phosphorus	TM181	<b>96.14</b> 85.62 : 116.58
Selenium	TM181	<b>108.87</b> 100.15 : 123.30
Strontium	TM181	<b>106.23</b> 89.82 : 110.49
Thallium	TM181	<b>92.02</b> 93.51 : 130.39
Tin	TM181	<b>98.51</b> 89.71 : 110.91
Titanium	TM181	<b>105.98</b> 78.57 : 125.05
Vanadium	TM181	<b>105.03</b> 91.61 : 110.18
Zinc	TM181	<b>96.58</b> 83.65 : 103.15

PAH by GCMS

SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

## PAH by GCMS

Component	Method Code	QC 24
Acenaphthene	TM218	<b>95.75</b> 73.81 : 109.35
Acenaphthylene	TM218	<b>87.06</b> 67.05 : 95.65
Anthracene	TM218	<b>93.34</b> 72.39 : 100.02
Benz(a)anthracene	TM218	<b>97.72</b> 74.79 : 118.85
Benzo(a)pyrene	TM218	<b>102.27</b> 73.75 : 119.70
Benzo(b)fluoranthene	TM218	<b>103.04</b> 75.06 : 120.22
Benzo(ghi)perylene	TM218	<b>97.48</b> 75.04 : 115.56
Benzo(k)fluoranthene	TM218	<b>98.12</b> 76.34 : 113.30
Chrysene	TM218	<b>101.75</b> 73.17 : 115.36
Dibenzo(ah)anthracene	TM218	<b>99.12</b> 74.81 : 113.99
Fluoranthene	TM218	<b>101.67</b> 75.32 : 108.37
Fluorene	TM218	<b>95.23</b> 71.61 : 107.41
Indeno(123cd)pyrene	TM218	<b>99.35</b> 74.70 : 117.26
Naphthalene	TM218	<b>96.14</b> 73.58 : 103.51
Phenanthrene	TM218	<b>98.73</b> 74.65 : 105.86
Pyrene	TM218	<b>100.40</b> 76.08 : 109.72

## pH

Component	Method Code	QC 21
pH	TM133	<b>98.49</b> 96.84 : 100.64

## Phenols by HPLC (S)

Component	Method Code	QC 28
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>96.41</b> 85.54 : 103.30
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>97.60</b> 86.02 : 103.87
Catechol by HPLC (S)	TM062 (S)	<b>63.47</b> 27.23 : 80.19
Cresols by HPLC (S)	TM062 (S)	<b>94.81</b> 79.99 : 98.02

**SDG:** 110224-25  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 119130  
**Superseded Report:**

Phenols by HPLC (S)

		QC 28
Naphthol by HPLC (S)	TM062 (S)	<b>89.22</b> 63.74 : 104.78
Phenol by HPLC (S)	TM062 (S)	<b>94.61</b> 81.28 : 100.85
Resorcinol HPLC (S)	TM062 (S)	<b>94.01</b> 80.50 : 98.19
Xylenols by HPLC (S)	TM062 (S)	<b>95.31</b> 86.98 : 101.98

Total Organic Carbon

Component	Method Code	QC 20	QC 29
Total Organic Carbon	TM132	<b>93.53</b> 88.75 : 104.70	<b>96.19</b> 88.75 : 104.70

Total Sulphate

Component	Method Code	QC 24
Total Sulphate	TM221	<b>90.47</b> 80.05 : 95.26

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 119130  
Superseded Report:

### Chromatogram

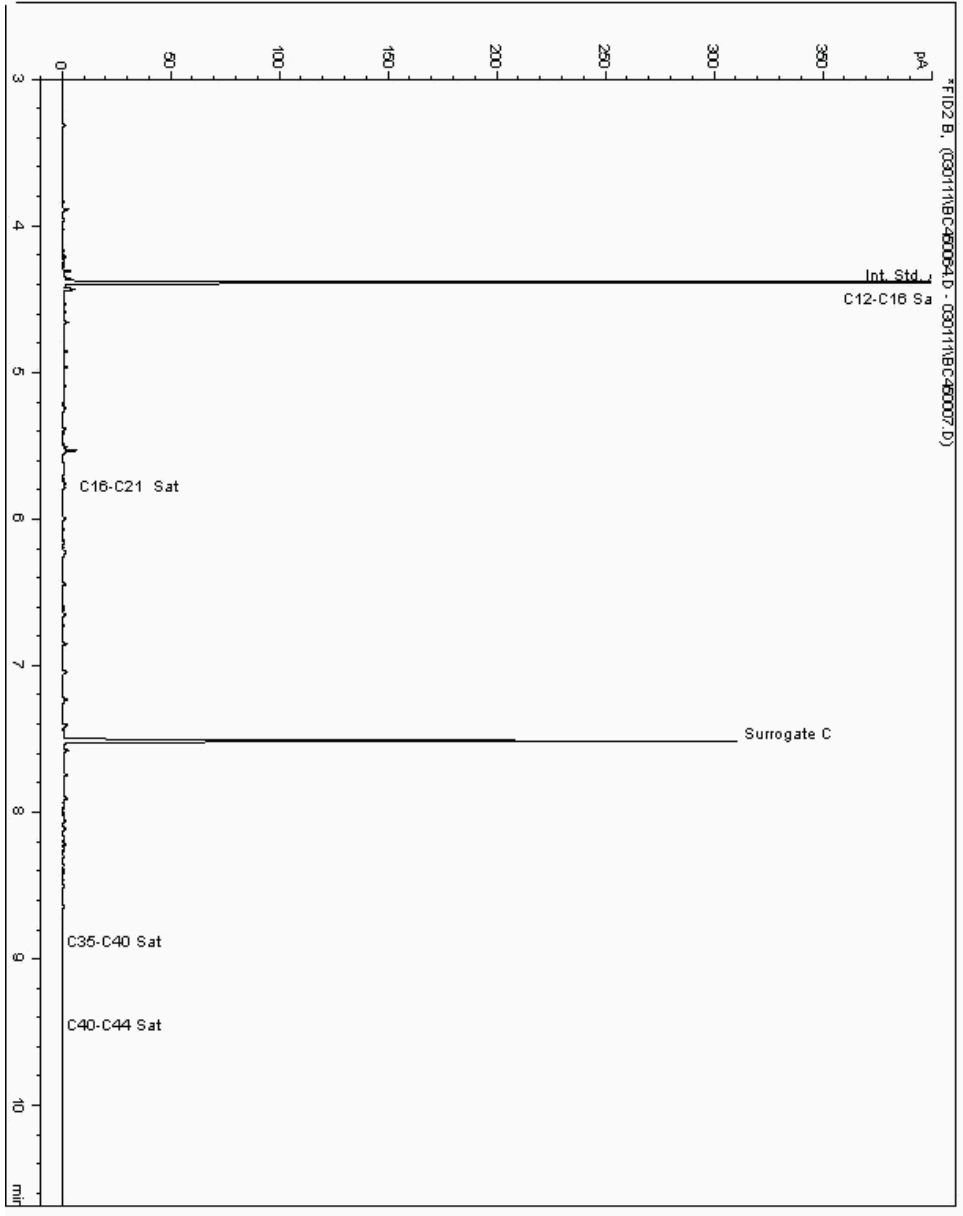
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2949130  
Sample ID: BH102

Depth: 2.50

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

Sample Identity: 3006027-2949130  
Date Acquired : 02/03/11 09:20:10 PM  
Units : ppb  
Dilution:



SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

# Chromatogram

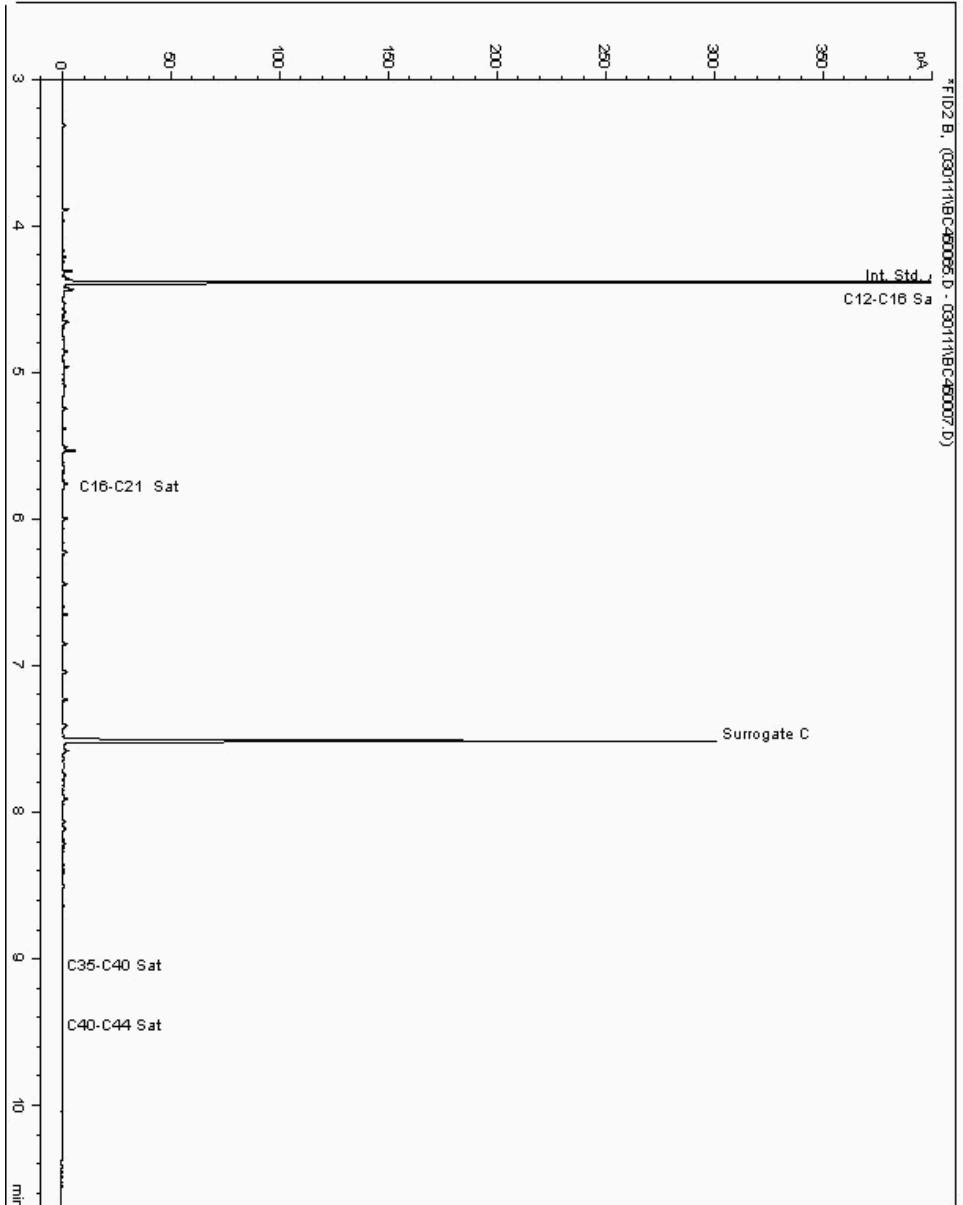
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2949162  
 Sample ID: BH106

Depth: 3.00

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

Sample Identity: 3005992-2949162  
 Date Acquired : 02/03/11 09:39:59 PM  
 Units : ppb  
 Dilution:



SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 119130  
Superseded Report:

# Chromatogram

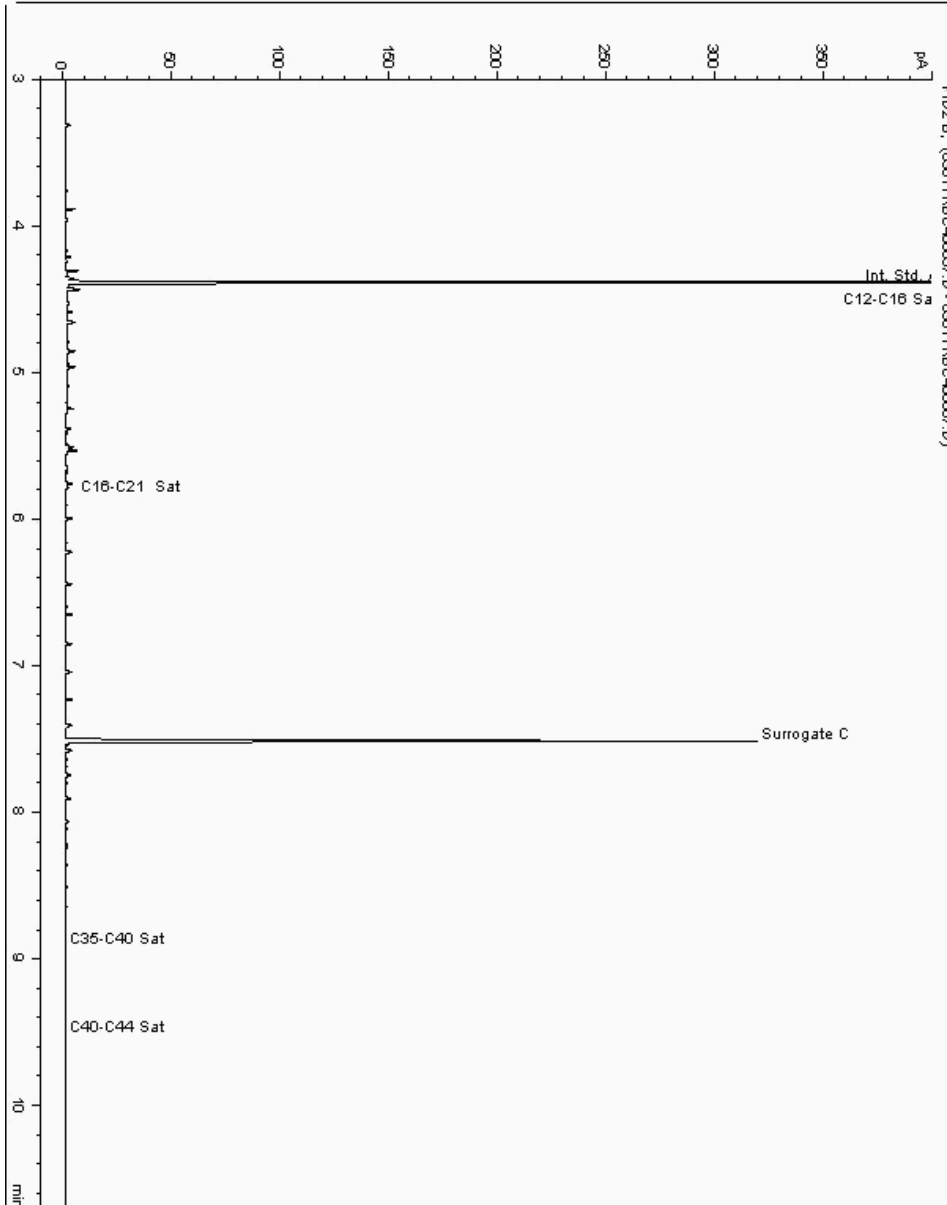
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2954534  
Sample ID: BH101

Depth: 5.50

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

Sample Identity: 3005982-2954534  
Date Acquired : 02/03/11 06:51:11 PM  
Units : ppb  
Dilution:





SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 119130  
Superseded Report:

# Chromatogram

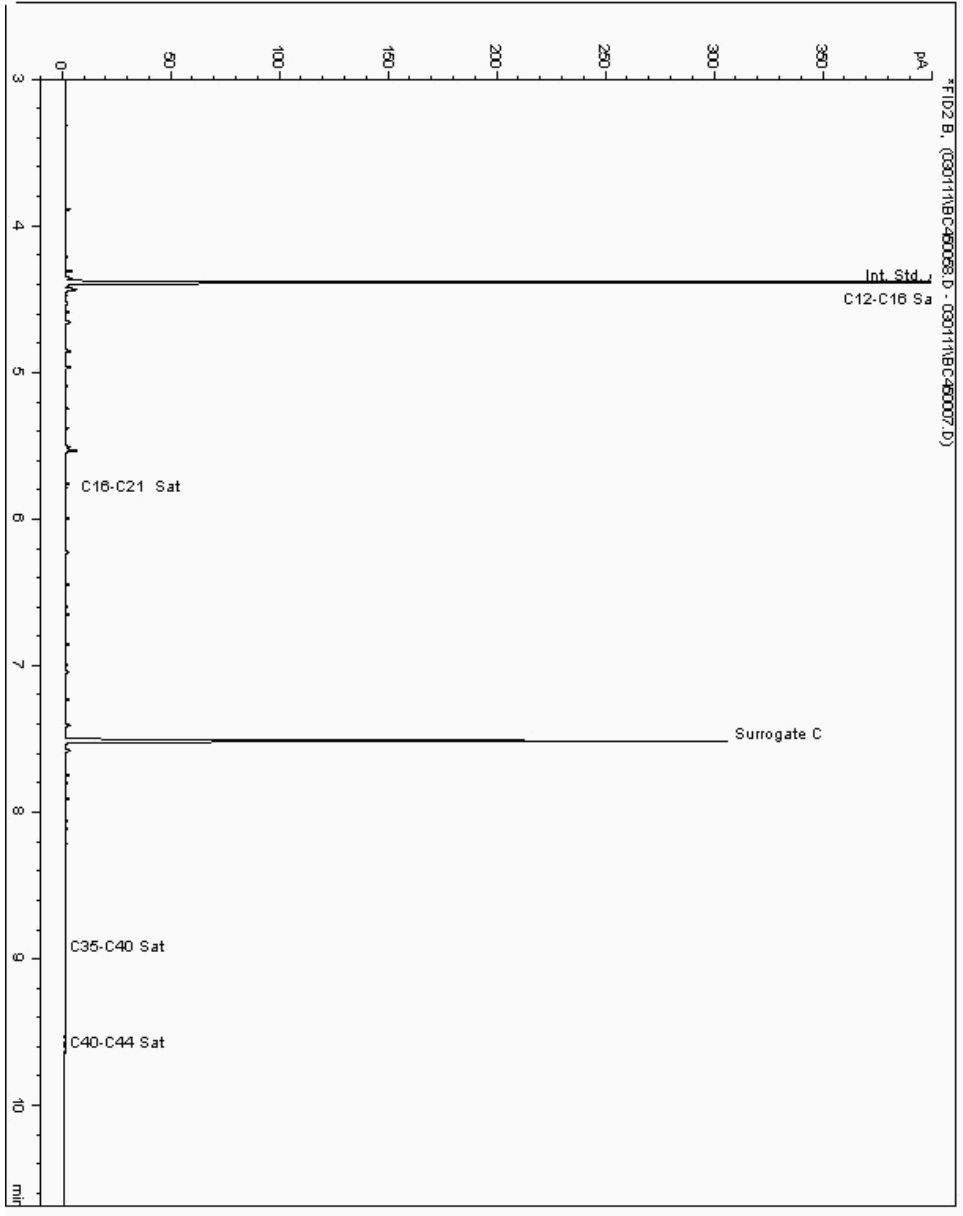
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2954557  
Sample ID: BH102

Depth: 1.50

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

Sample Identity: 3006009-2954557  
Date Acquired : 02/03/11 07:11:03 PM  
Units : ppb  
Dilution:



SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

# Chromatogram

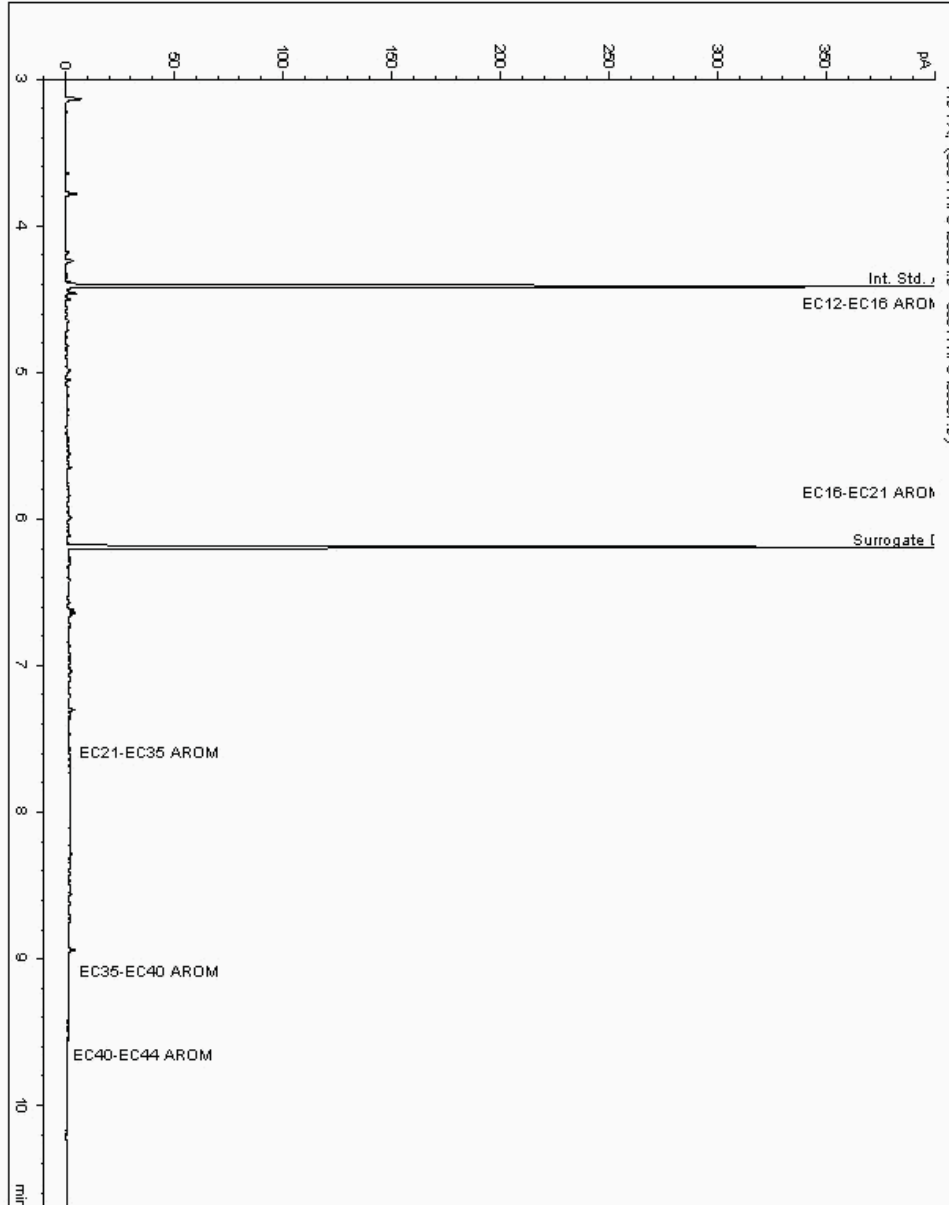
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2949130  
 Sample ID : BH102

Depth : 2.50

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

Sample Identity: 3006028-2949130  
 Date Acquired : 02/03/11 09:20:10 PM  
 Units : ppb  
 Dilution:



SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

# Chromatogram

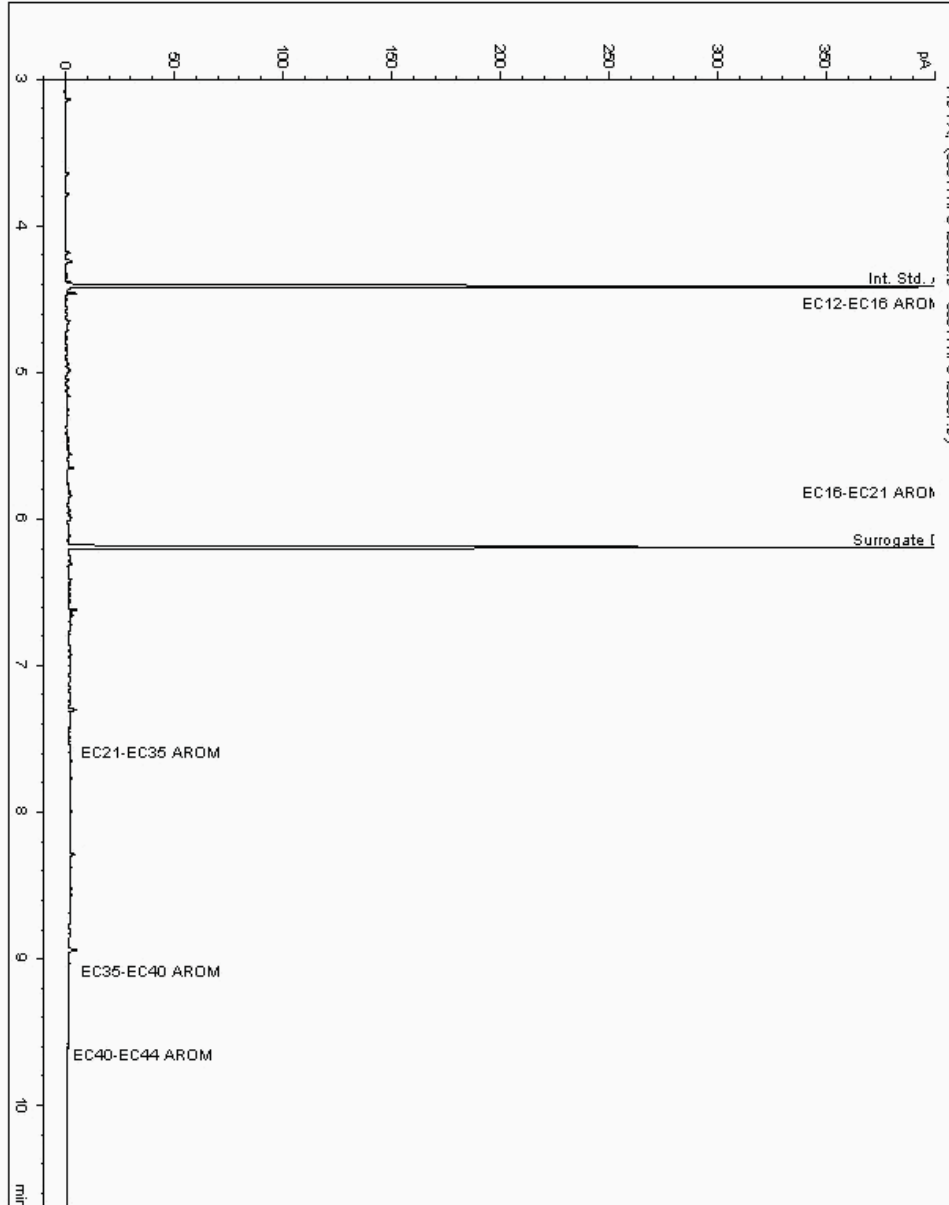
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2949162  
 Sample ID : BH106

Depth : 3.00

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

Sample Identity: 3005993-2949162  
 Date Acquired : 02/03/11 09:39:59 PM  
 Units : ppb  
 Dilution:



SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

# Chromatogram

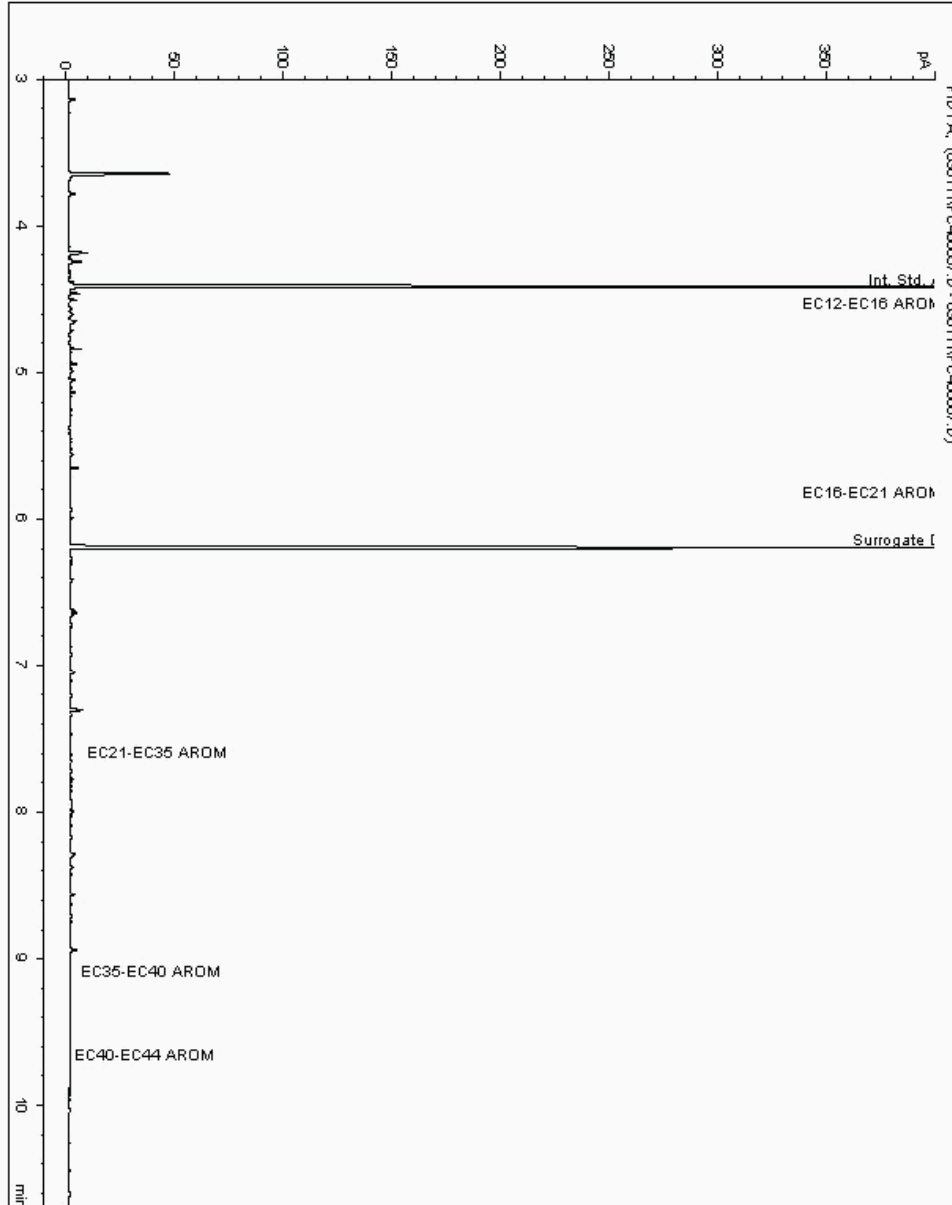
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2954534  
 Sample ID : BH101

Depth : 5.50

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

Sample Identity: 3005983-2954534  
 Date Acquired : 02/03/11 06:51:12 PM  
 Units : ppb  
 Dilution:



SDG: 110224-25  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 119130  
 Superseded Report:

# Chromatogram

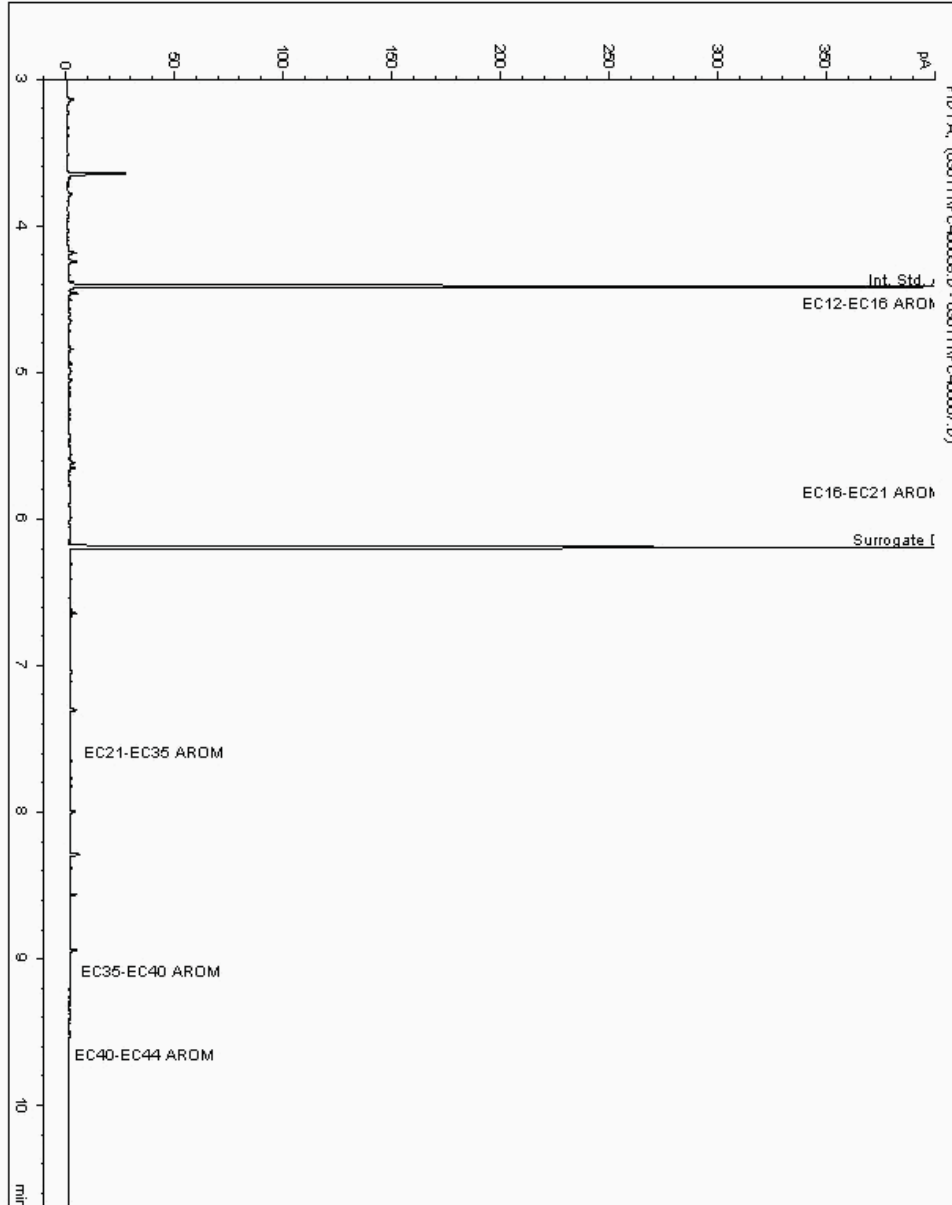
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2954557  
 Sample ID : BH102

Depth : 1.50

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

Sample Identity: 3006010-2954557  
 Date Acquired : 02/03/11 07:11:03 PM  
 Units : ppb  
 Dilution:



SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

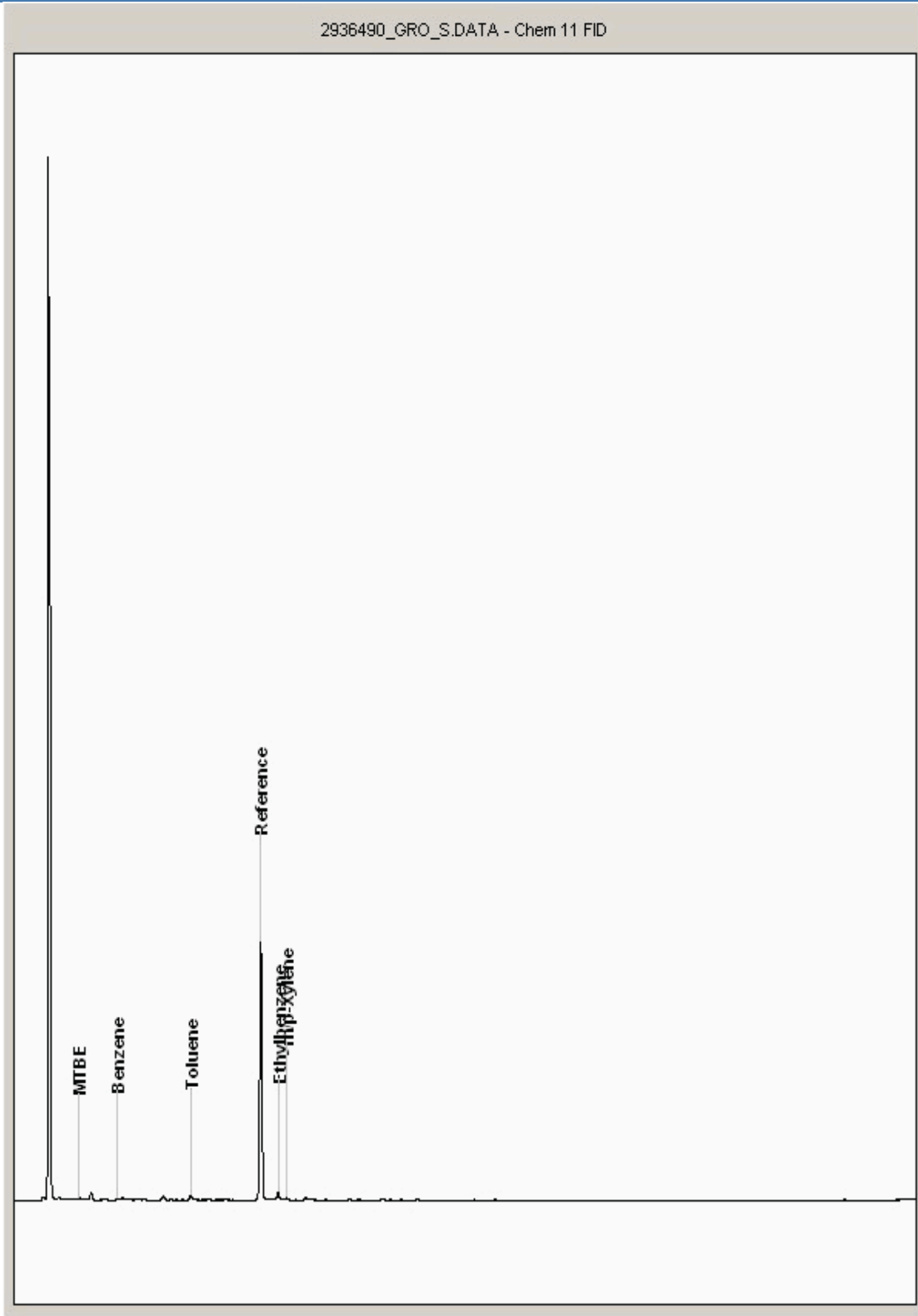
Order Number:  
Report Number: 119130  
Superseded Report:

# Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2936490  
Sample ID : BH101

Depth : 5.50



SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

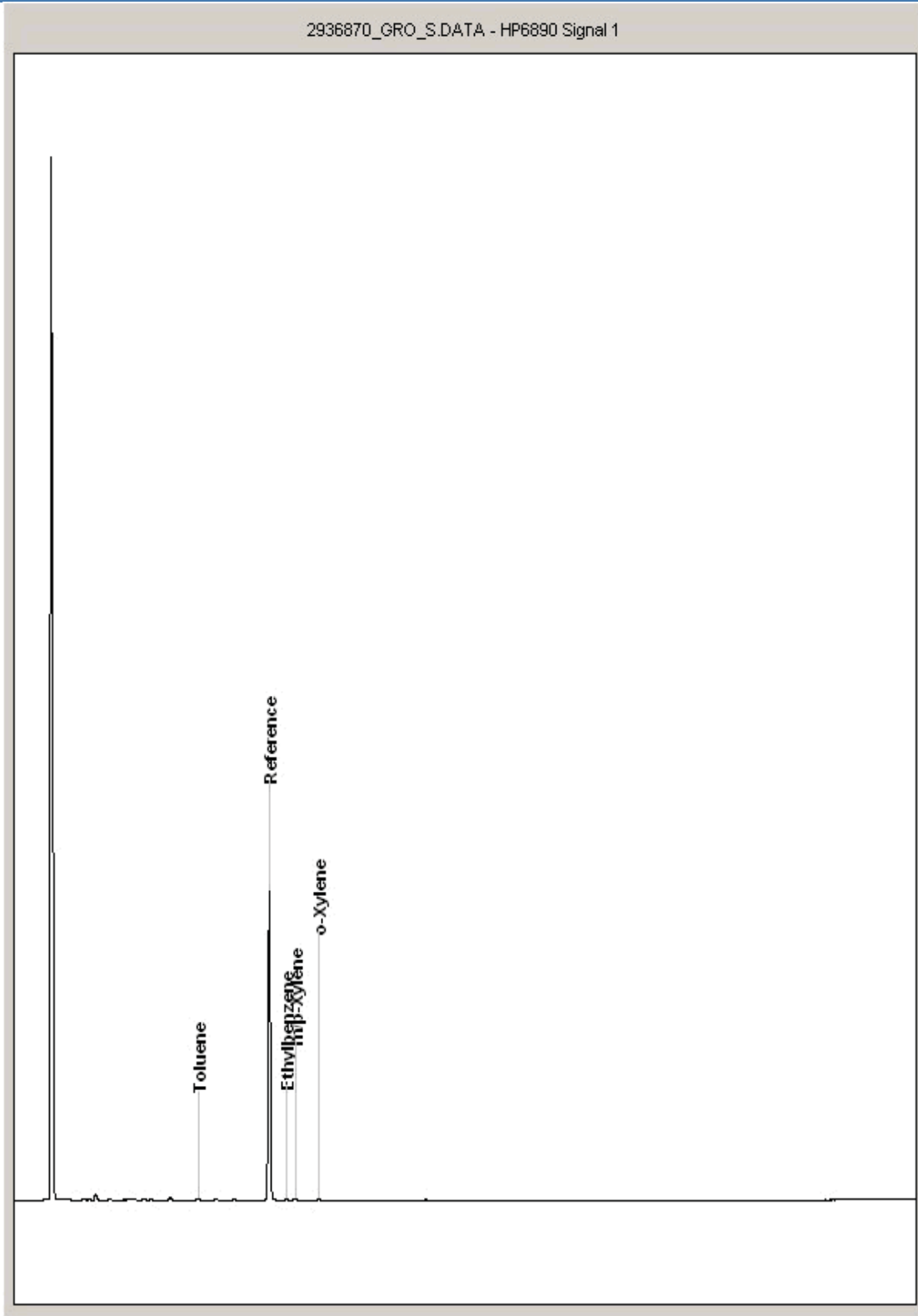
Order Number:  
Report Number: 119130  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2936870  
Sample ID : BH106

Depth : 3.00



SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

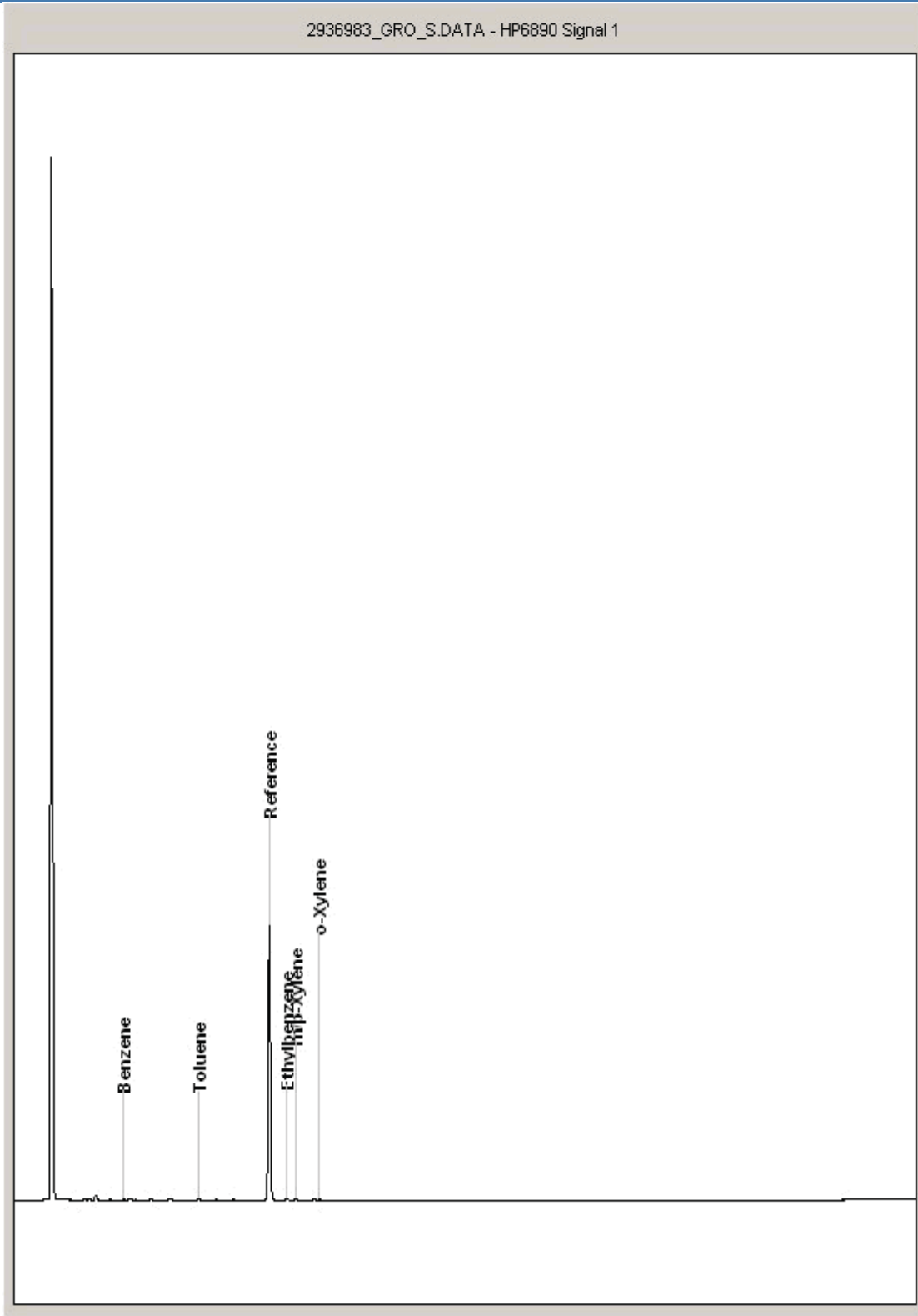
Order Number:  
Report Number: 119130  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2936983  
Sample ID : BH102

Depth : 1.50





SDG: 110224-25  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

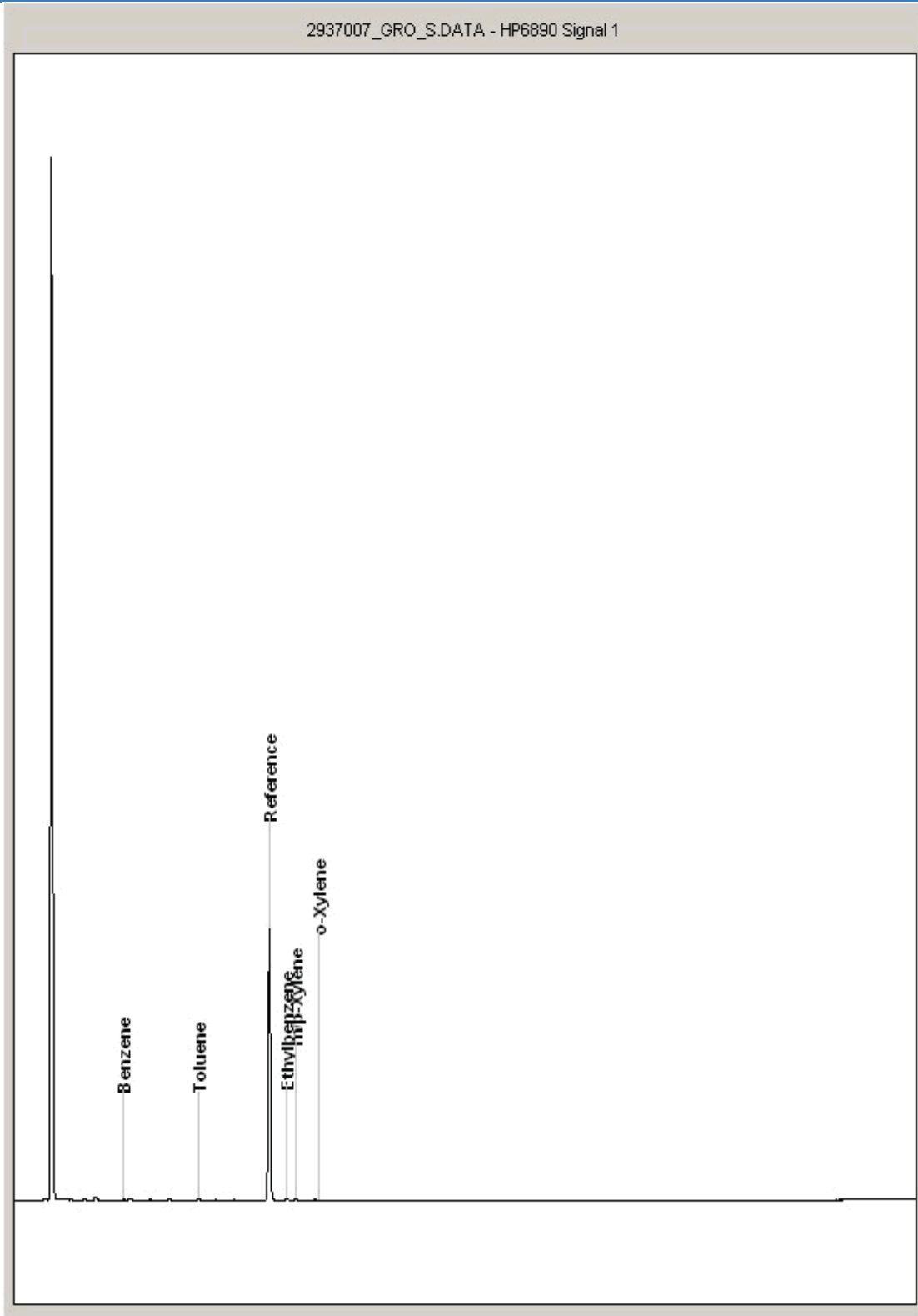
Order Number:  
Report Number: 119130  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2937007  
Sample ID : BH102

Depth : 2.50



**SDG:** 110224-25  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Labadmin

**Order Number:**  
**Report Number:** 119130  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

### SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXHERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXHERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXHERM	GCMS
HERBICIDES	D&C	HEXANE ACETONE	SOXHERM	GCMS
PESTICIDES	D&C	HEXANE ACETONE	SOXHERM	GCMS
EPH (GRO)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH O/G BY GC	D&C	HEXANE ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GCMS

### LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
EPH O/G	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

#### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

#### 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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:**

## CERTIFICATE OF ANALYSIS

**Date:** 28 February 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110222-21  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 118165

We received 6 samples on Tuesday February 22, 2011 and 3 of these samples were scheduled for analysis which was completed on Monday February 28, 2011. 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:

**Sonia McWhan**

Operations Manager



1291  
GROUP

**SDG:** 110222-21  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 118165  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2918214	BH101		1.25	21/02/2011
2918215	BH101		2.50	21/02/2011
2918216	BH108		2.00 - 2.20	20/02/2011
2918217	BH108		2.50	20/02/2011
2918218	BH108		4.50	20/02/2011
2918219	BH108		6.50	20/02/2011

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

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

SOLID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	2918214	2918216	2918218
	Customer Sample Reference	BH101	BH108	BH108
	AGS Reference			
	Depth (m)	1.25	2.00 - 2.20	4.50
	Container	1kg TUB 250g Amber Jar	1kg TUB 60g VOC 250g Amber Jar	250g Amber Jar 60g VOC
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 2	<span style="border: 1px solid black; padding: 2px;">X</span>	<span style="border: 1px solid black; padding: 2px;">X</span>
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 2	<span style="border: 1px solid black; padding: 2px;">X</span>	<span style="border: 1px solid black; padding: 2px;">X</span>
Easily Liberated Sulphide	All	NDPs: 0 Tests: 2	<span style="border: 1px solid black; padding: 2px;">X</span>	<span style="border: 1px solid black; padding: 2px;">X</span>
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 2	<span style="border: 1px solid black; padding: 2px;">X</span>	<span style="border: 1px solid black; padding: 2px;">X</span>
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 2	<span style="border: 1px solid black; padding: 2px;">X</span>	<span style="border: 1px solid black; padding: 2px;">X</span>
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2	<span style="border: 1px solid black; padding: 2px;">X</span>	<span style="border: 1px solid black; padding: 2px;">X</span>
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Barium	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Cadmium	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Chromium	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Copper	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Lead	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Mercury	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	
	Molybdenum	NDPs: 0 Tests: 1	<span style="border: 1px solid black; padding: 2px;">X</span>	

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

<b>SOLID</b> Results Legend X Test N No Determination Possible	Lab Sample No(s)	2918214	2918216	2918218		
	Customer Sample Reference	BH101	BH108	BH108		
	AGS Reference					
	Depth (m)	1.25	2.00 - 2.20	4.50		
	Container	1kg TUB 250g Amber Jar	1kg TUB 60g VOC	250g Amber Jar 60g VOC		
Metals by iCap-OES (Soil)	Nickel	NDPs: 0 Tests: 1	X			
	Vanadium	NDPs: 0 Tests: 1	X			
	Zinc	NDPs: 0 Tests: 1	X			
Oxygenates (S)	All	NDPs: 0 Tests: 2	X		X	
PAH by GCMS	All	NDPs: 0 Tests: 2	X		X	
pH	All	NDPs: 0 Tests: 3	X	X		X
Phenols by HPLC (S)	All	NDPs: 0 Tests: 2	X	X		
Sample description	All	NDPs: 0 Tests: 3	X	X	X	
Total Organic Carbon	All	NDPs: 0 Tests: 2	X		X	
Total Sulphate	All	NDPs: 0 Tests: 1	X			
TPH CWG GC (S)	All	NDPs: 0 Tests: 2	X		X	
VOC MS (S)	All	NDPs: 0 Tests: 2		X	X	

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

### Sample Descriptions

**Grain Sizes**

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2918214	BH101	1.25	Dark Brown	Silty Clay	0.063 - 0.1 mm	Stones	None
2918216	BH108	2.00 - 2.20	Light Brown	Clay Loam	0.063 - 0.1 mm	Stones	Coal fragments
2918218	BH108	4.50	Dark Brown	Silty Clay	0.063 - 0.1 mm	Stones	None

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:** 110222-21  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 118165  
**Superseded Report:**

Results Legend		Customer Sample R	BH101	BH108	BH108				
#	ISO17025 accredited.	<b>Depth (m)</b> <b>Sample Type</b> <b>Date Sampled</b> <b>Date Received</b> <b>SDG Ref</b> <b>Lab Sample No.(s)</b> <b>AGS Reference</b>	1.25	2.00 - 2.20	4.50				
M	mCERTS accredited.		Soil/Solid	Soil/Solid	Soil/Solid				
S	Non-conforming work.		21/02/2011	20/02/2011	20/02/2011				
aq	Aqueous / settled sample.		22/02/2011	22/02/2011	22/02/2011				
diss.filt	Dissolved / filtered sample.		110222-21	110222-21	110222-21				
tot.unfilt	Total / unfiltered sample.		2918214	2918216	2918218				
*	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.								
Component	LOD/Units		Method						
Asbestos Containing Material Screen	-		TM001	No ACM Detected	No ACM Detected				
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)	<0.025 M	<0.025 M					
Organic Carbon, Total	<0.2 %	TM132	1.34 #		1.54 #				
pH	1 pH Units	TM133	8.45 M	8.18 M	9.18 M				
Cyanide, Total	<1 mg/kg	TM153	<1 M	<1 M					
Cyanide, Free	<1 mg/kg	TM153	<1 M	<1 M					
Sulphide, Easily liberated	<15 mg/kg	TM180	<15 #	<15 #					
Arsenic	<0.6 mg/kg	TM181	4.54 M						
Barium	<0.6 mg/kg	TM181	290 #						
Cadmium	<0.02 mg/kg	TM181	<0.02 M						
Chromium	<0.9 mg/kg	TM181	29.9 M						
Copper	<1.4 mg/kg	TM181	17.8 M						
Lead	<0.7 mg/kg	TM181	9.79 M						
Mercury	<0.14 mg/kg	TM181	<0.14 M						
Molybdenum	<0.1 mg/kg	TM181	<0.1 #						
Nickel	<0.2 mg/kg	TM181	31.9 M						
Vanadium	<0.2 mg/kg	TM181	32.1 #						
Zinc	<1.9 mg/kg	TM181	50.6 M						
Sulphate, Total	<48 mg/kg	TM221	351 M						
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243	0.0408 M						
tert Butanol	<0.01 mg/kg	TM288	<0.01	<0.01					
tert-butyl ethyl ether	<0.001 mg/kg	TM288	<0.001	<0.001					



SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

PAH by GCMS

Results Legend			Customer Sample R		BH101	BH108					
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.25	2.00 - 2.20						
M	mCERTS accredited.			Soil/Solid	Soil/Solid						
S	Non-conforming work.			21/02/2011	20/02/2011						
aq	Aqueous / settled sample.			22/02/2011	22/02/2011						
diss.filt	Dissolved / filtered sample.			110222-21	110222-21						
tot.unfilt	Total / unfiltered sample.			2918214	2918216						
*	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.										
Component	LOD/Units	Method									
Naphthalene-d8 % recovery**	%	TM218		98.3	100						
Acenaphthene-d10 % recovery**	%	TM218	98.7	101							
Phenanthrene-d10 % recovery**	%	TM218	96.7	98.4							
Chrysene-d12 % recovery**	%	TM218	102	103							
Perylene-d12 % recovery**	%	TM218	100	99.8							
Naphthalene	<0.009 mg/kg	TM218	0.0421 M	0.0401 M							
Acenaphthylene	<0.012 mg/kg	TM218	0.0152 M	0.0202 M							
Acenaphthene	<0.008 mg/kg	TM218	0.01 M	<0.008 M							
Fluorene	<0.01 mg/kg	TM218	0.0128 M	<0.01 M							
Phenanthrene	<0.015 mg/kg	TM218	0.236 M	0.181 M							
Anthracene	<0.016 mg/kg	TM218	0.0713 M	0.0416 M							
Fluoranthene	<0.017 mg/kg	TM218	0.143 M	0.275 M							
Pyrene	<0.015 mg/kg	TM218	0.1 M	0.218 M							
Benz(a)anthracene	<0.014 mg/kg	TM218	0.0519 M	0.143 M							
Chrysene	<0.01 mg/kg	TM218	0.074 M	0.159 M							
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	0.11 M	0.179 M							
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	0.0315 M	0.0805 M							
Benzo(a)pyrene	<0.015 mg/kg	TM218	0.038 M	0.128 M							
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	0.0334 M	0.0834 M							
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	<0.023 M	0.0316 M							
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	0.0556 M	0.122 M							
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	1.02 M	1.7 M							

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

TPH CWG (S)

Results Legend		Customer Sample R	BH101	BH108				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.25	2.00 - 2.20				
M	mCERTS accredited.		Soil/Solid	Soil/Solid				
S	Non-conforming work.		21/02/2011	20/02/2011				
aq	Aqueous / settled sample.		22/02/2011	22/02/2011				
diss.filt	Dissolved / filtered sample.		110222-21	110222-21				
tot.unfilt	Total / unfiltered sample.		2918214	2918216				
*	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.							
Component	LOD/Units		Method					
GRO Surrogate % recovery**	%		TM089		59			
GRO >C5-C12	<0.044 mg/kg	TM089		0.0588				
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg	TM089	<0.005 #	<0.005 #				
Benzene	<0.01 mg/kg	TM089	<0.01 M	<0.01 M				
Aliphatics >C16-C35	<0.1 mg/kg	TM173	3.95					
Toluene	<0.002 mg/kg	TM089	<0.002 M	<0.002 M				
Ethylbenzene	<0.003 mg/kg	TM089	0.00342 M	<0.003 M				
m,p-Xylene	<0.006 mg/kg	TM089	<0.006 M	<0.006 M				
Total Aliphatics >C5-C44	<0.1 mg/kg	TM173	6.6					
o-Xylene	<0.003 mg/kg	TM089	<0.003 M	<0.003 M				
m,p,o-Xylene	<0.01 mg/kg	TM089	<0.01	<0.01				
BTEX, Total	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C5-C6	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C6-C8	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C8-C10	<0.01 mg/kg	TM089	<0.01	0.0204				
Total Aromatics >C6-C44	<0.1 mg/kg	TM173	7.79					
Aliphatics >C10-C12	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C12-C16	<0.1 mg/kg	TM173	2.52	6.74				
Aliphatics >C16-C21	<0.1 mg/kg	TM173	1.68	5.24				
Aliphatics >C21-C35	<0.1 mg/kg	TM173	2.27	13.5				
Aliphatics >C35-C44	<0.1 mg/kg	TM173	0.126	<0.1				
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	6.6	25.5				
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	<0.01	0.0156				
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	3.54	3.76				
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	1.58	9.3				
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	1.4	20.6				
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	1.27	2.5				
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	0.531	<0.1				
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	7.79	36.2				
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	14.4	61.8				
Total Aliphatics >C5-C12	<0.01 mg/kg	TM089	<0.01					
Total Aromatics >EC5-EC12	<0.01 mg/kg	TM089	<0.01					

**SDG:** 110222-21  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 118165  
**Superseded Report:**

**TPH CWG (S)**

Results Legend		Customer Sample R	BH101		BH108				
#	ISO17025 accredited, mCERTS accredited.		Depth (m)	1.25	2.00 - 2.20				
M	Non-conforming work.	Sample Type	Soil/Solid	Soil/Solid					
§	aq	Date Sampled	21/02/2011	20/02/2011					
diss.filt	Disolved / settled sample.	Date Received	22/02/2011	22/02/2011					
tot.unfilt	Total / unfiltered sample.	SDG Ref	110222-21	110222-21					
*	subcontracted test.	Lab Sample No.(s)	2918214	2918216					
**	% 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.	AGS Reference							
<b>Component</b>	<b>LOD/Units</b>	<b>Method</b>							
Total Aliphatics >C5-35	<0.1 mg/kg	TM173		25.5					
Total Aromatics >C5-35	<0.1 mg/kg	TM173		33.7					
Aromatics >EC35-EC40	<0.1 mg/kg	TM173	0.738						
Total Aliphatics & Aromatics >C5-35	<0.1 mg/kg	TM173		59.3					
Aliphatics >C35-C40	<0.1 mg/kg	TM173	0.126						
Aliphatics >C40-C44	<0.1 mg/kg	TM173	<0.1						
Total Aromatics >EC12-EC35	<0.1 mg/kg	TM173	6.52						
Total Aliphatics >C12-C35	<0.1 mg/kg	TM173	6.47						
Total Aliphatics >C12-C40	<0.1 mg/kg	TM173	6.6						
Total Aromatics >EC12-EC40	<0.1 mg/kg	TM173	7.25						
Total Aliphatics & Aromatics >C12-C44	<0.1 mg/kg	TM173	14.4						

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

VOC MS (S)

Results Legend		Customer Sample R	BH101	BH108			
#	ISO17025 accredited.						
M	mCERTS accredited.						
S	Non-conforming work.						
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)	1.25	2.00 - 2.20			
		Sample Type	Soil/Solid	Soil/Solid			
		Date Sampled	21/02/2011	20/02/2011			
		Date Received	22/02/2011	22/02/2011			
		SDG Ref	110222-21	110222-21			
		Lab Sample No.(s)	2918214	2918216			
		AGS Reference					
Component	LOD/Units	Method					
Toluene-d8**	%	TM116	94.6	96.3			
Methyl Tertiary Butyl Ether	<0.011 mg/kg	TM116	<0.011 M	<0.011 M			
Benzene	<0.009 mg/kg	TM116	<0.009 M	<0.009 M			
Toluene	<0.005 mg/kg	TM116	<0.005 M	<0.005 M			
Ethylbenzene	<0.004 mg/kg	TM116	0.00825 M	<0.004 M			
p/m-Xylene	<0.014 mg/kg	TM116	<0.014 #	<0.014 #			
o-Xylene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M			

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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

**SDG:** 110222-21  
**Job:** H\_ARCADIS\_NMK-340  
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**Location:** Simonside  
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**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 118165  
**Superseded Report:**

**Test Completion Dates**

Lab Sample No(s)	2918214	2918216	2918218
Customer Sample Ref.	BH101	BH108	BH108
AGS Ref.			
Depth	1.25	2.00 - 2.20	4.50
Type	SOLID	SOLID	SOLID
Anions by Kone (soil)	23-Feb-2011		
Asbestos Containing Material Screen	22-Feb-2011	22-Feb-2011	
Cyanide Comp/Free/Total/Thiocyanate	24-Feb-2011	24-Feb-2011	
Easily Liberated Sulphide	24-Feb-2011	24-Feb-2011	
EPH CWG (Aliphatic) GC (S)	25-Feb-2011	25-Feb-2011	
EPH CWG (Aromatic) GC (S)	25-Feb-2011	25-Feb-2011	
GRO by GC-FID (S)	24-Feb-2011	24-Feb-2011	
Metals by iCap-OES (Soil)	24-Feb-2011		
Oxygenates (S)	28-Feb-2011	28-Feb-2011	
PAH by GCMS	24-Feb-2011	24-Feb-2011	
pH	23-Feb-2011	23-Feb-2011	23-Feb-2011
Phenols by HPLC (S)	24-Feb-2011	24-Feb-2011	
Sample description	22-Feb-2011	22-Feb-2011	22-Feb-2011
Total Organic Carbon	24-Feb-2011		24-Feb-2011
Total Sulphate	24-Feb-2011		
TPH CWG GC (S)	25-Feb-2011	25-Feb-2011	
VOC MS (S)	24-Feb-2011	24-Feb-2011	

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
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 Superseded Report:

## ASSOCIATED AQC DATA

### Anions by Kone (soil)

Component	Method Code	QC 22
Chloride (soluble)	TM243	<b>100.98</b> 78.07 : 121.93
Water Soluble Sulphate as SO4 2:1 Extract	TM243	<b>98.75</b> 85.87 : 114.13

### Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 25
Free Cyanide	TM153	<b>101.82</b> 87.04 : 107.05
Thiocyanate	TM153	<b>99.73</b> 90.22 : 111.93
Total Cyanide	TM153	<b>102.10</b> 77.00 : 112.12

### Easily Liberated Sulphide

Component	Method Code	QC 28
Easily Liberated Sulphide	TM180	<b>101.72</b> 44.43 : 127.23

### EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 20	QC 20
Total Aliphatics >C12-C35	TM173	<b>81.81</b> 67.09 : 98.92	<b>93.60</b> 63.35 : 104.85

### EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 20	QC 20
Total Aromatics >EC12-EC35	TM173	<b>84.81</b> 63.44 : 117.90	<b>101.43</b> 64.98 : 117.66

### GRO by GC-FID (S)

Component	Method Code	QC 29
Benzene by GC (Moisture Corrected)	TM089	<b>94.20</b> 79.00 : 121.00
Ethylbenzene by GC (Moisture Corrected)	TM089	<b>94.90</b> 79.00 : 121.00

SDG: 110222-21  
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## GRO by GC-FID (S)

		QC 29
m & p Xylene by GC (Moisture Corrected)	TM089	<b>95.28</b> 79.00 : 121.00
MTBE GC-FID (Moisture Corrected)	TM089	<b>96.10</b> 79.00 : 121.00
o Xylene by GC (Moisture Corrected)	TM089	<b>95.80</b> 79.00 : 121.00
QC	TM089	<b>103.09</b> 79.00 : 121.00
Toluene by GC (Moisture Corrected)	TM089	<b>95.70</b> 79.00 : 121.00

## Metals by iCap-OES (Soil)

Component	Method Code	QC 27
Aluminium	TM181	<b>110.16</b> 94.29 : 126.83
Antimony	TM181	<b>94.75</b> 80.62 : 119.38
Arsenic	TM181	<b>107.58</b> 93.78 : 118.04
Barium	TM181	<b>112.19</b> 92.15 : 121.48
Beryllium	TM181	<b>104.57</b> 93.37 : 106.63
Boron	TM181	<b>115.13</b> 71.45 : 144.21
Cadmium	TM181	<b>100.00</b> 83.47 : 108.02
Chromium	TM181	<b>97.33</b> 86.66 : 111.67
Cobalt	TM181	<b>108.26</b> 91.65 : 115.98
Copper	TM181	<b>104.09</b> 90.86 : 109.48
Iron	TM181	<b>105.76</b> 100.21 : 121.44
Lead	TM181	<b>91.96</b> 81.17 : 121.35
Manganese	TM181	<b>98.78</b> 88.94 : 103.43
Mercury	TM181	<b>104.66</b> 96.85 : 124.11
Molybdenum	TM181	<b>90.88</b> 83.94 : 116.06
Nickel	TM181	<b>95.95</b> 83.34 : 114.35
Phosphorus	TM181	<b>99.83</b> 85.62 : 116.58
Selenium	TM181	<b>110.79</b> 100.15 : 123.30
Strontium	TM181	<b>100.48</b> 89.82 : 110.49
Thallium	TM181	<b>94.05</b> 93.51 : 130.39



SDG: 110222-21  
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Metals by iCap-OES (Soil)

		QC 27
Tin	TM181	<b>100.79</b> 89.71 : 110.91
Titanium	TM181	<b>102.28</b> 78.57 : 125.05
Vanadium	TM181	<b>101.48</b> 91.61 : 110.18
Zinc	TM181	<b>101.15</b> 83.65 : 103.15

PAH by GCMS

Component	Method Code	QC 27
Acenaphthene	TM218	<b>98.10</b> 78.03 : 113.03
Acenaphthylene	TM218	<b>93.90</b> 70.25 : 102.62
Anthracene	TM218	<b>93.89</b> 72.15 : 107.50
Benz(a)anthracene	TM218	<b>107.72</b> 79.35 : 115.30
Benzo(a)pyrene	TM218	<b>103.58</b> 79.80 : 116.48
Benzo(b)fluoranthene	TM218	<b>108.94</b> 79.51 : 116.19
Benzo(ghi)perylene	TM218	<b>102.53</b> 80.08 : 114.22
Benzo(k)fluoranthene	TM218	<b>99.12</b> 78.13 : 112.67
Chrysene	TM218	<b>104.66</b> 80.14 : 113.92
Dibenzo(ah)anthracene	TM218	<b>105.34</b> 76.87 : 114.95
Fluoranthene	TM218	<b>96.24</b> 76.32 : 107.92
Fluorene	TM218	<b>96.79</b> 75.68 : 111.55
Indeno(123cd)pyrene	TM218	<b>104.93</b> 74.42 : 114.62
Naphthalene	TM218	<b>93.16</b> 78.91 : 107.87
Phenanthrene	TM218	<b>95.90</b> 74.89 : 112.83
Pyrene	TM218	<b>94.73</b> 74.35 : 111.75

pH

Component	Method Code	QC 22	QC 20
pH	TM133	<b>98.49</b> 96.84 : 100.64	<b>97.74</b> 96.84 : 100.64

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## Phenols by HPLC (S)

Component	Method Code	QC 22
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>95.81</b> 85.54 : 103.30
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>95.21</b> 86.02 : 103.87
Catechol by HPLC (S)	TM062 (S)	<b>59.88</b> 27.23 : 80.19
Cresols by HPLC (S)	TM062 (S)	<b>93.81</b> 79.99 : 98.02
Napthol by HPLC (S)	TM062 (S)	<b>88.62</b> 63.74 : 104.78
Phenol by HPLC (S)	TM062 (S)	<b>93.41</b> 81.28 : 100.85
Resorcinol HPLC (S)	TM062 (S)	<b>94.61</b> 80.50 : 98.19
Xylenols by HPLC (S)	TM062 (S)	<b>94.81</b> 86.98 : 101.98

## Total Organic Carbon

Component	Method Code	QC 20
Total Organic Carbon	TM132	<b>97.96</b> 88.75 : 104.70

## Total Sulphate

Component	Method Code	QC 22
Total Sulphate	TM221	<b>92.69</b> 80.05 : 95.26

## VOC MS (S)

Component	Method Code	QC 20
1,1,1,2-tetrachloroethane	TM116	<b>96.32</b> 68.18 : 144.88
1,1,1-Trichloroethane	TM116	<b>99.62</b> 67.21 : 142.82
1,1,2-Trichloroethane	TM116	<b>106.05</b> 75.40 : 160.23
1,1-Dichloroethane	TM116	<b>102.46</b> 70.67 : 150.18
1,2-Dichloroethane	TM116	<b>102.76</b> 72.96 : 155.03
1,4-Dichlorobenzene	TM116	<b>93.79</b> 72.36 : 153.77
2-Chlorotoluene	TM116	<b>119.77</b> 83.36 : 177.15

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## VOC MS (S)

		QC 20
4-Chlorotoluene	TM116	<b>116.71</b> 84.28 : 179.10
Benzene	TM116	<b>97.91</b> 69.92 : 148.58
Carbon Disulphide	TM116	<b>76.27</b> 63.87 : 135.73
Carbontetrachloride	TM116	<b>98.76</b> 73.39 : 155.95
Chlorobenzene	TM116	<b>94.53</b> 69.59 : 147.89
Chloroform	TM116	<b>102.64</b> 70.48 : 149.78
Chloromethane	TM116	<b>123.11</b> 75.88 : 161.25
Cis-1,2-Dichloroethene	TM116	<b>100.43</b> 65.49 : 139.18
Dibromomethane	TM116	<b>102.68</b> 65.97 : 140.19
Dichloromethane	TM116	<b>104.67</b> 71.23 : 151.36
Ethylbenzene	TM116	<b>96.49</b> 68.41 : 145.37
Hexachlorobutadiene	TM116	<b>101.91</b> 85.39 : 181.46
Isopropylbenzene	TM116	<b>85.66</b> 58.18 : 123.62
Naphthalene	TM116	<b>100.57</b> 75.23 : 159.86
o-Xylene	TM116	<b>93.73</b> 65.38 : 138.92
p/m-Xylene	TM116	<b>94.93</b> 68.19 : 144.91
Sec-Butylbenzene	TM116	<b>87.46</b> 66.07 : 140.41
Tetrachloroethene	TM116	<b>101.12</b> 72.85 : 154.80
Toluene	TM116	<b>94.41</b> 67.17 : 142.75
Trichloroethene	TM116	<b>98.62</b> 68.75 : 146.10
Trichlorofluoromethane	TM116	<b>101.44</b> 62.67 : 133.18
Vinyl Chloride	TM116	<b>109.98</b> 67.16 : 142.72

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
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### Chromatogram

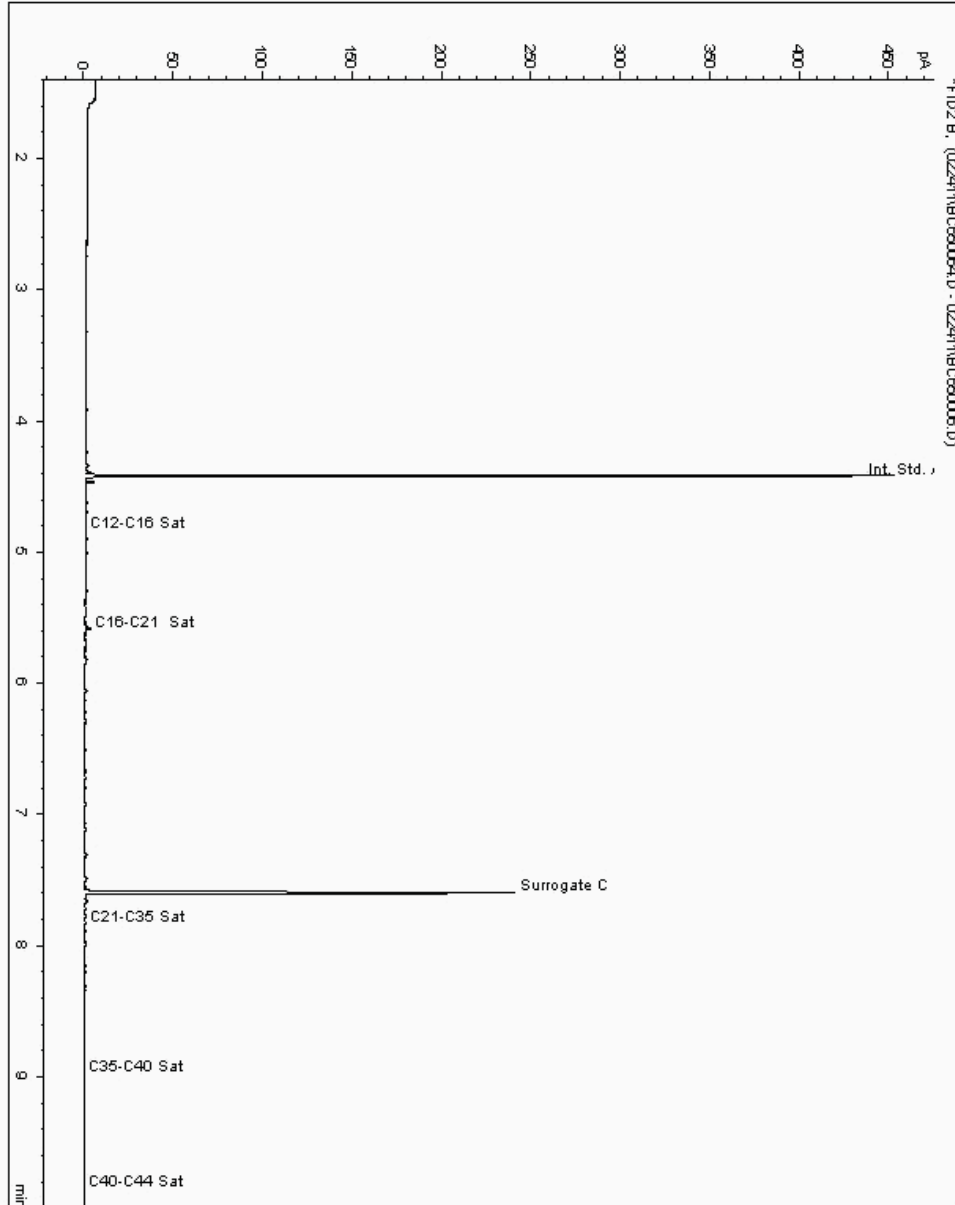
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2928541  
 Sample ID: BH101

Depth: 1.25

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

Sample Identity: 2986524-2928541  
 Date Acquired : 25/02/11 05:29:43 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.966



SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
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### Chromatogram

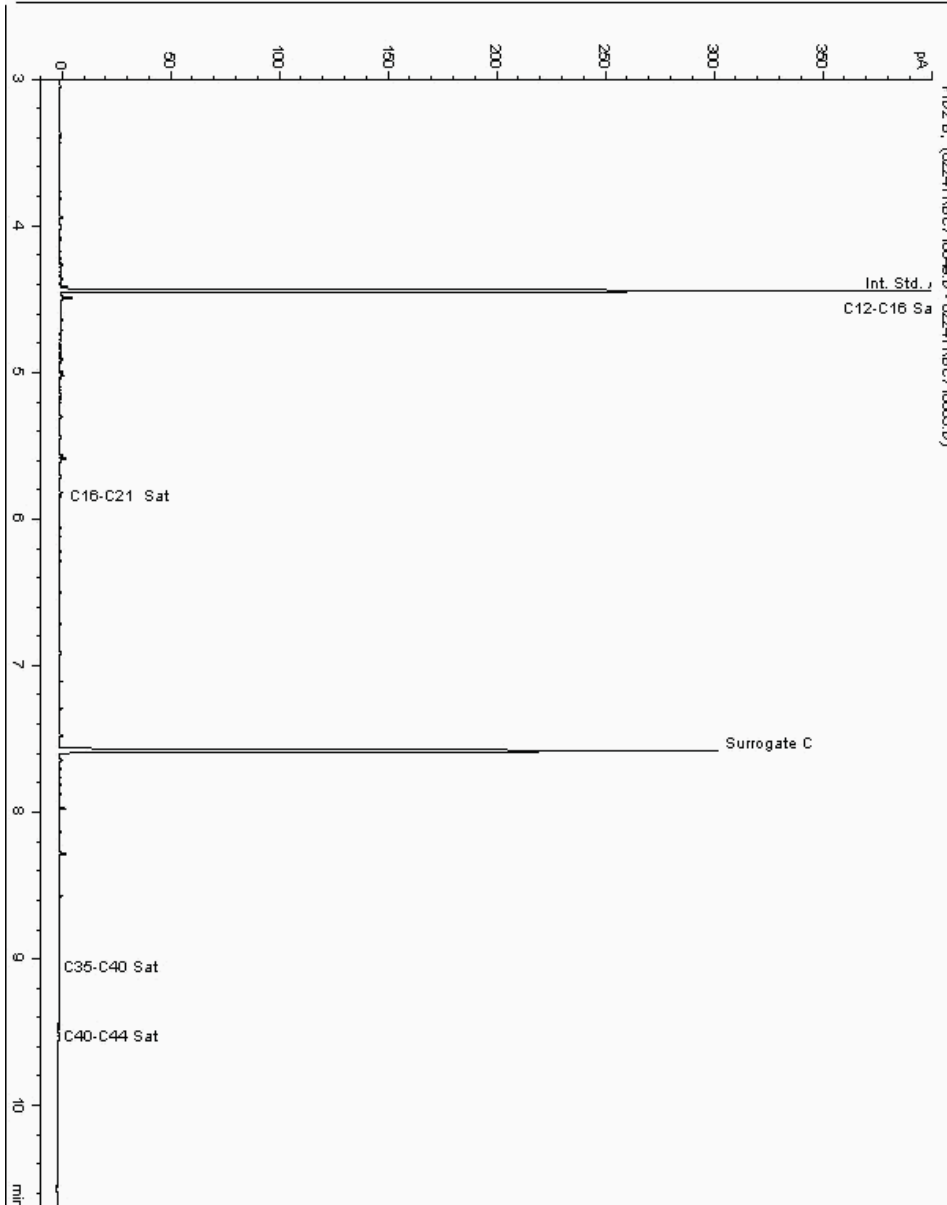
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2937472  
 Sample ID: BH108

Depth: 2.00 - 2.20

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

Sample Identity: 2991642-2937472  
 Date Acquired : 25/02/2011 09:33:41 PM  
 Units : ppb  
 Dilution:



SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
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### Chromatogram

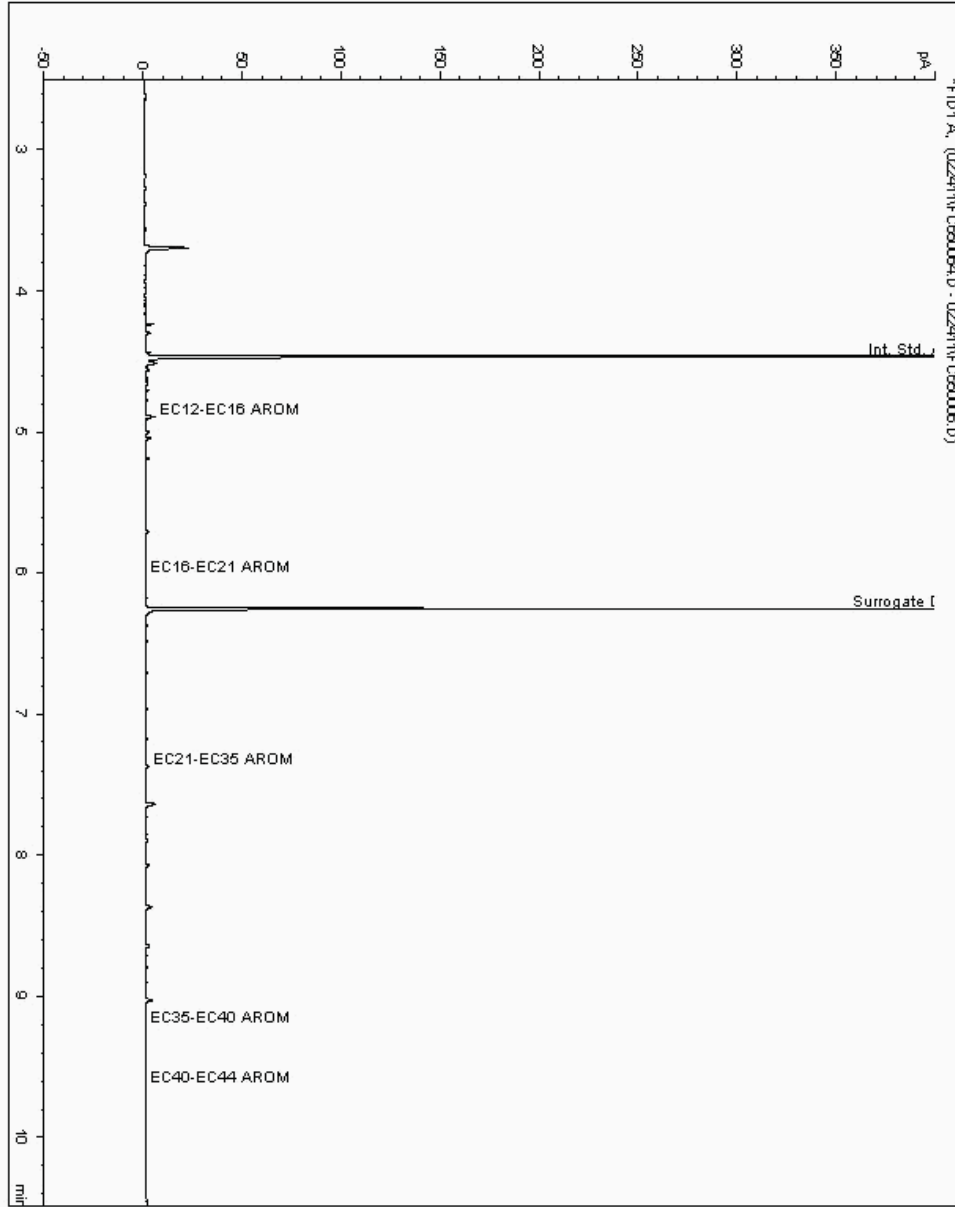
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2928541  
 Sample ID: BH101

Depth: 1.25

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

Sample Identity: 2986525-2928541  
 Date Acquired : 25/02/11 05:29:43 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 0.966



SDG: 110222-21  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 118165  
 Superseded Report:

### Chromatogram

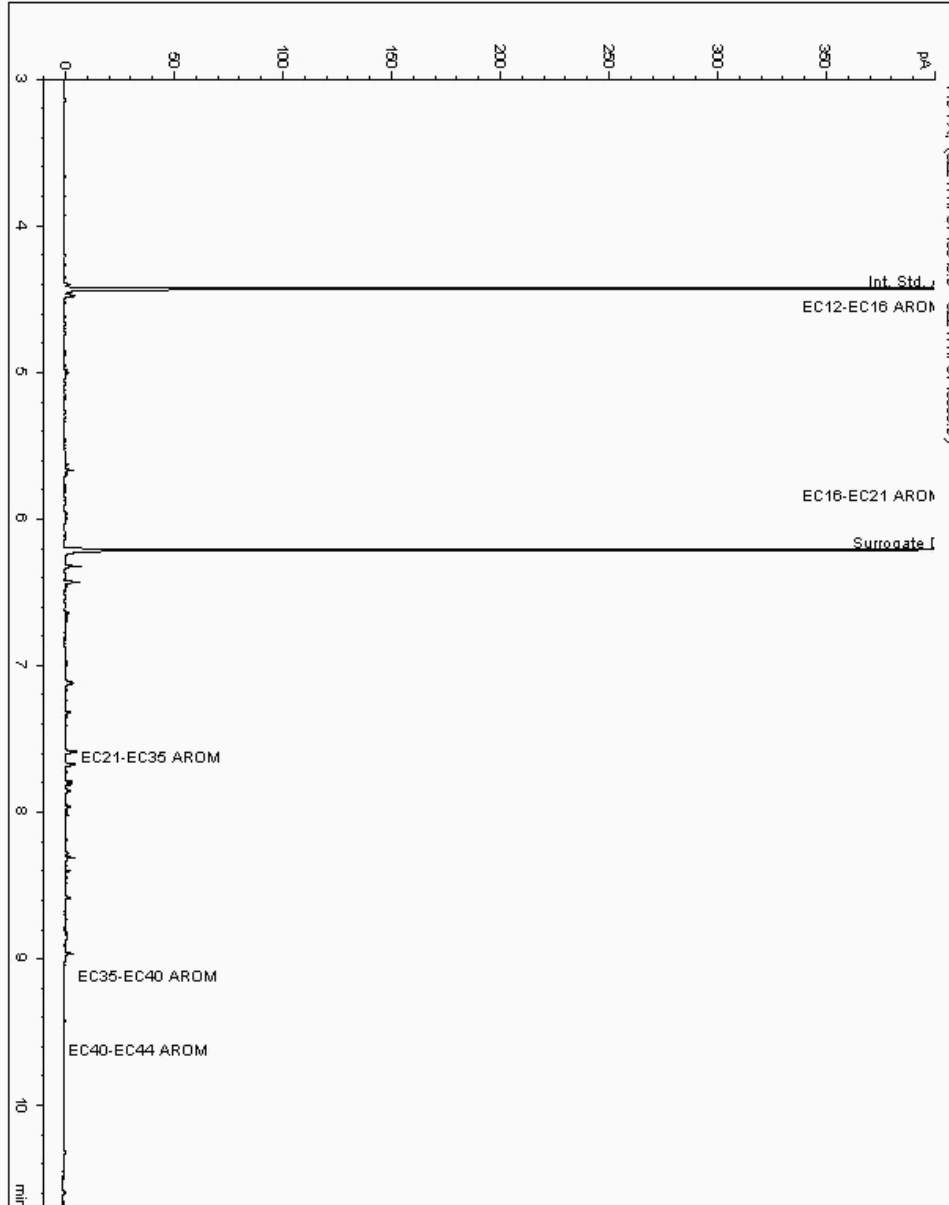
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2937472  
 Sample ID : BH108

Depth : 2.00 - 2.20

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

Sample Identity: 2991643-2937472  
 Date Acquired : 25/02/2011 09:33:41 PM  
 Units : ppb  
 Dilution:



SDG: 110222-21  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

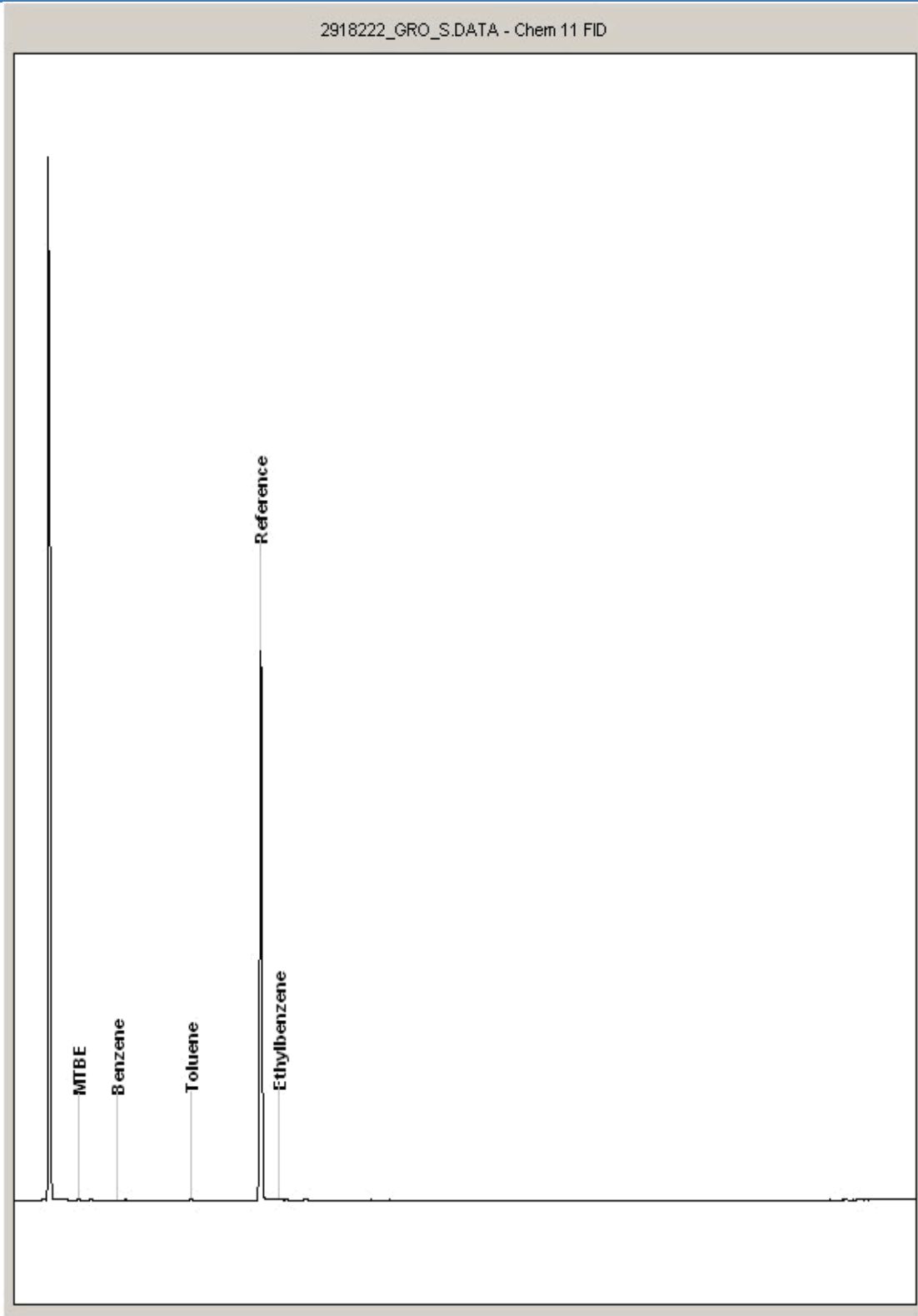
Order Number:  
Report Number: 118165  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2918222  
Sample ID : BH101

Depth : 1.25





SDG: 110222-21  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

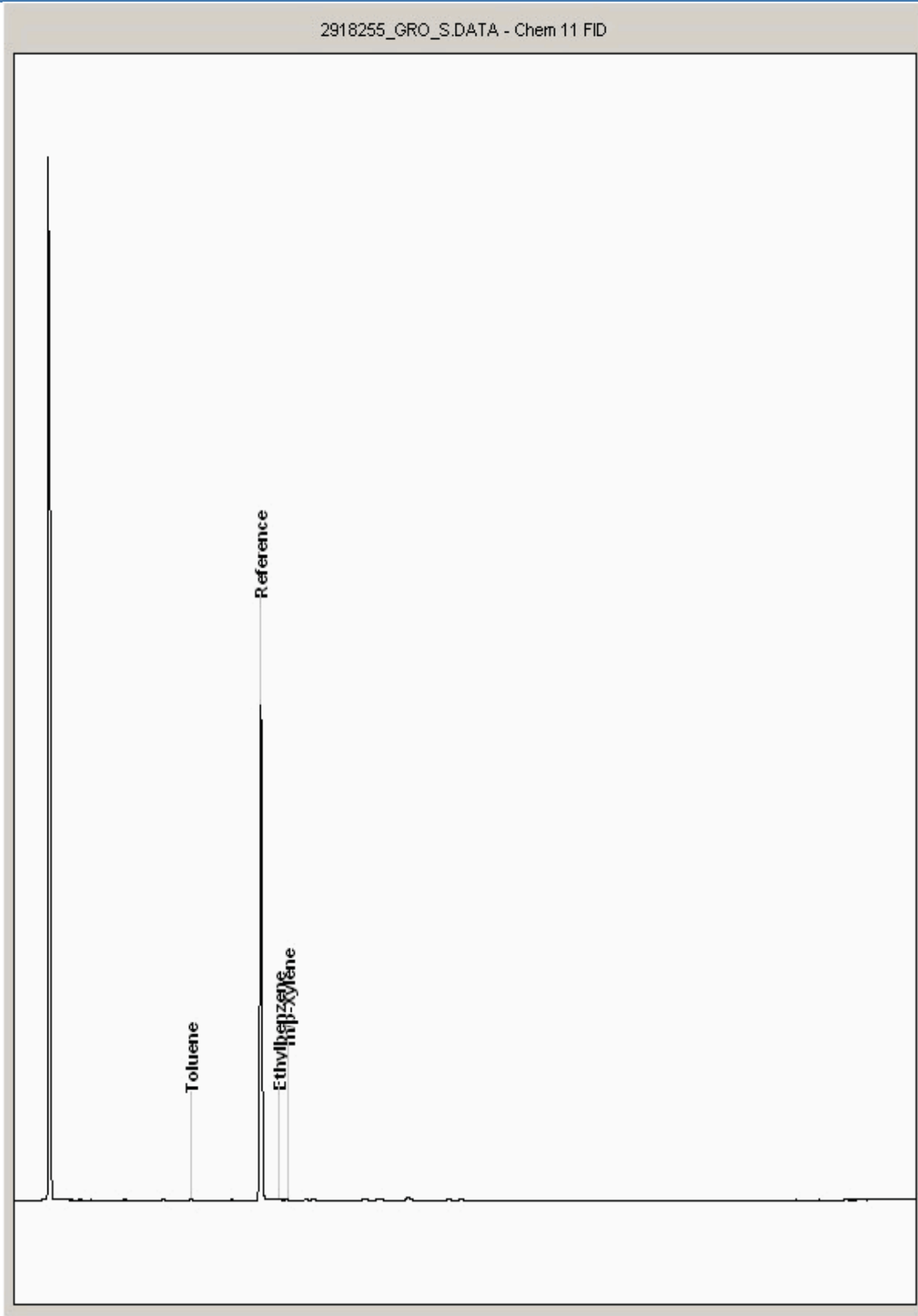
Order Number:  
Report Number: 118165  
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### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2918255  
Sample ID : BH108

Depth : 2.00 - 2.20



**SDG:** 110222-21  
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**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
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## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXTERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXTERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXTERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXTERM	GCMS
HERBICIDES	D&C	HEXANE ACETONE	SOXTERM	GCMS
PESTICIDES	D&C	HEXANE ACETONE	SOXTERM	GCMS
EPH (GRO)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH O/G BY GC	D&C	HEXANE ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
EPH O/G	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### 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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 25 February 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110218-44  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 117809

We received 5 samples on Friday February 18, 2011 and 3 of these samples were scheduled for analysis which was completed on Friday February 25, 2011. 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:

**Sonia McWhan**

Operations Manager



1291  
GROUP

**SDG:** 110218-44  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117809  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2898568	BH101		0.20 - 0.40	16/02/2011
2897837	BH101		0.50 - 0.80	16/02/2011
2897840	BH103		1.50 - 1.70	17/02/2011
2897885	BH103		2.20 - 2.40	17/02/2011
2897880	BH103		3.10 - 3.30	17/02/2011

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

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

SOLID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test  <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	2897885	2897880	2897840
	Customer Sample Reference	BH103	BH103	BH103
	AGS Reference			
	Depth (m)	2.20 - 2.40	3.10 - 3.30	1.50 - 1.70
	Container	60g VOC	250g Amber Jar	250g Amber Jar
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	X	
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 1	X	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1	X	
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1	X	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 2	X	X
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 2	X	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2	X	X
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 1	X	
	Barium	NDPs: 0 Tests: 1	X	
	Cadmium	NDPs: 0 Tests: 1	X	
	Chromium	NDPs: 0 Tests: 1	X	
	Copper	NDPs: 0 Tests: 1	X	
	Lead	NDPs: 0 Tests: 1	X	
	Mercury	NDPs: 0 Tests: 1	X	
	Molybdenum	NDPs: 0 Tests: 1	X	

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

SOLID Results Legend  <span style="background-color: yellow; border: 1px solid black; padding: 2px;">X</span> Test <span style="background-color: red; color: white; border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	2897885	2897880	2897840
	Customer Sample Reference	BH103	BH103	BH103
	AGS Reference			
	Depth (m)	2.20 - 2.40	3.10 - 3.30	1.50 - 1.70
	Container	60g VOC	250g Amber Jar	250g Amber Jar
Metals by iCap-OES (Soil)	Nickel	NDPs: 0 Tests: 1	X	
	Vanadium	NDPs: 0 Tests: 1	X	
	Zinc	NDPs: 0 Tests: 1	X	
Oxygenates (S)	All	NDPs: 0 Tests: 1		X
PAH by GCMS	All	NDPs: 0 Tests: 2	X	X
pH	All	NDPs: 0 Tests: 2	X	X
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1	X	
Sample description	All	NDPs: 0 Tests: 3	X	X X
Total Organic Carbon	All	NDPs: 0 Tests: 1		X
Total Sulphate	All	NDPs: 0 Tests: 1	X	
TPH CWG GC (S)	All	NDPs: 0 Tests: 2	X	X
VOC MS (S)	All	NDPs: 0 Tests: 1		X

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

### Sample Descriptions

**Grain Sizes**

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2897840	BH103	1.50 - 1.70	Dark Brown	Clay	<0.063 mm	Stones	N/A
2897880	BH103	3.10 - 3.30	Dark Brown	Clay	<0.063 mm	Stones	N/A
2897885	BH103	2.20 - 2.40	Dark Brown	Clay	<0.063 mm	Stones	N/A

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.

**CERTIFICATE OF ANALYSIS**

**SDG:** 110218-44  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117809  
**Superseded Report:**

Results Legend		Customer Sample R		BH103	BH103	BH103			
# ISO17025 accredited. M mCERTS accredited. S Non-conforming work. 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		1.50 - 1.70 Soil/Solid 17/02/2011 18/02/2011 110218-44 2897840	2.20 - 2.40 Soil/Solid 17/02/2011 18/02/2011 110218-44 2897885	3.10 - 3.30 Soil/Solid 17/02/2011 18/02/2011 110218-44 2897880			
Component	LOD/Units	Method							
Asbestos Containing Material Screen	-	TM001	No ACM Detected						
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)	<0.025 M						
Organic Carbon, Total	<0.2 %	TM132			1.7 #				
pH	1 pH Units	TM133	8.51 M		8.68 M				
Cyanide, Total	<1 mg/kg	TM153	<1 M						
Cyanide, Free	<1 mg/kg	TM153	<1 M						
Sulphide, Easily liberated	<15 mg/kg	TM180	<15 #						
Arsenic	<0.6 mg/kg	TM181	4.24 M						
Barium	<0.6 mg/kg	TM181	232 #						
Cadmium	<0.02 mg/kg	TM181	<0.02 M						
Chromium	<0.9 mg/kg	TM181	27.1 M						
Copper	<1.4 mg/kg	TM181	19.9 M						
Lead	<0.7 mg/kg	TM181	26.5 M						
Mercury	<0.14 mg/kg	TM181	<0.14 M						
Molybdenum	<0.1 mg/kg	TM181	<0.1 #						
Nickel	<0.2 mg/kg	TM181	30.3 M						
Vanadium	<0.2 mg/kg	TM181	26.4 #						
Zinc	<1.9 mg/kg	TM181	62.9 M						
Sulphate, Total	<48 mg/kg	TM221	458 M						
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243	0.034 M						
tert-butyl ethyl ether	<0.001 mg/kg	TM288		<0.001					



SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

PAH by GCMS

Results Legend		Customer Sample R	BH103	BH103				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.50 - 1.70	2.20 - 2.40				
M	mCERTS accredited.		Soil/Solid	Soil/Solid				
S	Non-conforming work.		17/02/2011	17/02/2011				
aq	Aqueous / settled sample.		18/02/2011	18/02/2011				
diss.filt	Dissolved / filtered sample.		110218-44	110218-44				
tot.unfilt	Total / unfiltered sample.		2897840	2897885				
*	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.							
Component	LOD/Units		Method					
Naphthalene-d8 % recovery**	%		TM218	94.3	92.5			
Acenaphthene-d10 % recovery**	%	TM218	92.8	91.6				
Phenanthrene-d10 % recovery**	%	TM218	91.2	89.8				
Chrysene-d12 % recovery**	%	TM218	91.8	91.8				
Perylene-d12 % recovery**	%	TM218	95.2	95.1				
Naphthalene	<0.009 mg/kg	TM218	0.0626 M	0.0498 M				
Acenaphthylene	<0.012 mg/kg	TM218	<0.012 M	<0.012 M				
Acenaphthene	<0.008 mg/kg	TM218	<0.008 M	<0.008 M				
Fluorene	<0.01 mg/kg	TM218	0.0174 M	0.0138 M				
Phenanthrene	<0.015 mg/kg	TM218	0.0892 M	0.0738 M				
Anthracene	<0.016 mg/kg	TM218	<0.016 M	<0.016 M				
Fluoranthene	<0.017 mg/kg	TM218	0.0422 M	0.0366 M				
Pyrene	<0.015 mg/kg	TM218	0.0456 M	0.0409 M				
Benz(a)anthracene	<0.014 mg/kg	TM218	0.0384 M	0.0294 M				
Chrysene	<0.01 mg/kg	TM218	0.0356 M	0.0247 M				
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	0.0519 M	0.0306 M				
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	0.0259 M	<0.014 M				
Benzo(a)pyrene	<0.015 mg/kg	TM218	0.0432 M	0.027 M				
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	0.0341 M	<0.018 M				
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	0.0275 M	<0.023 M				
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	0.0616 M	0.0355 M				
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	0.575 M	0.362 M				

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

TPH CWG (S)

Results Legend		Customer Sample R	BH103	BH103				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.50 - 1.70	2.20 - 2.40				
M	mCERTS accredited.		Soil/Solid	Soil/Solid				
S	Non-conforming work.		17/02/2011	17/02/2011				
aq	Aqueous / settled sample.		18/02/2011	18/02/2011				
diss.filt	Dissolved / filtered sample.		110218-44	110218-44				
tot.unfilt	Total / unfiltered sample.		2897840	2897885				
*	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.							
Component	LOD/Units		Method					
GRO Surrogate % recovery**	%		TM089		26			
GRO >C5-C12	<0.044 mg/kg	TM089		0.0901				
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg	TM089	<0.005 #	<0.005 #				
Benzene	<0.01 mg/kg	TM089	<0.01 M	<0.01 M				
Aliphatics >C16-C35	<0.1 mg/kg	TM173	20.8					
Toluene	<0.002 mg/kg	TM089	0.00565 M	0.00342 M				
Ethylbenzene	<0.003 mg/kg	TM089	0.0113 M	0.00684 M				
m,p-Xylene	<0.006 mg/kg	TM089	<0.006 M	<0.006 M				
Total Aliphatics >C5-C44	<0.1 mg/kg	TM173	44					
o-Xylene	<0.003 mg/kg	TM089	<0.003 M	<0.003 M				
m,p,o-Xylene	<0.01 mg/kg	TM089	<0.01	<0.01				
BTEX, Total	<0.01 mg/kg	TM089	0.017	0.0103				
Aliphatics >C5-C6	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C6-C8	<0.01 mg/kg	TM089	0.0124	0.0148				
Aliphatics >C8-C10	<0.01 mg/kg	TM089	0.0113	0.0125				
Total Aromatics >C6-C44	<0.1 mg/kg	TM173	62.6					
Aliphatics >C10-C12	<0.01 mg/kg	TM089	0.0271	0.0205				
Aliphatics >C12-C16	<0.1 mg/kg	TM173	22.1	27.2				
Aliphatics >C16-C21	<0.1 mg/kg	TM173	10.1	14.4				
Aliphatics >C21-C35	<0.1 mg/kg	TM173	10.7	14.5				
Aliphatics >C35-C44	<0.1 mg/kg	TM173	1.06	3.16				
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	44	59.3				
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	0.0215	0.0182				
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	0.0181	0.0137				
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	11.7	13.7				
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	13	17.2				
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	30.1	41				
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	7.71	14.3				
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	2.46	5.73				
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	62.5	86.2				
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	107	146				
Total Aliphatics >C5-C12	<0.01 mg/kg	TM089	0.0565					
Total Aromatics >EC5-EC12	<0.01 mg/kg	TM089	0.0486					

CERTIFICATE OF ANALYSIS

**SDG:** 110218-44      **Location:** Simonside      **Order Number:**  
**Job:** H\_ARCADIS\_NMK-340      **Customer:** ARCADIS Geraghty & Miller      **Report Number:** 117809  
**Client Reference:** 93749.02      **Attention:**      **Superseded Report:**

**TPH CWG (S)**

Results Legend		Customer Sample R	BH103	BH103					
#	ISO17025 accredited.	<b>Depth (m)</b> <b>Sample Type</b> <b>Date Sampled</b> <b>Date Received</b> <b>SDG Ref</b> <b>Lab Sample No.(s)</b> <b>AGS Reference</b>	1.50 - 1.70	2.20 - 2.40					
M	mCERTS accredited.		Soil/Solid	Soil/Solid					
§	Non-conforming work.								
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.								
<b>Component</b>	<b>LOD/Units</b>		<b>Method</b>						
Total Aliphatics >C5-35	<0.1 mg/kg		TM173		56.2				
Total Aromatics >C5-35	<0.1 mg/kg	TM173		71.9					
Aromatics >EC35-EC40	<0.1 mg/kg	TM173	5.25						
Total Aliphatics & Aromatics >C5-35	<0.1 mg/kg	TM173		128					
Aliphatics >C35-C40	<0.1 mg/kg	TM173	0.911						
Aliphatics >C40-C44	<0.1 mg/kg	TM173	0.148						
Total Aromatics >EC12-EC35	<0.1 mg/kg	TM173	54.8						
Total Aliphatics >C12-C35	<0.1 mg/kg	TM173	42.9						
Total Aliphatics >C12-C40	<0.1 mg/kg	TM173	43.8						
Total Aromatics >EC12-EC40	<0.1 mg/kg	TM173	60.1						
Total Aliphatics & Aromatics >C12-C44	<0.1 mg/kg	TM173	107						

**SDG:** 110218-44  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117809  
**Superseded Report:**

**VOC MS (S)**

Results Legend		Customer Sample R		BH103					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	2.20 - 2.40 Soil/Solid 17/02/2011 18/02/2011 110218-44 2897885						
M	mCERTS accredited.								
§	Non-conforming work.								
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.								
Component	LOD/Units			Method					
Toluene-d8**	%	TM116	87.3						
Methyl Tertiary Butyl Ether	<0.011 mg/kg	TM116	<0.011	M					
Benzene	<0.009 mg/kg	TM116	<0.009	M					
Toluene	<0.005 mg/kg	TM116	0.0198	M					
Ethylbenzene	<0.004 mg/kg	TM116	0.0519	M					
p/m-Xylene	<0.014 mg/kg	TM116	0.0277	#					
o-Xylene	<0.01 mg/kg	TM116	0.0135	M					

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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

**SDG:** 110218-44  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117809  
**Superseded Report:**

### Test Completion Dates

Lab Sample No(s)	2897840	2897880	2897885
Customer Sample Ref.	BH103	BH103	BH103
AGS Ref.			
Depth	1.50 - 1.70	3.10 - 3.30	2.20 - 2.40
Type	SOLID	SOLID	SOLID
Anions by Kone (soil)	22-Feb-2011		
Asbestos Containing Material Screen	18-Feb-2011		
Cyanide Comp/Free/Total/Thiocyanate	21-Feb-2011		
Easily Liberated Sulphide	21-Feb-2011		
EPH CWG (Aliphatic) GC (S)	23-Feb-2011		22-Feb-2011
EPH CWG (Aromatic) GC (S)	23-Feb-2011		22-Feb-2011
GRO by GC-FID (S)	24-Feb-2011		24-Feb-2011
Metals by iCap-OES (Soil)	23-Feb-2011		
Oxygenates (S)			25-Feb-2011
PAH by GCMS	22-Feb-2011		22-Feb-2011
pH	18-Feb-2011	18-Feb-2011	
Phenols by HPLC (S)	22-Feb-2011		
Sample description	18-Feb-2011	18-Feb-2011	18-Feb-2011
Total Organic Carbon		22-Feb-2011	
Total Sulphate	24-Feb-2011		
TPH CWG GC (S)	24-Feb-2011		24-Feb-2011
VOC MS (S)			22-Feb-2011

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
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Order Number:  
 Report Number: 117809  
 Superseded Report:

**ASSOCIATED AQC DATA**

Anions by Kone (soil)

Component	Method Code	QC 20
Chloride (soluble)	TM243	<b>97.47</b> 78.07 : 121.93
Water Soluble Sulphate as SO4 2:1 Extract	TM243	<b>96.68</b> 91.36 : 106.23

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 20
Free Cyanide	TM153	<b>102.76</b> 87.04 : 107.05
Thiocyanate	TM153	<b>105.89</b> 90.22 : 111.93
Total Cyanide	TM153	<b>95.44</b> 77.00 : 112.12

Easily Liberated Sulphide

Component	Method Code	QC 25
Easily Liberated Sulphide	TM180	<b>68.20</b> 44.43 : 127.23

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 21	QC 29
Total Aliphatics >C12-C35	TM173	<b>87.37</b> 69.61 : 98.11	<b>86.27</b> 64.28 : 103.38

EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 21	QC 29
Total Aromatics >EC12-EC35	TM173	<b>88.62</b> 72.46 : 119.87	<b>83.78</b> 66.16 : 121.82

Metals by iCap-OES (Soil)

Component	Method Code	QC 25
Aluminium	TM181	<b>117.46</b> 94.29 : 126.83
Antimony	TM181	<b>101.60</b> 80.62 : 119.38

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

Metals by iCap-OES (Soil)

		QC 25
Arsenic	TM181	<b>107.32</b> 93.78 : 118.04
Barium	TM181	<b>112.19</b> 92.15 : 121.48
Beryllium	TM181	<b>103.61</b> 93.37 : 106.63
Boron	TM181	<b>100.45</b> 71.45 : 144.21
Cadmium	TM181	<b>97.23</b> 83.47 : 108.02
Chromium	TM181	<b>102.05</b> 86.66 : 111.67
Cobalt	TM181	<b>106.57</b> 91.65 : 115.98
Copper	TM181	<b>106.41</b> 90.86 : 109.48
Iron	TM181	<b>109.02</b> 100.21 : 121.44
Lead	TM181	<b>95.23</b> 81.17 : 121.35
Manganese	TM181	<b>95.34</b> 88.94 : 103.43
Mercury	TM181	<b>109.40</b> 96.85 : 124.11
Molybdenum	TM181	<b>97.15</b> 83.94 : 116.06
Nickel	TM181	<b>100.76</b> 83.34 : 114.35
Phosphorus	TM181	<b>98.56</b> 85.62 : 116.58
Selenium	TM181	<b>106.55</b> 100.15 : 123.30
Strontium	TM181	<b>104.15</b> 89.82 : 110.49
Thallium	TM181	<b>102.91</b> 93.51 : 130.39
Tin	TM181	<b>100.20</b> 89.71 : 110.91
Titanium	TM181	<b>92.81</b> 78.57 : 125.05
Vanadium	TM181	<b>105.11</b> 91.61 : 110.18
Zinc	TM181	<b>96.44</b> 83.65 : 103.15

PAH by GCMS

Component	Method Code	QC 21
Acenaphthene	TM218	<b>91.67</b> 77.12 : 112.00
Acenaphthylene	TM218	<b>81.19</b> 67.85 : 104.34
Anthracene	TM218	<b>86.45</b> 70.38 : 106.86



SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

PAH by GCMS

		QC 21
Benz(a)anthracene	TM218	<b>91.74</b> 75.93 : 121.42
Benzo(a)pyrene	TM218	<b>93.20</b> 75.48 : 121.80
Benzo(b)fluoranthene	TM218	<b>93.57</b> 78.12 : 121.99
Benzo(ghi)perylene	TM218	<b>94.18</b> 78.41 : 115.87
Benzo(k)fluoranthene	TM218	<b>94.49</b> 77.71 : 116.48
Chrysene	TM218	<b>94.73</b> 78.09 : 115.69
Dibenzo(ah)anthracene	TM218	<b>93.79</b> 76.81 : 115.89
Fluoranthene	TM218	<b>89.50</b> 74.24 : 114.09
Fluorene	TM218	<b>88.82</b> 73.88 : 111.54
Indeno(123cd)pyrene	TM218	<b>93.80</b> 76.77 : 119.38
Naphthalene	TM218	<b>92.44</b> 76.04 : 107.88
Phenanthrene	TM218	<b>90.45</b> 74.34 : 113.46
Pyrene	TM218	<b>90.00</b> 74.69 : 113.49

pH

Component	Method Code	QC 20
pH	TM133	<b>98.37</b> 96.84 : 100.64

Phenols by HPLC (S)

Component	Method Code	QC 22
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>104.79</b> 85.13 : 105.17
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>100.60</b> 87.06 : 106.06
Catechol by HPLC (S)	TM062 (S)	<b>67.07</b> 27.40 : 94.47
Cresols by HPLC (S)	TM062 (S)	<b>96.61</b> 83.33 : 100.99
Naphthol by HPLC (S)	TM062 (S)	<b>95.21</b> 55.65 : 110.94
Phenol by HPLC (S)	TM062 (S)	<b>98.20</b> 83.94 : 101.65
Resorcinol HPLC (S)	TM062 (S)	<b>103.59</b> 83.97 : 105.22

SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

Phenols by HPLC (S)

		QC 22
Xylenols by HPLC (S)	TM062 (S)	<b>102.20</b> 83.64 : 102.70

Total Organic Carbon

Component	Method Code	QC 26
Total Organic Carbon	TM132	<b>101.06</b> 88.75 : 104.70

Total Sulphate

Component	Method Code	QC 20
Total Sulphate	TM221	<b>90.40</b> 80.05 : 95.26

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.  
 The figure detailed is the percentage recovery result for the AQC.  
 The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110218-44  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 117809  
Superseded Report:

# Chromatogram

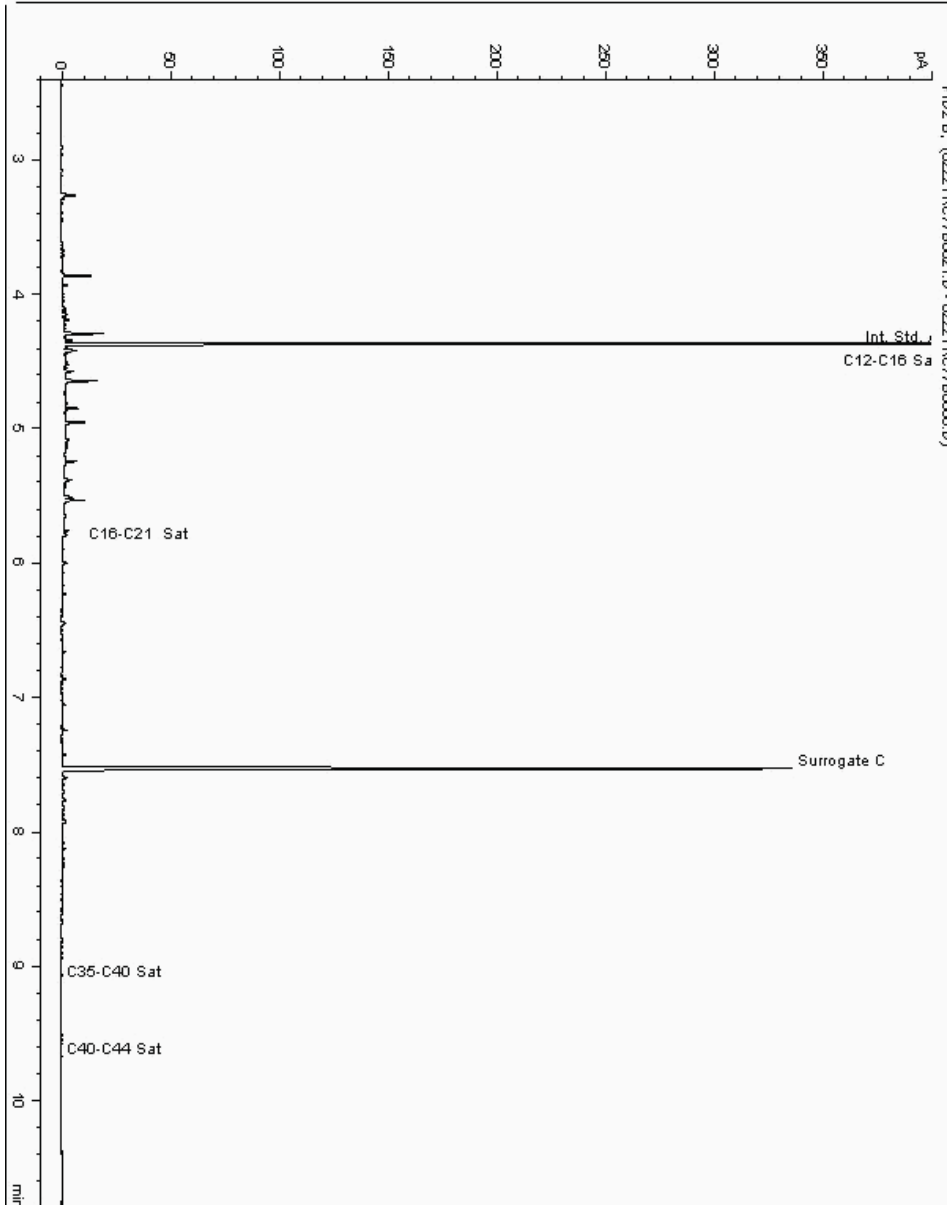
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 2910631  
Sample ID : BH103

Depth : 2.20 - 2.40

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

Sample Identity: 2967313-2910631  
Date Acquired : 22/02/11 18:40:45 PM  
Units : ppb  
Dilution:



SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

# Chromatogram

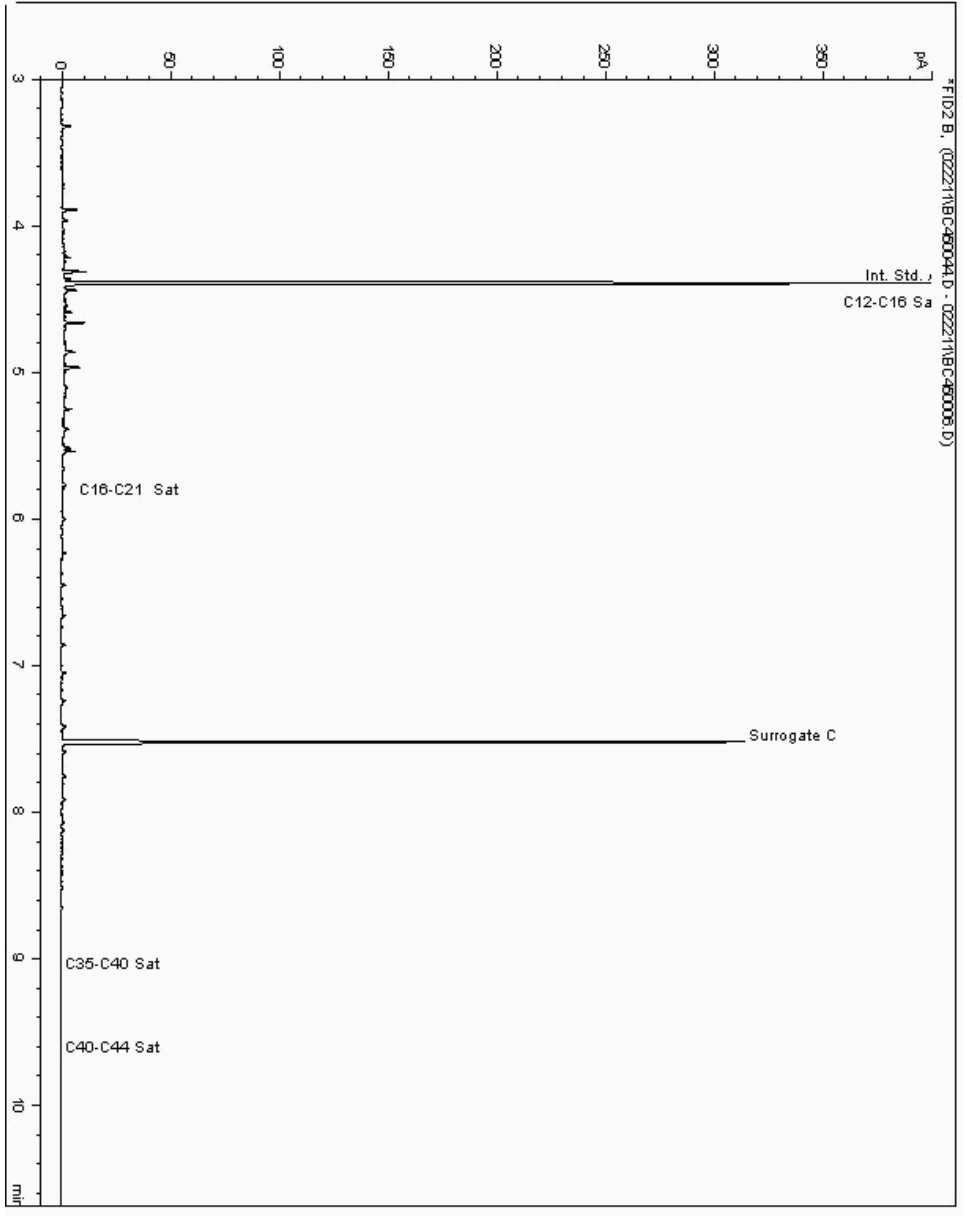
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2912747  
 Sample ID: BH103

Depth: 1.50 - 1.70

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

Sample Identity: 2967244-2912747  
 Date Acquired : 23/02/11 09:35:25 PM  
 Units : ppb  
 Dilution:



SDG: 110218-44  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117809  
 Superseded Report:

# Chromatogram

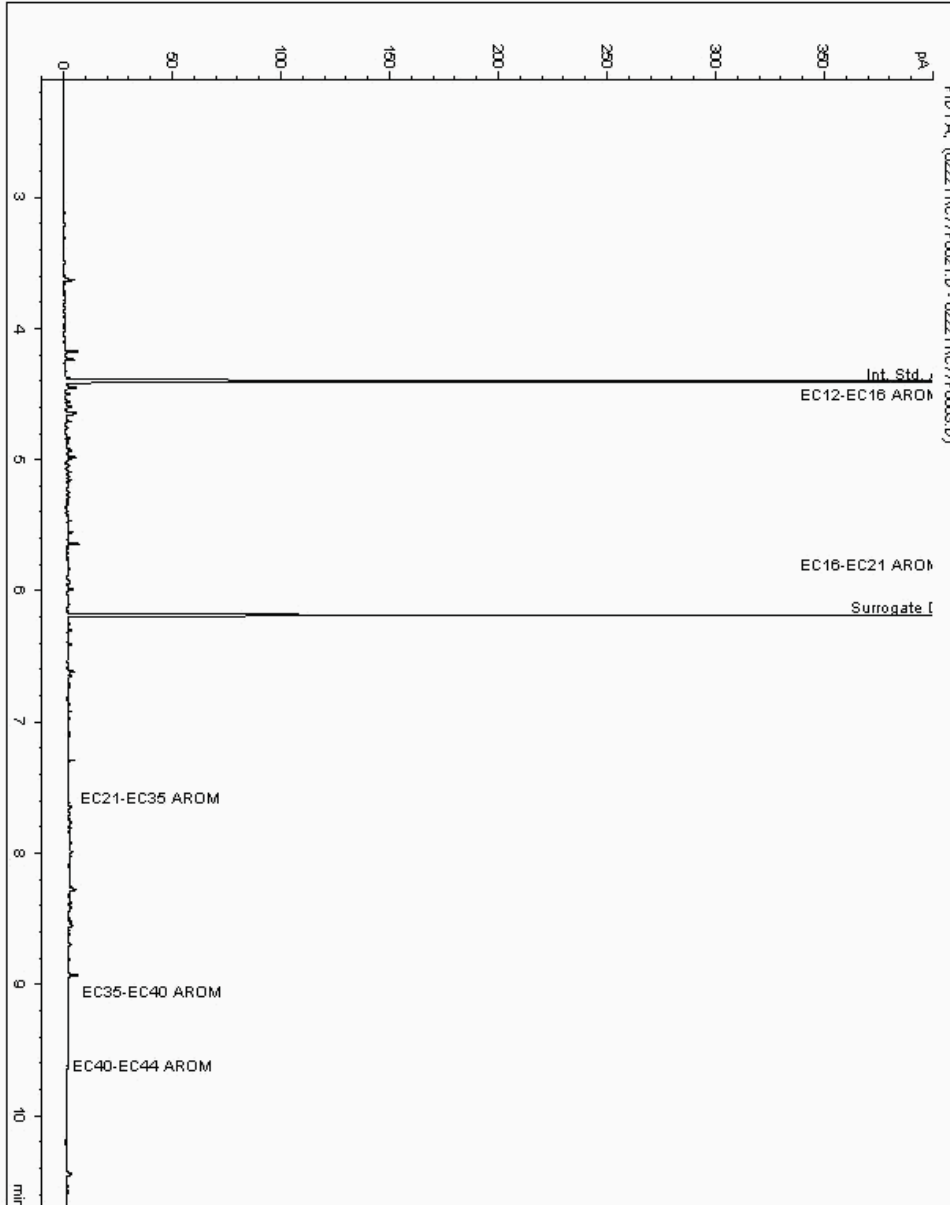
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2910631  
 Sample ID : BH103

Depth : 2.20 - 2.40

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

Sample Identity: 2967314-2910631  
 Date Acquired : 22/02/11 18:40:45 PM  
 Units : ppb  
 Dilution:



SDG: 110218-44  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 117809  
Superseded Report:

# Chromatogram

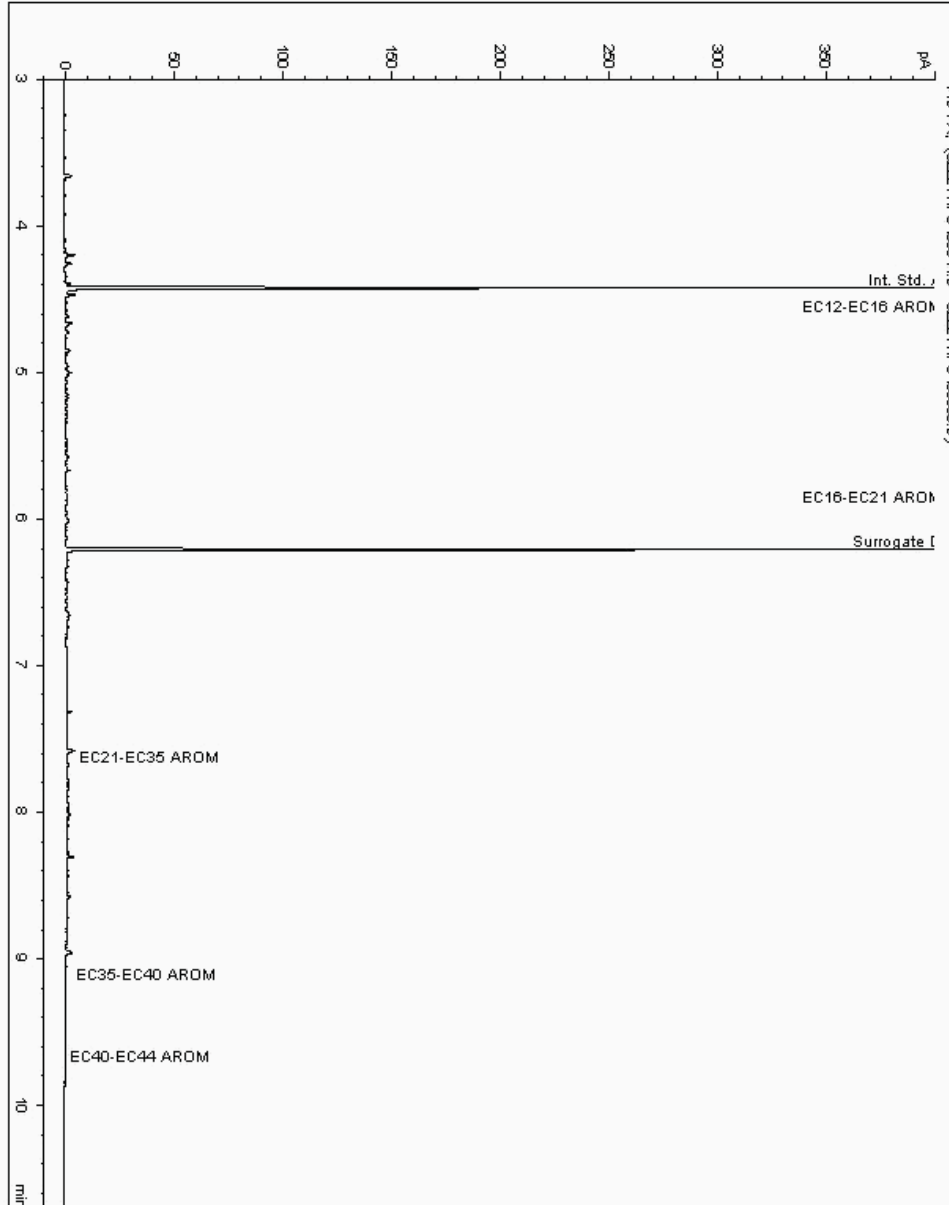
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2912747  
Sample ID: BH103

Depth: 1.50 - 1.70

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

Sample Identity: 2967245-2912747  
Date Acquired : 23/02/11 09:35:25 PM  
Units : ppb  
Dilution:



SDG: 110218-44  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

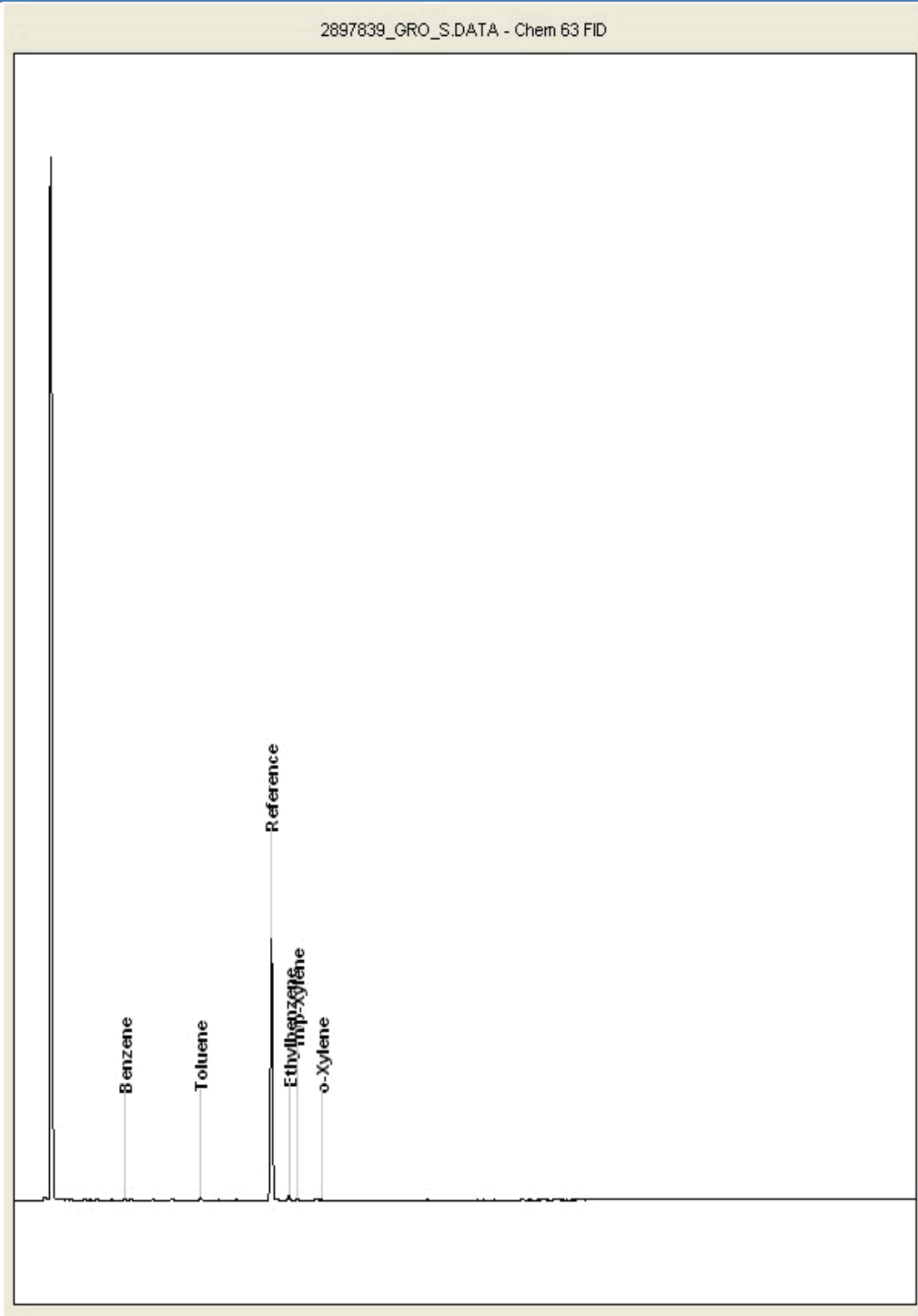
Order Number:  
Report Number: 117809  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2897839  
Sample ID : BH103

Depth : 1.50 - 1.70



SDG: 110218-44  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

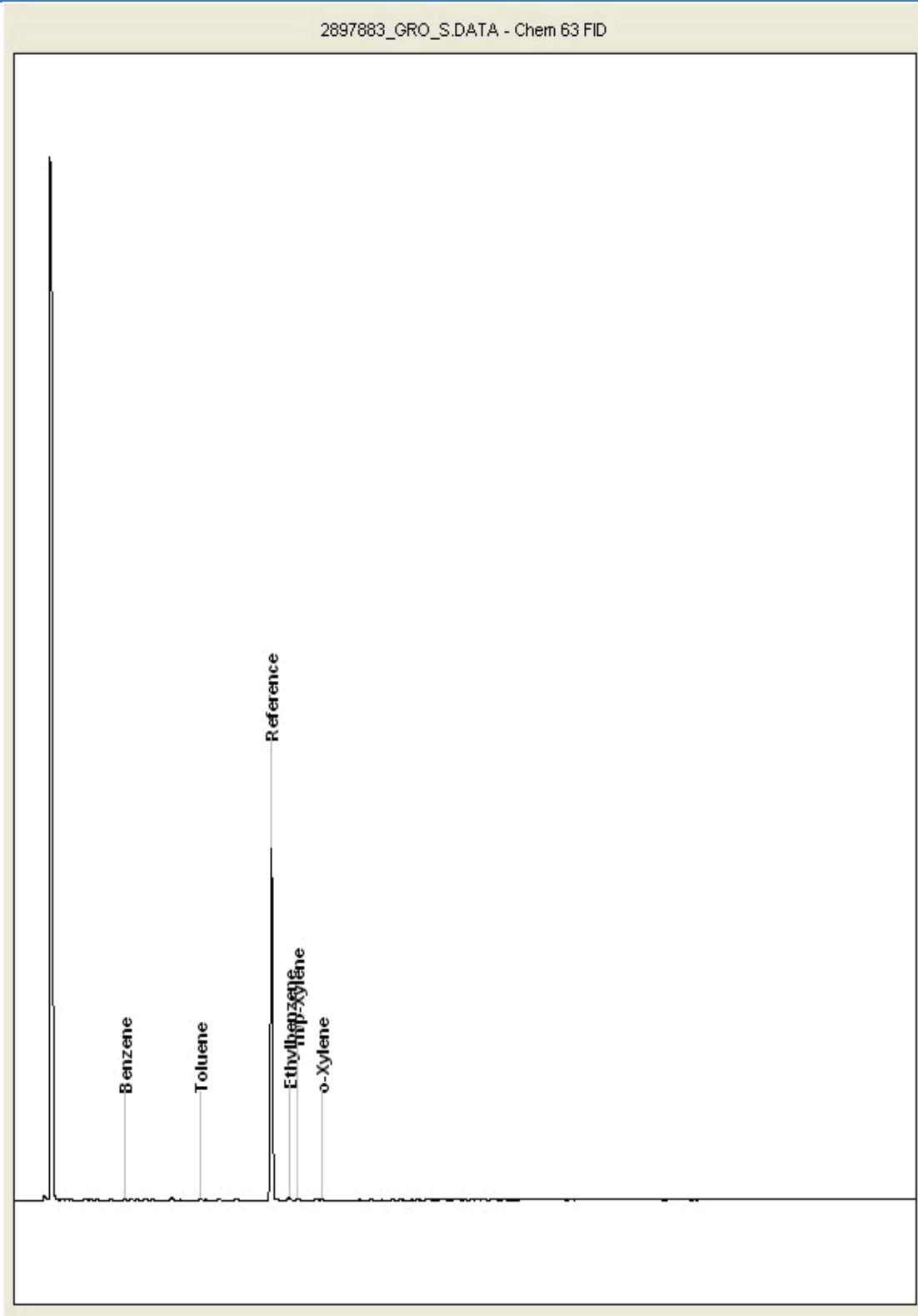
Order Number:  
Report Number: 117809  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2897883  
Sample ID : BH103

Depth : 2.20 - 2.40





**SDG:** 110218-44  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Labadmin

**Order Number:**  
**Report Number:** 117809  
**Superseded Report:**

## 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<sub>4</sub> 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXTERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXTERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXTERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXTERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH O/G BY GC	D&C	HEXANE/ACETONE	END OVER/END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER/END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRREXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRREXTRACTION (STIR-BAR)	GC FID
EPH O/G	HEXANE	STIRREXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRREXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRREXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRREXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### 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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:**

## CERTIFICATE OF ANALYSIS

**Date:** 22 February 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110217-3  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 117296

We received 4 samples on Thursday February 17, 2011 and 2 of these samples were scheduled for analysis which was completed on Tuesday February 22, 2011. 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:

**Sonia McWhan**

Operations Manager



1291  
GROUP

**SDG:** 110217-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117296  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2885189	BH105		3.80 - 4.00	16/02/2011
2885190	BH106		0.20 - 0.60	16/02/2011
2885191	BH106		0.60 - 0.80	16/02/2011
2885192	BH109		1.60 - 2.00	16/02/2011

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

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

SOLID Results Legend  <span style="background-color: yellow; border: 1px solid black; padding: 2px;">X</span> Test <span style="background-color: red; color: white; border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	2885191	2885192
	Customer Sample Reference	BH106	BH109
	AGS Reference		
	Depth (m)	0.60 - 0.80	1.60 - 2.00
	Container	250g Amber Jar 1kg TUB	250g Amber Jar 1kg TUB
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	X
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 2	X X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1	X
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1	X
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1	X
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1	X
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 2	X X
	Barium	NDPs: 0 Tests: 1	X
	Beryllium	NDPs: 0 Tests: 1	X
	Cadmium	NDPs: 0 Tests: 2	X X
	Chromium	NDPs: 0 Tests: 2	X X
	Copper	NDPs: 0 Tests: 2	X X
	Lead	NDPs: 0 Tests: 2	X X
	Mercury	NDPs: 0 Tests: 2	X X

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

<b>SOLID</b> Results Legend X Test N No Determination Possible	Lab Sample No(s)		2885191	2885192
	Customer Sample Reference		BH106	BH109
	AGS Reference			
	Depth (m)		0.60 - 0.80	1.60 - 2.00
	Container		250g Amber Jar 1kg TUB	60g VOC 250g Amber Jar 1kg TUB
Metals by iCap-OES (Soil)	Molybdenum	NDPs: 0 Tests: 1		X
	Nickel	NDPs: 0 Tests: 2	X	X
	Vanadium	NDPs: 0 Tests: 2	X	X
	Zinc	NDPs: 0 Tests: 2	X	X
Oxygenates (S)	All	NDPs: 0 Tests: 1		X
PAH by GCMS	All	NDPs: 0 Tests: 1		X
pH	All	NDPs: 0 Tests: 1	X	
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1	X	
Sample description	All	NDPs: 0 Tests: 2	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 1		X
Total Sulphate	All	NDPs: 0 Tests: 1		X
TPH CWG GC (S)	All	NDPs: 0 Tests: 1		X
VOC MS (S)	All	NDPs: 0 Tests: 1		X

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

### Sample Descriptions

**Grain Sizes**

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2885191	BH106	0.60 - 0.80	Dark Brown	Clay	<0.063 mm	Stones	None
2885192	BH109	1.60 - 2.00	Dark Brown	Clay Loam	0.063 - 0.1 mm	Stones	None

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.

CERTIFICATE OF ANALYSIS

**SDG:** 110217-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117296  
**Superseded Report:**

Results Legend		Customer Sample R		BH106	BH109				
#	ISO17025 accredited.	<b>Depth (m)</b> <b>Sample Type</b> <b>Date Sampled</b> <b>Date Received</b> <b>SDG Ref</b> <b>Lab Sample No.(s)</b> <b>AGS Reference</b>		0.60 - 0.80	1.60 - 2.00				
M	mCERTS accredited.			Soil/Solid	Soil/Solid				
S	Non-conforming work.								
aq	Aqueous / settled sample.			16/02/2011	16/02/2011				
diss.filt	Dissolved / filtered sample.			17/02/2011	17/02/2011				
tot.unfilt	Total / unfiltered sample.			110217-3	110217-3				
*	subcontracted test.			2885191	2885192				
**	% 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.								
Component	LOD/Units		Method						
Asbestos Containing Material Screen	-	TM001	No ACM Detected	No ACM Detected					
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)		<0.025 M					
Organic Carbon, Total	<0.2 %	TM132		2.69 #					
pH	1 pH Units	TM133		8.19 M					
Cyanide, Total	<1 mg/kg	TM153		13.6 M					
Cyanide, Free	<1 mg/kg	TM153		<1 M					
Sulphide, Easily liberated	<15 mg/kg	TM180		89.5 #					
Arsenic	<0.6 mg/kg	TM181	4.6 M	13.8 M					
Barium	<0.6 mg/kg	TM181		244 #					
Beryllium	<0.01 mg/kg	TM181	0.921 M						
Cadmium	<0.02 mg/kg	TM181		1.14 M					
Chromium	<0.9 mg/kg	TM181	29.1 M	30.1 M					
Copper	<1.4 mg/kg	TM181	18.9 M	86.4 M					
Lead	<0.7 mg/kg	TM181	13.5 M	281 M					
Mercury	<0.14 mg/kg	TM181	<0.14 M	<0.14 M					
Molybdenum	<0.1 mg/kg	TM181		0.614 #					
Nickel	<0.2 mg/kg	TM181		29.2 M					
Vanadium	<0.2 mg/kg	TM181	28.4 #	43.3 #					
Zinc	<1.9 mg/kg	TM181	46.6 M	351 M					
Sulphate, Total	<48 mg/kg	TM221		1130 M					
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243		0.234 M					
tert Butanol	<0.01 mg/kg	TM288		<0.01					
tert-butyl ethyl ether	<0.001 mg/kg	TM288		<0.001					

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

PAH by GCMS

Results Legend		Customer Sample R	BH109						
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.60 - 2.00 Soil/Solid 16/02/2011 17/02/2011 110217-3 2885192						
M	mCERTS accredited.								
S	Non-conforming work.								
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.								
Component	LOD/Units			Method					
Naphthalene-d8 % recovery**	%			TM218	96.4				
Acenaphthene-d10 % recovery**	%	TM218	94.9						
Phenanthrene-d10 % recovery**	%	TM218	89.2						
Chrysene-d12 % recovery**	%	TM218	92						
Perylene-d12 % recovery**	%	TM218	96						
Naphthalene	<0.009 mg/kg	TM218	0.955	M					
Acenaphthylene	<0.012 mg/kg	TM218	0.312	M					
Acenaphthene	<0.008 mg/kg	TM218	1.05	M					
Fluorene	<0.01 mg/kg	TM218	1.29	M					
Phenanthrene	<0.015 mg/kg	TM218	9.83	M					
Anthracene	<0.016 mg/kg	TM218	2.46	M					
Fluoranthene	<0.017 mg/kg	TM218	16.8	M					
Pyrene	<0.015 mg/kg	TM218	12.7	M					
Benz(a)anthracene	<0.014 mg/kg	TM218	8.72	M					
Chrysene	<0.01 mg/kg	TM218	7.42	M					
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	11.8	M					
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	3.95	M					
Benzo(a)pyrene	<0.015 mg/kg	TM218	8.72	M					
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	5.16	M					
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	1.76	M					
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	5.83	M					
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	98.8	M					



SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

TPH CWG (S)

Results Legend		Customer Sample R	BH109					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.60 - 2.00					
M	mCERTS accredited.		Soil/Solid					
S	Non-conforming work.		16/02/2011					
aq	Aqueous / settled sample.		17/02/2011					
diss.filt	Dissolved / filtered sample.		110217-3					
tot.unfilt	Total / unfiltered sample.		2885192					
*	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.							
Component	LOD/Units		Method					
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg		TM089	<0.005	#			
Benzene	<0.01 mg/kg	TM089	<0.01	M				
Aliphatics >C16-C35	<0.1 mg/kg	TM173	1140					
Toluene	<0.002 mg/kg	TM089	0.00372	M				
Ethylbenzene	<0.003 mg/kg	TM089	0.0062	M				
m,p-Xylene	<0.006 mg/kg	TM089	0.00744	M				
Total Aliphatics >C5-C44	<0.1 mg/kg	TM173	1300					
o-Xylene	<0.003 mg/kg	TM089	0.00372	M				
m,p,o-Xylene	<0.01 mg/kg	TM089	0.0112					
BTEX, Total	<0.01 mg/kg	TM089	0.0211					
Aliphatics >C5-C6	<0.01 mg/kg	TM089	0.0149					
Aliphatics >C6-C8	<0.01 mg/kg	TM089	0.0347					
Aliphatics >C8-C10	<0.01 mg/kg	TM089	0.0583					
Total Aromatics >C6-C44	<0.1 mg/kg	TM173	1070					
Aliphatics >C10-C12	<0.01 mg/kg	TM089	0.115					
Aliphatics >C12-C16	<0.1 mg/kg	TM173	68					
Aliphatics >C16-C21	<0.1 mg/kg	TM173	392					
Aliphatics >C21-C35	<0.1 mg/kg	TM173	744					
Aliphatics >C35-C44	<0.1 mg/kg	TM173	94.1					
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	1300					
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01					
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	<0.01					
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	0.057					
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	0.0769					
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	26.9					
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	185					
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	678					
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	180					
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	63.8					
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	1070					
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	2370					
Total Aliphatics >C5-C12	<0.01 mg/kg	TM089	0.223					
Total Aromatics >EC5-EC12	<0.01 mg/kg	TM089	0.141					
Aromatics >EC35-EC40	<0.1 mg/kg	TM173	116					
Aliphatics >C35-C40	<0.1 mg/kg	TM173	64.4					

**CERTIFICATE OF ANALYSIS**

**SDG:** 110217-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117296  
**Superseded Report:**

**TPH CWG (S)**

Results Legend		Customer Sample R	BH109				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.60 - 2.00 Soil/Solid 16/02/2011 17/02/2011 110217-3 2885192				
M	mCERTS accredited.						
§	Non-conforming work.						
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.						
Component	LOD/Units			Method			
Aliphatics >C40-C44	<0.1 mg/kg			TM173	29.7		
Total Aromatics >EC12-EC35	<0.1 mg/kg	TM173	890				
Total Aliphatics >C12-C35	<0.1 mg/kg	TM173	1200				
Total Aliphatics >C12-C40	<0.1 mg/kg	TM173	1270				
Total Aromatics >EC12-EC40	<0.1 mg/kg	TM173	1010				
Total Aliphatics & Aromatics >C12-C44	<0.1 mg/kg	TM173	2370				

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

 Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

 Order Number:  
 Report Number: 117296  
 Superseded Report:

**VOC MS (S)**

#	M	S	aq	diss.filt	tot.unfilt	*	**	Customer Sample R	Depth (m)	Sample Type	Date Sampled	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference							
<b>Results Legend</b> # ISO17025 accredited. M mCERTS accredited. S Non-conforming work. 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.								BH109														
<b>Component</b>	<b>LOD/Units</b>	<b>Method</b>																				
Toluene-d8**	%	TM116							1.60 - 2.00	Soil/Solid	16/02/2011	17/02/2011	110217-3	2885192								
Methyl Tertiary Butyl Ether	<0.011 mg/kg	TM116													M							
Benzene	<0.009 mg/kg	TM116													M							
Toluene	<0.005 mg/kg	TM116													M							
Ethylbenzene	<0.004 mg/kg	TM116													M							
p/m-Xylene	<0.014 mg/kg	TM116													#							
o-Xylene	<0.01 mg/kg	TM116													M							

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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

**SDG:** 110217-3  
**Job:** H\_ARCADIS\_NMK-340  
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**Location:** Simonside  
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**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117296  
**Superseded Report:**

### Test Completion Dates

Lab Sample No(s) Customer Sample Ref.	2885191	2885192
	BH106	BH109
AGS Ref.		
Depth	0.60 - 0.80	1.60 - 2.00
Type	SOLID	SOLID
Anions by Kone (soil)		18-Feb-2011
Asbestos Containing Material Screen	18-Feb-2011	17-Feb-2011
Cyanide Comp/Free/Total/Thiocyanate		18-Feb-2011
Easily Liberated Sulphide		21-Feb-2011
EPH CWG (Aliphatic) GC (S)		19-Feb-2011
EPH CWG (Aromatic) GC (S)		19-Feb-2011
GRO by GC-FID (S)		22-Feb-2011
Metals by iCap-OES (Soil)	22-Feb-2011	18-Feb-2011
Oxygenates (S)		21-Feb-2011
PAH by GCMS		19-Feb-2011
pH		18-Feb-2011
Phenols by HPLC (S)		18-Feb-2011
Sample description	18-Feb-2011	17-Feb-2011
Total Organic Carbon		21-Feb-2011
Total Sulphate		21-Feb-2011
TPH CWG GC (S)		22-Feb-2011
VOC MS (S)		22-Feb-2011

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
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Order Number:  
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 Superseded Report:

**ASSOCIATED AQC DATA**

Anions by Kone (soil)

Component	Method Code	QC 25
Chloride (soluble)	TM243	<b>92.89</b> 78.07 : 121.93
Water Soluble Sulphate as SO4 2:1 Extract	TM243	<b>96.43</b> 91.36 : 106.23

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 28
Free Cyanide	TM153	<b>103.32</b> 87.04 : 107.05
Thiocyanate	TM153	<b>103.74</b> 90.22 : 111.93
Total Cyanide	TM153	<b>101.67</b> 77.00 : 112.12

Easily Liberated Sulphide

Component	Method Code	QC 26
Easily Liberated Sulphide	TM180	<b>96.35</b> 44.43 : 127.23

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 20
Total Aliphatics >C12-C35	TM173	<b>84.01</b> 64.28 : 103.38

EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 20
Total Aromatics >EC12-EC35	TM173	<b>94.06</b> 66.16 : 121.82

Metals by iCap-OES (Soil)

Component	Method Code	QC 25	QC 20
Aluminium	TM181	<b>114.64</b> 99.74 : 133.84	<b>131.49</b> 99.42 : 133.41
Antimony	TM181	<b>92.50</b> 95.73 : 132.37	<b>123.33</b> 84.02 : 116.19

SDG: 110217-3  
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Location: Simonside  
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Order Number:  
 Report Number: 117296  
 Superseded Report:

Metals by iCap-OES (Soil)

		QC 25	QC 20
Arsenic	TM181	<b>107.15</b> 92.13 : 124.49	<b>115.42</b> 92.22 : 124.62
Barium	TM181	<b>108.57</b> 99.87 : 124.97	<b>110.33</b> -1.31 : 23.83
Beryllium	TM181	<b>93.07</b> 83.56 : 132.08	<b>104.49</b> 83.56 : 132.08
Boron	TM181	<b>106.89</b> 83.10 : 149.49	<b>147.36</b> 82.88 : 149.11
Cadmium	TM181	<b>96.43</b> 99.32 : 120.68	<b>105.89</b> 86.94 : 105.63
Chromium	TM181	<b>97.52</b> 89.88 : 120.16	<b>112.68</b> 89.76 : 120.00
Cobalt	TM181	<b>103.82</b> 94.73 : 120.59	<b>112.70</b> 94.43 : 120.21
Copper	TM181	<b>97.37</b> 93.26 : 114.97	<b>102.30</b> 93.32 : 115.05
Iron	TM181	<b>107.57</b> 100.19 : 127.85	<b>119.60</b> 99.77 : 127.31
Lead	TM181	<b>96.17</b> 81.63 : 123.21	<b>108.93</b> 81.75 : 123.40
Manganese	TM181	<b>94.69</b> 89.87 : 108.44	<b>106.41</b> 89.95 : 108.54
Mercury	TM181	<b>109.05</b> 101.30 : 128.70	<b>121.44</b> 101.30 : 128.70
Molybdenum	TM181	<b>95.60</b> 96.32 : 127.40	<b>122.57</b> 84.02 : 111.13
Nickel	TM181	<b>95.42</b> 88.13 : 116.85	<b>120.00</b> 88.14 : 116.87
Phosphorus	TM181	<b>93.96</b> 89.03 : 113.27	<b>120.34</b> 89.00 : 113.23
Selenium	TM181	<b>110.79</b> 95.46 : 126.52	<b>112.90</b> 95.45 : 126.51
Strontium	TM181	<b>103.19</b> 91.79 : 123.61	<b>115.93</b> 91.88 : 123.72
Thallium	TM181	<b>102.37</b> 81.67 : 125.57	<b>132.99</b> 81.64 : 125.52
Tin	TM181	<b>96.16</b> 97.01 : 132.90	<b>105.33</b> 84.94 : 116.37
Titanium	TM181	<b>121.85</b> 87.17 : 133.97	<b>113.11</b> 87.06 : 133.82
Vanadium	TM181	<b>100.66</b> 93.04 : 119.76	<b>111.31</b> 89.94 : 123.16
Zinc	TM181	<b>90.52</b> 82.78 : 113.72	<b>105.28</b> 82.72 : 113.65

PAH by GCMS

Component	Method Code	QC 23
Acenaphthene	TM218	<b>96.16</b> 76.67 : 113.81
Acenaphthylene	TM218	<b>87.08</b> 69.48 : 103.60
Anthracene	TM218	<b>92.58</b> 72.34 : 105.79

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
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Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
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Order Number:  
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PAH by GCMS

		QC 23
Benz(a)anthracene	TM218	<b>100.35</b> 78.05 : 118.23
Benzo(a)pyrene	TM218	<b>102.10</b> 71.76 : 115.28
Benzo(b)fluoranthene	TM218	<b>103.58</b> 75.47 : 118.01
Benzo(ghi)perylene	TM218	<b>100.08</b> 80.11 : 115.32
Benzo(k)fluoranthene	TM218	<b>100.40</b> 74.80 : 111.82
Chrysene	TM218	<b>102.09</b> 77.72 : 118.70
Dibenzo(ah)anthracene	TM218	<b>99.83</b> 81.32 : 115.59
Fluoranthene	TM218	<b>96.88</b> 80.57 : 113.55
Fluorene	TM218	<b>94.03</b> 75.59 : 110.55
Indeno(123cd)pyrene	TM218	<b>100.58</b> 74.93 : 117.17
Naphthalene	TM218	<b>92.56</b> 77.08 : 108.74
Phenanthrene	TM218	<b>95.92</b> 80.57 : 113.47
Pyrene	TM218	<b>96.59</b> 77.64 : 113.40

pH

Component	Method Code	QC 26
pH	TM133	<b>99.75</b> 98.46 : 102.30

Phenols by HPLC (S)

Component	Method Code	QC 28
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>97.01</b> 85.54 : 103.30
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>100.00</b> 86.02 : 103.87
Catechol by HPLC (S)	TM062 (S)	<b>65.27</b> 27.23 : 80.19
Cresols by HPLC (S)	TM062 (S)	<b>94.81</b> 79.99 : 98.02
Naphthol by HPLC (S)	TM062 (S)	<b>91.62</b> 63.74 : 104.78
Phenol by HPLC (S)	TM062 (S)	<b>95.21</b> 81.28 : 100.85
Resorcinol HPLC (S)	TM062 (S)	<b>92.81</b> 80.50 : 98.19



SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

Phenols by HPLC (S)

		QC 28
Xylenols by HPLC (S)	TM062 (S)	<b>95.01</b> 86.98 : 101.98

Total Organic Carbon

Component	Method Code	QC 25
Total Organic Carbon	TM132	<b>96.19</b> 88.75 : 104.70

Total Sulphate

Component	Method Code	QC 21
Total Sulphate	TM221	<b>82.08</b> 80.05 : 95.26

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

# Chromatogram

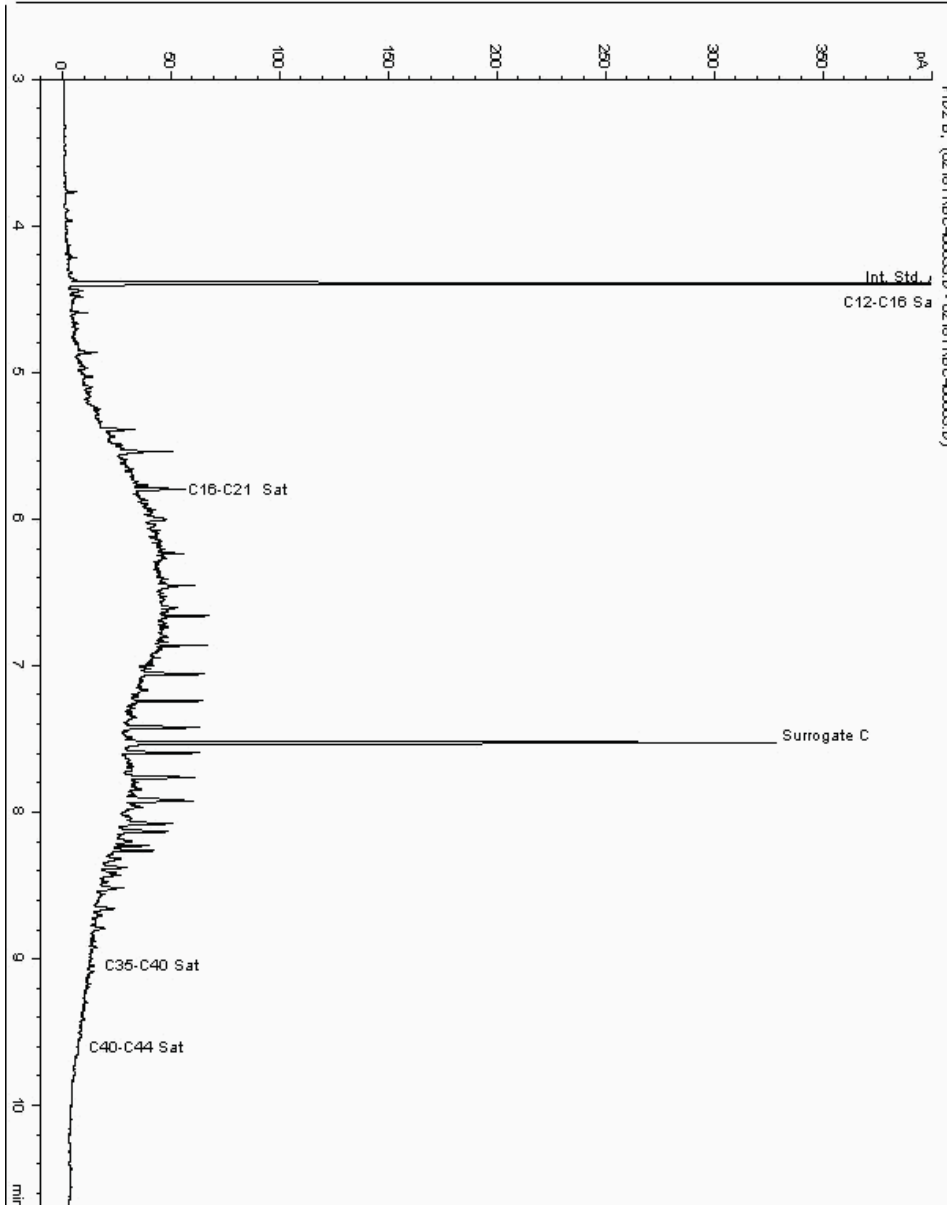
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2895369  
 Sample ID: BH109

Depth: 1.60 - 2.00

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

Sample Identity: 2956516-2895369  
 Date Acquired : 19/02/11 05:01:12 PM  
 Units : ppb  
 Dilution:



SDG: 110217-3  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117296  
 Superseded Report:

# Chromatogram

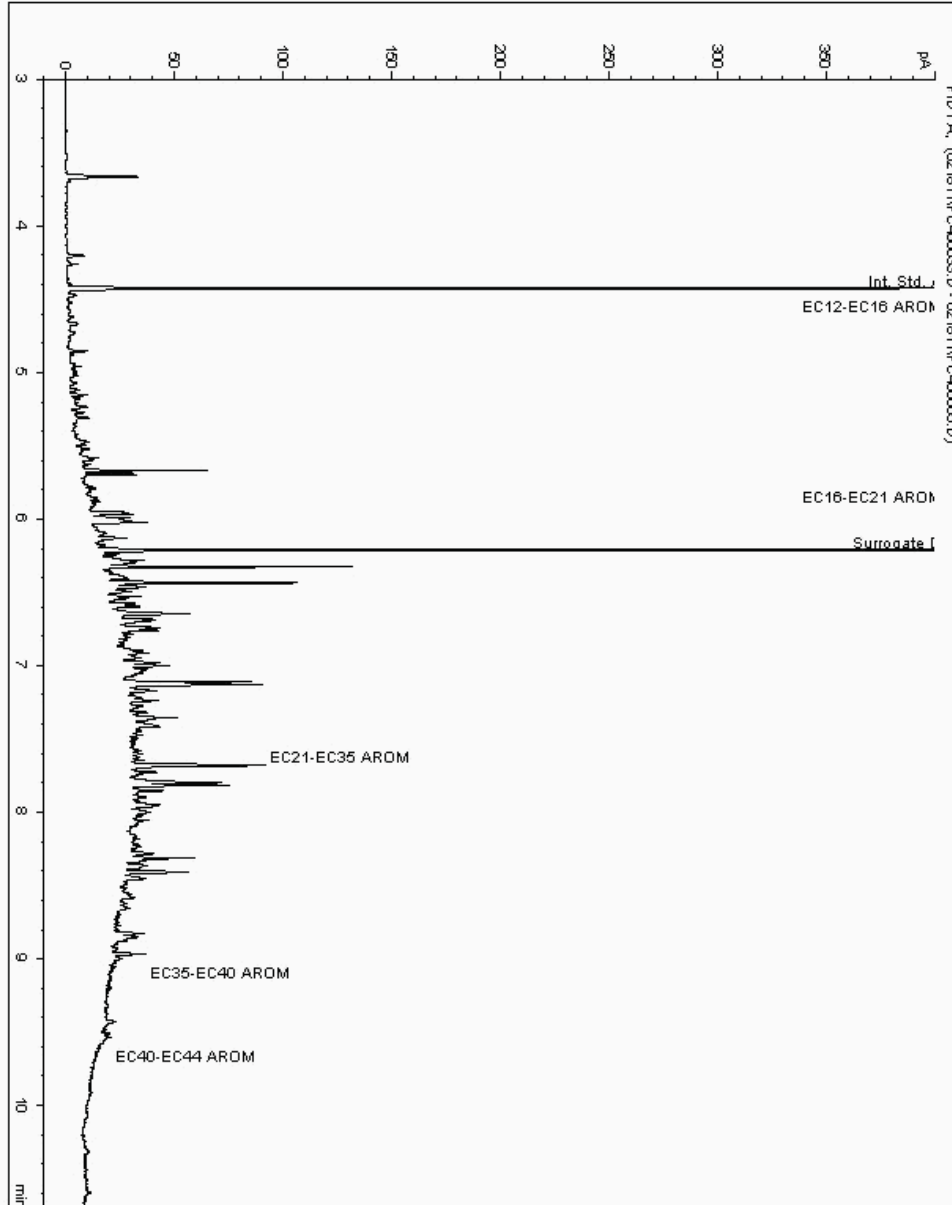
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 2895369  
 Sample ID : BH109

Depth : 1.60 - 2.00

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

Sample Identity: 2956517-2895369  
 Date Acquired : 19/02/11 05:01:12 PM  
 Units : ppb  
 Dilution:



SDG: 110217-3  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

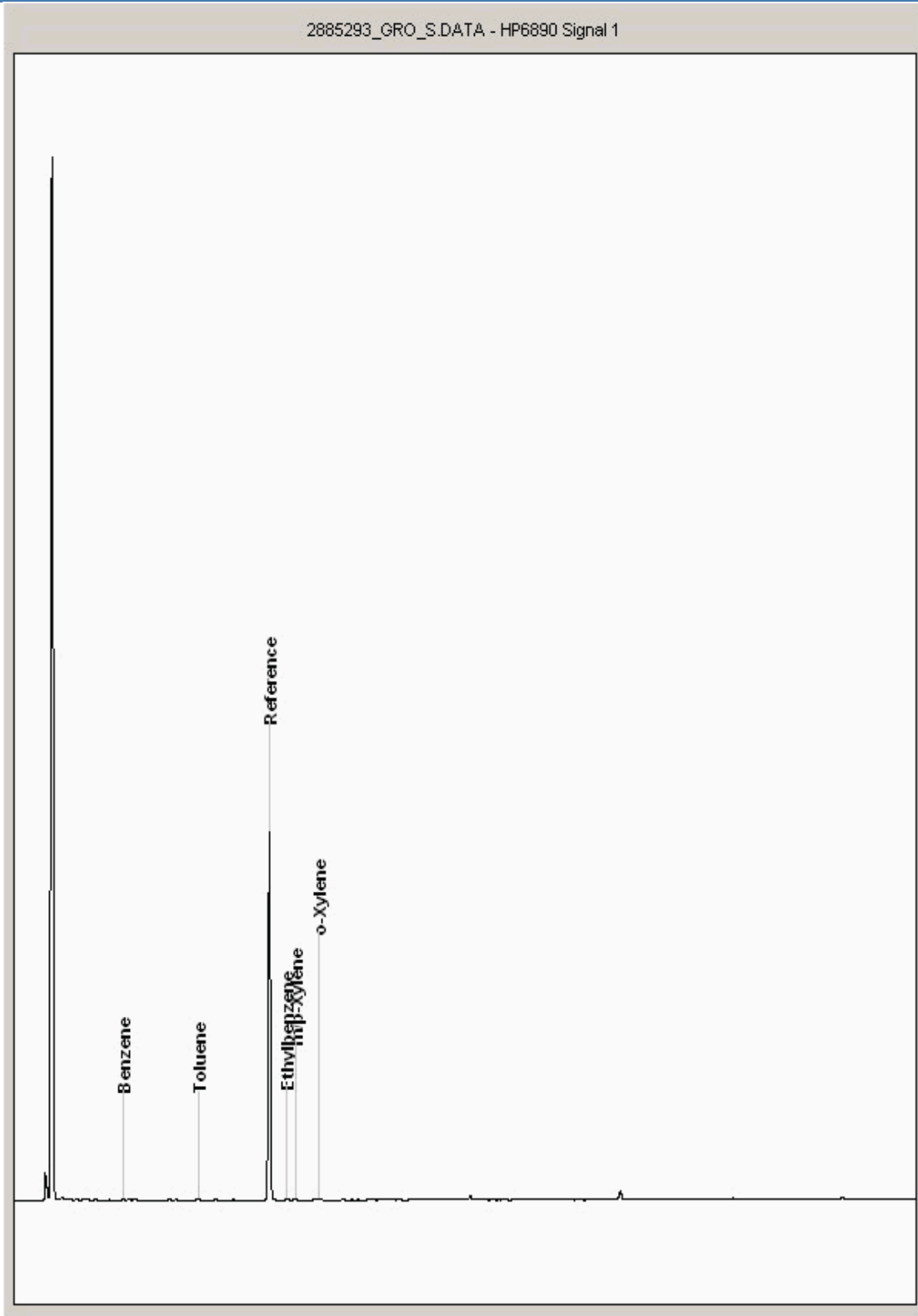
Order Number:  
Report Number: 117296  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2885293  
Sample ID : BH109

Depth : 1.60 - 2.00



**SDG:** 110217-3  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117296  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXTERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXTERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXTERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXTERM	GCMS
HERBICIDES	D&C	HEXANE ACETONE	SOXTERM	GCMS
PESTICIDES	D&C	HEXANE ACETONE	SOXTERM	GCMS
EPH (GRO)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH (MNOL)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE ACETONE	END OVER END	GCFID
EPH O/G BY GC	D&C	HEXANE ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH O/G	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### 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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:**

## CERTIFICATE OF ANALYSIS

**Date:** 22 February 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110216-16  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 117343

We received 4 samples on Wednesday February 16, 2011 and 4 of these samples were scheduled for analysis which was completed on Tuesday February 22, 2011. 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:

**Sonia McWhan**

Operations Manager



1291  
GROUP

**SDG:** 110216-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117343  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2878004	BH104		1.50 - 1.60	15/02/2011
2878005	BH104		2.50 - 2.60	15/02/2011
2878006	BH105		1.80 - 1.90	15/02/2011
2878008	BH105		2.80 - 2.90	15/02/2011

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

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

SOLID Results Legend  Test No Determination Possible	Lab Sample No(s)	2878008	2878006	2878005	2878004
	Customer Sample Reference	BH105	BH105	BH104	BH104
	AGS Reference				
	Depth (m)	2.80 - 2.90	1.80 - 1.90	2.50 - 2.60	1.50 - 1.60
	Container	60g VOC 250g Amber Jar	60g VOC 250g Amber Jar	1kg TUB 250g Amber Jar	60g VOC 250g Amber Jar
Anions by Kone (soil)	All	NDPs: 0 Tests: 1			
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 2			
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 2			
Easily Liberated Sulphide	All	NDPs: 0 Tests: 2			
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 3			
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 3			
GRO by GC-FID (S)	All	NDPs: 0 Tests: 3			
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 1			
	Barium	NDPs: 0 Tests: 1			
	Cadmium	NDPs: 0 Tests: 1			
	Chromium	NDPs: 0 Tests: 1			
	Copper	NDPs: 0 Tests: 1			
	Lead	NDPs: 0 Tests: 1			
	Mercury	NDPs: 0 Tests: 1			
	Molybdenum	NDPs: 0 Tests: 1			



SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

SOLID Results Legend  <span style="border: 1px solid black; padding: 2px;">X</span> Test  <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	2878008	2878006	2878005	2878004
	Customer Sample Reference	BH105	BH105	BH104	BH104
	AGS Reference				
	Depth (m)	2.80 - 2.90	1.80 - 1.90	2.50 - 2.60	1.50 - 1.60
	Container	60g VOC 250g Amber Jar	60g VOC 250g Amber Jar	1kg TUB 250g Amber Jar	60g VOC 250g Amber Jar
Metals by iCap-OES (Soil)	Nickel	NDPs: 0 Tests: 1		X	
	Vanadium	NDPs: 0 Tests: 1		X	
	Zinc	NDPs: 0 Tests: 1		X	
Oxygenates (S)	All	NDPs: 0 Tests: 3	X	X	X
PAH by GCMS	All	NDPs: 0 Tests: 3	X	X	X
pH	All	NDPs: 0 Tests: 4	X	X	X
Phenols by HPLC (S)	All	NDPs: 0 Tests: 2	X	X	
Sample description	All	NDPs: 0 Tests: 4	X	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 2	X		X
Total Sulphate	All	NDPs: 0 Tests: 1		X	
TPH CWG GC (S)	All	NDPs: 0 Tests: 3	X	X	X
VOC MS (S)	All	NDPs: 0 Tests: 3	X	X	X

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Sample Descriptions

**Grain Sizes**

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

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2878004	BH104	1.50 - 1.60	Light Brown	Sandy Silt Loam	0.1 - 2 mm	Stones	None
2878005	BH104	2.50 - 2.60	Dark Brown	Clay	<0.063 mm	Stones	None
2878006	BH105	1.80 - 1.90	Light Brown	Silty Clay Loam	0.063 - 0.1 mm	None	None
2878008	BH105	2.80 - 2.90	Dark Brown	Clay	<0.063 mm	Stones	None

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:** 110216-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117343  
**Superseded Report:**

Results Legend		Customer Sample R		BH104	BH104	BH105	BH105	
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	BH104	BH104	BH105	BH105		
M	mCERTS accredited.		1.50 - 1.60	2.50 - 2.60	1.80 - 1.90	2.80 - 2.90		
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
aq	Aqueous / settled sample.		15/02/2011	15/02/2011	15/02/2011	15/02/2011		
diss.filt	Dissolved / filtered sample.		16/02/2011	16/02/2011	16/02/2011	16/02/2011		
tot.unfilt	Total / unfiltered sample.		110216-16	110216-16	110216-16	110216-16		
*	subcontracted test.		2878004	2878005	2878006	2878008		
**	% 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.							
Component	LOD/Units		Method					
Asbestos Containing Material Screen	-		TM001	No ACM Detected		No ACM Detected		
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)	<0.025		<0.025			
Organic Carbon, Total	<0.2 %	TM132		1.58 #		1.46 #		
pH	1 pH Units	TM133	9.79	8.86	8.7	8.91		
Cyanide, Total	<1 mg/kg	TM153	<1		<1			
Cyanide, Free	<1 mg/kg	TM153	<1		<1			
Sulphide, Easily liberated	<15 mg/kg	TM180	<15		<15			
Arsenic	<0.6 mg/kg	TM181			4.93			
Barium	<0.6 mg/kg	TM181			214			
Cadmium	<0.02 mg/kg	TM181			<0.02			
Chromium	<0.9 mg/kg	TM181			31.2			
Copper	<1.4 mg/kg	TM181			17.9			
Lead	<0.7 mg/kg	TM181			11.7			
Mercury	<0.14 mg/kg	TM181			<0.14			
Molybdenum	<0.1 mg/kg	TM181			<0.1			
Nickel	<0.2 mg/kg	TM181			33.5			
Vanadium	<0.2 mg/kg	TM181			30			
Zinc	<1.9 mg/kg	TM181			60.7			
Sulphate, Total	<48 mg/kg	TM221			573			
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243			0.0506			
tert Butanol	<0.01 mg/kg	TM288	<0.01		<0.01	<0.01		
tert-butyl ethyl ether	<0.001 mg/kg	TM288	<0.001		<0.001	<0.001		

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

PAH by GCMS

Results Legend		Customer Sample R	BH104	BH105	BH105				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.50 - 1.60	1.80 - 1.90	2.80 - 2.90				
M	mCERTS accredited.		Soil/Solid	Soil/Solid	Soil/Solid				
S	Non-conforming work.		15/02/2011	15/02/2011	15/02/2011				
aq	Aqueous / settled sample.		16/02/2011	16/02/2011	16/02/2011				
diss.filt	Dissolved / filtered sample.		110216-16	110216-16	110216-16				
tot.unfilt	Total / unfiltered sample.		2878004	2878006	2878008				
*	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.								
Component	LOD/Units		Method						
Naphthalene-d8 % recovery**	%		TM218	88.2	95.1	86			
Acenaphthene-d10 % recovery**	%	TM218	89	96.4	85.2				
Phenanthrene-d10 % recovery**	%	TM218	90.2	97.7	84.1				
Chrysene-d12 % recovery**	%	TM218	86.2	94	80.4				
Perylene-d12 % recovery**	%	TM218	102	111	86				
Naphthalene	<0.009 mg/kg	TM218	0.0664 M	0.0789 M	0.0667 M				
Acenaphthylene	<0.012 mg/kg	TM218	<0.012 M	<0.012 M	<0.012 M				
Acenaphthene	<0.008 mg/kg	TM218	<0.008 M	<0.008 M	<0.008 M				
Fluorene	<0.01 mg/kg	TM218	0.0167 M	0.0214 M	0.0196 M				
Phenanthrene	<0.015 mg/kg	TM218	0.0993 M	0.121 M	0.103 M				
Anthracene	<0.016 mg/kg	TM218	<0.016 M	<0.016 M	<0.016 M				
Fluoranthene	<0.017 mg/kg	TM218	0.0399 M	0.0487 M	0.0384 M				
Pyrene	<0.015 mg/kg	TM218	0.0479 M	0.058 M	0.0442 M				
Benz(a)anthracene	<0.014 mg/kg	TM218	0.0284 M	0.0414 M	0.0259 M				
Chrysene	<0.01 mg/kg	TM218	0.0217 M	0.028 M	0.0224 M				
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	0.0378 M	0.0565 M	0.0386 M				
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	<0.014 M	0.0197 M	<0.014 M				
Benzo(a)pyrene	<0.015 mg/kg	TM218	0.0279 M	0.0417 M	0.027 M				
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	<0.018 M	<0.018 M	<0.018 M				
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	<0.023 M	<0.023 M	<0.023 M				
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	0.0412 M	0.0539 M	0.0501 M				
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	0.427 M	0.569 M	0.436 M				

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

TPH CWG (S)

Results Legend			Customer Sample R			BH104	BH105	BH105		
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.50 - 1.60	1.80 - 1.90	2.80 - 2.90				
M	mCERTS accredited.			Soil/Solid	Soil/Solid	Soil/Solid				
S	Non-conforming work.			15/02/2011	15/02/2011	15/02/2011				
aq	Aqueous / settled sample.			16/02/2011	16/02/2011	16/02/2011				
diss.filt	Dissolved / filtered sample.			110216-16	110216-16	110216-16				
tot.unfilt	Total / unfiltered sample.			2878004	2878006	2878008				
*	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.									
Component	LOD/Units	Method								
GRO Surrogate % recovery**	%	TM089		38		25				
GRO >C5-C12	<0.044 mg/kg	TM089	0.092		<0.044					
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg	TM089	<0.005 #	<0.005 #	<0.005 #					
Benzene	<0.01 mg/kg	TM089	<0.01 M	<0.01 M	<0.01 M					
Aliphatics >C16-C35	<0.1 mg/kg	TM173		14.6						
Toluene	<0.002 mg/kg	TM089	0.00345 M	0.00904 M	0.00456 M					
Ethylbenzene	<0.003 mg/kg	TM089	<0.003 M	0.0136 M	0.00684 M					
m,p-Xylene	<0.006 mg/kg	TM089	<0.006 M	<0.006 M	<0.006 M					
Total Aliphatics >C5-C44	<0.1 mg/kg	TM173		25						
o-Xylene	<0.003 mg/kg	TM089	<0.003 M	<0.003 M	<0.003 M					
m,p,o-Xylene	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01					
BTEX, Total	<0.01 mg/kg	TM089	<0.01	0.0226	0.0114					
Aliphatics >C5-C6	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01					
Aliphatics >C6-C8	<0.01 mg/kg	TM089	0.0173	<0.01	<0.01					
Aliphatics >C8-C10	<0.01 mg/kg	TM089	0.0127	<0.01	<0.01					
Total Aromatics >C6-C44	<0.1 mg/kg	TM173		115						
Aliphatics >C10-C12	<0.01 mg/kg	TM089	0.0138	<0.01	<0.01					
Aliphatics >C12-C16	<0.1 mg/kg	TM173	7.14	8.86	12.4					
Aliphatics >C16-C21	<0.1 mg/kg	TM173	5.8	5.61	5.41					
Aliphatics >C21-C35	<0.1 mg/kg	TM173	11.1	9.03	11.3					
Aliphatics >C35-C44	<0.1 mg/kg	TM173	1.1	1.5	<0.1					
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	25.2	25	29.1					
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01					
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01					
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	0.015	0.0181	0.0125					
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	<0.01	<0.01	<0.01					
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	4.77	38.3	10.7					
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	9.48	26.8	9.28					
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	26.7	37	25.2					
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	6.24	12.9	4.93					
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	1.74	4.57	<0.1					
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	47.2	115	50.2					
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	72.5	140	79.3					
Total Aliphatics >C5-C12	<0.01 mg/kg	TM089		<0.01						
Total Aromatics >EC5-EC12	<0.01 mg/kg	TM089		0.0316						



SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

TPH CWG (S)

Results Legend		Customer Sample R	Customer Sample R					
#	ISO17025 accredited. mCERTS accredited.		BH104	BH105	BH105			
M	Non-conforming work.	<b>Depth (m)</b>	1.50 - 1.60	1.80 - 1.90	2.80 - 2.90			
aq	Aqueous / settled sample.	<b>Sample Type</b>	Soil/Solid	Soil/Solid	Soil/Solid			
diss.filt	Dissolved / filtered sample.	<b>Date Sampled</b>	15/02/2011	15/02/2011	15/02/2011			
tot.unfilt	Total / unfiltered sample.	<b>Date Received</b>	16/02/2011	16/02/2011	16/02/2011			
*	subcontracted test.	<b>SDG Ref</b>	110216-16	110216-16	110216-16			
**	% 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.	<b>Lab Sample No.(s)</b>	2878004	2878006	2878008			
		<b>AGS Reference</b>						
Component	LOD/Units	Method						
Total Aliphatics >C5-35	<0.1 mg/kg	TM173	24.1		29.1			
Total Aromatics >C5-35	<0.1 mg/kg	TM173	41		45.2			
Aromatics >EC35-EC40	<0.1 mg/kg	TM173		8.3				
Total Aliphatics & Aromatics >C5-35	<0.1 mg/kg	TM173	65.1		74.4			
Aliphatics >C35-C40	<0.1 mg/kg	TM173		1.15				
Aliphatics >C40-C44	<0.1 mg/kg	TM173		0.346				
Total Aromatics >EC12-EC35	<0.1 mg/kg	TM173		102				
Total Aliphatics >C12-C35	<0.1 mg/kg	TM173		23.5				
Total Aliphatics >C12-C40	<0.1 mg/kg	TM173		24.6				
Total Aromatics >EC12-EC40	<0.1 mg/kg	TM173		110				
Total Aliphatics & Aromatics >C12-C44	<0.1 mg/kg	TM173		140				

### CERTIFICATE OF ANALYSIS

**SDG:** 110216-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117343  
**Superseded Report:**

**VOC MS (S)**

Results Legend		Customer Sample R					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	BH104	BH105	BH105		
M	mCERTS accredited.		1.50 - 1.60	1.80 - 1.90	2.80 - 2.90		
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid		
aq	Aqueous / settled sample.		15/02/2011	15/02/2011	15/02/2011		
diss.filt	Dissolved / filtered sample.		16/02/2011	16/02/2011	16/02/2011		
tot.unfilt	Total / unfiltered sample.		110216-16	110216-16	110216-16		
*	subcontracted test.		2878004	2878006	2878008		
**	% 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.						
Component	LOD/Units		Method				
Toluene-d8**	%	TM116	78.4	77	80.5		
Methyl Tertiary Butyl Ether	<0.011 mg/kg	TM116	<0.011 M	<0.011 M	<0.011 M		
Benzene	<0.009 mg/kg	TM116	<0.009 M	<0.009 M	<0.009 M		
Toluene	<0.005 mg/kg	TM116	0.00951 M	0.0111 M	0.0145 M		
Ethylbenzene	<0.004 mg/kg	TM116	<0.004 M	0.017 M	0.0209 M		
p/m-Xylene	<0.014 mg/kg	TM116	<0.014 #	<0.014 #	<0.014 #		
o-Xylene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M	<0.01 M		

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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



**SDG:** 110216-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117343  
**Superseded Report:**

**Test Completion Dates**

Lab Sample No(s)	2878004	2878005	2878006	2878008
Customer Sample Ref.	BH104	BH104	BH105	BH105
AGS Ref.				
Depth	1.50 - 1.60	2.50 - 2.60	1.80 - 1.90	2.80 - 2.90
Type	SOLID	SOLID	SOLID	SOLID
Anions by Kone (soil)			18-Feb-2011	
Asbestos Containing Material Screen	16-Feb-2011		16-Feb-2011	
Cyanide Comp/Free/Total/Thiocyanate	17-Feb-2011		17-Feb-2011	
Easily Liberated Sulphide	21-Feb-2011		21-Feb-2011	
EPH CWG (Aliphatic) GC (S)	18-Feb-2011		18-Feb-2011	19-Feb-2011
EPH CWG (Aromatic) GC (S)	18-Feb-2011		18-Feb-2011	19-Feb-2011
GRO by GC-FID (S)	18-Feb-2011		22-Feb-2011	22-Feb-2011
Metals by iCap-OES (Soil)			22-Feb-2011	
Oxygenates (S)	21-Feb-2011		21-Feb-2011	21-Feb-2011
PAH by GCMS	21-Feb-2011		21-Feb-2011	19-Feb-2011
pH	16-Feb-2011	16-Feb-2011	16-Feb-2011	16-Feb-2011
Phenols by HPLC (S)	17-Feb-2011		17-Feb-2011	
Sample description	16-Feb-2011	16-Feb-2011	16-Feb-2011	16-Feb-2011
Total Organic Carbon		17-Feb-2011		17-Feb-2011
Total Sulphate			21-Feb-2011	
TPH CWG GC (S)	18-Feb-2011		22-Feb-2011	22-Feb-2011
VOC MS (S)	19-Feb-2011		19-Feb-2011	20-Feb-2011

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
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Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

**ASSOCIATED AQC DATA**

Anions by Kone (soil)

Component	Method Code	QC 25
Chloride (soluble)	TM243	<b>106.30</b> 78.07 : 121.93
Water Soluble Sulphate as SO4 2:1 Extract	TM243	<b>97.45</b> 91.36 : 106.23

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 25
Free Cyanide	TM153	<b>103.30</b> 87.04 : 107.05
Thiocyanate	TM153	<b>105.52</b> 90.22 : 111.93
Total Cyanide	TM153	<b>100.23</b> 77.00 : 112.12

Easily Liberated Sulphide

Component	Method Code	QC 26
Easily Liberated Sulphide	TM180	<b>96.35</b> 44.43 : 127.23

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 26	QC 23	QC 20
Total Aliphatics >C12-C35	TM173	<b>88.08</b> 64.28 : 103.38	<b>90.71</b> 67.09 : 98.92	<b>84.01</b> 64.28 : 103.38

EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 26	QC 23	QC 20
Total Aromatics >EC12-EC35	TM173	<b>88.34</b> 66.16 : 121.82	<b>87.86</b> 63.44 : 117.90	<b>94.06</b> 66.16 : 121.82

Metals by iCap-OES (Soil)

Component	Method Code	QC 27	QC 28
Aluminium	TM181	<b>121.94</b> 99.74 : 133.84	<b>112.01</b> 94.29 : 126.83
Antimony	TM181	<b>102.23</b> 95.73 : 132.37	<b>102.23</b> 80.62 : 119.38

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

Metals by iCap-OES (Soil)

		QC 27	QC 28
Arsenic	TM181	<b>113.61</b> 92.13 : 124.49	<b>103.96</b> 93.78 : 118.04
Barium	TM181	<b>111.89</b> 99.87 : 124.97	<b>102.20</b> 92.15 : 121.48
Beryllium	TM181	<b>106.34</b> 83.56 : 132.08	<b>96.37</b> 93.37 : 106.63
Boron	TM181	<b>120.23</b> 83.10 : 149.49	<b>115.58</b> 71.45 : 144.21
Cadmium	TM181	<b>107.41</b> 99.32 : 120.68	<b>94.73</b> 83.47 : 108.02
Chromium	TM181	<b>108.06</b> 89.88 : 120.16	<b>98.57</b> 86.66 : 111.67
Cobalt	TM181	<b>112.52</b> 94.73 : 120.59	<b>103.82</b> 91.65 : 115.98
Copper	TM181	<b>106.85</b> 93.26 : 114.97	<b>97.81</b> 90.86 : 109.48
Iron	TM181	<b>114.62</b> 100.19 : 127.85	<b>100.42</b> 100.21 : 121.44
Lead	TM181	<b>120.41</b> 81.63 : 123.21	<b>91.57</b> 81.17 : 121.35
Manganese	TM181	<b>97.00</b> 89.87 : 108.44	<b>96.04</b> 88.94 : 103.43
Mercury	TM181	<b>121.44</b> 101.30 : 128.70	<b>108.44</b> 96.85 : 124.11
Molybdenum	TM181	<b>103.78</b> 96.32 : 127.40	<b>99.33</b> 83.94 : 116.06
Nickel	TM181	<b>102.82</b> 88.13 : 116.85	<b>97.86</b> 83.34 : 114.35
Phosphorus	TM181	<b>100.20</b> 89.03 : 113.27	<b>97.98</b> 85.62 : 116.58
Selenium	TM181	<b>110.08</b> 95.46 : 126.52	<b>109.27</b> 100.15 : 123.30
Strontium	TM181	<b>114.14</b> 91.79 : 123.61	<b>100.43</b> 89.82 : 110.49
Thallium	TM181	<b>114.98</b> 81.67 : 125.57	<b>106.76</b> 93.51 : 130.39
Tin	TM181	<b>109.97</b> 97.01 : 132.90	<b>96.32</b> 89.71 : 110.91
Titanium	TM181	<b>110.85</b> 87.17 : 133.97	<b>102.73</b> 78.57 : 125.05
Vanadium	TM181	<b>108.78</b> 93.04 : 119.76	<b>98.91</b> 91.61 : 110.18
Zinc	TM181	<b>98.08</b> 82.78 : 113.72	<b>92.12</b> 83.65 : 103.15

PAH by GCMS

Component	Method Code	QC 23	QC 28
Acenaphthene	TM218	<b>89.48</b> 78.38 : 107.88	<b>95.49</b> 73.81 : 109.35
Acenaphthylene	TM218	<b>79.81</b> 68.65 : 103.57	<b>93.69</b> 67.05 : 95.65
Anthracene	TM218	<b>83.96</b> 70.02 : 108.14	<b>97.52</b> 72.39 : 100.02

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

PAH by GCMS

		QC 23	QC 28
Benz(a)anthracene	TM218	<b>92.61</b> 75.52 : 122.57	<b>111.88</b> 74.79 : 118.85
Benzo(a)pyrene	TM218	<b>101.44</b> 71.24 : 119.68	<b>115.35</b> 73.75 : 119.70
Benzo(b)fluoranthene	TM218	<b>102.57</b> 75.05 : 121.20	<b>107.87</b> 75.06 : 120.22
Benzo(ghi)perylene	TM218	<b>96.29</b> 74.07 : 119.02	<b>103.47</b> 75.04 : 115.56
Benzo(k)fluoranthene	TM218	<b>98.12</b> 73.14 : 117.51	<b>103.08</b> 76.34 : 113.30
Chrysene	TM218	<b>94.38</b> 75.35 : 119.13	<b>93.63</b> 73.17 : 115.36
Dibenzo(ah)anthracene	TM218	<b>97.28</b> 72.56 : 120.05	<b>103.73</b> 74.81 : 113.99
Fluoranthene	TM218	<b>91.13</b> 75.41 : 112.08	<b>100.59</b> 75.32 : 108.37
Fluorene	TM218	<b>87.37</b> 79.26 : 109.59	<b>94.76</b> 71.61 : 107.41
Indeno(123cd)pyrene	TM218	<b>98.81</b> 71.54 : 119.37	<b>106.80</b> 74.70 : 117.26
Naphthalene	TM218	<b>87.37</b> 76.45 : 106.42	<b>93.01</b> 73.58 : 103.51
Phenanthrene	TM218	<b>88.62</b> 74.28 : 110.55	<b>96.93</b> 74.65 : 105.86
Pyrene	TM218	<b>90.72</b> 76.12 : 112.08	<b>100.28</b> 76.08 : 109.72

pH

Component	Method Code	QC 23
pH	TM133	<b>99.12</b> 96.84 : 100.64

Phenols by HPLC (S)

Component	Method Code	QC 25
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>98.80</b> 85.13 : 105.17
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>95.21</b> 87.06 : 106.06
Catechol by HPLC (S)	TM062 (S)	<b>76.05</b> 27.40 : 94.47
Cresols by HPLC (S)	TM062 (S)	<b>94.81</b> 83.33 : 100.99
Naphthol by HPLC (S)	TM062 (S)	<b>96.41</b> 55.65 : 110.94
Phenol by HPLC (S)	TM062 (S)	<b>97.01</b> 83.94 : 101.65
Resorcinol HPLC (S)	TM062 (S)	<b>99.40</b> 83.97 : 105.22

**SDG:** 110216-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117343  
**Superseded Report:**

Phenols by HPLC (S)

		QC 25
Xylenols by HPLC (S)	TM062 (S)	<b>99.00</b> 83.64 : 102.70

Total Organic Carbon

Component	Method Code	QC 20
Total Organic Carbon	TM132	<b>97.96</b> 88.75 : 104.70

Total Sulphate

Component	Method Code	QC 21
Total Sulphate	TM221	<b>82.08</b> 80.05 : 95.26

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.  
 The figure detailed is the percentage recovery result for the AQC.  
 The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Chromatogram

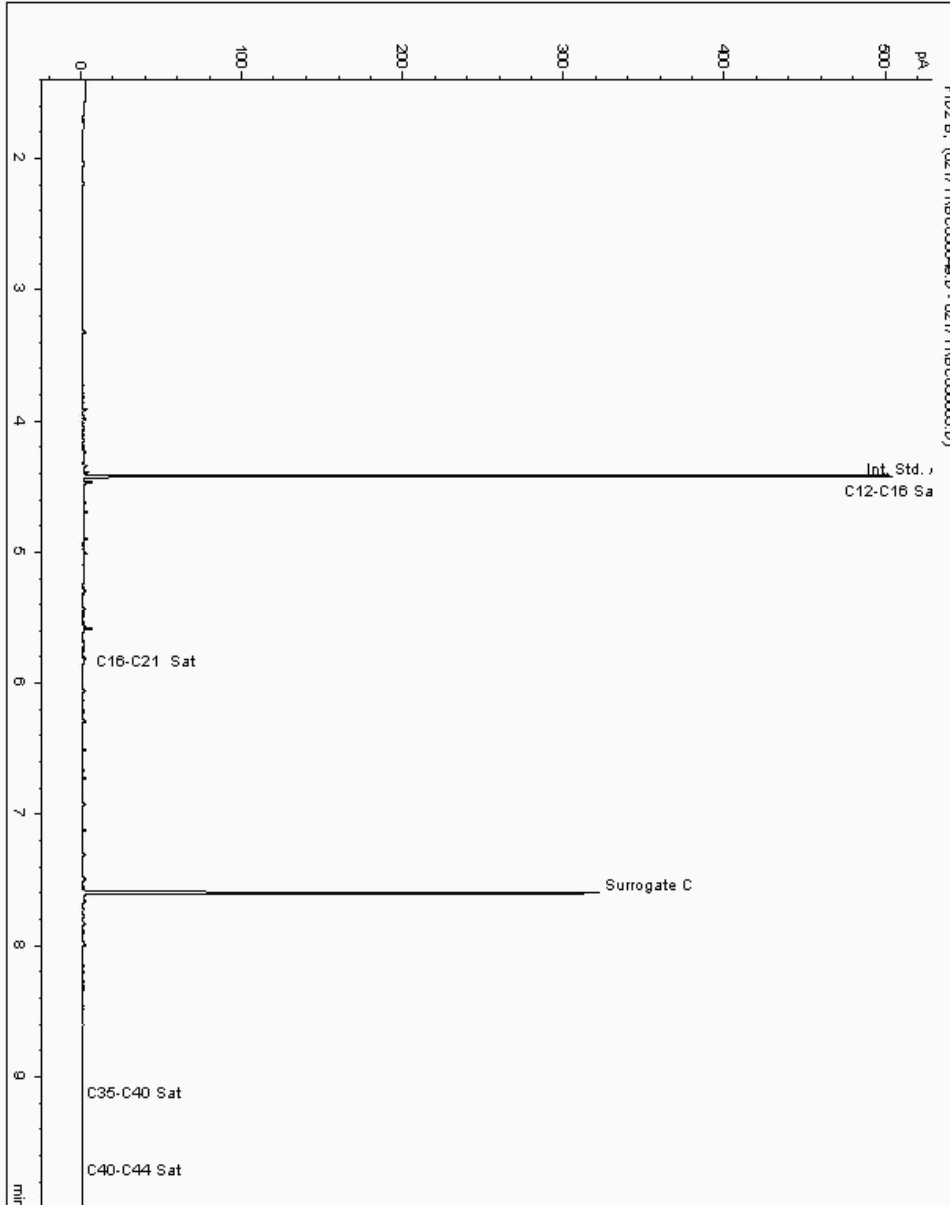
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2887307  
 Sample ID: BH105

Depth: 1.80 - 1.90

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

Sample Identity: 2949128-2887307  
 Date Acquired : 18/02/11 02:59:26 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 1.035



SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Chromatogram

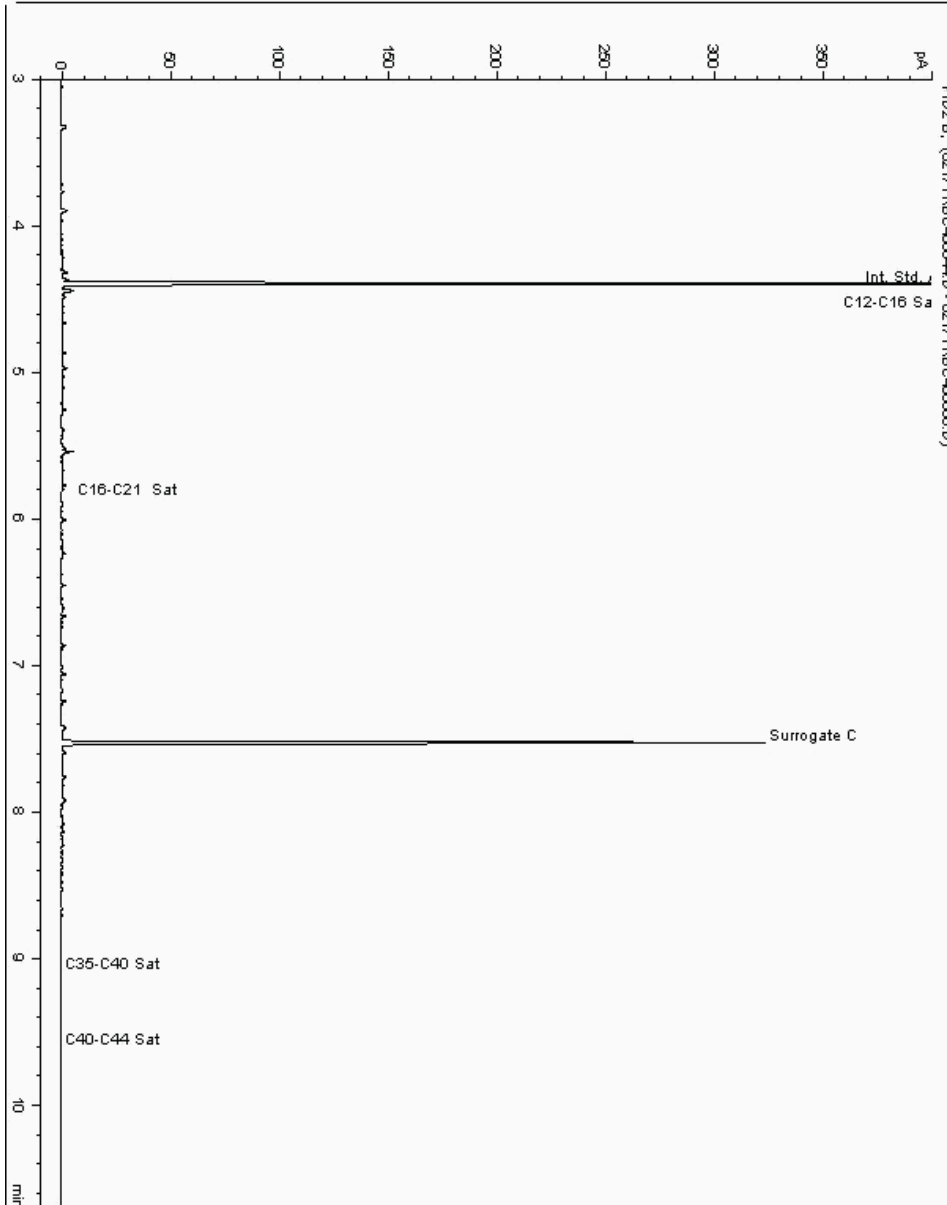
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2887541  
 Sample ID: BH104

Depth: 1.50 - 1.60

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

Sample Identity: 2949110-2887541  
 Date Acquired : 18/02/11 10:10:50 PM  
 Units : ppb  
 Dilution:



SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Chromatogram

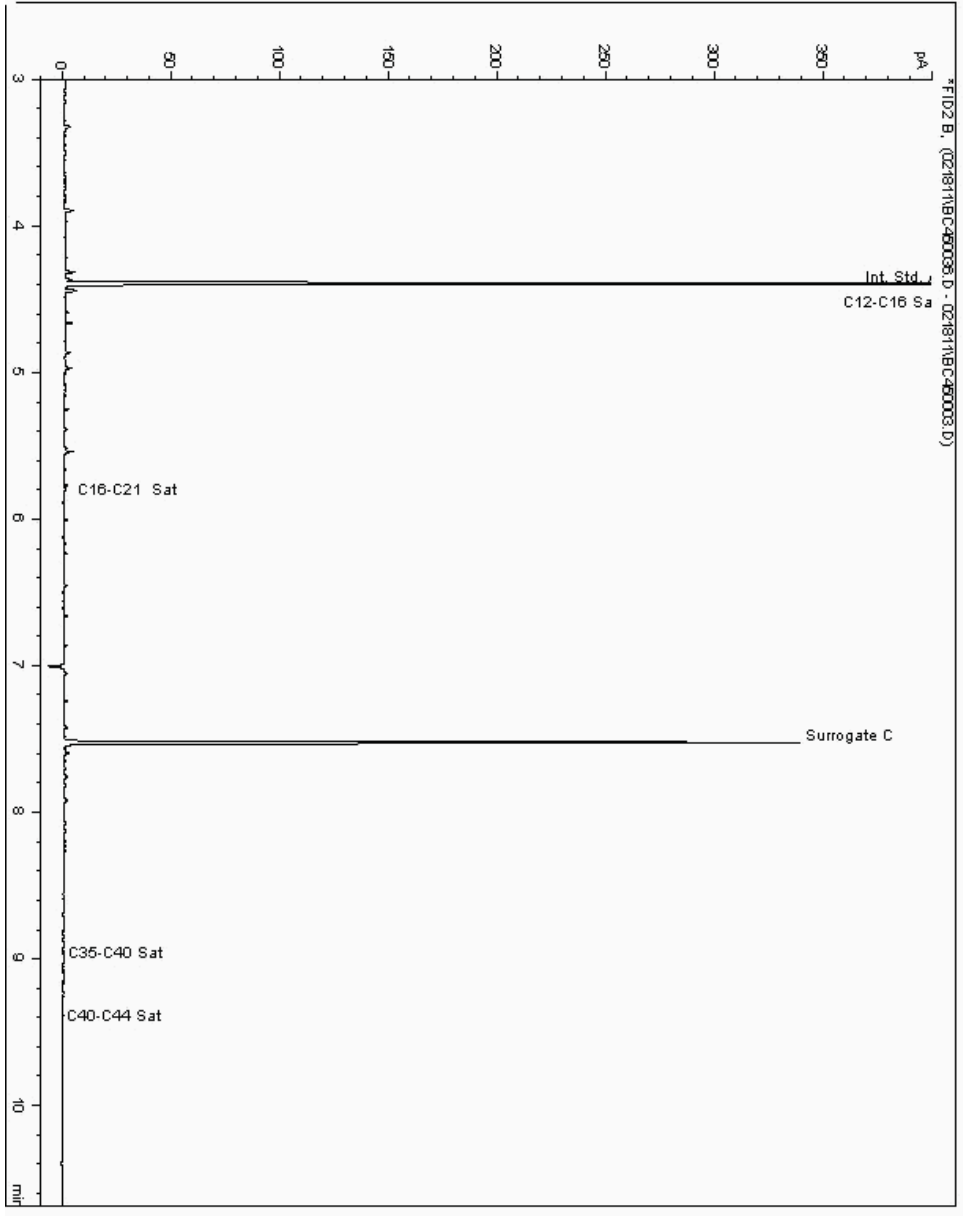
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2897273  
 Sample ID: BH105

Depth: 2.80 - 2.90

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

Sample Identity: 2955813-2897273  
 Date Acquired : 19/02/11 05:52:15 PM  
 Units : ppb  
 Dilution:





SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Chromatogram

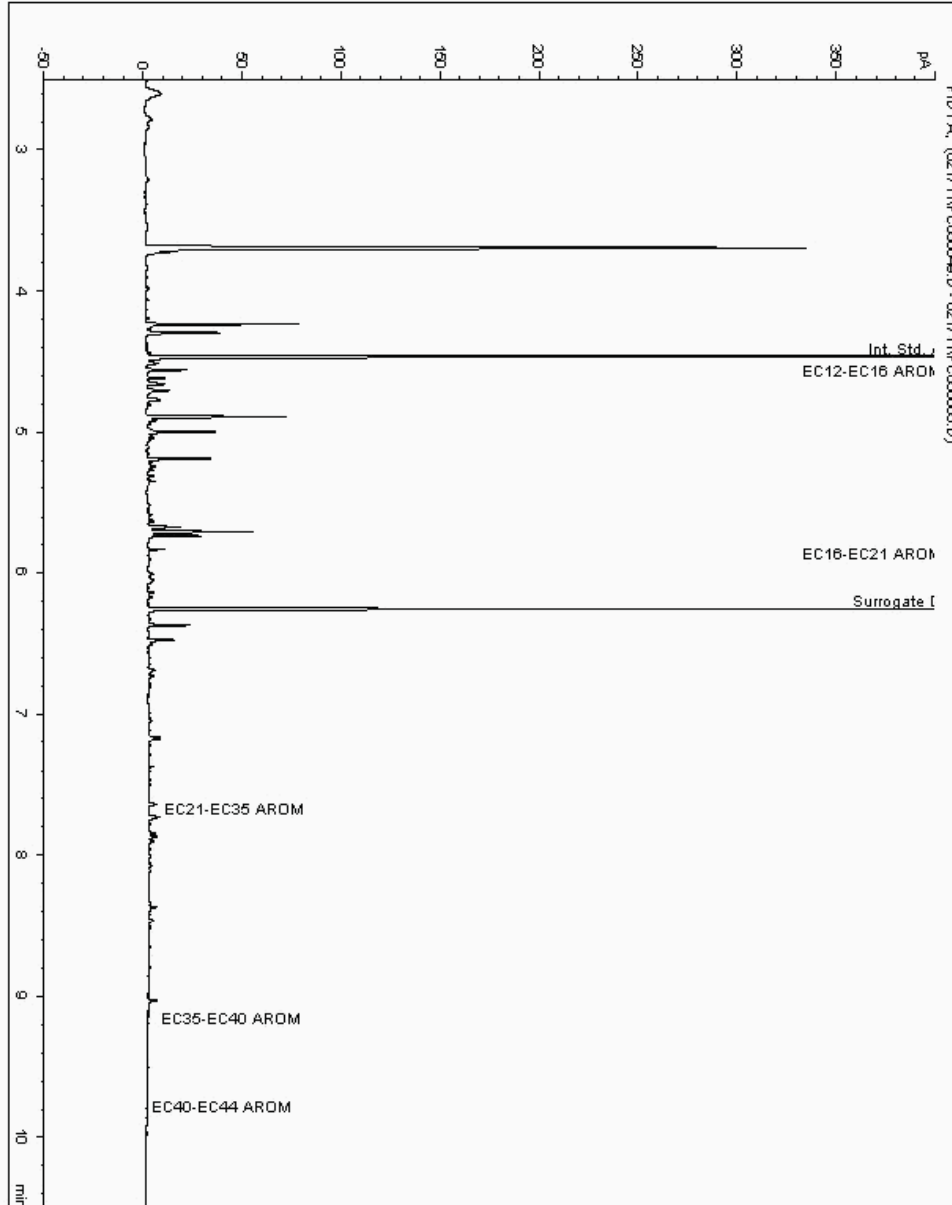
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2887307  
 Sample ID: BH105

Depth: 1.80 - 1.90

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

Sample Identity: 2949129-2887307  
 Date Acquired : 18/02/11 02:59:26 PM  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 1.035



SDG: 110216-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

Order Number:  
Report Number: 117343  
Superseded Report:

### Chromatogram

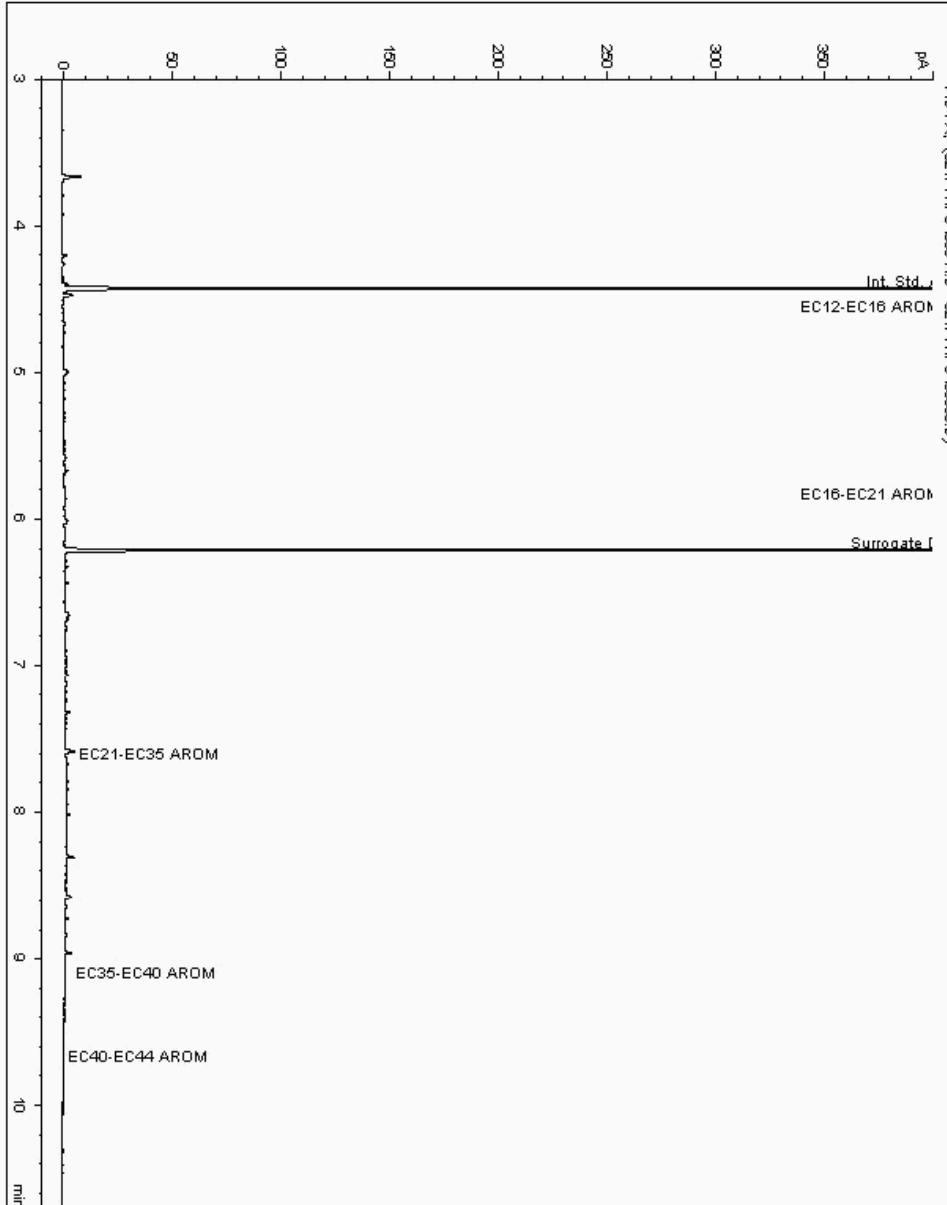
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2887541  
Sample ID: BH104

Depth: 1.50 - 1.60

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

Sample Identity: 29491111-2887541  
Date Acquired : 18/02/11 10:10:50 PM  
Units : ppb  
Dilution:



SDG: 110216-16  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention: Barry Plane

Order Number:  
 Report Number: 117343  
 Superseded Report:

### Chromatogram

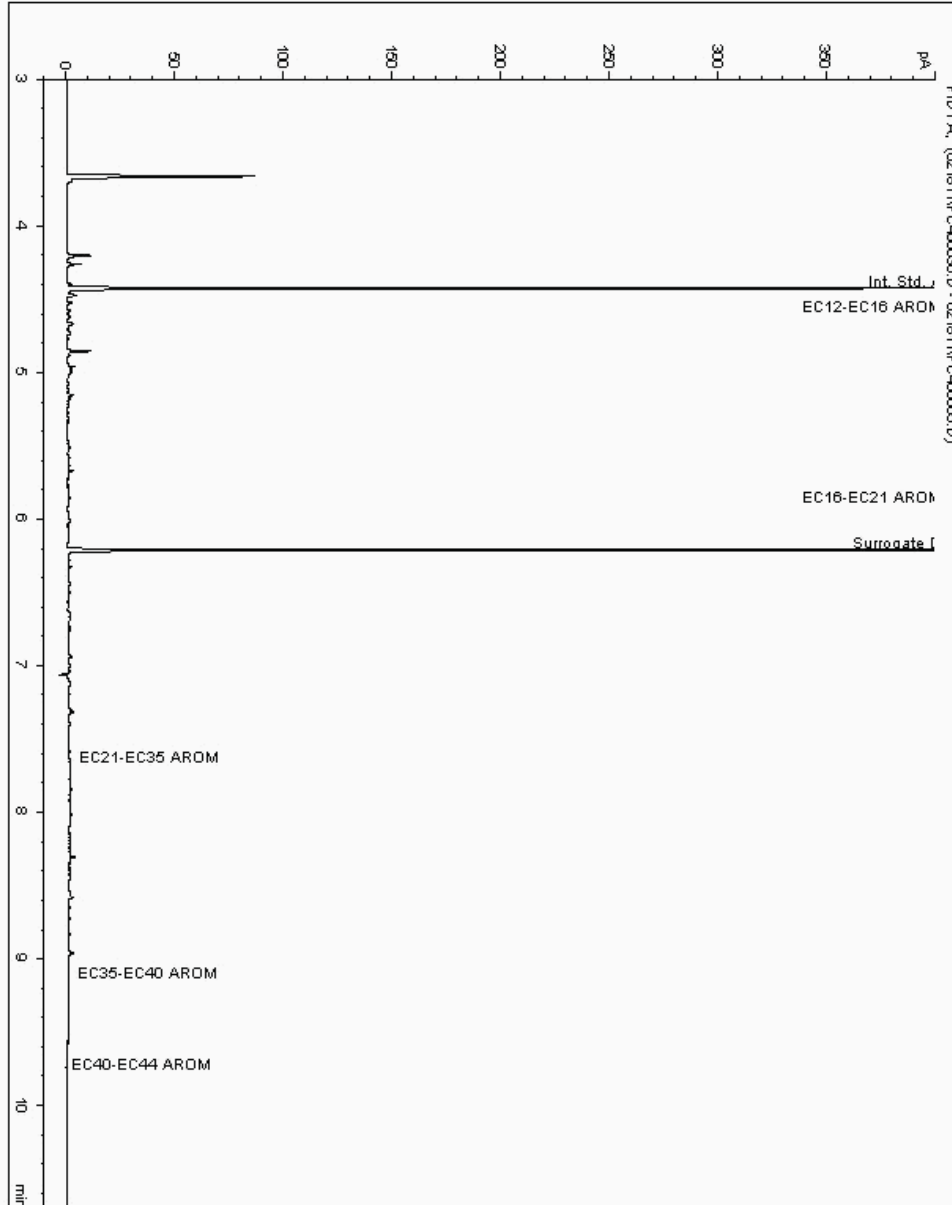
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2897273  
 Sample ID: BH105

Depth: 2.80 - 2.90

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

Sample Identity: 2955814-2897273  
 Date Acquired : 19/02/11 05:52:15 PM  
 Units : ppb  
 Dilution:



SDG: 110216-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

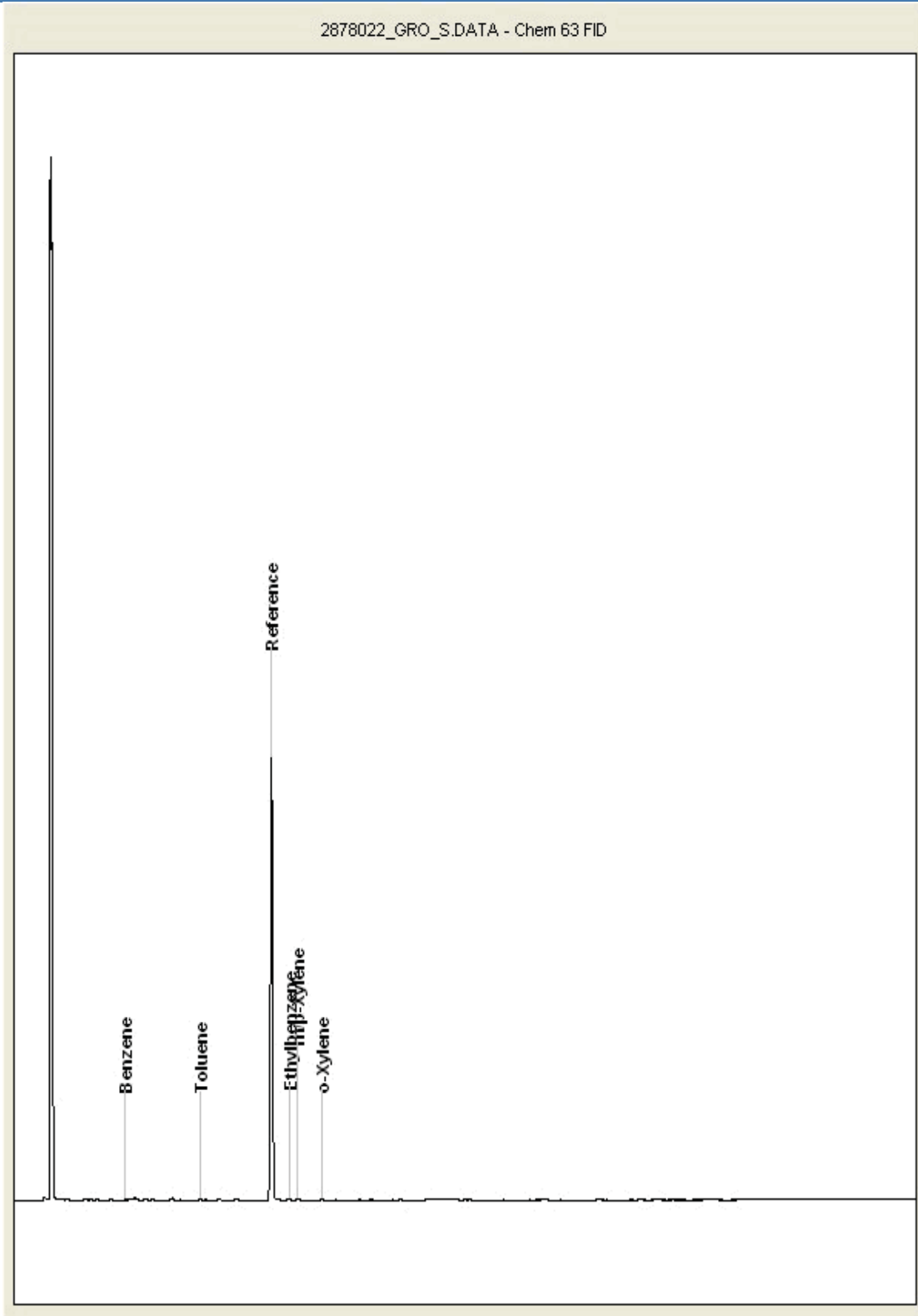
Order Number:  
Report Number: 117343  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2878022  
Sample ID : BH104

Depth : 1.50 - 1.60



SDG: 110216-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

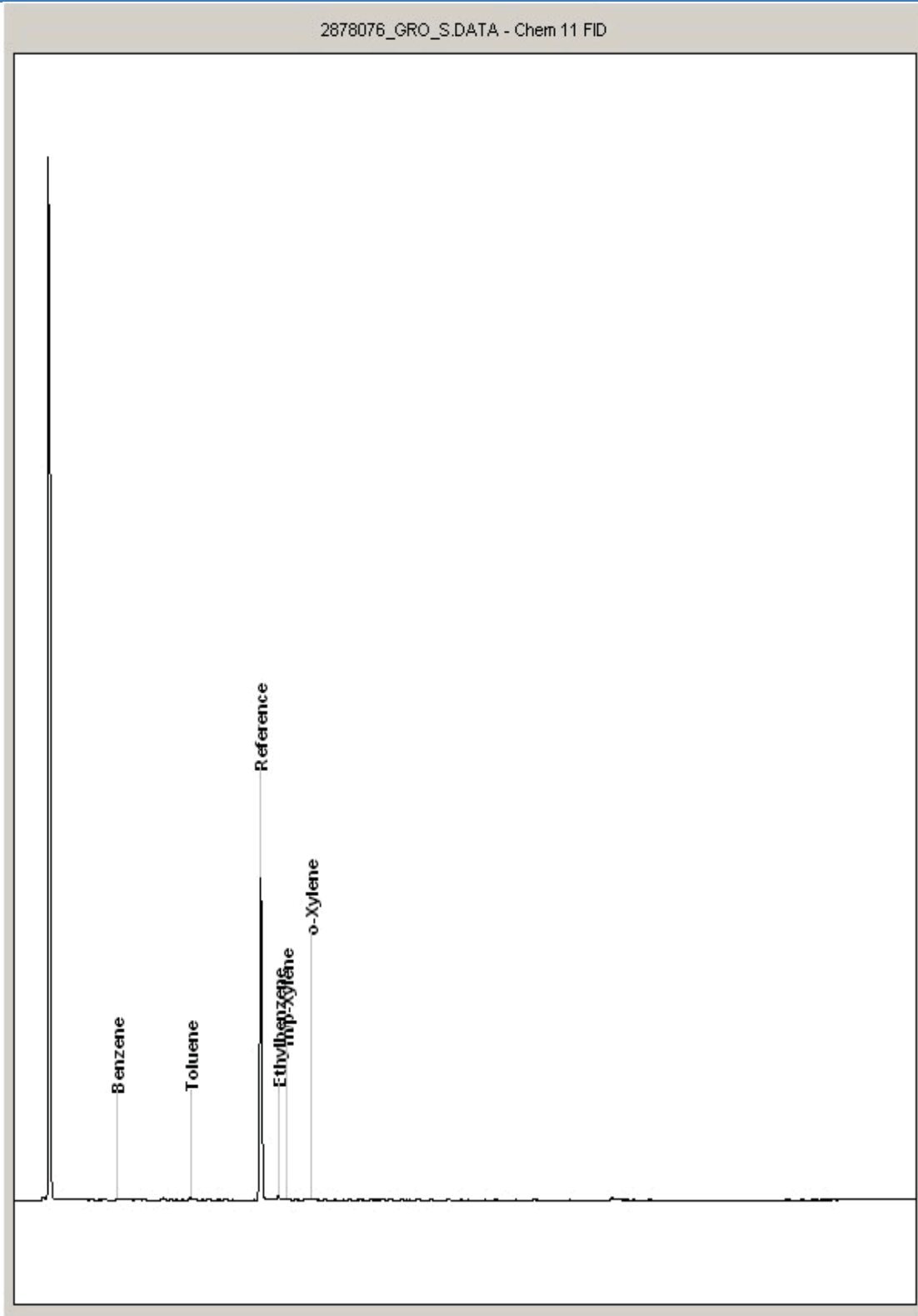
Order Number:  
Report Number: 117343  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2878076  
Sample ID : BH105

Depth : 1.80 - 1.90



SDG: 110216-16  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention: Barry Plane

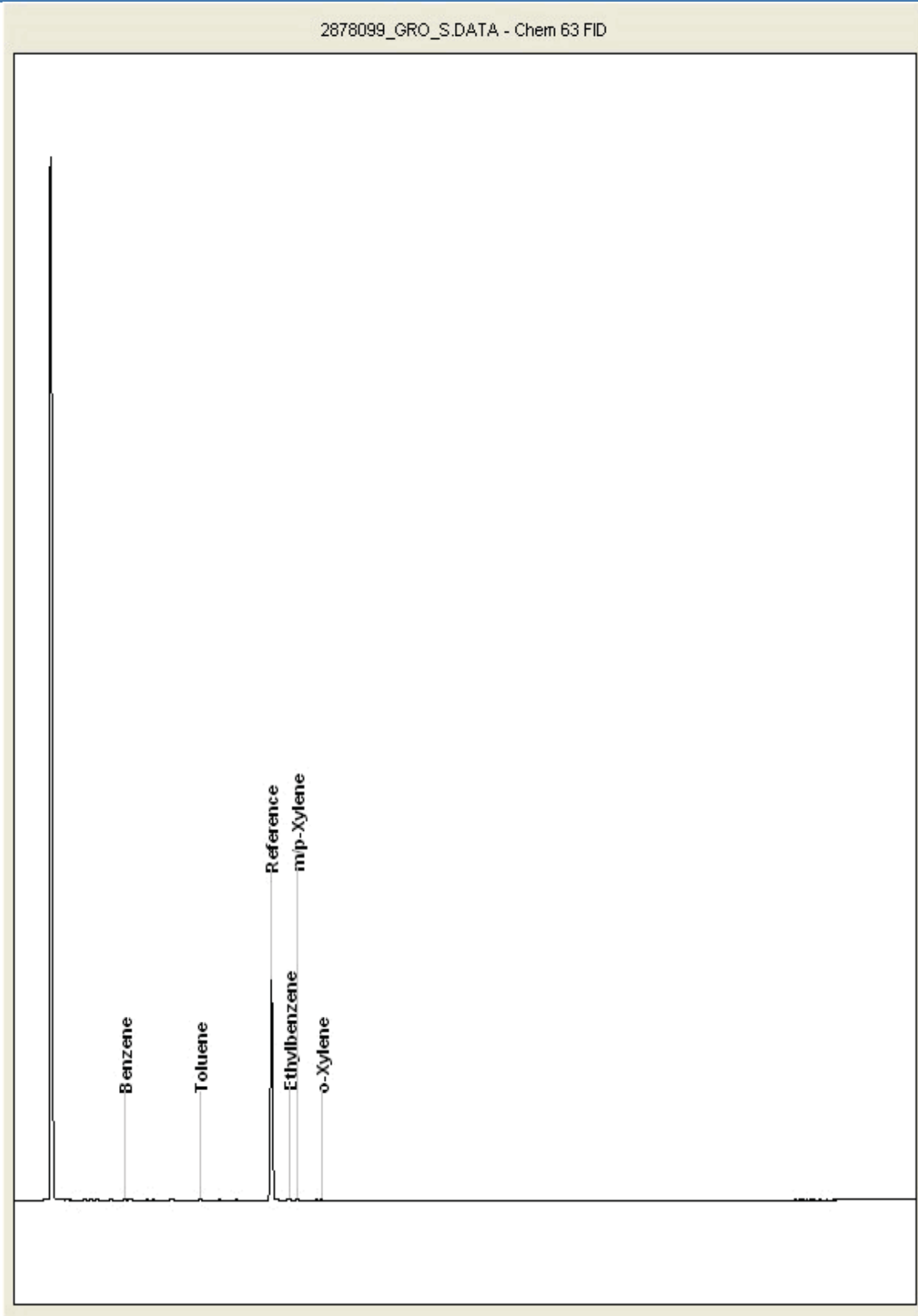
Order Number:  
Report Number: 117343  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2878099  
Sample ID : BH105

Depth : 2.80 - 2.90



**SDG:** 110216-16  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Barry Plane

**Order Number:**  
**Report Number:** 117343  
**Superseded Report:**

## 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 NH4 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

SOLID MATRICES EXTRACTION SUMMARY				
ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXHERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXHERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXHERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXHERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXHERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXHERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXHERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH O/G BY GC	D&C	HEXANE/ACETONE	END OVER/END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER/END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

LIQUID MATRICES EXTRACTION SUMMARY			
ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
EPH O/G	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCFID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

**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).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

**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.



ARCADIS Geraghty & Miller  
2 Craven Court  
Willie Snaith Road  
Newmarket  
Suffolk  
CB8 7FA

**Attention:** Barry Plane

## CERTIFICATE OF ANALYSIS

**Date:** 23 February 2011  
**Customer:** H\_ARCADIS\_NMK  
**Sample Delivery Group (SDG):** 110215-6  
**Your Reference:** 93749.02  
**Location:** Simonside  
**Report No:** 117493

We received 9 samples on Tuesday February 15, 2011 and 8 of these samples were scheduled for analysis which was completed on Wednesday February 23, 2011. 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:

**Sonia McWhan**

Operations Manager



1291  
GROUP



**SDG:** 110215-6  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117493  
**Superseded Report:**

### Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2870432	BH103		0.30 - 0.50	12/02/2011
2871212	BH104		0.00 - 0.30	13/02/2011
2871155	BH104		0.50 - 0.70	13/02/2011
2873064	BH105		0.40 - 0.60	13/02/2011
2870816	BH107		0.30 - 0.50	12/02/2011
2873065	BH108		0.00 - 0.20	13/02/2011
2871093	BH108		0.50 - 1.00	13/02/2011
2870459	BH109		0.30 - 0.60	12/02/2011
2870886	BH109		1.50 - 1.60	12/02/2011

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

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

SOLID Results Legend  <span style="background-color: yellow; border: 1px solid black; padding: 2px;">X</span> Test <span style="background-color: red; color: white; border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	
		2870459	BH109		0.30 - 0.60	400g Tub
		2873065	BH108		0.00 - 0.20	250g Amber Jar
		2871093	BH108		0.50 - 1.00	1kg TUB 60g VOC 400g Tub
		2870816	BH107		0.30 - 0.50	250g Amber Jar
	2873064	BH105		0.40 - 0.60	400g Tub	
	2871212	BH104		0.00 - 0.30	250g Amber Jar	
	2871155	BH104		0.50 - 0.70	400g Tub	
	2870432	BH103		0.30 - 0.50	60g VOC 250g Amber Jar 400g Tub 250g Amber Jar	
Anions by Kone (soil)	All	NDPs: 0 Tests: 2				
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 8				
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 2				
Easily Liberated Sulphide	All	NDPs: 0 Tests: 2				
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 2				
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 2				
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2				
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 8				
	Barium	NDPs: 0 Tests: 2				
	Beryllium	NDPs: 0 Tests: 6				
	Cadmium	NDPs: 0 Tests: 8				
	Chromium	NDPs: 0 Tests: 8				
	Copper	NDPs: 0 Tests: 8				
	Lead	NDPs: 0 Tests: 8				
	Mercury	NDPs: 0 Tests: 8				

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

<b>SOLID</b>  <b>Results Legend</b>  <span style="border: 1px solid black; padding: 2px;">X</span> Test  <span style="border: 1px solid black; padding: 2px;">N</span> No Determination Possible	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	
		2870432	BH103		0.30 - 0.50	250g Amber Jar
		2871155	BH104		0.50 - 0.70	250g Amber Jar
		2871212	BH104		0.00 - 0.30	400g Tub
		2873064	BH105		0.40 - 0.60	250g Amber Jar
		2870816	BH107		0.30 - 0.50	250g Amber Jar
	2873065	BH108		0.00 - 0.20	400g Tub	
	2871093	BH108		0.50 - 1.00	1kg TUB 60g VOC	
	2870459	BH109		0.30 - 0.60	400g Tub 250g Amber Jar	
Metals by iCap-OES (Soil)	Molybdenum	NDPs: 0 Tests: 2				
	Nickel	NDPs: 0 Tests: 8				
	Vanadium	NDPs: 0 Tests: 8				
	Zinc	NDPs: 0 Tests: 8				
Oxygenates (S)	All	NDPs: 0 Tests: 2				
PAH by GCMS	All	NDPs: 0 Tests: 2				
pH	All	NDPs: 0 Tests: 2				
Phenols by HPLC (S)	All	NDPs: 0 Tests: 2				
Sample description	All	NDPs: 0 Tests: 8				
Total Organic Carbon	All	NDPs: 0 Tests: 2				
Total Sulphate	All	NDPs: 0 Tests: 2				
TPH CWG GC (S)	All	NDPs: 0 Tests: 2				
VOC MS (S)	All	NDPs: 0 Tests: 2				

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

### Sample Descriptions

#### Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2870432	BH103	0.30 - 0.50	Dark Brown	Clay	<0.063 mm	None	None
2871155	BH104	0.50 - 0.70	Dark Brown	Clay	<0.063 mm	Stones	None
2871212	BH104	0.00 - 0.30	Dark Brown	Sandy Silt Loam	0.1 - 2 mm	Stones	None
2873064	BH105	0.40 - 0.60	Dark Brown	Clay	<0.063 mm	Stones	None
2870816	BH107	0.30 - 0.50	Dark Brown	Clay	<0.063 mm	Stones	None
2871093	BH108	0.50 - 1.00	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	Stones	None
2873065	BH108	0.00 - 0.20	Dark Brown	Sand	0.1 - 2 mm	Stones	None
2870459	BH109	0.30 - 0.60	Dark Brown	Clay Loam	<0.063 mm	Stones	None

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: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

Results Legend			Customer Sample R	BH103	BH104	BH104	BH105	BH107	BH108	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.30 - 0.50	0.00 - 0.30	0.50 - 0.70	0.40 - 0.60	0.30 - 0.50	0.00 - 0.20	
M	mCERTS accredited.			Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
S	Non-conforming work.			12/02/2011	13/02/2011	13/02/2011	13/02/2011	12/02/2011	12/02/2011	13/02/2011
aq	Aqueous / settled sample.			15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011
diss.filt	Dissolved / filtered sample.			110215-6	110215-6	110215-6	110215-6	110215-6	110215-6	110215-6
tot.unfilt	Total / unfiltered sample.			2870432	2871212	2871155	2873064	2870816	2873065	
*	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.									
Component	LOD/Units	Method								
Asbestos Containing Material Screen	-	TM001		No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)			<0.025					
Organic Carbon, Total	<0.2 %	TM132			1.49					
pH	1 pH Units	TM133			8.66					
Cyanide, Total	<1 mg/kg	TM153			<1					
Cyanide, Free	<1 mg/kg	TM153			<1					
Sulphide, Easily liberated	<15 mg/kg	TM180			<15					
Arsenic	<0.6 mg/kg	TM181	4.72	9.68	4.54	4.97	9.93	2.97		
Barium	<0.6 mg/kg	TM181			199					
Beryllium	<0.01 mg/kg	TM181	1.11	0.717		0.958	1.18	1.19		
Cadmium	<0.02 mg/kg	TM181	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Chromium	<0.9 mg/kg	TM181	30.7	16.1	28.3	26.9	30.1	13.8		
Copper	<1.4 mg/kg	TM181	18.5	22.5	17.8	16.5	40.6	47.8		
Lead	<0.7 mg/kg	TM181	11.9	54	11.5	11	50.1	42.3		
Mercury	<0.14 mg/kg	TM181	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	
Molybdenum	<0.1 mg/kg	TM181			<0.1					
Nickel	<0.2 mg/kg	TM181	32.3	17	30.6	29.7	31.4	18.1		
Vanadium	<0.2 mg/kg	TM181	30.1	27.5	28	27.6	42.3	128		
Zinc	<1.9 mg/kg	TM181	56.7	84.4	45.3	45.5	136	127		
Sulphate, Total	<48 mg/kg	TM221			288					
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243			0.0524					
tert Butanol	<0.01 mg/kg	TM288			<0.01					
tert-butyl ethyl ether	<0.001 mg/kg	TM288			<0.001					

**SDG:** 110215-6  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117493  
**Superseded Report:**

Results Legend		Customer Sample R	BH108	BH109				
#	ISO17025 accredited.		Depth (m)	0.50 - 1.00	0.30 - 0.60			
M	mCERTS accredited.	Sample Type	Soil/Solid	Soil/Solid				
S	Non-conforming work.	Date Sampled	13/02/2011	12/02/2011				
aq	Aqueous / settled sample.	Date Received	15/02/2011	15/02/2011				
diss.filt	Dissolved / filtered sample.	SDG Ref	110215-6	110215-6				
tot.unfilt	Total / unfiltered sample.	Lab Sample No.(s)	2871093	2870459				
*	subcontracted test.	AGS Reference						
**	% 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.							
Component	LOD/Units	Method						
Asbestos Containing Material Screen	-	TM001	No ACM Detected	No ACM Detected				
Phenols, Total monohydric	<0.025 mg/kg	TM062 (S)	<0.025					
Organic Carbon, Total	<0.2 %	TM132	5.29					
pH	1 pH Units	TM133	8.18					
Cyanide, Total	<1 mg/kg	TM153	<1					
Cyanide, Free	<1 mg/kg	TM153	<1					
Sulphide, Easily liberated	<15 mg/kg	TM180	<15					
Arsenic	<0.6 mg/kg	TM181	24.6	11.7				
Barium	<0.6 mg/kg	TM181	431					
Beryllium	<0.01 mg/kg	TM181		1.25				
Cadmium	<0.02 mg/kg	TM181	<0.02	<0.02				
Chromium	<0.9 mg/kg	TM181	31.3	28				
Copper	<1.4 mg/kg	TM181	146	37.7				
Lead	<0.7 mg/kg	TM181	202	21.9				
Mercury	<0.14 mg/kg	TM181	<0.14	<0.14				
Molybdenum	<0.1 mg/kg	TM181	2.25					
Nickel	<0.2 mg/kg	TM181	47.7	38.9				
Vanadium	<0.2 mg/kg	TM181	66.5	31.9				
Zinc	<1.9 mg/kg	TM181	357	83.4				
Sulphate, Total	<48 mg/kg	TM221	820					
Water Soluble Sulphate as SO4 2:1 Extract	<0.008 g/l	TM243	0.0543					
tert Butanol	<0.01 mg/kg	TM288	<0.01					
tert-butyl ethyl ether	<0.001 mg/kg	TM288	<0.001					

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

PAH by GCMS

Results Legend		Customer Sample R	BH104	BH108				
#	ISO17025 accredited.	Depth (m)	0.50 - 0.70	0.50 - 1.00				
M	mCERTS accredited.	Sample Type	Soil/Solid	Soil/Solid				
S	Non-conforming work.	Date Sampled	13/02/2011	13/02/2011				
aq	Aqueous / settled sample.	Date Received	15/02/2011	15/02/2011				
diss.filt	Dissolved / filtered sample.	SDG Ref	110215-6	110215-6				
tot.unfilt	Total / unfiltered sample.	Lab Sample No.(s)	2871155	2871093				
*	subcontracted test.	AGS Reference						
**	% 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.							
Component	LOD/Units	Method						
Naphthalene-d8 % recovery**	%	TM218	101	92.7				
Acenaphthene-d10 % recovery**	%	TM218	98.2	86				
Phenanthrene-d10 % recovery**	%	TM218	95.6	80.9				
Chrysene-d12 % recovery**	%	TM218	99.6	83.8				
Perylene-d12 % recovery**	%	TM218	97.9	79.6				
Naphthalene	<0.009 mg/kg	TM218	0.0631 M	0.137 M				
Acenaphthylene	<0.012 mg/kg	TM218	<0.012 M	0.0394 M				
Acenaphthene	<0.008 mg/kg	TM218	<0.008 M	0.0262 M				
Fluorene	<0.01 mg/kg	TM218	0.0164 M	0.0286 M				
Phenanthrene	<0.015 mg/kg	TM218	0.0871 M	0.458 M				
Anthracene	<0.016 mg/kg	TM218	<0.016 M	0.0978 M				
Fluoranthene	<0.017 mg/kg	TM218	0.0408 M	0.759 M				
Pyrene	<0.015 mg/kg	TM218	0.0437 M	0.6 M				
Benz(a)anthracene	<0.014 mg/kg	TM218	0.0231 M	0.477 M				
Chrysene	<0.01 mg/kg	TM218	0.0223 M	0.413 M				
Benzo(b)fluoranthene	<0.015 mg/kg	TM218	0.0343 M	0.663 M				
Benzo(k)fluoranthene	<0.014 mg/kg	TM218	<0.014 M	0.216 M				
Benzo(a)pyrene	<0.015 mg/kg	TM218	0.0282 M	0.409 M				
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218	<0.018 M	0.252 M				
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218	<0.023 M	0.0836 M				
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218	0.0383 M	0.312 M				
Polyaromatic hydrocarbons, Total	<0.118 mg/kg	TM218	0.397 M	4.97 M				

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

TPH CWG (S)

Results Legend		Customer Sample R	BH104	BH108				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.50 - 0.70	0.50 - 1.00				
M	mCERTS accredited.		Soil/Solid	Soil/Solid				
S	Non-conforming work.		13/02/2011	13/02/2011				
aq	Aqueous / settled sample.		15/02/2011	15/02/2011				
diss.filt	Dissolved / filtered sample.		110215-6	110215-6				
tot.unfilt	Total / unfiltered sample.		2871155	2871093				
*	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.							
Component	LOD/Units		Method					
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg		TM089	<0.005 #	<0.005 #			
Benzene	<0.01 mg/kg	TM089	<0.01 M	<0.01 M				
Aliphatics >C16-C35	<0.1 mg/kg	TM173	17.2	41.6				
Toluene	<0.002 mg/kg	TM089	0.0069 M	<0.002 M				
Ethylbenzene	<0.003 mg/kg	TM089	0.015 M	0.00417 M				
m,p-Xylene	<0.006 mg/kg	TM089	<0.006 M	<0.006 M				
Total Aliphatics >C5-C44	<0.1 mg/kg	TM173	25.7	57				
o-Xylene	<0.003 mg/kg	TM089	<0.003 M	<0.003 M				
m,p,o-Xylene	<0.01 mg/kg	TM089	<0.01	<0.01				
BTEX, Total	<0.01 mg/kg	TM089	0.0219	<0.01				
Aliphatics >C5-C6	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C6-C8	<0.01 mg/kg	TM089	0.0115	<0.01				
Aliphatics >C8-C10	<0.01 mg/kg	TM089	<0.01	<0.01				
Total Aromatics >C6-C44	<0.1 mg/kg	TM173	44.7	88.8				
Aliphatics >C10-C12	<0.01 mg/kg	TM089	<0.01	<0.01				
Aliphatics >C12-C16	<0.1 mg/kg	TM173	8.51	9.43				
Aliphatics >C16-C21	<0.1 mg/kg	TM173	5.46	8.63				
Aliphatics >C21-C35	<0.1 mg/kg	TM173	11.7	32.9				
Aliphatics >C35-C44	<0.1 mg/kg	TM173	<0.1	5.95				
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173	25.7	57				
Aromatics >EC5-EC7	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC7-EC8	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC8-EC10	<0.01 mg/kg	TM089	0.0242	<0.01				
Aromatics >EC10-EC12	<0.01 mg/kg	TM089	<0.01	<0.01				
Aromatics >EC12-EC16	<0.1 mg/kg	TM173	5.21	7.37				
Aromatics >EC16-EC21	<0.1 mg/kg	TM173	8.67	13.7				
Aromatics >EC21-EC35	<0.1 mg/kg	TM173	25.6	52.4				
Aromatics >EC35-EC44	<0.1 mg/kg	TM173	5.24	15.3				
Aromatics >EC40-EC44	<0.1 mg/kg	TM173	1.13	5.04				
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173	44.7	88.8				
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173	70.4	146				
Total Aliphatics >C5-C12	<0.01 mg/kg	TM089	0.0311	<0.01				
Total Aromatics >EC5-EC12	<0.01 mg/kg	TM089	0.0403	<0.01				
Aromatics >EC35-EC40	<0.1 mg/kg	TM173	4.11	10.3				
Aliphatics >C35-C40	<0.1 mg/kg	TM173	<0.1	4.42				





SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

VOC MS (S)

Results Legend		Customer Sample R		BH104	BH108			
#	ISO17025 accredited.	Depth (m)	0.50 - 0.70	0.50 - 1.00				
M	mCERTS accredited.	Sample Type	Soil/Solid	Soil/Solid				
S	Non-conforming work.	Date Sampled	13/02/2011	13/02/2011				
aq	Aqueous / settled sample.	Date Received	15/02/2011	15/02/2011				
diss.filt	Dissolved / filtered sample.	SDG Ref	110215-6	110215-6				
tot.unfilt	Total / unfiltered sample.	Lab Sample No.(s)	2871155	2871093				
*	subcontracted test.	AGS Reference						
**	% 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.							
Component	LOD/Units	Method						
Toluene-d8**	%	TM116	80.5	91.3				
Methyl Tertiary Butyl Ether	<0.011 mg/kg	TM116	<0.011 M	<0.011 M				
Benzene	<0.009 mg/kg	TM116	0.0135 M	<0.009 M				
Toluene	<0.005 mg/kg	TM116	0.028 M	0.0167 M				
Ethylbenzene	<0.004 mg/kg	TM116	0.0852 M	0.0567 M				
p/m-Xylene	<0.014 mg/kg	TM116	0.0235 #	<0.014 #				
o-Xylene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
<b>NFD</b>	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 <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
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		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
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		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished) <sup>1</sup>	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
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		
TM243				
TM288				

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

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

**Test Completion Dates**

Lab Sample No(s) Customer Sample Ref.	2870432	2871155	2871212	2873064	2870816	2871093	2873065	2870459
	BH103	BH104	BH104	BH105	BH107	BH108	BH108	BH109
AGS Ref.								
Depth	0.30 - 0.50	0.50 - 0.70	0.00 - 0.30	0.40 - 0.60	0.30 - 0.50	0.50 - 1.00	0.00 - 0.20	0.30 - 0.60
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Anions by Kone (soil)		18-Feb-2011				18-Feb-2011		
Asbestos Containing Material Screen	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011
Cyanide Comp/Free/Total/Thiocyanate		18-Feb-2011				18-Feb-2011		
Easily Liberated Sulphide		18-Feb-2011				21-Feb-2011		
EPH CWG (Aliphatic) GC (S)		19-Feb-2011				19-Feb-2011		
EPH CWG (Aromatic) GC (S)		19-Feb-2011				19-Feb-2011		
GRO by GC-FID (S)		22-Feb-2011				22-Feb-2011		
Metals by iCap-OES (Soil)	21-Feb-2011	21-Feb-2011	21-Feb-2011	21-Feb-2011	21-Feb-2011	21-Feb-2011	23-Feb-2011	21-Feb-2011
Oxygenates (S)		21-Feb-2011				21-Feb-2011		
PAH by GCMS		19-Feb-2011				19-Feb-2011		
pH		17-Feb-2011				17-Feb-2011		
Phenols by HPLC (S)		18-Feb-2011				18-Feb-2011		
Sample description	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011	17-Feb-2011
Total Organic Carbon		18-Feb-2011				18-Feb-2011		
Total Sulphate		22-Feb-2011				22-Feb-2011		
TPH CWG GC (S)		22-Feb-2011				22-Feb-2011		
VOC MS (S)		21-Feb-2011				21-Feb-2011		

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

**ASSOCIATED AQC DATA**

Anions by Kone (soil)

Component	Method Code	QC 27
Chloride (soluble)	TM243	<b>97.57</b> 78.07 : 121.93
Water Soluble Sulphate as SO4 2:1 Extract	TM243	<b>97.01</b> 91.36 : 106.23

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 28	QC 28
Free Cyanide	TM153	<b>103.17</b> 87.04 : 107.05	<b>103.32</b> 87.04 : 107.05
Thiocyanate	TM153	<b>102.77</b> 90.22 : 111.93	<b>103.74</b> 90.22 : 111.93
Total Cyanide	TM153	<b>100.99</b> 77.00 : 112.12	<b>101.67</b> 77.00 : 112.12

Easily Liberated Sulphide

Component	Method Code	QC 26	QC 26
Easily Liberated Sulphide	TM180	<b>88.80</b> 44.43 : 127.23	<b>96.35</b> 44.43 : 127.23

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 25
Total Aliphatics >C12-C35	TM173	<b>90.23</b> 68.60 : 100.41

EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 25
Total Aromatics >EC12-EC35	TM173	<b>96.24</b> 60.37 : 122.36

Metals by iCap-OES (Soil)

Component	Method Code	QC 20	QC 22
Aluminium	TM181	<b>124.18</b> 94.29 : 126.83	<b>127.79</b> 94.29 : 126.83
Antimony	TM181	<b>105.39</b> 80.62 : 119.38	<b>106.56</b> 80.62 : 119.38

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

Metals by iCap-OES (Soil)

		QC 20	QC 22
Arsenic	TM181	<b>108.18</b> 93.69 : 117.92	<b>108.01</b> 93.69 : 117.92
Barium	TM181	<b>111.70</b> 92.15 : 121.48	<b>113.85</b> 92.15 : 121.48
Beryllium	TM181	<b>103.45</b> 93.37 : 106.63	<b>106.50</b> 93.37 : 106.63
Boron	TM181	<b>121.93</b> 71.45 : 144.21	<b>137.06</b> 71.45 : 144.21
Cadmium	TM181	<b>94.02</b> 83.47 : 108.02	<b>91.69</b> 83.47 : 108.02
Chromium	TM181	<b>101.72</b> 86.66 : 111.67	<b>105.20</b> 86.66 : 111.67
Cobalt	TM181	<b>104.97</b> 91.65 : 115.98	<b>104.44</b> 91.65 : 115.98
Copper	TM181	<b>103.03</b> 90.86 : 109.48	<b>101.28</b> 90.86 : 109.48
Iron	TM181	<b>113.45</b> 100.21 : 121.44	<b>119.24</b> 100.21 : 121.44
Lead	TM181	<b>94.23</b> 81.17 : 121.35	<b>97.62</b> 81.17 : 121.35
Manganese	TM181	<b>93.66</b> 88.94 : 103.43	<b>97.22</b> 88.94 : 103.43
Mercury	TM181	<b>112.13</b> 96.85 : 124.11	<b>113.71</b> 96.85 : 124.11
Molybdenum	TM181	<b>101.60</b> 83.94 : 116.06	<b>99.33</b> 83.94 : 116.06
Nickel	TM181	<b>101.07</b> 83.34 : 114.35	<b>104.73</b> 83.34 : 114.35
Phosphorus	TM181	<b>98.84</b> 85.62 : 116.58	<b>103.40</b> 85.62 : 116.58
Selenium	TM181	<b>110.28</b> 100.15 : 123.30	<b>107.06</b> 100.15 : 123.30
Strontium	TM181	<b>103.96</b> 89.82 : 110.49	<b>107.67</b> 89.82 : 110.49
Thallium	TM181	<b>106.45</b> 93.51 : 130.39	<b>105.83</b> 93.51 : 130.39
Tin	TM181	<b>97.76</b> 89.71 : 110.91	<b>95.82</b> 89.71 : 110.91
Titanium	TM181	<b>96.96</b> 78.57 : 125.05	<b>112.47</b> 78.57 : 125.05
Vanadium	TM181	<b>104.95</b> 91.61 : 110.18	<b>106.83</b> 91.61 : 110.18
Zinc	TM181	<b>94.97</b> 83.65 : 103.15	<b>94.42</b> 83.65 : 103.15

PAH by GCMS

Component	Method Code	QC 27
Acenaphthene	TM218	<b>103.73</b> 77.12 : 112.00
Acenaphthylene	TM218	<b>96.68</b> 67.85 : 104.34
Anthracene	TM218	<b>97.79</b> 70.38 : 106.86

SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

PAH by GCMS

		QC 27
Benz(a)anthracene	TM218	<b>108.52</b> 75.93 : 121.42
Benzo(a)pyrene	TM218	<b>108.26</b> 75.48 : 121.80
Benzo(b)fluoranthene	TM218	<b>106.69</b> 78.12 : 121.99
Benzo(ghi)perylene	TM218	<b>100.43</b> 78.41 : 115.87
Benzo(k)fluoranthene	TM218	<b>106.94</b> 77.71 : 116.48
Chrysene	TM218	<b>106.04</b> 78.09 : 115.69
Dibenzo(ah)anthracene	TM218	<b>98.98</b> 76.81 : 115.89
Fluoranthene	TM218	<b>99.76</b> 74.24 : 114.09
Fluorene	TM218	<b>100.65</b> 73.88 : 111.54
Indeno(123cd)pyrene	TM218	<b>100.32</b> 76.77 : 119.38
Naphthalene	TM218	<b>103.36</b> 76.04 : 107.88
Phenanthrene	TM218	<b>100.37</b> 74.34 : 113.46
Pyrene	TM218	<b>99.05</b> 74.69 : 113.49

pH

Component	Method Code	QC 22
pH	TM133	<b>98.62</b> 96.84 : 100.64

Phenols by HPLC (S)

Component	Method Code	QC 26
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	<b>92.81</b> 85.54 : 103.30
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	<b>95.21</b> 86.02 : 103.87
Catechol by HPLC (S)	TM062 (S)	<b>62.28</b> 27.23 : 80.19
Cresols by HPLC (S)	TM062 (S)	<b>91.22</b> 79.99 : 98.02
Naphthol by HPLC (S)	TM062 (S)	<b>87.43</b> 63.74 : 104.78
Phenol by HPLC (S)	TM062 (S)	<b>90.42</b> 81.28 : 100.85
Resorcinol HPLC (S)	TM062 (S)	<b>88.62</b> 80.50 : 98.19

**SDG:** 110215-6  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:**

**Order Number:**  
**Report Number:** 117493  
**Superseded Report:**

Phenols by HPLC (S)

		QC 26
Xylenols by HPLC (S)	TM062 (S)	<b>91.82</b> 86.98 : 101.98

Total Organic Carbon

Component	Method Code	QC 27
Total Organic Carbon	TM132	<b>93.53</b> 88.75 : 104.70

Total Sulphate

Component	Method Code	QC 21
Total Sulphate	TM221	<b>85.05</b> 80.05 : 95.26

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.  
 The figure detailed is the percentage recovery result for the AQC.  
 The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.



SDG: 110215-6  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 117493  
Superseded Report:

### Chromatogram

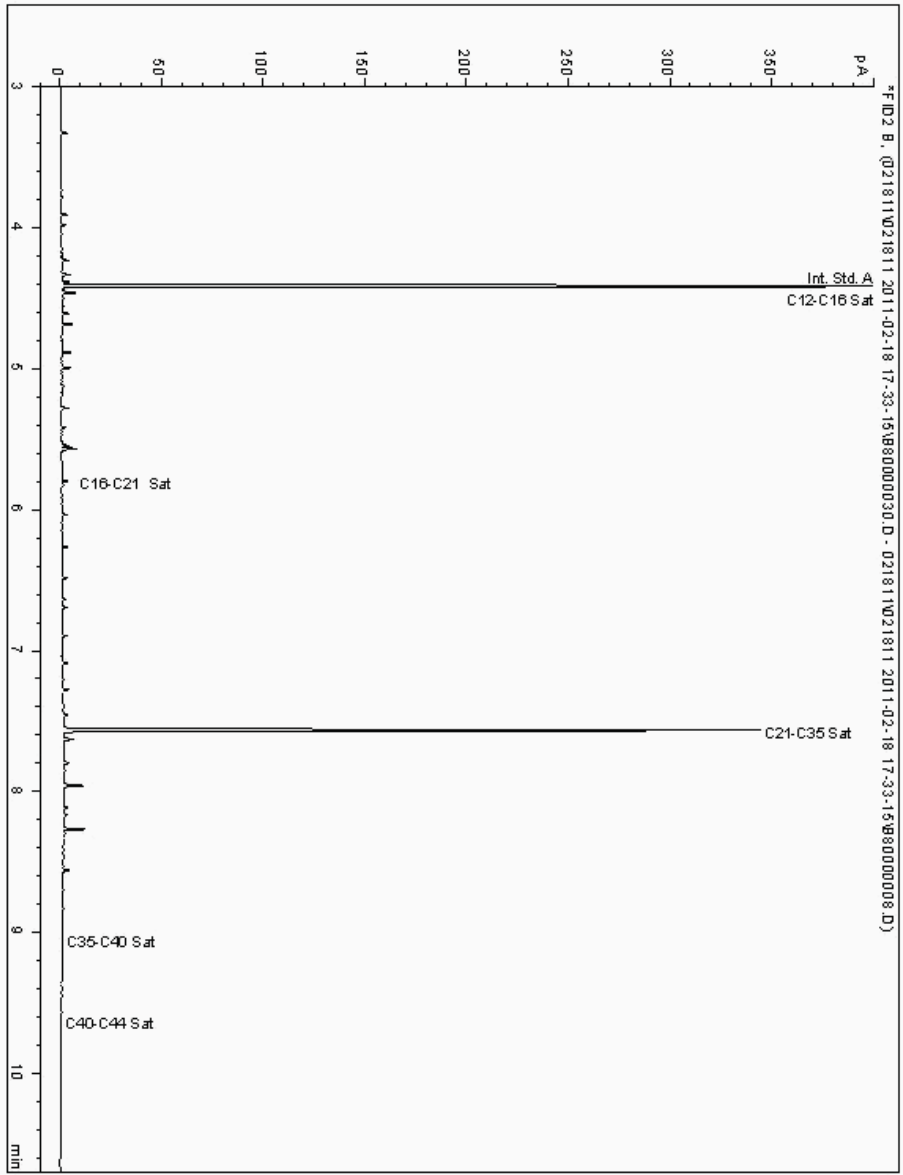
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2894635  
Sample ID: BH108

Depth: 0.50 - 1.00

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

Sample Identity: 2955725-2894635  
Date Acquired : 19/02/11 02:35:49  
Units : ppb  
Dilution :  
CF : 1  
Multiplier : 1.011



SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

### Chromatogram

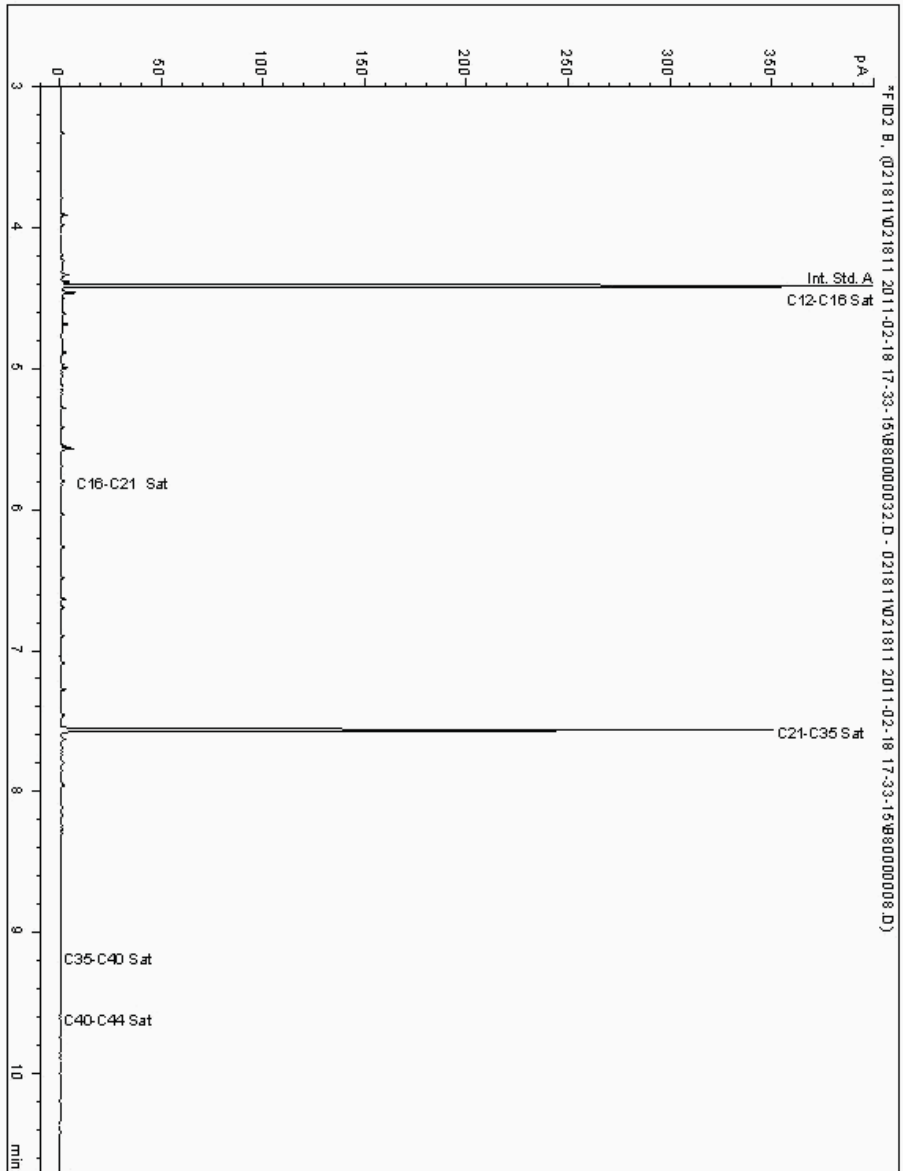
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No: 2894669  
 Sample ID: BH104

Depth: 0.50 - 0.70

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

Sample Identity: 2955746-2894669  
 Date Acquired : 19/02/11 03:08:18  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 1.036



SDG: 110215-6  
 Job: H\_ARCADIS\_NMK-340  
 Client Reference: 93749.02

Location: Simonside  
 Customer: ARCADIS Geraghty & Miller  
 Attention:

Order Number:  
 Report Number: 117493  
 Superseded Report:

# Chromatogram

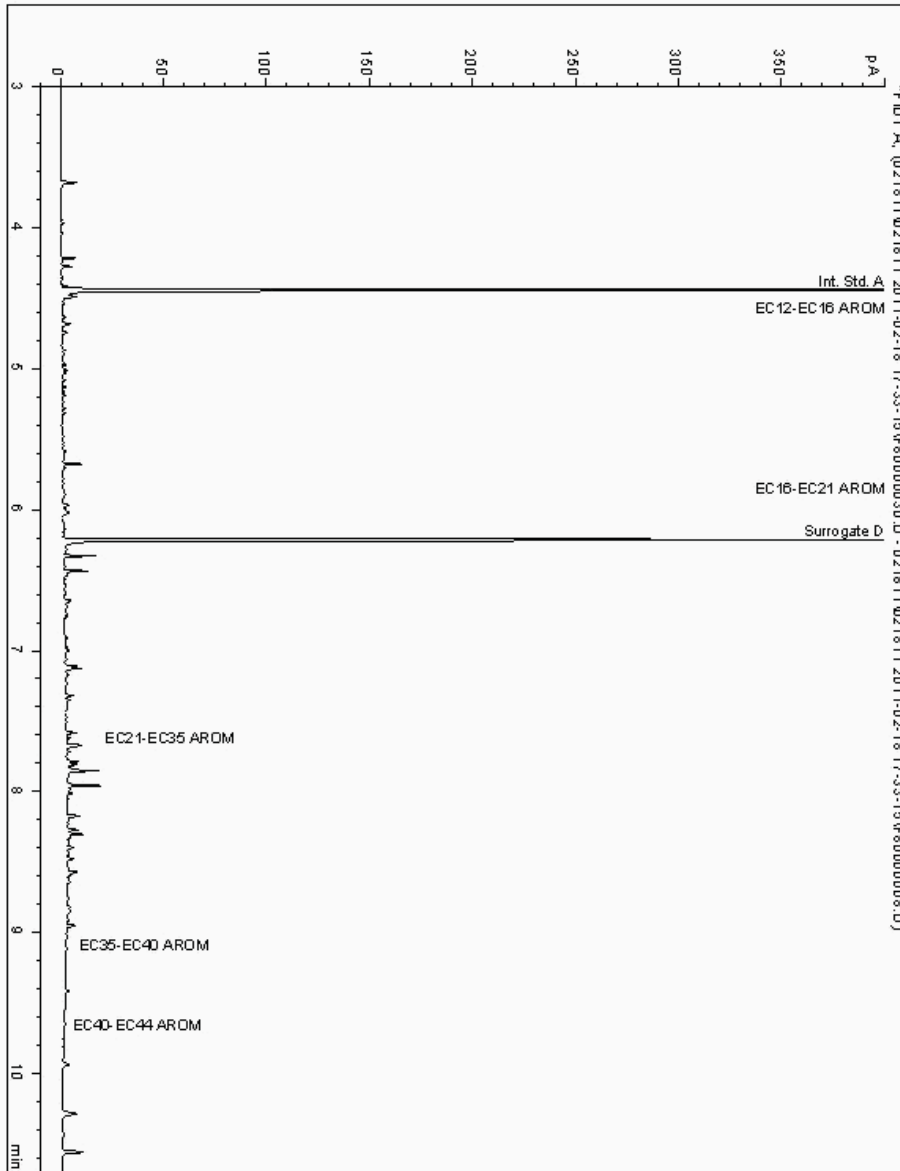
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2894635  
 Sample ID: BH108

Depth: 0.50 - 1.00

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

Sample Identity: 2955726-2894635  
 Date Acquired : 19/02/11 02:35:49  
 Units : ppb  
 Dilution :  
 CF : 1  
 Multiplier : 1.011



SDG: 110215-6  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

Order Number:  
Report Number: 117493  
Superseded Report:

# Chromatogram

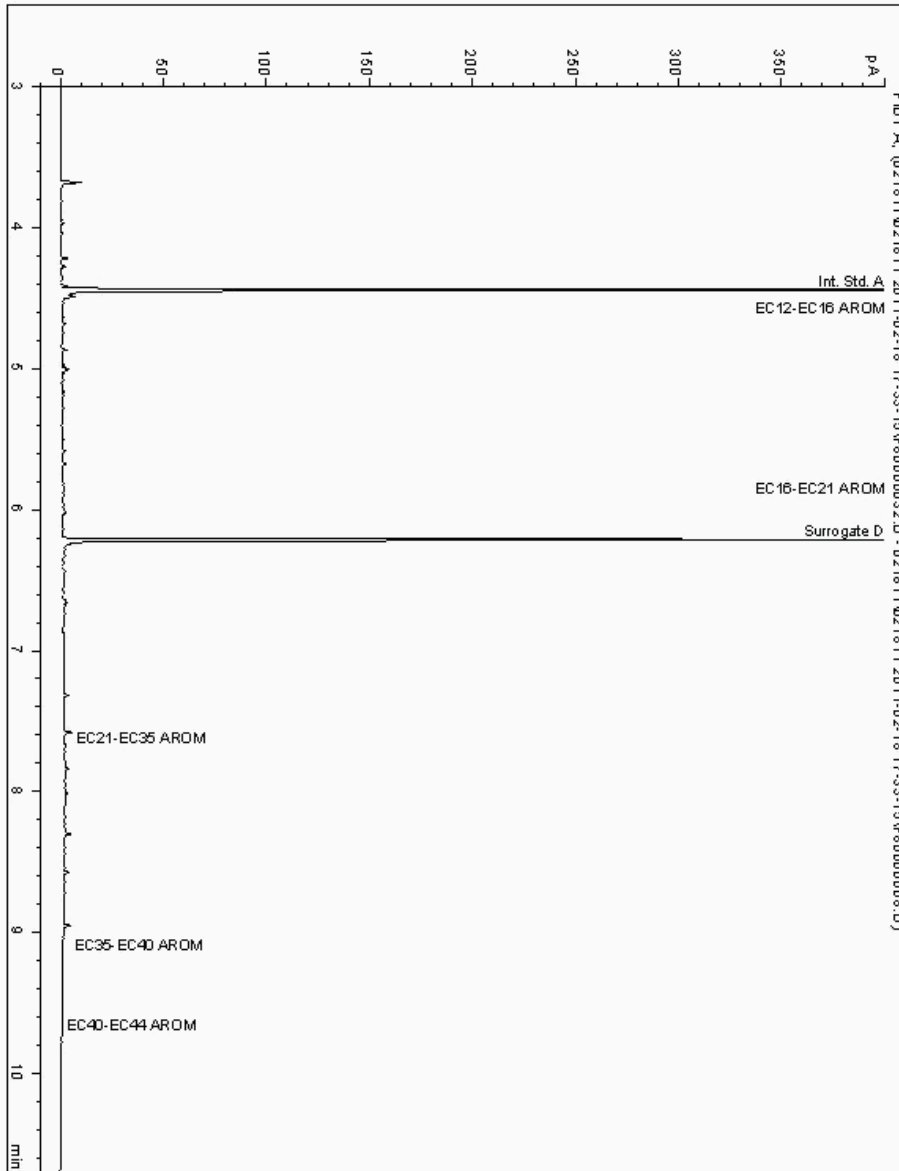
Analysis: EPH CWG (Aromatic) GC (S)

Sample No: 2894669  
Sample ID: BH104

Depth: 0.50 - 0.70

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

Sample Identity: 2955747-2894669  
Date Acquired : 19/02/11 03:08:18  
Units : ppb  
Dilution :  
CF : 1  
Multiplier : 1.036



SDG: 110215-6  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

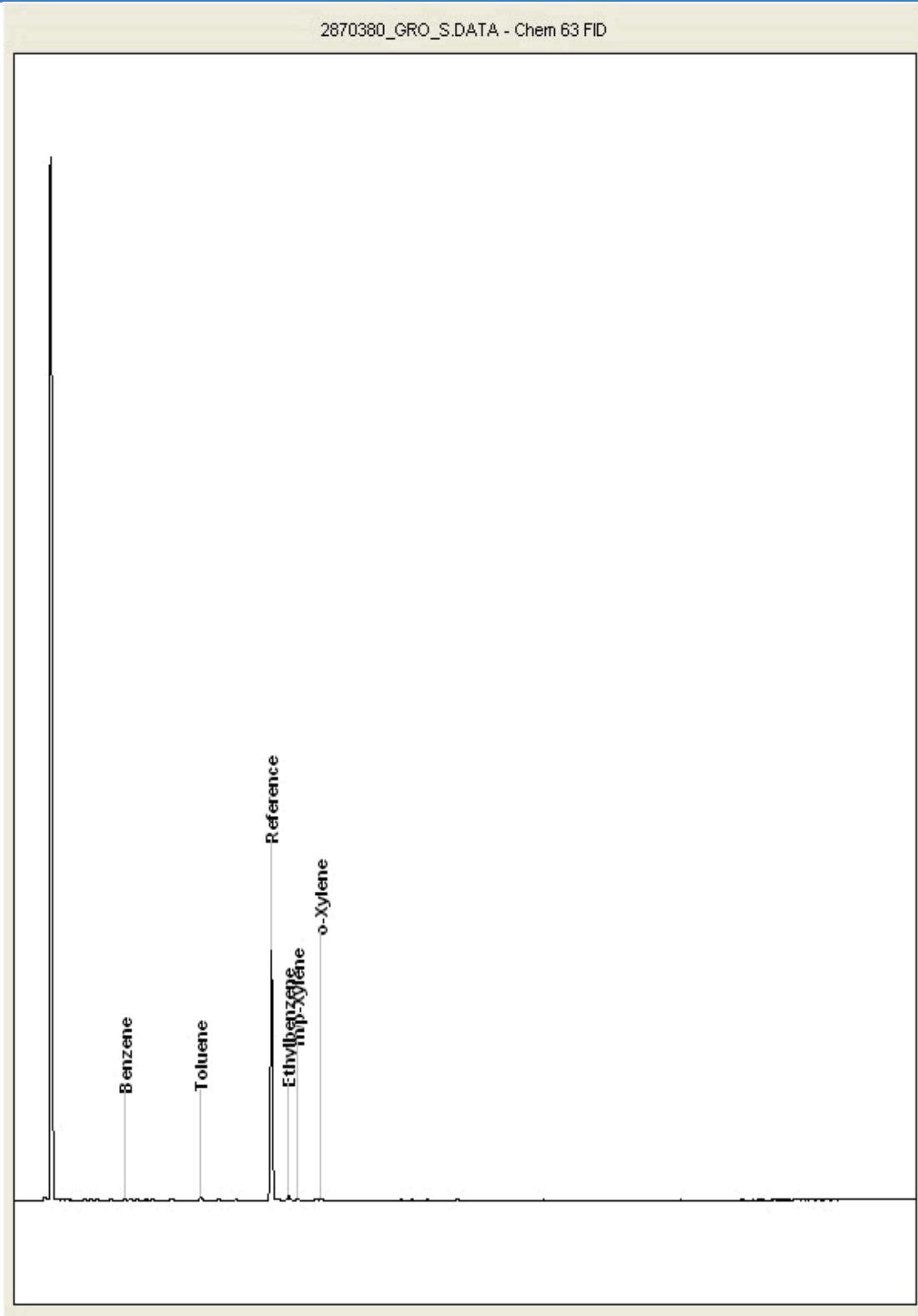
Order Number:  
Report Number: 117493  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2870380  
Sample ID : BH104

Depth : 0.50 - 0.70



SDG: 110215-6  
Job: H\_ARCADIS\_NMK-340  
Client Reference: 93749.02

Location: Simonside  
Customer: ARCADIS Geraghty & Miller  
Attention:

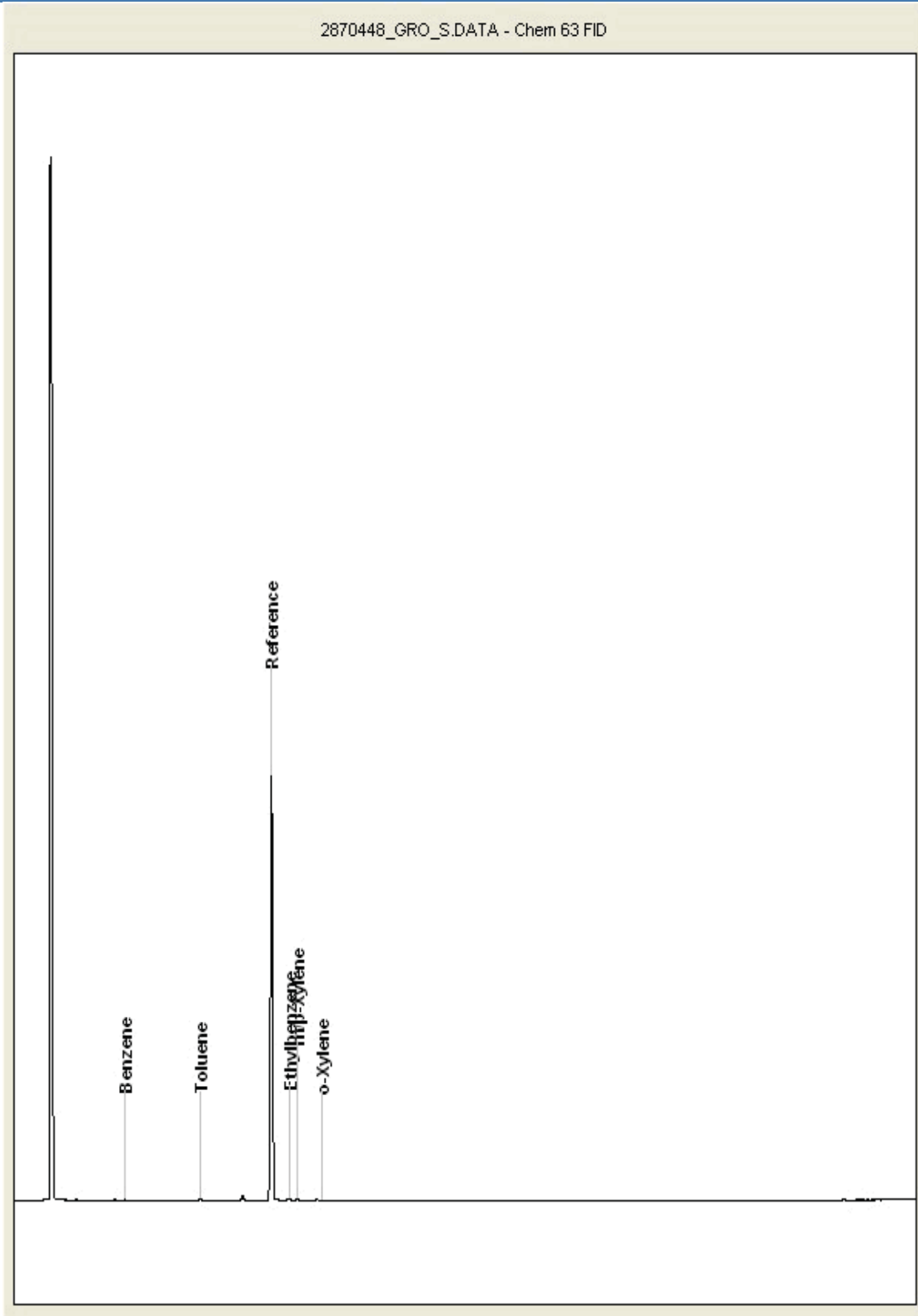
Order Number:  
Report Number: 117493  
Superseded Report:

### Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 2870448  
Sample ID : BH108

Depth : 0.50 - 1.00



**SDG:** 110215-6  
**Job:** H\_ARCADIS\_NMK-340  
**Client Reference:** 93749.02

**Location:** Simonside  
**Customer:** ARCADIS Geraghty & Miller  
**Attention:** Labadmin

**Order Number:**  
**Report Number:** 117493  
**Superseded Report:**

## 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<sub>4</sub> 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.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. 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.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. 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.

24. 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 ug/kg or ug/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.

## SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOXTERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOXTERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOXTERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOXTERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTERM	GCMS
EPH (GRO)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (MNOL)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER/END	GCFID
EPH O/G BY GC	D&C	HEXANE/ACETONE	END OVER/END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER/END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GCMS
C8-C10 (C6-C10) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM/ACETONE	SONICATE	GCMS

## LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH O/G	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST O/P/O/P	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### 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.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-



# Jones Environmental Laboratory

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

Arcadis UK Ltd  
2 Craven Court  
Newmarket  
Cambridge  
Cambridgeshire  
CB8 7FA

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781

**Attention :** Barry Plane  
**Date :** 7th March, 2011  
**Your reference :** 93749.02  
**Our reference :** Test Report 11/2719 Batch 1  
**Location :** SIMONSIDE  
**Date samples received :** 3rd March, 2011  
**Status :** Final report  
**Issue :** 1

Four 1.4l Silco-Can samples were received for analysis on 3rd March 2011 which was completed on 7th March 2011. The laboratory performed analysis via modified EPA method TO-15 using GC-MS.

A handwritten signature in blue ink, appearing to read "J W Farrell-Jones".

**J W Farrell- Jones CChem FRSC**  
**Chartered Chemist**



**Jones Environmental Laboratory**

**Client Name:** Arcadis UK Ltd  
**Reference:** 93749.02  
**Location:** SIMONSIDE  
**Contact:** Barry Plane  
**JE Job No.:** 11/2719

**Report : Gas**

J E Sample No.	1	2	3	4															
Sample ID	SG101	SG102	SG103	SG104															
Depth																			
COC No / misc																			
Containers	GC	GC	GC	GC															
Sample Date	01/03/2011	01/03/2011	01/03/2011	01/03/2011															
Sample Type	Gas	Gas	Gas	Gas															
Batch Number	1	1	1	1															
Date of Receipt	03/03/2011	03/03/2011	03/03/2011	03/03/2011															
													LOD	Units	Method No.				
Naphthalene	see tab	see tab	see tab	see tab										<10 - <52	ppbv-ug/m <sup>3</sup>	TM068G			
TPH CWG																			
Aliphatic >C4-C6	see tab	see tab	see tab	see tab										<10 - <33	ppbv-ug/m <sup>3</sup>	TM068G			
Aliphatic >C6-C8	see tab	see tab	see tab	see tab										<10 - <41	ppbv-ug/m <sup>3</sup>	TM068G			
Aliphatic >C8-C10	see tab	see tab	see tab	see tab										<10 - <53	ppbv-ug/m <sup>3</sup>	TM068G			
Aliphatic >C10-C12	see tab	see tab	see tab	see tab										<10 - <65	ppbv-ug/m <sup>3</sup>	TM068G			
Aromatic >C5-C7 (Benzene)	see tab	see tab	see tab	see tab										<10 - <32	ppbv-ug/m <sup>3</sup>	TM068G			
Aromatic >C7-C8 (Toluene)	see tab	see tab	see tab	see tab										<10 - <38	ppbv-ug/m <sup>3</sup>	TM068G			
Aromatic >C8-C10	see tab	see tab	see tab	see tab										<10 - <49	ppbv-ug/m <sup>3</sup>	TM068G			
Aromatic >C10-C12	see tab	see tab	see tab	see tab										<10 - <53	ppbv-ug/m <sup>3</sup>	TM068G			

Please see attached notes for all abbreviations and acronyms

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG101	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--1		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	267

### Q - Qualifiers

**B = Indicates analyte found in associated method blank**

**E = Indicates value exceeds calibration range**

**J = Indicates an estimated value**

**N = Indicates presumptive evidence of a compound**

**ND = Not detected**

### Key

**MDL = Method Detection Limit**

**RL = Reporting Limit**

**# = UKAS Accredited**

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
	81	Aliphatic >C4-C6		<10	10	10	<33	33	33
	100	Aliphatic >C6-C8		<10	10	10	<41	41	41
	130	Aliphatic >C8-C10		<10	10	10	<53	53	53
	160	Aliphatic >C10-C12		<10	10	10	<65	65	65
	78.11	Aromatic >C5-C7 (Benzene)		<10	10	10	<32	32	32
	92.14	Aromatic >C7-C8 (Toluene)		49	10	10	185	38	38
	120	Aromatic >C8-C10		13	10	10	64	49	49
	130	Aromatic >C10-C12		35	10	10	186	53	53
91-20-3	128.17	Naphthalene		<10	10	10	<52	52	52

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG102	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--2		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	540

### Q - Qualifiers

**B = Indicates analyte found in associated method blank**

**E = Indicates value exceeds calibration range**

**J = Indicates an estimated value**

**N = Indicates presumptive evidence of a compound**

**ND = Not detected**

### Key

**MDL = Method Detection Limit**

**RL = Reporting Limit**

**# = UKAS Accredited**

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
	81	Aliphatic >C4-C6		<10	10	10	<33	33	33
	100	Aliphatic >C6-C8		<10	10	10	<41	41	41
	130	Aliphatic >C8-C10		<10	10	10	<53	53	53
	160	Aliphatic >C10-C12		<10	10	10	<65	65	65
	78.11	Aromatic >C5-C7 (Benzene)		<10	10	10	<32	32	32
	92.14	Aromatic >C7-C8 (Toluene)		100	10	10	377	38	38
	120	Aromatic >C8-C10		16	10	10	79	49	49
	130	Aromatic >C10-C12		63	10	10	335	53	53
91-20-3	128.17	Naphthalene		<10	10	10	<52	52	52

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG103	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--3		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	261

### Q - Qualifiers

**B = Indicates analyte found in associated method blank**

**E = Indicates value exceeds calibration range**

**J = Indicates an estimated value**

**N = Indicates presumptive evidence of a compound**

**ND = Not detected**

### Key

**MDL = Method Detection Limit**

**RL = Reporting Limit**

**# = UKAS Accredited**

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
	81	Aliphatic >C4-C6		<10	10	10	<33	33	33
	100	Aliphatic >C6-C8		<10	10	10	<41	41	41
	130	Aliphatic >C8-C10		<10	10	10	<53	53	53
	160	Aliphatic >C10-C12		<10	10	10	<65	65	65
	78.11	Aromatic >C5-C7 (Benzene)		<10	10	10	<32	32	32
	92.14	Aromatic >C7-C8 (Toluene)		100	10	10	377	38	38
	120	Aromatic >C8-C10		20	10	10	98	49	49
	130	Aromatic >C10-C12		45	10	10	239	53	53
91-20-3	128.17	Naphthalene		<10	10	10	<52	52	52

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG104	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--4		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	537

### Q - Qualifiers

**B = Indicates analyte found in associated method blank**

**E = Indicates value exceeds calibration range**

**J = Indicates an estimated value**

**N = Indicates presumptive evidence of a compound**

**ND = Not detected**

### Key

**MDL = Method Detection Limit**

**RL = Reporting Limit**

**# = UKAS Accredited**

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
	81	Aliphatic >C4-C6		<10	10	10	<33	33	33
	100	Aliphatic >C6-C8		<10	10	10	<41	41	41
	130	Aliphatic >C8-C10		<10	10	10	<53	53	53
	160	Aliphatic >C10-C12		<10	10	10	<65	65	65
	78.11	Aromatic >C5-C7 (Benzene)		<10	10	10	<32	32	32
	92.14	Aromatic >C7-C8 (Toluene)		66	10	10	249	38	38
	120	Aromatic >C8-C10		14	10	10	69	49	49
	130	Aromatic >C10-C12		46	10	10	245	53	53
91-20-3	128.17	Naphthalene		<10	10	10	<52	52	52

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG101	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--1		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	267

<b>Q - Qualifiers</b>	<b>Key</b>
<b>B = Indicates analyte found in associated method blank</b>	<b>MDL = Method Detection Limit</b>
<b>E = Indicates value exceeds calibration range</b>	<b>RL = Reporting Limit</b>
<b>J = Indicates an estimated value</b>	<b># = UKAS Accredited</b>
<b>N = Indicates presumptive evidence of a compound</b>	
<b>ND = Not detected</b>	

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
1634-04-4	88.15	Methyl tertiary butyl ether		<1.5	1.5	1.5	<5.4	5.4	5.4
71-43-2	78.11	# Benzene		<1.5	1.5	1.5	<4.8	4.8	4.8
108-88-3	92.13	# Toluene		49.4	1.5	1.5	186.1	5.7	5.7
100-41-4	106.16	# Ethylbenzene		2.6	1.5	1.5	11.3	6.5	6.5
	106.17	# m&p - Xylenes		7.8	1.5	1.5	33.9	6.5	6.5
95-47-6	106.17	# o-Xylene		3.2	1.5	1.5	13.9	6.5	6.5

CAS No	Surrogate Recoveries	Run #1	Run #2	Limits
460-00-4	4-Bromofluorobenzene	97.41		65-128%

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG102	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--2		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	540

<b>Q - Qualifiers</b>	<b>Key</b>
<b>B = Indicates analyte found in associated method blank</b>	<b>MDL = Method Detection Limit</b>
<b>E = Indicates value exceeds calibration range</b>	<b>RL = Reporting Limit</b>
<b>J = Indicates an estimated value</b>	<b># = UKAS Accredited</b>
<b>N = Indicates presumptive evidence of a compound</b>	
<b>ND = Not detected</b>	

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
1634-04-4	88.15	Methyl tertiary butyl ether		82.1	1.5	1.5	296.0	5.4	5.4
71-43-2	78.11	# Benzene		2.8	1.5	1.5	8.9	4.8	4.8
108-88-3	92.13	# Toluene		99.5	1.5	1.5	374.9	5.7	5.7
100-41-4	106.16	# Ethylbenzene		2.8	1.5	1.5	12.2	6.5	6.5
	106.17	# m&p - Xylenes		9.5	1.5	1.5	41.3	6.5	6.5
95-47-6	106.17	# o-Xylene		4.1	1.5	1.5	17.8	6.5	6.5

CAS No	Surrogate Recoveries	Run #1	Run #2	Limits
460-00-4	4-Bromofluorobenzene	98.84		65-128%

## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG103	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--3		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	261

<b>Q - Qualifiers</b>	<b>Key</b>
<b>B = Indicates analyte found in associated method blank</b>	<b>MDL = Method Detection Limit</b>
<b>E = Indicates value exceeds calibration range</b>	<b>RL = Reporting Limit</b>
<b>J = Indicates an estimated value</b>	<b># = UKAS Accredited</b>
<b>N = Indicates presumptive evidence of a compound</b>	
<b>ND = Not detected</b>	

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
1634-04-4	88.15	Methyl tertiary butyl ether		<1.5	1.5	1.5	<5.4	5.4	5.4
71-43-2	78.11	# Benzene		<1.5	1.5	1.5	<4.8	4.8	4.8
108-88-3	92.13	# Toluene		100.5	1.5	1.5	378.7	5.7	5.7
100-41-4	106.16	# Ethylbenzene		3.0	1.5	1.5	13.0	6.5	6.5
	106.17	# m&p - Xylenes		14.1	1.5	1.5	61.2	6.5	6.5
95-47-6	106.17	# o-Xylene		4.0	1.5	1.5	17.4	6.5	6.5

CAS No	Surrogate Recoveries	Run #1	Run #2	Limits
460-00-4	4-Bromofluorobenzene	108.26		65-128%



## Jones Environmental Laboratory

<b>Client Name:</b>	Arcadis UK Ltd	<b>Date Sampled:</b>	01/03/11
<b>Project:</b>	Simonside	<b>Date Received:</b>	03/03/11
<b>Client Sample ID:</b>	SG104	<b>Date Analysed:</b>	03/03/11
<b>Depth:</b>	~		
<b>Lab Sample ID:</b>	11-2719--4		
<b>Matrix:</b>	Air		
<b>Method:</b>	TM068G (Modified US EPA T015)		

<b>Initial Vacuum (inches of Hg)</b>	~
<b>Final Pressure (psi)</b>	~
<b>PID Reading (ppm)</b>	~
<b>Canister Serial number</b>	537

### Q - Qualifiers

**B = Indicates analyte found in associated method blank**

**E = Indicates value exceeds calibration range**

**J = Indicates an estimated value**

**N = Indicates presumptive evidence of a compound**

**ND = Not detected**

### Key

**MDL = Method Detection Limit**

**RL = Reporting Limit**

**# = UKAS Accredited**

CAS No	Molecular Weight	Compound	Q	Result	RL	MDL	Result	RL	MDL
				ppbv	ppbv	ppbv	ug/m <sup>3</sup>	ug/m <sup>3</sup>	ug/m <sup>3</sup>
1634-04-4	88.15	Methyl tertiary butyl ether		<1.5	1.5	1.5	<5.4	5.4	5.4
71-43-2	78.11	# Benzene		<1.5	1.5	1.5	<4.8	4.8	4.8
108-88-3	92.13	# Toluene		66.0	1.5	1.5	248.7	5.7	5.7
100-41-4	106.16	# Ethylbenzene		2.4	1.5	1.5	10.4	6.5	6.5
	106.17	# m&p - Xylenes		8.5	1.5	1.5	36.9	6.5	6.5
95-47-6	106.17	# o-Xylene		3.3	1.5	1.5	14.3	6.5	6.5

CAS No	Surrogate Recoveries	Run #1	Run #2	Limits
460-00-4	4-Bromofluorobenzene	100.54		65-128%

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

### DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

*The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:*

- \$ sample temperature on receipt considered inappropriate for analysis requested
- ^ samples exceeding recommended holding times
- & samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials)
- ~ no sampling date given, unable to confirm if samples are with acceptable holding times

-----  
# - UKAS accredited

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

*The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:*

- \$ sample temperature on receipt considered inappropriate for analysis requested
- ^ samples exceeding recommended holding times
- & samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials)
- ~ no sampling date given, unable to confirm if samples are with acceptable holding times

### ABBREVIATIONS and ACRONYMS USED

- # - UKAS accredited
- M - MCERTS accredited
- NAD - No Asbestos Detected
- ND - None Detected (usually refers to VOC and/SVOC TICs)
- SS - Calibrated against a single substance
- \* - analysis subcontracted to a Jones Environmental approved laboratory.
- W - Results expressed on as received basis
- + Failed AQC results should be considered as indicative only and are not accredited.
- ++ Result outside calibration range, results should be considered as indicative only and are not accredited.
- SFE Surrogate recovery failure, results not accredited.
- SFV Surrogate failure on Volatiles possibly due to matrix effect.

Appendix I  
Derivation of Generic Assessment Criteria (GAC) for Continued Petroleum Use

## SUMMARY

The purpose of this document is to describe the general principles adopted in the derivation of the ARCADIS' Generic Assessment Criteria (GAC). The document and associated GAC underpins the generic quantitative risk assessments ARCADIS undertakes for its clients and is not intended for any other use or use by others. Guidance has been provided by the EA to aid development of GAC which are appropriate for a typical UK site, incorporating conservatism where warranted. Whilst not formally adopted by environment agencies in Scotland and Northern Ireland, the EA guidance is generally applied to help site assessment in the absence of country-specific guidance. ARCADIS has used the EA guidance to develop in-house GAC to aid assessment of land contamination sites, and in particular to assess risks to human health receptors from chronic health effects and risks to water resource receptors. The GAC do not consider potential risks to ecological receptors, which may need to be assessed on specific sites. The following non-statutory technical guidance has been referred to in deriving the GAC.

- EA Science Reports SC050021/SR2, SC050021/SR3 and SC050021/SR7.
- Related Toxicity and Soil Guideline Value reports
- EA Remedial Targets Methodology: *Hydrogeological Risk Assessment for Land Contamination* developed in consultation with the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Heritage and Environment Service.

The GAC used within this report have been derived for "continued petroleum end use". Based on the typical use and design of these sites, with buildings and/or hard standing present across the majority of the site, direct exposure to shallow soils is not considered active. A building typical of a petrol filling station shop (represented by the size of a bungalow) is adopted in the derivation of the GAC. A neighbouring resident is assumed present, comprising a small terraced house without basement.

ARCADIS has undertaken environmental works on hundreds of potentially contaminated sites across the UK. The typical shallow geology encountered comprises granular soils or made ground, with a low organic matter content. As such, ARCADIS has taken the decision to derive in-house GAC for a sand rather than sandy loam soil-type used by the EA to derive Soil Guideline Values, with an organic matter content of 0.34% (fraction of organic carbon content 0.002, typical of many sites).

Development of GAC\_03/September 2009

To derive Human Health GAC (HH-GAC), the following exposure pathways are considered active for potential soil or groundwater exposures:

Site End-Use	On-Site Pathways
Continued petroleum use	<ul style="list-style-type: none"> <li>• Inhalation of vapours outside from a soil or groundwater source</li> <li>• Inhalation of vapours inside from a soil or groundwater source</li> </ul>
Neighbouring resident	Migration of impacted groundwater beneath neighbouring property, and subsequently: <ul style="list-style-type: none"> <li>• Inhalation of indoor air in an off-site property (originating from an on-site soil or groundwater source)</li> <li>• Inhalation of outdoor air in an off-site garden (originating from an on-site soil or groundwater source)</li> </ul>

Two levels of water quality standard have been considered to enable Water Resource GAC (WR-GAC) to be developed depending on the environmental sensitivity of a site. The Set 1 WR-GAC are generally based on adopted Environmental Quality Standards, and are considered appropriate for sites that are not located in a high sensitivity setting. The Set 2 WR-GAC are generally based on adopted Drinking Water Standards, which are considered appropriate for higher sensitivity sites. No attenuation with transport off-site is assumed.

The following modelling tools have been utilised in the derivation of the GAC:

HH-GAC (on-site): CLEA 1.04 and RBCA Toolkit v2.5  
 HH-GAC (off-site): RBCA Toolkit v2.5 and Remedial Targets Worksheet v3.1  
 WR-GAC: Remedial Targets Worksheet v3.1

Selected model inputs and outputs are presented in the following tables.

	Air-water partition co-efficient		Diffusion co-efficient in air		Diffusion co-efficient in water		Relative molecular mass		Vapour pressure		Water solubility		Koc	
	cm <sup>3</sup> cm <sup>3</sup>	Notes	m <sup>2</sup> s <sup>-1</sup>	Notes	m <sup>2</sup> s <sup>-1</sup>	Notes	g mol <sup>-1</sup>	Notes	Pa	Notes	mg L <sup>-1</sup>	Notes	Log (dimension)	Notes
Benzene	1.16E-01	Science Report – SC050021/SR7	8.77E-06	Science Report – SC050021/SR7	6.64E-10	Science Report – SC050021/SR7	78.11	Science Report – SC050021/SR7	6.24E+03	Science Report – SC050021/SR7	1.78E+03	Science Report – SC050021/SR7	1.83E+00	Science Report – SC050021/SR7
Toluene	1.15E-01	Science Report – SC050021/SR7	7.79E-06	Science Report – SC050021/SR7	5.88E-10	Science Report – SC050021/SR7	92.14	Science Report – SC050021/SR7	1.73E+03	Science Report – SC050021/SR7	5.90E+02	Science Report – SC050021/SR7	2.31E+00	Science Report – SC050021/SR7
Ethylbenzene	1.39E-01	Science Report – SC050021/SR7	7.04E-06	Science Report – SC050021/SR7	5.31E-10	Science Report – SC050021/SR7	106.17	Science Report – SC050021/SR7	5.53E+02	Science Report – SC050021/SR7	1.80E+02	Science Report – SC050021/SR7	2.66E+00	Science Report – SC050021/SR7
Sum xylenes	1.04E-01	Average for three xylenes	7.03E-06	Average for three xylenes	5.3E-10	Average for three xylenes	106.17	Average for three xylenes	4.52E+02	Average for three xylenes	1.91E+02	Average for three xylenes	2.66E+00	Average for three xylenes
MTBE	2.04E-02	Literature review	7.10E-06	Literature review	9.00E-10	Literature review	88.17	Literature review	3.45E+04	Literature review	4.80E+04	Literature review	1.08E+00	Literature review
Aliphatic >C5-6	3.40E+01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	81	Literature review	3.60E+04	Literature review	3.60E+01	Literature review	2.90E+00	Literature review
Aliphatic >C6-8	5.10E+01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	100	Literature review	6.40E+03	Literature review	5.40E+00	Literature review	3.60E+00	Literature review
Aliphatic >C8-10	8.20E+01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	130	Literature review	6.40E+02	Literature review	4.30E-01	Literature review	4.51E+00	Literature review
Aliphatic >C10-12	1.30E+02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	160	Literature review	6.50E+01	Literature review	3.40E-02	Literature review	5.40E+00	Literature review
Aliphatic >C12-16	5.40E+02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	200	Literature review	4.80E+00	Literature review	7.60E-04	Literature review	6.70E+00	Literature review
Aliphatic >C16-35	6.40E+03	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	270	Literature review	7.70E-01	Literature review	1.30E-06	Literature review	9.00E+00	Literature review
Aromatic >C8-10	4.90E-01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	120	Literature review	6.40E+02	Literature review	6.50E+01	Literature review	3.20E+00	Literature review
Aromatic >C10-12	1.40E-01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	130	Literature review	6.40E+01	Literature review	2.50E+01	Literature review	3.40E+00	Literature review
Aromatic >C12-16	5.40E-02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	150	Literature review	4.80E+00	Literature review	5.80E+00	Literature review	3.70E+00	Literature review
Aromatic >C16-21	1.30E-02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	190	Literature review	7.70E-01	Literature review	5.10E-01	Literature review	4.20E+00	Literature review
Aromatic >C21-35	6.80E-04	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	240	Literature review	4.40E-04	Literature review	6.60E-03	Literature review	5.11E+00	Literature review

Chemical Name	Chemical Type	Oral HCV						Inhalation HCV						Oral MDI for adults		Inhalation MDI for adults		Notes
		Type	µg kg <sup>-1</sup> BW day <sup>-1</sup>	Notes	Oral exposure	Dermal exposure	Inhalation exposure	Type	µg kg <sup>-1</sup> BW day <sup>-1</sup>	Notes	Oral exposure	Dermal exposure	Inhalation exposure	Combine oral and Inhalation AC	µg kg <sup>-1</sup> BW day <sup>-1</sup>	Notes	µg kg <sup>-1</sup> BW day <sup>-1</sup>	
Benzene	organic	ID	2.90E-01	UK TOX (March 2009)	Yes	Yes	No	ID	1.40E+00	UK TOX (March 2009)	No	No	Yes	Yes	NR	NA	NR	NA
Toluene	organic	TDI	2.23E+02	UK TOX (March 2009)	Yes	Yes	No	TDI	1.40E+03	UK TOX (March 2009)	No	No	Yes	Yes	1.00E+01	UK TOX (March 2009)	5.20E+02	UK TOX (March 2009)
Ethylbenzene	organic	TDI	1.00E+02	UK TOX (March 2009)	Yes	Yes	No	TDI	2.20E+02	UK TOX (March 2009)	No	No	Yes	Yes	5.00E+00	UK TOX (March 2009)	1.30E+02	UK TOX (March 2009)
Sum xylenes	organic	TDI	1.80E+02	UK TOX (March 2009)	Yes	Yes	No	TDI	6.00E+01	UK TOX (March 2009)	No	No	Yes	Yes	1.10E+01	UK TOX (March 2009)	1.40E+02	UK TOX (March 2009)
MTBE	organic	TDI	8.60E+02	Literature review	Yes	Yes	No	TDI	8.60E+02	Literature review	No	No	Yes	Yes	3.00E+01	EU Risk Assessment Report	1.89E+02	EU Risk Assessment Report
Aliphatic >C5-6	organic	TDI	5.00E+03	TPHCWG	Yes	Yes	No	TDI	5.26E+03	TPHCWG	No	No	Yes	Yes	3.50E+05	TDI x 70kg (MDI unknown)	3.68E+05	TDI x 70kg (MDI unknown)
Aliphatic >C6-8	organic	TDI	5.00E+03	TPHCWG	Yes	Yes	No	TDI	5.26E+03	TPHCWG	No	No	Yes	Yes	3.50E+05	TDI x 70kg (MDI unknown)	3.68E+05	TDI x 70kg (MDI unknown)
Aliphatic >C8-10	organic	TDI	1.00E+02	TPHCWG	Yes	Yes	No	TDI	2.70E+02	TPHCWG	No	No	Yes	Yes	7.00E+03	TDI x 70kg (MDI unknown)	1.89E+04	TDI x 70kg (MDI unknown)
Aliphatic >C10-12	organic	TDI	1.00E+02	TPHCWG	Yes	Yes	No	TDI	2.70E+02	TPHCWG	No	No	Yes	Yes	7.00E+03	TDI x 70kg (MDI unknown)	1.89E+04	TDI x 70kg (MDI unknown)
Aliphatic >C12-16	organic	TDI	1.00E+02	TPHCWG	Yes	Yes	No	TDI	2.70E+02	TPHCWG	No	No	Yes	Yes	7.00E+03	TDI x 70kg (MDI unknown)	1.89E+04	TDI x 70kg (MDI unknown)
Aliphatic >C16-35	organic	TDI	2.00E+03	TPHCWG	Yes	Yes	No	NR			NR	NR	NR	NR	1.40E+05	TDI x 70kg (MDI unknown)	1.89E+04	TDI x 70kg (MDI unknown)
Aromatic >C8-10	organic	TDI	4.00E+01	TPHCWG	Yes	Yes	No	TDI	5.50E+01	TPHCWG	No	No	Yes	Yes	2.80E+03	TDI x 70kg (MDI unknown)	3.85E+03	TDI x 70kg (MDI unknown)
Aromatic >C10-12	organic	TDI	4.00E+01	TPHCWG	Yes	Yes	No	TDI	5.50E+01	TPHCWG	No	No	Yes	Yes	2.80E+03	TDI x 70kg (MDI unknown)	3.85E+03	TDI x 70kg (MDI unknown)
Aromatic >C12-16	organic	TDI	4.00E+01	TPHCWG	Yes	Yes	No	TDI	5.50E+01	TPHCWG	No	No	Yes	Yes	2.80E+03	TDI x 70kg (MDI unknown)	3.85E+03	TDI x 70kg (MDI unknown)
Aromatic >C16-21	organic	TDI	3.00E+01	TPHCWG	Yes	Yes	No	NR			NR	NR	NR	NR	2.10E+03	TDI x 70kg (MDI unknown)		
Aromatic >C21-35	organic	TDI	3.00E+01	TPHCWG	Yes	Yes	No	NR			NR	NR	NR	NR	2.10E+03	TDI x 70kg (MDI unknown)		

**PHYSICAL PROPERTIES**

		Commercial Land Use	Source
Soil type	na	Sand	Professional experience
Porosity (total)	cm3 cm-3	0.54	SC050021/SR3
Porosity (air-filled)*	cm3 cm-3	0.30	SC050021/SR3
Porosity (water-filled)*	cm3 cm-3	0.24	SC050021/SR3
Capillary fringe porosity (air-filled)	cm3 cm-3	0.01	Literature value
Capillary fringe porosity (water-filled)	cm3 cm-3	0.53	Literature value
Thickness of capillary fringe	m	0.1	Literature value
Residual soil water content	cm3 cm-3	0.07	SC050021/SR3
Saturated hydraulic conductivity	cm s-1	7.36E-03	SC050021/SR3
van Genuchten shape parameter	dimensionless	3.51E-01	SC050021/SR3
Bulk density	g cm-3	1.18	SC050021/SR3
Soil organic matter content	%	0.34	Professional experience
Threshold value of wind speed at 10m	m s-1	7.20	SC050021/SR3
Ambient soil temperature	K	283	SC050021/SR3
Mean annual windspeed (10m)	m s-1	5.00	SC050021/SR3
Fraction of site with hard or vegetative cover	m2 m-2	1.00	Conceptual Site Model
Depth to groundwater (RBCA)	m	1	Assumption
Infiltration rate in vadose zone	m day-1	6.80E-04	Likely worst-case
<b>Aquifer type**</b>	na	Sand	Assumption
Source width	m	40	Likely worst-case
Source length	m	40	Likely worst-case
Saturated aquifer thickness	m	10	Assumption
Mixing zone depth	m	5.5	Calculated in RTW
Hydraulic conductivity	m day-1	20	Literature value
Hydraulic gradient	m m-1	0.001	Typical value for sand
Aquifer soil organic matter content	%	0.34	Professional experience
Effective Porosity (total)**	cm3 cm-3	0.3	Literature value
Aquifer bulk density**	g cm-3	1.18	SC050021/SR3
Distance to neighbouring resident**	m	5	Likely worst-case

Notes:

\* Assumed to be present in foundation cracks when modelling in RBCA Toolkit

\*\* Only used to generate GAC for neighbouring residents through off-site migration of impact in groundwater

### BUILDING PROPERTIES

	Neighbouring Residential	Continued Petroleum Use	Source
Building footprint	2.80E+01	7.80E+01	SC050021/SR3
Living space air exchange rate	0.50	1.00	SC050021/SR3
Living space height (above ground)	4.8	2.4	SC050021/SR3
Living space height (below ground)	0.0	0.0	SC050021/SR3
Pressure difference	3.1	2.6	SC050021/SR3
Foundation thickness	1.50E-01	1.50E-01	SC050021/SR3
Floor crack area	4.23E+02	7.07E+02	SC050021/SR3

### Notes:

Petrol filling station shop modelled as a bungalow, with increased ventilation

### CLEA 1.04 EXPOSURE DATA

	Age Class Residents					
	1	2	3	4	5	6
Age class	-					
Frequency of soil and dust ingestion	days yr-1	365	365	365	365	365
Frequency of vegetable ingestion	days yr-1	365	365	365	365	365
Frequency of skin contact (indoors)	days yr-1	365	365	365	365	365
Frequency of skin contact (outdoors)	days yr-1	365	365	365	365	365
Frequency of inhalation (dust and vapour indoors)	days yr-1	365	365	365	365	365
Frequency of inhalation (dust and vapour outdoors)	days yr-1	365	365	365	365	365
Occupancy period (indoors)	hr day-1	23	23	23	23	19
Occupancy period (outdoors)	hr day-1	1	1	1	1	1
Soil to skin adherence factor (indoors)	mg cm-2 day-1	0.06	0.06	0.06	0.06	0.06
Soil to skin adherence factor (outdoors)	mg cm-2 day-1	1	1	1	1	1
Soil and dust ingestion rate	g day-1	0.1	0.1	0.1	0.1	0.1
Body weight	kg	5.6	9.8	12.7	15.1	16.9
Body height	m	0.7	0.8	0.9	0.9	1
Inhalation rate	m3 day-1	8.5	13.3	12.7	12.2	12.2
Max exposed skin (indoors)	m2 m-2	0.32	0.33	0.32	0.35	0.33
Max exposed skin (outdoors)	m2 m-2	0.26	0.26	0.25	0.28	0.26



**RBCA Toolkit EXPOSURE DATA**

		Age Class
<b>Averaging time</b>	yrs	0-6
<b>Body weight</b>	kg	6
<b>Exposure duration</b>	yrs	13.3
<b>Averaging time (vapour flux)</b>	yrs	6
<b>Exposure frequency (indoors)*</b>	days yr-1	6
<b>Exposure frequency (outdoors)*</b>	days yr-1	365
		16.8

**Notes:**

Time-weighted average used for 0-6 year old female child

\* RBCA Toolkit compares an acceptable air concentration to a predicted air concentration. Only the exposure frequency can be modified (i.e. inhalation rate, time exposed cannot). As such, the TDSI (or ID) was converted to an acceptable indoor air concentration using the time-weighted properties for a 0-6 year old female child. The exposure frequency for other scenarios was modified to account for the differing exposure scenarios for the remaining pathways, to be equivalent to modifying the inhalation rate and time exposed.



Appendix J  
Generic Assessment Criteria (GAC) for Continued Petroleum Use

ARCADIS Generic Assessment Criteria for Soils – Continued Petroleum Use

Compound	Theoretical Soil Saturation Limit	Human Health - CPU		Water Resources	
		Petrol Filling Station Worker - Inhalation	Neighbouring Resident	Set 1	Set 2
		mg/kg	mg/kg	mg/kg	mg/kg
Benzene	652	1.2	1.40	0.056	0.002
Toluene	374	2100	ND	0.16	0.032
Ethylbenzene	201	487	ND	0.11	0.11
Xylenes	216	175	ND	0.17	0.058
MTBE	11,100	270	355	0.018	0.018
ETBE	3,500	12	40	0.019	0.019
TBA	235,000	3,060	1080	0.014	0.014
Aliphatic >C5-6	375	212	ND	2.6	0.53
Aliphatic>C6-8	112	285	ND	5.3	1.1
Aliphatic>C8-10	365	37	ND	22	4.3
Aliphatic>C10-12	18	144	ND	ND	ND
Aliphatic>C12-16	7.6	658	ND	ND	ND
Aliphatic>C16-35	2.6	NR	NR	ND	ND
Aromatic >C5-C7 (as benzene)	652	1.2	1.40	0.056	0.002
Aromatic >C7-C8 (as toluene)	374	2100	ND	0.16	0.032
Aromatic >C8-10	224	51	144	0.9	0.18
Aromatic >C10-12	130	268	ND	1.3	0.26
Aromatic >C12-16	57	1,348	ND	2.6	0.52
Aromatic >C16-21	16	NR	NR	8.1	1.6
Aromatic >C21-35	1.7	NR	NR	ND	ND
Naphthalene	28	51	25	0.076	0.076
Acenaphthylene	96	2,838	ND	-	-
Acenaphthene	13	1.03E+04	ND	-	-
Fluorene	82	9.61E+04	ND	-	-
Phenanthrene	32	3.25E+05	ND	-	-
Anthracene	5.4	7.21E+05	ND	-	-
Fluoranthene	6.5	7.68E+04	ND	-	-
Pyrene	0.75	4.55E+05	ND	-	-
Benzo(a)anthracene	0.58	86	ND	-	-
Chrysene	0.15	4,657	ND	-	-
Benzo(b)fluoranthene	0.41	1,162	ND	0.026	0.026
Benzo(k)fluoranthene	0.23	1,733	ND	0.037	0.037
Benzo(a)pyrene	0.31	153	ND	0.91	0.013
Indeno(123cd)pyrene	0.021	997	ND	0.022	0.022
Dibenzo(ah)anthracene	0.001	93	ND	-	-
Benzo(ghi)perylene	0.006	1.0E+06	ND	0.11	0.11
Dichloroethane (1,1)	1610	9	50	0.0036	0.0036
Dichloroethane (1,2)	2160	0.034	0.063	0.013	0.004
Trichloroethane (111)	721	25	610	0.28	0.28
Tetrachloroethane (1122&1112)	1020	3.1	20	0.093	0.093
Dichloroethene (1,1)	196	1.2	34	0.075	0.075
Dichloroethene (cis 1,2)	2050	3.2	4.5	0.041	0.041
Dichloroethene (trans 1,2)	2050	6.4	9.1	0.041	0.041
Trichloroethene	724	0.40	4.8	0.013	0.013
Tetrachloroethene	183	4.9	95	0.021	0.021
Trichloromethane (chloroform)	2880	3.2	14	0.020	0.020
Vinyl Chloride (chloroethene)	1180	0.004	0.19	0.0011	0.0011
Chlorobenzene	279	33	206	0.33	0.33
Phenol	2.02E+04	9720	1700		
Mercury (elemental)	1.47	0.4	1.03		
Mercury (methylated)	36	214	ND		

Notes:

For benzo(ghi)perylene, calculated GAC is 1.4E+08 mg/kg. The theoretical maximum concentration of 1.0E+06 mg/kg presented as GAC.

*Italics* Target exceeds theoretical soil saturation limit. Concentrations above the soil saturation limit may indicate the presence of separate phase in soil, but does not necessarily present a significant risk

NR No appropriate inhalation reference dose identified during review of toxicological data

- No water quality standard identified as suitable for deriving generic assessment criteria

\* In the absence of specific current guidance on the assessment of lead, a review of worldwide target levels was undertaken, with the value representing the typical mid-point (USEPA Region 9)

NVP Contaminant has only a low vapour pressure in soil

ND Results of modelling indicates pathway not considered to present a significant risk

ARCADIS Generic Assessment Criteria for Groundwater – Continued Petroleum Use

Compound	Human Health - CPU		Water Resources	
	On-site Commercial Worker	Neighbouring Resident	Set 1	Set 2
	µg/l	µg/l	µg/l	µg/l
Benzene	13,000	774	30	1
Toluene	>SOL	>SOL	50	10
Ethylbenzene	>SOL	1.55E+05	20	20
Xylenes	>SOL	4.1E+04	30	10
MTBE	5,500,000	3.1E+05	15	15
ETBE	490,000	2.7E+04	13	13
TBA	22,000,000	9.1E+05	12	12
Aliphatic >C5-6	>SOL	>SOL	50	10
Aliphatic>C6-8	>SOL	>SOL	50	10
Aliphatic>C8-10	>SOL	>SOL	50	10
Aliphatic>C10-12	>SOL	>SOL	50	10
Aliphatic>C12-16	>SOL	>SOL	50	10
Aliphatic>C16-35	NR	NR	50	10
Aromatic >C5-C7 (as benzene)	13,000	774	50	10
Aromatic >C7-C8 (as toluene)	>SOL	>SOL	50	10
Aromatic >C8-10	>SOL	8.5E+03	50	10
Aromatic >C10-12	>SOL	1.09E+04	50	10
Aromatic >C12-16	>SOL	>SOL	50	10
Aromatic >C16-21	NR	NR	50	10
Aromatic >C21-35	NR	NR	50	10
Naphthalene	>SOL	3.44E+03	10	10
Acenaphthylene	>SOL	>SOL	-	-
Acenaphthene	>SOL	>SOL	-	-
Fluorene	>SOL	>SOL	-	-
Phenanthrene	>SOL	>SOL	-	-
Anthracene	>SOL	>SOL	-	-
Fluoranthene	>SOL	>SOL	-	-
Pyrene	>SOL	>SOL	-	-
Benzo(a)anthracene	>SOL	>SOL	-	-
Chrysene	>SOL	>SOL	-	-
Benzo(b)fluoranthene	>SOL	>SOL	0.025	0.025
Benzo(k)fluoranthene	>SOL	>SOL	0.025	0.025
Benzo(a)pyrene	>SOL	>SOL	0.7	0.01
Indeno(123cd)pyrene	>SOL	>SOL	0.025	0.025
Dibenzo(ah)anthracene	>SOL	>SOL	-	-
Benzo(ghi)perylene	>SOL	>SOL	0.025	0.025
Dichloroethane (1,1)	560,000	34,000	2.4	2.4
Dichloroethane (1,2)	860	51	10	3
Trichloroethane (111)	>SOL	220,000	100	100
Tetrachloroethane (1122&1112)	43,000	4,800	20	20
Dichloroethene (1,1)	200,000	14,000	30	30
Dichloroethene (cis 1,2)	46,000	2,800	50	50
Dichloroethene (trans 1,2)	93,000	5,700		
Trichloroethene	31,000	1,800	10	10
Tetrachloroethene	>SOL	23,000		
Trichloromethane (chloroform)	150,000	8,400	12	12
Vinyl Chloride (chloroethene)	1,300	93	0.5	0.5
Chlorobenzene	>SOL	58,000	90	90
Phenol	>SOL	912,000		
Mercury (elemental)	>SOL	7		
Mercury (methylated)	>SOL	23		

Notes:

>SOL

Target acceptable risk not exceeded at theoretical solubility concentration

NR

No appropriate inhalation reference dose identified during review of toxicological data

-

No water quality standard identified as suitable for deriving generic assessment criteria

Appendix K  
Soil Gas Quantitative Assessment – Methodology

## APPENDIX K Soil Gas Quantitative Assessment – Methodology

The quantitative soil gas assessment has been undertaken using site-specific information, where available, to determine whether the measured concentrations of CoC in soil gas measured beneath The Site present potentially unacceptable risks to the identified receptors.

### Non-statutory Regulatory Technical Guidance

The following documents, which have been consulted in undertaking this assessment, present guiding principles in assessing potentially contaminated land:

#### *General*

- Model Procedures for the Management of Land Contamination, DEFRA & Environment Agency (R&D Publication CLR 11).

#### *Human Health*

- Scotland and Northern Ireland Forum for Environmental Research Methodology (SNIFFER, 2003),
- Human health toxicological assessment of contaminants in soil. Environment Agency Science Report SC050021/SR2 (EA, 2009a),
- Updated technical background to the CLEA model. Environment Agency Science Report SC050021/SR3 (EA, 2009b),
- Compilation of data for priority organic pollutants for derivation of Soil Guideline Values. Environment Agency Science Report SC050021/SR7 (EA, 2008).

### Calculating Hazard Indices

In order to derive human health hazard indices, an assessment of the level of human exposure to the CoC is undertaken, deriving a predicted daily average intake for each exposure pathway assessed. The predicted average daily intake is compared to an acceptable daily intake, or a health criteria value. This ratio of exposure to toxicity is defined as a Hazard Index, and for an individual chemical and exposure pathway:

$$HI_{ij} = ADE_{ij} / TDSI_{ij} \quad (\text{Threshold Compounds})$$
$$HI_{ij} = ADE_{ij} / ID_{ij} \quad (\text{Non-Threshold Compounds})$$

$HI_{ij}$	Hazard index for chemical i, exposure pathway j.
$ADE_{ij}$	Average daily intake for chemical i, exposure pathway j.
TDSI or $ID_{ij}$	Reference dose for chemical i, exposure pathway j.

Hazard indices above 1.0 indicate the potential for adverse health effects and suggest the need to undertake a further level of investigation or action.

### Modelling Tools

There are a number of modelling tools that have been developed to help quantify the potential risk posed to human health receptors, and can be adapted to incorporate the guidance presented within the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) and Environment Agency (EA) guidance on assessing potential chronic health effects from humans affected by land contamination. These include:

#### *SNIFFER v.1.02*

This excel-based modelling tool was developed by the Scotland and Northern Ireland Forum for Environmental Research in 2003, and implements the guidance presented within the "Method for Deriving Site Specific Human Health Assessment Criteria for Contaminants in Soil" (SNIFFER, 2003).

Since the Environment Agency of England and Wales released the updated guidance as part of the CLEA methodology in January 2009, the assumptions inherent within the SNIFFER model mean that it is less easy to adapt to the UK methodology for assessing land contamination. However, SNIFFER does not model vapour intrusion and vapour emission using appropriate sub-models – which are pathways of concern.

#### *CLEA 1.06*

Released as the latest version of the CLEA model in October 2009, Contaminated Land Exposure Assessment (CLEA) version 1.06 enables quantification of levels and calculation of SSAC for CoC present in soils beneath a site. It can also estimate the risk from measured concentrations from additional source media, including soil gas. The model is deterministic.

#### *RISC v.4*

Risk Integrated Software for Clean-ups (RISC - version 4) is a proprietary modelling tool. Although originally based on the Risk Based Corrective Action (RBCA) methodology (ASTM International (ASTM) Designation E1739-95 and E2081-00), its flexibility allows it, in part, to be adapted to implement the guidance published by the Environment Agency. The tool can be used to model on-site exposure to a range of source media, including groundwater. The vapour migration pathway to indoor air is assessed via the Johnson and Ettinger sub-model, as recommended by the CLEA methodology. It is noted that the vapour migration pathway to indoor air from groundwater considers contaminant transport via diffusion, but does not include the potential effects of advection. This is based on the assumption that capillary fringe diffusion resistance dominates the problem.

#### *RBCA v.2.5*

Risk Based Corrective Action Toolkit for Chemical Releases (RBCA – version 2.5) is a second proprietary modelling tool that incorporates the Risk Based Corrective Action (RBCA) methodology. It can be adapted to an extent to implement the guidance published by the Environment Agency, and the vapour migration pathway to indoor air is assessed via the Johnson and Ettinger sub-model, as recommended by the CLEA methodology. However the model compares the predicted air concentration to a defined acceptable air concentration, rather than calculating a dose and comparing to a tolerable daily soil intake for inhalation pathways. This requires alteration of the exposure duration within the model to ensure that the assumptions inherent in the CLEA methodology are incorporated into the assessment of the vapour migration pathways.

For the purposes of this assessment, CLEA 1.06 has been adopted as a suitable modelling tool to assess the potential risks to human health receptors from soil gas.



Appendix L  
Soil Gas Quantitative Assessment – Chemical and Toxicological Input Parameters

Contaminant	Toxicological Data <sup>1</sup>	
	Inhalation	Data Source
Symbol	mg/kg-day	
Units		
Benzene	1.4 x 10 <sup>-3</sup>	EA
Ethylbenzene	0.22	EA
Toluene	1.4	EA
Xylenes	0.06	EA

**Notes:**

A comprehensive review of existing toxicity data has been undertaken, including UK, WHO, European and other sources, such as the IRIS database. Where UK data is not available the most stringent of the available values has been selected.

<sup>1</sup>

EA

Data taken from TOX reports

Appendix M  
Soil Gas Quantitative Assessment – Physical and Building Input Parameters

Parameter	Value	Source
<b>Unsaturated Zone Parameters</b>		
Lithology	Sand	Site data
Distance to building foundation from source (m)	0.15	Estimated based on site data
Vapour permeability (m <sup>2</sup> )	7.54 x 10 <sup>-12</sup>	
Total porosity (cm <sup>3</sup> /cm <sup>3</sup> )	0.54	
Water content (cm <sup>3</sup> /cm <sup>3</sup> )	0.24	Sand (EA, 2009b) <sup>[1]</sup>
Air-filled porosity (cm <sup>3</sup> /cm <sup>3</sup> )	0.3	
Residual soil water content (cm <sup>3</sup> /cm <sup>3</sup> )	0.07	
<b>On-Site Building Dimensions (Shop Building)</b>		
Cross sectional area of building (m <sup>2</sup> )	107	Calculated for the existing shop building
Foundation Perimeter (m)	48	
Living space height (above ground) (m)	2.4	Bungalow (EA, 2009b) adopted as approximation for petrol filling station shop building <sup>[1]</sup>
Living space height (below ground) (m)	0	
Living space air exchange rate (hr <sup>-1</sup> )	1	Value selected from EA (2009b) - suitable for a commercial building.
Pressure difference (soil to enclosed space) (Pa)	2.6	
Foundation Depth (m)	0.15	Bungalow (EA, 2009b) adopted as approximation for petrol filling station <sup>[1]</sup>
Floor crack area (cm <sup>2</sup> )	960	Calculated for the existing shop building

Notes:

<sup>[1]</sup> Environment Agency, 2009b. Updated technical background to the CLEA model. Science Report – SC050021/SR3.

Appendix N  
Soil Gas Quantitative Assessment – Human Health Exposure Input Parameters

Exposure Parameter	Units	Commercial Worker
Body Weight	kg	70
Exposure Duration	years	49
Inhalation Rate	m <sup>3</sup> /hour	0.617
Exposure Frequency for Indoor Air Events	events/year	230
Time Indoors	hours/day	8.3

Notes:  
 Exposure parameter values presented for a 16-65 year old female, representing a typical commercial worker (EA, 2009b).

Appendix O  
Soil Gas Quantitative Assessment – CLEA Model Output

