



**GEO-ENVIRONMENTAL SITE ASSESSMENT
LAND OFF JACQUES WAY,
WREXHAM
LL11 2AD**

REC REFERENCE: 102904P1R1

REPORT PREPARED FOR: CASTLEMEAD GROUP LTD

OCTOBER 2018



National Consultancy, Locally Delivered

A CONCEPT LIFE SCIENCES COMPANY





QUALITY ASSURANCE

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EXECUTIVE SUMMARY	
Site Address	Land off Jacques Way, Wrexham LL11 2AD
Grid Reference	E:332874, N:350690
Site Area	0.98 ha
Adjacent Site Use	The subject site is an irregular shaped parcel of land located between a footpath to the south, railway tracks to the east and west, and a Premier Inn to the north. The site is accessed off Jacques Way.
Environmental Setting	Geology – The site is underlain by glaciofluvial sand and gravel / alluvium overlying Eturia Formation (mudstone). Aquifers – The site is underlain by a Secondary (A) Aquifer (mudstone and sand/gravel). Sensitive Land Uses – Residential dwellings within close proximity. Hydrology – River Gwenfro is located 11m to the south-west of the site.
Site History	Historical maps indicate that the site was located between railway land with associated embankments present. Wats Dyke was recorded from 1957 and from 1988 the site was used as a scrapyard. It is unclear whether mounds shown on the historical mapping are associated with the scrapyard.
Landfill Sites & Ground Gases	A historic landfill is located 477m to the south-east of the site which accepted inert, industrial, commercial and household waste between 1969 and 1972. This is potential source of ground gas, and poses a low risk to the site.
Radon	Differing information with respect to radon has been noted with each source stating: ▶ The UK radon website: 5% and 10% of homes are above the Action Level, basic radon protective measures required. ▶ Wrexham Council records: no risk to the site posed by radon with a risk to 1-3% of buildings (letter from the Contaminated Land Officer, dated the 5th September, reference Search 765).
Coal Mining	Site is located within a coal mining reporting area, however lies outside of a development high risk area. A CMRA is not deemed necessary for this site.
Initial Conceptual Site Model (CSM)	Human Health On-site - moderate – high risk onsite contaminants have been identified associated with historical site use as a scrapyard. Off-site - The risk posed by offsite sources is considered low-moderate . Controlled Waters The risk of contamination to the underlying groundwater and adjacent River Gwenfro is low .
Preliminary Geotechnical Assessment	Ground Conditions The site is underlain by glaciofluvial sand and gravel / alluvium deposits which in turn overlie mudstone. Constraints: ▶ Deep Made Ground generated from mounding and former use as a scrap yard, including potential historic foundations; ▶ Soft alluvial clays underlying the Made Ground; ▶ Wat's Dyke is located in the east of the site; ▶ Railway lines are located adjacent to the east and west of the site; ▶ Elevated sulphate may pose a risk to concrete foundations and infrastructure.
Recommendations	▶ Further enquiry with the British Geological Society to determine whether the site requires radon protection measures. ▶ Updated human health and controlled waters risk assessment using data from previous site investigations and current screening values; ▶ Remedial Strategy as required based on further assessment of the above.





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1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants Ltd (REC) has been commissioned by Castlemead Group Limited to undertake a Phase I Geo-Environmental Site Assessment at their site off Jacques Way, Wrexham LL11 2AD.

Revision 1 of the report has been updated to reflect information provided by the Contaminated Land Officer at Wrexham Council.

1.2 Proposed Development

The proposed development is for affordable housing units comprising 1 detached dwelling, 18 semi-detached dwellings, 6 flats and associated works. A proposed development plan is shown as Drawing No. 003 contained within Appendix II.

1.3 Objectives

The objectives of the desk based study are to:

- ▶ Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));
- ▶ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors; and,
- ▶ Provide a factual and interpretative report relating to the desk study and provide preliminary recommendations on any potential development issues.

1.4 Sources of Information

Background information was sought from the following sources:

- ▶ Groundsure Database Search;
- ▶ Historical mapping dated 1846 to 2012. A selection of historical maps are reproduced in Appendix IV;
- ▶ On-line planning records held by Wrexham Council;
- ▶ Consultations with representatives of the Wrexham Council;
- ▶ Environment Agency Groundwater Vulnerability Map (www.environment-agency.gov.uk/wiyby);
- ▶ Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2015); and,
- ▶ British Geological Survey Map (Sheet 121, 1:50,000, Wrexham, Solid & Drift edition).





The Contaminated Land Officer at Wrexham Council has provided REC with the following information:

- ▶ RPS Phase II Contamination Assessment, reference RCM4019-008 R FINAL, dated October 2004; and,
- ▶ RPS Groundwater Contamination Assessment, reference RCM4642-009 R FINAL, dated November 2007.

1.5 Risk Classification

REC Ltd has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the property development. The risk classification definitions are summarised below:

Risk	Definition
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low-Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of a future redevelopment of the site etc.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation.
Moderate-High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine to level of risk and associated liability.

1.6 Limitations of the Study

The full limitations of this report are presented in Appendix I.





2.0 SITE SETTING

2.1 Site Details

Site Address	Land off Jacques Way, Wrexham LL11 2AD
National Grid Reference	E:332874, N:350690
Site Area	0.98 ha

A site location map is presented in Appendix II as Drawing No. 102904-001.

2.2 Current Site Use

Site Walkover Brief

A site walkover was undertaken on 2nd October 2017 and the following site description comprises the site's current layout / features based on the REC Engineer's observations at the time of the site walkover. The walkover is primarily used to identify potential sources of soil and water contamination present at the site. The walkover is not a professional assessment of any potential future remedial, demolition or decommissioning works required and advice on such matters should be sought by the appropriate specialist contractors.

In addition, photographs were obtained by Castlemead Group of the pumping station and associated electricity substation located adjacent to the north of the site (see plate 3), utilised by the Premier Inn development.

Site Description

The subject site is an irregular shaped parcel of land located between a footpath to the south, railway tracks to the west and east and a Premier Inn development to the north. The site is accessed off Jacques Way.

The site is currently securely fenced off with palisade style fencing on all sides. The site is accessed via a secure locked gate off Jacques Way.

The majority of the site is covered with overgrown vegetation comprising grasses and small bushes. During the walkover there was evidence of Japanese Knotweed at the southwest end of the site close to the site boundary.

There was evidence of waste tipping/stockpiling on site close to the site entrance. This comprised general rubbish, chipboard, pallets and safety barriers. There is a possibility of ACM to be present within tipped material.

The site is elevated above the railway tracks on the eastern and western side. The topography of the site is relatively level with some localised hummocks.

Hazardous Materials Storage

No ASTs or USTs were observed onsite.



Polychlorinated Biphenyls (PCBs)

No equipment that may potentially contain PCBs was observed at the site.

Asbestos Containing Material (ACM)

Although no ACMs were identified during the site walkover, given the former site use, the presence of ACM cannot be entirely discounted, especially within fly tipped material present. The contractor undertaking the demolition/redevelopment works should undertake a Type 3 Asbestos Survey and implement an asbestos management plan to comply with the Control of Asbestos Regulations 2012.

Waste Storage

Some waste is present onsite thought to be left as a result of the Premier Inn development to the north of the site. Waste generally comprises chipboard, pallets and safety barriers.

2.3 Surrounding Area

The surrounding land uses are summarised below:

Direction	Land Use
North	Premier Inn (associated pumping station and electricity substation) and Regent Street (A541) beyond.
East	Railway Lines and Wrexham General Train Station.
South	Footpaths and shrub land.
West	Railway Lines and residential properties beyond.





3.0 SITE HISTORY

3.1 On-Site Historical Development

A review of historical maps pertinent to the site is summarised in Table 3.1 below.

Table 3.1 Summary of Potentially Contaminative Historical Land Uses

Map Edition	Historical Land Use
1873 (1:2,500)	The site is an irregular shaped parcel of land with railway line embankments in the east. A rectangular building encroaches in the south.
1899 (1:2,500)	A mound feature is present across the site.
1912 (1:2,500)	Buildings are now present in the north of the site.
1937 – 1939 (1:2,500)	The mound feature across the site has changed shape. An additional building is present in the north of the site.
1957 – 1958 (1:2,500)	Buildings associated with Wat's Dyke and present onsite. A footpath is present in the centre of the site exiting the northern boundary. A garage is located in the north.
1988 – 1992 (1:2,500)	The centre of the site is recorded as a scrapyard.
2014 (1:10,000)	The garage is no longer present onsite.

Site observations contained within Sections 4.1 and 4.2 of the RPS Groundwater Contamination Assessment suggests that the scrap yard was no longer operational by 2007.

3.2 Off-Site Historical Development

A review of potentially contaminative land uses identified on historical Ordnance Survey maps within a 250m radius of the site is summarised below in Table 3.2.

Table 3.2 Summary of Potentially Contaminative Off-Site Historical Land Uses

Surrounding Feature	Distance	Dates	Direction
Pumping station and electricity substation associated with Premier Inn Hotel	Adjacent	Pre 2014 to Present	North
Railway Land and infrastructure.	Adjacent and beyond	Pre 1846 to Present	East and West
Various industrial infrastructure comprising iron works, saw mill, timber yard, brewery, garage, etc....	From 20m	Pre 1873 to Present	North, East, South and West
Refuse Tip <i>No longer in use</i>	477m and 662m	Pre 1910 to Pre 1969 Pre 1972	South west



3.3 Planning History

REC has undertaken a review of on-line planning records held by Wrexham Council and a total of one historic planning application for the subject site is recorded:

- ▶ Case Number: P/2011/0884 | Proposed Development: Erection of Hotel (Use Class C1), Creation of New Access Road, Associated Car Parking, Landscaping, Improvement Works to Wats Dyke and Other Associated Works | Decision: Granted 28/05/2012.

According to communication from Wrexham Council, this development consists of a four-storey hotel with associated access road and car parking to the north of the site; radon gas protection measures were installed.

3.4 Summary of Previous Reports

3.4.1 RPS Phase II Contamination Assessment (reference RCM4019-008 R FINAL, dated October 2004)

An intrusive investigation was undertaken by RPS between the 10th and 12th August 2004 comprising:

- ▶ Six cable percussive boreholes (completed to depths of 5.0m - 8.0m bgl);
- ▶ Eight trial pits (completed to depths of 2.5m – 3.2m bgl);
- ▶ All cable percussive boreholes were completed as groundwater and/or groundwater monitoring installations;
- ▶ 25 soil samples and two groundwater samples were analysed for a range of determinands including heavy metals and pH, semi volatile organic compounds (SVOCs), volatile organic compounds (VOCs), Total Petroleum Hydrocarbons (TPHs), speciated Poly Aromatic Hydrocarbons (PAHs), leachates, asbestos and PCBs; and,
- ▶ Six rounds of ground gas monitoring completed over 4 weeks.

3.4.2 RPS Groundwater Contamination Assessment, reference RCM4642-009 R FINAL, dated November 2007.

An intrusive site investigation was completed between the 13th and 20th August 2007, comprising of:

- ▶ Six cable percussive boreholes were completed to a maximum depth of 12.5m bgl and installed with groundwater monitoring wells.
- ▶ Groundwater sampling and surface water sampling from the River Gwenfro was undertaken on two occasions;
- ▶ Samples were analysed for a range of determinands including: heavy metals, pH, ammoniacal nitrogen, Speciated TPHs, PAHs, SVOCs, VOCs and PCBs.

3.4.3 Summary of Ground Conditions and Contamination

Made Ground Soils

Made Ground was encountered to a maximum depth of 5.3m bgl (BH6 south of the site). Gravel within the Made Ground included brick, glass, ash, sandstone cobbles, plastic, slate, timber, ceramic, fabric, metal and solidified foundry waste. Hydrocarbon odours were encountered within the Made



Ground in the southeast and southwest of the site.

The following contaminants were identified at elevated concentrations (compared to Dutch and UK Screening Values, 2000-2004): heavy metals (chromium, copper, lead, zinc), sulphate, chrysotile asbestos fibres (quantified at 2-50%), total aliphatic TPHs, total aromatic TPHs, sum of ten PAHs.

Natural Soils

Drift deposits were encountered within all cable percussive boreholes and two trial pits (south east and north of the site), comprising:

- ▶ Soft brown silty clay and occasional sand lenses, from 4.0m to 5.30m bgl to a maximum depth of 6.10m bgl in the south of the site;
- ▶ Sandy clay with gravel and cobbles, from 0.4m to 6.1m bgl to an unproven depth of 8.0m bgl in the south of the site;
- ▶ Sand and gravel in the centre and south east of the site, from 0.3m to 3.5m bgl to a maximum depth of 8.0m bgl;
- ▶ Silt was encountered from 9.0m bgl; and,
- ▶ Soft to firm brown clay (interpreted by RPS as belonging to the Carboniferous Marl Formation due to standard penetration testing refusal within this material) was encountered in the east of the site (BH3) from 4.4m to 5.0m bgl.

Ground Gas

Carbon dioxide concentrations ranged from 0.2% v/v to 2.8% v/v, flammable gases were below detection (<0.1% v/v), and flow rates were low (<0.1 to 0.2 l/hr).

Groundwater

Perched groundwater was encountered between 4.10m and 6.5m bgl during the 2004 and 2007 RPS site investigations within granular sand and gravels overlying clay and silt. Elevated concentrations of metals (chromium and copper), ammoniacal nitrogen and TPH was identified within groundwater samples. No elevated concentrations of any determinands were identified within surface water samples from the River Gwenfro. As no significantly elevated concentrations were identified in the groundwater or surface water samples, RPS concluded that there was no significant risk to the underlying Secondary A Aquifers or the River Gwenfro.





4.0 ENVIRONMENTAL SETTING

4.1 Geology & Hydrogeology

The British Geological Survey (BGS) map for the site, (Sheet 121, 1:50,000, Wrexham, Solid & Drift edition) indicates that the site is underlain by the following geological sequence:

Geological Unit	Classification	Description	Aquifer Classification	Sensitivity
Drift	Glaciofluvial Sheet Deposits, Devensian	Sand and Gravel	Secondary (A)	Moderate
Solid	Eturia Formation	Mudstone	Secondary (A)	Moderate

The Groundsure report indicates there are three groundwater abstractions within 2km radius of the site the closest of which is a historical abstraction located 201m to the west of the site associated with Tetley Brewing Company. There are five surface water abstraction licences within 2km of the site, the nearest of which is located 507 to the site west and is associated with effluent and slurry dilution.

Groundwater was encountered between 4.10m and 6.5m bgl during the 2004 and 2007 RPS site investigations.

4.2 Geotechnical Data

Geotechnical Data presented within the Groundsure report identifies the following ground conditions:

Hazard	Designation
Shrink-Swell Clay	Very Low
Landslides	Very Low
Ground Dissolution	Null - Negligible
Compressible Ground	Moderate
Collapsible Deposits	Very Low
Running Sand	Low

4.3 Coal Mining

The site is in an area which is affected by coal mining therefore a Coal Authority CON29M Coal Mining Report (Appendix VI) was obtained for the purposes of this report. The pertinent observations of the report are reproduced below:

The property is in a surface area that could be affected by underground mining in 1 seam of coal at 330m to 380m depth, and last worked in 1917. Any movement in the ground due to coal mining activity should have stopped.

However, the property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods, however, reserves of coal exist in the area which could be



worked at some time in the future. Additionally, the site lies outside a Development High Risk Area, Surface Coal Resource Area, Area of Probable Shallow Coal Mine Workings and an Area of Past/Current Surface Mining.

Taking into account the above, a Coal Mining Risk assessment is not deemed necessary for this site.

4.4 Hydrology

Surface water features in the vicinity of the subject site are as follows:

Surface Water Feature	Quality*	Distance (m)	Direction
River Gwenfro (flowing west to east)	B-C	11	South-West

Wrexham Council state that a flood consequence assessment was undertaken in 2006 for the Premier Inn Development that suggested that the proposed development (apartment blocks at that time) was feasible (Reference 765, dated 5th September 2018).

4.5 Radon Risk Potential

The following information has been obtained regarding radon:

- ▶ The UK radon website indicates the site is situated in an area where between 5% and 10% of homes are above the Action Level and that the BGS reports that basic radon protective measures are necessary in the construction of new dwellings or extensions;
- ▶ Wrexham Council's records state that there is no risk to the site posed by radon with a risk to 1-3% of buildings (letter from the Contaminated Land Officer, dated the 5th September, reference Search 765); and
- ▶ Radon and gas protection measures were incorporated within the construction of the Premier Inn to the north of the site under planning application P/2011/0884.

4.6 Industrial Land Uses

The subject site was previously occupied by a Jacques Scrap Yard with extensive mounding throughout.

The following sources of contamination were identified in the RPS site investigations:

- ▶ Soils: Heavy metals, sulphate, TPHs, PAHs, and chrysotile asbestos fibres.

The site is situated within a mixed commercial and residential area with the Trade Directory recording twenty four trade entries within 250m, entries within 100m are listed below:

- ▶ A pumping station with associated electricity substation is located adjacent to the north of the site associated with the Premier Inn (constructed post 2012, see section 3.3);
- ▶ Two electricity substations are located 43m and 44m to the east, and 56m south-east;
- ▶ Tyre replacement and vehicle repair garage (ATS Euromaster) is located 45m to the north-west;
- ▶ Wrexham Rail Station is located 52m to the east;
- ▶ Container storage depot located 67m to the north-west; and,



- ▶ A bed and bedroom furniture manufacturer located 89m to the south-east.

4.7 Sensitive Land Uses

The following sensitive land uses have been identified within close proximity to the site;

- ▶ Residential properties are located beyond railway land to the west of the site.

4.8 Site Sensitivity Assessment

The site is considered to be located within a low-moderate sensitivity setting due to the following reasons:

- ▶ Residential properties are located in close proximity, beyond offsite railway land;
- ▶ The underlying solid geology is classified as a Secondary (A) aquifer; and,
- ▶ The underlying drift geology comprises sand and gravel which may transmit mobile contamination into the underlying aquifer.

4.9 Geotechnical Assessment

The following potential geotechnical constraints have been identified on site:

- ▶ Deep Made Ground generated from mounding and former use as a scrap yard, including potential historic foundations;
- ▶ Soft alluvial clays underlying the Made Ground;
- ▶ Wat's Dyke is located in the east of the site;
- ▶ Railway lines are located adjacent to the east and west of the site;
- ▶ Elevated sulphate may pose a risk to concrete foundations and infrastructure.





5.0 CONSULTATIONS

5.1 Contaminated Land Officer

The Contaminated Land Officer at Wrexham Council has provided the following letters to REC:

- ▶ Initial review of the REC Geo-environmental Site Assessment Report (REC Reference 102904p1r0, dated October 2017), reference Preplanning Consultation, letter dated 17th August 2018; and,
- ▶ Response to a contaminated land search, reference Search 765, letter dated 5th September 2018.

REC have responded to the letter dated the 17th August (reference Preplanning Consultation) with the following:

- ▶ Response to letter dated 17th August 2018, REC reference 01c102904, letter dated 27th September.

5.2 Landfill Sites and Waste Treatment Sites

The Environment Agency record one landfill within 1km of the site. The entry relates to a historic landfill located 477m to the south-east of the site which accepted inert, industrial, commercial and household waste. The licence was first issued in Jan 1969 and surrendered in December 1972. Historical mapping dated 1971 also indicates a refuse tip 662m to the south-east of the site.

Historical mapping also indicates the presence of a scrap yard onsite from 1988.

5.3 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table only includes records not otherwise detailed in the report.

Table 5.1 Summary of Groundsure Data

Activity	0-249m	250-500m	Details
Contaminated Land Register Entries and Notices	0	0	Not Applicable (N/A).
Authorised industrial processes (IPC/IPPC/LAPPC).	0	0	N/A.
Fuel Stations Entries	1	2	The closest of which is an obsolete licence associated with Regent Service Station located 83m to the west of the site. The nearest active licence is located 332m to the north-west and registered to Shell Wrexham.
Licensed radioactive substances	0	16	The nearest of which is registered to Glyndwr University for the disposal of radioactive waste.
Enforcements, prohibitions or prosecutions	0	0	N/A
Discharge Consents	8	2	The closest discharge consent is 95m to the south-east related to trade effluent discharges at Wrexham Lager Brewery.



Activity	0- 249m	250- 500m	Details
Pollution Incidents	0	0	N/A
Consents issued under the Planning (Hazardous Substances) Act 1990	0	0	N/A
Control of Major Accident Hazard (COMAH) sites	0	0	N/A.





6.0 CONCEPTUAL SITE MODEL (CSM)

6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), REC has developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area.

6.2 Contaminant Sources

On-Site Sources

The RPS site investigation reports identified the following contaminants within Made Ground soils associated with the former scrap yard:

- ▶ Heavy metals, sulphate, TPHs, PAHs, and chrysotile asbestos fibres.

Off-site Potential Sources

A number of potential off-site contamination sources have been identified as follows:

- ▶ Adjacent railway land may be a source of heavy metals and PAHs.
- ▶ The vehicle repair garage (45m to the northwest), container storage depot (67m to the northwest) and former petrol filling station (83m to the west) may be a source of fuels, heavy metals, PAHs, glyphosate and surfactants.

The electricity substation and pumping station are recent additions associated with the Premier Inn development to the north. As the Premier Inn was constructed post 2011, they are not considered to be a source of PCB contamination. The other two electricity substations are located too far from the site to be considered as a potential contamination source.

6.3 Potential Pathways

Receptors may be potentially at risk from the identified potential sources of contamination via the following pathways:

- ▶ Migration of mobile contaminants on or off site via services, sewers and manmade conduits;
- ▶ Direct contact, ingestion (home grown produce and contaminated dusts) and inhalation of contaminants on site;
- ▶ Migration of contaminated dusts during earthworks;
- ▶ Migration of mobile contaminants into groundwater and transport into surface waters;
- ▶ Migration of mobile contaminants directly into the surface waters;
- ▶ Migration of hazardous gases; and,
- ▶ Consumption of contaminated potable waters.





6.4 Potential Receptors

Human Receptors

- ▶ Construction workers during the redevelopment of the site from hazardous short term exposure;
- ▶ Future users of the site and buildings; and,
- ▶ Users of adjacent areas due to off-site migration of gases, vapours or contaminated dust.

Controlled Waters

- ▶ Groundwater contained within the underlying Secondary (A) Aquifer; and
- ▶ River Gwenfro located at 11m to the southwest of the site.

6.5 Preliminary Risk Assessment

Human Health

On-site

Made Ground deposits from the sites historical use as a scrap yard is likely to pose a **moderate-high** risk to human receptors.

The chemical testing data contained within the RPS reports is likely to be representative of a worst case scenario on site, and it is likely that the organic compounds will have further degraded. The chemical testing results within these reports should be compared to the latest guideline values available and the requirement for remedial measures to protect human health assessed.

Off-site

The risk posed by adjacent railway land is considered **low-moderate** due to its active state.

Controlled Waters

The RPS Groundwater Risk Assessment (reference RCM4642-009 R FINAL, dated November 2007) concluded that the site posed a low risk to controlled waters. Communication from Wrexham Council confirms that Natural Resource Wales (NRW) has previously viewed this report as part of the planning application for the adjacent Premier Inn Development and stated that no further site investigation works required. Wrexham Council have recommended that NRW is contacted again to confirm this, due to the change of current screening values.

Ecological Sites / Ecosystems

Sensitive ecological receptors have been identified on the site as follows:

- ▶ Mature and semi-mature trees on-site.

It is anticipated that the risk to ecological receptors on-site and off-site is **low-moderate** based on the potential for a number of contamination sources.





Buildings, Foundations and Services

Future redevelopment of the site will include the construction of new foundations. Elevated sulphate concentrations could affect the integrity of buried concrete structures. Services may be affected by the presence of aggressive contaminants which may corrode or penetrate services. Water supply pipes can be susceptible to penetration by hydrocarbons which may then affect the quality of the water supply.

Overall Environmental Risk Assessment

The overall risk to the site is considered **moderate** this is based on the likely presence of a number of contaminants within the subject site area.





7.0 CONCLUSIONS & RECOMMENDATIONS

Current Environmental Risk	
The site is currently securely fenced off with palisade style fencing on all sides. The site is accessed via a secure locked gate off Jacques Way. The majority of the site is covered with overgrown vegetation comprising grasses and small bushes. There is evidence of Japanese Knotweed at the southwest end of the site close to the site boundary. There was evidence of waste tipping/stockpiling on site close to the site entrance. This comprised general rubbish, chipboard, pallets and safety barriers. In the sites current state the environmental risk is considered to be low-moderate .	
Environmental Sensitivity	
Geology – The site is underlain by glaciofluvial sand and gravel / alluvium overlying Eturia Formation (mudstone). Aquifers – The site is underlain by a Secondary (A) Aquifer (mudstone and sand/gravel). Sensitive Land Uses - Residential dwellings within close proximity. Hydrology – River Gwenfro is located 11m to the south-west of the site.	
Likelihood of Historical Contamination	
Historical maps indicate that the site was located between railway land with extensive mounding present. Wats Dyke was recorded from 1957 and from 1988 the site was used as a scrapyard. The likelihood of historical contamination is considered moderate-high .	
Likelihood of Regulatory Action	
Communication with the Contaminated Land Officer at Wrexham Council is ongoing.	
Radon Risk	
▶ The UK radon website: 5% and 10% of homes are above the Action Level, basic radon protective measures required. ▶ Wrexham Council records: no risk to the site posed by radon with a risk to 1-3% of buildings (letter from the Contaminated Land Officer, dated the 5th September, reference Search 765).	
Preliminary Geotechnical Assessment	
Ground Conditions The site is underlain by glaciofluvial sand and gravel / alluvium deposits which in turn overlie mudstone. Constraints: ▶ Deep Made Ground generated from mounding and former use as a scrap yard, including potential historic foundations; ▶ Soft alluvial clays underlying the Made Ground; ▶ Wat's Dyke is located in the east of the site; ▶ Railway lines are located adjacent to the east and west of the site; ▶ Elevated sulphate may pose a risk to concrete foundations and infrastructure.	
Initial Conceptual Site Model (CSM)	
Human Health On-site - moderate – high risk onsite contaminants have been identified associated with historical site use as a scrap yard. Off-site - The risk posed by offsite sources is considered low-moderate . Controlled Waters The risk of contamination to the underlying groundwater and adjacent River Gwenfro is low .	
Overall Environmental Risk Rating	
Moderate	
Recommendations	▶ Further enquiry with the British Geological Society to determine whether the site requires radon protection measures. ▶ Updated human health and controlled waters risk assessment using data from previous site investigations and current screening values; ▶ Remedial Strategy.

END OF REPORT



APPENDIX I

LIMITATIONS





1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Ltd and the Client.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.
5. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
6. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
7. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
8. REC cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.
9. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.





Geo-Environmental Assessment
Land off Jacques Way
Wrexham
October 2018
102904p1r1

APPENDIX II

DRAWINGS

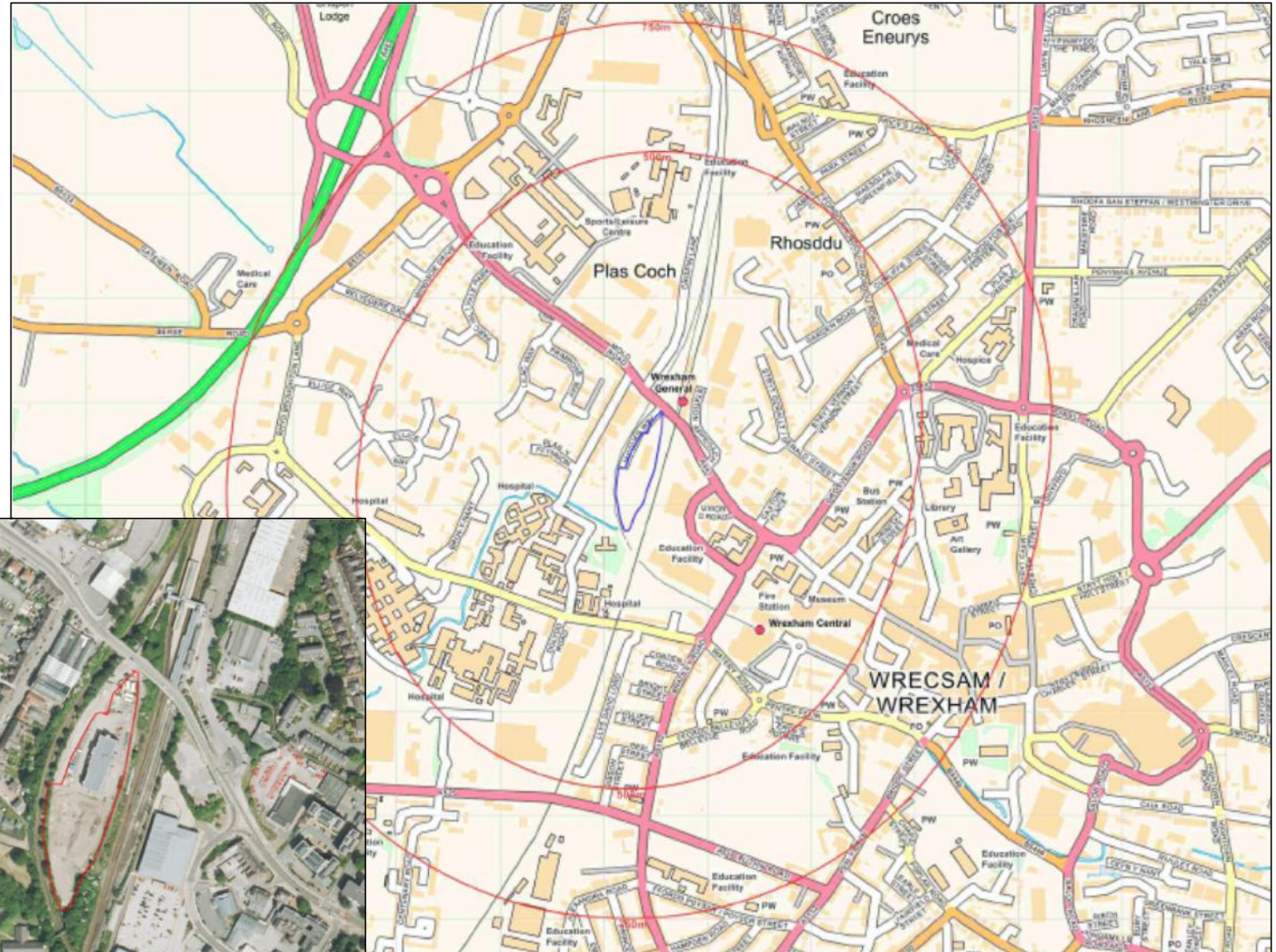


KEY:



Site Boundary

The client must not amend any drawing, design or other intellectual property produced by REC Ltd, without permission in writing from REC Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, REC Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or other intellectual property.



REC Ltd
Osprey House,
Pacific Quay, Broadway,
Manchester, M50 2UE

T: +44 161 868 1300
rec ltd.co.uk

Job Title:

Land off Jacques Way,
Wrexham

Client:

Castlemead Group Ltd

Job No: 102904-001

Drawn By: AL

Approved by: VT

Notes:

N.T.S

Drawing Title:

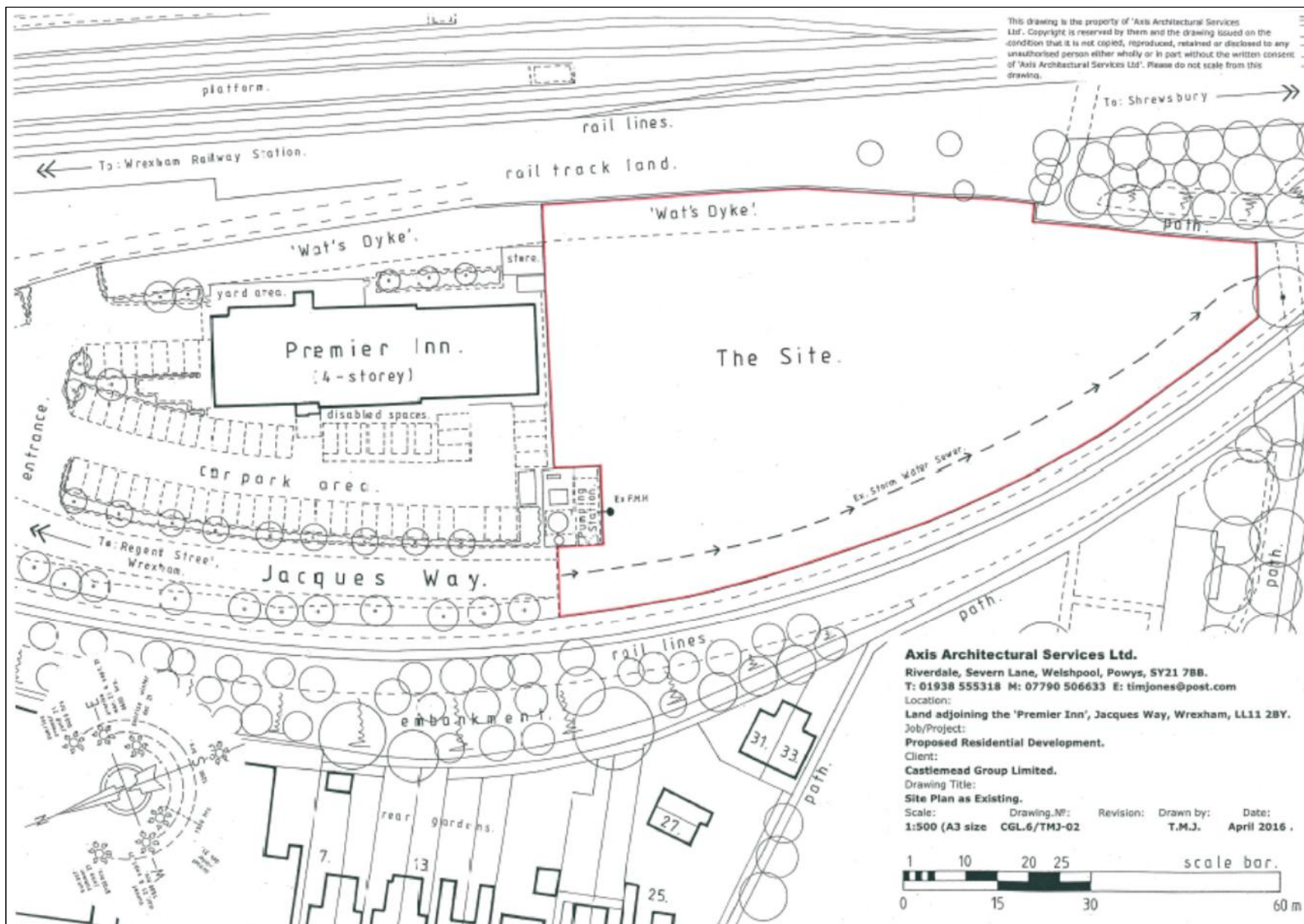
Site Location Plan

KEY:



Site Boundary

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REC



REC Ltd
 Osprey House,
 Pacific Quay, Broadway,
 Manchester, M50 2UE
 T: +44 161 868 1300
 rec ltd.co.uk

Job Title:

Land off Jacques Way,
 Wrexham

Client:

Castlemead Group Ltd

Job No: 102904-002

Drawn By: AL

Approved by: VT

Notes:

N.T.S

Drawing Title:

Site Plan

KEY:



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Job Title:

Land off Jacques Way

Client:

Castlemead Group

Job No: 102904

Drawn by: EK

Approved by: ML

Notes:

NOT TO SCALE

Drawing Title:

003 – Proposed Development Plan



Geo-Environmental Assessment
Land off Jacques Way
Wrexham
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102904p1r1

APPENDIX III

PHOTOGRAPHS





PLATE 1: SITES CURRENT STATE



PLATE 2: FLY TIPPED MATERIAL PRESENT





PLATE 3: ELECTRICITY SUBSTATION LOCATED IN THE NORTH OF THE SITE



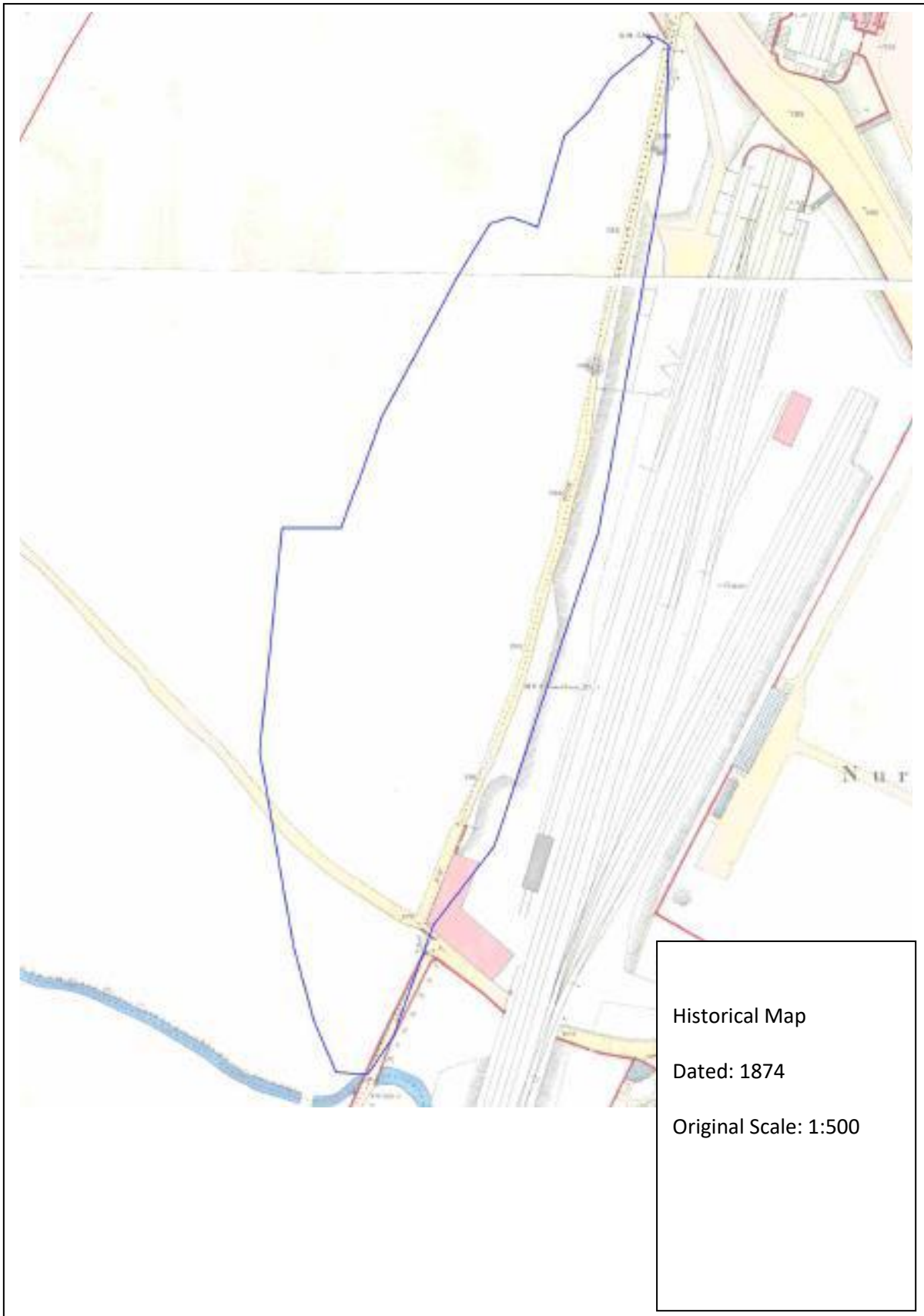


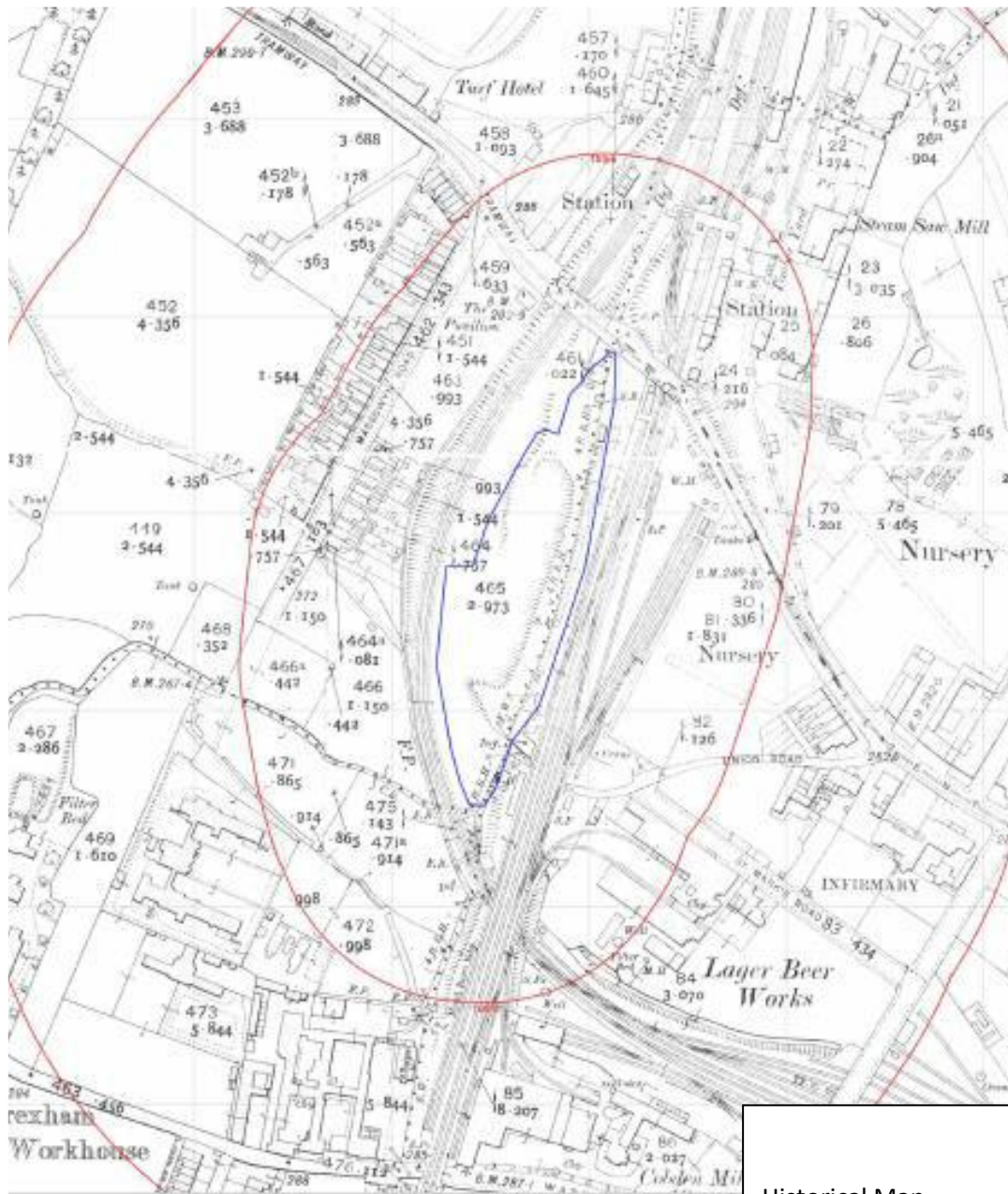
Geo-Environmental Assessment
Land off Jacques Way
Wrexham
October 2018
102904p1r1

APPENDIX IV

HISTORICAL MAPS







Historical Map

Dated: 1913

Original Scale: 1:2,500



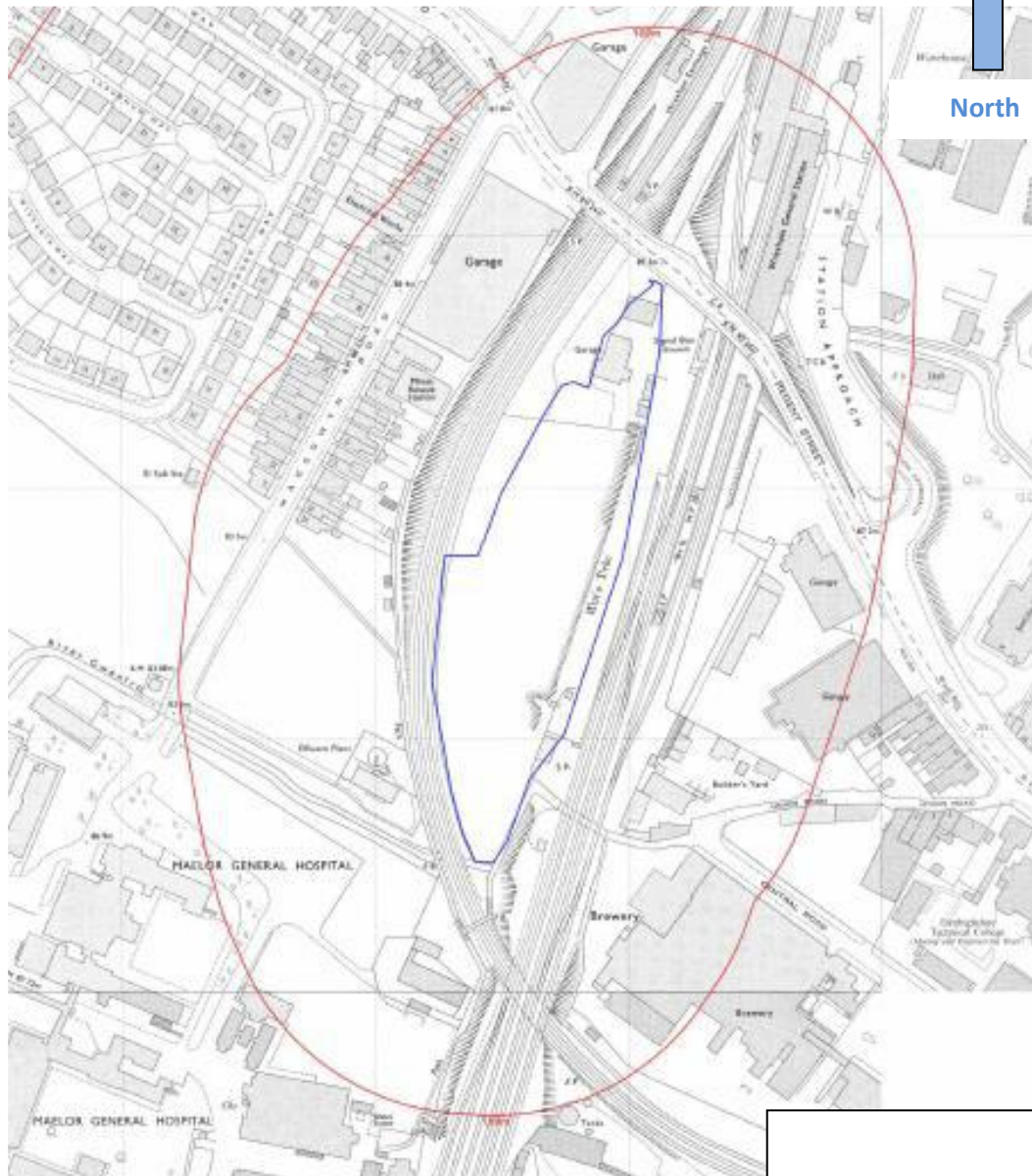


Historical Map

Dated: 1957

Original Scale: 1:2,500



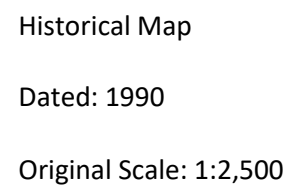
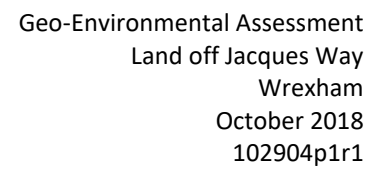


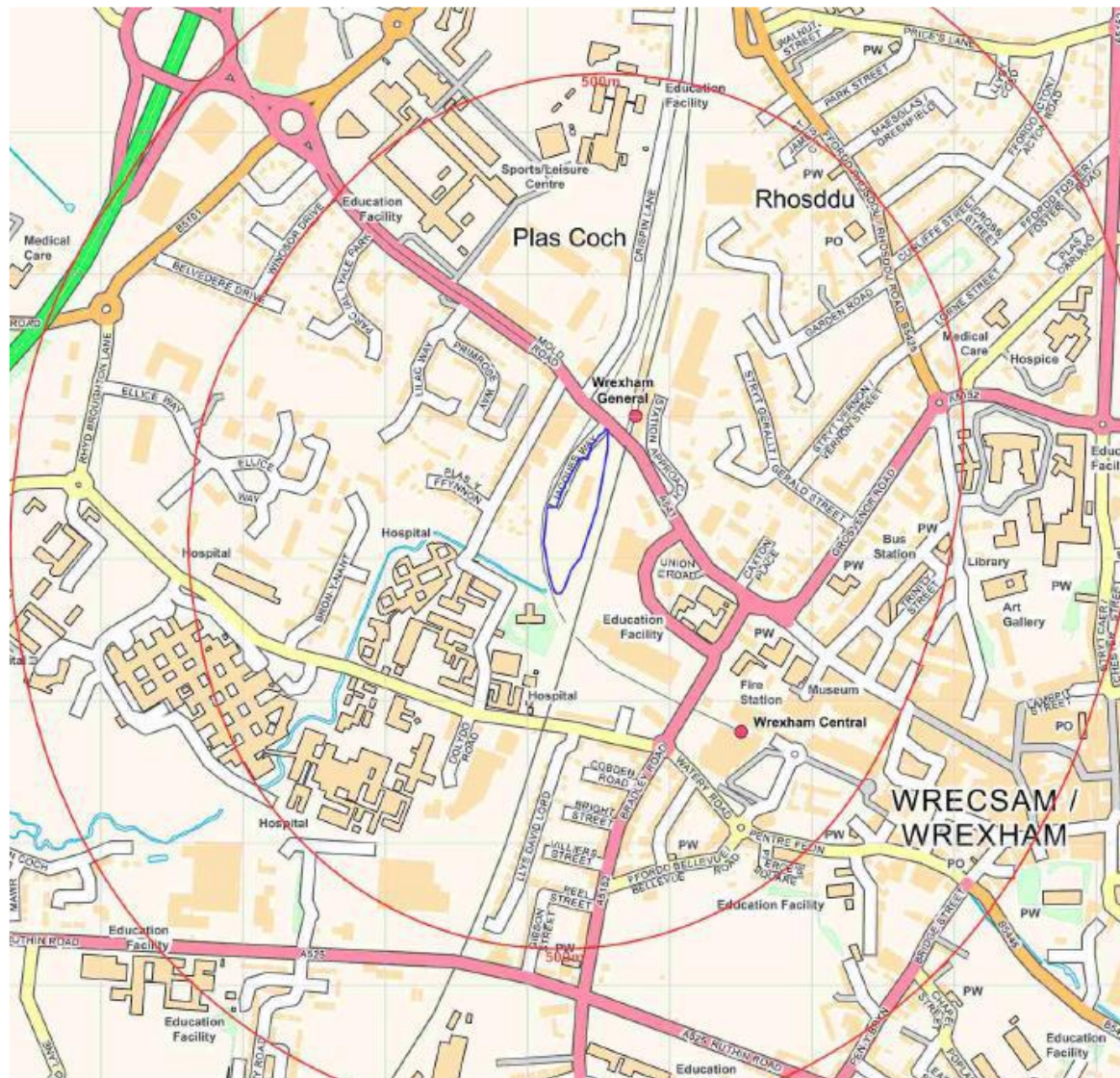
Historical Map

Dated: 1970

Original Scale: 1:2,500







Historical Map

Dated: 2014

Original Scale: 1:10,000





Geo-Environmental Assessment
Land off Jacques Way
Wrexham
October 2018
102904p1r1

APPENDIX V

REGULATORY CORRESPONDENCE



K James

Kerry James Planning
Hen Vicarage
Llanrhaeadr
Denbigh
LL16 4NU

Eich Cyf/Your Ref
Ein Cyf/Our ref
Dyddiad/Date
Gofynner am/Ask for
Rhif Cyswllt/Contact No
E-bost/E-mail

Land off Jacques Way
Preplanning Consultation
17 August 2018
Helen Bradshawe
01978 298774
Helen.bradshawe@wrexham.gov.uk

Letter sent via email

Dear Ms K James

RE: LAND OFF JACQUES WAY, WREXHAM, LL11 2BY

I have received the following report for review in relation to the proposed development of the erection of affordable housing units comprising 1 detached dwelling, 18 semi-detached dwellings and 6 flats and associated works.

- Geo-Environmental Site Assessment, Land off Jacques Way, Wrexham, REC, reference 102904p1r0, October 2017.

In relation to the report I can provide the following comments:

The report includes a description of the site including its past historical uses. An appraisal of the site environmental setting is presented including its geology, hydrogeology and hydrological regime, mining activities, waste management issues, and identification of additional environmental sources, pathways and receptors. This information has been used to compile a site conceptual model, which identifies potential sources, pathways and receptors and likely pollution linkages.

1. Section 2.2 of the report states that no equipment that may potentially contain PCBs was observed at the site, however in Section 4.6 an electricity substation is located onsite which can be associated with PCBs, please can you clarify if a substation is present on the site?
2. Section 5 states that the Contaminated Land Officer had been contacted in relation to the site and REC were awaiting the response, detailing the email sent within the appendices; however on review of our records and the email system the Contaminated Land Team did not receive any requests for information in relation to the site. On review of the email, the environmental consultant search request has a charge of £70+ VAT. The Contaminated Land Team hold a number of records in relation to this site and it would be prudent to obtain this information when completing any further investigations at the site.

3. A pumping station is shown immediately adjacent to the site on the Site Plan within the Appendices; however this is not identified within the report. If this is present this will need to be address especially in relation to the sites conceptual model.
4. Please note that Natural Resources Wales (NRW) is the regulator of controlled waters and as such they should be consulted and forwarded copies of all the relevant information for this site.

If no further investigation is undertaken before the submission of a planning application for the site then the following conditions and note to applicants would be recommended to be applied to any future planning permission.

Conditions

ZP01B SITE SPECIFIC CONTAMINATED LAND – PHASED INVESTIGATION

No development shall take place until a phased site investigation of the nature and extent of contamination, has been carried out and submitted to and approved in writing by the Local Planning Authority. If any contamination is found during the site investigation, no part of the development shall commence until a scheme specifying the measures that will be taken to remediate the site to render it suitable for the development hereby permitted has been submitted to and approved in writing by the local planning authority. The site shall thereafter be remediated in accordance with the approved scheme. If during the course of development any contamination is found that has not been identified in the site investigation, no further development shall take place on those parts of the site where that contamination has been found until an additional scheme of remediation has been submitted to and approved in writing by the local planning authority for those parts of the site. The relevant parts of the site shall thereafter be remediated in accordance with the additional scheme of remediation.

ZP02A VERIFICATION REPORT - CONTAMINATED LAND

Each part of the site subject to the remediation under the scheme(s) approved as part of condition @@ shall not be occupied/used until a Validation Report has been completed in respect of that part of the site and submitted to and approved in writing by the Local Planning Authority.

Note to Applicants

A11NA SITE CONTAMINATION

Further advice on compliance with condition no. @@ may be obtained by contacting the Council's Environment and Planning section on 01978 298989 or contaminatedland@wrexham.gov.uk. Should the investigation identify contamination issues that may affect receptors other than the site users e.g. groundwater, then it is recommended that these works are also addressed in consultation with the Council's Environment and Planning section prior to commencement of works on site.

Should you have any queries regarding this information please do not hesitate to contact me on.

Yours sincerely,



Helen Bradshawe
Contaminated Land Officer

Emma Khadun
REC Ltd
Osprey House, Pacific Quay,
Broadway,
Manchester,
M50 2UE

Eich Cyf/Your Ref
Ein Cyf/Our ref
Dyddiad/Date
Gofynner am/Ask for
Rhif Cyswllt/Contact No
E-bost/E-mail

Jacques Scrap yard
Search 765
05 September 2018
Helen Bradshawe
01978 298 774
Helen.Bradshawe@wrexham.gov.uk

Dear Emma,

RE: LAND OFF JACQUES WAY, WREXHAM

Thank you for your query in relation to in

1. This Authority does not yet have a comprehensive database regarding historic land use or contamination. However, the limited information available to the Housing and Public Protection Department indicates that there are no historic landfill sites within 250 metres of the area shown on the plan that you provided. The site was previously a garage and a scrap yard. Along the eastern boundary of the site is Wat's Dyke.
2. Our records indicate that there are no instances of nuisance / complaints associated with the site or immediate surrounding premises and no formal notices have been issued by the Authority.
3. The site was subject to site investigation in 2004 and 2008, the NRW satisfied at this time that there was no significant risks to controlled waters (minor aquifer and River Gwenfro). The main findings of the report were:
 - a. Asbestos sheeting identified within the made ground – Chrysotile and Amosite fibres identified.
 - b. Localised areas of heavy metal, TPH and PAH contamination identified within the made ground.
 - c. Potential for PCB contamination, needs to be investigated further.
 - d. Elevated soil gas – Carbon Dioxide with negligible flow rates.
 - e. The NRW stated that no further site investigation works are required with respect to groundwater (although there is a possibility that they may change this position since 2008 in light of current guidance etc).
4. The site may be located in a flood risk area. A flood consequence assessment was undertaken in 2006. It is stated within the report that the proposed development was feasible at that time (apartment blocks).

5. A 4 storey hotel with associated access road and car park is to the north of the site. This section has been remediated to the satisfaction of this department and the NRW. It is noted that they had radon gas protection measures installed.
6. Our records indicate that there are no private water abstractions in the vicinity of the site.
7. Our records indicate that there is no risk to radon within the vicinity of the site. The radon map indicates a risk level of 1-3%.
8. Note that Japanese knotweed was also identified within the site. This Authority does not keep details of records of Japanese Knotweed, if you require any information on this please contact the NRW.
9. As previously stated we do not have a comprehensive database of historic land uses or contamination, however, our records show that the site is on an area of a former depot and warehouses a use that may give rise to ground contamination and therefore at some time will have to be considered by the council under Part IIA. Unfortunately the Council does not yet have a list of prioritised sites for inspection under Part IIA and therefore it is impossible to advise you of a likely time when such an assessment would take place.

I have copies for the reports for from 2004 / 2008 that I will try to send over email. In regards to the development of the hotel adjacent the information is detailed on the councils planning portal under P/2011/0884.

If you require any further information, please do not hesitate to contact me.

Yours sincerely

A handwritten signature in black ink, appearing to read 'H. Bradshaw' with a stylized flourish at the end.

Helen Bradshawe
Contaminated Land Officer



Helen Bradshawe
Contaminated Land Officer
Wrexham County Borough Council
Guildhall
Wrexham
LL11 1AY

Our Ref: 01c102904
Date: 27th September 2018

By Email: helen.bradshawe@wrexham.gov.uk

Dear Helen,

Land off Jacques Way, Wrexham, LL11 2BY – Response to Letter Dated 17/08/2018 (Your Ref: Preplanning Consultation)

Further to your letter dated the 17th August 2018 ref: 'Preplanning Consultation', Resource & Environmental Consultants Ltd (REC) is pleased to provide further clarification regarding the four queries raised. This relates to the proposed development of the site: affordable housing units comprising 1 detached dwelling, 18 semi-detached dwellings, 6 flats and associated works.

The following two preplanning conditions have been imposed on the planning determination for the site:

- ▶ Condition ZP10B: requirement for a phased contaminated land site investigation; and,
- ▶ Condition ZP02A: relating to the submission of a Verification Report to the Local Authority confirming that all remedial works were completed prior to first use or occupation.

The letter dated the 17th August 2018 raised the following four points:

1. Clarification of whether an electricity substation is present on site;
2. The Local Council holds a number of relevant records related to the site; that holds a number of records in relation to this site and no request for this information has been received by the Contaminated Land Officer;
3. A pumping station located adjacent to the site has not been included within the Conceptual Site Model (CSM); and,
4. Natural Resource Wales (NRW) is the controlled waters regulator, and should be forwarded all relevant information for the site.

Previous Reports

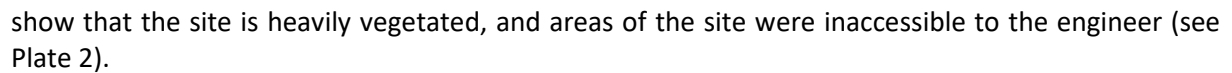
REC has produced the following report for the site:

- ▶ Geo-Environmental Site Assessment, Land off Jacques Way, Wrexham, REC reference 102904p1r0, October 2017.

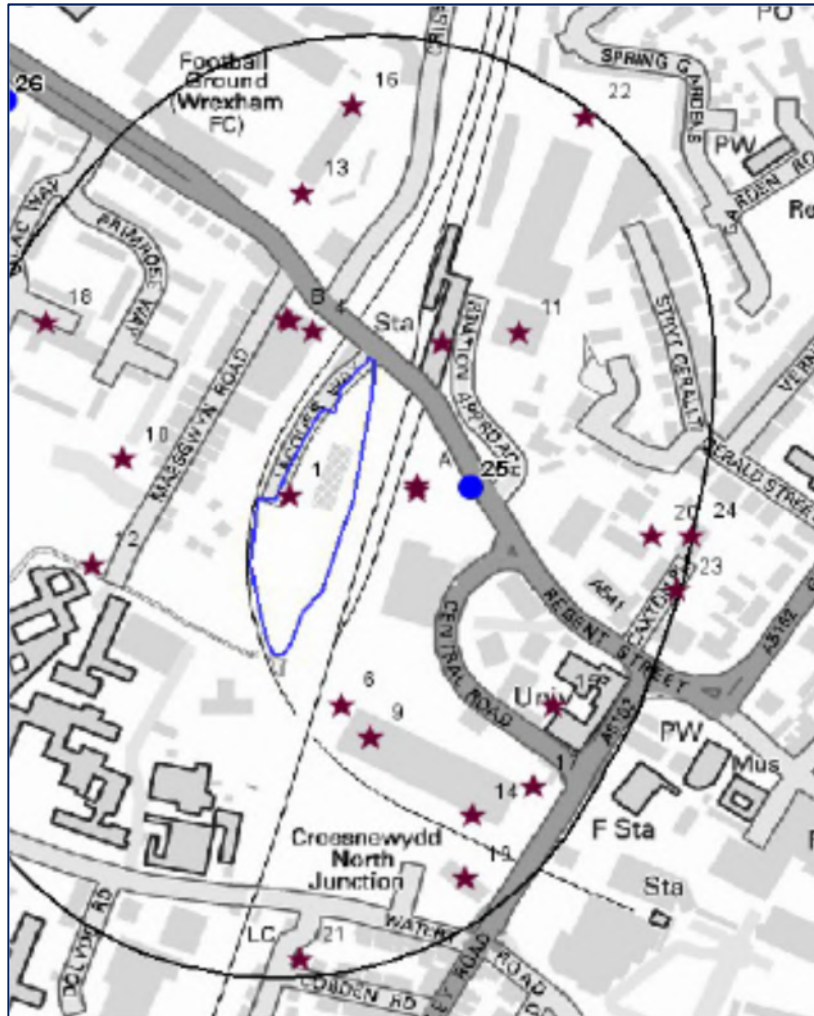
1. Electricity Substation

The location of the electrical substation is shown as a red star labelled 1 in Plate 1. It is unclear whether an electricity substation is /was present on site. Photos taken during site walkover in October 2017





The electricity substation is also not present on historical mapping of the site, nor included within the description of the site from the 2004 site walkover. Poly Chlorinated Biphenyl (PCB) analysis of select soil samples tested by RPS in 2004 revealed concentrations ranging from below the limit of detection to 0.07 mg/kg. The report concludes that there is a very low risk to the site from PCB contamination. PCB testing undertaken on groundwater samples by RPS in 2007 were below the limit of detection.



Given the limited PCB concentrations identified within the soil in 2004, it is more likely that the electricity substation is a more recent addition associated with the development of the Premier Inn in the north of the site, and therefore the site is unlikely to be affected by PCBs as new electrical substations do not tend to include coolant containing PCBs.

An additional site walkover will be undertaken by Castlemead Group to confirm whether the electricity substation is present on site to verify the above and if a historical electrical substation is identified then, with the approval of the local authority, further soil sampling may be required to check for the presence of PCB contamination.





Plate 2: Over view of site, looking north

2. Information Provided by the Local Council

REC has now been furnished with the following information from the Local Council:

- ▶ Response to a contaminated land search, reference Search 765, letter dated 5th September 2018;
- ▶ RPS Phase II Contamination Assessment, reference RCM4019-008 R FINAL, dated October 2004 and,
- ▶ RPS Groundwater Contamination Assessment, reference RCM4642-009 R FINAL, dated November 2007.

REC will recommend to our client that the REC Phase I Geo environmental report and conceptual site model (CSM) are updated to reflect the information provided by the Local Council search, the pump house and electricity substation, and summarise pertinent information from the two site investigation reports.

The site observations contained within Sections 4.1 and 4.2 of the RPS Groundwater Contaminated Assessment suggest that the scrap yard was no longer operational by 2007. The chemical testing data contained within the RPS reports is therefore likely to be representative of a worst case scenario on site, and it is likely that the organic compounds will have further degraded. The chemical testing results within these reports will be compared to the latest guideline values available and the requirement for any further ground investigation or remedial works assessed.





3. Controlled Waters

REC will forward our updated report to NRW, together with the previous RPS reports compiled for the site. It is anticipated that as the RPS Groundwater Contamination Assessment concluded that the site posed a low risk to controlled waters and has previously viewed this report, that NRW will not raise any objections.

4. Radon

Mapping available on the UK Radon Website suggests that the site will need radon protection as the site is located within a 1km grid square where there is a maximum radon potential of 10-30% (see Appendix I). This is contrary to the information provided in your letter dated the 5th September (reference Search 765), which states that the Council's records state that there is no risk to the site posed by radon with a risk to 1-3% of buildings. REC note that radon and gas protection measures were incorporated within the construction of the Premier Inn to the north of the site under planning application P/2011/0884. As per the advice on the UK Radon Website, REC will seek permission from our client to raise a query with the British Geological Society in order to confirm the status of the site and whether radon protection measures are necessary for the proposed development.

REC shall recommend to our client that the REC Phase I Geo-Environment Site Assessment should be updated as detailed above and will forward on a copy of the updated report in due course.

Should you have any further queries, please do not hesitate to contact me.

Yours sincerely,

For and on behalf of REC Ltd

Emma Khadun
Senior Consultant

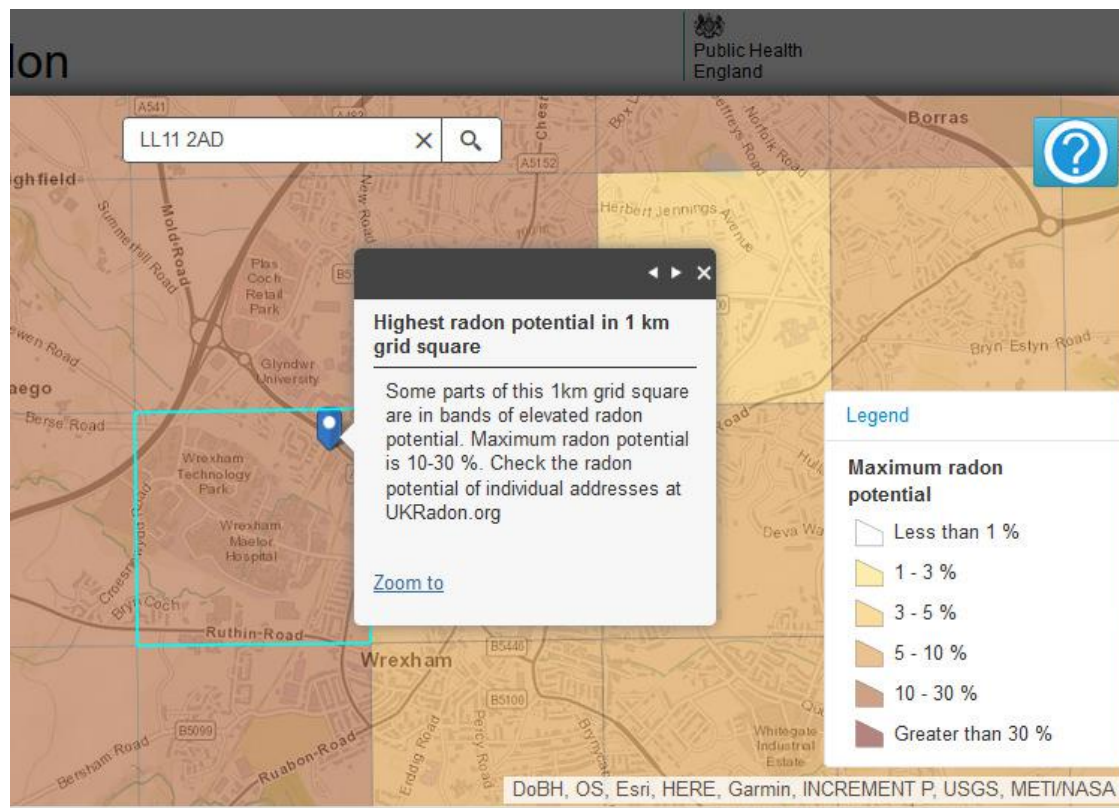
Reviewed and Authorised

Louise Stock
Associate Director





Appendix I – Extract from UK Radon Online Mapping Website





Geo-Environmental Assessment
Land off Jacques Way
Wrexham
October 2018
102904p1r1

APPENDIX VI
COAL MINING REPORT





The Coal
Authority

Resolving the **impacts** of mining

CON29M Non-Residential Mining Report

LAND OFF JAQUES WAY, WREXHAM,
LL11 2AD
WREXHAM

Date of enquiry: 03 October 2017
Date enquiry received: 03 October 2017
Issue date: 03 October 2017

Our reference: 51001643140001
Your reference: GS-4313690



CON29M Non-Residential Mining Report

This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

GROUNDSURE LIMITED

Enquiry address

LAND OFF JACQUES WAY, WREXHAM, LL11 2AD,
WREXHAM

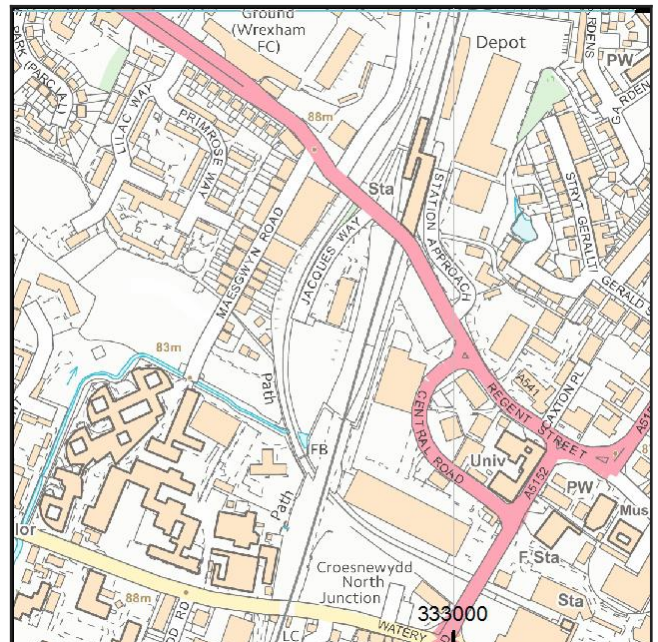
How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority
 /thecoalauthority
 /coalauthority



Approximate position of property



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Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	No
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is in a surface area that could be affected by underground mining in 1 seam of coal at 330m to 380m depth, and last worked in 1917.

Any movement in the ground due to coal mining activity should have stopped.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions applicable at the time the report was produced.

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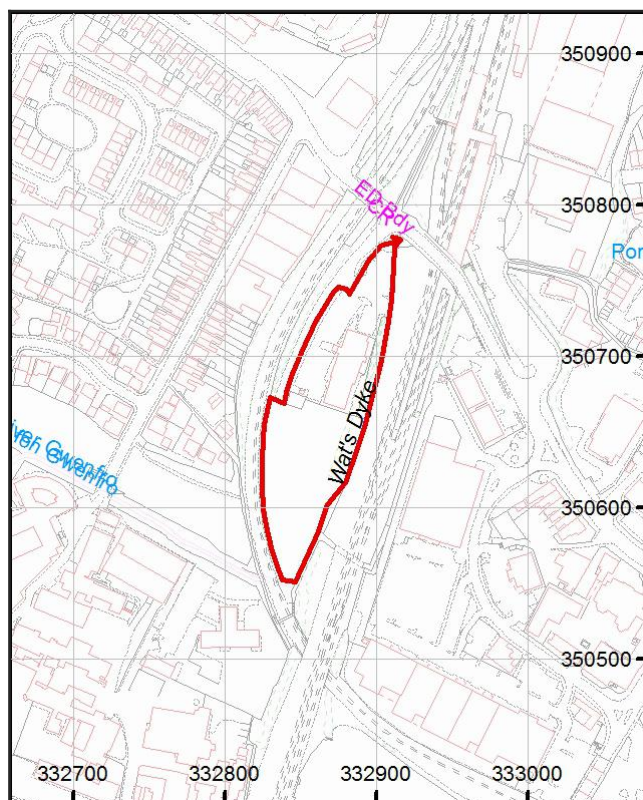
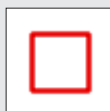
Alternative formats

If you would like this report in an alternative format, please contact our communications team.

Enquiry boundary

Key

Approximate position of enquiry boundary shown



How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority

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Land off Jacques Way
Wrexham
October 2018
102904p1r1

APPENDIX VII
PREVIOUS REPORTS



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PHASE II CONTAMINATION ASSESSMENT

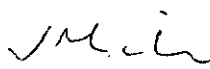
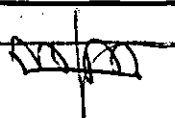
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PHASE II CONTAMINATION ASSESSMENT

**JAQUES SCRAP YARD
REGENT STREET
WREXHAM
LL11 2AD**

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EXECUTIVE SUMMARY

Project Background	Castlemead Homes Ltd commissioned RPS Health, Safety & Environment to undertake a Phase II Contamination Assessment of the land at Jaques Scrap Yard, Regent Street, Wrexham prior to the proposed acquisition for residential redevelopment.
Site Details	Jaques Scrap Yard Regent Street, Wrexham, LL11 2AD NGR 332870 350680 Site area: 1.3 hectares
Current Condition and Activities	The site is occupied by Jaques Scrap Yard comprising a garage. The main garage building is located in the north of the site, with two smaller out houses located in the east and southeast of the site. The remainder of the site is used for the storage of scrap vehicles, which are salvaged for parts.
Site History	The site is shown as greenfield in 1879, with railway lines only located to the east of the site. By 1899, the railway line to the west has been developed and the site is shown with areas marked as infilled by unknown material. By 1912, a small building has been developed in the north of the site. By 1989, the site is labelled as a garage and a scrap yard and only 3 small out buildings are shown. Anecdotal information indicates that the site has been used as a scrap yard for approximately 50 years.
Potential Contamination Sources	The potential sources of contamination have been identified from current and previous land uses as a scrap yard, garage and from historical infilling on the site. These include heavy metals, inorganic compounds, acids, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), fuels, oils, phenols, asbestos and solvents.
Site Setting	The site is underlain by permeable Glacial Sand and Gravels at the northern half of the site and made ground at the southern half. Alluvium materials may be present beneath the made ground deposits. Solid bedrock consists of the low permeability Carboniferous Ruabon Marl Formation. The groundwater aquifers associated with the Alluvium and Carboniferous Deposits are classed as Minor Aquifers. The site is located approximately 100 m to the east of a

	groundwater Source Protection Zone (SPZ) Zone II and approximately 150 m to the east of the Zone I SPZ associated with licensed groundwater abstractions for the Wrexham Lager Brewery. The nearest surface watercourse to the site is the River Gwenfro, located adjacent to the south of the site. No sensitive surface water abstractions have been identified within 1 km of the site. The site is located adjacent to an indicative fluvial flood plain. The site is within an area where radon gas protection measures are required. Wat's Dyke, a scheduled Ancient Monument, is located within the site along the eastern boundary. No exploratory locations were positioned within a protection perimeter of the monument.
Intrusive Investigations	Intrusive investigations involved the excavation of 6 boreholes to depths of between 5.0 and 8.0 m below ground level (bgl) and 8 trial pits to depths of between 2.5 and 3.2 m bgl. A total of 6 boreholes were completed as permanent groundwater and gas monitoring points. A total of 25 soil samples and 2 groundwater samples were submitted to a UKAS accredited laboratory for analysis which included: • Metals and pH; • SVOC (semi-volatile organic compounds) • VOC (volatile organic compounds) • TPH (total petroleum hydrocarbons) • Leachability analysis • Asbestos • PCB (polychlorinated biphenyls) Ground gas monitoring was undertaken on 2 occasions.
Identified Contamination	The results of the soil and groundwater chemical analysis and gas monitoring have identified: • Soil contamination by elevated concentrations of chromium, lead, copper and zinc in the east and the centre of the site in the made ground; • Contamination by highly elevated concentrations of oils and fuels in the west, southeast and centre of the site associated with shallow made ground

	deposits. • Carbon dioxide concentrations up to 2.8 % by volume but a slight positive flow was only measured in one borehole on one occasion; • Slightly elevated concentrations of ammoniacal nitrogen in one groundwater sample; • Asbestos sheeting in one location in the centre of the site; and • Japanese Knotweed within the western boundary of the site, adjacent to the railway line.
Risk Assessment	The risk assessment has identified that the following receptors are sensitive to elevated concentrations of metals, fuels, oils, carbon dioxide and to the presence of asbestos identified in the made ground: • Moderate to high potential that future site users will be impacted by dermal contact and ingestion of contaminants within gardens and elevated carbon dioxide concentrations within buildings; • Slight potential that the adjacent River Gwenfro could be impacted by surface runoff from the currently unpaved site and by lateral migration of contaminants from the made ground through permeable strata; • Moderate potential that vegetation will be impacted from root uptake within gardens of residential properties; and • Moderate potential that buildings (including the Ancient Monument) will be impacted from the presence of Japanese Knotweed on site, elevated carbon dioxide concentrations and from the redevelopment of the site.
Conclusions and Recommendations	It is recommended that further assessment be undertaken to determine the risk to human health and surface water from elevated fuels, oils and metals identified in the made ground beneath the site. Should the development comprise a hardstanding layer with very limited landscaped areas, the risk of exposure to human health and to controlled waters will be significantly reduced. However, given that RPS has not reviewed a detailed redevelopment proposal to assess the risks in more detail,

	a quantitative risk assessment (QRA) may be required. Alternatively, once a detailed development plan has been assessed it may be possible to remove made ground to a depth of 1 m bgl from beneath landscape areas and gardens (if present) and redeposit under areas of hardstanding, such as, access roads and car parking. In addition, clean top-soil should be deposited in the landscaped or garden areas. The area surrounding TP2 (at 2.1 m bgl) in the centre of the site should be excavated to remove any asbestos containing materials by an authorised contractor and disposed of under appropriate duty of care procedures. The carbon dioxide concentrations identified may require the incorporation of gas protection measures. The environmental setting of the site (Section 2) has also identified a requirement for radon gas protection measures to be used. These could be combined within a gas protection scheme. Construction workers involved in the redevelopment should adhere to protective health and safety measures related to the elevated concentrations of hydrocarbons and the presence of asbestos. Eradication of Japanese Knotweed should be undertaken prior to redevelopment commencing. In reference to Wat's Dyke, an archaeological survey and a scheduled monument consent may be required prior to redevelopment in accordance with the requirements of the CADW (Welsh Historical Monuments) and the Ancient Monuments and Archaeological Areas Act 1979.
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1 INTRODUCTION

- 1.1 Castlemead Homes Ltd commissioned RPS Health, Safety & Environment to undertake a Phase II Contamination Assessment of the land at Jaques Scrap Yard, Regent Street, Wrexham prior to the proposed acquisition for residential redevelopment.
- 1.2 It is proposed to redevelop the site to residential houses with gardens.
- 1.3 The principle objectives of the site investigation were to:
 - i determine the presence, nature and extent of any soil and groundwater contamination at the site;
 - ii determine presence of any flammable and asphyxiating gases from any areas of infill on site;
 - iii determine the potential liability and environmental risk posed by any such contamination;
 - iv determine requirements for further investigation and/or risk assessment; and
 - v identify potential requirements for remedial action and if necessary, provide indicative costs for such works.
- 1.4 In order to achieve these objectives the following items of work were undertaken:
 - i detailed walkover of the site and discussion with site personnel;
 - ii excavation of 6 boreholes and 8 trial pits and the collection of representative soil samples and groundwater samples;
 - iii analysis of soil and groundwater samples for a range of contaminants including metals, total petroleum hydrocarbons (TPH), semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC);
 - iv monitoring of ground gas concentrations and groundwater levels in the boreholes;
 - v collection of groundwater samples where encountered; and
 - vi production of a conceptual site model (CSM) and qualitative risk assessment using current published guidance.

2 BACKGROUND INFORMATION

- 2.1 Details of the environmental setting and historical development of the site are outlined below.

Site Location and Description

- 2.2 The site is located off Regents Street, Wrexham at NGR 332870 350680. A site location plan is provided in Figure 1.
- 2.3 The site is lenticular in shape, approximately 1.3 hectares in size and is bound to the east, south and west by railway sidings. The railway sidings to the west are situated within a cutting approximately 4 m below the level of the site. To the north is Regent Street, beyond which is the Wrexham General Railway Station. Beyond railway sidings to the west are two garages, a fire station and approximately 9 residential houses. To the east, beyond the railway sidings is open land and a petrol filling station. The River Gwenfro is located adjacent to the south of the site. Approximately 100 m to the south, is Wrexham Meallor Hospital.
- 2.4 The site slopes downwards from Regent Street in the north to the River Gwenfro in the south. The site is occupied by Jaques Garage comprising a scrap yard. The main garage building is located in the north of the site, with two smaller outhouses located in the east and southeast of the site. The remainder of the site is used for the storage of scrap vehicles, which are salvaged for parts.

Site History

- 2.5 The site is shown as greenfield in 1879, with railway sidings only located to the east of the site. By 1899, a railway sidings to the west has been developed and the site is shown with areas marked as infilled. Beyond the railway sidings to the east is a nursery, a timber/steam saw mill is located 100 m to the northeast, a brewery is located 100 m to the southeast and open land is located adjacent to the west and south of the site, beyond the railway sidings.
- 2.6 By 1912, residential properties have been developed beyond the railway line to the west and a tramway is located along Regent Street. On site, a small building has been developed in the north.
- 2.7 The 1937 map shows an additional building has been developed in the north and two small outhouses in the east of the site. A bus depot is shown beyond the railway line to the northwest, the tramway on Regent Street has been removed and the nursery to the east is shown as a series of buildings. Another garage has been developed 50 m to the northwest and Wrexham Hospital has been developed 100 m to the southwest.

- 2.8 The 1960 map shows a builder's yard is located 50 m to the east beyond the railway sidings and the series of buildings to the east, where the nursery was located, are shown as garages.
- 2.9 The 1970 map shows a small sewage effluent treatment plant located adjacent to the southwest of the site beyond the railway sidings. By 1989, the site is labelled as a garage and a scrap yard and only 3 small outbuildings are shown. The bus depot to the northwest has been redeveloped into a series of garages and the builder's yard to the east has become part of the brewery.
- 2.10 There is relatively little change to the site and the surrounding area between the publication of the 1989 and 2000 maps.
- 2.11 Anecdotal information indicates that the site has been used as a scrap yard for at least 50 years.

Site Sensitivity

Geology

- 2.12 Information obtained from the published geological map (British Geological Survey (BGS) Sheet 121, Wrexham Solid and Drift Edition) indicates that the site is underlain by Glacial Sand and Gravels in the northern half of the site and made ground in the southern half. Alluvium may be present beneath the made ground deposits. Solid bedrock underlying the made ground and drift deposits, consists of the Carboniferous Ruabon Marl Formation.
- 2.13 The drift geology present beneath the site is highly permeable and will permit the lateral and vertical migration of potential mobile contaminants present on site. However, the Ruabon Marl Formation is of low permeability and will inhibit further migration.
- 2.14 A Coal Authority report indicates that the site is within the zone of influence from workings of a coal seam between 330 m and 370 m below ground. However, the last date of working was 1917 and ground movements should have now ceased. The Coal Authority has no knowledge of any mine entries within the site boundary or within 20 m of the site and there are no faults or weaknesses at the surface which could affect the stability of the site.

Hydrogeology

- 2.15 The Groundwater Vulnerability Map of West Cheshire (sheet 16, scale 1:10,000) indicates the groundwater aquifers associated with the Alluvium and Carboniferous Deposits are classed as a Minor Aquifer.
- 2.16 The site is located approximately 100 m to the east of a groundwater Source Protection Zone (SPZ) Zone II and approximately 150 m to the east of the Zone I SPZ associated with licensed groundwater abstractions for Wrexham Lager Brewery. The SPZ Zone III is located

to the northwest of the Zone II and approximately 1 km from the site. The brewery has seven authorisations to abstract groundwater for process water. The borehole abstractions are located to the west of the brewery and the site, in an upgradient direction and are, therefore, considered to upgradient of the site.

Hydrology

- 2.17 The nearest surface watercourse to the site is the River Gwenfro, which flows to the east and is located adjacent to the south of the site. The Environment Agency has assigned river quality classification of Grade B for 2002 (good chemistry quality) at a point to the southeast of the site. In 2000, the river did not meet the chemistry quality target and was graded poor (Grade E) indicating that the river quality has significantly improved. The River Gwenfro to the southwest of the site, has also been classified as chemistry Grade B (good quality).
- 2.18 The brewery is permitted to discharge to the River Gwenfro at a point approximately 100 m to the south of the site. The effluent plant located adjacent to the west of the site beyond the railway line is also permitted to discharge sewerage to the River Gwenfro.
- 2.19 A total of 37 pollution incidents to controlled waters have been identified within 1 km of the site and one is directly attributed to the site. In November 1998, fire water/foam entered the River Gwenfro from runoff. The incident was classified as a minor incident.
- 2.20 A total of two licensed surface water abstractions from the River Gwenfro have been identified within 1 km of the site. These are authorised to Wrexham County Borough Council, for effluent/slurry dilution and Mr J Rees, for spray irrigation and are located approximately 500 m to the southeast and southwest, respectively.
- 2.21 The site is located adjacent to an indicative fluvial flood plain. However, the site level is approximately 8-10 m above the level of the River Gwenfro.

Neighbouring Ecology

- 2.22 Wat's Dyke, a scheduled Ancient Monument is located within the site along the eastern boundary. The Monument is classified as linear earthworking dating back to possibly the early medieval period and is believed to have been largely destroyed, except for approximately a 120 m stretch.
- 2.23 Gatewen Marsh, located approximately 800 m to the northwest of the site is a Site of Special Scientific Interest (SSSI) for biological reasons.

Landfill

- 2.24 The site is a registered scrap yard, licence 37037 and is classified as very small. The site is authorised to accept vehicles, associated vehicle parts and wastes (for example, oil and fuels).
- 2.25 The Environment Agency indicates that the site's waste OPRA (Operator and Pollution Risk Appraisal) score for 2003 was 80 points out of a maximum score of 150. This indicates that the site has a medium to high environmental risk. Within the OPRA classification, high risk was assigned to groundwater, surface water, control (no control mechanism in operation) and human (sensitive receptors/dwellings located in the vicinity of the site).
- 2.26 Anecdotal information from site personnel indicates that the site was raised by 3-4 m above the level of the adjacent railway line by the deposition of inert and construction waste prior to the site's operation as a scrap yard.
- 2.27 The former Parciau Landfill, is located approximately 470 m to the southeast of the site. Additional information obtained from the Environment Agency and Wrexham County Borough Council states that the landfill was an old gravel pit in the early 1900's and was infilled with ash waste before being used as a refuse tip. The last date of waste input is recorded to be 1972 and the composition of waste is made up of 10 % inert, 30 % household/combustible material and 60 % industrial waste. No gas monitoring control measures are in operation at the site.

Radon

- 2.28 The site is located within an area where between 1 % and 3 % of homes are above the action level, and the BGS recommend that radon protection measures should be installed.

Previous Reports

- 2.29 RPS is aware of a number of site investigations which have recently taken place at the site but have not reviewed any reports.

Initial Conceptual Site Model (CSM)

- 2.30 Information from the environmental setting, historical development and assessment of current uses of the site has been used to identify potential pollutant linkages that may be present at the site. This is a qualitative assessment of the likely source - pathway - target relationships that may be present on the site. These are discussed below in relation to the proposed development of the site. The conceptual model is used to design the site investigation and is assessed further, after the intrusive investigation. The revised CSM is discussed in Section 6 of this report.

Potential Sources of Contamination

2.31 The following potential sources of contamination have been identified:

Table 2A: Potential Sources of Contamination

Former Site Use/Activity	Potential Contaminants
Scrap yard and garage	Heavy metals, inorganic compounds, acids, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), fuels, oils, phenols, asbestos and solvents.
Infilling of inert waste and construction waste/made ground	Metals, inorganic compound, PAH, asbestos and ground gases.

Potential Receptors

2.32 The environmental setting and historical review has identified the following potential receptors to any contamination that may be present:

- Human health (on site and off site)
- Groundwater/surface water
- Plant growth
- Properties (on site and off site)
- Ancient Monument

Potential Pathways

2.33 Potential exposure pathways to the identified receptors of the anticipated contaminants include:

- Ingestion
- Dermal contact with vapours or contaminated ground
- Inhalation of dust and vapours
- Migration of mobile contaminants through the permeable strata in the sub-surface
- Migration along utility services
- Root uptake
- Vibration

Other Issues

- 2.34 A small cluster of Japanese Knotweed was noted to be growing along the western boundary of the site.

3 SITE INVESTIGATION

Summary

- 3.1 The site investigation has been designed on the basis of the initial CSM in order to identify the existence of the anticipated pollutant linkages and to determine their significance.
- 3.2 Principal contamination expected at the site was anticipated to be heavy metals, inorganic compounds, acids, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), fuels, oils, phenols, asbestos and solvents.
- 3.3 Information obtained from this intrusive investigation has been used to refine the CSM and enable recommendations regarding the site suitability and any potential remedial measures to be presented.

Methodology

- 3.4 An intrusive investigation was undertaken at the site between 10 and 12 August 2004. It comprised the excavation of 6 boreholes by cable percussive method and 8 trial pits using a hydraulic excavator fitted with a 2 ft, toothed bucket. The location of the excavation points is provided in Figure 2.
- 3.5 Boreholes were drilled to depths of between 5.0 m and 8.0 m below ground level (bgl).
- 3.6 Trial pits were excavated to depths between 2.5 m and 3.2 m bgl.
- 3.7 Excavation locations were targeted at those areas which were deemed to present the most likely sources of contamination based on the former and current uses of the site and to provide sufficient coverage of the site.
- 3.8 Access to certain areas was restricted due to the presence of the garage buildings, hardstanding immediately surrounding the garage, services and operational activities. In addition, an area of the site located in the centre was used as car parking for a local office building. The site owners requested that excavations were not undertaken in these areas.
- 3.9 A total of 6 boreholes were completed as permanent groundwater and/or gas monitoring points by the installation of 50 mm plain and slotted pipe (0.5 to 1.0 mm slot size) and the annular space filled with granular (2 to 5 mm) non-calcareous pea gravel. The top 0.5 m of the annular space was sealed with bentonite clay. All positions were finished with a gas tap, a steel lockable flush cover and a bentonite seal in the top half metre of the installation.
- 3.10 Soils arising from the boreholes and trial pits were examined by visual and olfactory inspection and the appearance and nature of the soil was recorded by the RPS Site Representative. All 6 boreholes and 8 trial

pits were lithologically logged during advancement to determine the stratigraphical relationships of the underlying geology and fill materials and detailed borehole and trial pit records were made (Appendix A).

- 3.11 Sampling procedures adopted during the site investigation and further monitoring were designed to minimise the potential for cross contamination.

Chemical Analysis

- 3.12 Representative samples were collected by the RPS Site Representative during the investigation. A total of 25 soil samples and 2 groundwater samples were submitted to a UKAS accredited laboratory under the 'Chain of Custody' procedure for the analysis for a range of determinands which included the following:

- Metals and pH;
- SVOC (semi-volatile organic compounds)
- VOC (volatile organic compounds)
- TPH (total petroleum hydrocarbons)
- Leachability analysis
- Asbestos
- PCB (polychlorinated biphenyls)

- 3.13 The analytical results are provided in Appendix B and summarised in Section 5 of this report.

Monitoring

- 3.14 Groundwater monitoring was undertaken at all exploratory positions following the completion of drilling works and was encountered in 2 monitoring wells (BH2 and BH6).
- 3.15 Groundwater rest levels were recorded in all boreholes using a dip meter. Groundwater samples were collected from each borehole after purging the wells at least three volumes of groundwater or until steady state conditions had been achieved. Boreholes were purged and sampled using disposable bailers.
- 3.16 Ground gas monitoring was undertaken on the 12 August 2004 and 9 September 2004 in 6 boreholes after completion of drilling works and preferably during low atmospheric pressure periods. The installed wells were monitored for flammable gas (calibrated to methane), carbon dioxide, oxygen, and gas flow using a portable infrared gas analyser GA95.

4 FIELD OBSERVATIONS

- 4.1 Approximately two thirds of the site is bareground, with the remainder comprising loose hardcore (area currently used as temporary car parking) and hardstanding. The main garage buildings are located in the north and are surrounded by concrete hardstanding. Two large metal above storage ground tanks for waste oil and fuel are located behind the main garage building.
- 4.2 Three small outbuildings are located along the eastern boundary, with the building located in the southeast being used for the storage of engines. Adjacent to this small outbuilding in the southeast is an area of hardstanding where a sump is located to collect spilled engine oil. The sump drains to the west of the site.

Ground Conditions

- 4.3 A full description of soil conditions encountered at the site is included in the lithological logs presented in Appendix A. A summary of the ground conditions encountered during the ground investigation is provided below.
- 4.4 Made ground was encountered in all exploratory locations to a maximum depth of 5.3 m bgl in BH6. The made ground was thickest in the south corner of the site (BH6) and shallowest adjacent to the small outbuilding in the southeast of the site (BH5 2.0 m bgl and TP4 0.3 m bgl) and the main garage building in the north of the site (TP8 0.4 m bgl). Made ground comprised dark brown, sandy gravely clay with frequent red brick, glass, ash, sandstone cobbles, plastic, slate pieces, occasional pieces of wood, ceramic, rags, metal and solidified molten foundry waste.
- 4.5 Hydrocarbon odours were detected in TP3 at 0.3 m bgl and in TP4 from the surface to 1.9 m bgl. In TP2, frequent suspected bonded asbestos cement sheeting was encountered at 2.1 m bgl. TP8 was excavated in concrete hardstanding surface cover, which extended to 0.2 m bgl.
- 4.6 Natural drift deposits were encountered in all of the borehole locations and in the trial pits TP4 and TP8. Natural drift deposits comprised soft brown silty clay with occasional sand in BH2, BH4 and BH6 and were encountered from 4.0 m bgl in BH4 and 5.30 m bgl in BH6 to maximum depths ranging from 5.0 m bgl in BH4 (the base of the borehole) to 6.10 m bgl in BH6.
- 4.7 Drift deposits of yellow/brown, occasionally mottled grey, sandy clay with gravels and cobbles were encountered in BH3, BH5, BH6 and TP8. This strata was encountered at depths ranging from 0.4 m bgl in TP8 to 6.1 m bgl in BH6 to maximum depths of between 2.5 m bgl in TP8 (the base of the trial pit) and 8.0 m bgl in BH6 (the base of the borehole).

- 4.8 Drift deposits of red/brown fine sand and gravel were encountered in BH1, BH5 and TP4 and were encountered from depths ranging between 0.3 m bgl in TP4 to 3.5 m bgl in BH1 to maximum depths ranging between 2.7 m bgl in TP4 (the base of the trial pit) and 8.0 m bgl in BH1 (the base of the borehole).
- 4.9 In BH3, soft becoming firmer brown clay (Carboniferous Marl Formation solid deposits) was encountered between 4.4 m bgl to 5.0 m bgl (the base of the borehole).
- 4.10 The ground conditions encountered are summarised in Table 4A below.

Table 4A Description of Geological Strata Encountered

Location	Strata Description	Thickness (m)	Depth Range Encountered (m bgl)
Widespread	Made ground.	South: 5.3, Southeast: 0.3, East: 3.5, Centre: 3.5, North: 0.4, West: 5.0.	0-5.3.
South and West	Soft brown silty sandy clay. Alluvium.	West: 1.0, South: 0.8.	4-6.1.
North, east and south	Yellow/brown occasionally mottled grey sandy clay with gravels. Alluvium.	South: 1.9 (unproven to base of borehole), Southeast: 2.7, East: 0.9, North: 2.1 (unproven to base of trial pit).	0.4-8.0 (unproven to base of borehole).
Centre and southeast	Red/brown fine sand and gravel. Alluvium.	Southeast: 0.3 and 2.4 (unproven to bases of holes), Centre: 4.5 (unproven to base of borehole).	0.3-8.0 (unproven to the base of the borehole).
East (BH3)	Soft to firm brown clay. Carboniferous Marl Formation.	4.5 (unproven to base of the borehole).	3.5-8.0 (unproven to the base of the borehole).

Groundwater Conditions

- 4.11 Groundwater was encountered in 2 monitoring wells, BH2 and BH6.
- 4.12 Rest levels ranged from between 4.10 to 4.34 m bgl in BH2 to between 5.70 to 5.85 m bgl in BH6 as detailed in Table 4B. A groundwater rest

level could not be obtained from BH1 on 12 August 2004 due to rainwater runoff continuously entering the borehole during monitoring.

4.13 The groundwater encountered was associated with the alluvium deposits of soft brown clayey sand with coarse gravel in BH2 between 4.10 m and 5.0 m bgl and the yellow brown clayey sand with coarse gravel in BH6 between 6.1m and 8.0 m bgl.

4.14 Based on field observations and the site survey, groundwater flow within the made ground and underlying drift deposits is considered to be towards the south to the River Gwenfro.

Table 4B Groundwater monitoring results recorded in 6 exploratory locations on 12.08.04 and 09.09.04.

Borehole	Date	Groundwater Depth (m bgl)	Base of Borehole (m bgl)
BH1	12.08.04	No measurement	-
BH1	09.09.04	Dry	7.64
BH2	12.08.04	4.1	6.0
BH2	09.09.04	4.34	6.0
BH3	12.08.04	Dry	5.0
BH3	09.09.04	Dry	5.0
BH4	12.08.04	Dry	5.0
BH4	09.09.04	Dry	5.0
BH5	12.08.04	Dry	5.0
BH5	09.09.04	Dry	5.0
BH6	12.08.04	5.7	7.85
BH6	09.09.04	5.85	7.85

Ground Gas Monitoring

4.15 Concentrations of flammable gas, carbon dioxide, oxygen and flow rates were measured on two occasions. The results are presented in Table 4C.

Table 4C Gas monitoring results

Borehole	Date	Flammable Gas (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Pressure (mb)	Flow (l/h)
BH1	12.08.04	<0.1	1.0	15.1	992	<0.1
BH1	09.09.04	<0.1	2.8	16.7	1020	<0.1
BH2	12.08.04	<0.1	1.4	19.0	993	0.2
BH2	09.09.04	<0.1	1.3	19.8	1021	<0.1
BH3	12.08.04	<0.1	1.7	13.5	992	<0.1
BH3	09.09.04	<0.1	2.1	18.1	1020	<0.1
BH4	12.08.04	<0.1	2.2	15.4	993	<0.1
BH4	09.09.04	<0.1	2.8	17.8	1020	<0.1
BH5	12.08.04	<0.1	0.2	17.9	993	<0.1
BH5	09.09.04	<0.1	2.1	17.1	1020	<0.1
BH6	12.08.04	<0.1	0.2	18.8	993	<0.1
BH6	09.09.04	<0.1	1.4	17.7	1020	<0.1

Bold type indicates levels of CO₂ above 1.5% Short Term Exposure Limit (STEL).

- 4.16 Flammable gas was not detected above the instrument limit of detection in the 6 boreholes on the two gas monitoring occasions.
- 4.16 Carbon dioxide was detected in all boreholes up to a maximum concentration of 2.8 % by volume on BH1 and BH4 on 9 September 2004. These boreholes are located in the centre and southwest of the site respectively.
- 4.17 A slight positive flow of gas was detected in BH2 on 12 August 2004 but is not associated with any significant concentration of carbon dioxide.
- 4.18 Depleted concentrations of oxygen were encountered in BH1 (15.1 % by volume), BH3 (13.5 % by volume) and BH4 (15.4 % by volume). These concentrations indicate anaerobic conditions within the boreholes.

5 SUMMARY OF ANALYTICAL RESULTS

- 5.1 A summary of all soil, leachability and groundwater results are displayed in Tables 5A, 5B, and 5C. The results are provided in full in Appendix B.
- 5.2 In order to evaluate whether a particular substance presents a significant hazard, the concentration at which it is found in the environment is compared to relevant guidelines or standards. Where these do not exist professional judgement is used.
- 5.3 For soils, the UK Contaminated Land Exposure Assessment (CLEA), 2002 soil guidance values (SGV's) for residential with gardens land use have been used as screening criteria, where available. In the absence of CLEA, other guideline values such as Dutch, 2000 and USEPA have been referenced as detailed in Appendix C. Analytical results for water samples have been compared to the Environmental Quality Standards (EQS) for List I and II substances. Where EQS are not available, results have been compared to concentrations in the Water Supply Regulations 2000 and the Dutch circular on target values and intervention values for soil remediation 2000.
- 5.4 These guidelines are purely used as indicative guidance to provide an indication of the level of any contamination present.

Soil Analysis

pH

- 5.5 pH values ranged from 7.49 in BH2 (0.5-1.0 m bgl) to 8.80 in TP5 (2.5 m bgl) and indicates neutral to alkaline conditions on site.

Metals

- 5.6 Concentrations of arsenic, cadmium, mercury, nickel, selenium and boron did not exceed the relevant soil guideline values.
- 5.7 Chromium concentrations ranged between less than the Limit of Detection (LOD) in 2 samples and 140 mg kg⁻¹. The sample from BH3 (1.5-2.0 m bgl) exceeded the CLEA SGV of 130 mg kg⁻¹.
- 5.8 The CLEA lead SGV of 450 mg kg⁻¹ was exceeded in TP6 (0.2 m bgl) where the concentration of lead was 916 mg kg⁻¹. The minimum value of lead detected was less than the LOD in 2 samples.
- 5.9 Concentrations of copper ranged between less than the LOD in 2 samples and 519 mg kg⁻¹ in BH3 (1.5-2.0 m bgl). There is no CLEA SGV for copper since it is toxic to plant growth rather than human health, therefore, the Dutch 2000 assessment criteria has been referenced. The sample from BH3 (1.5-2.0 m bgl) exceeded the Dutch Intervention Value (DIV) of 190 mg kg⁻¹.

- 5.10 Zinc concentrations ranged between less than the LOD in BH4 (2.5 m bgl) and 1,367 mg kg⁻¹ in TP5 (0.9 m bgl). There is no CLEA SGV for zinc because it is considered to be harmful to plant growth rather than human health. Comparison to the Dutch 2000 assessment criteria indicates that 2 samples exceed the DIV of 720 mg kg⁻¹ in BH1 (3.1-3.5 m bgl, 916 mg kg⁻¹) and TP5 (0.9 m bgl, 1,367 mg kg⁻¹).

Inorganics

- 5.11 Total cyanide was detected above the LOD in the sample from TP1 (0.4 m bgl) at 5 mg kg⁻¹ but did not exceed the Dutch 2000 DIV of 50 mg kg⁻¹.
- 5.12 Concentrations of free cyanide were not detected above the LOD.
- 5.13 Sulphate concentrations ranged between 584 mg kg⁻¹ in BH3 (3.5-4.0 m bgl) and 4,855 mg kg⁻¹ in BH6 (2.0-2.5 m bgl). With respect to human health, these concentrations are not considered to be significantly elevated.

Other Determinands

- 5.14 The asbestos determination in TP2 (2.1 m bgl) were between 2-50 % chrysotile fibres (white asbestos).

Organics

- 5.15 Total petroleum hydrocarbons (TPH) have been divided into aliphatics (mineral oil) and aromatics.
- 5.16 Total aliphatics ranged between less than the LOD in 2 samples and 16,613 mg kg⁻¹ in TP4 (0.1-0.2 m bgl). Comparison to the Dutch 2000 assessment criteria for mineral oil shows that 7 samples exceed the DTV of 50 mg kg⁻¹ and of these, 1 sample from TP4 (0.1-0.2 m bgl) exceeds the DIV of 5,000 mg kg⁻¹.
- 5.17 Total aromatics ranged from less than the LOD in 2 samples and 2,574 mg kg⁻¹ in TP4 (0.1-0.2 m bgl). A similarly elevated concentration of total aromatics of 2,064 mg kg⁻¹ was detected in TP3 (0.3 m bgl).
- 5.18 The following VOC were detected above the LOD:
- Toluene between less than the LOD in 1 sample and 0.13 mg kg⁻¹ in TP8 (0.4 m bgl), but does not exceed the DIV;
 - Ethylbenzene between less than the LOD in 8 samples and 0.03 mg kg⁻¹ in TP3 (0.3 m bgl), but does not exceed the DIV;
 - P/m-Xylene between less than the LOD in 6 samples and 0.09 mg kg⁻¹ in TP3 (0.3 m bgl), but does not exceed the DIV;
 - o-Xylene between less than the LOD in 10 samples and 0.010 mg kg⁻¹ in TP3 (0.3 m bgl), but does not exceed the DIV;

- Benzene between less than the LOD in 11 samples and 0.004 mg kg⁻¹ in TP3 (0.3 m bgl), which does not exceed the DIV.

5.19 The following SVOC were detected above the LOD:

- Total PAHs (total of 16) between less than the LOD in 3 samples and 63.03 mg kg⁻¹ in TP3 (0.3 m bgl) (see below);
- Phenol between less than the LOD in 12 samples and 0.46 mg kg⁻¹ in TP7 (0.9 m bgl) does not exceed the DIV;
- Carbazole between less than the LOD in 12 samples and 0.66 mg kg⁻¹ in BH6 (4.0-4.5 m bgl);
- Dibenzofuran between less than the LOD in 12 samples and 0.14 mg kg⁻¹ in TP8 (0.4 m bgl);
- Di-n-Octyl phthalate between less than the LOD in 11 samples and 0.87 mg kg⁻¹ in BH3 (1.5-2.0 m bgl);
- Bis (2-ethylhexyl) phthalate between less than the LOD in 6 samples and 13.73 mg kg⁻¹ in BH3 (1.5-2.0 m bgl). There is no CLEA SGV for phthalates as they are widely distributed in the environment and are of relatively low toxicity.

5.20 A total of 3 samples exceed the DIV of 40.0 mg kg⁻¹ for the sum of 10 PAH in the following samples; BH6 (4.0-4.5 m bgl - 41.88 mg kg⁻¹), TP3 (0.3 m bgl - 41.26 mg kg⁻¹) and TP6 (0.2 m bgl - 41.08 mg kg⁻¹).

5.21 PCB was analysed on 3 samples and concentrations ranged between less than the LOD in 2 samples and 0.07 mg kg⁻¹ in TP2 (2.0 m bgl). This concentration is not considered to be elevated in relation to Environment Agency hazardous waste guidance value of 50 mg kg⁻¹ (R & D Project P1-482, September 2002).

Leachate Analysis

5.22 Leachability analysis was undertaken for 5 samples, which were representative of site conditions at varying depths, from BH1 (2.0-2.5 m bgl), BH4 (0.5-1.0 m bgl), BH6 (2.0-2.5 m bgl), TP2 (0.7 m bgl) and TP5 (2.5 m bgl) for metals.

5.23 The results were compared to the EQS assessment criteria and indicate that some of the determinands analysed do have the potential to leach, in particular zinc and copper. Zinc concentrations ranged between 54 µg l⁻¹ and 151 µg l⁻¹ but are not considered to be significantly elevated with respect to the EQS, which ranges between 75-500 µg l⁻¹. Copper concentrations ranged between 23 µg l⁻¹ and 158 µg l⁻¹ and all 5 samples exceeded the copper EQS, which ranges between 1-28 µg l⁻¹.

Groundwater Analysis

- 5.24 pH values ranged from 8.12 in BH6 to 8.23 in BH2 and represent slightly alkaline conditions in the groundwater.
- 5.25 The two groundwater samples were analysed for metals, boron, major ions (including iron (dissolved and total), nitrate, magnesium, chloride and sulphide), ammoniacal nitrogen, cyanide (total and free), PCB, VOC, SVOC and TPH (EPH).
- 5.26 With the exception of ammoniacal nitrogen and EPH (DRO) C10-C12, samples did not exceed the applicable determinands assessment criteria values.
- 5.27 The ammoniacal concentration was 0.2 mg l^{-1} in BH6, which exceeds the EQS of 0.02 mg l^{-1} .
- 5.28 An EPH (DRO) C10-C12 concentration of $202 \text{ } \mu\text{g l}^{-1}$ was detected in the groundwater sample from BH2. This value exceeds the Dutch target mineral oil value (DTV) of $50 \text{ } \mu\text{g l}^{-1}$ but does not exceed the Dutch intervention value (DIV) of $600 \text{ } \mu\text{g l}^{-1}$.

Summary of Results

- 5.29 Elevated concentrations of metals and hydrocarbons in the soils, above the relevant assessment criteria, were detected in isolated areas of the site.
- 5.30 Leachability tests for metals indicate that copper and zinc have the potential to leach and migrate.
- 5.31 Ammoniacal nitrogen was slightly elevated in the groundwater sample from BH6 at 0.2 mg l^{-1} .

Table 5A – Summary of chemical data for 25 soil samples.

Determinands	Minimum Concentration (mg kg ⁻¹)	Maximum Concentration (mg kg ⁻¹)	Nr of Samples Above Soil Guideline Screening Values (mg kg ⁻¹)
Arsenic	<1 in 4 samples	16 in BH3 (1.5-2.0 m bgl)	0
Cadmium	<1 in 13 samples	8 in TP5 (0.90 m bgl)	2
Chromium	<1 in 2 samples	140 in BH3 (1.5-2.0 m bgl)	1
*Copper	<1 in 2 samples	519 in BH3 (1.5-2.0 m bgl)	1 (DIV)
Mercury	<1 in 20 samples	7 in TP5 (2.5 m bgl)	0
Nickel	<1 in 2 samples	43 in BH1 (3.1-3.5 m bgl)	0
Lead	<1 in 2 samples	916 in TP6 (0.2 m bgl)	1
Selenium	<1 in 16 samples	2 in 4 samples	0
*Zinc	<1 in BH4 (2.5 m bgl)	1,367 in TP5 (0.9 m bgl)	2 (DIV)
Sulphate	584 in BH3 (3.5-4.0 m bgl)	4,855 in BH6 (2.0-2.5 m bgl)	-
Boron (water soluble)	<1 in 4 samples	3 in BH6 (2.0-2.5 m bgl and 4.0-4.5 m bgl)	0
Cyanide (total)	<1 in 19 samples	5 in TP1 (0.4 m bgl)	0
Cyanide (free)	<1	<1	0
Asbestos	NFD	2-50 % Chrysotile TP2 (2.1 m bgl)	1
PCB	<1 in 2 samples	0.07 in TP2 (2.0 m bgl)	-
*pH	7.49 in BH2 (0.5-1.0 m bgl)	8.80 in TP5 (2.5 m bgl)	-
Total Aliphatics (mineral oil)	<10 in 2 samples	16,613 in TP4 (0.1-0.2 m bgl)	1 (DIV)
Total Aromatic	<10 in 2 samples	2,574 in TP4 (0.1-0.2 m bgl)	-
*VOC	<0.001 in 1 sample	0.13 in TP8 (0.4 m bgl)	0 (DIV)
Toluene	<0.001 in 8 samples	0.03 in TP3 (0.3 m bgl)	0
Ethylbenzene	<0.001 in 6 samples	0.09 in TP3 (0.3 m bgl)	0 (DIV)
P/m-Xylene	<0.001 in 10 samples	0.10 in TP3 (0.3 m bgl)	0 (DIV)
o-Xylene	<0.001 in 11 samples	0.004 in TP3 (0.3 m bgl)	0
Benzene	<0.1 in 3 samples	63.03 in TP3 (0.3 m bgl)	-
*SVOC	<0.1 in 3 samples	41.88 in BH6 (4.0-4.5 m bgl)	3 (DIV)

Determinands	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Nr of Samples Above Soil Guideline Screening Values (mg/kg)
SVOC cont:			
Phenol	<0.1 in 12 samples	0.46 in TP7 (0.9 m bgl)	0 (DIV)
Carbazole	<0.1 in 12 samples	0.66 in BH6 (4.0-4.5 m bgl)	-
Dibenzofuran	<0.1 in 12 samples	0.14 in TP8 (0.4 m bgl)	-
Di-n-Octyl phthalate	<0.1 in 11 samples	0.87 in BH3 (1.5-2.0 m bgl)	-
Bis (2-ethylhexyl) phthalate	<0.1 in 6 samples	13.73 in BH3 (1.5-2.0 m bgl)	5 USEPA

¹Total PAHs include the following: Naphthlene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene and Benzo(ghi)perylene.

*No SGV provided by the UK Contaminated Land Exposure Assessment (CLEA) model.

Table 5 B – Summary of leachability analysis for 5 soil samples.

Determinands	Minimum Concentration ($\mu\text{g l}^{-1}$)	Maximum Concentration ($\mu\text{g l}^{-1}$)	Nr. of Samples Above Groundwater Guideline Values ($\mu\text{g l}^{-1}$)
Arsenic	2 in TP2 (0.7 m bgl)	10 in TP5 (2.5 m bgl)	0
Cadmium	<0.4	<0.4	0
Boron	27 in BH6 (2.0-2.5 m bgl)	56 in TP5 (2.5 m bgl)	0
Copper	23 in TP2 (0.7 m bgl)	158 in TP5 (2.5 m bgl)	5
Mercury	<0.05 in 2 samples	0.06 in BH1 (2.0-2.5 m bgl)	0
Nickel	<1 in TP2 (0.7 m bgl)	5 in BH4 (0.5-1.0 m bgl and TP5 (2.5 m bgl)	0
Lead	5 in BH1 (2.0-2.5 m bgl)	8 in TP5 (2.5 m bgl)	0
Selenium	<1 in 3 samples	4 in BH1 (2.0-2.5 m bgl)	-
Zinc	54 in 2 samples	151 in TP5 (2.5 m bgl)	0

Table 5 C – Summary of chemical data for groundwater samples taken from 2 exploratory positions.

Determinands	Minimum Concentration ($\mu\text{g l}^{-1}$)	Maximum Concentration ($\mu\text{g l}^{-1}$)	Nr of Samples Above Groundwater Guideline Screening Values ($\mu\text{g l}^{-1}$)
Arsenic	<1	<1	0
Cadmium	<0.4	<0.4	0
Chromium	1 in BH2	2 in BH6	0
Copper	1 in BH6	4 in BH2	0
Mercury	<0.05	<0.05	0
Nickel	5 in BH2	8 in BH6	0
Lead	<1	<1	0
Selenium	<1	<1	0
Boron	33 in BH6	119 in BH2	0
Zinc	27 in BH2	29 in BH6	0
Iron	35 in BH6	43 in BH2	0
Magnesium	6,514 in BH2	12,760 in BH6	0
Iron (total)	282.80 in BH2	310.50 in BH6	-
Nitrate as NO3	21.1 in BH6	43.0 in BH2	0
Sulphate (soluble)	96 in BH6	98 in BH2	0
Chloride	19 in BH2	56 in BH6	0
Sulphide	<0.05	<0.05	0
Ammoniacal nitrogen as NH4-N	<0.2 in BH2	0.2 in BH6	0
Cyanide (total and free)	<0.05	<0.05	0
pH	8.12 in BH6	8.23 in BH2	-
PCB	<1	<1	0
EPH (DRO) (C10-C40)	<10 in BH6	202 in BH2	0 (DIV)
EPH C10-C12	<10 in BH6	21 in BH2	-
EPH >C12-C16	<10 in BH6	20 in BH2	-
EPH >C16-C21	<10 in BH6	38 in BH2	-
EPH >C21-35	<10 in BH2	111 in BH6	-
EPH >C35	<10 in BH2	12 in BH6	-

JQUES SCRAP YARD

Determinands	Minimum Concentration (µg l ⁻¹)	Maximum Concentration (µg l ⁻¹)	Nr of Samples Above Groundwater Guideline Screening Values (µg l ⁻¹)
VOCS	<1	<1	0
SVOC	<1	<1	0

6 RISK ASSESSMENT

- 6.1 A qualitative risk assessment (QRA) has been undertaken in line with current government guidance to provide a preliminary indication of the significance of any elevated concentrations of contaminants measured at the site during the intrusive investigation. This requires an assessment of the toxicity of individual contaminants and the likely exposure sensitive receptors may receive.
- 6.2 The overall aim of the QRA is to characterise areas of concern and to identify those areas that require more investigation in order to make an informed decision with respect to the potential risk that the site poses to the development and to the environment.
- 6.3 The results of field observations, field measurements and the chemical analysis of samples collected during the intrusive investigation constitute the hazard identification stage of the risk assessment process. These hazards or sources of contamination will be assessed further in relation to the initial CSM produced earlier in section 2 of this report, in order to identify significant pollutant linkages, which may be present at the site now and in the future, with respect to the proposed redevelopment.
- 6.4 The proposed redevelopment of the site comprises residential housing with gardens, although no detailed site redevelopment plan is available.

Conceptual Site Model

- 6.5 In order to carry out the risk assessment the conceptual model (CSM) of the site presented in section 2 has been up-dated in relation to the results of the site investigation.

Sources of Contamination

- 6.6 The results of the soil and groundwater chemical analysis and gas monitoring have identified localised contamination as follows:
- TP2 (2.1 m bgl) in the centre of the site: 2-50 % Chrysotile asbestos;
 - TP3 (0.3 m bgl) in the southwest of the site: 2,064 mg kg⁻¹ total aromatic hydrocarbons and 41.26 mg kg⁻¹ total of 10 polynuclear aromatic hydrocarbons (PAH);
 - TP4 (0.1-0.2 m bgl) in the southeast of the site: 16,613 mg kg⁻¹ mineral oils and 2,574 mg kg⁻¹ total aromatic hydrocarbons;
 - TP5 (0.9 m bgl) in the east of the site: 1,367 mg kg⁻¹ zinc;
 - TP6 (0.2 m bgl) in the centre of the site: 916 mg kg⁻¹ lead and 41.08 mg kg⁻¹ PAH;

- BH1 (3.1-3.5 m bgl) in the centre of the site: 916 mg kg⁻¹ zinc;
- BH3 (1.5-2.0 m bgl) in the east of the site: 140 mg kg⁻¹ chromium and 519 mg kg⁻¹ copper;
- BH6 (4.0-4.5 m bgl) in the south of the site: 41.88 mg kg⁻¹ PAH.
- High leachability concentrations of copper across the site, which are potentially mobile and, therefore, have the potential to migrate.
- Elevated carbon dioxide concentrations in the centre and the southwest of the site;
- A slightly elevated concentration of ammoniacal nitrogen in the groundwater sample from BH6, in the south of the site; and
- Japanese Knotweed identified growing in the west of the site adjacent to the railway sidings.

Receptors of Contamination

6.7 The following significant receptors could be affected by the contamination present on the site;

- Future site occupants;
- current site users;
- construction workers, future site users and occupiers;
- surface watercourse (River Gwenfro);
- shallow groundwater (present in drift deposits);
- deep groundwater (present in solid geology);
- flora, fauna, habitats and ecology systems;
- buildings, foundations and services; and
- Ancient Monument.

Contaminant Migration & Exposure Pathways

6.8 Potential significant migration and exposure pathways that may be relevant to the site include:

- inhalation, of contaminants in the soil and groundwater;
- dermal contact with contaminants;
- ingestion of soil, dust and plants;
- migration of ground gases through permeable strata;
- vertical migration of mobile substances through the sub-surface to deeper groundwater;
- surface water run-off following rainfall;
- lateral migration of contaminated groundwater to the River Gwenfro;
- root uptake by vegetation and home grown vegetables; and

- vibration caused by construction work.

Risk Characterisation and Evaluation

- 6.9 The risk characterisation and evaluation refers to the conceptual model and takes account of any mitigating circumstances that relate to the site and the proposed redevelopment. The significance of any potential risk or liability is therefore evaluated.

Future Users of the Site/Construction Workers

- 6.10 As significantly elevated volatile concentrations have not been detected in the soil samples, the inhalation pathway for exposure to human health to soils is effectively eliminated.
- 6.11 Elevated concentrations of metals and hydrocarbons underneath buildings are unlikely to pose a significant risk to human health due to the standard inclusion of a slab and sub-base foundation within new housing developments, which will eliminate the dermal and ingestion contact pathway.
- 6.12 Future residents of the site are, however, likely to be exposed via ingestion and dermal contact to contamination in the soil in gardens. Lead, chromium, fuels and oils in the made ground up to 2.0 m bgl in the east, centre, southwest and west of the site exceeded the CLEA SGV for residential end use with gardens or other relevant assessment criteria. In addition, homegrown vegetable consumption could provide a pathway for contaminants in the soil to impact future site residents through ingestion of home-grown produce.
- 6.13 The presence of asbestos containing materials in TP2 at 2.1 m bgl represents a significant risk to construction workers, who may unavoidably damage the sheeting during the redevelopment and be exposed via inhalation to asbestos fibres. The risks can be mitigated by the use of appropriate personal protective equipment during the redevelopment work.
- 6.14 Construction workers and future maintenance or service installation engineers are likely to come into contact with contaminated soils and ground gases in confined spaces. However, should construction workers adhere to personal protective health and safety precautions, the risks are significantly reduced.
- 6.15 The concentrations of ground gases measured in the centre, east, southeast and southwest of the site are asphyxiating in confined spaces. However, methane gas had not been detected above the instrument limit of detection and, therefore, is not considered to pose a risk to the proposed redevelopment. Carbon dioxide presents a potential risk to future site residents and buildings. Measured concentrations at present (given 2 gas monitoring occasions) indicate that gas protection

measures to the following standards are required: Characteristic Situation Number 2 (CIRIA Report 149).

Groundwater

- 6.16 There is a potential pathway between shallow groundwater in the alluvial drift deposits and the adjacent River Gwenfro. However, as groundwater was not significantly impacted by mobile contamination a significant pollutant linkage is not present. Furthermore, as the redevelopment will comprise covering the site in a significant amount of hardstanding, the potential for rain ingress and subsequent mobilisation of contamination from the made ground will be considerably reduced.
- 6.17 During redevelopment of the site, contaminant mobilisation could occur.
- 6.18 Contamination identified on site is unlikely to impact the SPZ Zone I and II (groundwater abstraction for the brewery) as this is located upgradient to the site.
- 6.19 An elevated concentration of ammoniacal nitrogen was detected in groundwater in BH6. Ammoniacal nitrogen is toxic to aquatic life and, therefore, has a low EQS. It is not considered that the concentration of ammoniacal nitrogen (0.2 mg l^{-1}) is significantly elevated and is unlikely to impact upon the River Gwenfro due to degradation of the contaminant.
- 6.20 A pathway is present to allow the vertical migration of contaminants to deeper groundwater (Minor Aquifer in Carboniferous deposits) as the underlying natural deposits, comprising sand and gravels are highly permeable. However, shallow groundwater did not contain significantly elevated concentrations of metals, fuels and oils which could impact upon the deeper groundwater and, therefore, the risk to groundwater is considered to be low.

Surface Waters

- 6.21 No significantly elevated concentrations of metals, oils and fuels have been encountered in the groundwater samples. Therefore, the potential to impact on the River Gwenfro through groundwater migration is considered low. However, there is still a potential that contaminants from the site may enter the surface water through surface runoff.

Vegetation and Flora

- 6.22 Vegetation and flora in the future redevelopment are a potential receptor to ground contamination via root uptake. Concentrations of copper, zinc and hydrocarbons in the soil would be potentially toxic to plant growth.

Buildings Materials/Services and Foundation

- 6.23 Elevated concentrations of fuels and oils present in the soil have the potential to affect plastic potable supply pipes. The risk posed to utility service pipes can be mitigated by the provision of an inert surrounding the underground pipes.
- 6.24 Japanese Knotweed poses a risk to buildings because it grows vigorously through the soil from a woody rhizome, which can cause damage to underground structures and can penetrate tarmac and concrete through small cracks. New shoots can emerge from spreading rhizomes within a 7 m radius of the edge of the main group of stems and, therefore, Knotweed can quickly colonise large areas of land if not controlled.
- 6.25 The Ancient Monument is classified as a sensitive receptor under Part IIA of the Environment Act 1990. Redevelopment of the site could pose significant harm to the Ancient Monument. It is understood that development will not be undertaken in the vicinity of the Monument, however, further assessment and consultation with the Local Authority is likely to be required.

7 CONCLUSIONS AND RECOMMENDATIONS

Summary of Contamination

- 7.1 Elevated concentrations of metals, fuels and oil were encountered in localised areas of the site.
- 7.2 Elevated carbon dioxide concentrations up to 2.8 % by volume in the centre of the site and the southwest of the site.
- 7.3 Japanese Knotweed has been identified growing in the west of the site adjacent to the railway sidings.
- 7.4 Bonded asbestos cement sheeting has been identified in the centre of the site in the vicinity of TP2.

Risk Assessment

- 7.5 The risk assessment has identified that the following receptors identified in the preliminary conceptual model (Section 2) are sensitive to elevated concentrations of metals, fuels, oils, carbon dioxide and to the presence of asbestos identified in the made ground:

- Moderate to high potential that future site users will be impacted by dermal contact and ingestion of contaminants within gardens, ingestion of homegrown vegetables and elevated carbon dioxide concentrations within buildings;
- Slight potential that surface water will be impacted by contaminants identified on site from surface runoff and potential lateral migration of contaminants through permeable strata;
- Moderate potential that vegetation will be impacted from root uptake within gardens of residential properties; and
- Moderate potential that buildings (including the Ancient Monument) will be impacted from the presence of Japanese Knotweed on site, elevated carbon dioxide concentrations and from redevelopment of the site.

Recommendations

- 7.6 It is recommended that further assessment be undertaken to determine the risk to human health and surface water from elevated fuels, oils and metals identified in the made ground beneath the site. Should the development comprise a hardstanding layer with very limited landscaped areas, the risk to human health by dermal contact and to groundwater/River Gwenfro by rain ingress into the ground and mobilisation of contaminants from the made ground, will be significantly reduced. However, given that RPS has not reviewed a detailed redevelopment proposal to assess the risks in more detail, a

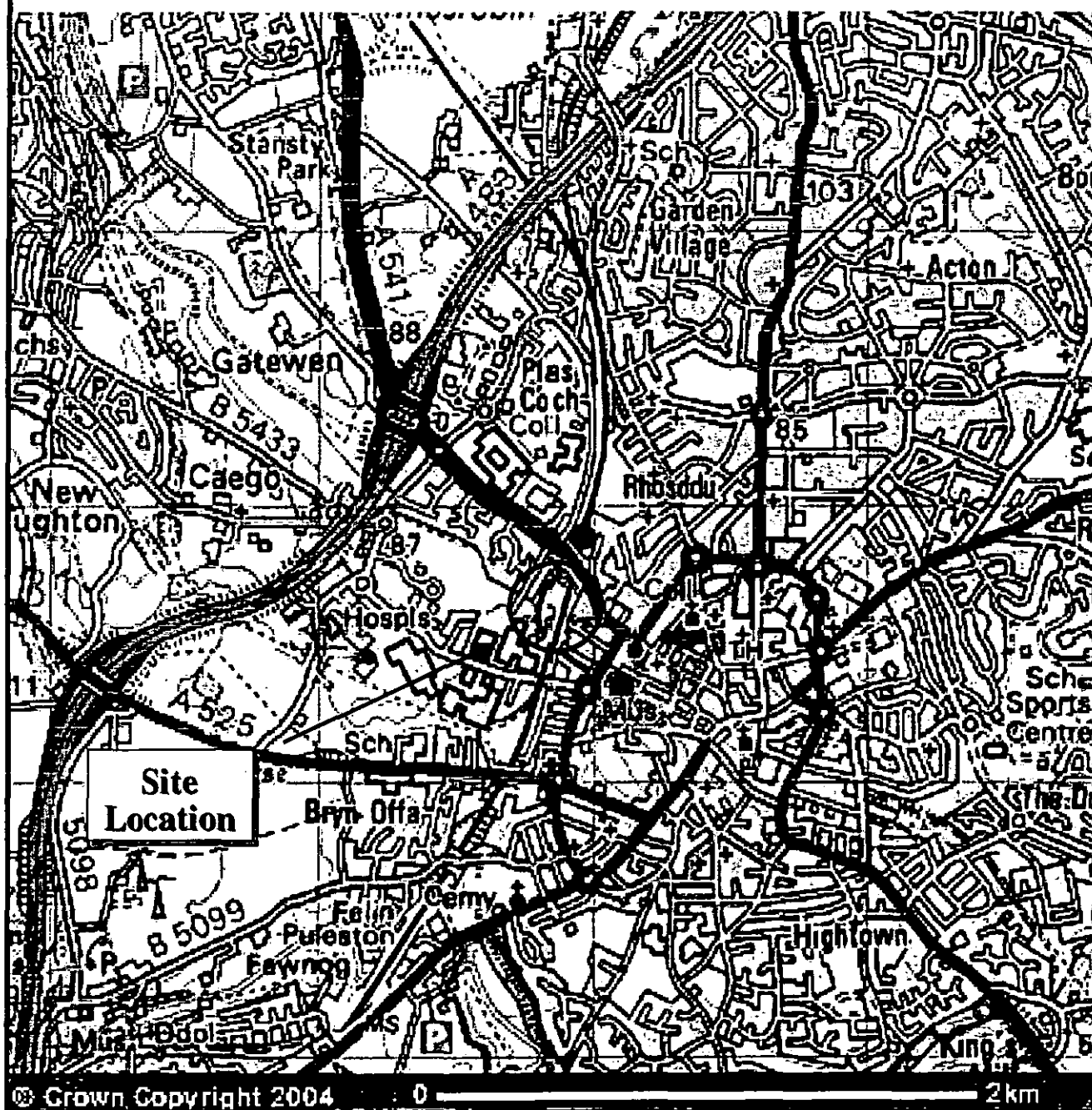
quantitative risk assessment (QRA) may be required. A QRA would provide site specific remedial targets to determine whether remedial action is required, where the maximum contaminant concentration is greater than the remedial targets produced by the QRA.

- 7.7 Should remediation be required, we would recommend that validation testing is undertaken to demonstrate that the contamination has been removed. Remediation should be carried out in accordance with a Remedial Method Statement (RMS). The Local Authority will require a verification statement following any remediation.
- 7.8 Alternatively, once a detailed development plan has been devised and assessed by RPS, it may be possible to determine whether a 1 m depth of made ground can be removed and either re-deposited under areas of hardstanding or be taken off site. Clean top-soil/sub-base should then be placed within the garden/hardstanding areas. Validation testing of imported fill should be undertaken to determine suitability for use, particularly in landscaped or gardens areas (if present).
- 7.9 The area surrounding TP2 (at 2.1 m bgl) in the centre of the site should be excavated to remove any asbestos containing materials by an authorised contractor and disposed of under appropriate duty of care procedures. Any further suspected asbestos containing material identified during the redevelopment should be forwarded to a laboratory for positive identification and removed off site in the same manner.
- 7.10 The carbon dioxide concentrations identified may require gas protection measures to be incorporated into the new houses. The environmental setting of the site (Section 2) has also identified the requirement for radon gas protection measures to be used. These could be combined within any gas protection measures.
- 7.11 Construction workers involved in the redevelopment should adhere to protective health and safety related to the elevated concentrations of hydrocarbons and the presence of asbestos.
- 7.12 Current operations at the site have prevented an area from being investigated in the north of the site, which is marked on Figure 2. This area may need further investigation once operations at the site have ceased.
- 7.13 Eradication of Japanese Knotweed prior to redevelopment is recommended.
- 7.14 The Ancient Monument located in the east of the site may require further assessment to determine the impact caused by the redevelopment of the site once a detailed redevelopment plan has been finalised. An archaeological survey and a scheduled monument consent may be required prior to redevelopment in accordance with the

requirements of the CADW (Welsh Historical Monuments) and the Ancient Monuments and Archaeological Areas Act 1979.

FIGURE 1
Site Location Plan

Reproduced from the 2004 Ordnance Survey
1:25,000 map with the permission of the controller of
Her Majesty's Stationery Office, © Crown Copyright



Health, Safety
and Environment

THIS DRAWING IS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON
SITE. DISCREPANCIES, AMBIGUITIES AND/OR OMISSIONS BETWEEN THIS
DRAWING AND INFORMATION GIVEN ELSEWHERE MUST BE REPORTED
IMMEDIATELY TO THIS OFFICE FOR CLARIFICATION BEFORE PROCEEDING.

© RPS CONSULTANTS, 52 PRINCESS STREET, MANCHESTER, M1 4JX.
TEL: 0161 237 9531 FAX: 0161 237 3315

TITLE : Phase II Contamination Assessment

PROJECT : Jaques Scrap Yard

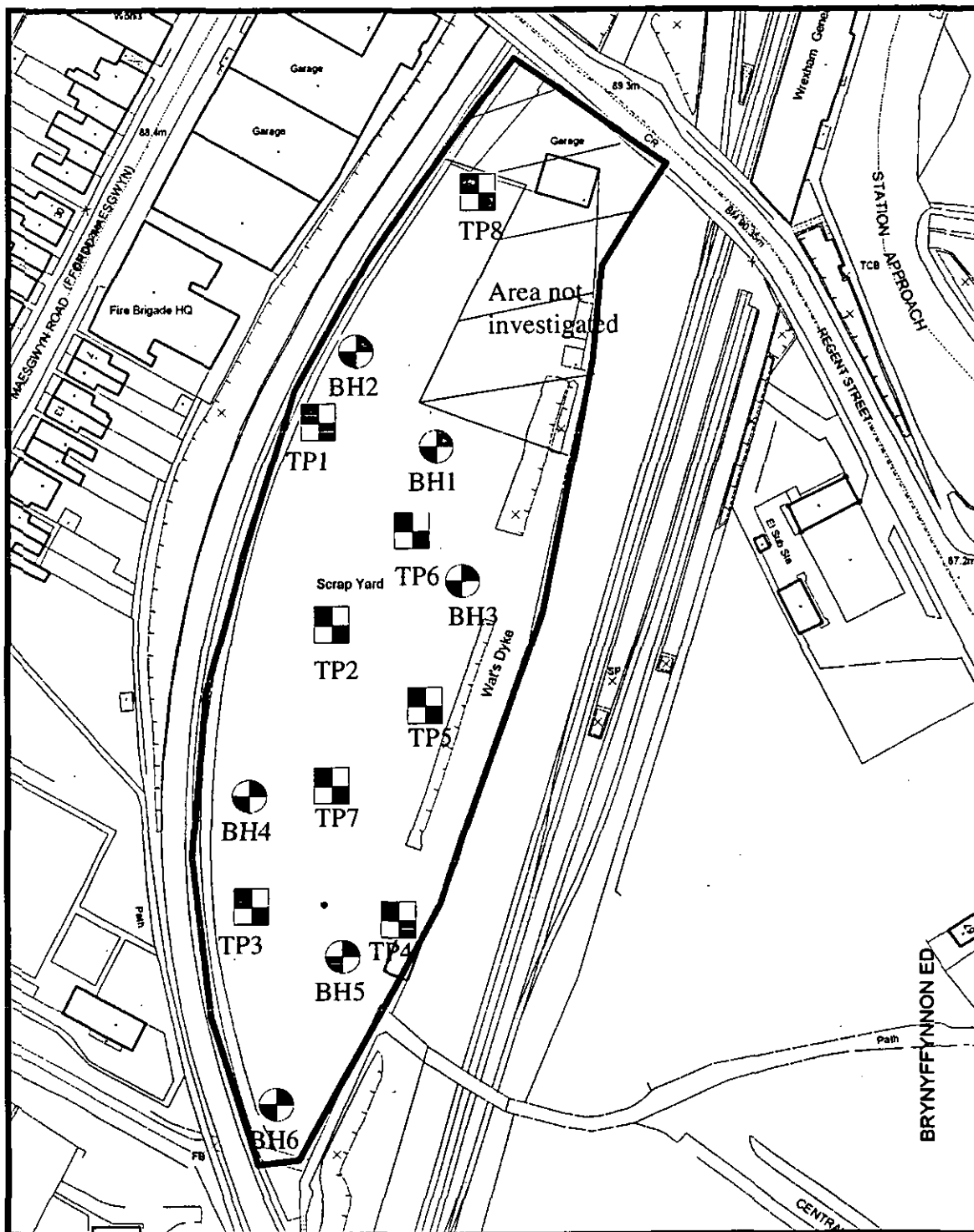
PROJECT No : RCM4019

DRAWING No : Figure 1

DATE : October 2004

SCALE : As Shown

FIGURE 2
Borehole Location Plan



THIS DRAWING IS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE. DISCREPANCIES, AMBIGUITIES AND/OR OMISSIONS BETWEEN THIS DRAWING AND INFORMATION GIVEN ELSEWHERE MUST BE REPORTED IMMEDIATELY TO THIS OFFICE FOR CLARIFICATION BEFORE PROCEEDING.

© RPS CONSULTANTS, 52 PRINCESS STREET, MANCHESTER, M1 4DX.
TEL: 0161 237 9859 FAX: 0161 237 3315

TITLE : Borehole Location Plan

PROJECT : Jaques Scrap Yard, Wrexham

PROJECT No : RCM4019

DRAWING No : Figure 2

DATE : October 2004

SCALE : Not to Scale



Appendix A

Log of Borehole: 1

Project: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

RPS

Health, Safety
and Environment

Depth m	Lithological	Lithological Description	Relative	Sample	Well Data	Analytical Schedule
0		Ground Surface				
0		Made Ground Dark brown sandy fine to coarse sub-angular to sub-rounded gravelly clay with red bricks, ash, cobbles and glass.				
1						
2				SS		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH, Leachable metals.
3				SS		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH.
4		Soft brown wet medium angular gravelly sandy CLAY.				
5						
6						
7						
8						

Drill method: Cable Percussive

Hole size: 150 mm

Elevation:

Drill date: 11.08.04

Water strike: None

Checked by: EPM

Log of Borehole: 2

Project: Jaques

Project No: RCM4019

Client: Castlemead Homes

Engineer: JM

RPS

Health, Safety
and Environment

Depth m	Lithological	Lithological Description	Relative	Sample	Well Data	Analytical Schedule
0		Ground Surface				
0		Made Ground				
		Coarse gravel surface cover over brown to dark brown sandy fine to coarse sub-angular to sub-rounded gravelly clay with rare pieces of metal and rags.		SS		Metals, Boron, Cyanide, pH, Sulphate, TPH, SVOC, VOC, Asbestos.
1						
2						
3						
4		Made Ground				
		Coarse gravel surface cover over brown to dark brown sandy fine to coarse sub-angular to sub-rounded gravelly clay with red brick, glass, occasional ash and sandstone gravels.		SS		Metals, Boron, Cyanide, pH.
		Yellow brown clayey SAND with fine to medium sub-rounded to sub-angular gravel.				
5		Soft brown SILT and CLAY with occasional coarse gravel.				
6						

Drill method: Cable percussive

Hole size: 200 mm

Elevation:

Drill date: 10.08.04

Water strike: None

Checked by: EPM

Log of Borehole: 3

Project: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

RPS

Health, Safety
and Environment

Depth m	Lithological	Lithological Description	Relative	Sample	Well Data	Analytical Schedule
0		Ground Surface				
0		Made Ground Dark brown/brown fine to coarse sub-angular to sub-rounded gravelly sand with frequent cobbles, red brick and plastic.				
1						
2				SS		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, PCB, TPH.
3						
4		Brown sandy fine to coarse sub-angular to sub-rounded gravelly CLAY with occasional cobbles.		SS		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH.
5		Soft to firm brown CLAY.				

Drill method: Cable Percussive

Hole size: 150 mm

Elevation:

Drill date: 11.08.04

Water strike: None

Checked by: EPM

Log of Borehole: 4

Project: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

RPS

Health, Safety
and Environment

Depth m	Lithological	Lithological Description	Relative	Sample	Well Data	Analytical Schedule
0		Ground Surface				
0		Made Ground Brown/dark brown sandy clay with fine to coarse sub-angular to sub-rounded gravels, red brick and glass.		SS		Metals, Boron, Cyanide, pH, TPH, SVOC, VOC, Leachable metals.
1						
2		Made Ground Dark brown sandy fine to coarse sub-angular to sub-rounded gravelly clay with sandstone cobbles, red brick, occasional ash, rags and pieces of coal.		SS		Metals, Boron, Cyanide, pH.
3						
4		Soft brown SILT and CLAY.				
5						

Drill method: Cable percussive

Drill date: 10.08.04

Hole size: 150 mm

Water strike: None

Elevation:

Checked by: EPM

Log of Borehole: 5

Project: Jaques

Project No: RCM4019

Client: Castlemead Home Ltd

Engineer: JM

RPS

Health, Safety
and Environment

Depth m	Lithological	Lithological Description	Relative	Sample	Well Data	Analytical Schedule
0		Ground Surface				
		Made Ground				
		Brown/light brown sandy fine to medium sub-angular to sub-rounded gravelly clay with red brick fragments and cobbles.				
1						
2		Dark brown sandy CLAY with sandstone cobbles and fine to coarse sub-angular to rounded gravel.				
3		Friable brown sandy CLAY with fine to coarse sub-angular to rounded gravel, sandstone cobbles and pieces of coal.		SS		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC.
4						
5		Red brown fine GRAVEL and SAND. Gravels are medium to coarse sub-angular to sub-rounded.				

Drill method: Cable Percussive

Drill date: 11.08.04

Hole size: 150 mm

Water strike: None

Elevation:

Checked by: EPM

Log of Borehole: 6

Project: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

RPS

Health, Safety
and Environment

Depth m	Lithological	Lithological Description	Relative	Sample	Well Data	Analytical Schedule
0		Ground Surface				
0		Made Ground Brown/dark brown sandy coarse sub-angular gravelly clay with red brick, occasional sandstone, glass, metal and rare ceramic and plastic.				
1						
2				SS		Metals, Boron, Cyanide, pH, Sulphate, PCB, Leachable metals.
3						
4				SS		Metals, Boron, Cyanide, pH, TPH, SVOC, VOC.
5						
6		Soft yellow brown slightly gravelly CLAY. Gravels are coarse sub-angular gravel.				
7		Brown yellow mottled grey clayey SAND with fine to medium sub-rounded to sub- angular gravel and sandstone cobbles.				
8						

Drill method: Cable percussive

Hole size: 150 mm

Elevation:

Drill date: 10.08.04

Water strike: 6.10 m

Checked by: EPM

Trial Pit No. 1

RPS

Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground Dark brown sandy clay with fine to coarse angular to rounded gravels, frequent fragments and whole red brick, construction rubble, cobbles, plastic car aprts, occasional tarmac pieces, metals (large and small pieces), plastic, wood, glass and slate.		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH.
		Terminated due to unstable sides.	SS	
1				
2				

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 2

RPS Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground Compacted rubble over dark brown sandy fine to coarse sub-angular to sub-rounded gravels with cobbles, fragments and whole red brick, construction rubble, metal, plastic and car pieces.		Metals, Boron, Cyanide, Sulphate, pH, Leachable metals.
			SS	
1				
2		Frequent cement tiles at 2.10 m bgl. Whole red brick chimney breast and large boulder at 2.60 m bgl.	SS	
		Terminated due to large boulder obstruction and unstable sides.	SS	PCB. Asbestos.

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 3

RPSHealth, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground Compacted rubble surface over dark brown/black sandy fine to coarse sub-angular to sub-rounded gravel with red brick fragments and whole, construction rubble, glass, plastic bags/pieces, metal, molten foundry waste and boulders.	SS	Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH.
		Hydrocarbon odour at 0.30 m bgl. Buried concrete at 1.70 m bgl		
1				
2				
3				

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 4Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

[illegible]

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 5

RPS

Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground Dark brown sandy fine to coarse sub-angular to sub-rounded gravels and cobbles.		Metals, Boron, Cyanide, Sulphate, pH.
		Made Ground Dark brown fine sand with occasional fine to medium angular to sub-rounded gravels, cobbles, pieces of metal and rare brick.		
1		Made Ground Light brown sandy clay with frequent red brick, tiles, drainpipe, slate and occasional molten foundry waste.	SS	Metals, Boron, Cyanide, Sulphate, pH, Leachable metals.
2				
3			SS	

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 6



Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground Dark brown fine to coarse sub-angular to sub-rounded gravels, cobbles, metal, plastic and frequent glass.		Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH, Asbestos.
		Made Ground Black fine to medium grained sand.	SS	
		Made Ground Light brown sandy fine to medium sub-angular gravelly clay with red brick fragments, cobbles, boulders, glass and ceramic pieces.		
		Made Ground Dark brown sandy fine to medium sub-angular gravelly clay with red brick fragments, cobbles, boulders, glass and ceramic pieces.		
1				
2				
			SS	Metals, Boron, Cyanide, Sulphate, pH.

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 7



Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground Oily gravel sub-surface over dark brown/brown sandy fine to coarse sub-angular to sub-rounded gravelly clay with red brick, plastic, cobbles and glass.		
		Made Ground Red brown/orange medium to fine sand with sandstone cobbles and red brick.		
1		Made Ground Dark brown/brown sandy fine to coarse sub-angular to sub-rounded gravelly clay with red brick, plastic, cobbles, glass, slate, large metal pieces, sandstone slab and frequent white powdery fine sand.	SS	Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH.
2				

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Trial Pit No. 8



Health, Safety
and Environment

Project Title: Jaques

Project No: RCM4019

Client: Castlemead Homes Ltd

Engineer: JM

Depth (m)	Lithological Symbol	Lithological Description	Sample Type	Analytical Schedule
0		Ground Surface		
		Made Ground		
		Concrete.		
		Made Ground		
		Hardcore rubble over dark brown sandy medium to coarse sub-angular to angular gravels, red brick and ceramic tiles.		
		Brown sandy CLAY with frequent coarse to medium sub-angular to rounded gravels and frequent rounded cobbles.	SS	Metals, Boron, Cyanide, Sulphate, pH, SVOC, VOC, TPH.
1				
			SS	Metals, Boron, Cyanide, Sulphate, pH.
2				

Excavation method JCB

Excavation date 11.08.04

Checked by: EPM

Appendix B

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4	BH5	Method Code	LoD/Units
Depth (m)	2.00-2.50	3.10-3.50	0.5-1.0	4.0	1.50-2.00	3.50-4.00	0.5-1.0	2.5	3-3.50		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Sample Received Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Batch	2	2	1	1	2	2	1	1	2		
Sample Number(s)	19-23	24-27	1-4	5	28-32	33-36	6-10	11	37-39		
Arsenic	15	10	<1	8	16	9	1	<1	9	TM129*	<1 mg/kg
Cadmium	3	6	<1	1	1	<1	1	<1	<1	TM129*	<1 mg/kg
Chromium	25	46	19	25	140	30	30	<1	21	TM129*	<1 mg/kg
Copper	119	168	49	52	519	34	48	<1	21	TM129*	<1 mg/kg
Lead	244	444	48	327	248	92	153	<1	91	TM129*	<1 mg/kg
Mercury	<1	<1	<1	<1	<1	<1	<1	<1	<1	TM129*	<1 mg/kg
Nickel	26	43	17	23	35	36	19	<1	23	TM129*	<1 mg/kg
Selenium	<1	<1	<1	<1	2	<1	<1	<1	<1	TM129*	<1 mg/kg
Zinc	539	916	107	704	701	225	360	<1	127	TM129*	<1 mg/kg
Total Sulphate	1763	4156	1837	-	2344	584	-	-	628	TM148	<50 mg/kg
Boron (Water Soluble)	1	2	<1	2	1	<1	<1	<1	1	TM129*	<1 mg/kg
Total Cyanide	<1	<1	<1	<1	<1	<1	<1	<1	<1	TM153*	<1 mg/kg
Free Cyanide	<1	<1	<1	<1	<1	<1	<1	<1	<1	TM153*	<1 mg/kg
Asbestos *	-	-	-	-	-	-	-	-	-		<0.01 %
Asbestos Presence Screen	-	-	NFD	-	-	-	-	-	-	TM001	NONE
Asbestos Type *	-	-	-	-	-	-	-	-	-		NONE
pH Value In Soil	8.06	8.10	7.49	7.75	8.10	8.55	7.87	7.72	7.97	TM133*	<1.00 pH Units
RAPID ASSESSMENT PACKAGE											
Total Extractable Hydrocarbons	900	855	185	-	287	126	3949	-	-	TM154*	<10 mg/kg
Aliphatics >C6-C8	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aliphatics >C8-C10	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aliphatics >C10-C12	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aliphatics >C12-C16	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aliphatics >C16-C21	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aliphatics >C21-C35	174	167	26	-	30	17	571	-	-	TM154*	<10 mg/kg
Aliphatics >C35-C40	<10	<10	<10	-	<10	<10	161	-	-	TM154*	<10 mg/kg
Total Aliphatics >C6-C40 (Min Oils)	188	186	33	-	36	25	740	-	-	TM154*	<10 mg/kg
Aromatics >C6-C7	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aromatics >C7-C8	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg
Aromatics >C8-C10	<10	<10	<10	-	<10	<10	<10	-	-	TM154*	<10 mg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

☒

1

- * ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

[illegible]

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

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Sample Identity	BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4	BH5	Method Code	LoD/Units
Depth (m)	2.00-2.50	3.10-3.50	0.5-1.0	4.0	1.50-2.00	3.50-4.00	0.5-1.0	2.5	3-3.50		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Sample Received Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Batch	2	2	1	1	2	2	1	1	2		
Sample Number(s)	19-23	24-27	1-4	5	28-32	33-36	6-10	11	37-39		
SVOC											
Phenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2-Chlorophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2-Methylphenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Methylphenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2-Nitrophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Nitrophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2,4-Dichlorophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2,4-Dimethylphenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Chloro-3-methylphenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2,4,6-Trichlorophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2,4,5-Trichlorophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Pentachlorophenol	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
1,3-Dichlorobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
1,4-Dichlorobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
1,2-Dichlorobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
1,2,4-Trichlorobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Nitrobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Azobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Hexachlorobenzene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Naphthalene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Acenaphthylene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Acenaphthene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Fluorene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Phenanthrene X	<100	<100	<500	-	199	<100	<500	-	<100	TM143	<100 µg/kg
Anthracene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Fluoranthene X	<100	290	901	-	522	186	<500	-	<100	TM143	<100 µg/kg
Pyrene X	<100	281	807	-	475	167	<500	-	<100	TM143	<100 µg/kg
Benzo(a)anthracene X	<100	128	<500	-	264	<100	<500	-	<100	TM143	<100 µg/kg
Chrysene X	<100	<100	<500	-	243	<100	<500	-	<100	TM143	<100 µg/kg
Benzo(b)fluoranthene X	<100	<100	<500	-	249	<100	<500	-	<100	TM143	<100 µg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
* MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4	BH5	Method Code	LoD/Units
Depth (m)	2.00-2.50	3.10-3.50	0.5-1.0	4.0	1.50-2.00	3.50-4.00	0.5-1.0	2.5	3-3.50		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Sample Received Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Batch	2	2	1	1	2	2	1	1	2		
Sample Number(s)	19-23	24-27	1-4	5	28-32	33-36	6-10	11	37-39		
SVOC (cont)											
Benzo(k)fluoranthene	<100	<100	<500	-	205	<100	<500	-	<100	TM143	<100 µg/kg
Benzo(a)pyrene	<100	<100	<500	-	239	<100	<500	-	<100	TM143	<100 µg/kg
Indeno(1,2,3-cd)pyrene	<100	<100	<500	-	138	<100	<500	-	<100	TM143	<100 µg/kg
Dibenzo(a,h)anthracene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Benzo(ghi)perylene	<100	<100	<500	-	134	<100	<500	-	<100	TM143	<100 µg/kg
2-Chloronaphthalene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2-Methylnaphthalene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Carbazole	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Isophorone	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Dibenzofuran	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Dimethyl phthalate	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Diethyl phthalate	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Di-n-butyl phthalate	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Di-n-Octyl phthalate	<100	<100	<500	-	873	<100	<500	-	<100	TM143	<100 µg/kg
Bis(2-ethylhexyl) phthalate	<100	<100	<500	-	13725	8679	<500	-	1402	TM143	<100 µg/kg
Butylbenzyl phthalate	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Chloroaniline	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2-Nitroaniline	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
3-Nitroaniline	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Nitroaniline	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2,4-Dinitrotoluene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
2,6-Dinitrotoluene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Bis(2-chloroethyl)ether	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Bromophenylphenylether	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
4-Chlorophenylphenylether	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Hexachloroethane	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Hexachlorobutadiene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Hexachlorocyclopentadiene	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
Bis(2-chloroethoxy)methane	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg
N-nitrosodi-n-propylamine	<100	<100	<500	-	<100	<100	<500	-	<100	TM143	<100 µg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4	BH5	Method Code	LoD/Units
Depth (m)	2.00-2.50	3.10-3.50	0.5-1.0	4.0	1.50-2.00	3.50-4.00	0.5-1.0	2.5	3-3.50		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Sample Received Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Batch	2	2	1	1	2	2	1	1	2		
Sample Number(s)	19-23	24-27	1-4	5	28-32	33-36	6-10	11	37-39		
VOC											
Dichlorodifluoromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Chloromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Vinyl Chloride	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Bromomethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Chloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Trichlorofluoromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
trans-1-2-Dichloroethene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Dichloromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Carbon Disulphide	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,1-Dichloroethene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,1-Dichloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Methyl Tertiary Butyl Ether	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
cis-1-2-Dichloroethene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Bromochloromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Chloroform	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
2,2-Dichloropropane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,2-Dichloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,1,1-Trichloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,1-Dichloropropene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Benzene	<1	3	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Carbontetrachloride	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Dibromomethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,2-Dichloropropane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Bromodichloromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Trichloroethene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
cis-1-3-Dichloropropene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
trans-1-3-Dichloropropene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
1,1,2-Trichloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg
Toluene ✕	55	96	5	-	30	31	3	-	7	TM116 [#]	<1 ug/kg
1,3-Dichloropropane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 [#]	<1 ug/kg

All results expressed on a dry weight basis.

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
* MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01

Client: RPS Consultants Ltd

Client Ref. No.: RCM4019

Matrix: SOLID

Location: Wrexham

Client Contact: Joanna Miles

Sample Identity	BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4	BH5	Method Code	LoD/Units
Depth (m)	2.00-2.50	3.10-3.50	0.5-1.0	4.0	1.50-2.00	3.50-4.00	0.5-1.0	2.5	3-3.50		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Sample Received Date	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04	11.08.04	10.08.04	10.08.04	11.08.04		
Batch	2	2	1	1	2	2	1	1	2		
Sample Number(s)	19-23	24-27	1-4	5	28-32	33-36	6-10	11	37-39		
VOC (cont)											
Dibromochloromethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,2-Dibromoethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Tetrachloroethene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,1,1,2-Tetrachloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Chlorobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Ethylbenzene X	<1	13	<1	-	<1	3	<1	-	<1	TM116 ^u	<1 ug/kg
p/m-Xylene X	<1	22	<1	-	5	7	<1	-	2	TM116 ^u	<1 ug/kg
Bromoform	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Styrene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,1,2,2-Tetrachloroethane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
o-Xylene X	<1	<1	<1	-	<1	2	<1	-	<1	TM116 ^u	<1 ug/kg
1,2,3-Trichloropropane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Isopropylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Bromobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
2-Chlorotoluene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Propylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
4-Chlorotoluene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,2,4-Trimethylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
4-Isopropyltoluene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,3,5-Trimethylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,2-Dichlorobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,4-Dichlorobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
sec-Butylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
tert-Butylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,3-Dichlorobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
n-Butylbenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,2-Dibromo-3-chloropropane	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,2,4-Trichlorobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
Naphthalene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg
1,2,3-Trichlorobenzene	<1	<1	<1	-	<1	<1	<1	-	<1	TM116 ^u	<1 ug/kg

All results expressed on a dry weight basis.

Date 09.09.2004

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» Shown on prev. report

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

[illegible]

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	BH6	BH6	TP1	TP2	TP2	TP2	TP3	TP4	TP4	Method Code	LoD/Units
Depth (m)	2-2.5	4-4.5	0.40	0.70	2.00	2.10	0.30	0.10-0.20	1.90		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Sample Received Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Batch	1	1	2	2	2	2	2	2	2		
Sample Number(s)	12-14	15-18	40-43	44-45	46	47	48-51	52	53		
Arsenic	7	<1	5	3	-	-	<1	-	-	TM129*	<1 mg/kg
Cadmium	<1	<1	<1	<1	-	-	<1	-	-	TM129*	<1 mg/kg
Chromium	23	<1	27	44	-	-	28	-	-	TM129*	<1 mg/kg
Copper	122	<1	22	29	-	-	13	-	-	TM129*	<1 mg/kg
Lead	121	<1	224	130	-	-	65	-	-	TM129*	<1 mg/kg
Mercury	<1	<1	<1	<1	-	-	<1	-	-	TM129*	<1 mg/kg
Nickel	21	<1	16	17	-	-	15	-	-	TM129*	<1 mg/kg
Selenium	<1	<1	<1	<1	-	-	<1	-	-	TM129*	<1 mg/kg
Zinc	178	<1	255	300	-	-	190	-	-	TM129*	<1 mg/kg
Total Sulphate	4855	-	1673	1601	-	-	1913	-	-	TM148	<50 mg/kg
Boron (Water Soluble)	3	3	1	2	-	-	3	-	-	TM129*	<1 mg/kg
Total Cyanide	<1	<1	5	<1	-	-	<1	-	-	TM153*	<1 mg/kg
Free Cyanide	<1	<1	<1	<1	-	-	<1	-	-	TM153*	<1 mg/kg
Asbestos *	-	-	-	-	-	2-50%	-	-	-		<0.01 %
Asbestos Presence Screen	-	-	-	-	-	FD	-	-	-	TM001	NONE
Asbestos Type *	-	-	-	-	-	Chrysotile	-	-	-		NONE
pH Value In Soil	7.55	7.74	8.29	8.14	-	-	7.76	-	-	TM133*	<1.00 pH Units
RAPID ASSESSMENT PACKAGE											
Total Extractable Hydrocarbons	-	NONE	178	-	-	-	22040	32849	440	TM154*	<10 mg/kg
Aliphatics >C6-C8	-	<10	<10	-	-	-	<10	<10	<10	TM154*	<10 mg/kg
Aliphatics >C8-C10	-	<10	<10	-	-	-	<10	<10	<10	TM154*	<10 mg/kg
Aliphatics >C10-C12	X	<10	<10	-	-	-	54	16	<10	TM154*	<10 mg/kg
Aliphatics >C12-C16	X	<10	<10	-	-	-	246	308	<10	TM154*	<10 mg/kg
Aliphatics >C16-C21	X	<10	<10	-	-	-	8724	829	14	TM154*	<10 mg/kg
Aliphatics >C21-C35	X	87	29	-	-	-	1331	14128	297	TM154*	<10 mg/kg
Aliphatics >C35-C40	X	<10	<10	-	-	-	<10	1332	<10	TM154*	<10 mg/kg
Total Aliphatics >C6-C40 (Min Oils)	-	95	36	-	-	-	10362	16613	318	TM154*	<10 mg/kg
Aromatics >C6-C7	-	<10	<10	-	-	-	<10	<10	<10	TM154*	<10 mg/kg
Aromatics >C7-C8	-	<10	<10	-	-	-	<10	<10	<10	TM154*	<10 mg/kg
Aromatics >C8-C10	-	<10	<10	-	-	-	<10	<10	<10	TM154*	<10 mg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

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» Shown on prev. report

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

[illegible]

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	D116	D116	TP1	TP2	TP2	TP2	TP3	TP4	TP4	Method Code	LoD/Units
Depth (m)	2-2.5	4-4.5	0.40	0.70	2.00	2.10	0.30	0.10-0.20	1.90		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Sample Received Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Batch	1	1	2	2	2	2	2	2	2		
Sample Number(s)	12-14	15-18	40-43	44-45	46	47	48-51	52	53		
SVOC											
Phenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2-Chlorophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2-Methylphenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Methylphenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2-Nitrophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Nitrophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2,4-Dichlorophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2,4-Dimethylphenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Chloro-3-methylphenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2,4,6-Trichlorophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2,4,5-Trichlorophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Pentachlorophenol	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
1,3-Dichlorobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
1,4-Dichlorobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
1,2-Dichlorobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
1,2,4-Trichlorobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Nitrobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Azobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Hexachlorobenzene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Naphthalene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Acenaphthylene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Acenaphthene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Fluorene	-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Phenanthrene X	-	8087	454	-	-	-	7523	-	-	TM143	<100 µg/kg
Anthracene X	-	2434	123	-	-	-	2142	-	-	TM143	<100 µg/kg
Fluoranthene X	-	10677	1136	-	-	-	14596	-	-	TM143	<100 µg/kg
Pyrene X	-	10058	1130	-	-	-	14006	-	-	TM143	<100 µg/kg
Benzo(a)anthracene X	-	5252	575	-	-	-	4623	-	-	TM143	<100 µg/kg
Chrysene X	-	3793	485	-	-	-	4371	-	-	TM143	<100 µg/kg
Benzo(b)fluoranthene X	-	3667	519	-	-	-	4466	-	-	TM143	<100 µg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	BH6	BH6	TP1	TP2	TP2	TP2	TP3	TP4	TP4	Method Code	LoD/Units	
Depth (m)	2-2.5	4-4.5	0.40	0.70	2.00	2.10	0.30	0.10-0.20	1.90			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sampled Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04			
Sample Received Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04			
Batch	1	1	2	2	2	2	2	2	2			
Sample Number(s)	12-14	15-18	40-43	44-45	46	47	48-51	52	53			
SVOC (cont)												
Benzo(k)fluoranthene	X	-	3040	462	-	-	-	3852	-	-	TM143	<100 µg/kg
Benzo(a)pyrene	X	-	4033	559	-	-	-	4156	-	-	TM143	<100 µg/kg
Indeno(1,2,3-cd)pyrene	X	-	2603	286	-	-	-	<2000	-	-	TM143	<100 µg/kg
Dibenzo(a,h)anthracene		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Benzo(ghi)perylene	X	-	1961	272	-	-	-	<2000	-	-	TM143	<100 µg/kg
2-Chloronaphthalene		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2-Methylnaphthalene	X	-	<500	<100	-	-	-	3296	-	-	TM143	<100 µg/kg
Carbazole	X	-	664	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Isophorone		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Dibenzofuran		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Dimethyl phthalate		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Diethyl phthalate		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Di-n-butyl phthalate		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Di-n-Octyl phthalate		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Bis(2-ethylhexyl) phthalate	X	-	<500	3448	-	-	-	<2000	-	-	TM143	<100 µg/kg
Butylbenzyl phthalate		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Chloroaniline		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2-Nitroaniline		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
3-Nitroaniline		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Nitroaniline		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2,4-Dinitrotoluene		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
2,6-Dinitrotoluene		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Bis(2-chloroethyl)ether		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Bromophenylphenylether		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
4-Chlorophenylphenylether		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Hexachloroethane		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Hexachlorobutadiene		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Hexachlorocyclopentadiene		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
Bis(2-chloroethoxy)methane		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg
N-nitrosodi-n-propylamine		-	<500	<100	-	-	-	<2000	-	-	TM143	<100 µg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

Validated ☒
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ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01

Client: RPS Consultants Ltd

Client Ref. No.: RCM4019

Matrix: SOLID

Location: Wrexham

Client Contact: Joanna Miles

Sample Identity	BH6	BH6	TP1	TP2	TP2	TP2	TP3	TP4	TP4	Method Code	LoD/Units
Depth (m)	2-2.5	4-4.5	0.40	0.70	2.00	2.10	0.30	0.10-0.20	1.90		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Sample Received Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Batch	1	1	2	2	2	2	2	2	2		
Sample Number(s)	12-14	15-18	40-43	44-45	46	47	48-51	52	53		
VOC											
Dichlorodifluoromethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Chloromethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Vinyl Chloride	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Bromomethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Chloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Trichlorofluoromethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
trans-1-2-Dichloroethene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Dichloromethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Carbon Disulphide	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,1-Dichloroethene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,1-Dichloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Methyl Tertiary Butyl Ether	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
cis-1-2-Dichloroethene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Bromochloromethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Chloroform	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
2,2-Dichloropropane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,2-Dichloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,1,1-Trichloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,1-Dichloropropene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Benzene X	-	<1	<1	-	-	-	4	-	-	TM116 ^a	<1 ug/kg
Carbontetrachloride	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Dibromomethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,2-Dichloropropane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Bromodichloromethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Trichloroethene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
cis-1-3-Dichloropropene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
trans-1-3-Dichloropropene	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
1,1,2-Trichloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg
Toluene X	-	<1	5	-	-	-	14	-	-	TM116 ^a	<1 ug/kg
1,3-Dichloropropane	-	<1	<1	-	-	-	<1	-	-	TM116 ^a	<1 ug/kg

All results expressed on a dry weight basis.

Date 09.09.2004

Validated



Preliminary



ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited

M MCERTS accredited

* Subcontracted test

» Shown on prev. report

Job Number: 04/12190/02/01

Client: RPS Consultants Ltd

Client Ref. No.: RCM4019

Matrix: SOLID

Location: Wrexham

Client Contact: Joanna Miles

Sample Identity	BH6	BH6	TP1	TP2	TP2	TP2	TP3	TP4	TP4	Method Code	LoD/Units
Depth (m)	2-2.5	4-4.5	0.40	0.70	2.00	2.10	0.30	0.10-0.20	1.90		
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sampled Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Sample Received Date	10.08.04	10.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04		
Batch	1	1	2	2	2	2	2	2	2		
Sample Number(s)	12-14	15-18	40-43	44-45	46	47	48-51	52	53		
VOC (cont)											
Dibromochloromethane	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,2-Dibromoethane	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Tetrachloroethene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,1,1,2-Tetrachloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Chlorobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Ethylbenzene X	-	<1	<1	-	-	-	27	-	-	TM116 [#]	<1 ug/kg
p/m-Xylene X	-	<1	<1	-	-	-	93	-	-	TM116 [#]	<1 ug/kg
Bromoform	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Styrene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,1,2,2-Tetrachloroethane	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
o-Xylene X	-	<1	<1	-	-	-	96	-	-	TM116 [#]	<1 ug/kg
1,2,3-Trichloropropane	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Isopropylbenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Bromobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
2-Chlorotoluene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Propylbenzene X	-	<1	<1	-	-	-	6	-	-	TM116 [#]	<1 ug/kg
4-Chlorotoluene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,2,4-Trimethylbenzene X	-	<1	<1	-	-	-	65	-	-	TM116 [#]	<1 ug/kg
4-Isopropyltoluene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,3,5-Trimethylbenzene X	-	<1	<1	-	-	-	71	-	-	TM116 [#]	<1 ug/kg
1,2-Dichlorobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,4-Dichlorobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
sec-Butylbenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
tert-Butylbenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,3-Dichlorobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
n-Butylbenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,2-Dibromo-3-chloropropane	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,2,4-Trichlorobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
Naphthalene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg
1,2,3-Trichlorobenzene	-	<1	<1	-	-	-	<1	-	-	TM116 [#]	<1 ug/kg

All results expressed on a dry weight basis.

Date 09.09.2004

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- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

[illegible]

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	TP5	TP5	TP6	TP6	TP7	TP8	TP8			Method Code	LoD/Units
Depth (m)	0.90	2.50	0.20	2.10	0.90	0.40	1.50				
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL				
Sampled Date	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04				
Sample Received Date	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04				
Batch	2	2	2	2	2	2	2				
Sample Number(s)	54	55-56	57-60	61	62-65	67-69	70				
Arsenic	5	9	2	7	2	12	3			TM129*	<1 mg/kg
Cadmium	8	<1	5	<1	<1	2	<1			TM129*	<1 mg/kg
Chromium	17	13	23	33	17	21	18			TM129*	<1 mg/kg
Copper	49	29	83	52	16	63	15			TM129*	<1 mg/kg
Lead	354	172	916	220	72	264	52			TM129*	<1 mg/kg
Mercury	<1	7	<1	<1	<1	<1	<1			TM129*	<1 mg/kg
Nickel	18	14	30	22	8	23	23			TM129*	<1 mg/kg
Selenium	2	<1	2	<1	1	<1	2			TM129*	<1 mg/kg
Zinc	1367	182	403	236	113	483	95			TM129*	<1 mg/kg
Total Sulphate	1041	1508	1814	2613	1820	1367	719			TM148	<50 mg/kg
Boron (Water Soluble)	1	1	2	2	1	2	1			TM129*	<1 mg/kg
Total Cyanide	<1	<1	<1	<1	<1	<1	<1			TM153 ^M	<1 mg/kg
Free Cyanide	<1	<1	<1	<1	<1	<1	<1			TM153 ^M	<1 mg/kg
Asbestos *	-	-	-	-	-	-	-				<0.01 %
Asbestos Presence Screen	-	-	NFD	-	-	-	-			TM001	NONE
Asbestos Type *	-	-	-	-	-	-	-				NONE
pH Value In Soil	7.50	8.80	7.71	8.07	8.10	7.77	7.64			TM133*	<1.00 pH Units
RAPID ASSESSMENT PACKAGE											
Total Extractable Hydrocarbons	-	-	3840	-	205	942	-			TM154*	<10 mg/kg
Aliphatics >C6-C8	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg
Aliphatics >C8-C10	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg
Aliphatics >C10-C12	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg
Aliphatics >C12-C16	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg
Aliphatics >C16-C21	-	-	72	-	<10	13	-			TM154*	<10 mg/kg
Aliphatics >C21-C35	-	-	1783	-	39	354	-			TM154*	<10 mg/kg
Aliphatics >C35-C40	-	-	236	-	<10	<10	-			TM154*	<10 mg/kg
Total Aliphatics >C6-C40 (Min Oils)	-	-	2099	-	43	372	-			TM154*	<10 mg/kg
Aromatics >C6-C7	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg
Aromatics >C7-C8	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg
Aromatics >C8-C10	-	-	<10	-	<10	<10	-			TM154*	<10 mg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

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* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

All results expressed on a dry weight basis.

Date 09.09.2004

ISO 17025 accredited
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Matrix: SOLID
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All results expressed on a dry weight basis.

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Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 04/12190/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

Sample Identity	TP5	TP5	TP6	TP6	TP7	TP8	TP8					Method Code	LoD/Units
Depth (m)	(0.90)	2.50	(0.20)	2.10	(0.90)	(0.40)	1.50						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL						
Sampled Date	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04						
Sample Received Date	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04						
Batch	2	2	2	2	2	2	2						
Sample Number(s)	54	55-56	57-60	61	62-65	67-69	70						
SVOC (cont)													
Benzo(k)fluoranthene X	-	-	4197	-	303	3873	-					TM143	<100 µg/kg
Benzo(a)pyrene X	-	-	5689	-	317	5001	-					TM143	<100 µg/kg
Indeno(1,2,3-cd)pyrene X	-	-	3117	-	212	2573	-					TM143	<100 µg/kg
Dibenzo(a,h)anthracene X	-	-	<1000	-	<100	596	-					TM143	<100 µg/kg
Benzo(ghi)perylene X	-	-	2973	-	214	2442	-					TM143	<100 µg/kg
2-Chloronaphthalene X	-	-	<1000	-	300	<100	-					TM143	<100 µg/kg
2-Methylnaphthalene X	-	-	<1000	-	<100	208	-					TM143	<100 µg/kg
Carbazole	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Isophorone	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Dibenzofuran X	-	-	<1000	-	<100	139	-					TM143	<100 µg/kg
Dimethyl phthalate	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Diethyl phthalate	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Di-n-butyl phthalate	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Di-n-Octyl phthalate X	-	-	<1000	-	687	<100	-					TM143	<100 µg/kg
Bis(2-ethylhexyl) phthalate X	-	-	7943	-	8970	4851	-					TM143	<100 µg/kg
Butylbenzyl phthalate	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
4-Chloroaniline	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
2-Nitroaniline	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
3-Nitroaniline	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
4-Nitroaniline	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
2,4-Dinitrotoluene	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
2,6-Dinitrotoluene	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Bis(2-chloroethyl)ether	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
4-Bromophenylphenylether	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
4-Chlorophenylphenylether	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Hexachloroethane	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Hexachlorobutadiene	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Hexachlorocyclopentadiene	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
Bis(2-chloroethoxy)methane	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg
N-nitrosodi-n-propylamine	-	-	<1000	-	<100	<100	-					TM143	<100 µg/kg

All results expressed on a dry weight basis.

Date 09.09.2004

- * ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

All results expressed on a dry weight basis.

Date 09.09.2004

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

* ISO 17025 accredited
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* Subcontracted test
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Job Number: 04/12190/02/01

Client: RPS Consultants Ltd

Client Ref. No.: RCM4019

Matrix: SOLID

Location: Wrexham

Client Contact: Joanna Miles

Sample Identity	TP5	TP5	TP6	TP6	TP7	TP8	TP8					Method Code	LoD/Units
Depth (m)	0.90	2.50	0.20	2.10	0.90	0.40	1.50						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL						
Sampled Date	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04						
Sample Received Date	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04	11.08.04						
Batch	2	2	2	2	2	2	2						
Sample Number(s)	54	55-56	57-60	61	62-65	67-69	70						
VOC (cont)													
Dibromochloromethane	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,2-Dibromoethane	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Tetrachloroethene	-	-	<1	-	<1	4	-					TM116 ^a	<1 ug/kg
1,1,1,2-Tetrachloroethane	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Chlorobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Ethylbenzene	-	-	<1	-	2	13	-					TM116 ^a	<1 ug/kg
p/m-Xylene	-	-	<1	-	4	23	-					TM116 ^a	<1 ug/kg
Bromoform	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Styrene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,1,2,2-Tetrachloroethane	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
o-Xylene	-	-	<1	-	<1	8	-					TM116 ^a	<1 ug/kg
1,2,3-Trichloropropane	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Isopropylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Bromobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
2-Chlorotoluene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Propylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
4-Chlorotoluene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,2,4-Trimethylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
4-Isopropyltoluene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,3,5-Trimethylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,2-Dichlorobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,4-Dichlorobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
sec-Butylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
tert-Butylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,3-Dichlorobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
n-Butylbenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,2-Dibromo-3-chloropropane	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,2,4-Trichlorobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
Naphthalene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg
1,2,3-Trichlorobenzene	-	-	<1	-	<1	<1	-					TM116 ^a	<1 ug/kg

All results expressed on a dry weight basis.

Date 09.09.2004

☒

11

- * ISO 17025 accredited
- ^M MCERTS accredited
- * Subcontracted test
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Matrix: SOLID
Location: Wrexham
Client Contact: Joanna Miles

[illegible]

Date 09.09.2004

☒

10

- * ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- >> Shown on prev. report

Matrix: LIQUID
Location: WREXHAM ST
Client Contact: Joanna Miles

[illegible]

Date 31.08.2004

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LIQUID
Location: WREXHAM ST
Client Contact: Joanna Miles

Date 31.08.2004

Validated	☒
Preliminary	☐

ALcontrol Geochem Analytical Services

- # ISO 17025 accredited
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Job Number: 04/12398/02/01
Client: RPS Consultants Ltd
Client Ref. No.: RCM4019

Matrix: LIQUID
Location: WREXHAM ST
Client Contact: Joanna Miles

Sample Identity	BH2	BH6								Method Code	LoD/Units
Depth (m)											
Sample Type	WATER	WATER									
Sampled Date	12.08.04	12.08.04									
Sample Received Date	13.08.04	13.08.04									
Batch	1	1									
Sample Number(s)	1-6	7-13									
SVOC (cont)											
Benzo(k)fluoranthene	<1	<1								TM143	<1 µg/l
Benzo(a)pyrene	<1	<1								TM143	<1 µg/l
Indeno(1,2,3-cd)pyrene	<1	<1								TM143	<1 µg/l
Dibenzo(a,h)anthracene	<1	<1								TM143	<1 µg/l
Benzo(ghi)perylene	<1	<1								TM143	<1 µg/l
2-Chloronaphthalene	<1	<1								TM143	<1 µg/l
2-Methylnaphthalene	<1	<1								TM143	<1 µg/l
Carbazole	<1	<1								TM143	<1 µg/l
Isophorone	<1	<1								TM143	<1 µg/l
Dibenzofuran	<1	<1								TM143	<1 µg/l
Dimethyl phthalate	<1	<1								TM143	<1 µg/l
Diethyl phthalate	<1	<1								TM143	<1 µg/l
Di-n-butyl phthalate	<1	<1								TM143	<1 µg/l
Di-n-Octyl phthalate	<1	<1								TM143	<1 µg/l
Bis(2-ethylhexyl) phthalate	<1	<1								TM143	<1 µg/l
Butylbenzyl phthalate	<1	<1								TM143	<1 µg/l
4-Chloroaniline	<1	<1								TM143	<1 µg/l
2-Nitroaniline	<1	<1								TM143	<1 µg/l
3-Nitroaniline	<1	<1								TM143	<1 µg/l
4-Nitroaniline	<1	<1								TM143	<1 µg/l
2,4-Dinitrotoluene	<1	<1								TM143	<1 µg/l
2,6-Dinitrotoluene	<1	<1								TM143	<1 µg/l
Bis(2-chloroethyl)ether	<1	<1								TM143	<1 µg/l
4-Bromophenylphenylether	<1	<1								TM143	<1 µg/l
4-Chlorophenylphenylether	<1	<1								TM143	<1 µg/l
Hexachloroethane	<1	<1								TM143	<1 µg/l
Hexachlorobutadiene	<1	<1								TM143	<1 µg/l
Hexachlorocyclopentadiene	<1	<1								TM143	<1 µg/l
Bis(2-chloroethoxy)methane	<1	<1								TM143	<1 µg/l
N-nitrosodi-n-propylamine	<1	<1								TM143	<1 µg/l

Date 31.08.2004

☒

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LIQUID
Location: WREXHAM ST
Client Contact: Joanna Miles

Date 31.08.2004

☒

11

- # ISO 17025 accredited
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Matrix: LIQUID
Location: WREXHAM ST
Client Contact: Joanna Miles

Sample Identity	BH2	BH6									Method Code	LoD/Units
Depth (m)												
Sample Type	WATER	WATER										
Sampled Date	12.08.04	12.08.04										
Sample Received Date	13.08.04	13.08.04										
Batch	1	1										
Sample Number(s)	1-6	7-13										
VOC (cont)												
Dibromochloromethane	<1	<1									TM116*	<1 ug/l
1,2-Dibromoethane	<1	<1									TM116*	<1 ug/l
Tetrachloroethene	<1	<1									TM116*	<1 ug/l
1,1,1,2-Tetrachloroethane	<1	<1									TM116*	<1 ug/l
Chlorobenzene	<1	<1									TM116*	<1 ug/l
Ethylbenzene	<1	<1									TM116*	<1 ug/l
p/m-Xylene	<1	<1									TM116*	<1 ug/l
Bromofuran	<1	<1									TM116*	<1 ug/l
Styrene	<1	<1									TM116*	<1 ug/l
1,1,2,2-Tetrachloroethane	<1	<1									TM116*	<1 ug/l
o-Xylene	<1	<1									TM116*	<1 ug/l
1,2,3-Trichloropropane	<1	<1									TM116*	<1 ug/l
Isopropylbenzene	<1	<1									TM116*	<1 ug/l
Bromobenzene	<1	<1									TM116*	<1 ug/l
2-Chlorotoluene	<1	<1									TM116*	<1 ug/l
Propylbenzene	<1	<1									TM116*	<1 ug/l
4-Chlorotoluene	<1	<1									TM116*	<1 ug/l
1,2,4-Trimethylbenzene	<1	<1									TM116*	<1 ug/l
4-Isopropyltoluene	<1	<1									TM116*	<1 ug/l
1,3,5-Trimethylbenzene	<1	<1									TM116*	<1 ug/l
1,2-Dichlorobenzene	<1	<1									TM116*	<1 ug/l
1,4-Dichlorobenzene	<1	<1									TM116*	<1 ug/l
sec-Butylbenzene	<1	<1									TM116*	<1 ug/l
tert-Butylbenzene	<1	<1									TM116*	<1 ug/l
1,3-Dichlorobenzene	<1	<1									TM116*	<1 ug/l
n-Butylbenzene	<1	<1									TM116*	<1 ug/l
1,2-Dibromo-3-chloropropane	<1	<1									TM116*	<1 ug/l
1,2,4-Trichlorobenzene	<1	<1									TM116*	<1 ug/l
Naphthalene	<1	<1									TM116*	<1 ug/l
1,2,3-Trichlorobenzene	<1	<1									TM116*	<1 ug/l

Date 31.08.2004

Validated**ALcontrol Geochem Analytical Services**

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* Subcontracted test

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Job Number: 04/12398/02/01

Client: RPS Consultants Ltd

Client Ref. No.: RCM4019

Matrix: LIQUID

Location: WREXHAM ST

Client Contact: Joanna Miles

[illegible]

Date 31.08.2004

Appendix C

Generic Assessment Criteria

Both the Statutory Guidance (DETR Circular 02/2002) and CLR7 (Environment Agency, March 2002) promote the use of guideline values / generic assessment criteria for the assessment of land contamination. SGVs are not binding standards but can be useful in forming judgements regarding the level of risk i.e. unacceptable or acceptable.

The analytical results have been assessed using published guideline values. In accordance with the guidance given in CLR7, where available, UK assessment criteria (CLEA) has been used for the qualitative risk assessment. Where such UK values have not been published, assessment criteria from Europe and then America has been used for comparative screening purposes.

The generic assessment criteria used for this study included :-

Contaminated Land Exposure Assessment CLEA Soil Guideline Values R & D Publications CLR 10 and CLR GV's 1-10, Environmental Agency and DEFRA, Published by WRc March 2002.

The CLEA model has been developed on behalf of the Environment Agency and Department of the Environment, Food and Rural Affairs for the estimation of child and adult chronic exposures to soil contaminants for those potentially living, working and or playing on contaminated sites over long periods. The model is a computer-based application that combines information on the toxicity of soil contaminants with estimates of potential adult and child chronic exposures.

The model has been used for the derivation of the UK Soil Guideline Values (GVs). The GV's are referred to as "intervention values" and can be used to assess potential significant risks to human health via chronic exposure to contaminated soil. The EA have defined the GV's as "*the concentrations of a soil based contaminant where the estimated average daily exposure for the critical receptor in each standard land use equals the relevant health criteria*". They represent soil concentrations above which might present an unacceptable risk to the long term health of site-users, further investigation and / or remediation is therefore likely to be required. It should also be noted that they are only guideline values and should not be regarded as statutory standards.

Under Part IIA of the Environmental Protection Act 1990, the CLEA GV's are intended to meet the conditions set out in Chapter A, Table B and aid in the assessment of human health effects from contaminated soil ("*human health effects arising from the intake of a contaminant or other direct bodily contact with a contaminant*" DETR Circular February 2000). I.e. they form a safe baseline against which unacceptable intakes of soil based contaminants can be measured for the protection of human health. Despite their development in the Part IIA regime the GV's are anticipated to be used for wider applications such as in the planning regime and in the selection of remedial targets to ensure

future land uses do not pose unacceptable health risks to the intended land user.

The CLEA model has been used to develop GVs for three 'standard' land uses:

- Residential with and without gardens.
- Allotments.
- Industrial / commercial.

These categories of land use are representative of a range of generic site conditions incorporated into the CLEA site conceptual models but they are not considered to accurately reflect either the conditions of a specific site or the behaviour of a particular individual. The conceptual models are based on three elements: land use, fate of contaminants and contaminant toxicity. Assessors must judge the applicability of the generic conceptual model upon which the GV is based in comparison with the conditions encountered on the site being investigated.

The GVs are designed to be protective of the health of the 'critical receptor' for each of the standard land uses. It is a conservative approach to safeguard the health of the most sensitive receptor. The GVs for the residential and allotment land uses are designed to be protective of young children, the 0 to 6 year old child where-as for the commercial / industrial land use the GVs are designed to be protective of an adult worker over a standard lifetime.

Potential long term health risks are modelled in CLEA via the exposure pathways of:

- Ingestion of soil, home-grown vegetables, household dust and soil attached to vegetables.
- Inhalation of outdoor and indoor vapours, fugitive soil dust and fugitive household dust.
- Dermal contact with soil and household dust.

CLEA 2002 only models the long term risks to human health from the exposure to soil based contamination (0-0.5m bgl). The GVs should not be used to assess acute or occupational health risks or risks to groundwater, surface water, ecosystems, buildings, property or any other receptor.

Dutch Ministry of Environment Target and Intervention Values for the Evaluation of Contamination in Soil and Groundwater, May 1994 (Amended 1998)

Prior to 1994, the Dutch Ministry of Housing, Spatial Planning and the Environment had produced a working framework with which to evaluate and provide targeted 'clean-up' levels for a range of possible pollutants in soils and groundwater. These guidelines were updated in 1994, and have since been enforceable in the Netherlands. Some values were updated in 1998.

Where applicable, contaminant concentrations have been assessed against these latter Dutch Government guidelines.

The guidelines indicate Target (T) values, and Intervention (I) values. The 'T' and 'I' values are based on an extensive ecotoxicological and human toxicological study undertaken by RIVM (Dutch Government Research Institution). Some of the 'I' values are based on risk to the environment, others on human health risk. Where both are of relevance, the lower of the two values has been adopted as the 'I' value. It is important to establish whether it is human health or 'eco-risk' which is of concern at the site in question.

Exceeding an 'I' value is taken to indicate significant contamination that may have a serious impact on human health and/or the environment, dependent upon the presence of sensitive receptors. In the Netherlands, these values are used to indicate a need for remediation, assuming that greater than 25m³ of soil or 100m³ of groundwater is contaminated to those levels. The Guidelines also state that serious contamination may also occur below the 'I' level.

It should be noted that the 'T' values are not specific clean-up criteria. They represent targeted objectives. However, these may prove impractical, and in the Netherlands, site-specific values need to be agreed with the relevant authorities before remedial works proceed.

Although in common usage in Europe, it should be recognised that these guidelines have no regulating status outside the Netherlands. The Dutch guidelines present concentrations of a wider range of contaminants than UK guidance, and can be used as an initial screening tool to establish a general understanding of the levels and extent of contamination.

The Dutch guidance contains a number of notes for certain individual and groups of parameters. In some cases, these refer back to the original RIVM study. As an example, for individual aliphatic chlorinated hydrocarbons not mentioned in the list, the 'I' value is 50 mg/kg for soil, but groundwater values must be calculated on the basis of equilibrium formulae used in the RIVM study. Other parameters may not be mentioned in the current list, but will eventually be included in new Soil Protection Guidelines still under development.

US Soil Screening Levels

There are a number of federal and state sets of guideline values. The US EPA federal soil screening levels were developed to help standardise and accelerate the evaluation and clean-up of contaminated soils at sites on the National Priorities List (NPL), (US EPA 1996). The US EPA are clear that the soil screening levels (SSLs) are not national clean-up targets and exceeding them does not necessarily trigger the need for remedial action. Rather they were developed to screen out areas of a site on the NPL that do not require further action or study under the Comprehensive Environmental Response,

Compensation and Liability Act (CERCLA) – better known as the Superfund. The SSLs anticipate a future residential land use.

The toxicological basis of SSLs are oral cancer slope factors, non-cancer reference doses, inhalation unit risk factors and reference concentrations. Drinking water and health based standards are used to determine screening levels in groundwater (US EPA 1996).

Ground gas

Guidance relating to Approved Document C of the Building Regulations and Waste Management Paper No 27 are often used as a benchmark for the construction of houses on land producing landfill gas. The former advises that passive gas protection measures should be incorporated into the building design where methane concentrations in the ground are below 1% by volume and carbon dioxide concentrations are above 1.5% by volume. Where concentrations of methane are greater than 1% by volume active gas protection measures should be considered. The concentration targets are based upon Occupational Exposure Limits, produced by the Health and Safety Executive.

Water Quality - Environmental Quality Standards (EQS)

In the UK there are statutory objectives and water quality principles determined by European Community (EC), international agreements and national law. Under the Water Resources Act 1991 the Secretary of State has powers to establish statutory objectives whilst the Environment Agency (England and Wales) and the Scottish Environment Protection Agency (SEPA) have the responsibility to enforce water quality aspects and ensure that they are achieved.

Environmental water quality standards have been established for particular stretches of inland and coastal waters supporting requirements of European Directives and national requirements to protect and improve water quality. A number of standards concerning dangerous substances discharged into the aquatic environment and quality of water used for particular purposes such as bathing waters, sources of drinking water, shellfish and freshwater fish are used for the Environment Agency and SEPA.

The EC Dangerous Substances framework Directive (76/464/ECC) controlled discharges of 129 toxic substances to surface water and other waters. Emission of dangerous substances to surface water are also controlled by the Water Resources Act 1991. The Dangerous Substances Directive and 'daughters' Directives provide for emission limits and Environmental Quality Objectives (EQOs) for receiving waters. In the UK Environmental Quality Standards (EQSs) have been set in accordance with the EC EQOs. Discharges of Dangerous Substances to groundwater are dealt with by the EC Groundwater Directive (80/68/EEC) implemented in the UK by the Groundwater Regulations 1998. The regulations require the prevention of the discharge of List I substances to groundwater, and investigation of List II substances prior

to direct or indirect discharge. List I and II referred to in this Directive are not identical to those contained in the dangerous substances Directive.

In the UK, the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 list a number of substances (referred sometimes as Red List substances) whose emissions to water are prescribed for Integrated Pollution Control (to be replaced by Pollution and Prevention Control (PPC). Processes producing these substances must use BATNEEC and discharges must comply with the EQS set in the Surface Water (Dangerous Substances) (Classification) Regulations 1989, as amended. These regulations implemented various EC Daughter Directives relating List I Substances inputs to inland and coastal and territorial waters. EQS for a total of 20 List II Substances in EC Directive 76/464/EEC are set by the Surface Water (Dangerous Substances)(Classification) Regulations 1997 and 1998.

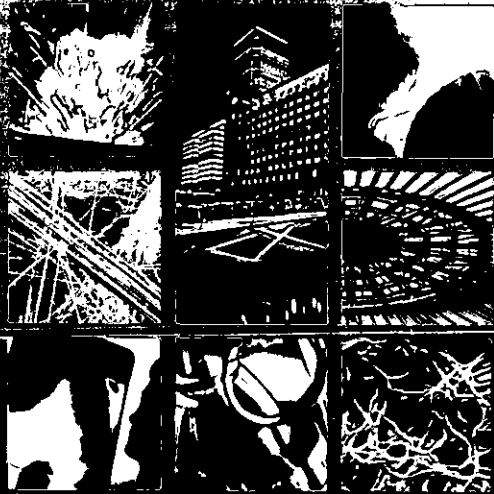
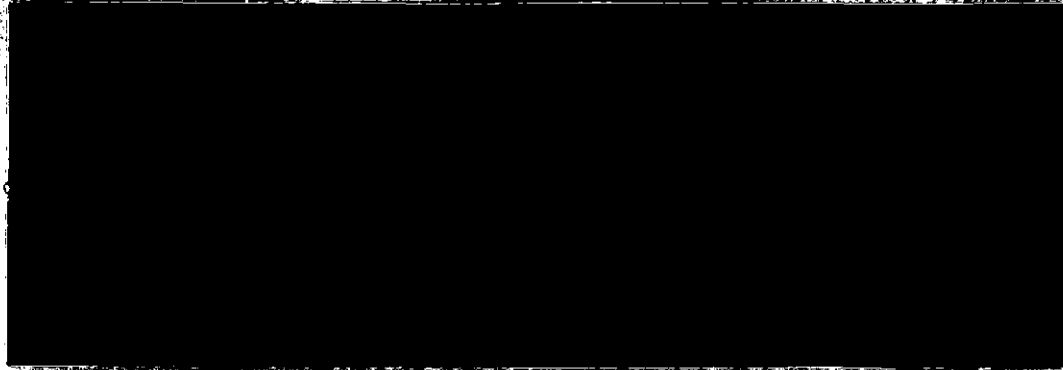
The Surface Waters (Abstraction for Drinking Water)(Classification) Regulations 1996 implement the EC Surface Water Abstraction Directive (75/440/EEC) which sets quality objectives for the surface water sources from which drinking water is taken. Surface water abstracted for public water supply has to comply with standards related to the quality of the water and the number of people that the abstraction supplies.

The EC Bathing Water Directive (76/160/EEC) establishes standards for the quality of fresh or sea water (other than swimming pools) where bathing is "traditionally practised by a large number of bathers". Regulations implementing in the UK the EC directive are the Bathing Water (Classification) Regulations 1991.

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RPS



RPS

**Former Jaques Scrap Yard
Regent Street
Wrexham**

Groundwater Contamination Assessment

For

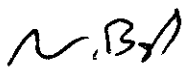
Castlemead Homes Limited



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**RCM4642-009R FINAL
November 2007**

This report has been prepared within the RPS Group Quality Management System to British Standard EN ISO 9001:2000			
Report Type:		Groundwater Contamination Assessment	
Report Status:		Final	
Project Reference:		RCM4642-009 R	
	Consultant	Signature:	Date
Report Author:	Aaron Cousins Environmental Consultant		8 November 2007
Technical Review:	Neil Bagley Principal Consultant		8 November 2007

RPS SITE INVESTIGATION

General Terms

1. The assessments made in this report are based on the ground conditions as revealed by trial pits and boreholes, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discreet areas of contamination ("hotspots") and there can be no certainty that any or all such areas have been located and/or sampled.
2. There may be special conditions appertaining to the site which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.
3. Where any data supplied by the Client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by RPS Companies for inaccuracies within the data supplied by other parties.
4. Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
5. Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
6. This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a re-interpretation of the report in whole or part after its original submission.
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CONTENTS

EXECUTIVE SUMMARY

- 1 INTRODUCTION
- 2 BACKGROUND INFORMATION
- 3 SITE INVESTIGATION
- 4 FIELD OBSERVATIONS
- 5 SUMMARY OF ANALYTICAL RESULTS
- 6 RISK ASSESSMENT
- 7 CONCLUSIONS AND RECOMMENDATIONS

FIGURES

- Figure 1 Site Location Map
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APPENDICES

- Appendix A Borehole Records
Appendix B Groundwater Analytical Data

EXECUTIVE SUMMARY

Project Background	Castlemead Homes Limited commissioned RPS Health, Safety & Environment to undertake a Groundwater Contamination Assessment of the former Jaques Scrap Yard, Wrexham prior to the proposed redevelopment. The site was previously subject to an initial Phase II Contamination Assessment undertaken by RPS Health, Safety & Environment, reference RCM4019-008 R Final, October 2004. Following this it was identified that further groundwater investigation was necessary.
Site Details	Former Jaques Scrap Yard Regent Street Wrexham NGR 332870 350680.
Current Condition and Activities	The site is located in a mixed commercial/light industrial area of Wrexham and is bounded to the east and west by operational railway lines. Regent Street forms the northern perimeter of the site. Towards the south the site tapers to a point beyond which is the River Gwenfro. Site topography is generally flat, the railway line to the west is set in a cutting and the River to the south is located approximately 7 m below the ground level of the site. It appears evident that the ground levels on site may have been built up.
Site History	During 1879 the site is shown as green field land with a railway line located to the east. A second railway line was then constructed to the west of the site. Evidence suggests that the level of the site was built up, possibly by the deposition of arisings resulting from the railway cutting located to the west. The site appears to have been initially partly developed during 1937, a structure appears to have been erected in the north eastern corner of the site; two further structures were erected which are later labelled 'Garage'. The site is labelled 'Scrap Yard' on the 1970 map. Historical maps of the site remain largely unchanged to the most recent. Anecdotal information suggests that the site was used for the storage of waste motor vehicles for approximately 50 years and has in part operated as a motor vehicle maintenance and repair garage.
Potential Contamination Sources	Principal contaminants potentially impacting groundwater have been identified as metals and hydrocarbons. Such contaminants were identified in Made Ground deposits during the initial site investigation.

Site Setting	The River Gwenfro is located adjacent to the southern point of the site. The site is directly underlain by Superficial Deposits comprising Glacial Sands and Gravels. Solid bedrock underlying the Superficial Deposits is indicated to comprise the Carboniferous Etruria Formation which is classified as a Minor Aquifer.
Intrusive Investigations	The intrusive investigation comprised the advancement of six boreholes by cable percussive technique to a maximum depth of 12.5 m.bgl. Each borehole was installed as a groundwater monitoring well. Groundwater monitoring and sampling of the River Gwenfro was undertaken on two occasions.
Identified Contamination	No significantly elevated contaminant concentrations have been identified in any of the samples taken from the groundwater monitoring wells or from the River Gwenfro.
Risk Assessment	Shallow groundwater present on site does not appear to have been impacted and as such no significant risk to controlled waters has been identified.
Conclusions and Recommendations	This Groundwater Contamination Assessment has indicated that groundwater present on site is not significantly contaminated and as such there is no significant risk to the underlying Minor Aquifer or the River Gwenfro.

1 INTRODUCTION

- 1.1 Castlemead Homes Limited commissioned RPS Health, Safety & Environment to undertake a Groundwater Contamination Assessment of the former Jaques Scrap Yard, Wrexham prior to the proposed redevelopment.
- 1.2 The site was previously subject to an initial Phase II Contamination Assessment undertaken by RPS Health, Safety & Environment, reference RCM4019-008 R Final, October 2004. This report identified elevated concentrations of chromium, lead, copper and hydrocarbons in Made Ground deposits. The report was submitted to the Local Authority and Environment Agency Wales for comment who suggested that further groundwater investigation was required in order to develop a more accurate conceptual model of the groundwater regime associated with the site.
- 1.3 The principal objectives of this investigation were to:
 - i investigate the potential presence, nature and extent of groundwater contamination beneath the site;
 - ii develop a hydrogeological conceptual site model;
 - iii determine the potential liability and environmental risk posed by any such contamination;
 - iv determine requirements for further investigation and/or quantitative risk assessment; and
 - v identify the potential requirements for remedial action and provide indicative costs for such works.
- 1.4 In order to achieve these objectives the following items of work were undertaken:
 - i the excavation of six boreholes and the subsequent installation of groundwater monitoring wells;
 - ii the collection of representative groundwater samples and surface water samples on two separate occasions;
 - iii the analysis of groundwater samples for a range of contaminants including metals, petroleum hydrocarbons, poly-aromatic hydrocarbons, semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC);
 - iv the monitoring of groundwater levels in the wells;
 - v the production of a conceptual site model (CSM) and qualitative risk assessment in accordance with current published guidance.

2 BACKGROUND INFORMATION

- 2.1 Details of the environmental setting and historical development of the site are outlined in the Phase II Contamination Assessment report prepared by RPS Health, Safety & Environment, reference RCM4019-008 R Final, dated October 2004 and are summarised below.

Site Location and Description

- 2.2 The site is located in Wrexham at national grid reference 332870 350680. A site location plan is presented as Figure 1.
- 2.3 The site is located in a mixed commercial/light industrial area of Wrexham and is bounded to the east and west by operational railway lines. Regent Street forms the northern perimeter of the site. Towards the south the site tapers to a point beyond which is the River Gwenfro. Site topography is generally flat, the railway line to the west is set in a cutting and the River to the south is located approximately 7 m below the ground level of the site. It appears evident that the ground levels on site may have been built up.

Site History

- 2.4 The earliest map reviewed, published during 1879, shows the site as green field land, a railway line is present to the east of the site, beyond which is the town of Wrexham; to the east are open fields.
- 2.5 The next available map, dated 1899 indicates that a railway line has been constructed to the west of the site. Hatching, which is likely to indicate earthworks are apparent on site; this may be a result of tipping arisings resulting from the adjacent railway cutting. The next available map, dated 1912, indicates that further earthworks have been carried out on site; these now covers a large area of the site. A single square structure is marked in the northeastern corner of the site. The map dated 1937 indicates that two further structures have been erected to the south of the original structure; these are later labelled 'Garage'.
- 2.6 The map dated 1968 indicates that the earthworks shown on earlier maps have been removed it is considered likely that the site was levelled. An embankment remains along the eastern perimeter of the site which is labelled 'Wat's Dyke'. The map published in 1970 labels the site as 'Scrap Yard'; the buildings to the north of the site remain labelled as 'Garage'. Historical maps of the site remain largely unchanged to the most recent.
- 2.7 The site is currently a registered Scrap Yard, (License 37037). Anecdotal information suggests that the site was used for the storage of waste motor vehicles for approximately 50 years and has in part operated as a motor vehicle maintenance and repair garage.
- 2.8 Further anecdotal information suggests that ground level was raised by approximately 3 to 4 metres. It is considered possible that arisings

resulting from the excavation of the adjacent railway cutting were deposited on site.

Site Sensitivity

Hydrology

- 2.9 The River Gwenfro is located adjacent to the southern point of the site and lies approximately 7 metres below the ground level of the site. This section of river bank has been lined with stone block work. The river flows towards the east; it flows beneath an operational railway line immediately upstream of the site, and is culvert immediately downstream of the site. The river was classified as 'Grade B (Good)' for river chemistry by Environment Agency Wales during 2002.
- 2.10 A brewery formerly held a Discharge Consent associated with the River Gwenfro that was positioned approximately 100 m south of the site; this has since been revoked. Welsh Water hold a license to release sewage discharges to the River Gwenfro, the discharge is positioned upstream of the site and is positioned approximately 115 m to the west of the site.
- 2.11 A single recorded Pollution Incident, Reference '37299', appears to be attributable to the site. The incident is reported to have involved the runoff of fire water/foam to the River Gwenfro, further information has not been made available.

Geology

- 2.12 British Geological Survey Map, Wrexham, Sheet 121, Solid and Drift edition, 1:50,000 scale, indicates that the site is directly underlain by Superficial Deposits comprising Glacial Sands and Gravels (northern extent of the site) and Made Ground (southern extent of the site). Solid bedrock underlying the Superficial Deposits is indicated to comprise the Carboniferous Etruria Formation, formerly know as the Ruabon Marl Formation. The Etruria Formation is described by the British Geological Survey as red, purple, brown, ochreous, green, grey and commonly mottled mudstone with lenticular pedogenic horizons.
- 2.13 A Coal Authority report related to the site indicates that the site is located within the likely zone of influence of a coal seam located between 330 m and 370 m below ground level. It states that the last working date of such was 1917 and that any associated ground movements should now have ceased.

Hydrogeology

- 2.14 Groundwater Vulnerability Map, West Cheshire, Sheet 16, 1:10,000 scale, indicates that the underlying Etruria Formation is classified as a Minor Aquifer.
- 2.15 A single groundwater abstraction is located within 1 km of the site. This is operated by Carlsberg Tetley Brewing Ltd and is located approximately 225 m west of the site; it is considered likely that this abstraction has now ceased operation. A Source Protection Zone is

associated with the abstraction; the site lies approximately 100 m east of the outer perimeter of the Source Protection Zone.

Statutory Protected Land and Ecosystems

- 2.16 Wat's Dyke, a scheduled ancient monument, is located within the perimeter of the site. This ancient historical monument runs in a north to south direction through the eastern extent of the site. This feature is not apparent on site and the exact position is therefore difficult to identify. The necessary precautions were taken to prevent significant disturbance to this feature during intrusive investigation works.
- 2.17 Gatewen Marsh, a Site of Special Scientific Interest is located approximately 800 m northwest of the site.

Landfill

- 2.18 The site is currently a registered Scrap Yard, (License 37037). RPS understands that Castlemead Homes are in the process of liaising with the former operators with a view to arrange the surrender of the associated Waste Management License. This report has not been produced for the purpose of this license surrender.
- 2.19 No licensed landfill sites have been identified within 500 m of the site.

Previous Reports

- 2.20 RPS is not aware of any third party environmental reports associated with the site.

3 SITE INVESTIGATION

Summary

- 3.1 This site investigation has been designed to further investigate groundwater previously identified on site within the Made Ground and Glacial Sands and Gravels.
- 3.2 Principal contaminants potentially impacting groundwater have been identified as metals and hydrocarbons. Such contaminants were identified in Made Ground deposits during the initial site investigation.
- 3.3 Information obtained during this intrusive investigation has been used to refine the conceptual site model and enable qualitative risk assessment to be carried out in accordance with current legislation.

Methodology

- 3.4 The intrusive investigation was undertaken between Monday 13th August and Monday 20th August 2007. It comprised the excavation of six boreholes by cable percussive technique to a maximum depth of 12.50 metres below ground level (m bgl). The location of the exploratory locations is presented as Figure 2.
- 3.5 Borehole locations were located to provide widespread coverage of the site but were restricted by the presence of Wat's Dyke and underground utility services. Prior to excavation, all locations were cleared for underground services by an independent specialist contractor.
- 3.6 All six boreholes were completed as permanent groundwater monitoring wells by the installation of 50mm plain and slotted HDPE stand pipe (0.5 to 1.0mm slot size). The resulting annular space was filled with fine non-calcareous pea gravel. Bentonite seals of at least 1 metre in length were placed immediately below ground level and at the boundary of made ground and natural strata. This measure was designed in order to prevent contaminants from entering the borehole from the surface and to prevent the vertical migration of the contaminants associated with the made ground. All positions were finished with a rubber seal and a steel cover.
- 3.7 The boreholes were lithologically logged during advancement in order to determine the stratigraphical relationship of the underlying strata and fill materials. Detailed borehole records and monitoring well construction details were made and are presented as Appendix A.
- 3.8 On completion each borehole location was surveyed in relation to an arbitrary datum in order to provide an accurate indication of the relative level of the upper surface of the various groundwater bodies identified across the site.

Monitoring

- 3.9 Prior to groundwater monitoring and the collection of samples, the standing groundwater level was measured to below ground level using

an oil/water interface meter. Three well volumes of groundwater were calculated and purged from the well

Chemical Analysis

- 3.10 Groundwater samples were collected on the 26 September 2007 and the 11 October 2007 by trained RPS personnel from five of the six monitoring wells and from two points on the River Gwenfro as indicated in the plan presented as Figure 2.
- 3.11 Following completion of the groundwater purge, samples were collected directly from the dedicated HDPE pipe using laboratory supplied glass and plastic bottles. The water to be analysed for metal concentrations was filtered on site in order to prevent analytical errors. On each occasion, a total of five samples were collected by RPS and were submitted to a UKAS accredited laboratory under the 'Chain of Custody' procedure for the analysis for a range of determinands which included the following:
- Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, V, Be, B, Se, Ba);
 - pH;
 - Ammoniacal Nitrogen as N;
 - Speciated petroleum hydrocarbons and BTEX (TPHCWG);
 - Speciated polyaromatic hydrocarbons (PAH 16 speciated);
 - Cyanide (free and total);
 - Semi volatile organic compounds (including phenols and phthalates);
 - Volatile organic compounds; and,
 - Polychlorinated Biphenyls
- 3.12 The analytical results are provided in full as Appendix B and summarised in Section 5 of this report.

4 FIELD OBSERVATIONS

- 4.1 At the time of investigation two buildings remained present on site; both were located at the northern extent of the site, the area surrounding these was laid to hardstanding in the form of concrete or bitumen bonded aggregate. The majority of the site comprised compacted and levelled bare ground. The remnants of a structure remain present adjacent to the eastern perimeter towards the south of the site.
- 4.2 Hydrocarbon staining was evident on the south facing wall and hardstanding to the south of the existing building located at the northern extent of the site, this staining could be followed to a surface water drain which appeared to be blocked. It is considered likely that this staining is associated with a bulk storage tank which appears to have been located adjacent to the external wall of this building. Hydrocarbon staining was also evident in the vicinity of the remnants of the structure located towards the southern extent of the site.

Ground Conditions

- 4.3 A full description of soil conditions encountered at the site is included in the lithological logs presented in Appendix A. A summary of the ground conditions encountered during the ground investigation is provided below.
- 4.4 Made Ground was identified at all borehole locations; the depth and composition varied significantly across the site but was predominantly granular comprising sand and gravel of mixed lithology with fragments of concrete, brick, glass, coal and metal. The made ground was found to grade into natural Sands and Gravels, likely to be of glacial origin. this made the determination of the boundary between made ground and natural strata difficult to identify. In general made ground was present to depths of between 3.0 and 3.9 m.bgl.
- 4.5 The glacial sand and gravel deposits identified beneath the made ground also varied significantly in composition. These superficial deposits graded from sands and gravels to fine sands with narrow bands of silt. In some boreholes the sands and gravels became dense and the presence of cobbles up to 100mm in diameter made advancement of the borehole slow.
- 4.6 Deposits of Silt were identified beneath the sands and gravels in boreholes BH102 and BH106, both at a depth of 9.00 m.bgl. The deepest borehole, BH102 was advanced to a depth of 12.50 m.bgl, bedrock was not proven in this or any borehole. BH105 was terminated at a depth of 9.00 m.bgl as progress proved to be slow due to dense sand and gravels. The borehole was partly backfilled and the response zone of the monitoring well was installed at a relatively shallow layer in order to target a shallow perched groundwater body that was identified between approximately 5.5 m.bgl and 6.5 m.bgl.

Groundwater Conditions

- 4.7 Groundwater was encountered in all six monitoring wells, however insufficient water to collect a representative samples was present in BH105 to on both occasions. Groundwater rest levels ranged from 0.485 m below arbitrary datum (m.bAD) (BH105) to 2.755 m.bAD (BH104). The arbitrary benchmark used was the footpath of the wooden bridge that crosses the River Gwenfro at surface water sampling point SW1 which is identified in Figure 2.
- 4.8 The shallow groundwater identified on site appears to be present in several individual groundwater bodies. These are located in the granular sand and gravels and are perched upon less permeable bands of clayey and silty material. The underlying fine sand/silt deposits identified at an approximate depth of 9.0 m.bgl were found to be saturated.
- 4.9 The groundwater flow regime of the shallow perched bodies is therefore complex and plotting water table contours on a plan indicates no distinct pattern of groundwater flow direction. It is considered likely that groundwater associated with the fine sand/silt deposits identified at depth flows towards the River Gwenfro which is located to the south of the site.

Table 4B Groundwater monitoring rest level data.

Borehole Identifier	National Grid Reference	Monitoring Date	BH Base m aABM	GW Level m aABM
BH101	SJ 32852 50710	26/09/2007	-4.705	-2.425
BH102	SJ 32842 50593	26/09/2007	-6.125	-1.455
BH103	SJ 32854 50628	26/09/2007	-4.885	-2.485
BH104	SJ 32866 50677	26/09/2007	-5.355	-2.685
BH105	SJ 32886 50767	26/09/2007	-0.675	-0.505
BH106	SJ 32839 50664	26/09/2007	-5.01	-2.39
BH101	SJ 32852 50710	11/10/2007	-4.615	-2.465
BH102	SJ 32842 50593	11/10/2007	-5.835	-1.355
BH103	SJ 32854 50628	11/10/2007	-4.645	-2.025
BH104	SJ 32866 50677	11/10/2007	-5.275	-2.755
BH105	SJ 32886 50767	11/10/2007	-0.655	-0.485
BH106	SJ 32839 50664	11/10/2007	-4.9	-2.46

5 SUMMARY OF ANALYTICAL RESULTS

- 5.1 In order to evaluate whether a particular contaminant presents a significant hazard, the concentration at which it is identified in the environment is compared to relevant guidelines or standards.
- 5.2 Based on the preliminary conceptual model the groundwater and River Gwenfro were considered as the most sensitive receptors and as such analytical results for groundwater and surface water samples have been compared to the Statutory Environmental Quality Standards (EQS) for List I and II substances where available. These guidelines are purely used as indicative guidance to provide an indication of the level of any contamination present. Based on monitoring information made available by the Environment Agency for the River Gwenfro, EQS values for freshwater bodies with a hardness value of 250+ mg/l CaCO₃ supporting none salmonoid aquatic life has been assumed.
- 5.3 Where EQS values are not available, the UK Drinking Water Standards (DWS) have been adopted; these have been taken from Water Supply (Water Quality) Regulations 2000 (SI 2000/3184). In the absence of both EQS and DWS values, World Health Organisation Guideline for Drinking Water Quality, 1984 values have been adopted.

Groundwater Analysis

Metals

- 5.4 No toxic metal concentrations were identified in excess of the relevant EQS values in any sample taken during both sampling visits. Chromium was identified at 5 ug l⁻¹ in the sample taken from BH106 on 26/09/2007 which is equivalent to the relevant EQS value. During the same monitoring visit samples from BH101, BH102 and BH104 were found to contain 3 ug l⁻¹ chromium. The samples collected on 11/10/2007 were all found to contain less than 2 ug l⁻¹ chromium.

Inorganic Compounds

- 5.5 pH values of groundwater samples were identified to range from 7.85 to 8.17 (11/10/2007) with a mean pH value of 7.97 which indicates that slightly alkaline groundwater conditions persist in groundwater across the site. Similar values were identified in samples taken on 26/09/2007.
- 5.6 Conductivity values ranged from 0.75 mS/cm (BH106, 26/09/2007) to 0.95 mS/cm (BH103, 11/10/2007).
- 5.7 Ammoniacal Nitrogen concentrations were identified at a maximum concentration of 0.3 mg l⁻¹ (BH103, 11/10/2007).
- 5.8 Total and free cyanide concentrations were not identified at a concentration in excess of the laboratory limit of detection of 0.05 mg/l⁻¹.

Petroleum Hydrocarbons

- 5.9 No petroleum hydrocarbon compounds were identified at concentrations greater than the laboratory limit of detection of $10 \mu\text{g l}^{-1}$. This limit of detection is considerably less than the relevant available EQS values.

Polyaromatic Hydrocarbons

- 5.10 No PAH concentrations were identified at a concentration greater than the relevant guideline values. The majority of identified concentrations were less than the laboratory limit of detection. Samples BH101 and BH104 collected on 26/09/2007 contained detectable PAH concentrations with a total PAH concentration being identified at 1800 ng l^{-1} and 1400 ng l^{-1} respectively. Of all of the five groundwater samples collected on 11/10/2007 the only detectable PAH concentrations was benzo(a)pyrene; this was detected at 13 ng l^{-1} in BH106.

Polychlorinated Biphenyls

- 5.11 No PCB concentrations were identified in excess of the laboratory limit of detection of 10 ng l^{-1} .

Semi Volatile Organic Compounds

- 5.12 Only 3-Nitroaniline and hexachlorocyclopentadiene were identified at a concentration greater than the laboratory limit of detection of $1 \mu\text{g l}^{-1}$ in a single sample. The identified concentration of both compounds was $2 \mu\text{g l}^{-1}$.

Volatile Organic Compounds

- 5.13 No VOCs were identified at a concentration greater than the laboratory limit of detection of $1 \mu\text{g l}^{-1}$.

*Surface Water Analysis**Metals*

- 5.14 No toxic metal concentrations were identified in exceedance of the relevant EQS in any sample taken during both sampling visits.

Inorganic Compounds

- 5.15 pH values of surface water samples were identified to range from 8.32 to 8.43 which indicates that slightly alkaline groundwater conditions prevail in the river at this location.
- 5.16 Conductivity values ranged from 0.60 mS/cm (SW1, 26/09/2007) to 0.96 mS/cm (SW2, 26/09/2007).
- 5.17 Ammoniacal Nitrogen concentrations did not exceed the limit of detection of 0.2 mg l^{-1} .

- 5.18 Total and free cyanide concentrations were not identified at a concentration in excess of the laboratory limit of detection of 0.05 mg/l⁻¹.

Petroleum Hydrocarbons

- 5.19 No petroleum hydrocarbon compounds were identified at concentration greater than the laboratory limit of detection of 10 ug l⁻¹.

Polyaromatic Hydrocarbons

- 5.20 No PAHs were identified at a concentration greater than the relevant guideline values. The majority of concentrations were less than the laboratory limit of detection. Sample SW2 (26/09/2007) contained detectable concentrations of PAHs with a total PAH 16 value of 460 ug l⁻¹.

Polychlorinated Biphenyls

- 5.21 No PCB concentrations were identified in excess of the laboratory limit of detection of 10 ng l⁻¹.

Semi Volatile Organic Compounds

- 5.22 No SVOC concentrations were identified at concentration greater than the laboratory limit of detection of 1 ug l⁻¹.

Volatile Organic Compounds

- 5.23 Non VOCs were identified at a concentration greater than the laboratory limit of detection of 1 ug l⁻¹.

Summary of Results

- 5.24 No exceedances of the adopted guideline values have been identified.

6 RISK ASSESSMENT

- 6.1 A qualitative risk assessment (QRA) has been undertaken in line with current government guidance in order to identify the significance of any identified contamination. This requires an assessment of the toxicity on individual contaminants and the likely exposure sensitive receptors may receive which is presented in the following paragraphs.
- 6.2 The overall aim of the QRA is to characterise areas of concern and to identify any areas that may require further investigation.
- 6.3 The results of field observations, field measurements and the chemical analysis of samples collected during the intrusive investigation constitute the hazard identification stage of the risk assessment process.

Conceptual Site Model

- 6.4 In order to implement the risk assessment the following conceptual model has been developed.

Sources of Contamination

- 6.5 The results of the groundwater and surface water chemical analysis have not identified any significant contamination which suggests that no significant source of groundwater contamination exists on site.

Receptors of Contamination

The underlying Minor Aquifer and River Gwenfro were previously identified as key controlled waters in relation to the site, and were therefore considered to be the most significant receptors.

Contaminant Migration & Exposure Pathways

- 6.6 Potential significant migration and exposure pathways that may be relevant to the site include:
- vertical migration of mobile substances through the sub-surface to deeper groundwater,
 - lateral migration of contaminated groundwater to the River Gwenfro,

Risk Characterisation and Evaluation

- 6.7 The risk characterisation and evaluation refers to the conceptual model and takes account of any mitigating circumstances that relate to the site and the proposed redevelopment. The significance of any potential risk or liability is therefore evaluated.
- 6.8 Shallow groundwater present on site does not appear to have been significantly impacted and as such no significant risk to controlled waters has been identified.

7 CONCLUSIONS AND RECOMMENDATIONS

Summary of Contamination

- 7.1 No significant groundwater or surface water contamination has been identified.

Risk Assessment

- 7.2 Although soil contamination was identified in Made Ground deposits during the initial site investigation, the analysis of shallow groundwater and the River Gwenfro suggests that such contamination is not significantly mobile.
- 7.3 Shallow groundwater present on site does not appear to have been impacted and as such no significant risk to controlled waters has been identified.

Recommendations

- 7.4 This Groundwater Contamination Assessment has indicated that groundwater present on site is not significantly contaminated and as such there is no significant risk to the underlying Minor Aquifer or the River Gwenfro.

FIGURE 1
Site Location Plan



— Site Boundary

Project: Jacques Yard
 Project Number: RCM4642
 Date: November 2007
 Scale: Not To Scale
 Appendix A: Site Location Plan

RPS Health, Safety
 and Environment

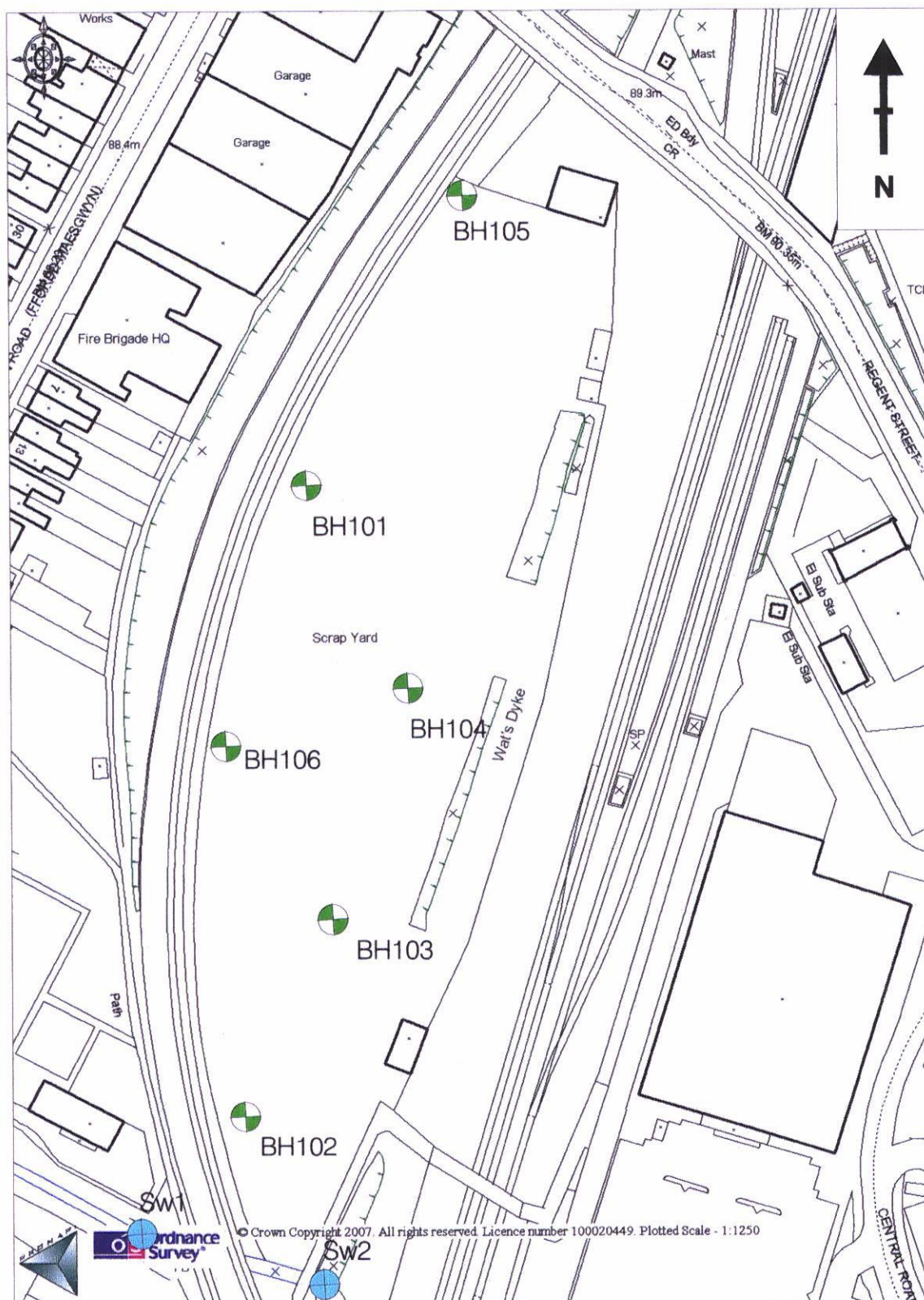
52 Princess Street
 Manchester
 M1 6JX

☎ 0161 237 9858

📠 0161 237 3315

🌐 www.rpsgroup.com

FIGURE 2
Monitoring Point Location Plan



Project: Jacques Yard

Project Number: RCM4642

Date: November 2007

Scale: Not To Scale

Appendix B: Borehole Location Plan

RPS Health, Safety
and Environment

52 Princess Street
Manchester
M1 6JX

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Appendix A
Borehole Records



RPS Health, Safety and Environment
52 Princess Street
Manchester, M1 6JX
Tel: 0161 2379858 Fax: 0161 2373315

Site
Jaques Yard, Wrexham

Borehole
Number
BH101

Boring Method Cable Percussion	Casing Diameter 150mm cased to 10.70m	Ground Level (mAD) 4.74	Client Castlemead Homes Ltd	Job Number RCM4642
	Location 3.00318 E 53.04942 N	Dates 13/08/2007 - 14/08/2007	Engineer Aaron Cousins	Sheet 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							MADE GROUND. Dark grey brown fine to coarse sand and gravel. Gravel is fine to coarse subangular to subrounded of limestone with fragments of ash, brick and glass. (Fill) Becoming predominantly firm to stiff red brown clay with fragments of metal, roofing slate and gravel to cobble sized fragments of brick and tan fine grained sandstone.			
						(3.90)				
					0.84	3.90 (0.20)				
					0.64	4.10	Tan to mid brown subangular to subrounded fine SAND. (Glacial Till)			
						(0.60)				
					0.04	4.70	Tan to mid brown finely laminated silty CLAY with occasional laminations of red brown clay and occasion fragments of fine to coarse subrounded sandstone and limestone gravel. (Glacial Till)			
						(0.60)				
					-0.56	5.30	Light brown grey fine SAND. (Glacial Till)			
						(2.50)	Brown subangular to subrounded fine to coarse GRAVEL of mixed lithologies including dark grey mudstone, pink brown sandstone, light grey quartzite and purple-pink granite. (Glacial Till)			
					-3.06	7.80				
						(0.40)				
					-3.46	8.20	Dark to orange brown silty CLAY with occasional fragments of orange brown subrounded fine grained sandstone gravel. (Glacial Till)			
						(2.50)	Light to mid brown subangular to subrounded coarse SAND and angular fine to coarse GRAVEL of mixed lithology including brown sandstone, pink and white quartzite and dark grey mudstone. (Glacial Till) Gravels becoming well graded with occasional cobbles of mid to dark grey limestone.			

Remarks
Groundwater rest level 6.76 m.bgl.
Chiselling from 4.90m to 5.10m for 0.5 hours. Chiselling from 5.40m to 5.80m for 1 hour. Chiselling from 6.10m to 6.60m for 1 hour. Chiselling from 6.90m to 7.10m for 0.5 hours. Chiselling from 8.30m to 8.50m for 0.5 hours. Chiselling from 8.70m to 8.90m for 0.5 hours. Water added from 4.90m to 8.00m. Excavating from 0.00m to 1.10m for 1 hour.

Scale (approx)	Logged By
1:50	MG
Figure No. RCM4642.BH101	



RPS Health, Safety and Environment
52 Princess Street
Manchester, M1 6JX
Tel: 0161 2379858 Fax: 0161 2373315

Site
Jaques Yard, Wrexham

Borehole
Number
BH101

Boring Method
Cable Percussion

Casing Diameter
150mm cased to 10.70m

Ground Level (mAD)
4.74

Client
Castlemead Homes Ltd

Job
Number
RCM4642

Location
3.00316 E 53.04942 N

Dates
13/08/2007-
14/08/2007

Engineer
Aaron Cousins

Sheet
2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					-5.96	(2.50) 10.70	Complete at 10.70m			

Remarks

Scale
(approx)

1:50

Logged
By

MG

Figure No.

RCM4642.BH101



RPS Health, Safety and Environment
52 Princess Street
Manchester, M1 6JX
Tel: 0161 2379858 Fax: 0161 2373315

Site
Jaques Yard, Wrexham

Borehole
Number
BH102

Boring Method
Cable Percussion

Casing Diameter
150mm Cased to 12.00m

Ground Level (mAD)
4.48

Client
Castlemead Homes Ltd

Job
Number
RCM4642

Location
3.00327 E 53.04836 N

Dates
14/08/2007-
15/08/2007

Engineer
Aaron Cousins

Sheet
1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							MADE GROUND. Dark grey brown slightly silty fine to coarse sand with subangular to subrounded fine to coarse gravel of mixed lithology including tan sandstone, dark grey mudstone, concrete, brick and occasional metal fragments. (Fill)			
					1.38	3.10				
						(2.00)	Grey brown silty fine to coarse SAND with subangular to subrounded fine to coarse gravel of tan sandstone and dark grey mudstone. (Glacial Till)			
					-0.62	5.10	Soft pale brown mottled grey sandy CLAY with occasional fine to coarse subangular to subrounded gravel of mixed lithology including tan sandstone, dark grey mudstone and pale limestone. (Glacial Till)			
				Water strike(1) at 5.63m, rose to 5.61m in 20 mins.	-1.62	6.10	Pale grey brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone and pale grey limestone with some broken cobbles. Silty in patches. (Glacial Till)			
					-3.22	7.70	Grey brown silty fine SAND with occasional subangular to subrounded fine to coarse gravel of mixed lithology including tan sandstone and dark grey mudstone. (Glacial Till)			
					-4.52	9.00	Soft to firm grey brown fine sandy SILT with occasional subangular to subrounded fine to coarse gravel of tan sandstone and dark grey mudstone. (Glacial Till)			

Remarks

Groundwater rest level 5.79 m.bgl.
Chiselling from 6.50m to 6.70m for 0.5 hours. Water added from 6.10m to 6.30m. Excavating from 0.00m to 1.20m for 1 hour.

Scale
(approx)

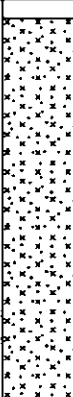
1:50

Logged
By

AC

Figure No.

RCM4642.BH102

					RPS Health, Safety and Environment 52 Princess Street Manchester, M1 6JX Tel: 0161 2379858 Fax: 0161 2373315					Site Jaques Yard, Wrexham			Borehole Number BH102	
Boring Method Cable Percussion		Casing Diameter 150mm cased to 12.00m			Ground Level (mAD) 4.48		Client Castlemead Homes Ltd			Job Number RCM4642				
		Location 3.00327 E 53.04836 N			Dates 14/08/2007- 15/08/2007		Engineer Aaron Cousins			Sheet 2/2				
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr				
					-8.02	(3.50) 12.50								
							Complete at 12.50m							
Remarks								Scale (approx) 1:50	Logged By AC	Figure No. RCM4642.BH102				



RPS Health, Safety and Environment
52 Princess Street
Manchester, M1 6JX
Tel: 0161 2379858 Fax: 0161 2373315

Site
Jaques Yard, Wrexham

Borehole
Number
BH103

Boring Method
Cable Percussion

Casing Diameter
150mm cased to 9.50m

Ground Level (mAD)
4.51

Client
Castlemead Homes Ltd

Job
Number
RCM4642

Location
3.00309 E 53.04868 N

Dates
15/08/2007-
16/08/2007

Engineer
Aaron Cousins

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							MADE GROUND. Dark grey brown slightly silty fine to coarse sand with subangular to subrounded fine to coarse gravel of mixed lithology including tan sandstone, dark grey mudstone, coal, concrete, brick with occasional fragments of metal and roofing slate. (Fill)			
						(3.60)				
					0.91	3.60				
						(0.40)	Brown slightly silty fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone and pale grey limestone (Glacial Till)			
					0.51	4.00				
						(1.20)	Brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone. (Glacial Till)			
					-0.69	5.20				
						(0.40)	Soft finely laminated red brown SILT with bands of orange brown clay and occasional lenses of sand and fragments of fine to medium gravel of tan sandstone and dark grey mudstone. (Glacial Till)			
					-1.09	5.60				
						(0.40)	Orange brown slightly silty fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone. (Glacial Till)			
					-1.49	6.00				
						(1.80)	Pale brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone, pale grey limestone and pink granite with some broken cobbles. (Glacial Till)			
				Water strike(1) at 7.32m, rose to 7.28m in 20 mins.	-3.29	7.80				
						(1.70)	Red brown silty fine to medium SAND with occasional fine to medium sub angular gravel of dark grey mudstone. (Glacial Till)			
					-4.99	9.50				

Remarks
Groundwater rest level 6.75 m.bgl.
Chiselling from 4.80m to 5.00m for 1 hour. Chiselling from 6.90m to 7.30m for 1 hour. Water added from 4.00m to 6.50m. Excavating from 0.00m to 1.20m for 1 hour.

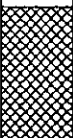
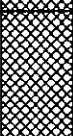
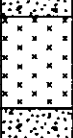
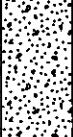
Scale
(approx)

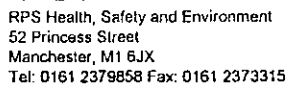
1:50

Logged
By

AC

Figure No.
RCM4642.BH103

		RPS Health, Safety and Environment 52 Princess Street Manchester, M1 6JX Tel: 0161 2379858 Fax: 0161 2373315			Site Jaques Yard, Wrexham		Borehole Number BH104			
Boring Method Cable Percussion		Casing Diameter 150mm cased to 10.00m		Ground Level (mAD) 4.67		Client Castlemead Homes Ltd		Job Number RCM4642		
		Location 3.00292 E 53.049 N		Dates 16/08/2007		Engineer Aaron Cousins		Sheet 1/2		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
1.50	D1				3.17	1.50 (1.50)	MADE GROUND. Dark grey brown slightly silty fine to coarse sand with subangular to subrounded fine to coarse gravel of mixed lithology including tan sandstone, dark grey mudstone, concrete, brick and occasional metal and glass fragments. Several whole bricks (Fill)			
					1.67	3.00 (1.20)	MADE GROUND. Grey brown silty fine to coarse sand with subangular to subrounded fine to coarse gravel of tan sandstone, dark grey mudstone and occasional fragments of brick. (Fill)			
					0.47	4.20 (0.60)	Layer of coal ash.			
					-0.13	4.80 (4.70)	Pale brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone and pale grey limestone. (Glacial Till)			
5.60	D2				-4.83	9.50 (0.70)	Soft to firm finely laminated orange brown SILT with bands of orange brown clay and lenses of sand. (Glacial Till)			
							Pale brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone, pale grey limestone and pink granite with some broken cobbles. Silty in patches. (Glacial Till)			
				Water strike(1) at 8.10m, rose to 8.09m in 20 mins.						
Remarks Groundwater rest level 6.93 m.bgl. Chiselling from 5.40m to 5.80m for 1 hour. Chiselling from 6.70m to 6.90m for 0.5 hours. Chiselling from 8.90m to 9.10m for 0.5 hours. Water added from 5.00m to 9.50m. Excavating from 0.00m to 1.20m for 1 hour.								Scale (approx) 1:50	Logged By AC	
								Figure No. RCM4642.BH104		



Site
Jaques Yard, Wrexham

Borehole
Number
BH104

Boring Method
Cable Percussion

Casing Diameter
150mm cased to 10.00m

Ground Level (mAD)	4.67
--------------------	------

Client	Castlemead Homes Ltd
--------	----------------------

Job
Number
RCM4642

Location
3.00292 E 53.049 N

Dates
16/08/2007

Engineer
Aaron Cousins

Sheet
2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					-5.53	(0.70) 10.20	Till			
							Complete at 10.20m			

Remarks

Scale (approx)

1:50

Logged
By

AC

Figure No.

RCM4642.BH104

		RPS Health, Safety and Environment 52 Princess Street Manchester, M1 6JX Tel: 0161 2379858 Fax: 0161 2373315				Site Jaques Yard, Wrexham		Borehole Number BH105		
		Boring Method Cable Percussion		Casing Diameter 150mm cased to 9.00m		Ground Level (mAD) 6.50		Client Castlemead Homes Ltd		Job Number RCM4642
		Location 3.00265 E 53.04993 N		Dates 17/08/2007		Engineer Aaron Cousins		Sheet 1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mAD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							MADE GROUND. Dark grey brown slightly silty fine to coarse sand with subangular to subrounded fine to coarse gravel of mixed lithology including tan sandstone, dark grey mudstone, concrete, brick and occasional metal fragments. (Fill)			
						(2.00)				
					4.50	2.00	MADE GROUND. Grey brown silty fine to coarse sand with subangular to subrounded fine to coarse gravel of tan sandstone, dark grey mudstone and occasional fragments of brick. (Fill)			
						(1.00)				
					3.50	3.00	Pale brown slightly silty fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone and pale grey limestone. (Glacial Till)			
						(1.90)				
					1.80	4.90	Soft to firm orange brown SILT with occasional gravel and patches of fine to medium sand. Gravel is subangular to subrounded fine to coarse of mixed lithology. (Glacial Till)			
					1.40	5.10				
				Water strike(1) at 5.47m, no rise after 20 mins, sealed at 6.60m.		(1.40)	Brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone, pale grey limestone and pink granite. (Glacial Till)			
					0.00	6.50	Soft to firm finely laminated orange brown SILT with bands of orange brown clay and occasional pockets of sand. (Glacial Till)			
						(1.00)				
					-1.00	7.50	Pale brown fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse of mixed lithology including tan sandstone, dark grey mudstone and pale grey limestone with some broken cobbles. Silty in patches. (Glacial Till)			
						(1.50)				
							Obstruction (probable cobble/boulder).			
					-2.50	9.00				
							Complete at 9.00m			
Remarks Borehole terminated at 9.0 m.bgl due to very slow progress. Groundwater rest level 8.80 m.bgl. Chiselling from 8.00m to 9.00m for 2.5 hours. Water added from 5.00m to 6.50m. Water added from 7.40m to 9.00m. Excavating from 0.00m to 1.20m for 1 hour.								Scale (approx)	Logged By	
								1:50	AC	
								Figure No. RCM4642.BH105		



RPS Health, Safety and Environment
52 Princess Street
Manchester, M1 6JX
Tel: 0161 2379858 Fax: 0161 2373315

Site
Jaques Yard, Wrexham

Borehole
Number
BH106

Boring Method
Cable Percussion

Casing Diameter
150mm cased to 11.00m

Ground Level (mOD)
4.04

Client
Castlemead Homes Ltd

Job
Number
RCM4642

Location
3.00332 E 53.049 N

Dates
20/08/2007

Engineer
Aaron Cousins

Sheet
1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							MADE GROUND. Dark grey brown slightly silty fine to coarse sand with subangular to subrounded fine to coarse gravel of mixed lithology including tan sandstone, dark grey mudstone, concrete, brick and occasional metal fragments. (Fill)			
					0.54	3.50 (3.50)				
					-0.48	4.50 (1.00)	Grey brown silty fine to coarse SAND with subangular to subrounded fine to coarse gravel of tan sandstone and dark grey mudstone. (Glacial Till)			
					-0.88	4.90 (0.40)	Soft finely laminated brown SILT with bands of orange brown clay and occasional lenses of fine to medium sand. (Glacial Till)			
						(2.30)	Mid brown fine to coarse SAND and GRAVEL. Gravel is fine to coarse subangular to subrounded of mixed lithology including tan sandstone, dark grey mudstone, pale grey limestone and pink granite with some broken cobbles. Silty in patches. (Glacial Till)			
				Water strike(1) at 6.02m, no rise after 20 mins, sealed at 9.00m.			Becoming silty and stained dark brown.			
					-3.16	7.20 (1.80)	Red brown silty fine SAND with occasional fine to medium gravel of dark grey mudstone and tan sandstone. Almost cohesive when wet. (Glacial Till)			
					-4.96	9.00	Stiff to very stiff red brown SILT with occasional bands of sand and occasional gravel of fine to medium subangular dark grey mudstone and tan sandstone. Breaks along crenulated horizontal plains of weakness of up to 10 mm in thickness. (Glacial Till)			

Remarks
Water added from 4.90m to 7.20m. Excavating from 0.00m to 1.20m for 1 hour.

Scale
(approx)

1:50

Logged
By

AC

Figure No.
RCM4642.BH106

					RPS Health, Safety and Environment 52 Princess Street Manchester, M1 6JX Tel: 0161 2379858 Fax: 0161 2373315					Site Jaques Yard, Wrexham			Borehole Number BH106	
Boring Method Cable Percussion		Casing Diameter 150mm cased to 11.00m			Ground Level (mOD) 4.04		Client Castlemead Homes Ltd			Job Number RCM4642				
		Location 3.00332 E 53.049 N			Dates 20/08/2007		Engineer Aaron Cousins			Sheet 2/2				
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr				
					-7.76	(2.80) 11.80								
							Complete at 11.80m							
Remarks								Scale (approx)	Logged By					
								1:50	AC					
								Figure No. RCM4642.BH106						

Appendix B
Groundwater Analytical Data



ALcontrol Geochem

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.co.uk
website: www.alcontrol.co.uk

RPS Consultants Ltd
52 Princess Street
Manchester
M1 6JX

ATTN: Aaron Cousins

CERTIFICATE OF ANALYSIS

Date: 25 October, 2007

Our Reference: 07/16941/02/01

Your Reference:

Location: JAQUES YARD

A total of 44 samples was received for analysis on Wednesday, 26 September 2007 and completed on Thursday, 11 October 2007. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

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

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.

Signed

Diane Whittlestone
Customer Services

Jane Seymour
Customer Services

David O'Hare
Customer Services

Caroline Suttie
Customer Services

Valid if signed by any of the above signatories.

Compiled By

Laura Parr



ALcontrol Geochem

TEST SCHEDULE

JOB NUMBER: 07/16941/02

CLIENT : RPS Consultants Ltd

CONTACT : Aaron Cousins

DATE OF RECEIPT : 26/09/07

LOCATION : JAKES YARD

BATCH NUMBER: 1

CLIENT REF/CODE:

ORDER NUMBER : 02454

TURNAROUND : 5 days

Numeric values indicate additional scheduling

* indicates test subcontracted

[illegible]

BATCH NUMBER : 1
CLIENT REF/CODE :
ORDER NUMBER : 02454
TURNAROUND : 5 days

Numeric values indicate additional scheduling

* Indicates test subcontracted

[illegible]

ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/16941/02

CLIENT : RPS Consultants Ltd

CONTACT : Aaron Cousins

DATE OF RECEIPT : 26/09/07

LOCATION : JAQUES YARD

BATCH NUMBER : 1

CLIENT REF/CODE :

ORDER NUMBER : 02454

TURNAROUND : 5 days

Numeric values indicate
additional scheduling

* indicates test subcontracted

UKAS Accredited ?	Sample Identity	Sample Number	P / V	Depth	Sample Type		Total Number of Tests	
					Mercury Total (CVAA) (HNO3) (W)		5	5
					Lead Total MS (HNO3) (W)		5	5
					Copper Total MS (HNO3) (W)		5	5
					Chromium Total MS (HNO3) (W)		5	5
					Cadmium Total MS (HNO3) (W)		5	5
					Arsenic Total MS (HNO3) (W)		5	5
✓					VOC MS (W)		7	7
					SVOC Inc PAH MS (W)		7	7
					PAH Spec MS Aqueous (W)		7	7
					PCB 7 Congeners (W)		7	7
✓					GRO CWG GC (W)		7	7
					EPH CWG GC Aqueous (W)		7	7
✓					Ammoniacal Nitrogen as N (W)		7	7
✓					Cyanide Total (W)		7	7
✓					Cyanide Free (W)		7	7
✓					Take NaOH (W)		2	2
✓					Boron ICP-MS (W)		0	0
✓					Vanadium ICP-MS (W)		2	2
✓					Beryllium (ICP-MS) (W)		2	2
✓					Barium ICP-MS (W)		2	2
✓					Mercury Dissolved (W) (CVAA)		2	2
✓					Metals ICP-MS 9 (W)		2	2
✓					Conductivity (W)		7	7
✓					pH (W)		7	7

ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/16941/02

CLIENT : RPS Consultants Ltd

CONTACT : Aaron Cousins

DATE OF RECEIPT : 26/09/07

LOCATION : JAQUES YARD

BATCH NUMBER : 1

CLIENT REF/CODE :

ORDER NUMBER : 02454

TURNAROUND : 5 days

Numeric values indicate
additional scheduling

* indicates test subcontracted

Sample Number	Sample Identity	UKAS Accredited ?		P / V	Depth	Sample Type	Nickel Total MS (HNO3) /W	Selenium Total MS (HNO3) /W	Zinc Total MS (HNO3) /W	Barium Total MS (HNO3) /W	Beryllium Total MS (HNO3) /W	Vanadium Total MS (HNO3) /W	Boron Total MS (HNO3) /W										
1	BH101	1glass	-	LIQUID																			
2	BH101	1plastic	-	LIQUID			X	X	X	X	X	X	X										
3	BH101	2SO4 125ml	-	LIQUID																			
4	BH101	2SO4 125ml	-	LIQUID			Sample on Hold																
5	BH101	Vial	-	LIQUID																			
6	BH101	Vial	-	LIQUID																			
7	BH102	1glass	-	LIQUID																			
8	BH102	1plastic	-	LIQUID			X	X	X	X	X	X	X										
9	BH102	2SO4 125ml	-	LIQUID																			
10	BH102	NaOH	-	LIQUID																			
11	BH102	NaOH	-	LIQUID			Sample on Hold																
12	BH102	Vial	-	LIQUID																			
13	BH102	Vial	-	LIQUID																			
14	BH103	1glass	-	LIQUID																			
15	BH103	1plastic	-	LIQUID			X	X	X	X	X	X	X										
16	BH103	NaOH	-	LIQUID																			
17	BH103	NaOH	-	LIQUID			Sample on Hold																
18	BH103	Vial	-	LIQUID																			
19	BH103	Vial	-	LIQUID																			
20	BH104	1glass	-	LIQUID																			
21	BH104	1plastic	-	LIQUID			X	X	X	X	X	X	X										
22	BH104	NaOH	-	LIQUID																			

ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/16941/02
CLIENT : RPS Consultants Ltd
CONTACT : Aaron Cousins
DATE OF RECEIPT : 26/09/07
LOCATION : JAKUES YARD

BATCH NUMBER : 1
CLIENT REF/CODE :
ORDER NUMBER : 02454
TURNAROUND : 5 days

Numeric values indicate
 additional scheduling
 * Indicates test subcontracted

Sample Number	Sample Identity	P / V	Depth	UKAS Accredited ?	Sample on Hold									
					Nickel Total MS (HNO3) (W)	Selenium Total MS (HNO3) (W)	Zinc Total MS (HNO3) (W)	Barium Total MS (HNO3) (W)	Beryllium Total MS (HNO3) (W)	Vanadium Total MS (HNO3) (W)	Boron Total MS (HNO3) (W)			
23	BH104	NaOH	-	LIQUID										
24	BH104	Vial	-	LIQUID										
25	BH104	Vial	-	LIQUID										
26	BH106	1glass	-	LIQUID										
27	BH106	1plastic	-	LIQUID	X	X	X	X	X	X	X			
28	BH106	2SO4 125r	-	LIQUID										
29	BH106	Vial	-	LIQUID										
30	BH106	Vial	-	LIQUID										
31	SW1	1glass	-	LIQUID										
32	SW1	1glass	-	LIQUID										
33	SW1	1plastic	-	LIQUID										
34	SW1	2SO4 125r	-	LIQUID										
35	SW1	NaOH	-	LIQUID										
36	SW1	Vial	-	LIQUID										
37	SW1	Vial	-	LIQUID										
38	SW2	1glass	-	LIQUID										
39	SW2	1glass	-	LIQUID										
40	SW2	1plastic	-	LIQUID										
41	SW2	2SO4 125r	-	LIQUID										
42	SW2	NaOH	-	LIQUID										
43	SW2	Vial	-	LIQUID										
44	SW2	Vial	-	LIQUID										

ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/16941/02
 CLIENT : RPS Consultants Ltd
 CONTACT : Aaron Cousins
 DATE OF RECEIPT : 26/09/07
 LOCATION : JAKUES YARD

BATCH NUMBER : 1
 CLIENT REF/CODE :
 ORDER NUMBER : 02454
 TURNAROUND : 5 days

Numeric values indicate
 additional scheduling
 * indicates test subcontracted

Sample Identity	Sample Number	P / V	Depth	Sample Type	UKAS Accredited ?	Total Number of Tests														
						5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
				Nickel Total MS (HNO3) /AO		5														
				Selenium Total MS (HNO3) /AO		5														
				Zinc Total MS (HNO3) /AO		5														
				Barium Total MS (HNO3) /AO		5														
				Beryllium Total MS (HNO3) /AO		5														
				Vanadium Total MS (HNO3) /AO		5														
				Boron Total MS (HNO3) /AO		5														

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/16941/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2				
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Sample Received Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	1-6	7-13	14-19	20-25	26-30	31-37	38-44				
										Method Code	Lod/Units
Arsenic Dissolved (ICP-MS)	-	-	-	-	-	<1	<1			TM152 [#]	<1 ug/l
Barium Dissolved (ICP-MS)	-	-	-	-	-	43	43			TM152 [#]	<1 ug/l
Beryllium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1			TM152 [#]	<1 ug/l
Boron Dissolved (ICP-MS)	-	-	-	-	-	<10	<10			TM152 [#]	<10 ug/l
Cadmium Dissolved (ICP-MS)	-	-	-	-	-	<0.4	<0.4			TM152 [#]	<0.4 ug/l
Chromium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1			TM152 [#]	<1 ug/l
Copper Dissolved (ICP-MS)	-	-	-	-	-	2	12			TM152 [#]	<1 ug/l
Lead Dissolved (ICP-MS)	-	-	-	-	-	<1	<1			TM152 [#]	<1 ug/l
Nickel Dissolved (ICP-MS)	-	-	-	-	-	3	3			TM152 [#]	<1 ug/l
Selenium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1			TM152 [#]	<1 ug/l
Vanadium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1			TM152 [#]	<1 ug/l
Zinc Dissolved (ICP-MS)	-	-	-	-	-	17	9			TM152 [#]	<3 ug/l
Arsenic Total (HNO3 Digest)	2	8	5	2	3	-	-			TM152	<1 ug/l
Barium Total (HNO3 Digest)	74	150	220	73	86	-	-			TM152	<1 ug/l
Beryllium Total (HNO3 Digest)	<1	<1	<1	<1	<1	-	-			TM152	<1 ug/l
Boron Total (HNO3 Digest)	72	<10	180	47	80	-	-			TM152	<10 ug/l
Cadmium Total (HNO3 Digest)	<0.4	<0.4	<0.4	<0.4	<0.4	-	-			TM152	<0.4 ug/l
Chromium Total (HNO3 Digest)	3	3	2	3	5	-	-			TM152	<1 ug/l
Copper Total (HNO3 Digest)	7	2	11	16	3	-	-			TM152	<1 ug/l
Lead Total (HNO3 Digest)	<1	<1	<1	<1	4	-	-			TM152	<1 ug/l
Nickel Total (HNO3 Digest)	4	8	8	7	6	-	-			TM152	<1 ug/l
Selenium Total (HNO3 Digest)	7	7	10	8	11	-	-			TM152	<1 ug/l
Vanadium Total (HNO3 Digest)	<1	1	<1	<1	<1	-	-			TM152	<1 ug/l
Zinc Total (HNO3 Digest)	82	67	120	82	68	-	-			TM152	<3 ug/l
Mercury Dissolved (CVAA)	-	-	-	-	-	<0.05	<0.05			TM127 [#]	<0.05 ug/l
Mercury Total (HNO3 Digest)	<0.05	<0.05	<0.05	<0.05	<0.05	-	-			TM127	<0.05 ug/l
Conductivity (at 25 deg.C)	0.80	0.82	0.91	0.80	0.75	0.60	0.96			TM120 [#]	<0.014 mS/cm
Ammoniacal Nitrogen as N	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2			TM099 [#]	<0.2 mg/l
Total Cyanide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			TM153 [#]	<0.05 mg/l
Free Cyanide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			TM153 [#]	<0.05 mg/l
pH Value	8.12	8.17	8.12	8.16	8.08	8.43	8.43			TM133 [#]	<1.00 pH Units

Date 25.10.2007

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- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

[illegible]

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- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

[illegible]

Date 25.10.2007

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ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

[illegible]

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Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/16941/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2				
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Sample Received Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	1-6	7-13	14-19	20-25	26-30	31-37	38-44				
SVOC by GCMS											
Phenols											
2-Chlorophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2-Methylphenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2-Nitrophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,4-Dichlorophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,4,5-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Chloro-3-methylphenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Nitrophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Phenol	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
PAHs											
2-Chloronaphthalene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2-Methylnaphthalene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Acenaphthene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Anthracene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Benzo(a)anthracene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Benzo(a)pyrene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Benzo(b)fluoranthene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Benzo(ghi)perylene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Benzo(k)fluoranthene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Chrysene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Dibenzo(a,h)anthracene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Fluoranthene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Fluorene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Indeno(1,2,3-cd)pyrene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l

Date 25.10.2007

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Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/16941/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAKES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2			Method Code	LoD/Units
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Sample Received Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	1-6	7-13	14-19	20-25	26-30	31-37	38-44				
PAHs (cont)											
Naphthalene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Phenanthrene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Pyrene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Phthalates											
Bis(2-ethylhexyl) phthalate	<2	<2	<2	<2	<2	<2	<2			TM176	<2 ug/l
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Di-n-butyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Di-n-Octyl phthalate	<5	<5	<5	<5	<5	<5	<5			TM176	<5 ug/l
Diethyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Other Semi-volatiles											
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,4-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Bromophenylphenylether	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Chlorophenylphenylether	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Nitroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Azobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Bis(2-chloroethoxy)methane	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Bis(2-chloroethyl)ether	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Carbazole	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Dibenzofuran	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l

Date 25.10.2007

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» Shown on prev. report

Client Contact: Aaron Cousins

Date 25.10.2007

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ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/16941/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2			Method Code	LoD/Units
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Sample Received Date	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07	26.09.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	1-6	7-13	14-19	20-25	26-30	31-37	38-44				
Volatile Organic Compounds											
Dichlorodifluoromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Chloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Bromomethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Chloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Trichlorofluoromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
trans-1-2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Dichloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Carbon Disulphide	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Methyl Tertiary Butyl Ether	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
cis-1-2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Bromochloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Chloroform	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,1-Dichloropropene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Benzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Carbontetrachloride	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Dibromomethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Trichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
cis-1-3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
trans-1-3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
Toluene	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l
1,3-Dichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^e	<1 ug/l

Date 25.10.2007

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- >> Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Date 25.10.2007

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» Shown on prev. report

Client Contact: Aaron Cousins

Date 25.10.2007

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 07/16941/02/01
 Client: RPS Consultants Ltd
 Client Ref. No.:

Report Key :

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

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

Summary of Method Codes contained within report :

Method No.	Reference	Description	Accredited	ISO 17025	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
TM070	Modified: US EPA Method 8250 & 625	Determination of Total Polychlorinated Biphenyls (PCB's) as Aroclor 1254 and the ICE 7 Congeners by GC-MS				NA	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.				NA	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)				NA	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓			NA	
TM099	BS 2690: Part 7:1968 / BS 6068: Part 2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser	✓			NA	
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS	✓			NA	
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter	✓			NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy				NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy	✓			NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓			NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS				NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS	✓			NA	
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	✓			NA	
TM174		Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID				NA	

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

Table Of Results - Appendix

Client Ref. No.:

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP No Determination Possible

* Subcontracted test

NFD No Fibres Detected

» Result previously reported (Incremental reports only)

ISO 17025 accredited

M MCERTS Accredited

PFD **Possible Fibres Detected**

EC Equivalent Carbon (Aromatics C8-C35)

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

Summary of Method Codes contained within report :

[illegible]

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

ALcontrol Geochem Analytical Services Table Of Results - Appendix

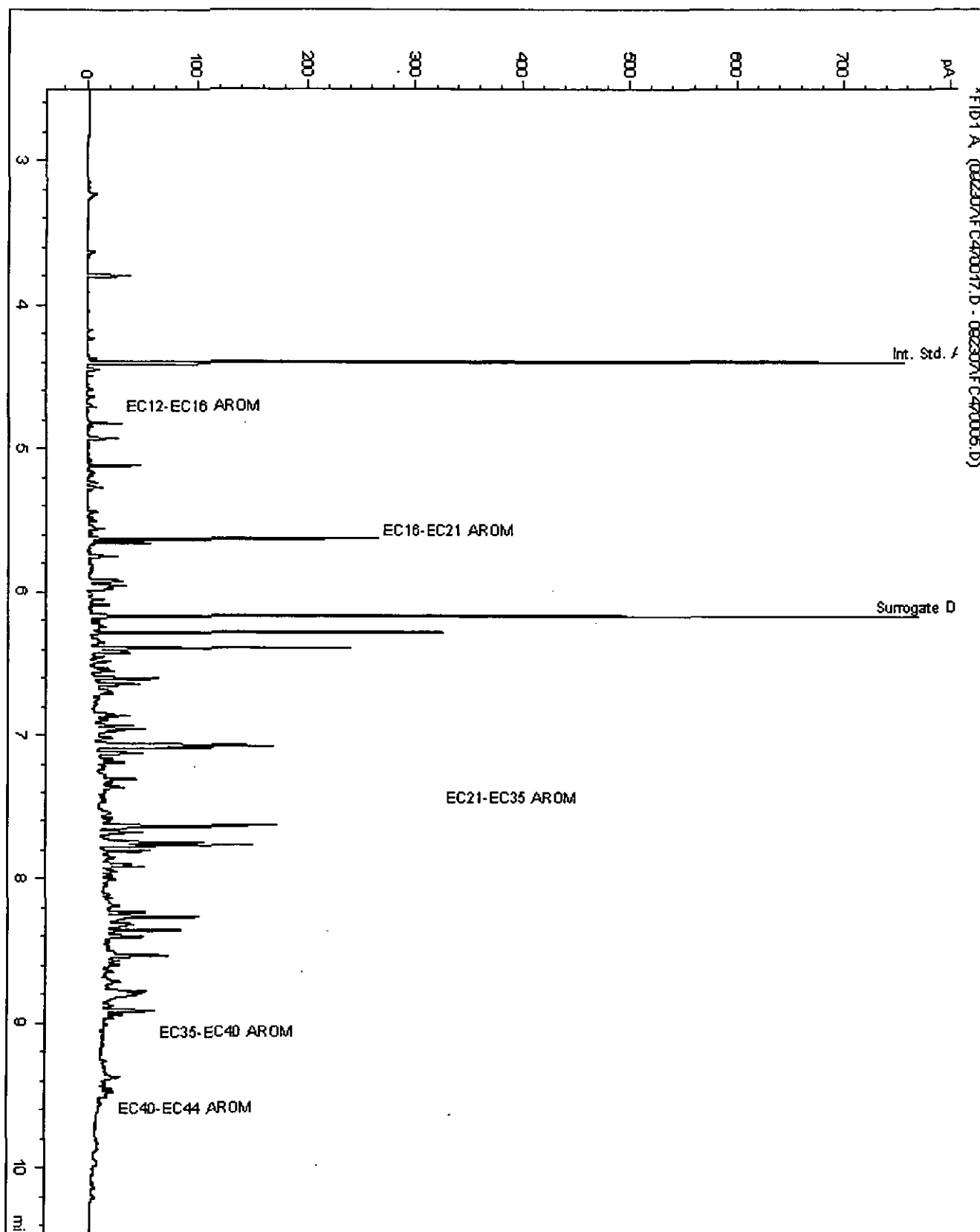
Job Number: 07/16941/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Summary of Coolbox temperatures

[illegible]

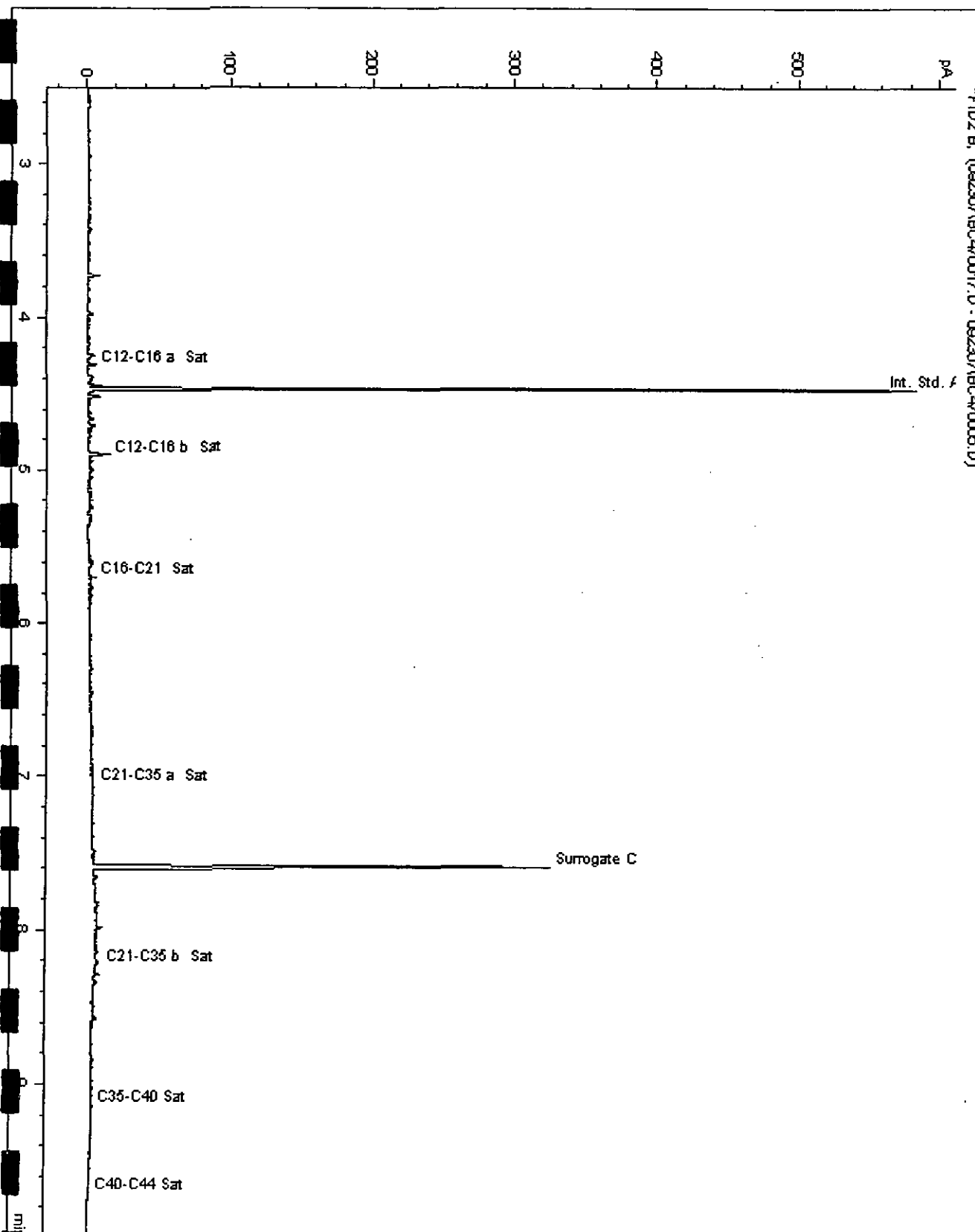
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200716491-2/S
Date Acquired : 23/09/07 21:54:57 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.000



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

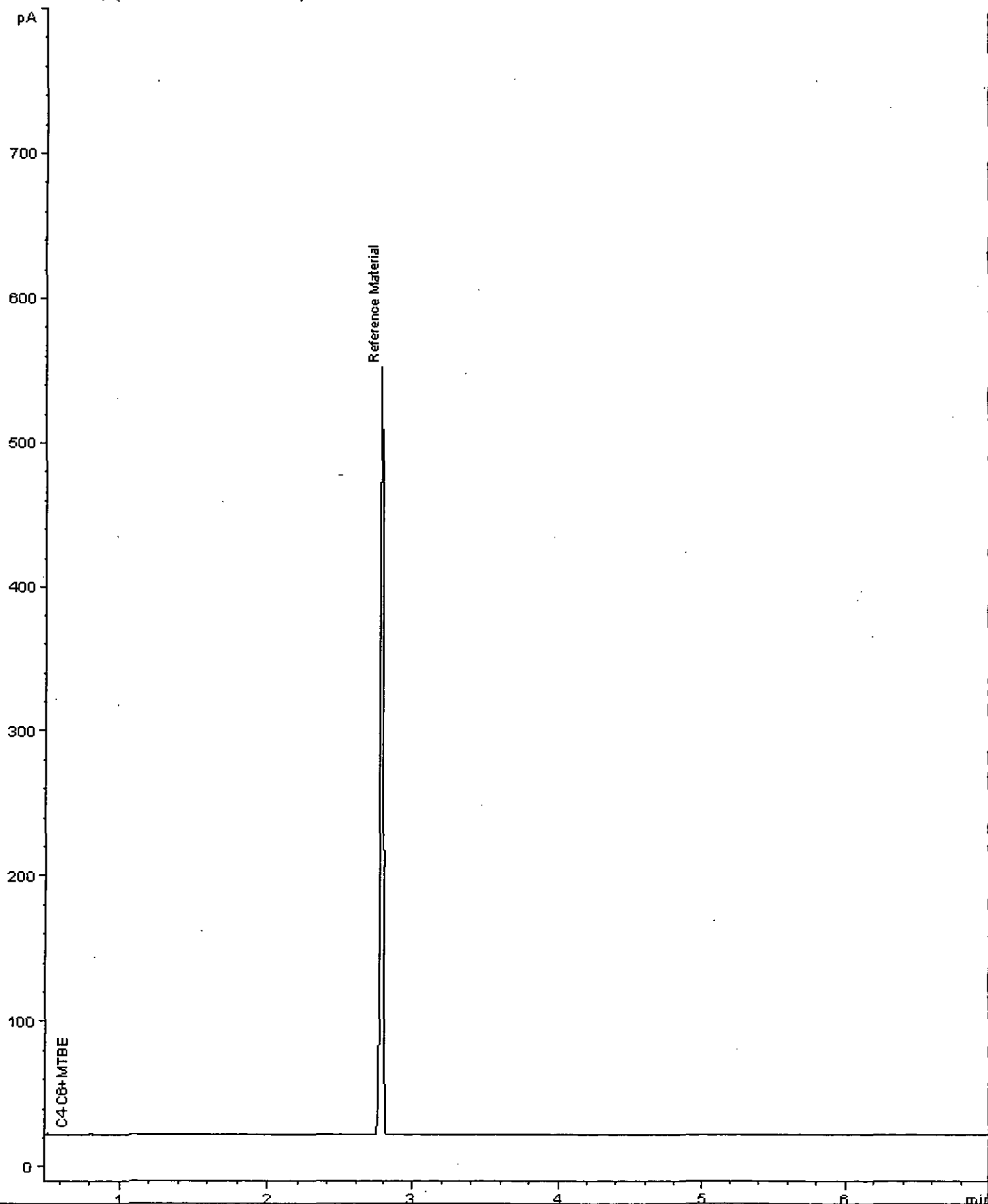
Sample Identity: 200716491-2/S
Date Acquired : 23/09/07 21:54:57 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.000



ALcontrol Geochem Analytical Services
Gasoline Range Organics

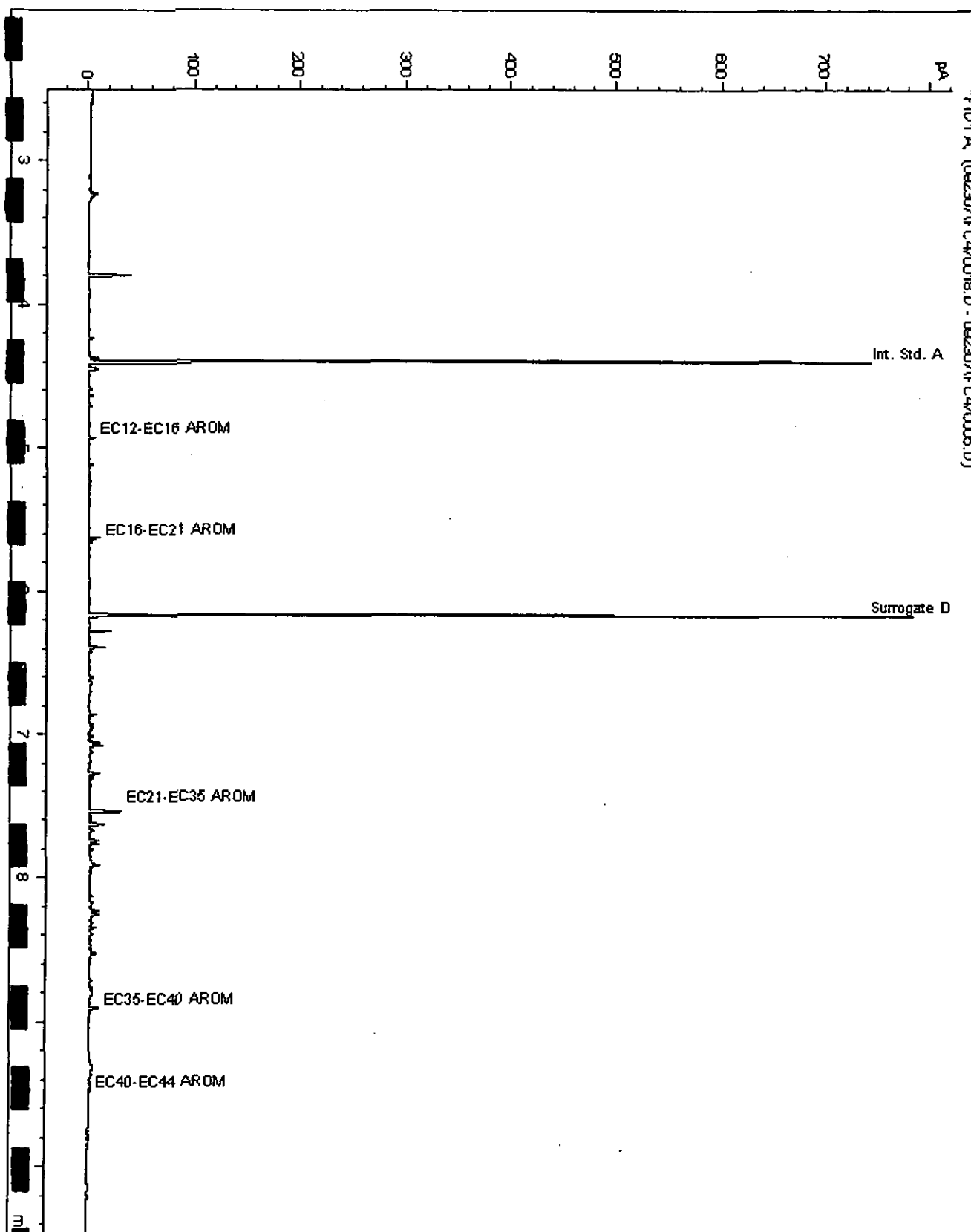
Sample Identity : 200716491-3/S
Date Acquired : 21/09/07 04:26:07 PM
Units : ppb
Dilution : 1

FID1 A, (070920VPIBROWN060.D)



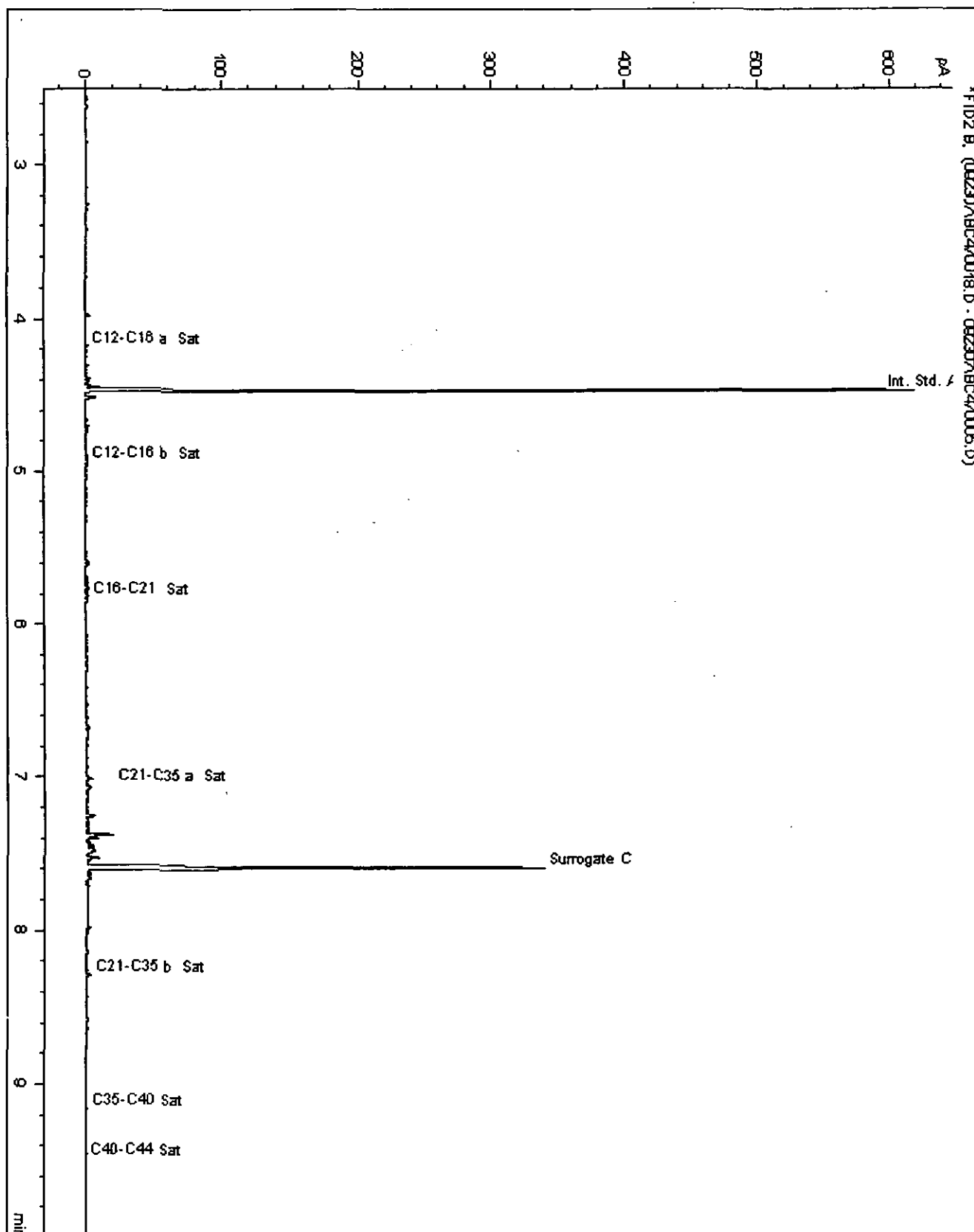
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200716491-7/S
Date Acquired : 23/09/07 22:13:35 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.001



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

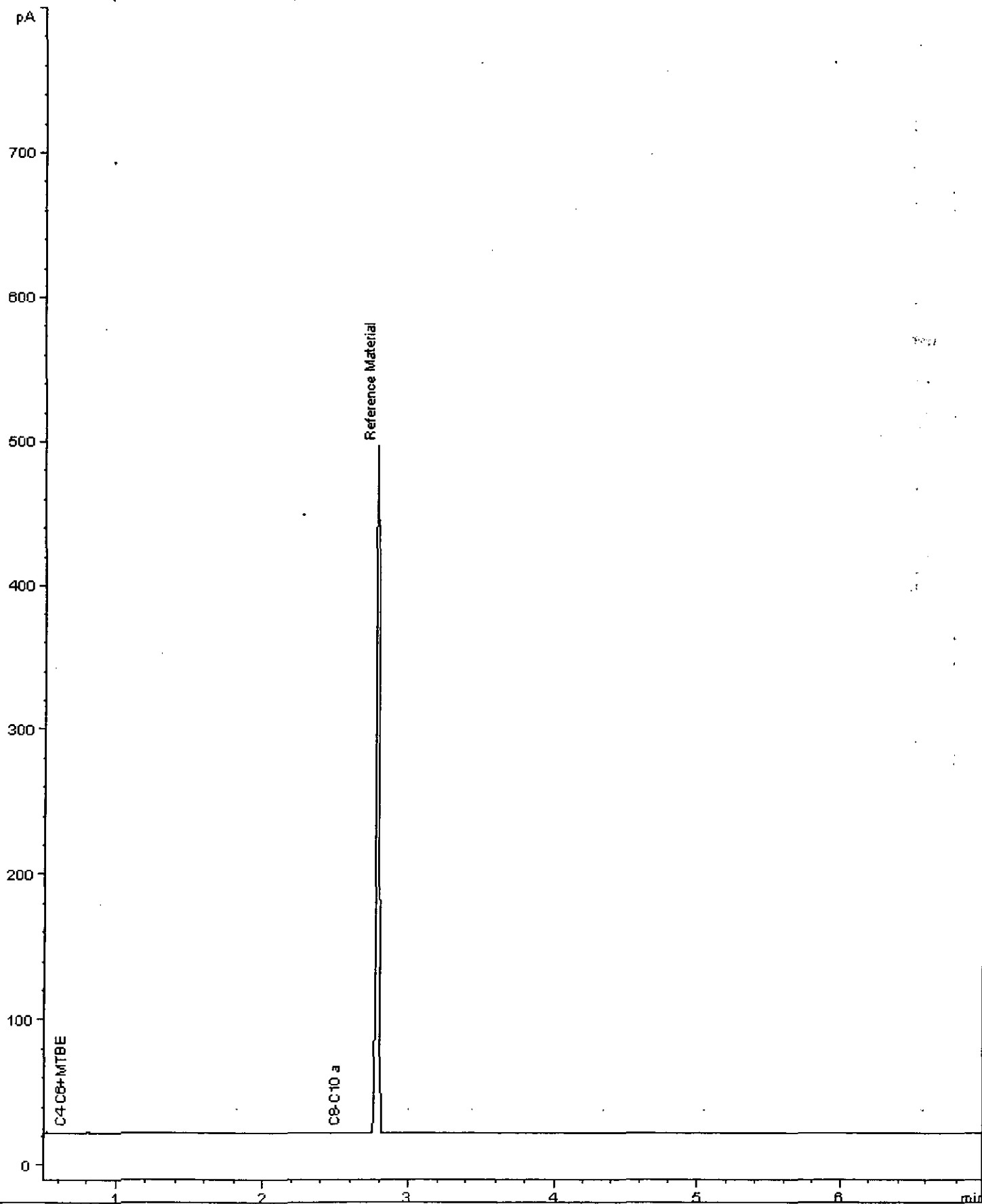
Sample Identity: 200716491-7/3
Date Acquired : 23/09/07 22:13:35 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.001



Alcontrol Geochem Analytical Services
Gasoline Range Organics

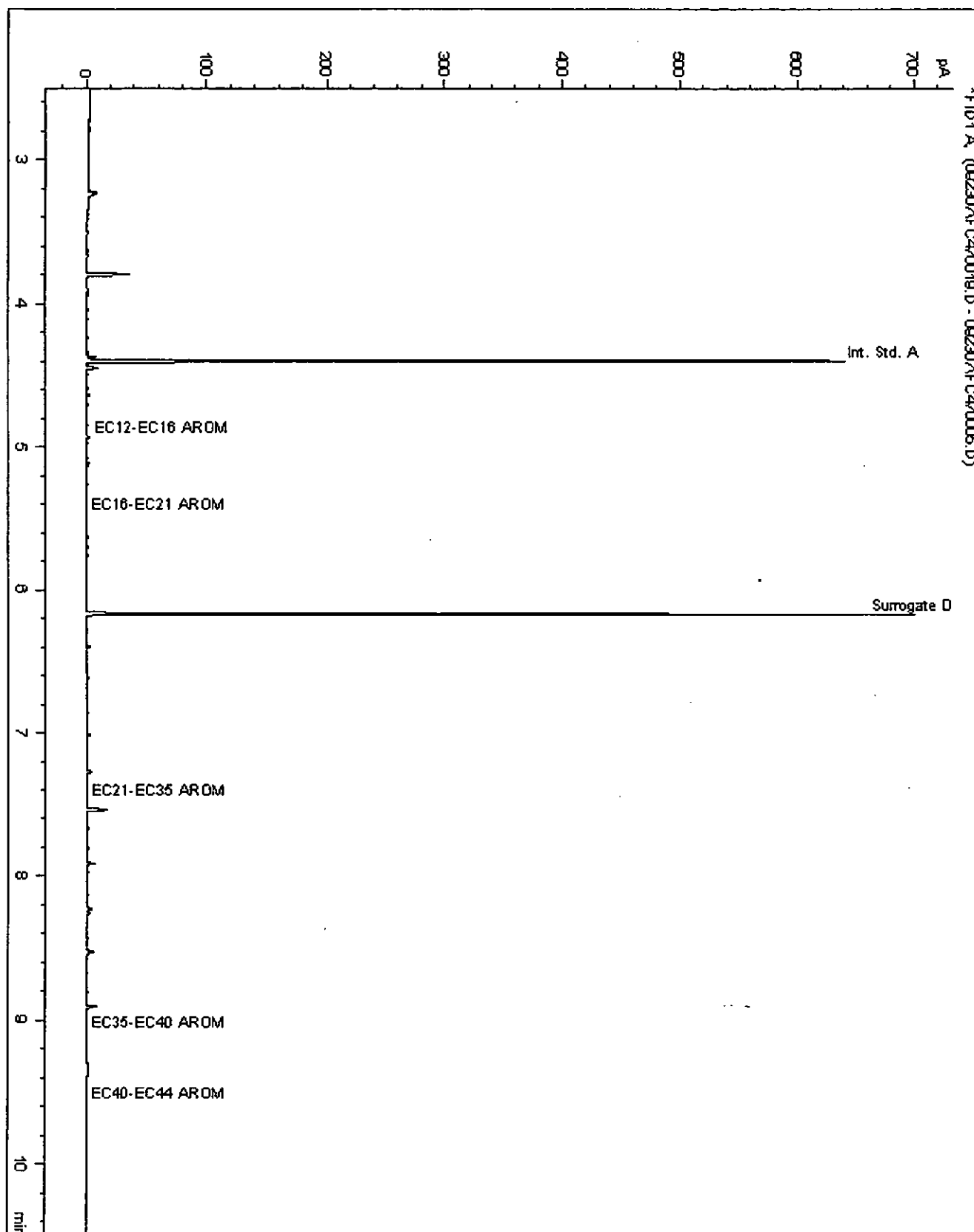
Sample Identity : 200716491-8/S
Date Acquired : 21/09/07 04:40:07 PM
Units : ppb
Dilution : 1

FID1 A, (070920VP\BROWN061.D)



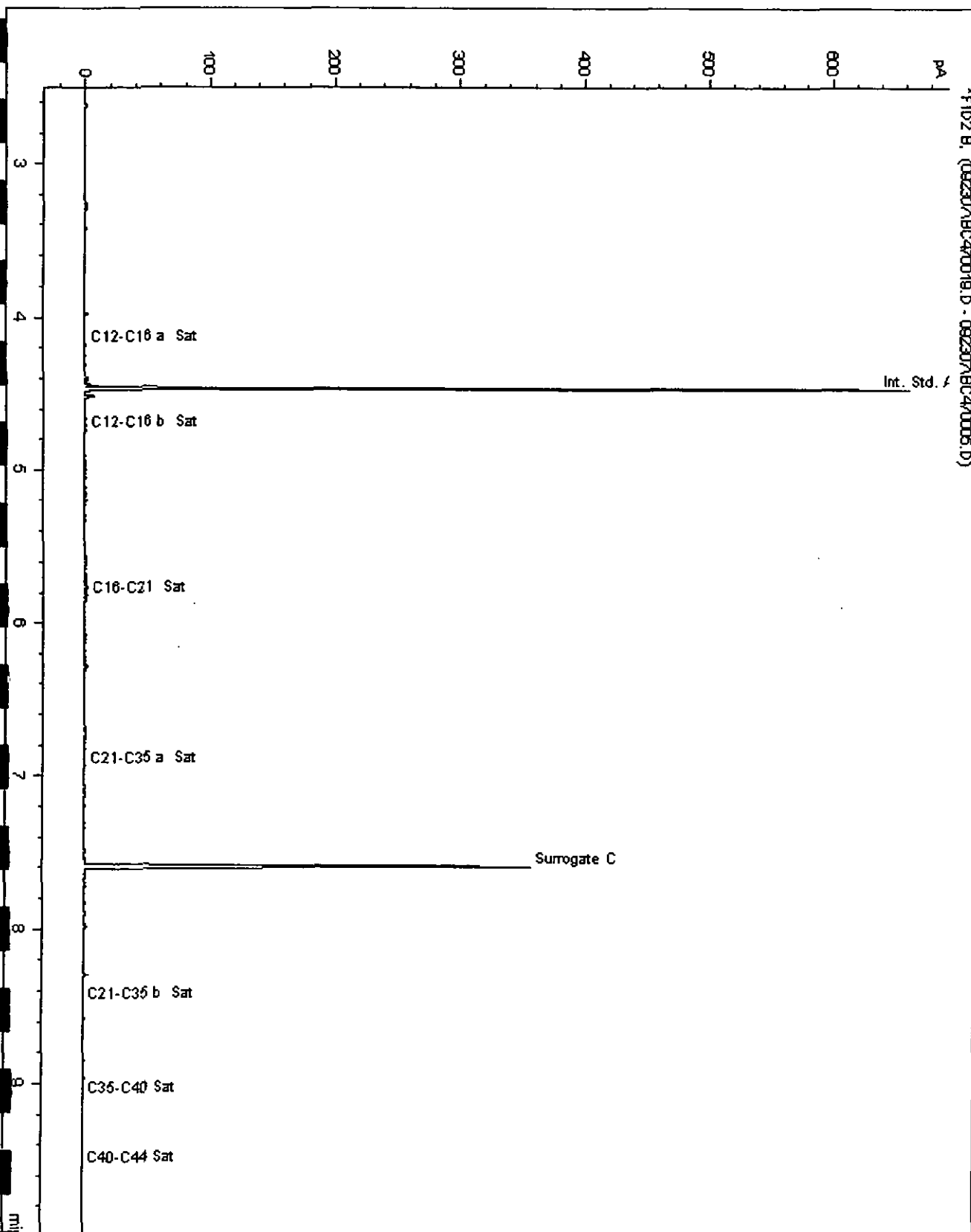
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200716491-12/S
Date Acquired : 23/09/07 22:32:13 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.995



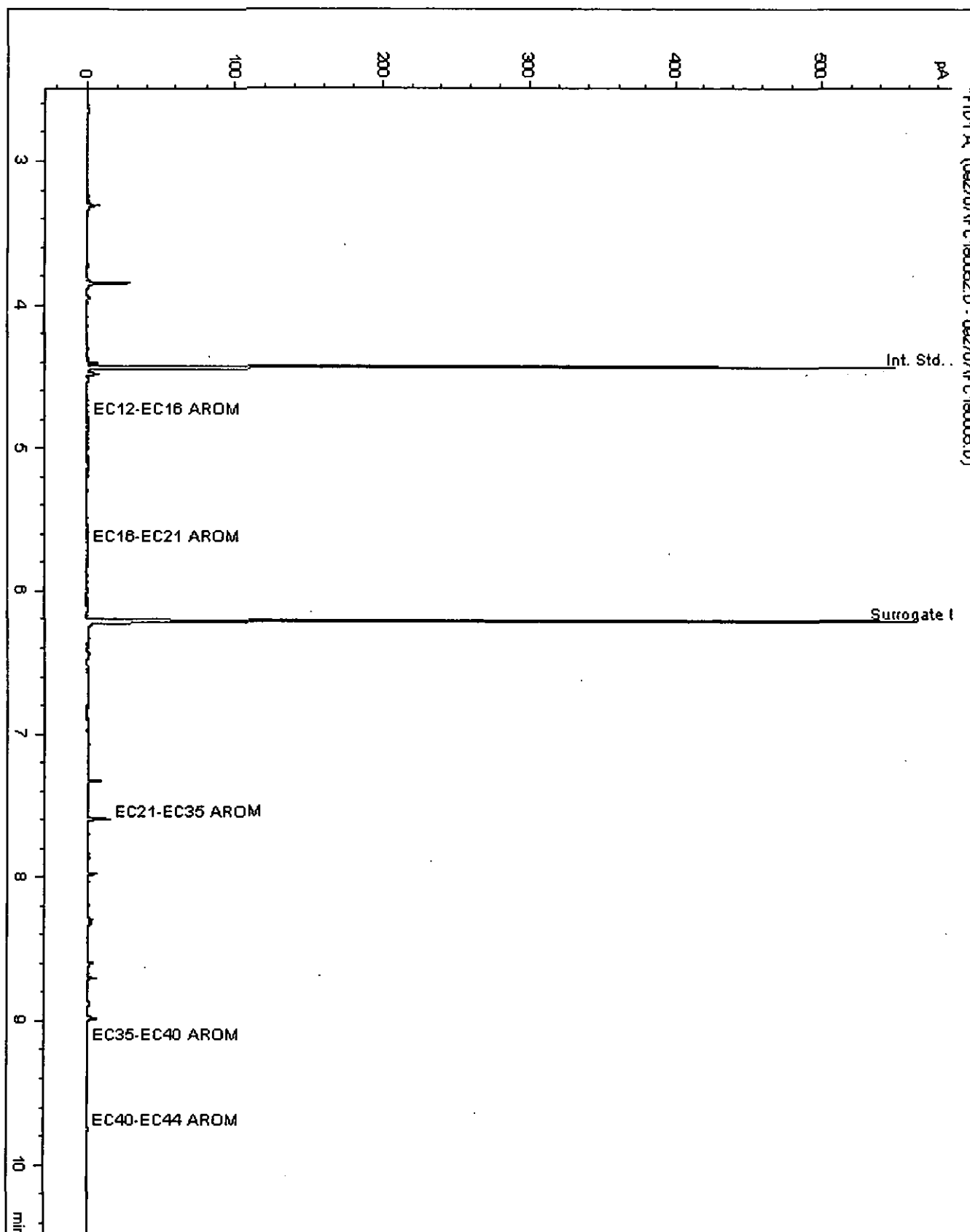
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200716491-12/S
Date Acquired : 23/09/07 22:32:13 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.995



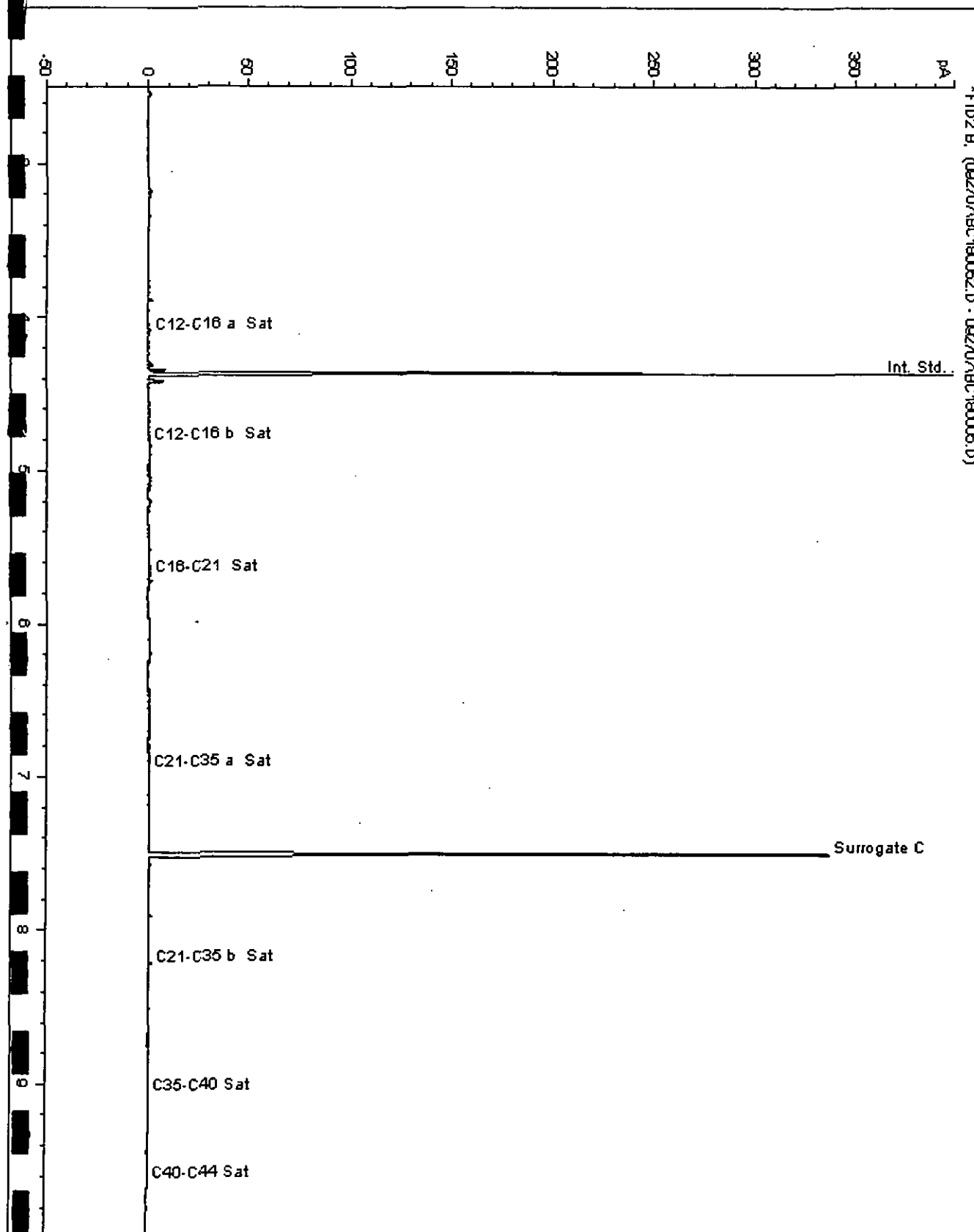
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200716491-25/S
Date Acquired : 28/09/07 01:04:31
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.003



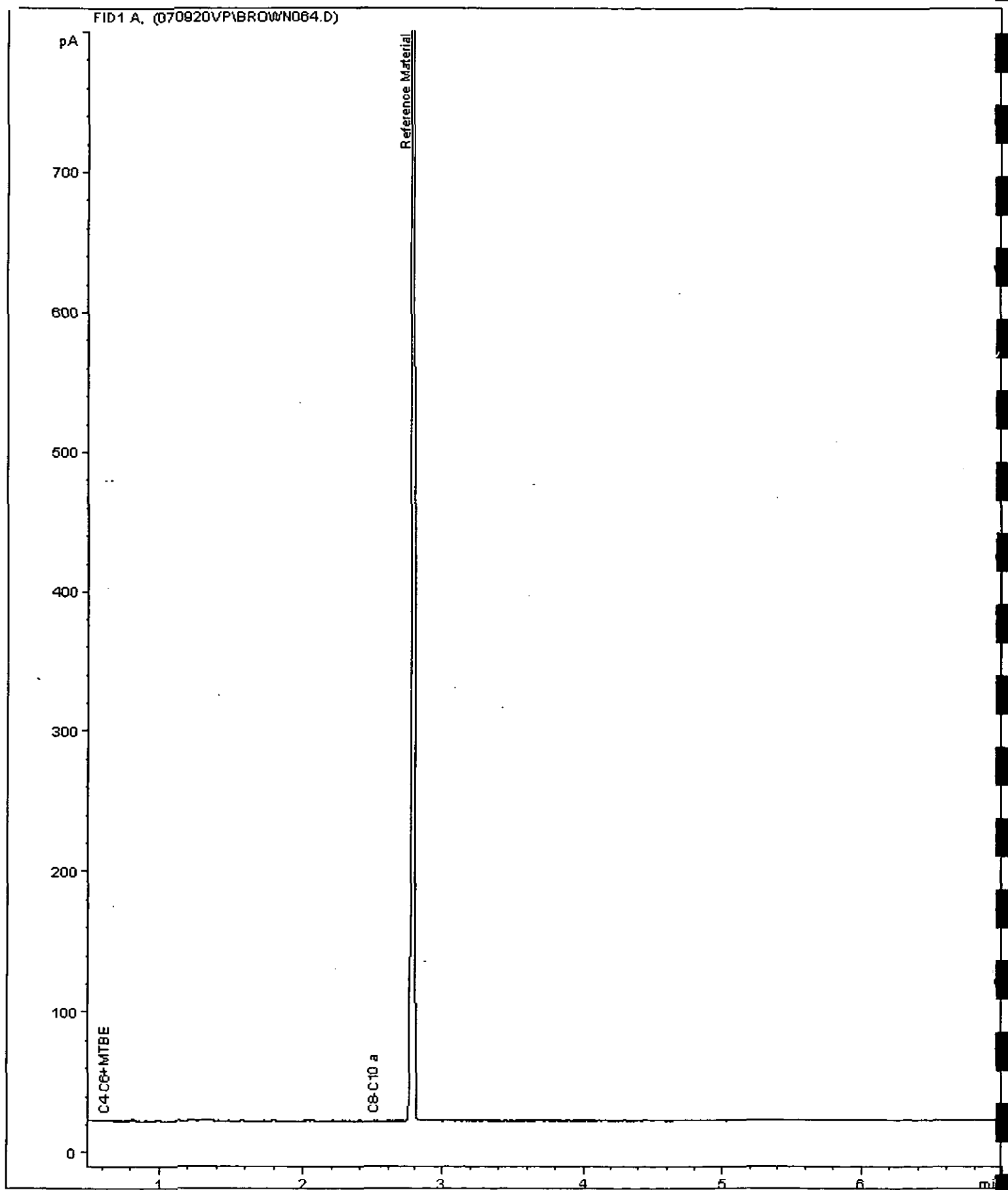
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200716491-25/3
Date Acquired : 28/09/07 01:04:31
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.003



ALcontrol Geochem Analytical Services
Gasoline Range Organics

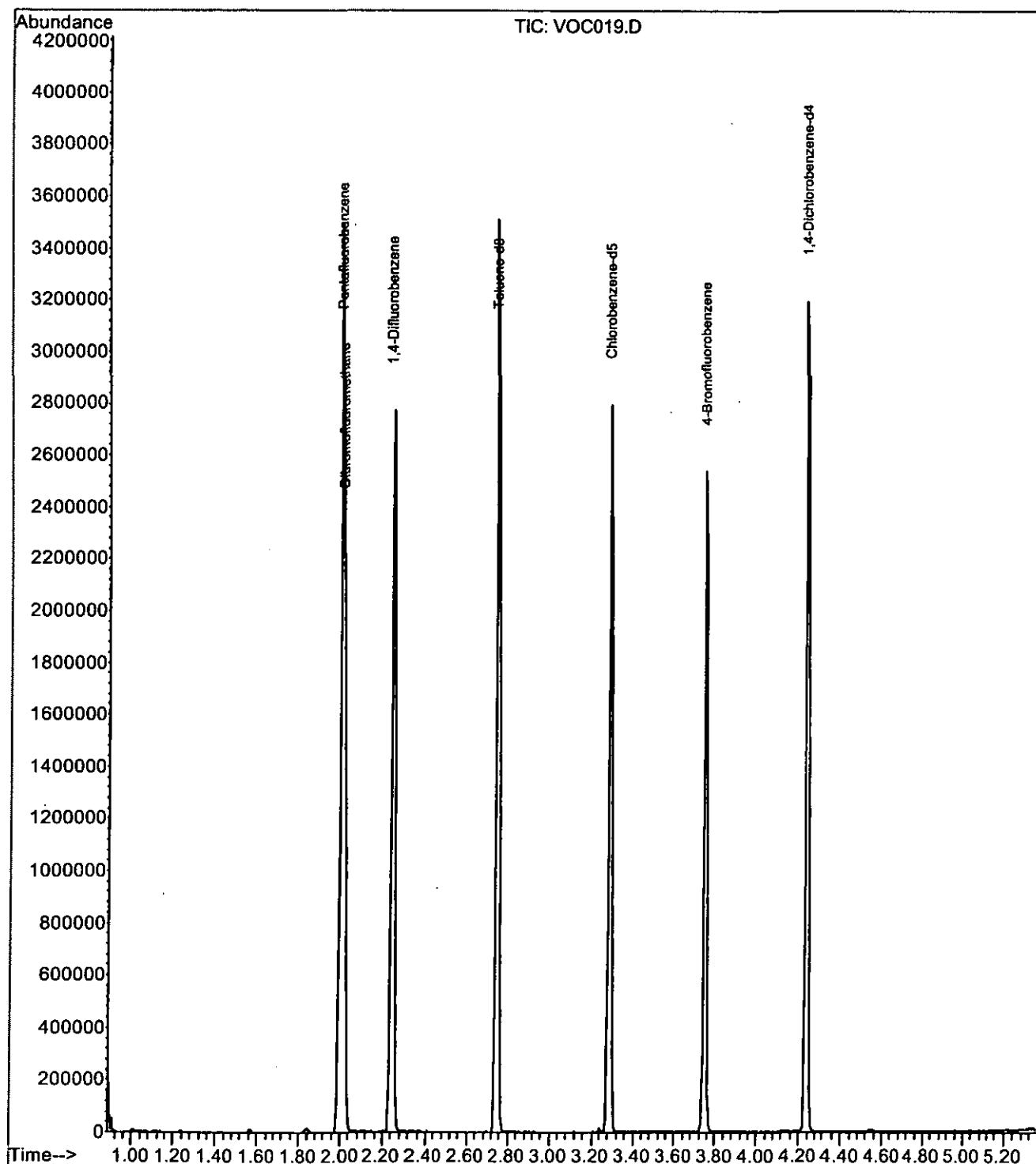
Sample Identity : 200716491-26/S
Date Acquired : 21/09/07 05:22:20 PM
Units : ppb
Dilution : 1



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
 Data File : VOC019.D
 Acq On : 28 Sep 2007 20:17
 Operator : Alcontrol Labs
 Sample : 200716941-006
 Misc : /water
 ALS Vial : 19 Sample Multiplier: 1

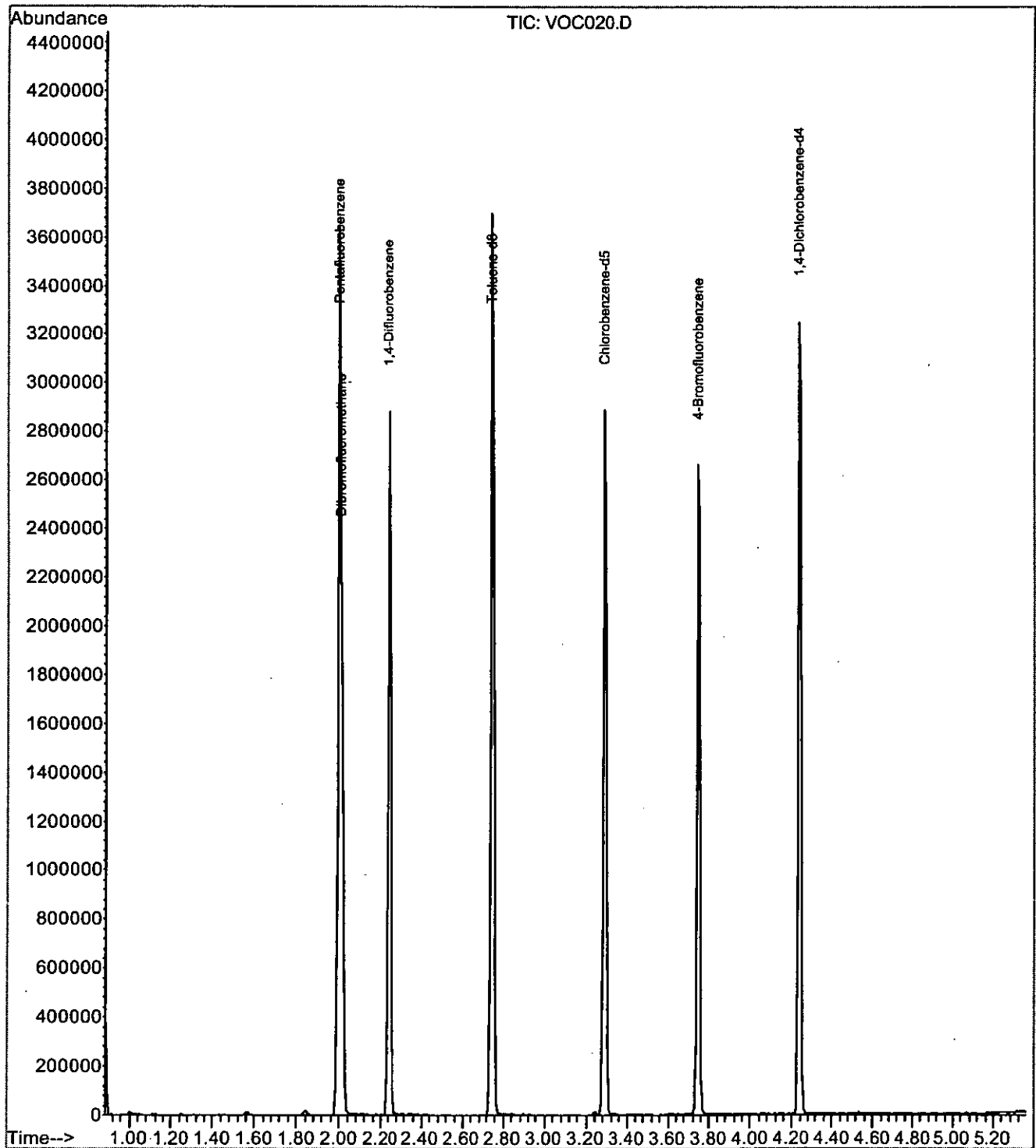
Quant Time: Oct 01 06:54:03 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Thu Sep 27 09:11:12 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
 Data File : VOC020.D
 Acq On : 28 Sep 2007 20:28
 Operator : Alcontrol Labs
 Sample : 200716941-013
 Misc : /water
 ALS Vial : 20 Sample Multiplier: 1

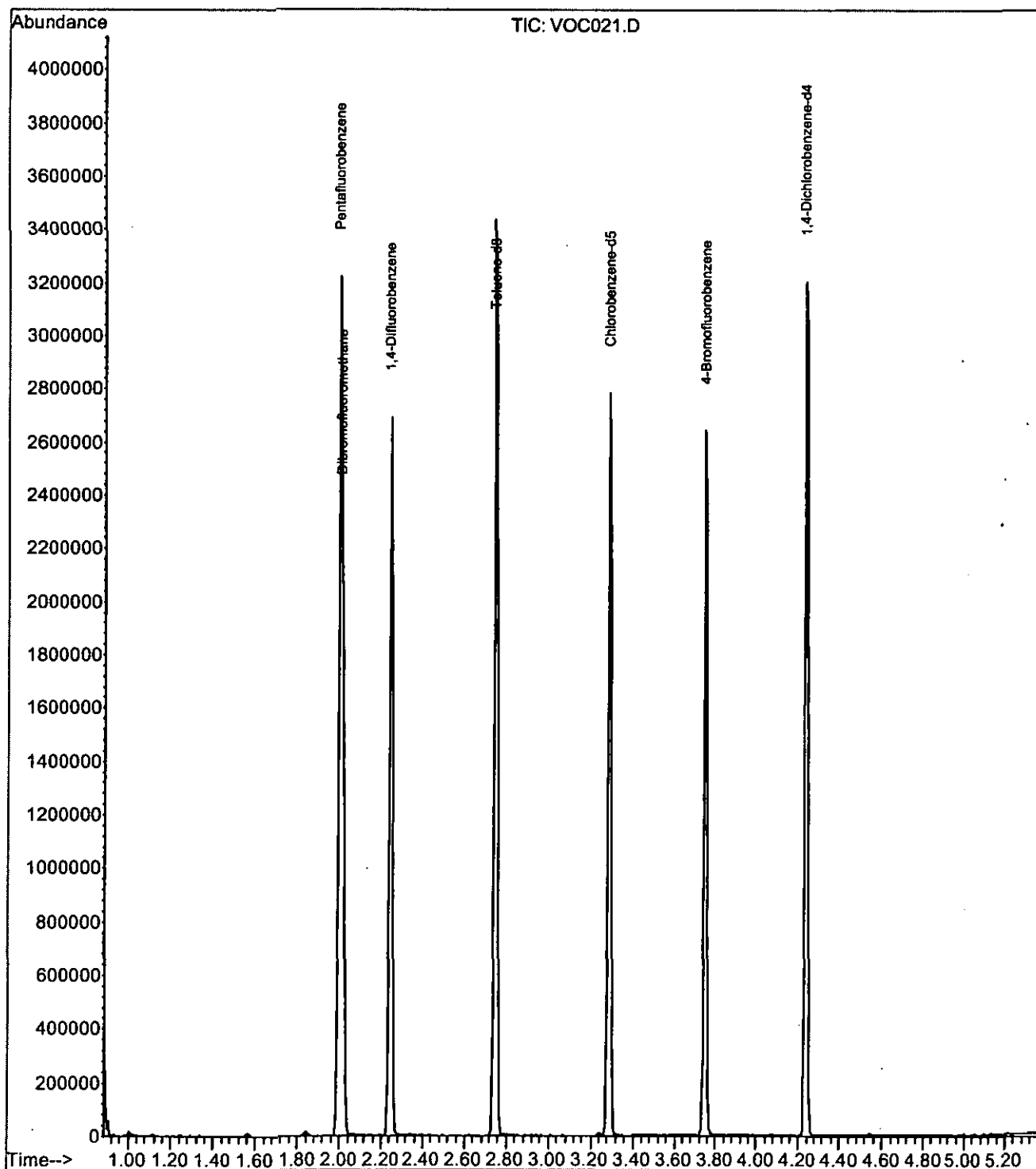
Quant Time: Oct 01 06:54:05 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Thu Sep 27 09:11:12 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
 Data File : VOC021.D
 Acq On : 28 Sep 2007 20:38
 Operator : Alcontrol Labs
 Sample : 200716941-019
 Misc : /water
 ALS Vial : 21 Sample Multiplier: 1

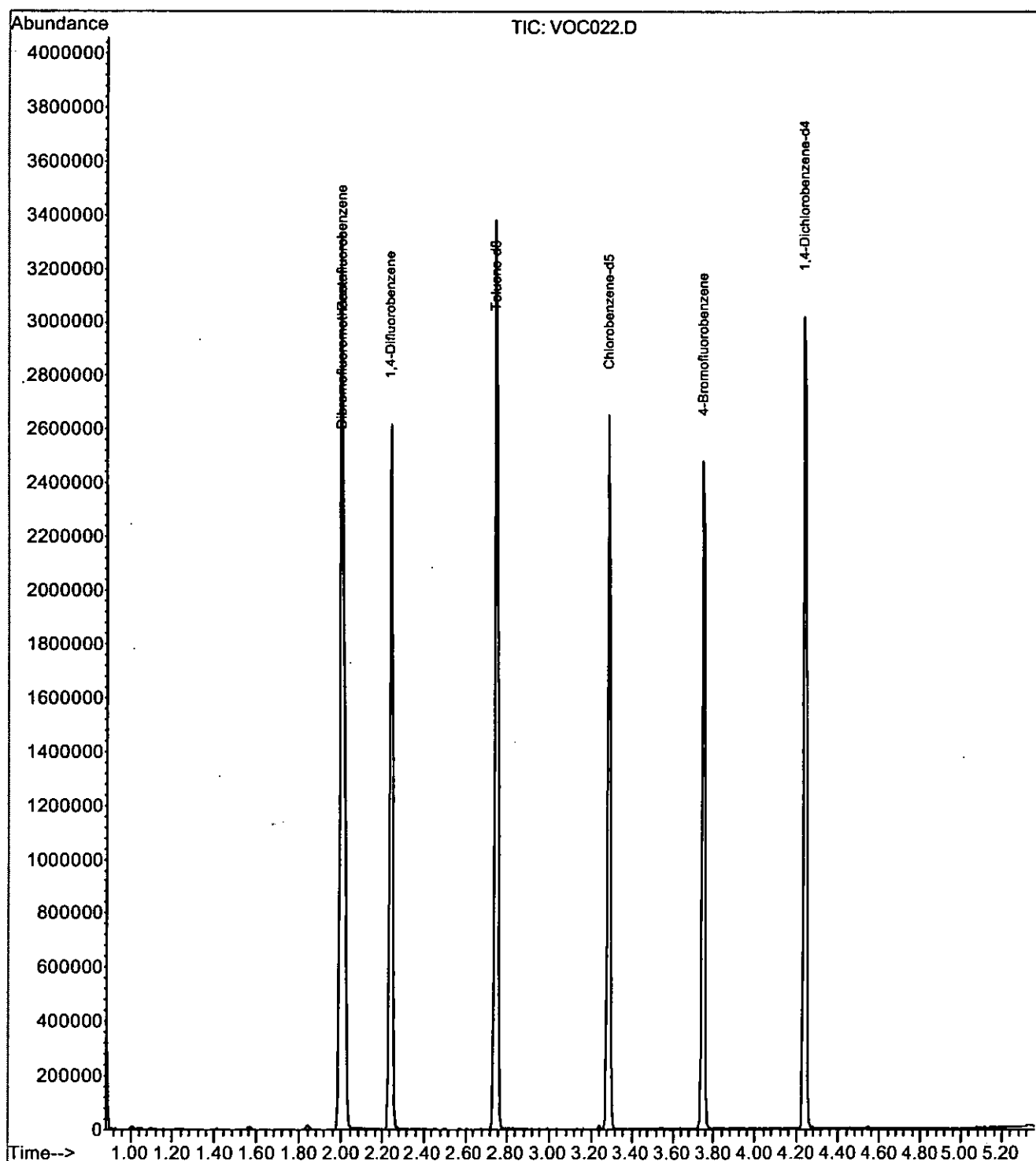
Quant Time: Oct 01 06:54:07 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Thu Sep 27 09:11:12 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
 Data File : VOC022.D
 Acq On : 28 Sep 2007 20:49
 Operator : Alcontrol Labs
 Sample : 200716941-025
 Misc : /water
 ALS Vial : 22 Sample Multiplier: 1

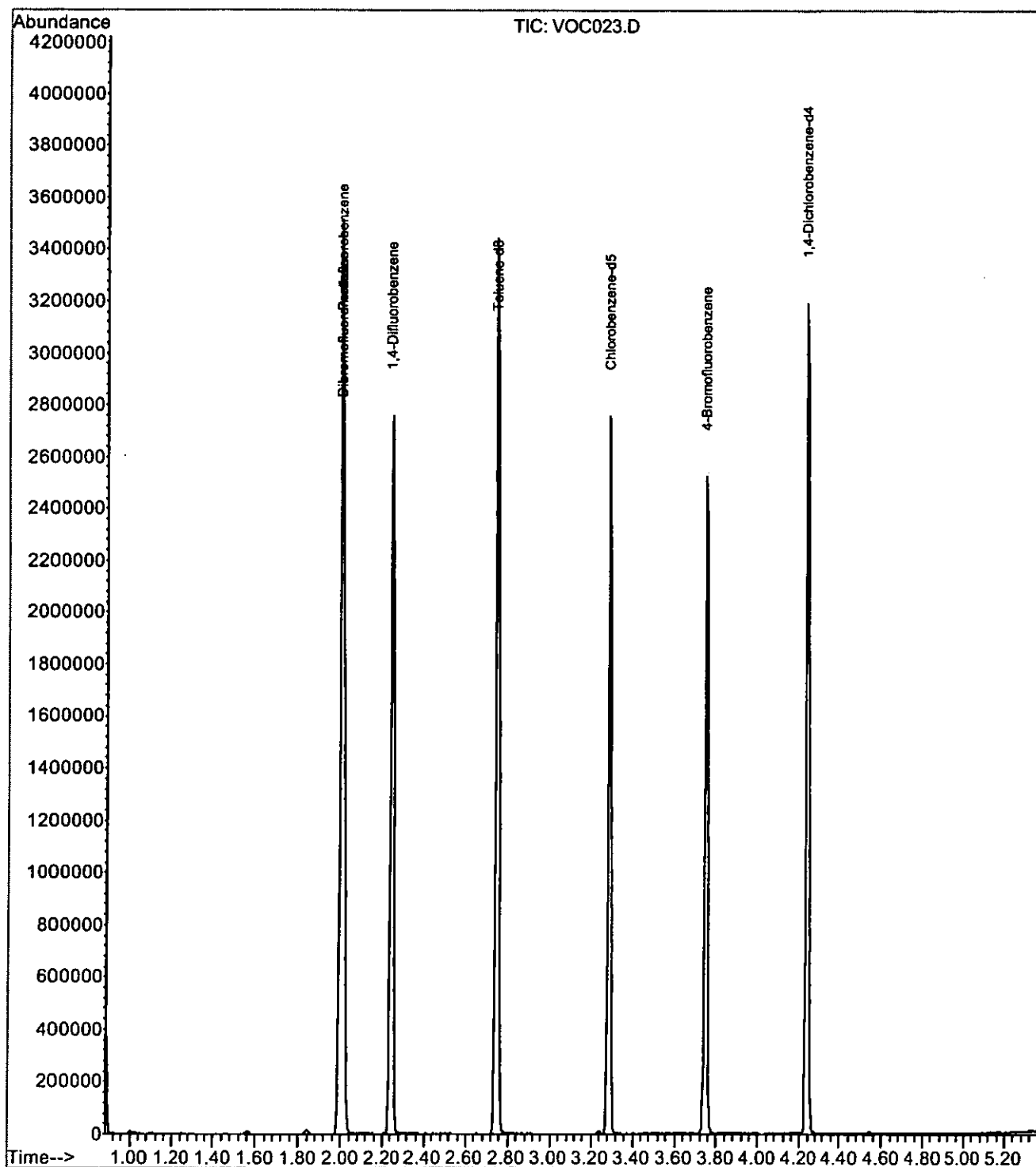
Quant Time: Oct 01 06:54:09 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Thu Sep 27 09:11:12 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
 Data File : VOC023.D
 Acq On : 28 Sep 2007 21:00
 Operator : Alcontrol Labs
 Sample : 200716941-030
 Misc : /water
 ALS Vial : 23 Sample Multiplier: 1

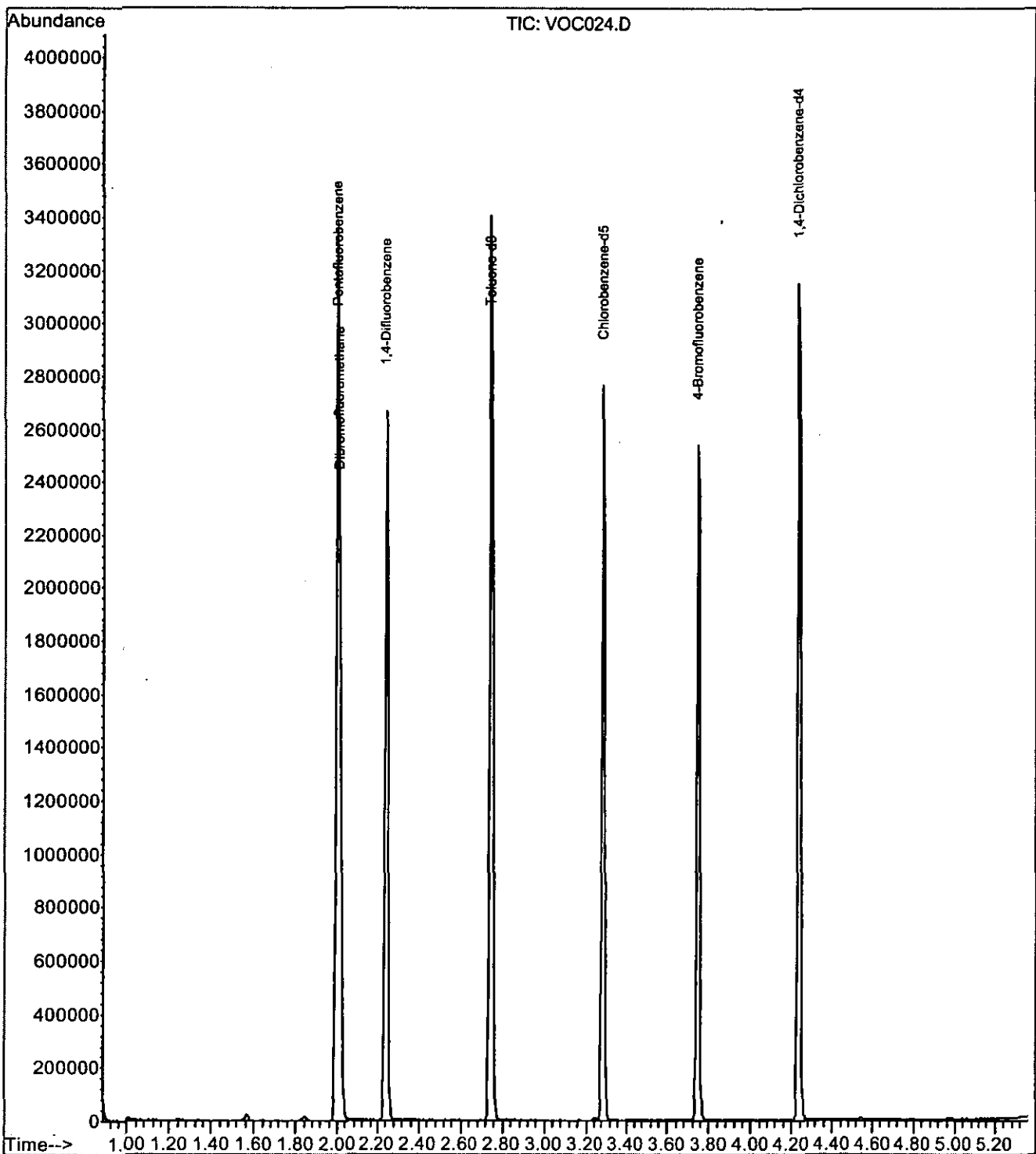
Quant Time: Oct 01 06:54:11 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Thu Sep 27 09:11:12 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
 Data File : VOC024.D
 Acq On : 28 Sep 2007 21:11
 Operator : Alcontrol Labs
 Sample : 200716941-037
 Misc : /water
 ALS Vial : 24 Sample Multiplier: 1

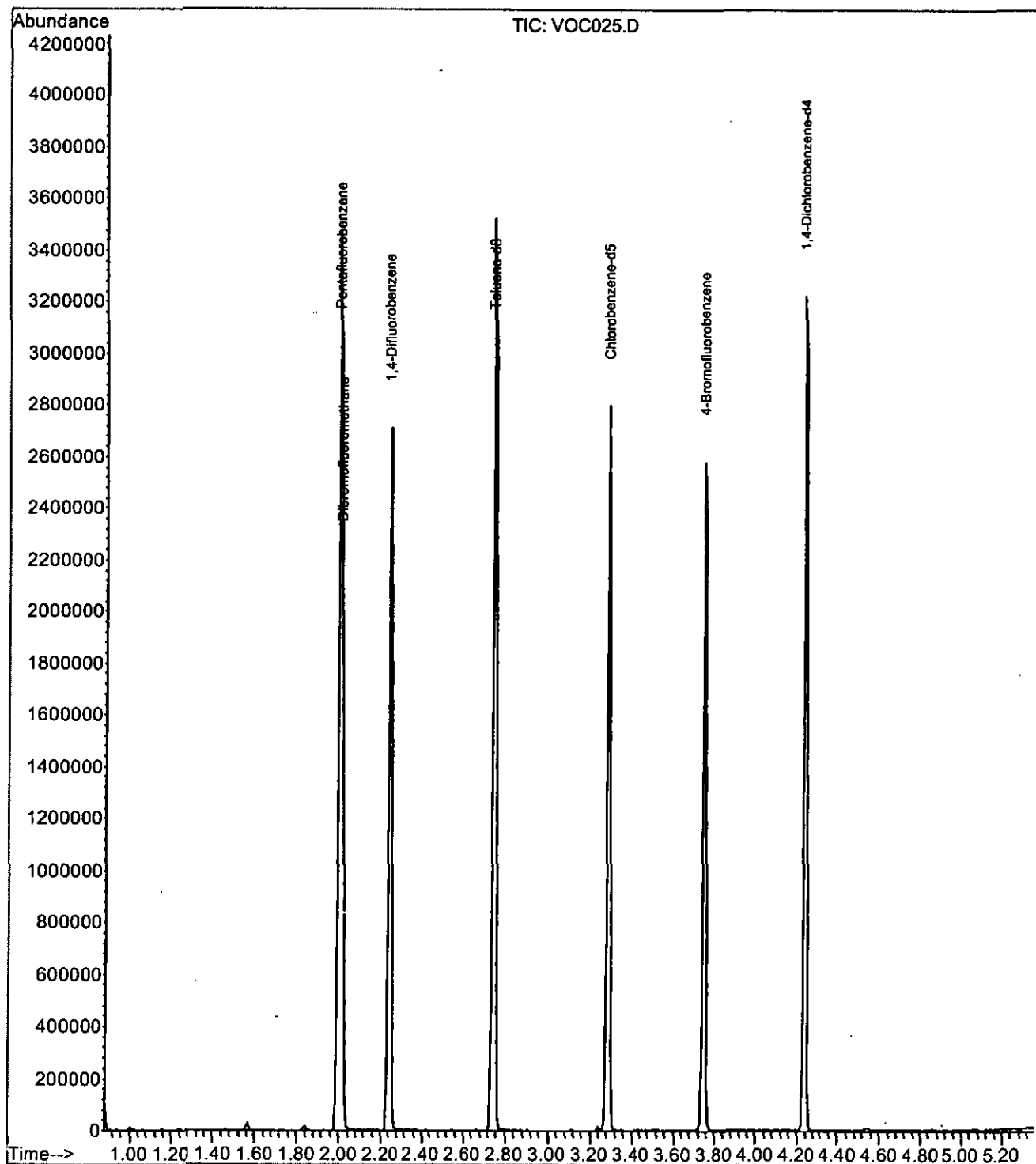
Quant Time: Oct 01 06:54:13 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Thu Sep 27 09:11:12 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\092807\
Data File : VOC025.D
Acq On : 28 Sep 2007 21:22
Operator : Alcontrol Labs
Sample : 200716941-044
Misc : /water
ALS Vial : 25 Sample Multiplier: 1

Quant Time: Oct 01 06:54:15 2007
Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
Quant Title : Volatile Organic Compounds (EPA 624/8260)
QLast Update : Thu Sep 27 09:11:12 2007
Response via : Initial Calibration



APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All 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 Geochem 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, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD – no fibres detected. If asbestos is detected, then identification is carried out by ALcontrol Shutter. If a sample is suspected of containing asbestos, then further preparation and analysis will be suspended on that sample until the asbestos result is known. If asbestos is present, then no further analysis will be undertaken.
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 no preserved sample is received for cyanide or phenol analysis (HPLC), the laboratory will preserve 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. **Surrogate recoveries** – Currently the only analysis, which is surrogate corrected, is PAHs on soils. For EPH on soils the result is not surrogate corrected, but a percentage recovery is quoted.
13. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
14. 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).
15. Total of 8 speciated phenols by HPLC includes Resorcinol, Catechol, Phenol, Naphthol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
16. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
17. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



ALcontrol Geochem

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Tel: (01244) 528700
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email: mkt@alcontrol.co.uk
website: www.alcontrol.co.uk

RECEIVED

20 NOV 2007

RPS Consultants Ltd
52 Princess Street
Manchester
M1 6JX

ATTN: Aaron Cousins

CERTIFICATE OF ANALYSIS

Date: 01 November, 2007

Our Reference: 07/18017/02/01

Your Reference:

Location: JAQUES YARD

A total of 42 samples was received for analysis on Thursday, 11 October 2007 and completed on Monday, 29 October 2007. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

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

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.

Signed

Diane Whittlestone

Customer Services

Jane Seymour

Customer Services

David O'Hare

Customer Services

Caroline Suttie

Customer Services

Valid if signed by any of the above signatories.

Compiled By

Laura Parr



ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/18017/02

BATCH NUMBER : 1

Numeric values indicate
additional scheduling

CLIENT : RPS Consultants Ltd

CLIENT REF/ CODE :

CONTACT : Aaron Cousins

ORDER NUMBER : 02454

* indicates test subcontracted

DATE OF RECEIPT : 11/10/07

TURNAROUND : 5 days

LOCATION : JAKES YARD

Sample Number	Sample Identity	UKAS Accredited ?		pH (W)	Conductivity (W)	Metals ICP-MS 9 (W)	Mercury Dissolved (W) (CVAA)	Barium ICP-MS (W)	Beryllium (ICP-MS) (W)	Vanadium ICP-MS (W)	Boron ICP-MS (W)	Take NaOH (W)	Cyanide Free (W)	Cyanide Total (W)	Ammoniacal Nitrogen as N (W)	EPH CWG GC Aqueous (W)	GRO CWG GC (W)	PCB 7 Congeners (W)	PAH Spec MS Aqueous (W)	SVOC Inc PAH MS (W)	VOC MS (W)	Arsenic Total MS (HNO3) (W)	Cadmium Total MS (HNO3) (W)	Chromium Total MS (HNO3) (W)	Copper Total MS (HNO3) (W)	Lead Total MS (HNO3) (W)	Mercury Total (CVAA) (HNO3) (W)
		Depth	P / V																								
23	BH104	-	1glass																								
24	BH104	-	1plastic	X	X																	X	X	X	X	X	X
25	BH104	-	NaOH										X														
26	BH104	-	Vial																								
27	BH104	-	Vial																								
28	BH106	-	1glass																								
29	BH106	-	1plastic	X	X																	X	X	X	X	X	X
30	BH106	-	NaOH										X														
31	BH106	-	Vial																								
32	SW1	-	1glass				X																				
33	SW1	-	1plastic	X	X	X																					
34	SW1	-	2SO4 125ml																								
35	SW1	-	2SO4 125ml																								
36	SW1	-	Vial				Sample on Hold																				
37	SW1	-	Vial																								
38	SW2	-	1glass				X																				
39	SW2	-	1plastic	X	X	X																					
40	SW2	-	2SO4 125ml																								
41	SW2	-	Vial																								
42	SW2	-	Vial																								
		Total Number of Tests		7	7	2	2	2	2	2	0	3	7	7	7	7	7	7	7	7	7	5	5	5	5	5	5

ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/18017/02

CLIENT : RPS Consultants Ltd

CONTACT : Aaron Cousins

DATE OF RECEIPT : 11/10/07

LOCATION : JAKES YARD

BATCH NUMBER : 1

CLIENT REF/CODE :

ORDER NUMBER : 02454

TURNAROUND : 5 days

Numeric values indicate
additional scheduling

* indicates test subcontracted

		UKAS Accredited 7																			
Sample Number	Sample Identity	P / V	Depth	Sample Type	Nickel Total MS (HNO3) /Wt	Selenium Total MS (HNO3) /Wt	Zinc Total MS (HNO3) /Wt	Barium Total MS (HNO3) /Wt	Beryllium Total MS (HNO3) /Wt	Vanadium Total MS (HNO3) /Wt	Boron Total MS (HNO3) /Wt										
23	BH104	1lglass	-	LIQUID																	
24	BH104	1lplastic	-	LIQUID	X	X	X	X	X	X	X										
25	BH104	NaOH	-	LIQUID																	
26	BH104	Vial	-	LIQUID																	
27	BH104	Vial	-	LIQUID																	
28	BH106	1lglass	-	LIQUID																	
29	BH106	1lplastic	-	LIQUID	X	X	X	X	X	X	X										
30	BH106	NaOH	-	LIQUID																	
31	BH106	Vial	-	LIQUID																	
32	SW1	1lglass	-	LIQUID																	
33	SW1	1lplastic	-	LIQUID																	
34	SW1	2SO4 125ml	-	LIQUID																	
35	SW1	2SO4 125ml	-	LIQUID																	
36	SW1	Vial	-	LIQUID																	
37	SW1	Vial	-	LIQUID																	
38	SW2	1lglass	-	LIQUID																	
39	SW2	1lplastic	-	LIQUID																	
40	SW2	2SO4 125ml	-	LIQUID																	
41	SW2	Vial	-	LIQUID																	
42	SW2	Vial	-	LIQUID																	
Total Number of Tests					5	5	5	5	5	5	5										

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/18017/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAKUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2					Method Code	LoD/Units
Depth (m)	-	-	-	-	-	-	-						
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID						
Sampled Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07						
Sample Received Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07						
Batch	1	1	1	1	1	1	1						
Sample Number(s)	2-9	10-16	17-22	23-27	28-31	32-37	38-42						
Arsenic Dissolved (ICP-MS)	-	-	-	-	-	<1	<1					TM152 [#]	<1 ug/l
Barium Dissolved (ICP-MS)	-	-	-	-	-	53	60					TM152 [#]	<1 ug/l
Beryllium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1					TM152 [#]	<1 ug/l
Boron Dissolved (ICP-MS)	-	-	-	-	-	48	49					TM152 [#]	<10 ug/l
Cadmium Dissolved (ICP-MS)	-	-	-	-	-	<0.4	<0.4					TM152 [#]	<0.4 ug/l
Chromium Dissolved (ICP-MS)	-	-	-	-	-	1	1					TM152 [#]	<1 ug/l
Copper Dissolved (ICP-MS)	-	-	-	-	-	<1	<1					TM152 [#]	<1 ug/l
Lead Dissolved (ICP-MS)	-	-	-	-	-	<1	1					TM152 [#]	<1 ug/l
Nickel Dissolved (ICP-MS)	-	-	-	-	-	2	3					TM152 [#]	<1 ug/l
Selenium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1					TM152 [#]	<1 ug/l
Vanadium Dissolved (ICP-MS)	-	-	-	-	-	<1	<1					TM152 [#]	<1 ug/l
Zinc Dissolved (ICP-MS)	-	-	-	-	-	24	28					TM152 [#]	<3 ug/l
Arsenic Total (HNO3 Digest)	<1	5	<1	<1	<1	-	-					TM152	<1 ug/l
Barium Total (HNO3 Digest)	68	140	130	72	86	-	-					TM152	<1 ug/l
Beryllium Total (HNO3 Digest)	<1	<1	<1	<1	<1	-	-					TM152	<1 ug/l
Boron Total (HNO3 Digest)	140	67	140	110	160	-	-					TM152	<10 ug/l
Cadmium Total (HNO3 Digest)	<0.4	<0.4	<0.4	<0.4	<0.4	-	-					TM152	<0.4 ug/l
Chromium Total (HNO3 Digest)	<1	2	<1	1	<1	-	-					TM152	<1 ug/l
Copper Total (HNO3 Digest)	<1	3	<1	<1	<1	-	-					TM152	<1 ug/l
Lead Total (HNO3 Digest)	<1	<1	<1	<1	<1	-	-					TM152	<1 ug/l
Nickel Total (HNO3 Digest)	2	3	5	3	2	-	-					TM152	<1 ug/l
Selenium Total (HNO3 Digest)	<1	<1	<1	1	1	-	-					TM152	<1 ug/l
Vanadium Total (HNO3 Digest)	<1	1	<1	<1	<1	-	-					TM152	<1 ug/l
Zinc Total (HNO3 Digest)	58	91	51	110	53	-	-					TM152	<3 ug/l
Mercury Dissolved (CVAA)	-	-	-	-	-	<0.05	<0.05					TM127 [#]	<0.05 ug/l
Mercury Total (HNO3 Digest)	<0.05	<0.05	<0.05	<0.05	<0.05	-	-					TM127	<0.05 ug/l
Conductivity (at 25 deg.C)	0.84	0.89	0.95	0.88	0.86	0.84	0.85					TM120 [#]	<0.014 mS/cm
Ammoniacal Nitrogen as N	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.2					TM099 [#]	<0.2 mg/l
Total Cyanide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					TM153 [#]	<0.05 mg/l
Free Cyanide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					TM153 [#]	<0.05 mg/l
pH Value	7.86	8.02	7.97	7.85	8.17	8.36	8.32					TM133 [#]	<1.00 pH Units

Date 01.11.2007

☒

11

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Client Contact: Aaron Cousins

Date 01.11.2007

☒

11

» Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Date 01.11.2007

☒

» Shown on prev. report

Client Contact: Aaron Cousins

Date 01.11.2007

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/18017/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2					Method Code	Lob/Units
Depth (m)	-	-	-	-	-	-	-						
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID						
Sampled Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07						
Sample Received Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07						
Batch	1	1	1	1	1	1	1						
Sample Number(s)	2-9	10-16	17-22	23-27	28-31	32-37	38-42						
SVOC by GCMS													
Phenols													
2-Chlorophenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2-Methylphenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2-Nitrophenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2,4-Dichlorophenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2,4,5-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
4-Chloro-3-methylphenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
4-Nitrophenol	<2	<2	<2	<2	<2	<2	<2					TM176	<1 ug/l
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Phenol	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
PAHs													
2-Chloronaphthalene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
2-Methylnaphthalene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Acenaphthene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Anthracene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Benzo(a)anthracene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Benzo(a)pyrene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Benzo(b)fluoranthene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Benzo(ghi)perylene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Benzo(k)fluoranthene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Chrysene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Dibenzo(a,h)anthracene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Fluoranthene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Fluorene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l
Indeno(1,2,3-cd)pyrene	<1	<1	<1	<1	<1	<1	<1					TM176	<1 ug/l

Date 01.11.2007

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/18017/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2				
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07				
Sample Received Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	2-9	10-16	17-22	23-27	28-31	32-37	38-42				
PAHs (cont)											
Naphthalene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Phenanthrene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Pyrene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Phthalates											
Bis(2-ethylhexyl) phthalate	<2	<2	<2	<2	<2	<2	<2			TM176	<2 ug/l
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Di-n-butyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Di-n-Octyl phthalate	<5	<5	<5	<5	<5	<5	<5			TM176	<5 ug/l
Diethyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Other Semi-volatiles											
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,4-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
3-Nitroaniline	<1	<1	<1	<2	<1	<1	<1			TM176	<1 ug/l
4-Bromophenylphenylether	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Chlorophenylphenylether	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
4-Nitroaniline	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Azobenzene	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Bis(2-chloroethoxy)methane	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Bis(2-chloroethyl)ether	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Carbazole	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l
Dibenzofuran	<1	<1	<1	<1	<1	<1	<1			TM176	<1 ug/l

Date 01.11.2007

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11

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

[illegible]

Date 01.11.2007

Validated ☒
Preliminary ☐

ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 07/18017/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2			Method Code	LoD/Units
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07				
Sample Received Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	2-9	10-16	17-22	23-27	28-31	32-37	38-42				
Volatile Organic Compounds											
Dichlorodifluoromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Chloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Bromomethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Chloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Trichlorofluoromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
trans-1-2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Dichloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Carbon Disulphide	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Methyl Tertiary Butyl Ether	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
cis-1-2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Bromochloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Chloroform	<1	<1	<1	<1	1	<1	<1			TM116 ^a	<1 ug/l
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1-Dichloropropene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Benzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Carbontetrachloride	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Dibromomethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Trichloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
cis-1-3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
trans-1-3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Toluene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,3-Dichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l

Date 01.11.2007

Validated



Preliminary



ALcontrol Geochem Analytical Services

Table Of Results

ISO 17025 accredited

M MCERTS accredited

* Subcontracted test

» Shown on prev. report

Job Number: 07/18017/02/01

Matrix: LIQUID

Client: RPS Consultants Ltd

Location: JAQUES YARD

Client Ref. No.:

Client Contact: Aaron Cousins

Sample Identity	BH101	BH102	BH103	BH104	BH106	SW1	SW2			Method Code	LoD/Units
Depth (m)	-	-	-	-	-	-	-				
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID				
Sampled Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07				
Sample Received Date	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07	11.10.07				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	2-9	10-16	17-22	23-27	28-31	32-37	38-42				
Volatile Organic Compounds (cont)											
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2-Dibromoethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1,1,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
p/m-Xylene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Bromoform	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Styrene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
o-Xylene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2,3-Trichloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Isopropylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Bromobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
2-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Propylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
4-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2,4-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
4-Isopropyltoluene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,3,5-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
sec-Butylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
tert-Butylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
n-Butylbenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2-Dibromo-3-chloropropane	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
Naphthalene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l
1,2,3-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1			TM116 ^a	<1 ug/l

Date 01.11.2007

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11

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LIQUID
Location: JAQUES YARD
Client Contact: Aaron Cousins

[illegible]

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ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 07/18017/02/01
 Client: RPS Consultants Ltd
 Client Ref. No.:

Report Key :

NDP No Determination Possible
 NFD No Fibres Detected
 # ISO 17025 accredited
 PFD Possible Fibres Detected

* Subcontracted test
 » Result previously reported (Incremental reports only)
 M MCERTS Accredited
 EC Equivalent Carbon (Aromatics C8-C35)

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

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

Summary of Method Codes contained within report :

Method No.	Reference	Description	Accredited	ISO 17025	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
TM070	Modified: US EPA Method 8250 & 625	Determination of Total Polychlorinated Biphenyls (PCB's) as Aroclor 1254 and the ICE 7 Congeners by GC-MS				NA	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.				NA	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)				NA	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓			NA	
TM099	BS 2690: Part 7:1968 / BS 6068: Part 2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser	✓			NA	
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS	✓			NA	
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter	✓			NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy				NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy	✓			NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓			NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS				NA	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS	✓			NA	
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	✓			NA	
TM174		Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID				NA	

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

Table Of Results - Appendix

Client Ref. No.:

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP No Determination Possible

✱

Subcontracted test

NFD **No Fibres Detected**

»

Result previously reported (Incremental reports only)

ISO 17025 accredited

M

MCERTS Accredited

PFD **Possible Fibres Detected**

EC

Equivalent Carbon (Aromatics C8-C35)

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

Summary of Method Codes contained within report :

[illegible]

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

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

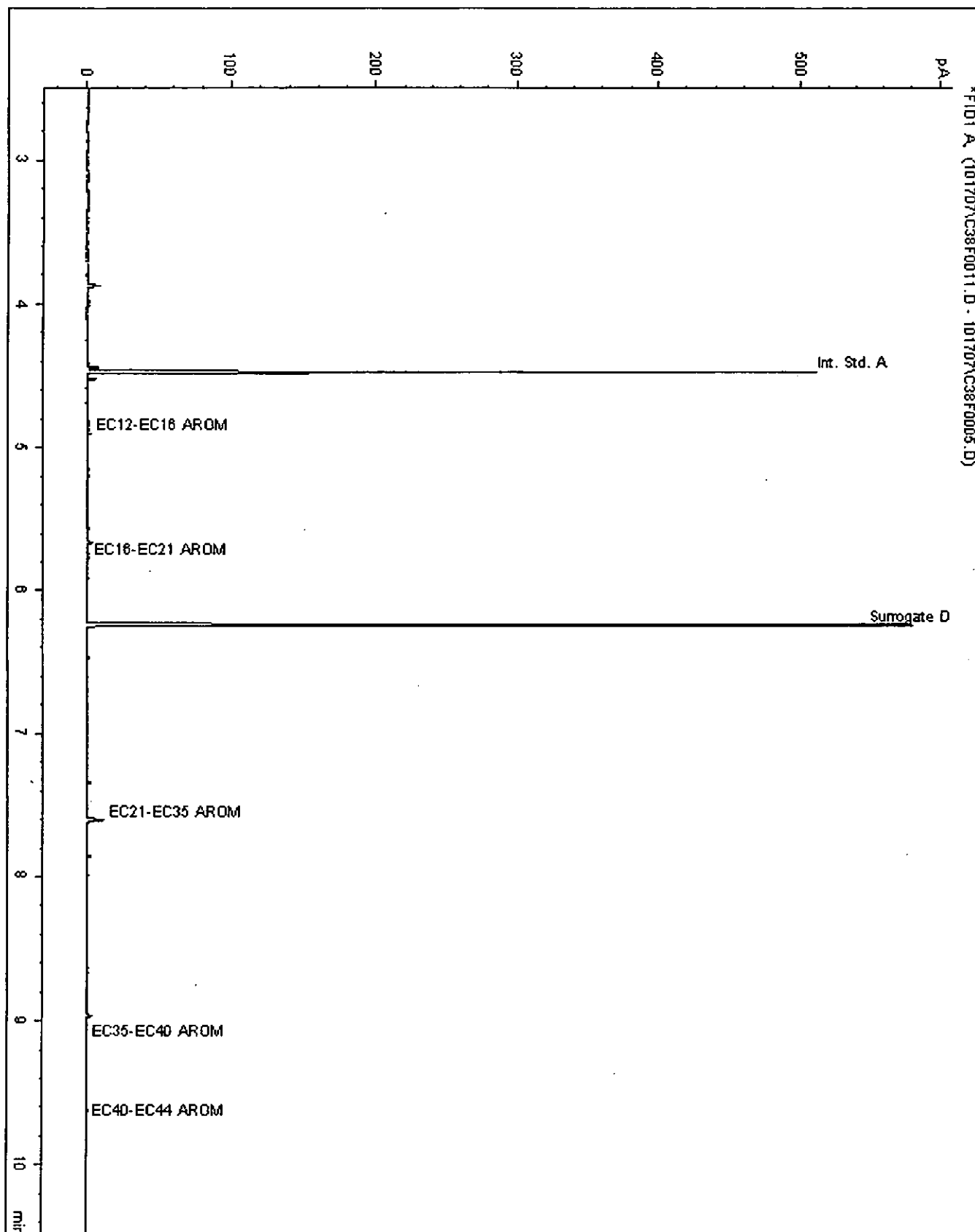
Job Number: 07/18017/02/01
Client: RPS Consultants Ltd
Client Ref. No.:

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	18.2

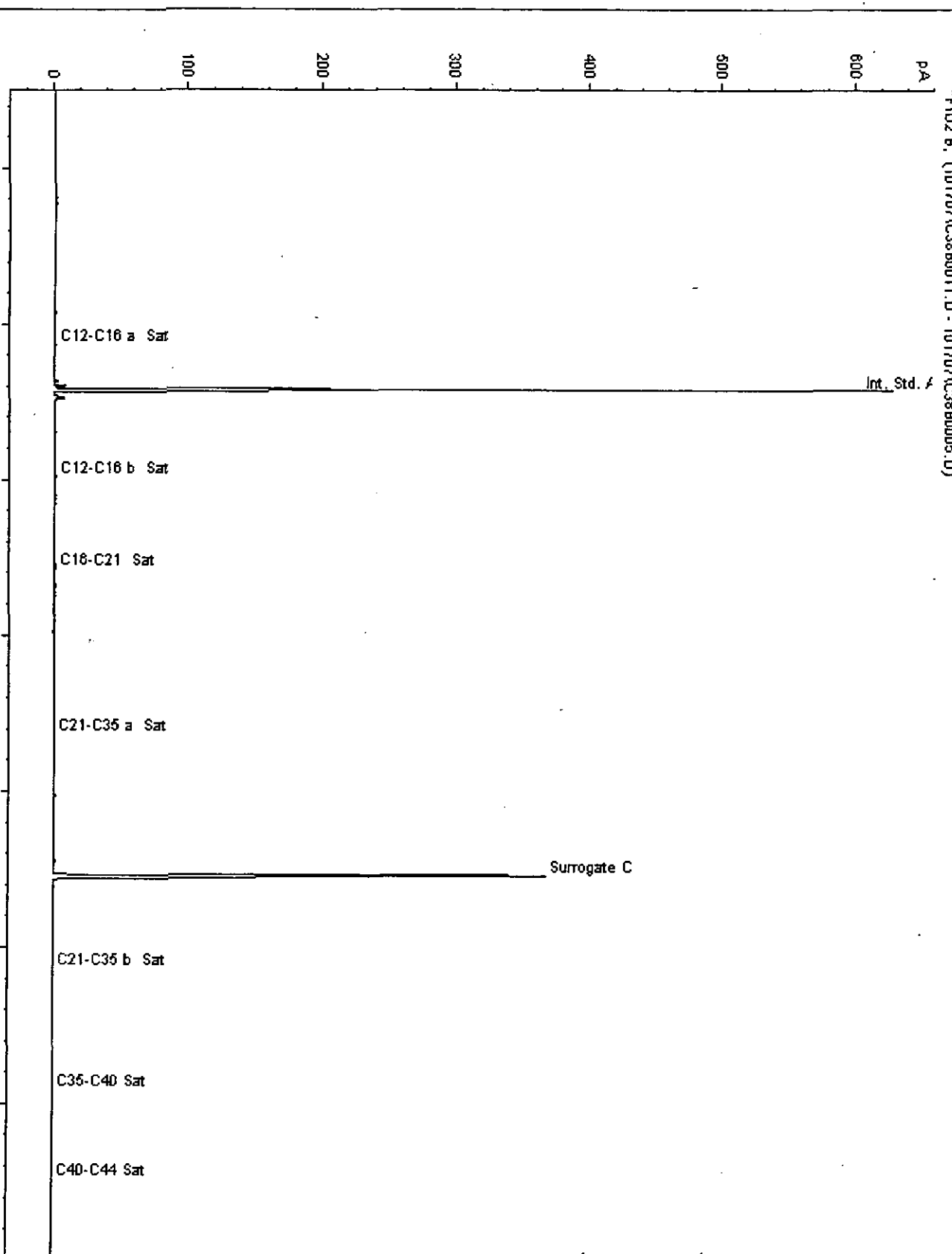
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-2/W
Date Acquired : 17/10/07 20:15:10 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



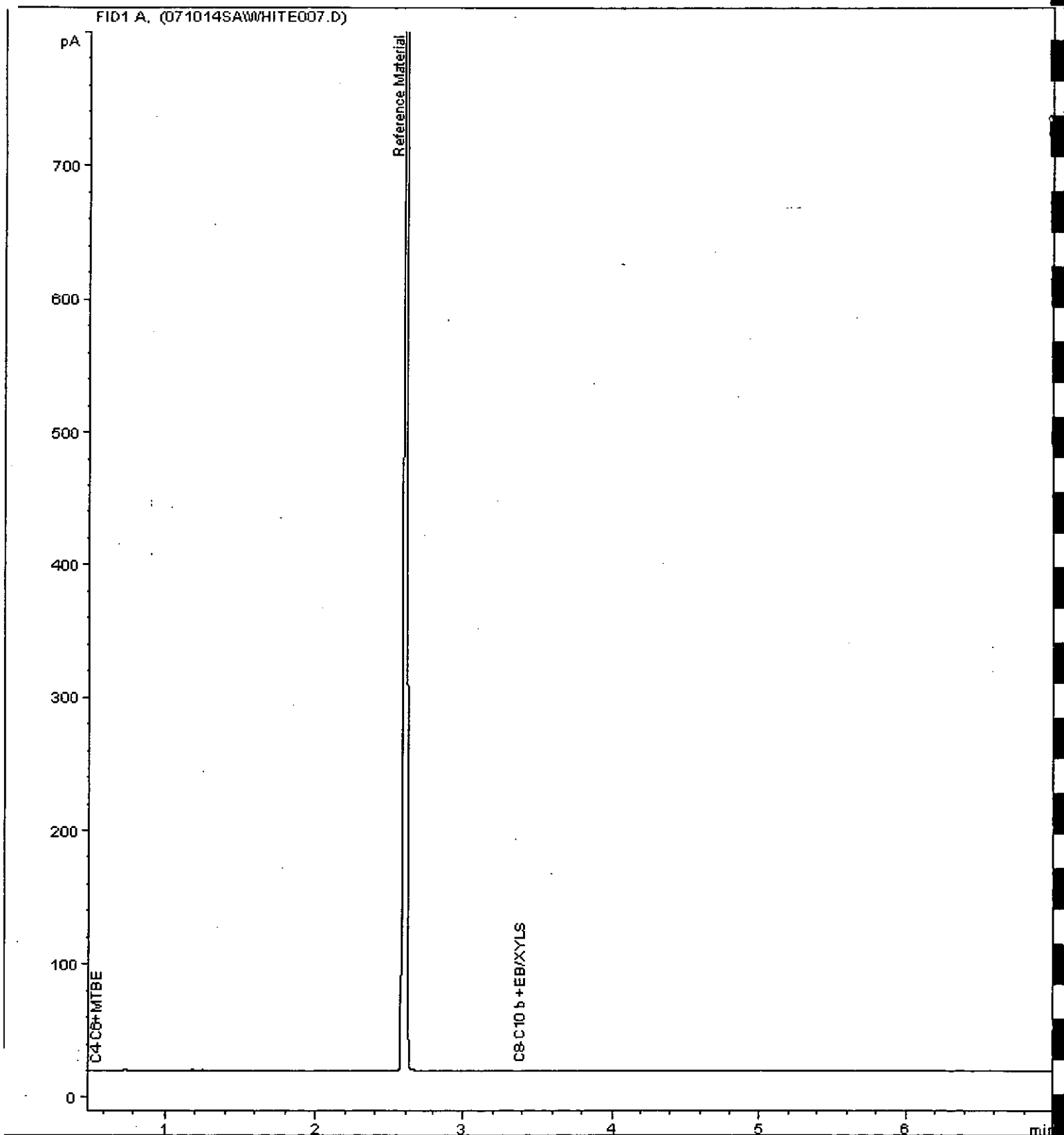
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200718017-2/W
Date Acquired : 17/10/07 20:15:10 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



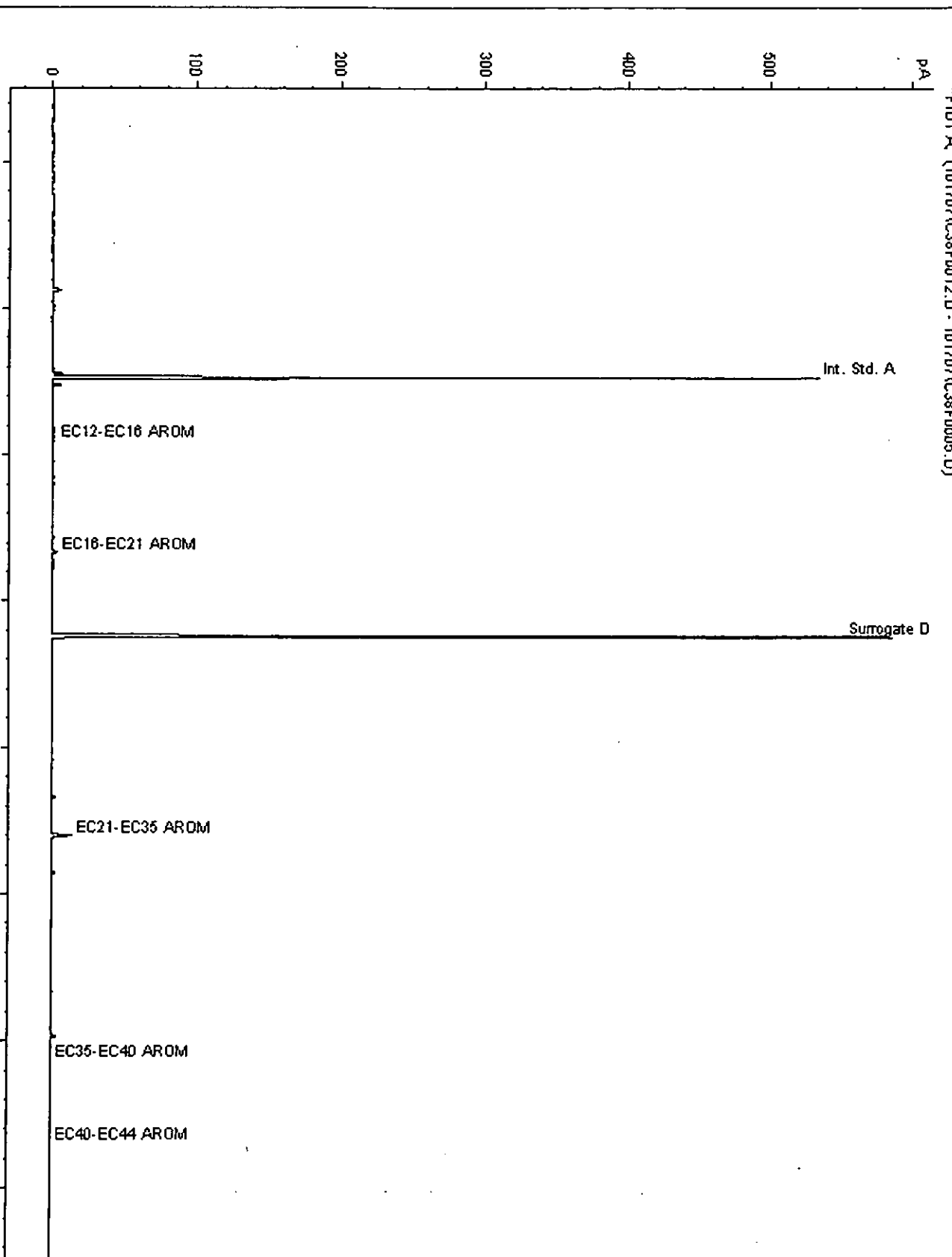
ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200718017-7/W
Date Acquired : 14/10/07 15:17:24 PM
Units : ppb
Dilution : 1



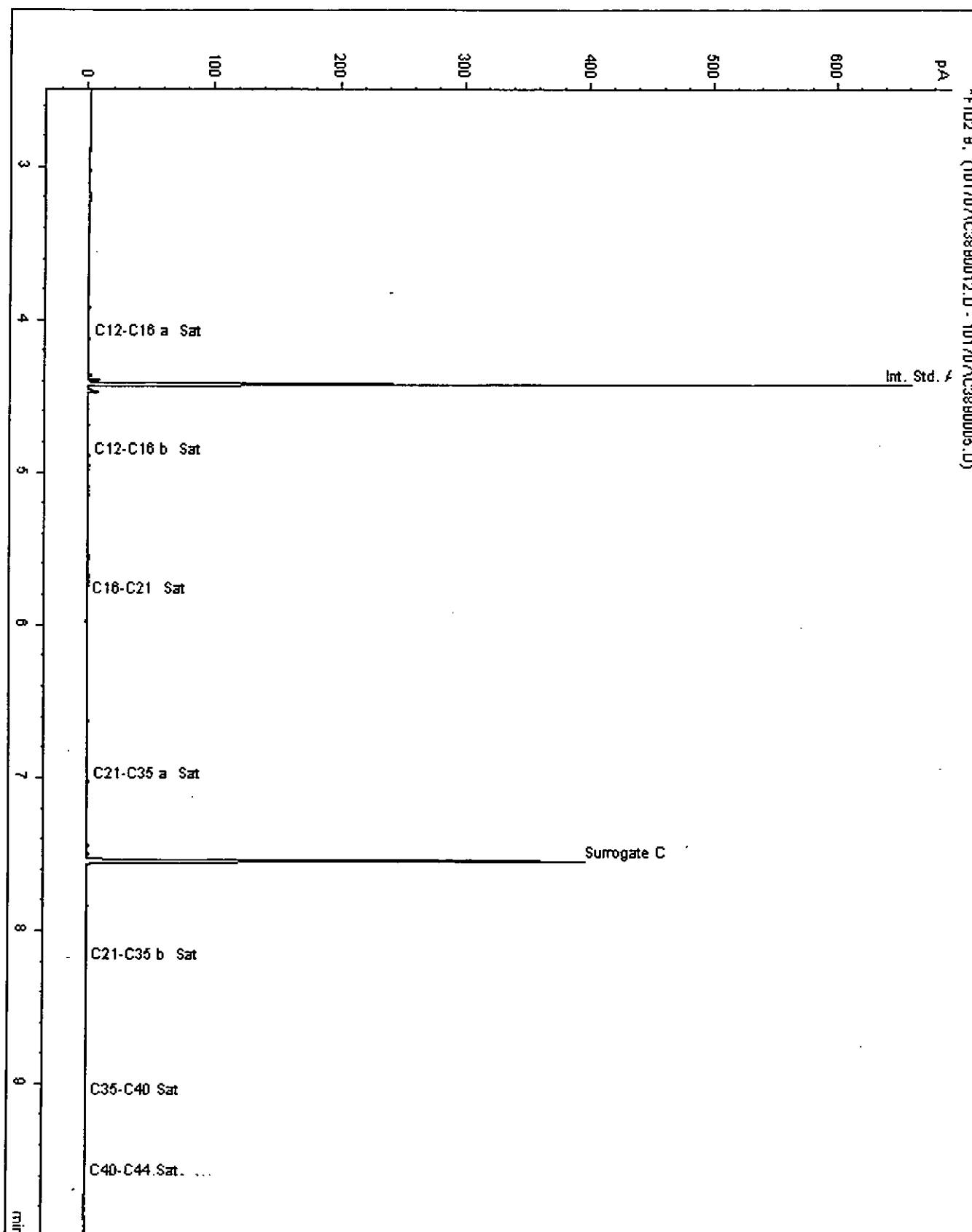
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-10/W
Date Acquired : 17/10/07 20:33:29 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



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

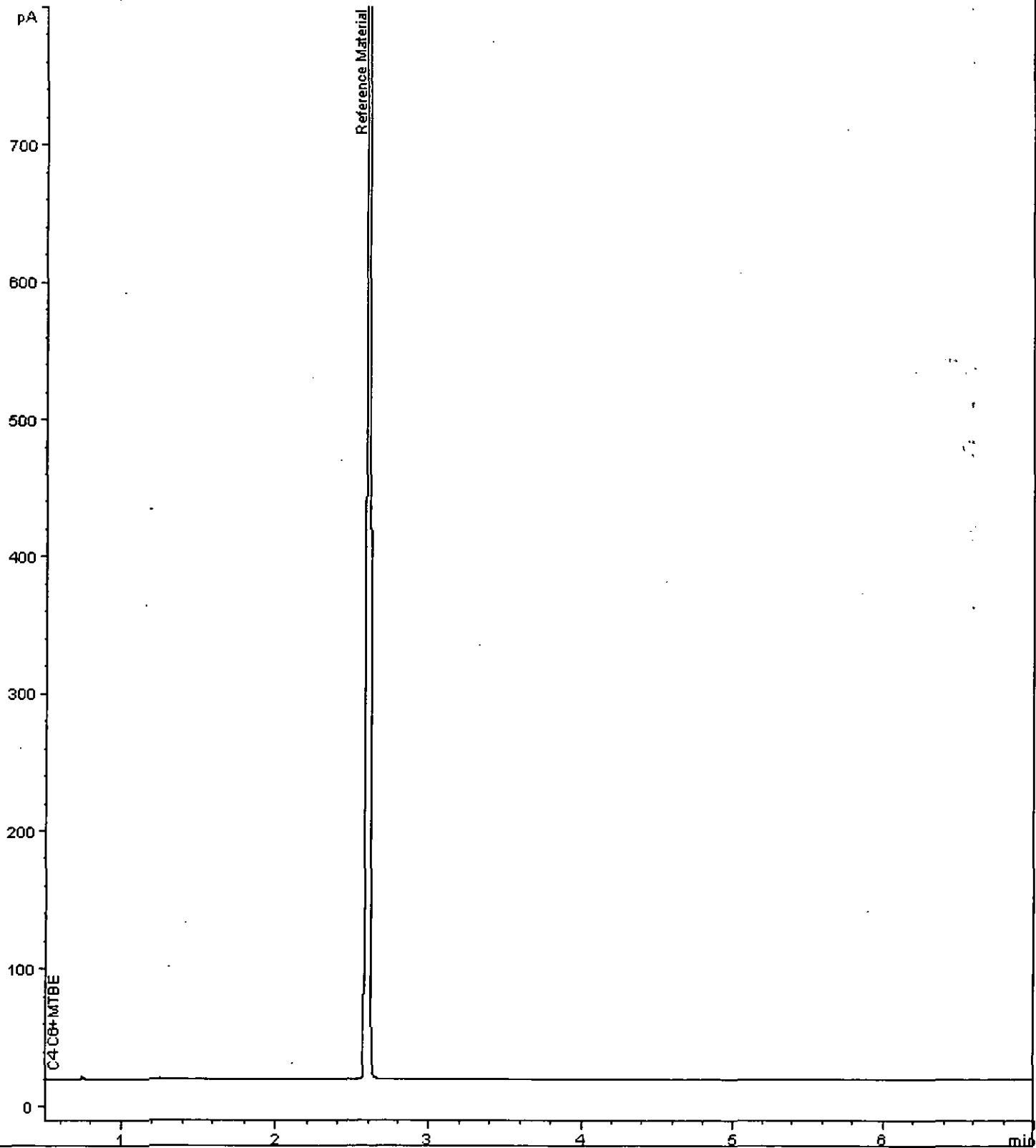
Sample Identity: 200718017-10/W
Date Acquired : 17/10/07 20:33:29 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



ALcontrol Geochem Analytical Services
Gasoline Range Organics

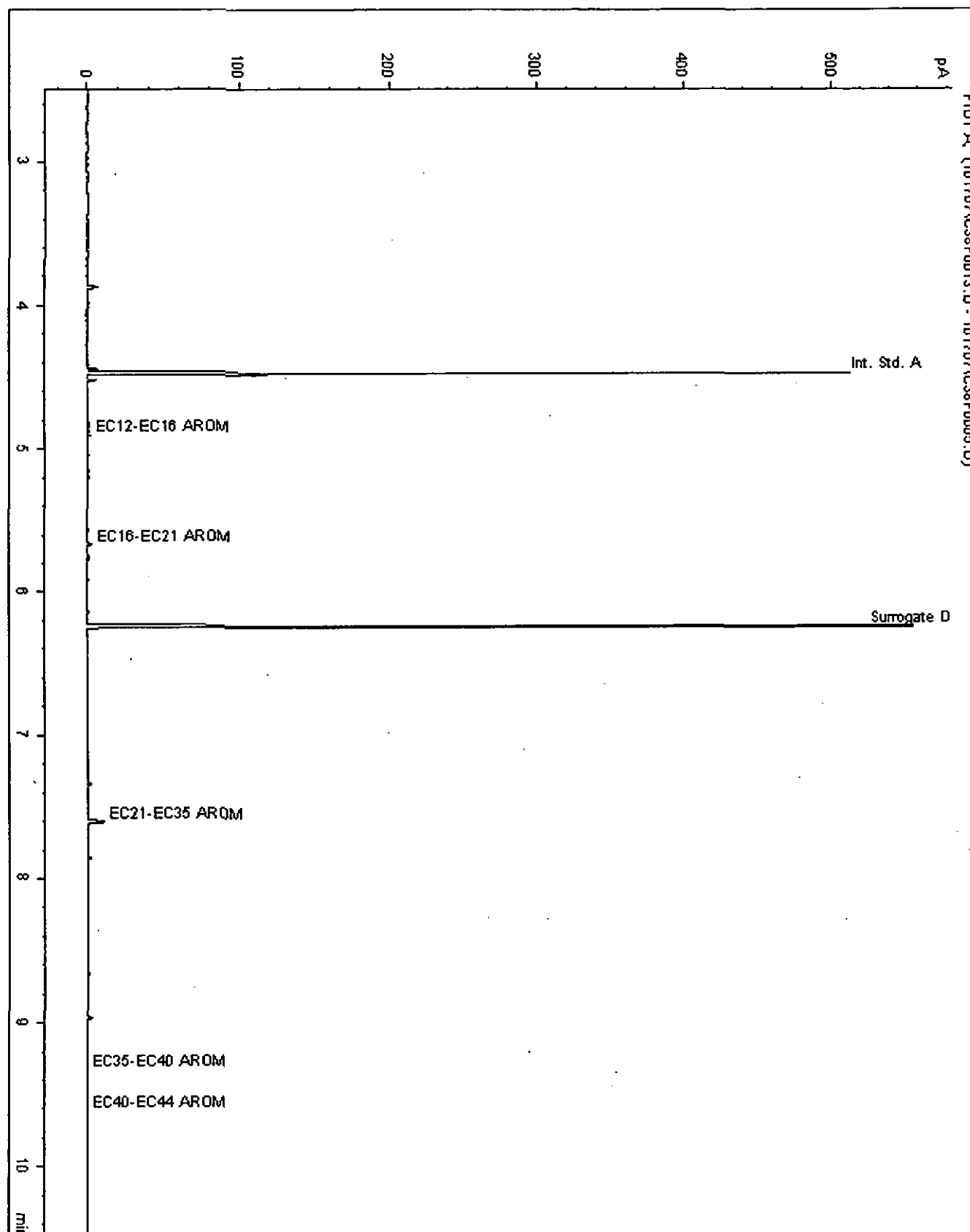
Sample Identity : 200718017-15/W
Date Acquired : 14/10/07 15:31:31 PM
Units : ppb
Dilution : 1

FID1 A, (071014SAWWHITE008.D)



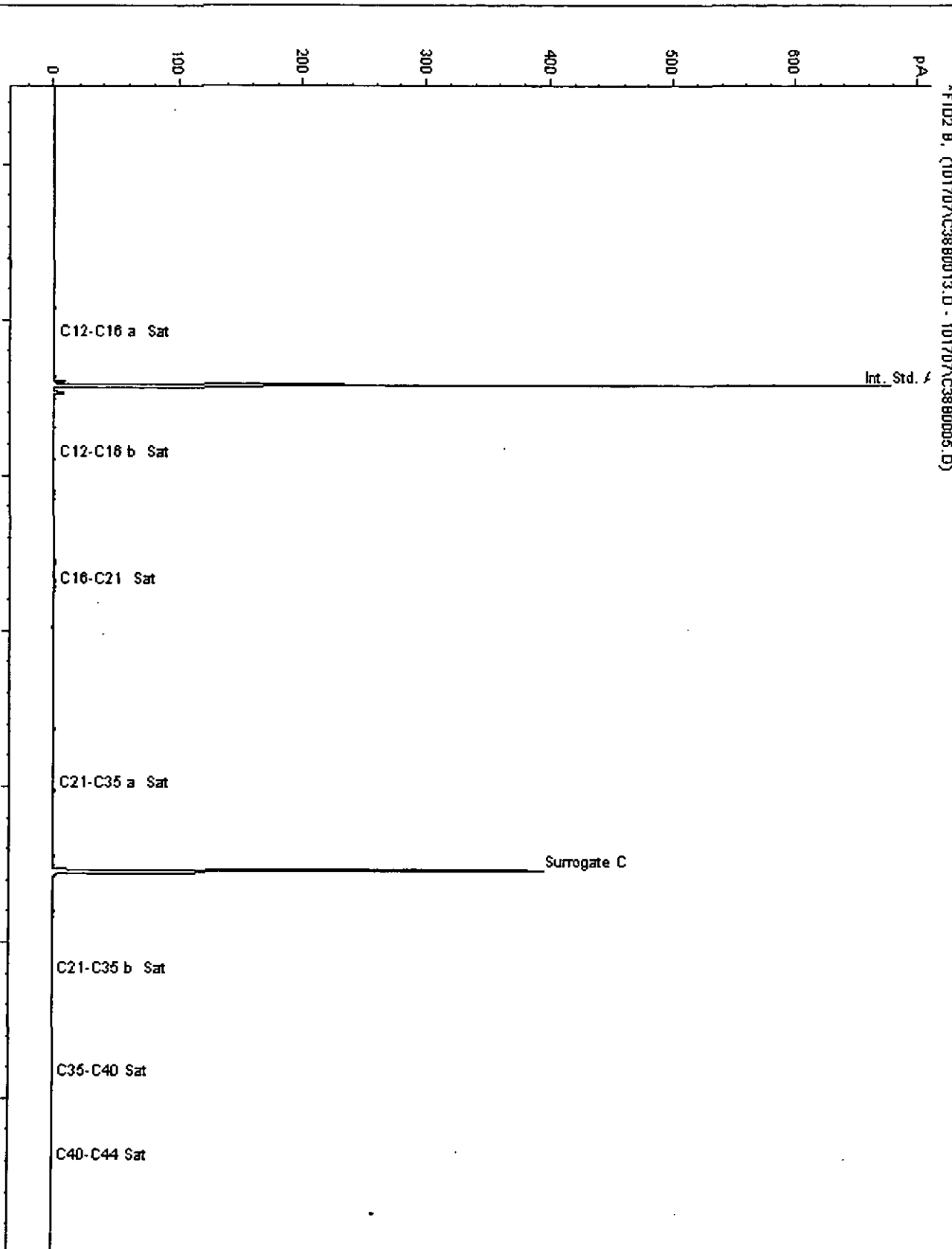
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-17/W
Date Acquired : 17/10/07 20:51:26 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



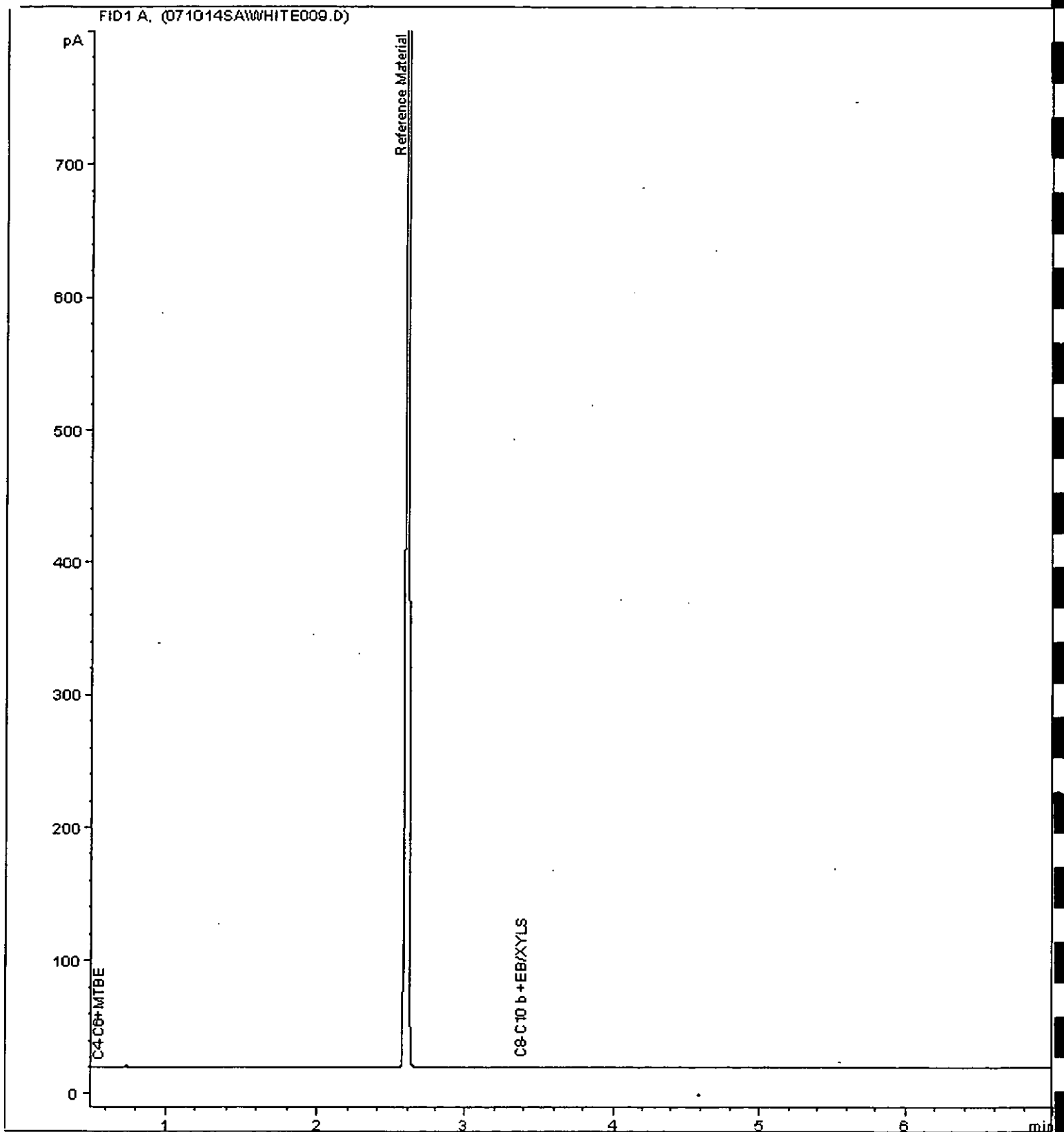
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200718017-17/W
Date Acquired : 17/10/07 20:51:26 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



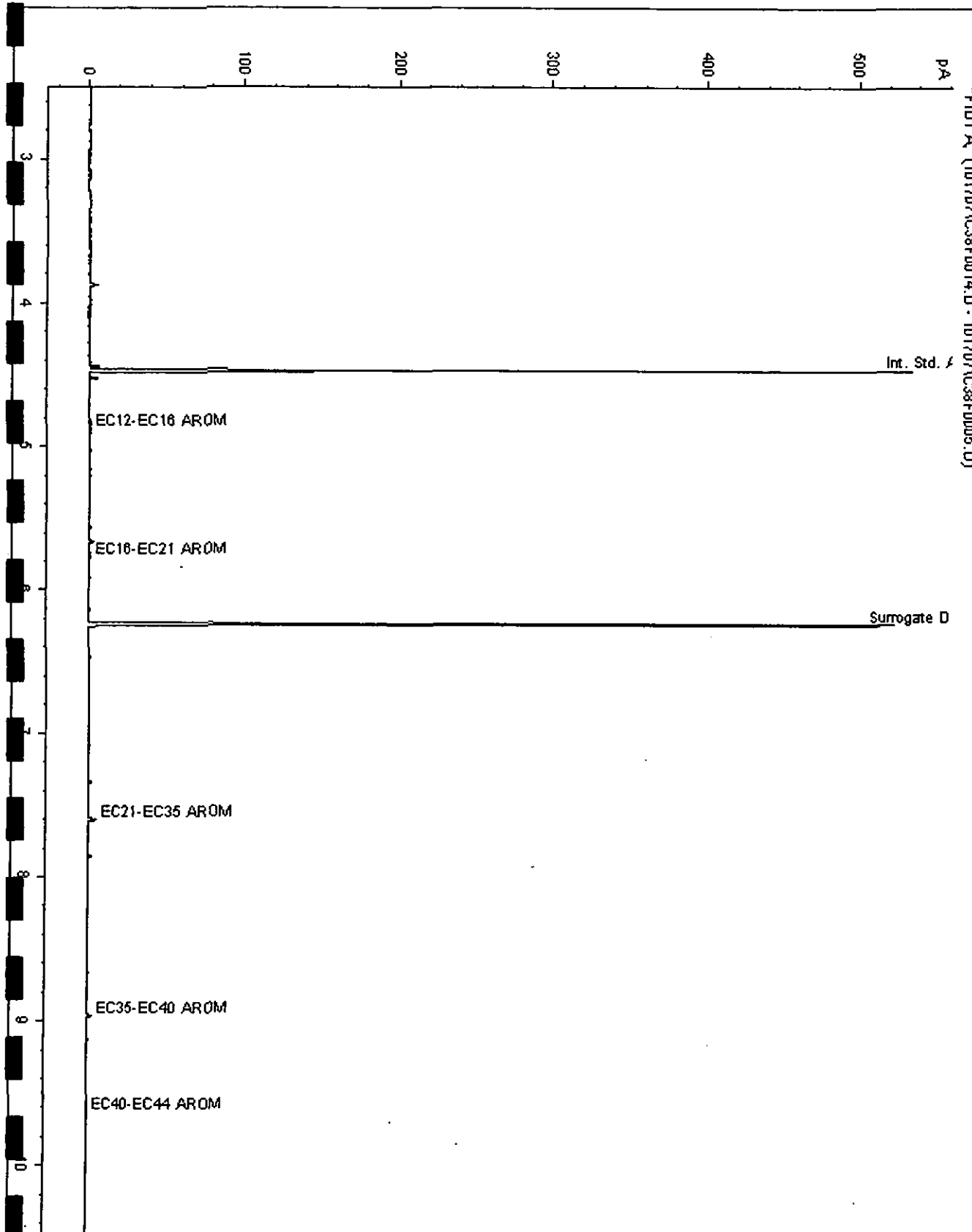
ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200718017-21/W
Date Acquired : 14/10/07 15:45:32 PM
Units : ppb
Dilution : 1



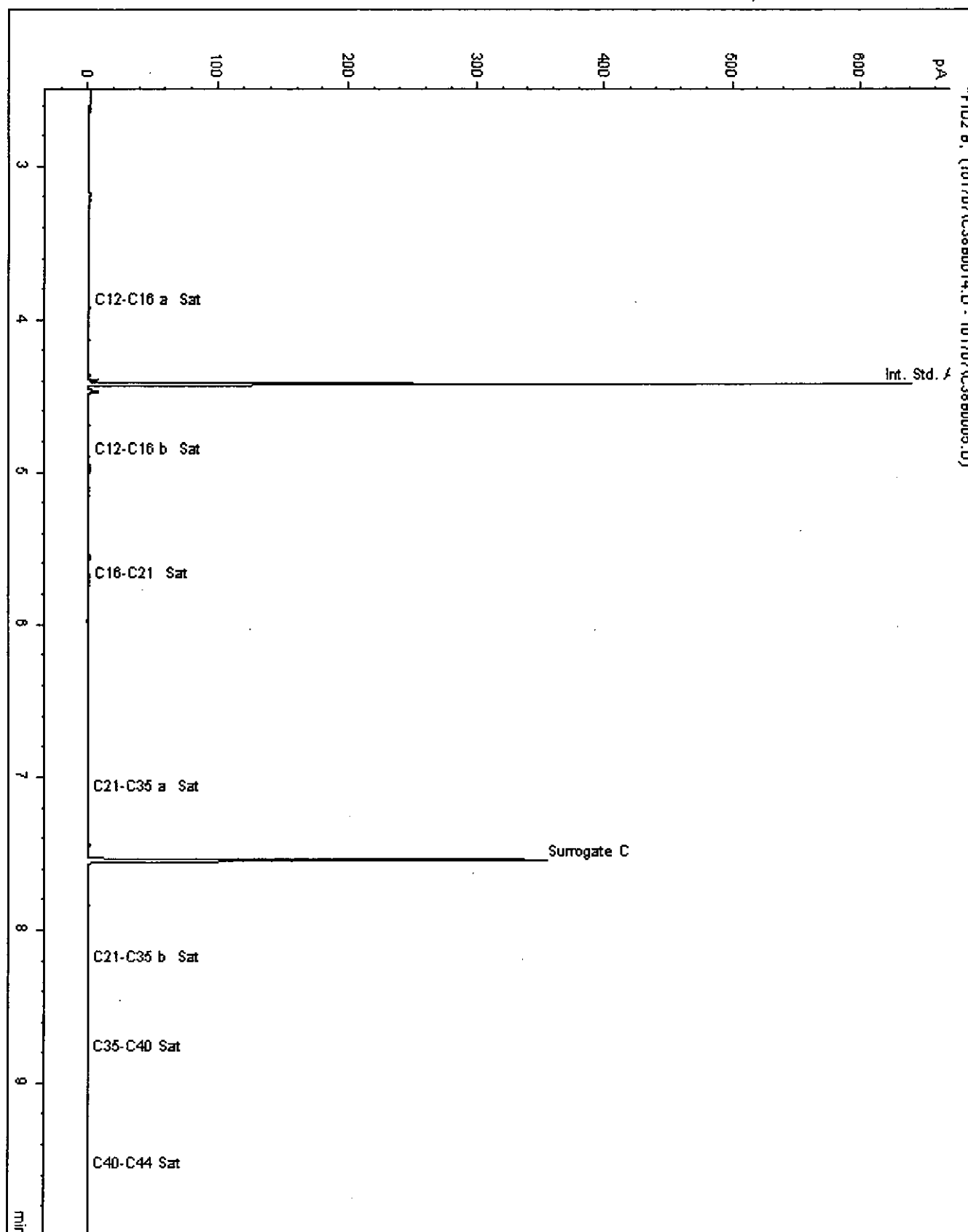
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-23/W
Date Acquired : 17/10/07 21:09:33 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



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

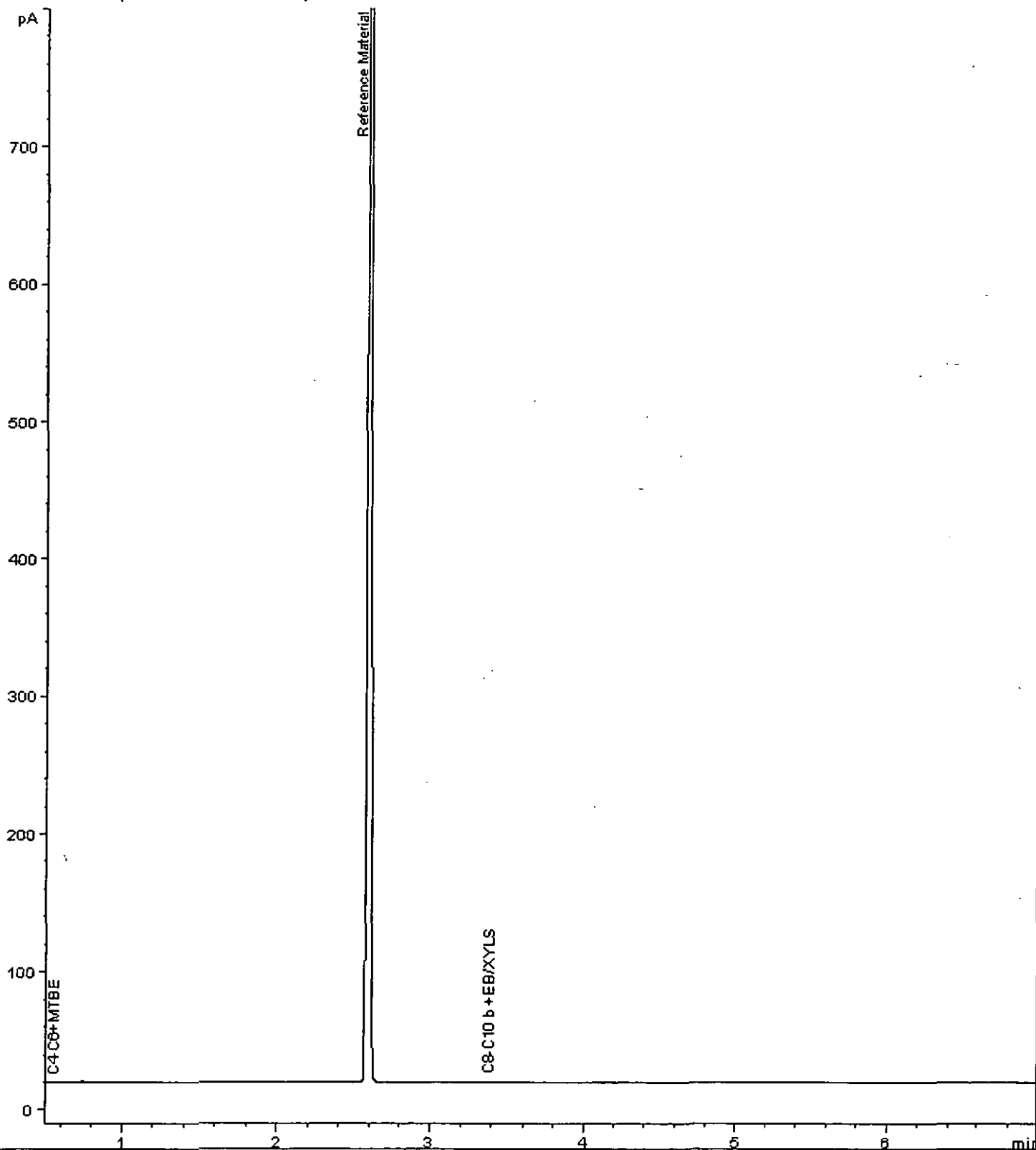
Sample Identity: 200718017-23/W
Date Acquired : 17/10/07 21:09:34 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



ALcontrol Geochem Analytical Services
Gasoline Range Organics

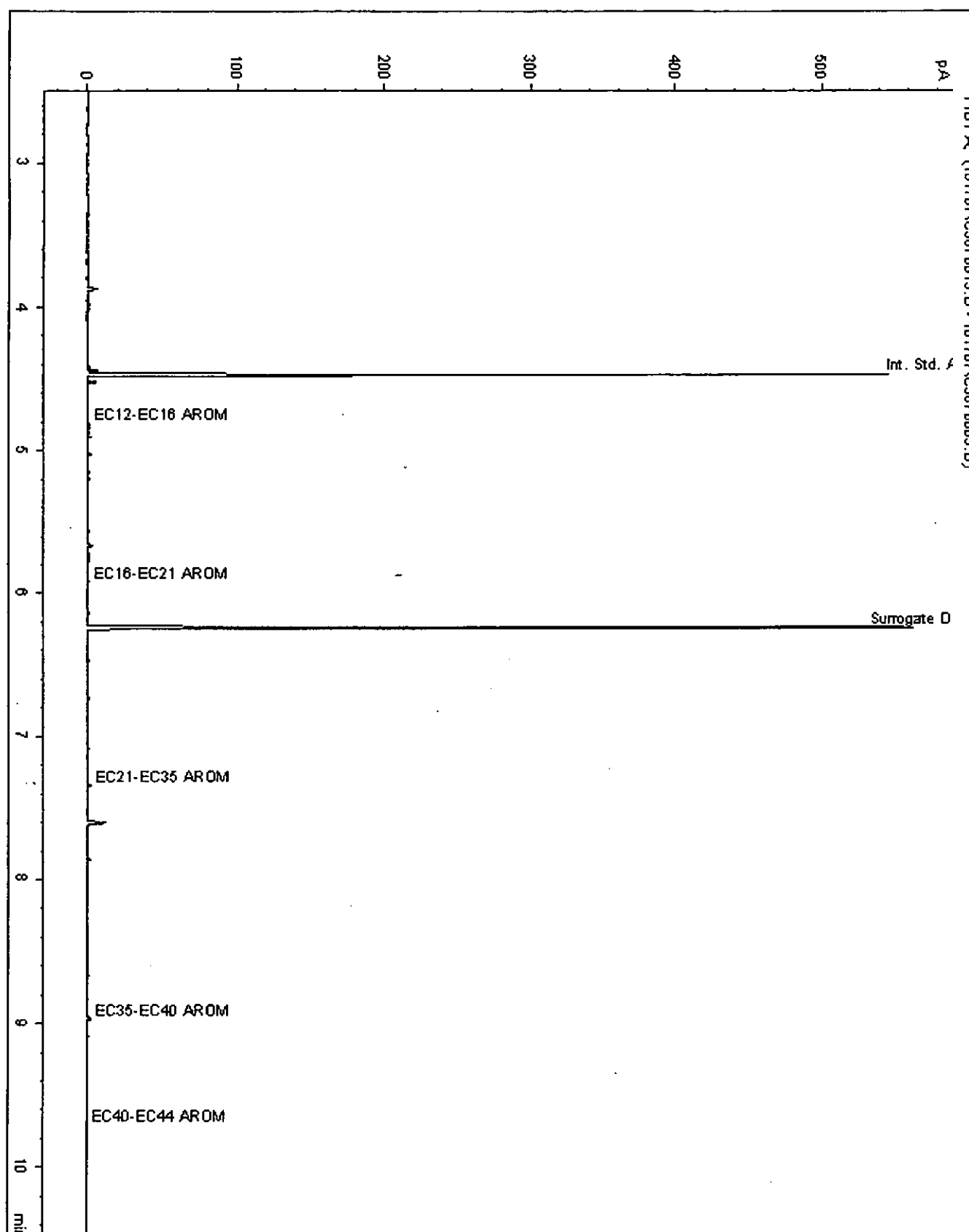
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Units : ppb
Dilution : 1

FID1 A, (071014SAWHITE010.D)



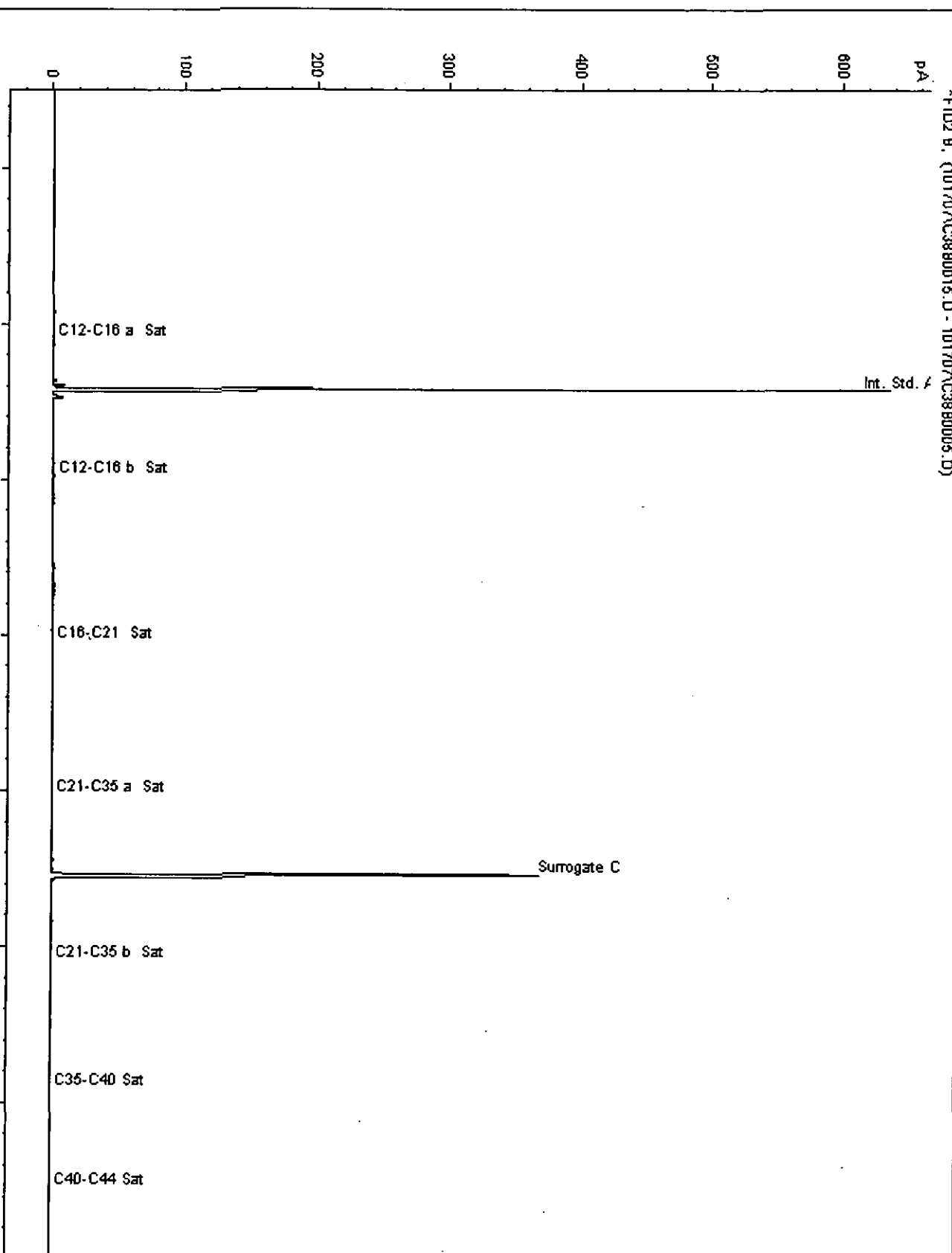
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-28/W
Date Acquired : 17/10/07 21:27:32 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



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

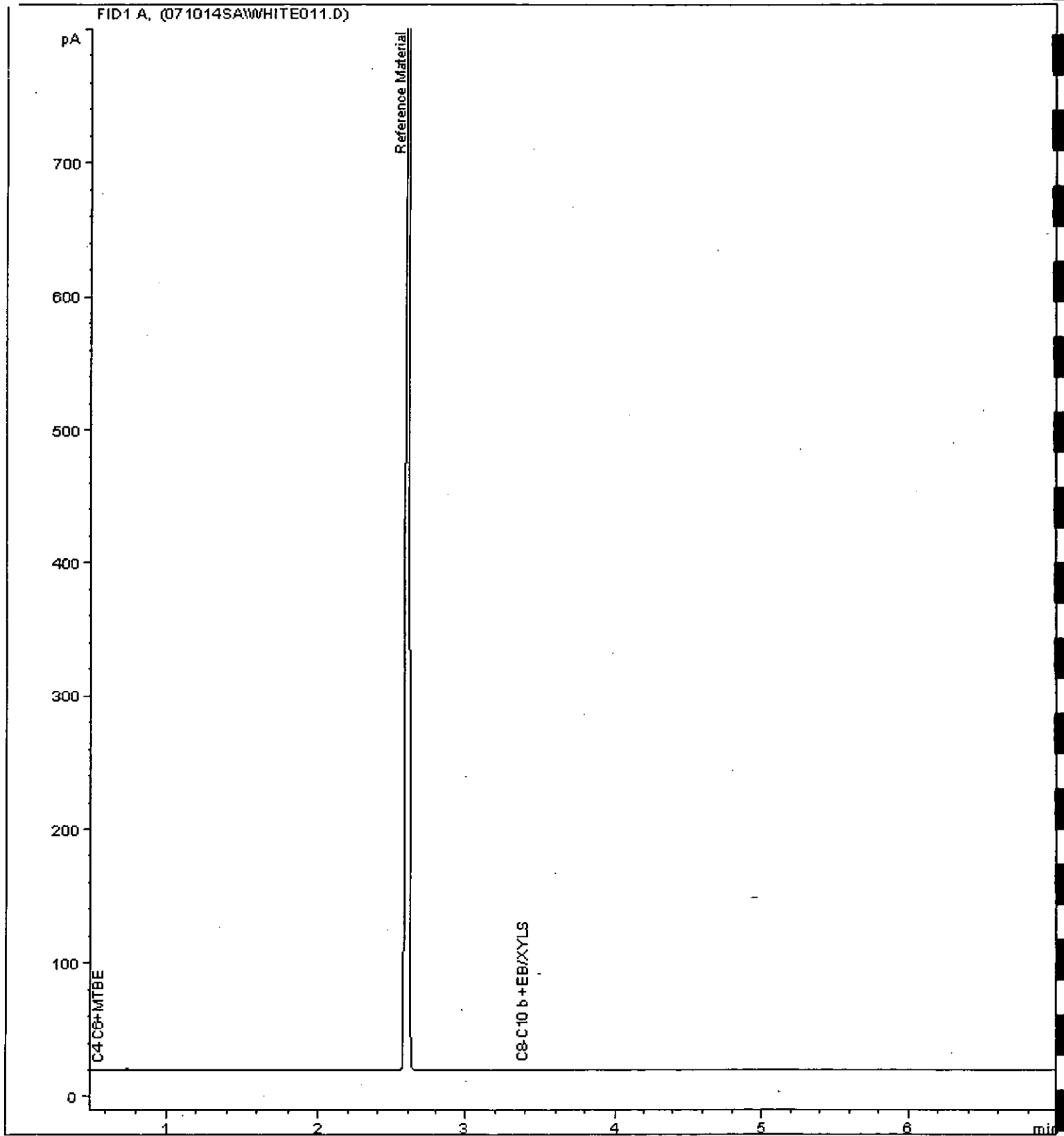
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Date Acquired : 17/10/07 21:27:31 PM
Units : ppb
Dilution :
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Multiplier : 0.016



*FID2 B, (101707\C38B0015.D - 101707\C38B0005.D)

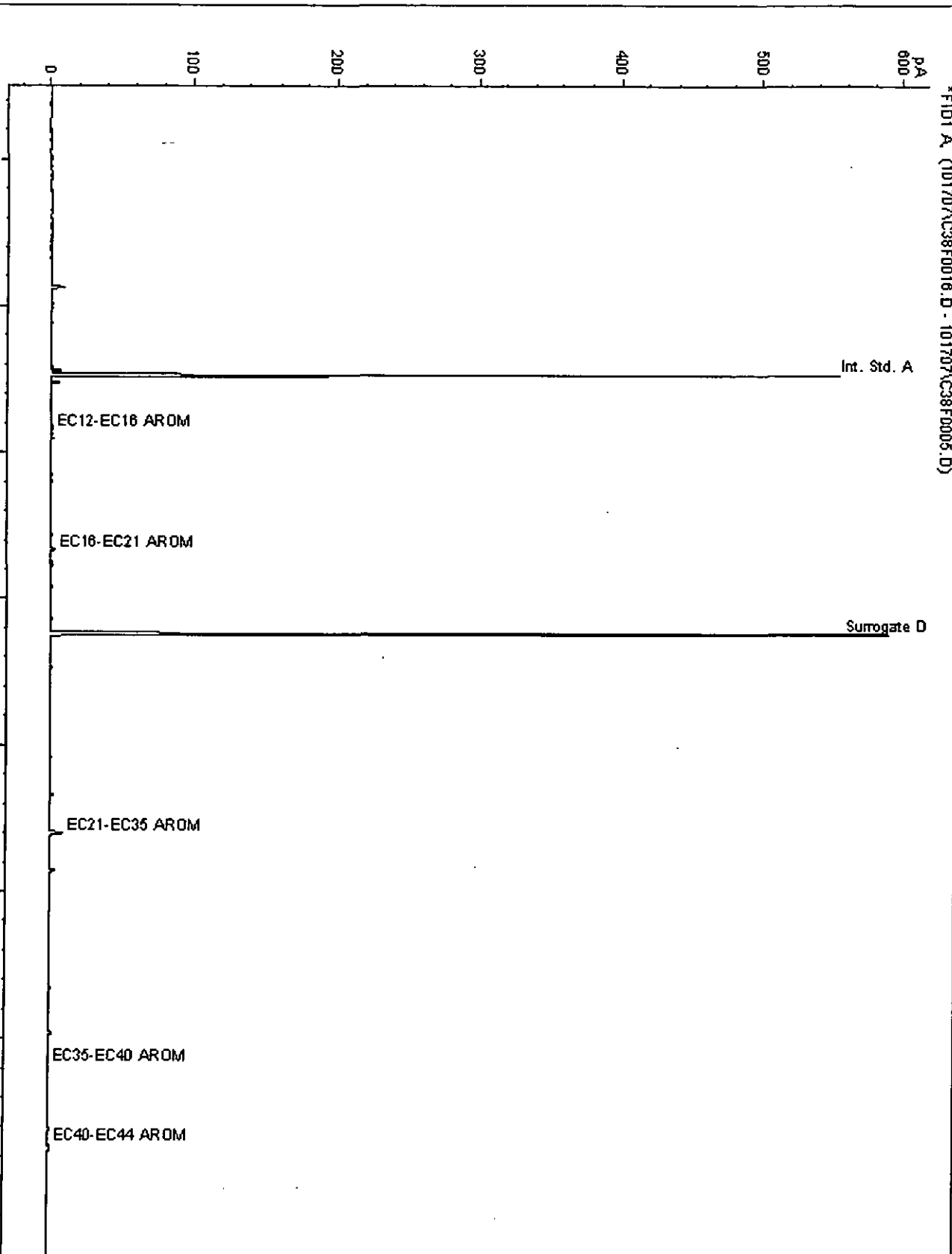
ALcontrol Geöchem Analytical Services
Gasoline Range Organics

Sample Identity : 200718017-31/W
Date Acquired : 14/10/07 16:13:42 PM
Units : ppb
Dilution : 1



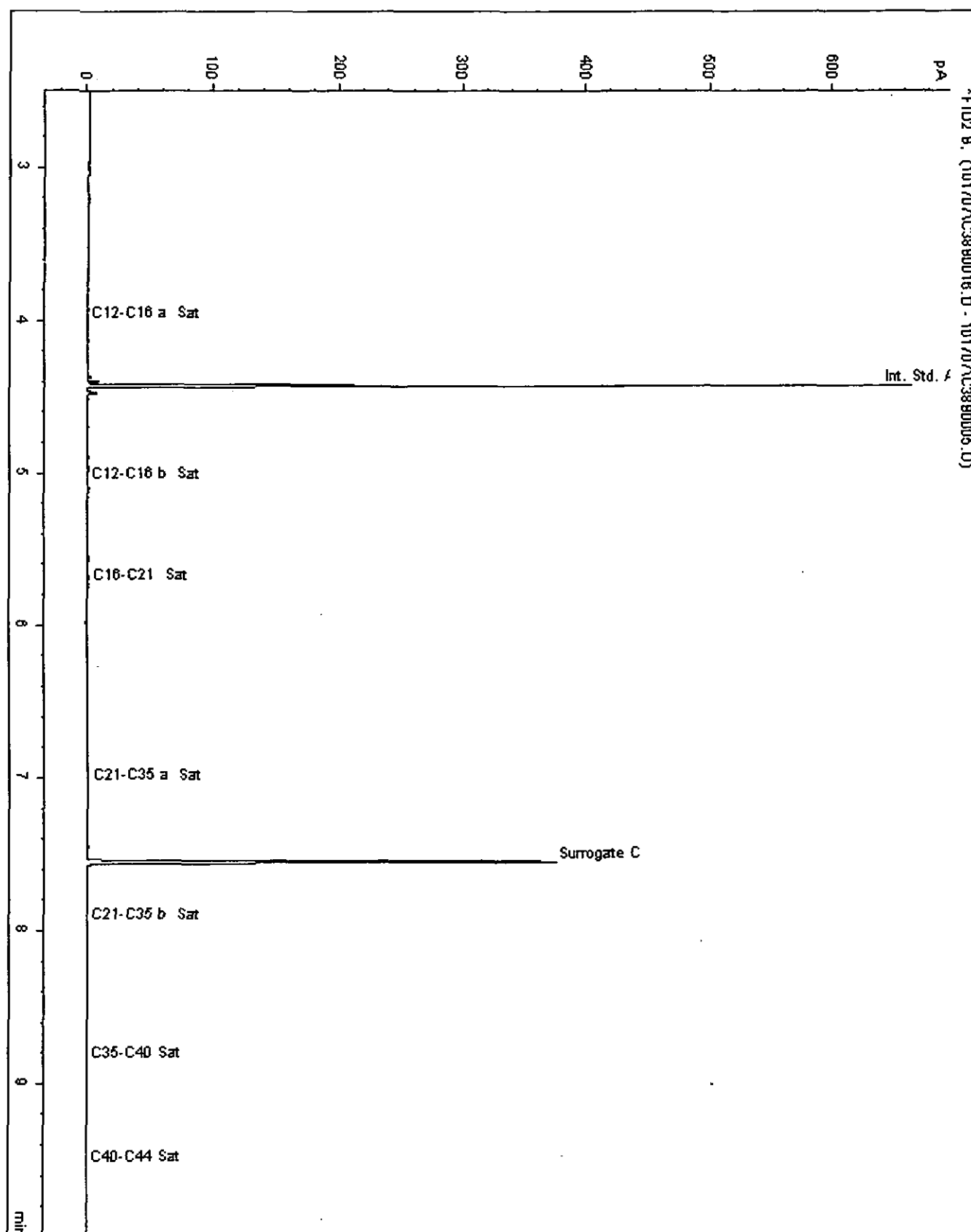
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-32/W
Date Acquired : 17/10/07 21:45:49 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



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

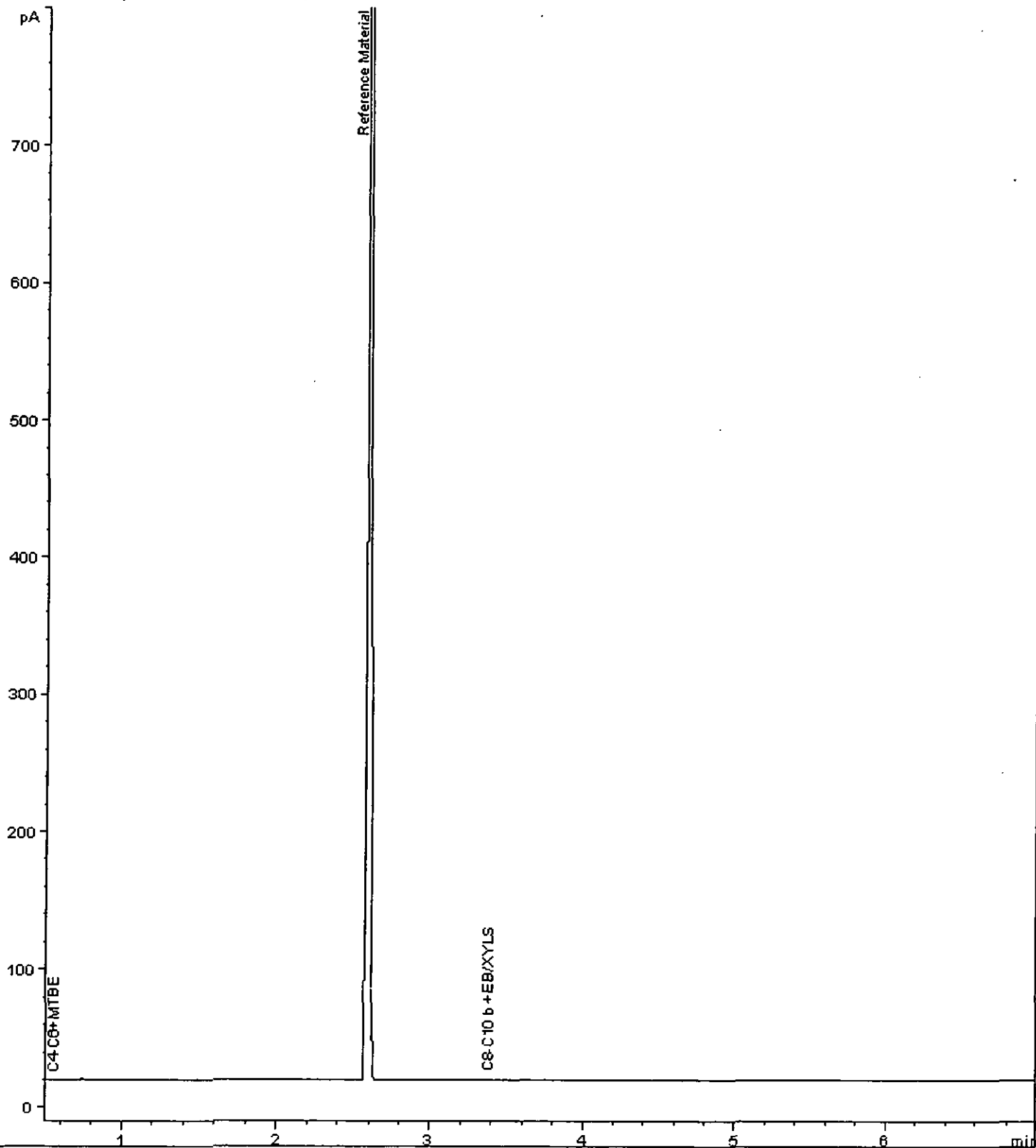
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Date Acquired : 17/10/07 21:45:50 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



ALcontrol Geochem Analytical Services
Gasoline Range Organics

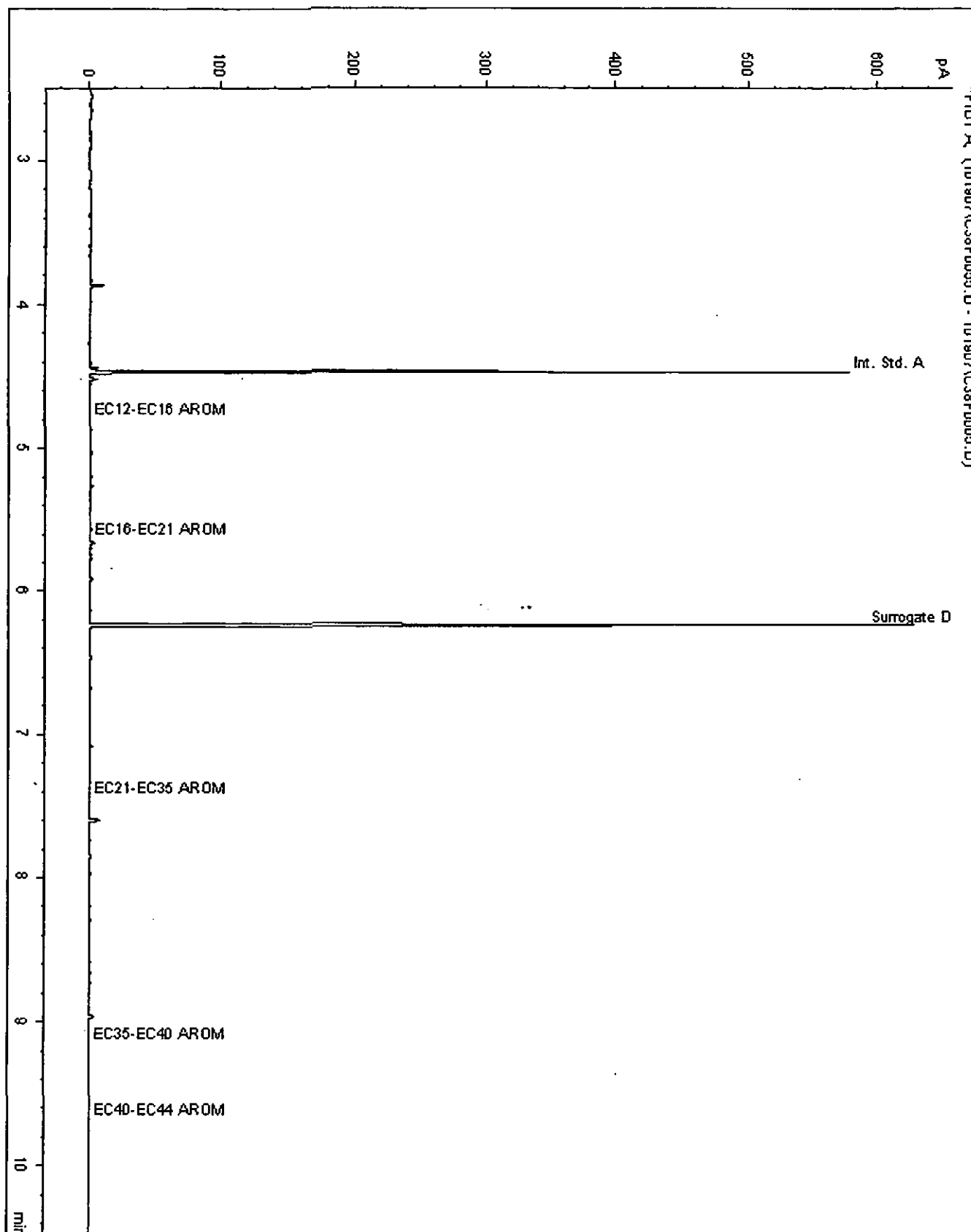
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Date Acquired : 14/10/07 16:27:50 PM
Units : ppb
Dilution : 1

FID1 A, (071014SA\WHITE012.D)



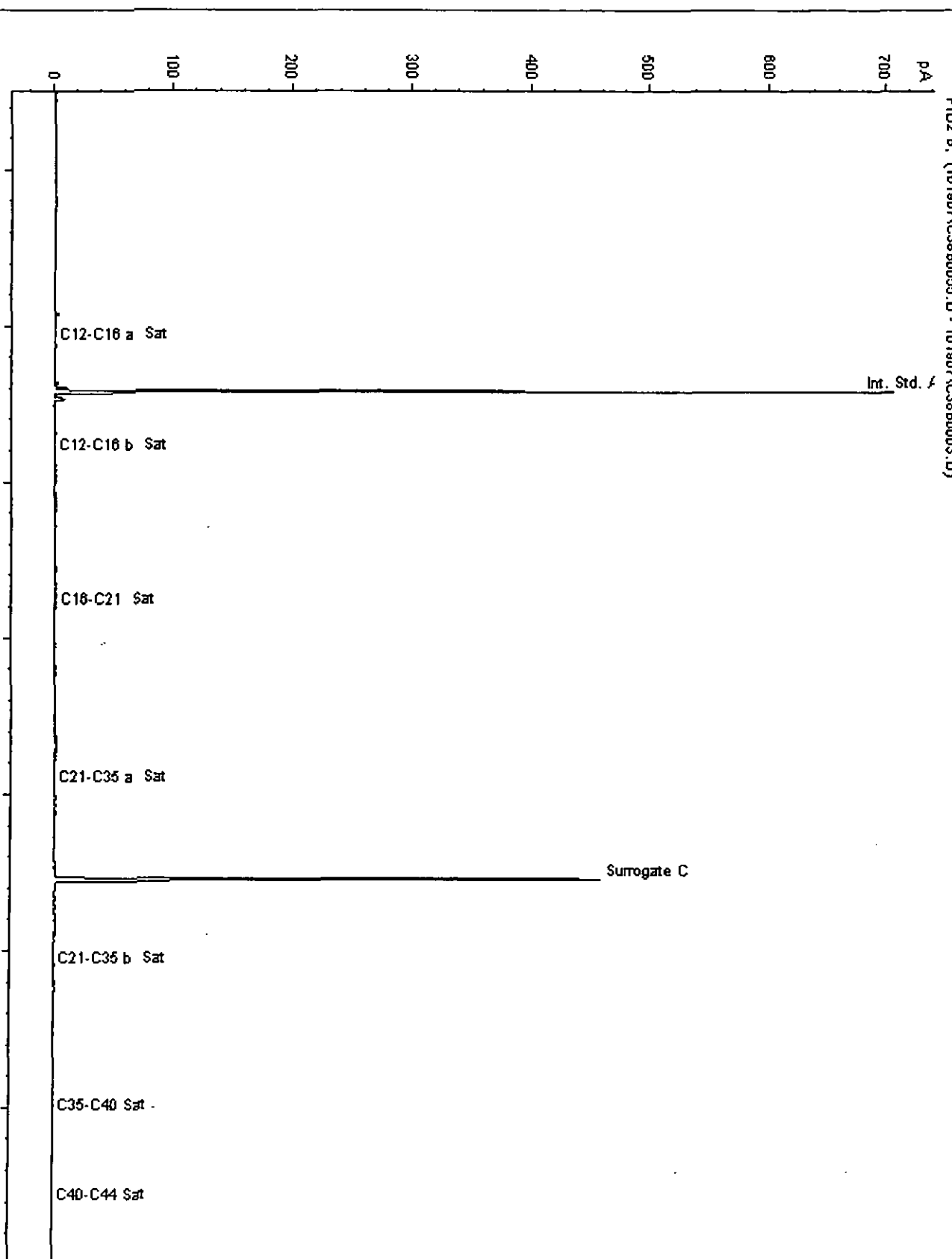
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200718017-38/W
Date Acquired : 20/10/07 10:13:42 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



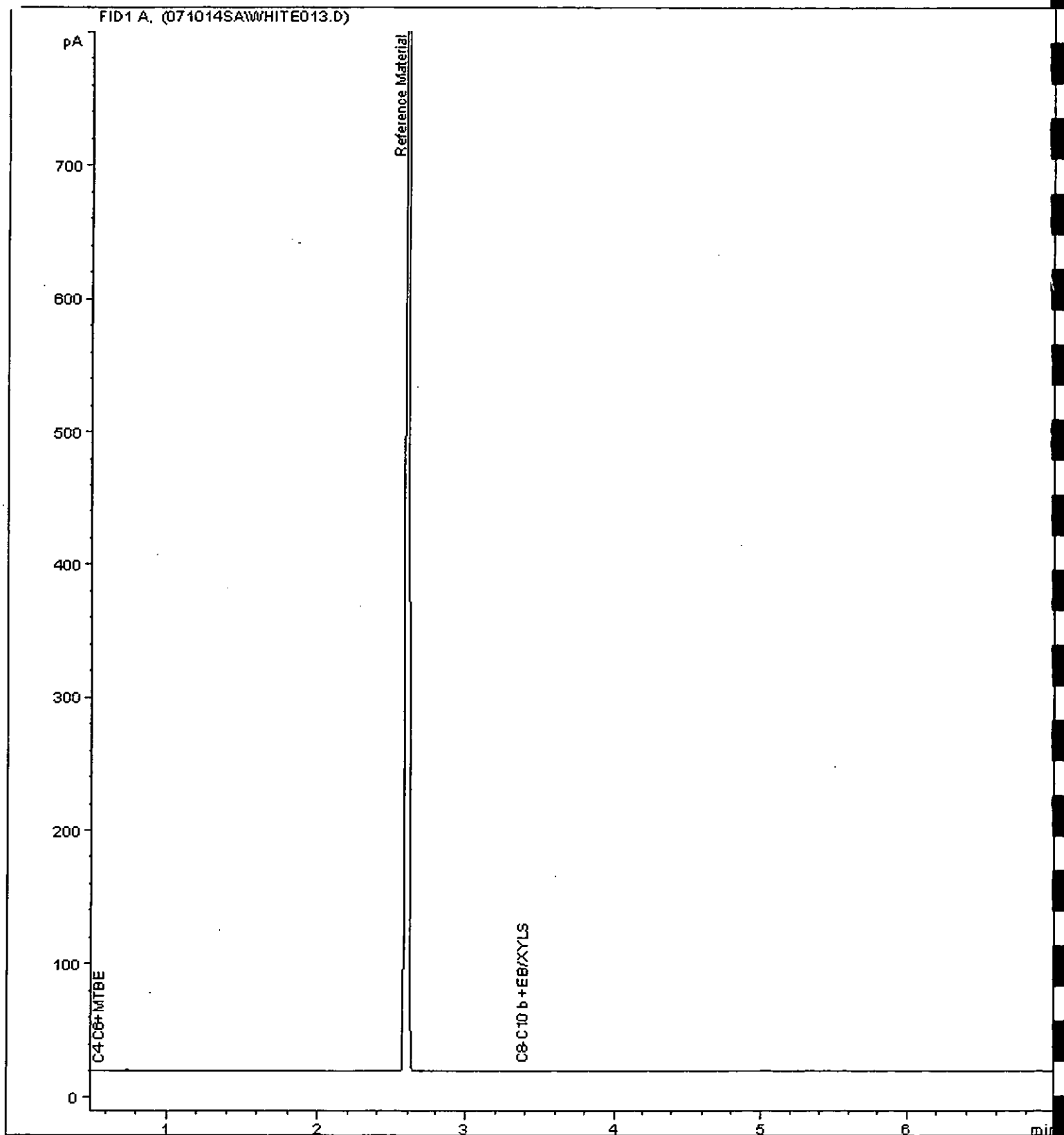
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200718017-38/W
Date Acquired : 20/10/07 10:13:42 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



ALcontrol Geochem Analytical Services
Gasoline Range Organics

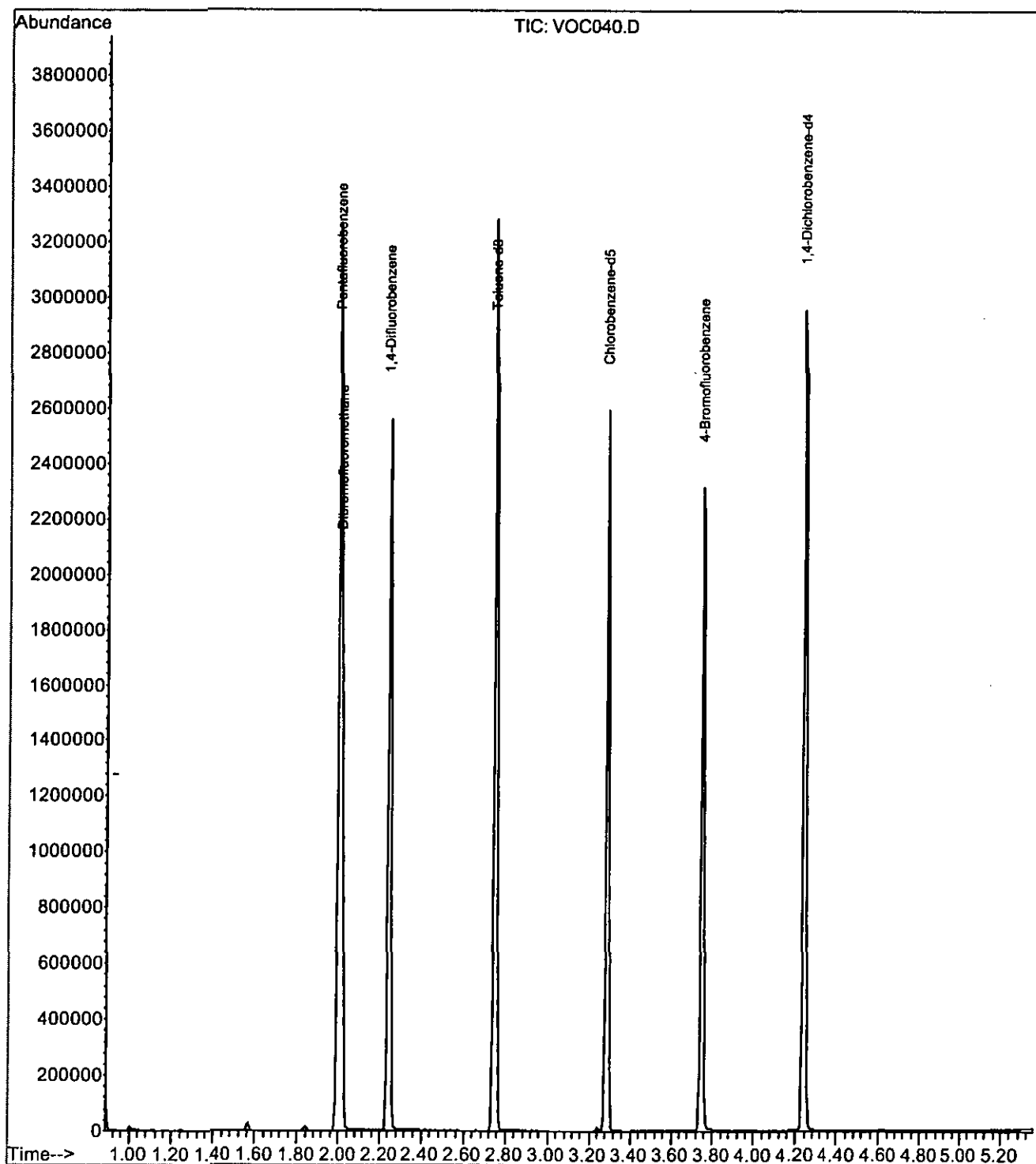
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Date Acquired : 14/10/07 16:41:52 PM
Units : ppb
Dilution : 1



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
 Data File : VOC040.D
 Acq On : 16 Oct 2007 00:52
 Operator : Alcontrol Labs
 Sample : 200718017-042
 Misc : /water
 ALS Vial : 40 Sample Multiplier: 1

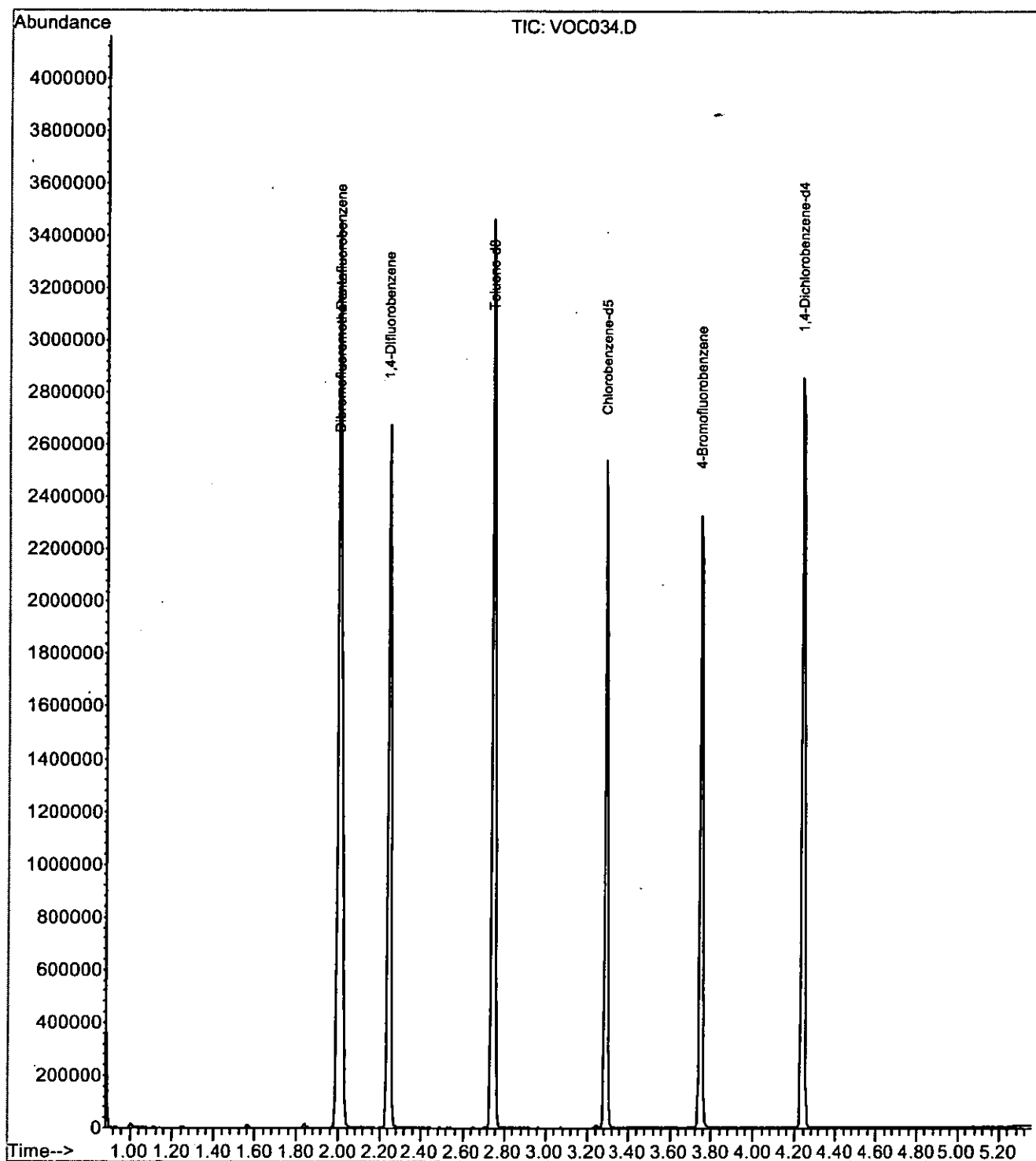
Quant Time: Oct 17 07:01:01 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
 Data File : VOC034.D
 Acq On : 15 Oct 2007 23:47
 Operator : Alcontrol Labs
 Sample : 200718017-008
 Misc : /water
 ALS Vial : 34 Sample Multiplier: 1

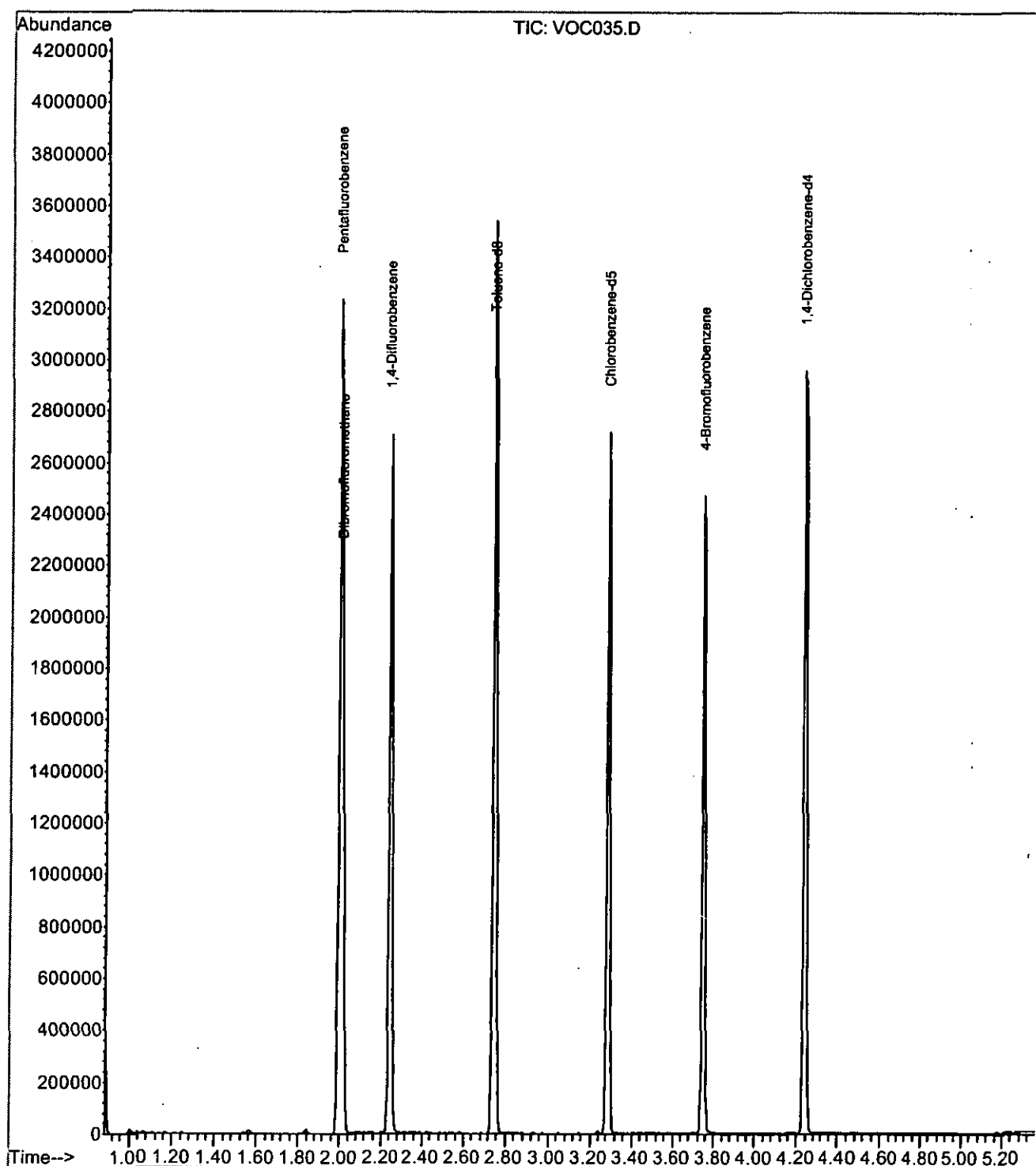
Quant Time: Oct 17 07:00:49 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
 Data File : VOC035.D
 Acq On : 15 Oct 2007 23:57
 Operator : Alcontrol Labs
 Sample : 200718017-016
 Misc : /water
 ALS Vial : 35 Sample Multiplier: 1

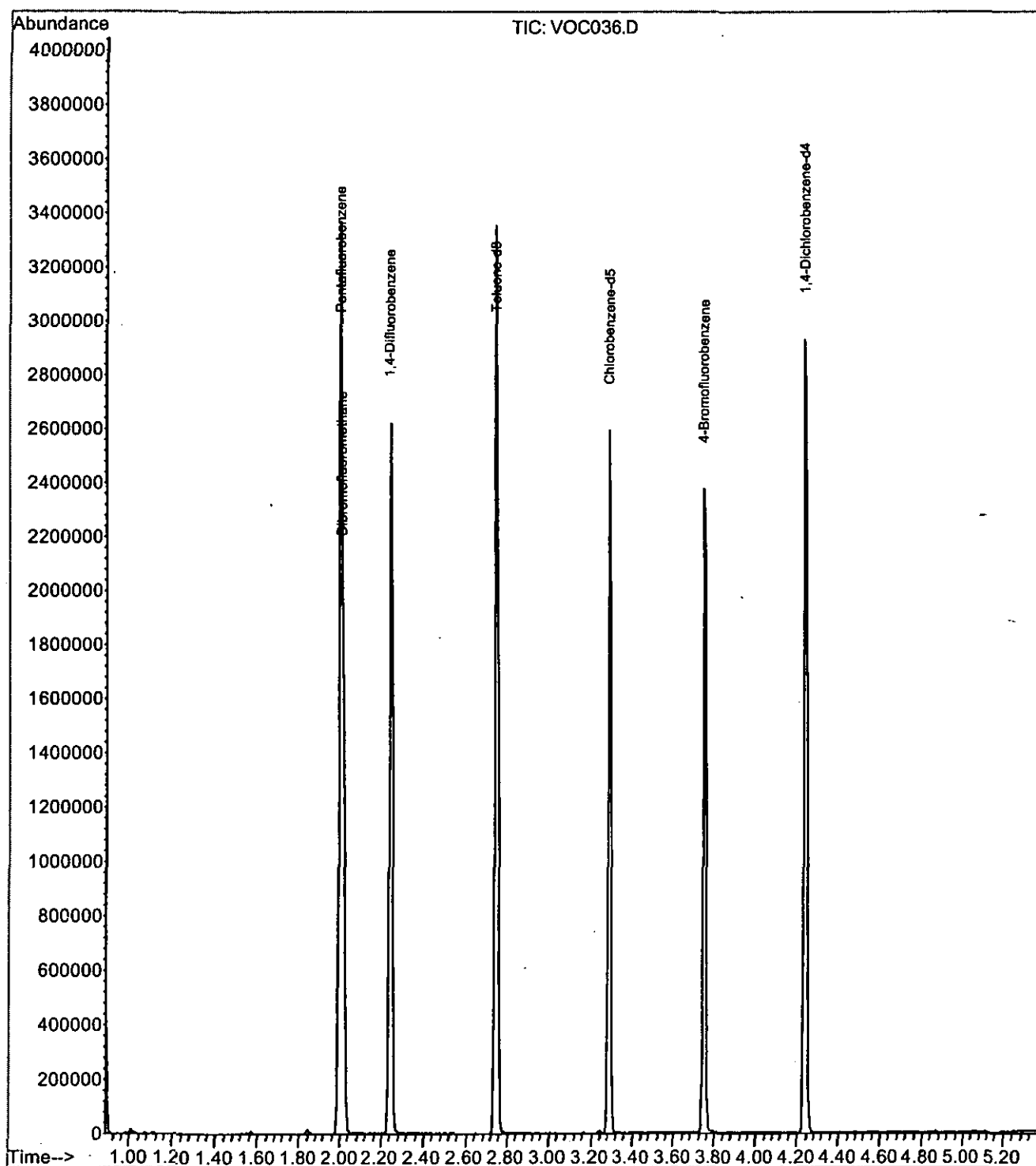
Quant Time: Oct 17 07:00:51 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
 Data File : VOC036.D
 Acq On : 16 Oct 2007 00:08
 Operator : Alcontrol Labs
 Sample : 200718017-022
 Misc : /water
 ALS Vial : 36 Sample Multiplier: 1

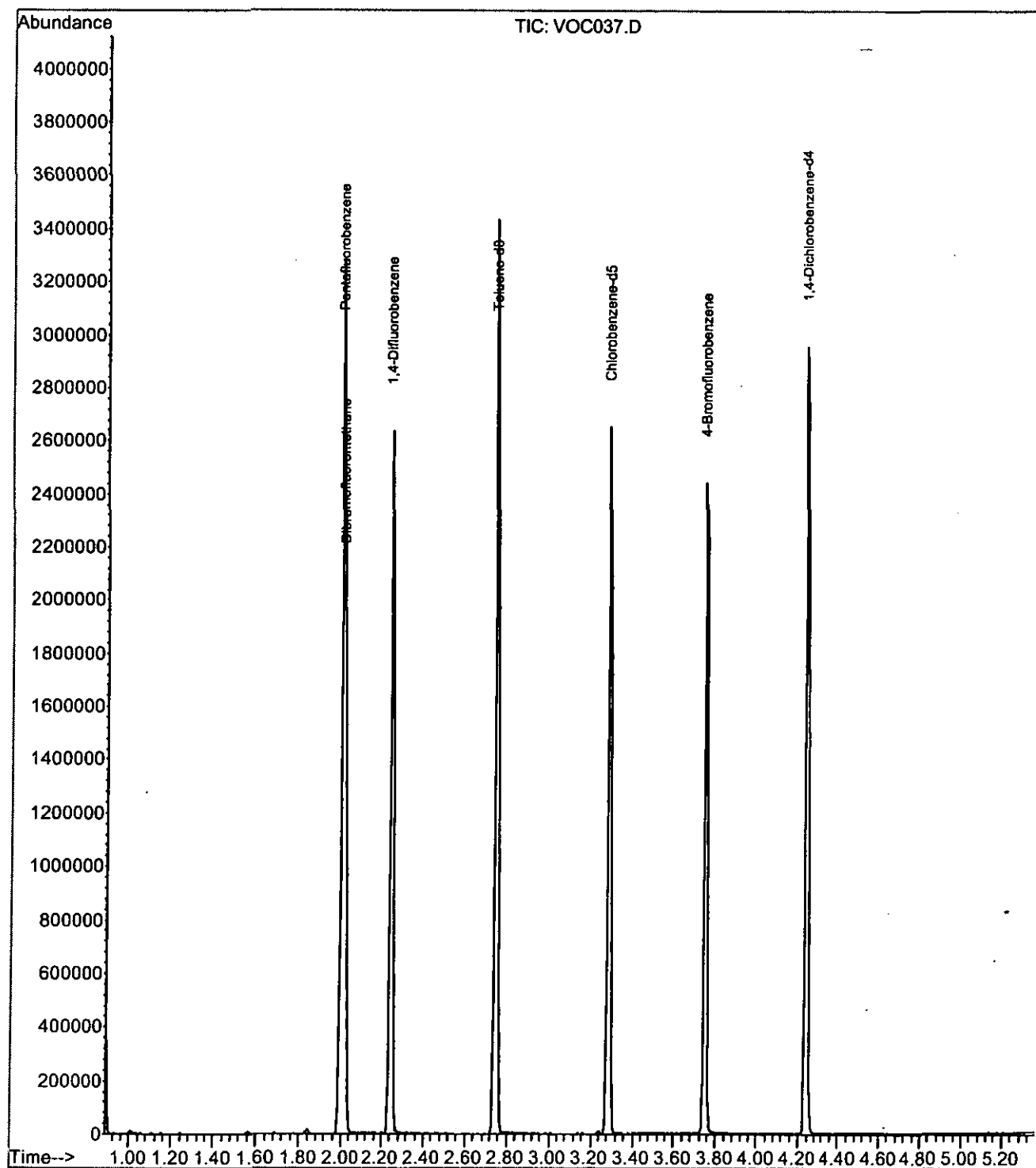
Quant Time: Oct 17 07:00:53 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
 Data File : VOC037.D
 Acq On : 16 Oct 2007 00:19
 Operator : Alcontrol Labs
 Sample : 200718017-027
 Misc : /water
 ALS Vial : 37 Sample Multiplier: 1

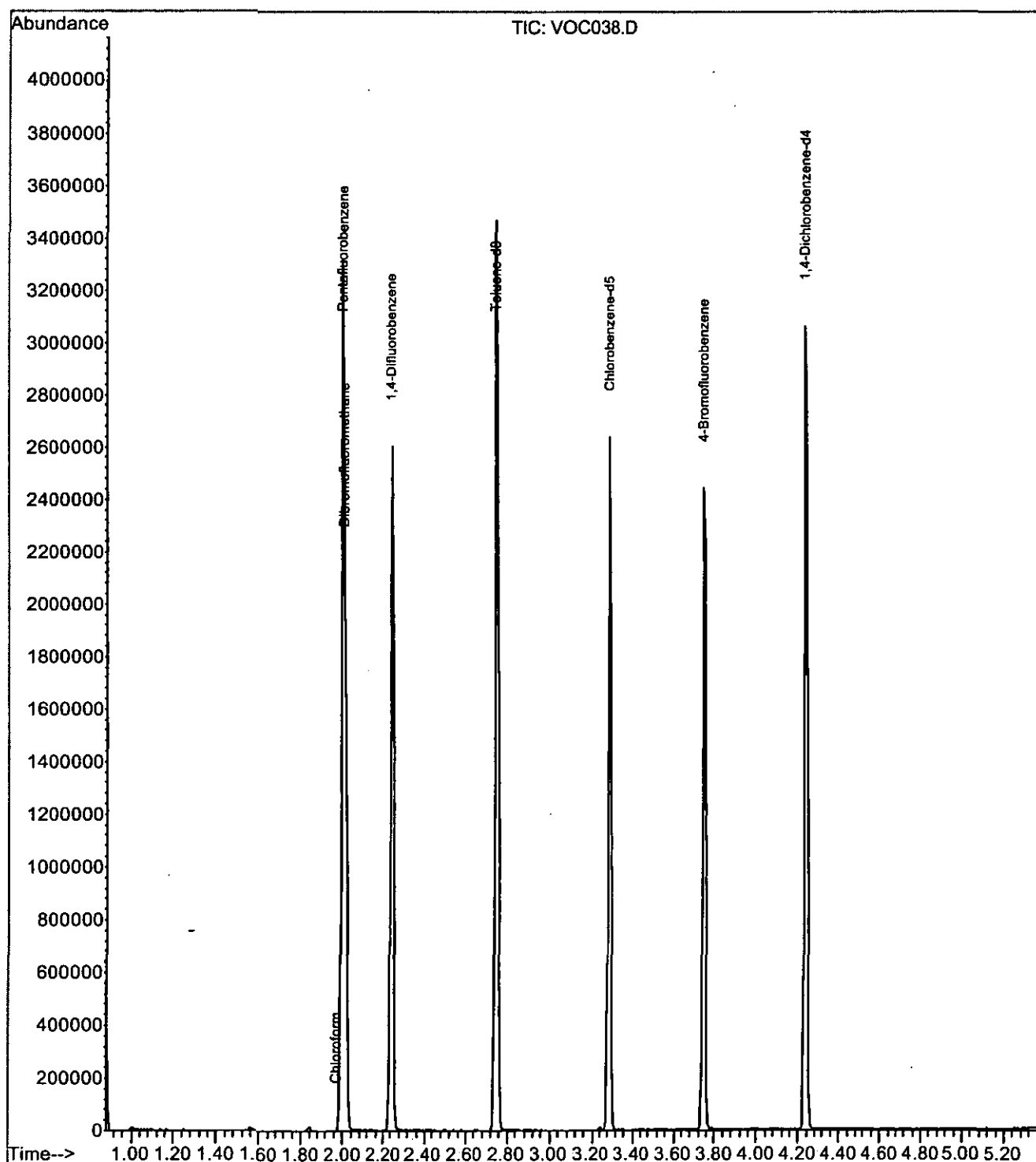
Quant Time: Oct 17 07:00:55 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
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 Acq On : 16 Oct 2007 00:30
 Operator : Alcontrol Labs
 Sample : 200718017-031
 Misc : /water
 ALS Vial : 38 Sample Multiplier: 1

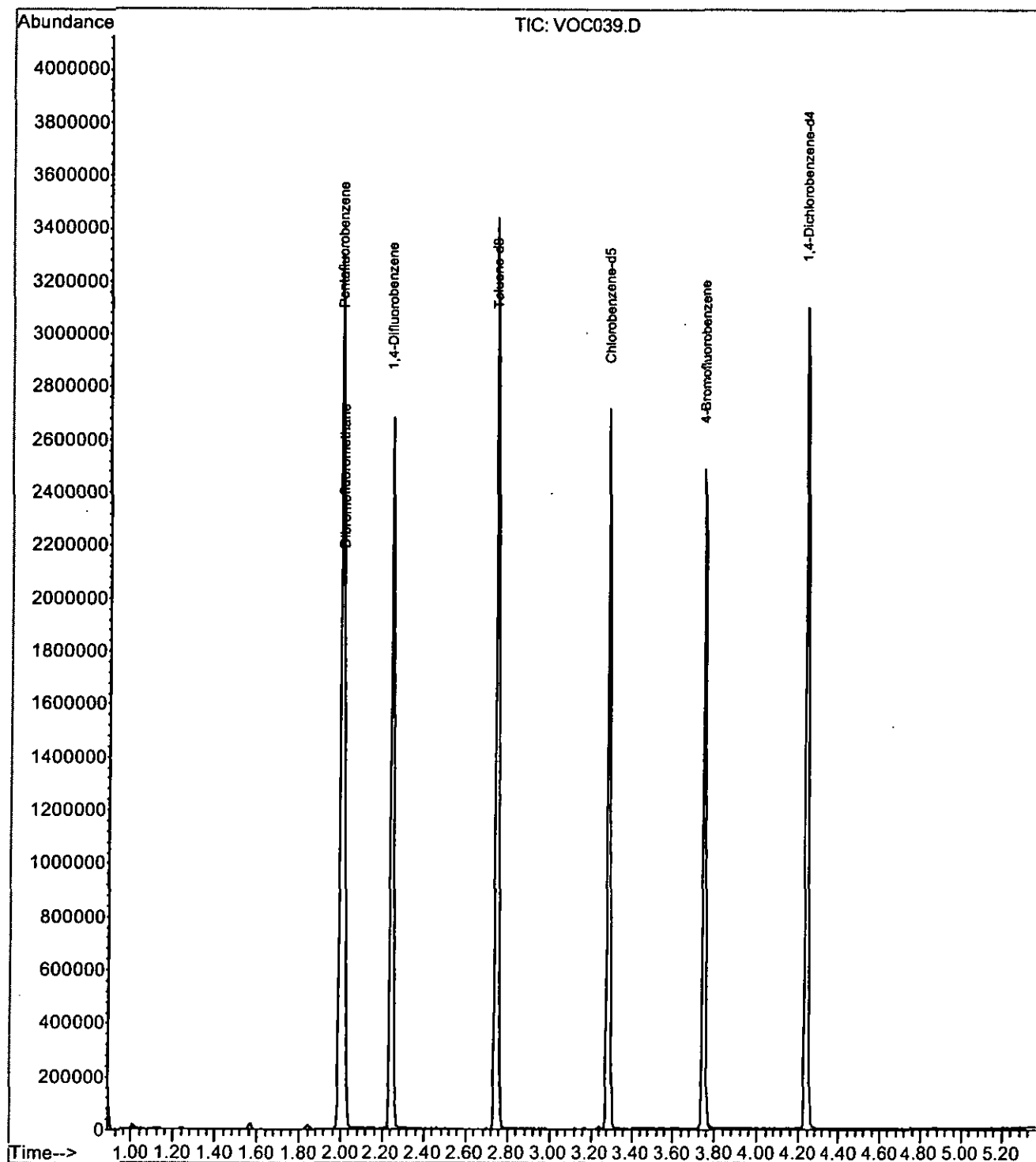
Quant Time: Oct 17 07:00:57 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : C:\MSDCHEM\1\DATA\101507\
 Data File : VOC039.D
 Acq On : 16 Oct 2007 00:41
 Operator : Alcontrol Labs
 Sample : 200718017-037
 Misc : /water
 ALS Vial : 39 Sample Multiplier: 1

Quant Time: Oct 17 07:00:59 2007
 Quant Method : C:\MSDCHEM\1\METHODS\FASTVOC2.M
 Quant Title : Volatile Organic Compounds (EPA 624/8260)
 QLast Update : Wed Oct 17 06:59:02 2007
 Response via : Initial Calibration



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 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 Geochem 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, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD – no fibres detected. If asbestos is detected, then identification is carried out by ALcontrol Shutler. If a sample is suspected of containing asbestos, then further preparation and analysis will be suspended on that sample until the asbestos result is known. If asbestos is present, then no further analysis will be undertaken.
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 no preserved sample is received for cyanide or phenol analysis (HPLC), the laboratory will preserve 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. **Surrogate recoveries** – Currently the only analysis, which is surrogate corrected, is PAHs on soils. For EPH on soils the result is not surrogate corrected, but a percentage recovery is quoted.
13. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
14. 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).
15. Total of 8 speciated phenols by HPLC includes Resorcinol, Catechol, Phenol, Naphthol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
16. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
17. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

RPS

Our services include:

- Asbestos Consultancy
- Contaminated Land
- Disability Access Auditing
- Emissions Monitoring
- Environmental Due Diligence
- Environmental Management
- Environmental Risk Assessment
- Fire Safety Consultancy
- Health and Safety Consultancy
- Human Health Risk Assessment
- Integrated Logistic Support
- IPPC / BAF
- Laboratory Analysis
- Legionella & Indoor Air Quality
- Occupational Hygiene
- Occupational Health
- Procurement Management Support
- Reliability and Maintainability
- System Safety Management
- Training

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